The CEYLON MEDICAL JOURNAL

Official Publication of the Sri Lanka Medical Association

Vol. 20 JUNE 1975 No. 2

CONTENTS

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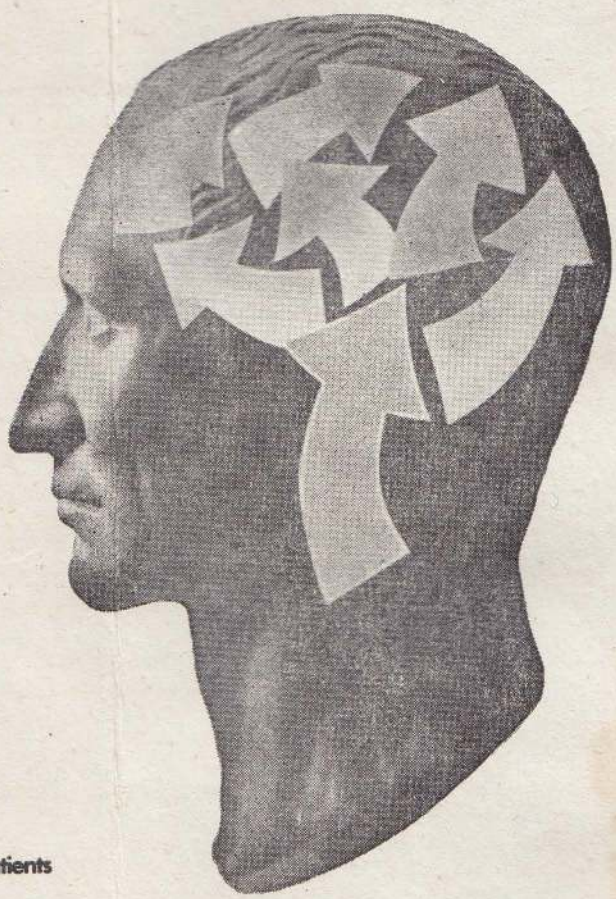

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WISSMER, B. A. L. (1963). The effect of orally administered trioxyethylrutin on haemorrhoids. *Current Therapeutic Research*, **5**, 391 – 400.

RENEVEY, R. (1963). Les hemorroides de la grossesse. *Praxis*, **52**, 121–124.

MATSUSHIMA, Y. and KINUGASA, A. (1966). Trial experience with Venoruton. *New Drugs and Clinic*, **15**, 112–114.

CLYNE, M. B., FREELING, P. and GINSBORG, S. (1967). Troxerutin in the treatment of haemorrhoids. *Practitioner*, **198**, 420–423.

Sinnatamby, C. S. (1973). The treatment of haemorrhoids. *Clinical Trials Journal (London)*, **10**, 45–51.

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The CEYLON MEDICAL JOURNAL

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JUNE 1975

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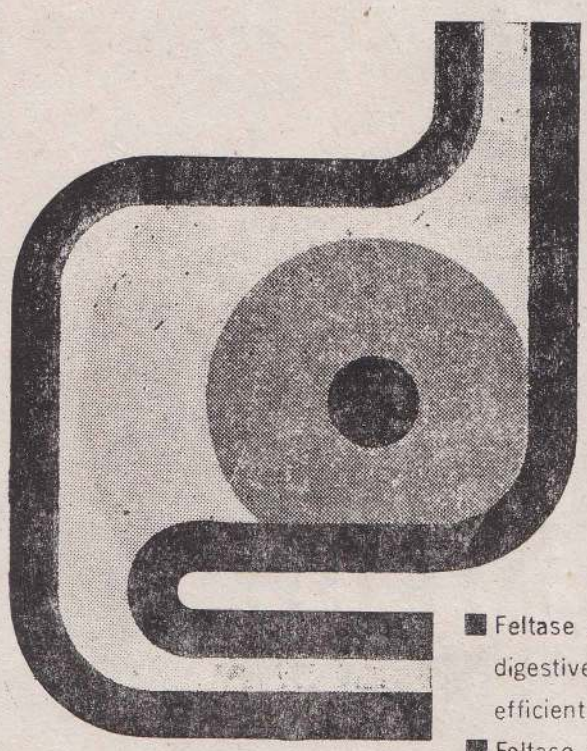

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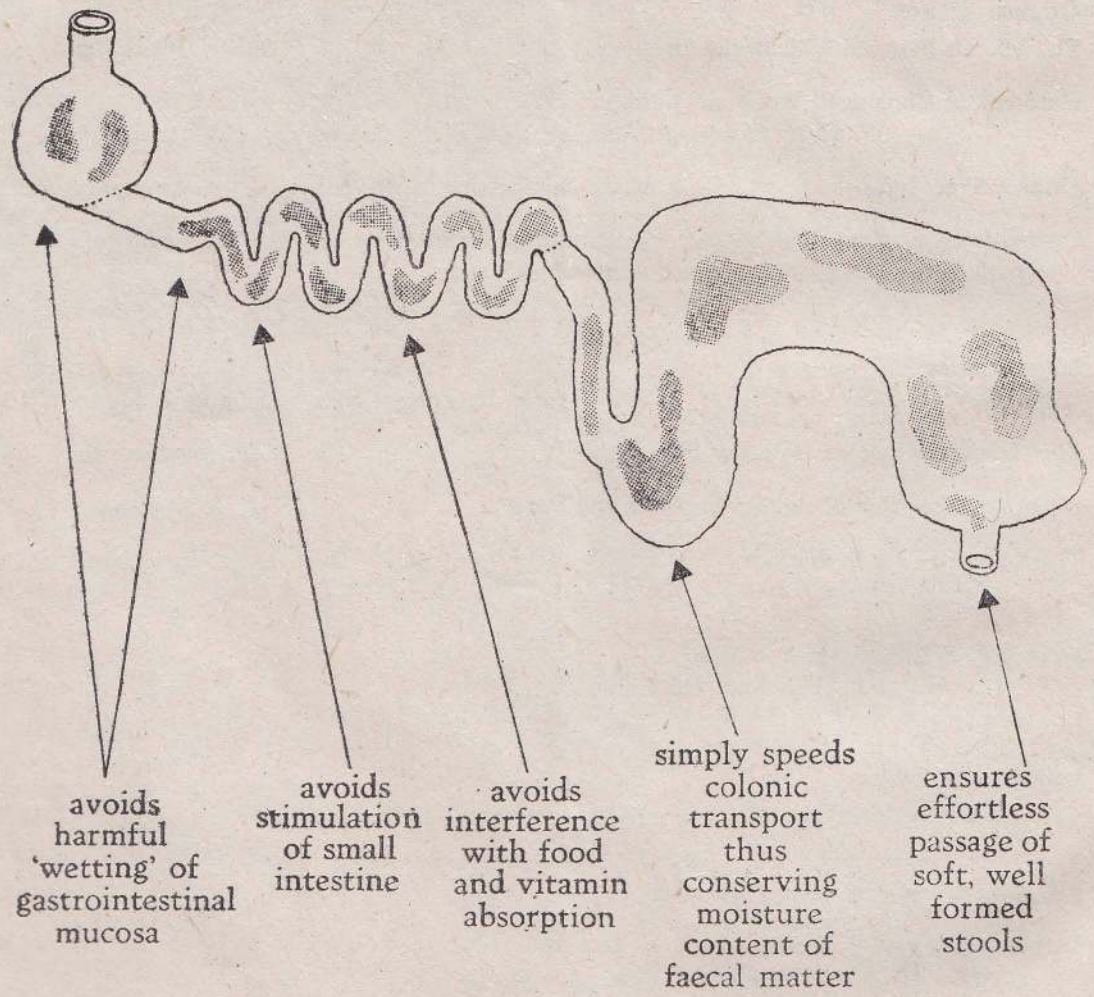

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Abbreviatious used in the article should conform to those given in the Appendix. Non standard abbreviations especially of infrequently used words should not be used.

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Tables should not exceed 8" x 6" in size. They should be self-explanatory and should supplement not duplicate the text. Since the purpose of the data is to compare and classify related items, the data must be logically and clearly laid out. The tables should be typed on separate sheets, be given Arabic numerals and each must have a caption above the tabular material.

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APPENDIX – ABBREVIATIONS

Blood Pressure	B. P.	Inches	in.	Milligram	mg.
Centimetre	cm.	International Unit	i.u.	Minute	min.
Cubic millimetre	cu.mm.	Intramuscular	i.m.	Millilitre	ml.
Feet	ft.	Intravenous	i.v.	Molar	M.
Fluid ounce	fl. oz.	Kilogram	kg.	Ounce	oz.
Gallon	gal.	Litre	l.	Per cent	%
Grain	gr.	Metre	m.	Pint	pt.
Gramme	g.	Microgram	mcg.	Pound	lb.
Hour	hr.	Milliequivalent	m Eq.	Yard	yd.
		Year	yr.		

Editorial

Drugs; Supply, Quality & Cost

For some time now the Medical Profession has been perturbed by the increasing cost of drugs, the non-availability of essential drugs and also the poor quality of some of the drugs available for use in clinical practice.

Repeated requests have been made by members of the Medical Profession to the Independent Medical Practitioners' Association and the Sri Lanka Medical Association regarding the problems which they have to face in their practice. As individual appeals to the SPC while of help to a particular doctor or patient did not seem to be a remedy for this situation the SLMA decided to have a seminar so that members could collectively voice their opinions and in this way draw the attention of the SPC to the problems as they affect the medical profession as a whole.

As the President, Dr. S. A. Cabraal emphasised, the Medical Profession has nothing against the policy of importation of drugs solely by the State. The Medical Profession was concerned only with drawing attention to the problems which have arisen as a result of this policy so that they could be satisfactorily solved with benefit both to the public as well as to the doctors. There was no question of asking for the importation of drugs to be given back to the private sector.

The SLMA was not concerned with evaluating the work of the SPC or to discuss the advantages and the disadvantages of the State take-over of the import and distribution of drugs. The Seminar was solely concerned with trying to bring to the notice of the SPC (if it was not already aware) of the problem facing the doctors as reflected in their numerous complaints. It was not concerned with criticizing the SPC for the sake of bringing it into disrepute as some have alleged. If this was the intention, there was no need to invite the Chairman of the SPC and the staff and also give full time to the Chairman to express his views on the platform. The Medical Profession as a whole needed information on what was happening in this country with regard to drugs and what means are being taken to solve these problems, for there was undoubtedly a failure of communication between the SPC and the Medical Profession as a whole.

One of the points discussed by the speakers was the high prices of drugs sold by the SPC. The speakers made it clear that they were aware that world prices of drugs have increased owing to various factors. What they were protesting was against the arbitrary way in which prices are fixed on the existing C.I.F. values. As pointed out by 2 speakers, the retail price of a drug in the past was equal to the C.I.F +100%. For example Diazepam 5 mg tablets which is obtained by the SPC at a C.I.F. value of Rs. 7.56 per 1000, would have in the past been sold at a retail price of Rs. 15.12.

But now, *many of the common drugs* are sold at a price greater than C.I.F. + 100%; usually at a price equal to C.I.F. + 300 to 400%. In some cases drugs are sold at a price greater than C.I.F. plus *thousand per cent*. For example the retail price of Diazepam 5 mg is Rs. 120.00 per 1000 which is equal to C.I.F. + 1487%. Similarly the C.I.F. value of chlorpheniramine tablets is Rs. 3.73 per 1000 while the retail price is Rs. 50.00 which is equal to C.I.F. plus 1240%.

It has been argued that retail prices equal to C.I.F. plus more than 100% is charged only for 30% of drugs, while for 70% of drugs the price is fixed at C.I.F. + 100%, but as pointed out this 30% comprise about 500 drugs and what is even more important is that these 500 drugs constitute over 90% of the *commonly used* drugs. This means that people now have to pay more for the common drugs with the new method of price fixing than they would have, if fixed according to the method adopted in the past when the private sector was importing these same drugs. These facts are irrefutable.

Such price fixing has also been justified on the basis that the price for any particular drug is still within the price range prevailing before the SPC take-over. This is a fallacious argument because it assumes that in the past many bought the drugs in the higher price range. In fact many, bought drugs in the lower price range, indentical brands of which are now sold at higher prices on the basis that these prices are still within the original price range.

The Chairman of the SPC has stated that such high prices have been fixed for common drugs to give Rs. 4 million to the Government in lieu of FEEC's. In view of the fact that the amount involved is small in terms of the impact on the economy of the country and since the high prices of essential drugs hits the ordinary man very hard we make a strong appeal to the Ministry of Finance to waive this amount so that all prices could be fixed at C.I.F. + 100%. The Chairman of the SPC himself has said that he would support the SLMA and IMPA in asking the Government to waive the Rs. 4 million.

The numerous letters received frequently both by the IMPA and the SLMA testify to the frequent shortages of even common drugs such as Ferrous sulphate, Vitamin C and Paracetamol and Frusemide to mention only a few. When one becomes available another is found to be out of stock. This has proved quite irksome to the doctors who prescribe the drug and causes much hardship to the patients who have to spend much time and money going from place to place in search of these drugs.

The SPC should not wait for doctors to inform them that a drug is not available. There must be an efficient method devised to give early warning of a likely shortage.

The speakers also drew attention to the poor quality of some of the drugs imported. Some were of doubtful potency as in the well known case of Polish Insulin, while in others the keeping qualities

were poor. All this had a bad effect on the patient, who in addition had to pay a high price for them. Attention of the SPC has been drawn to these poor quality drugs by individuals and by members of the Formulary Committee. The speakers hoped that at least now steps will be taken to import drugs from sources which have been found to be good in the past. This is particularly true for drugs where differences in bioavailability has been shown to exist between different brands.

We recommend that in view of the fact that bioavailability testing can only be done on a very limited scale at present in this country and not as routine procedure, where differences in bioavailability exist, brands known from past usage to be reliable, should be imported.

One speaker also spotlighted the fact that products which have an expiry date are brought in bulk and sold loose to patients. This leaves room for outdated products to be sold as there is no way of checking the expiry date. It is therefore strongly recommended that all dated products should only be sold in original containers with the expiry date clearly marked by the manufacturer.

Another aspect to which attention was focused was the poor quality of some of the pharmacists who were in charge of dispensing, in chemist shops. There have been several instances where the wrong drug had been dispensed because of a similarity of names. The confusion has arisen not only regarding similar generic names with which they were probably unfamiliar but also with familiar brand names as well. There have also been instances where one type of anti-malarial has been dispensed for another such as for example primaquine for chloroquine. Since many of the drugs that are prescribed today have powerful effects on the body and not mere harmless placebo effects such mistakes can often have serious consequences.

It is regrettable that the training of pharmacists by the Ceylon Medical College Council has ceased. Those who wish to qualify as pharmacists now, have merely to submit proof that they have undergone a period of apprenticeship under a qualified pharmacist, to allow them to sit for the examination. This training is not properly supervised as is evident from the results of the examination where not more than 8 to 10 candidates out of about 175 pass each year. The examiners have found that many cannot even dispense a simple mixture or ointment, yet as apprentices they man many of the chemist shops and dispense prescriptions. If we are to prevent an increasing incidence of morbidity and mortality due to wrong dispensing the Health Ministry should restore the internal pharmacist training course immediately and do away with the external pharmacist examination once and for all. Even if the Health Services do not wish to employ pharmacists this step will ensure that at least well trained pharmacists will be available to the private sector for employment in the chemist shops.

It was also brought to the notice of the audience that people come from other countries to purchase popular brands of drugs not available in their own countries and that substantial amounts of imported drugs are taken out to neighbouring countries, thus aggravating the drug shortage. The only solution would be to ban the taking away of imported drugs by people leaving the country except small amounts for personal use.

The seminar sponsored by the SLMA has served a very important function in spotlighting the problems faced by the Medical Profession with regard to the supply, cost and quality of the drugs made available to them by the SPC.

The seminar provided clear evidence that these complaints are not those of a few individuals with some ulterior motive but those of many medical practitioners who are concerned with the treatment of their patients in everyday practice.

The presence of the Chairman as well as the staff of the SPC was a salutary one, as all of them were able to get a first-hand account of the situation from the point of view of the doctors. The Chairman admitted that there have been problems regarding quality and shortage of drugs and gave reasons for their occurrence. He also admitted that he had to fix the retail price of some drugs at CIF + 300–400%, due to circumstances beyond his control. What was even more important was the fact that he was able to give in outline, corrective measures he proposed taking to avoid any recurrence in the future.

It is therefore strange to find a correspondent of a weekly newspaper who had obviously not been present at the seminar, abusing the SLMA with hackneyed terms such as "Medical Mudalali's" and making personal attacks on the speakers for focusing attention on the shortcomings of the SPC. If there were no shortcomings there would have been no need for the Chairman to discuss the corrective measures he has taken or will take in the near future.

The correspondent obviously subscribes to the philosophy that Government Institutions should not be criticized in public whatever their shortcomings and that if criticism cannot be met the critics must be abused.

THE MARCUS FERNANDO MEMORIAL ORATION 1974

Hepatic Amoebiasis

S. RAMACHANDRAN*

Ceylon Medical Journal, 1975, **20**, 69 - 81

I thank you most sincerely, Mr. President, for the very kind manner in which you have, this evening, introduced me to this distinguished gathering.

President, Members of the Council of the Sri Lanka Medical Association, guests, ladies and gentlemen, I am deeply conscious of the singular honour bestowed upon me in being invited to deliver the Sir Marcus Fernando Memorial Oration for a second time in four years. I regard it with pride as the highest honour, which it has been my privilege to receive, and for this, I am grateful to the Sri Lanka Medical Association.

At the turn of this century, Sir Leonard Rogers began his series of investigations in India which were to form so much of the basis of our present understanding of the problems concerning hepatic amoebiasis. He later reviewed and summarised his work in the Lettsomian lectures delivered before the Medical Society of London in 1922 (Rogers, 1922). In Sri Lanka, during this period, Sir Hilarian Marcus Fernando, took an abiding interest in locally prevalent diseases like malaria, amoebiasis and ankylostomiasis. These topics formed the theme of his Presidential address to the Ceylon Branch of the British Medical Association in 1905. It is thus fitting that my subject hepatic amoebiasis should amply commemorate the memory of this brilliant physician whose outstanding achievements have been excellently documented by the late Lord Rosenheim in the inaugural oration of this series in 1969. As a result of his many distinctions he stands amongst the medical giants of this country who have been a source of inspiration to their future generations.

*Physician, Colombo North Hospital, Ragama.

Since the time of Sir Marcus, there has been a moving tide in our concepts on hepatic amoebiasis. This tide, while running strong, helped to enlighten us on many of the problems beset with misinformation and misplaced emphasis.

Hepatic amoebiasis is the commonest extra-intestinal manifestation of intestinal amoebiasis. Numerous terminologies have been used in the clinical classification of this disease (Wilmot, 1962; Islam, 1969). For practical purposes, I prefer to adhere to a simplified description: namely,

1. *Hepatic amoebiasis where pus is demonstrated* – the proven amoebic liver abscess, and 2. *Hepatic amoebiasis where no pus* is demonstrable. Either of these conditions could present acutely, subacutely or in a chronic manner (Ramachandran *et al.*, 1972a). This classification would eliminate the use of the term *'amoebic hepatitis'*, a medical misnomer.

Two vital questions arise as a consequence of this clinical grouping: firstly, are all liver abscesses caused by *Entamoeba histolytica*, and secondly, what is the definitive aetiology, probable pathogenesis and the best criteria for diagnosis of the condition we commonly consider as hepatic amoebiasis without demonstrable pus? Recent developments in the immunodiagnosis of amoebic infections and clinico-pathological studies on large series of cases with hepatic amoebiasis have, in no small measure, helped us to unravel the answers to these outstanding problems.

Entamoeba histolytica induces an antibody response only when it invades host tissues. The antibody response is partly dependent on the quantity of the parasitic products taken into the reticulo-endothelial-system, and is hence enhanced by repeated exposure to infection. Death of the parasite potentiates further the antibody response. In order to detect the presence of antibodies,

skin tests and serological reactions have been used.

A positive intra-dermal skin reaction of the immediate type could occur due to the introduction of antigens derived from the protozoan into the skin of individuals with invasive amoebiasis. The antibodies causing this type of reaction belong to the IgE or reaginic class. Maddison and her colleagues (1968) obtained a positive skin reaction in about 83 per cent of patients with liver abscesses. From their observations, they concluded that the intra-dermal test is less sensitive than the serological reactions in the detection of antibodies in invasive amoebiasis. It becomes clear that further refinements in skin testing awaits the production of more purified antigens from the protozoan. This would reduce the incidence of positive reactions in healthy control subjects.

The widespread use of reliable serological tests have done much to dispel some commonly held myths about hepatic amoebiasis (Powell, 1969). These tests depend on the presence of antibodies of a heterogenous type belonging mainly to the IgG class. The various techniques used in serological testing are 1. Precipitin test, 3. Latex agglutination test, 2. Complement fixation test, 4. Haemagglutination test, 5. Indirect fluorescent antibody test, 6. Immunodiffusion, 7. Immuno-electrophoresis, and 8. Counter-immunoelectrophoresis. In order that any single test may be of use for clinical work in endemic areas, the method used should be easy to perform, not too time consuming, specific, reasonably sensitive, reproducible and inexpensive.

These conditions have, to some extent, been satisfied by the indirect fluorescent antibody test using a slide method. All patients with proven liver abscess had a positive indirect fluorescent antibody test in serum dilutions of 1:10 and above. When a dilution of 1:20 was taken as a significant titre, 94.1 per cent of the cases gave a positive result. (Ramachandran & Rajakulendran, 1975). In contrast, in patients with other clinical illnesses where hepatic involvement is not uncommon, as in typhoid fever, leptospirosis and malaria, and in viral hepatitis and alcoholic hepatitis; a positive result at a serum dilution of 1:20 was obtained in only 5.3 per cent of cases. These results not only indicate the specificity and sensitivity of the method used, but also exemplify, fairly conclusively, an amoebic aetiology in these cases with liver abscess. In other studies using the indirect fluorescent antibody test, Maddison and her group (1968) in South Africa had a 95 per cent positivity while Agarwal *et al.*, (1971) from India reported a figure of 96 per cent. Jayewardene *et al.*, (1973) reporting a significantly positive test in 75% and using a tube method indicated the need for a simplified slide technique. We, in our studies also observed that the serum dilutions giving a positive result did not correlate with the nature and severity of the clinical illness. Nor was there any correlation with the degree of tissue invasion as suggested by the size of the abscess cavity as judged by the quantity of pus evacuated.

Our observations therefore show beyond doubt that in Sri Lanka, as in most tropical countries, all liver abscesses except the small ones found in suppurative cholangitis, portal pylephlebitis and generalised septicaemias are of amoebic origin, no matter whether or not the pus obtained is sterile and amoebae are present.

This brings us to the possible cause for the infrequency of finding amoebae in liver pus evacuated from an abscess, even though the trophozoites may be seen in the wall of the abscess in histological sections or in scrapings. Amoebic liver pus, an autolysate of liver tissue, was noted to have a pH range 5.8 to 6.4 a sub-optimal pH. When used as a culture medium, and innoculated with living *Entamoebae histolytica* there was no growth of the protozoan. It would appear that the low pH of amoebic pus does not potentiate growth nor survival of the trophozoites within the abscess cavity, (Ramachandran, Induruwa & Rajakulendran, 1975).

The next question to be settled is the nature of the syndrome of hepatic amoebiasis where no pus may be demonstrable. Although Powell in South Africa has stated that this condition is rarely if ever seen in his country (Powell, 1969), clinicians working in parts of Asia, including Sri Lanka, are quite familiar with patients having this clinical entity.

Indirect fluorescent antibody tests done on patients suspected as having this disorder were positive in 89.4 per cent at a serum dilution of 1:10 and 73.7 per cent at the significant titre of 1:20 or above (Ramachandran & Rajakulendran, 1975). This, once again, suggests very strongly and convincingly an amoebic aetiology for the syndrome. The values for the positive titres obtained were comparable to the titres observed in patients with proven amoebic liver abscess.

A modification of the criteria for diagnosis of this condition laid down by Kean (1955) would be fever, right chest or hypochondrial pain, hepatomegaly, hepatic tenderness, a previous history of amoebiasis, leucocytosis, elevated erythrocyte sedimentation rate, suggestive radiological changes and a satisfactory response to amoebicidal therapy. By analysing the clinical features in patients diagnosed as having this syndrome and confirming its amoebic aetiology by the presence of a positive indirect fluorescent antibody test, it became possible to give a more precise and realistic assessment of the criteria which should be used in diagnosis. It was observed that the more convincing criteria would be the presence of fever, hepatomegaly, hepatic tenderness, significantly raised erythrocyte sedimentation rate, radiological charges, and a good response to amoebicidals. Leucocytosis and a previous history of amoebic infection appear to be criteria of lesser importance (Ramachandran, de Mel & Rajakulendran, 1975).

What then would be the pathogenesis for this syndrome? In a study on 100 cases with hepatic amoebiasis it was observed by us that pus amounting to only a few millilitres was sometimes incidentally obtained during per-cutaneous liver biopsy, thus supporting the contention of Lamont and Pooler (1958) and Milroy Paul (1960), that the syndrome may be due to the presence of small deep seated abscesses not requiring therapeutic aspiration or not accessible to an aspirating needle. Vascular factors and congestion due to histamine release from necrotic liver tissue may be a cause for the hepatomegaly. In support of this contention is the rapid relief of symptoms and loss of hepatomegaly observed by us with decompression of an abscess of small dimensions by closed aspiration. The rapid loss of symptoms and signs would hardly be explained by any other factor.

On the other hand, the occurrence of a variety of non-specific histological lesions in the liver may indicate that the syndrome may be the result of a non-specific reactive hepatitis secondary to chronic intestinal amoebiasis (Ramachandran, Sivalingam & Perumal, 1973). The lesions observed were focal mononuclear infiltration (94.6%), granulomata (41.6%), portal tract infiltration (97.2%) and the presence of necrosis and microabscesses (10.3%). (Figures 1 & 2). The discrete nature of the hepatic lesions further exemplifies the error in the use of the term *'amebic hepatitis'*. The hepatic lesions appear to be due to portal invasion by amoebae and their metabolic products, bacteria and toxins as a consequence of the intestinal ulceration. In support of this postulate is the occurrence of non-specific hepatic lesions of a similar type in other diseases with intestinal ulceration like typhoid and paratyphoid fever (Ramachandran, Godfrey & Perera, 1974) and ulcerative colitis.

Thus in cases diagnosed as having the syndrome of hepatic amoebiasis without demonstrable pus, the aetiology appears to be of amoebic origin; the pathogenesis is probably due to single or multiple factors like the presence of small deep seated abscesses vascular congestion and the occurrence of a non-specific reactive hepatitis due to intestinal amoebiasis (Figure 3). The clinical features of importance in diagnosis have already been detailed.

Having dealt with some problems which have, until recently, been the subject for conjecture and controversy, I shall myself confine to clinical problems concerning the disease as it presents itself in Sri Lanka.

The association between amoebic dysentery and hepatic amoebiasis

Hepatic amoebiasis usually occurs after a variable period of time following intestinal infections with the *Entamoeba histolytica*. (Craig, 1946). In our studies conducted in Sri Lanka it was noted that the hepatic illness could occur from a few days to several years, sometimes as long as 10 to 15 years, after intestinal infection (Rajasuriya *et al.*, 1962; Ramachandran *et al.*, 1972a). This indicates the importance of chronic asymptomatic infections in the causation of the hepatic disease. However, in a more recent study, we observed that hepatic manifestations of a significant type could occur

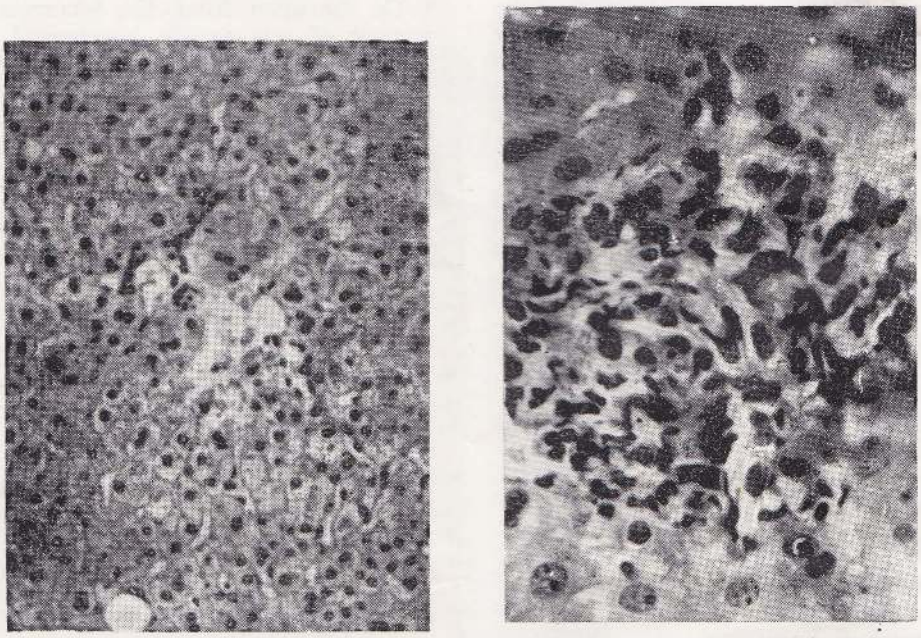


FIG. 1. Focal mononuclear cell infiltration and granulomatous lesions observed in patients with hepatic amoebiasis without demonstrable pus (Ramachandran *et al.*, 1973).

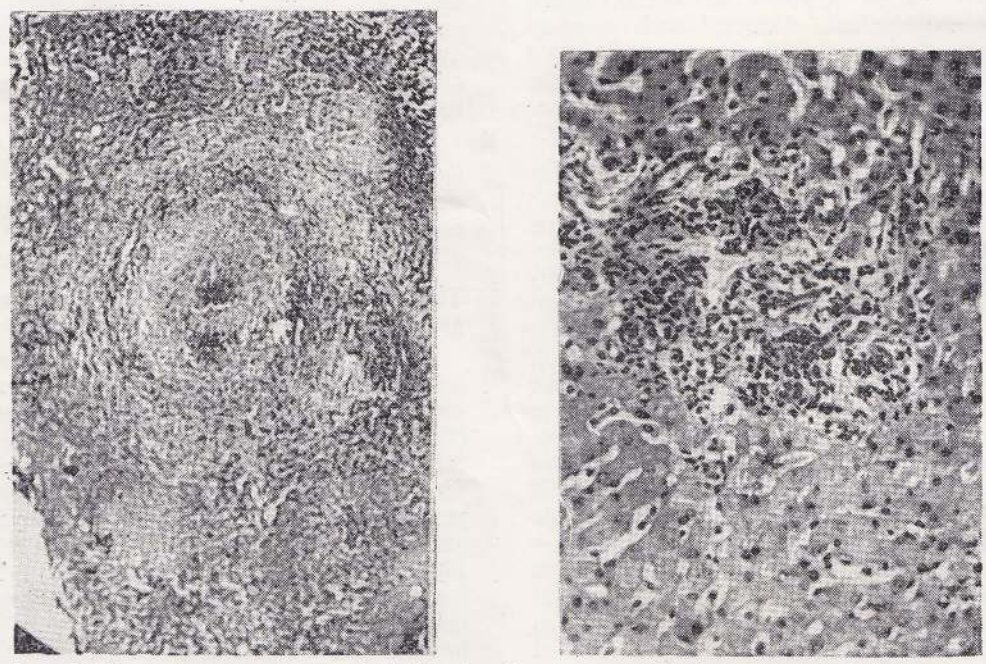


FIG. 2. Micro-abscess and portal infiltration in patients with hepatic amoebiasis without demonstrable pus (Ramachandran *et al.*, 1973).

1. SMALL ABSCESSES
(Lamont, M. C. E. & Pooler, N. R., 1958; Paul, M. A., 1960)

2. VASCULAR FACTORS

3. NON-SPECIFIC HEPATIC REACTION INTESTINAL ULCERATION
(Kean, B. H., 1955 & 1957; Ramachandran, S; Sivalingam, S. & Perumal, J. R. A., 1973)

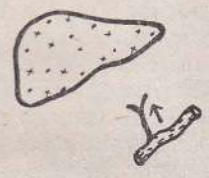


FIG. 3. Concepts in hepatic amoebiasis without demonstrable pus.

in 57.5 per cent of cases during episodes of acute amoebic dysentery (Ramachandran, de Saram, Rajapakse & Sivalingam, 1973). The hepatic manifestations were liver abscess (3.5%), hepatic amoebiasis without pus (25%) and tender hepatomegaly (29%). Non-specific histological changes akin to that already described were noted in the latter two groups of patients. Hence it would appear that hepatic involvement could occur during acute amoebic colitis or may be postponed for variable periods after symptomatic or asymptomatic intestinal amoebiasis.

As hepatic amoebiasis presents a serious problem in certain semi-urban and rural areas in Sri Lanka it becomes necessary to study *the epidemiology of the disease* in this country. From our studies there is good evidence that 3 main factors are responsible for the high incidence of the disease. They are 1. the high incidence of intestinal infections with *Entamoeba histolytica,* 2. adverse environmental conditions, and 3. personal predisposition and a breakdown in the resistance of the individual (Ramachandran *et al.,* 1972a).

A previous history of diarrhoea could occur in up to 56.8 per cent of cases of hepatic amoebiasis, indicating the high incidence of intestinal infection with the protozoan. In the presence of this high prevalence of intestinal infections adverse environmental conditions like poor environmental sanitation and pollution would predispose to the spread of infection. With this exposure to the above factors, inadequate personal hygiene, personal predisposition and reduced resistance of the individual may precipitate the occurrence of the illness. The latter factors appear to be an interaction between chronic alcoholism, intestinal helminthiasis, inadequate dietary protein and physical exertion and exhaustion.

The incidence of moderate to severe alcoholism varies from about 55 to 90 per cent in studies conducted in this country (Rajasuriya *et al.,* 1962; Ramachandran *et al.,* 1972a; CanagaRetna, 1974). The majority of patients took toddy and arrack, (both coconut and pot arrack) for long periods. While the hepatotoxicity of alcohol in the occurrence of the discase cannot be overlooked (Anderson, 1953), the high incidence of toddy drinking indicated that this drink may serve as a transport medium for the protozoan from pollution by birds and flies during its collection from the coconut palm. However, when we innoculated samples of toddy with the trophozoite there was no growth of the protozoan. This we attributed once again to the very low pH of toddy, ranging from 3.2 to 3.6, which would be an adverse factor for the growth and survival of the trophozoites. Hence it is more probable that toddy may serve as a transport medium for the more resistant cysts of Entamoeba rather than the vegetature forms.

The high incidence of intestinal worm infestations suggests that mucosal erosions produced by these parasites may facilitate the entry of *Entamoeba histolytica* into the portal circulation while a dietary lack of protein may, by causing an alteration of the gut flora, and gut mucosa could enhance amoebic invasion of the intestinal mucosa (Lamont & Pooler, 1958; Islam, 1969).

Having considered the epidemiological aspects of the disease the *clinical features of importance in diagnosis* needs mention. The more important signs and symptoms in these patients are shown in the next slide. Fever, chest or abdominal pain were the commonest symptoms while hepatomegaly and hepatic tenderness were the most

important signs. Less important clinical features would be nausea, vomiting, cough, dyspnoea, haemoptysis and diarrhoea. The clinical importance of these features with respect to the occurrence of syndromes due to this disease would be considered after assessment of the role of laboratory investigations and simple radiology in the diagnosis of the disease. I have already drawn attention to the relative importance of leucocytosis which may not be a constant feature of the illness. On the other hand significant elevations in the erythrocyte sedimentation rate, noted in about 80 to 90 per cent or more of the cases becomes a better diagnostic index. Elevations in the aspartate transaminase (SGOT) and pyruvate transaminase (SGPT) are only mild to moderate when they do occur. I am not convinced that a rise in serum alkaline phosphatase values in hepatic amoebiasis is good evidence of a hepatic abscess of appreciable size. Thus laboratory investigations may be of some value only in an indirect manner, namely by noting the triad of a leucocytosis, high sedimentation rate and normal serum enzyme values.

Similarly, serum proteins in hepatic amoebiasis, show non-specific changes commonly found in other liver diseases, and are of little diagnostic importance. The commonest changes were a significant fall in serum albumin, a rise in alpha 2 globulin and gamma globulins. While the low albumin may result from dietary factors, hepatic dysfunction or from intestinal protein loss or malabsorption, the rise in alpha 2 globulin indicates a non-specific change due to infection and tissue necrosis. The rise in gamma globulins is in all probability a result of reticulo-endothelial system stimulation due to amoebic infection (Ramachandran, Nagarajah & Senthe Shanmuganathan, 1975).

By contrast, radiology plays a vital role in diagnosis. In the absence of scanning techniques, one has to only rely on simple radiology. The commonest radiological abnormality noted is an elevation of the right dome of the diaphragm. Its incidence in different studies varies from 27 per cent to high values of over 80 per cent (Ramachandran, Jayawardena & Perumal, 1971). Other abnormalities include the presence of pleuro-pulmonary reactions like effusions, consolidation, pulmonary abscess and collapse.

By virtue of its anatomical situation, an abscess arising in the left lobe of the liver, could show radiological appearances peculiar to itself (Ramachandran, 1974). In a study of left lobe abscesses, an elevation of the left dome of the diaphragm occurred in 43 per cent of cases, while left sided pleuro-pulmonary changes were noted in 14 per cent. However, it was noted that 36 per cent had an elevation of the right dome of the diaphragm. We also observed that an elevation of the right dome may occur in abscesses situated in the inferior portions of the right lobe of the liver as shown in this slide. This phenomenon of an elevation of the right dome of the diaphragm in abscesses situated remote from the superior pole of the right hepatic lobe is probably due to factors like a non-specific hepatic reaction affecting the rest of the liver, vascular congestion, and the presence of multiple abscesses. In the case of an epigastric lump due to a left lobe liver abscess a soft tissue mass may be seen. A barium meal would show a crescentic deformity of the stomach and duodenum around the left and inferior margins of the lump. It thus becomes apparent that simple radiology is not only useful in diagnosis, but also in distinguishing a left from a right lobe liver abscess.

Having dealt with various features common to hepatic amoebiasis as a whole, I shall devote the rest of the time to aspects of the amoebic liver abscess. Our concepts of diseases and syndromes should be constantly open to renewed appraisal in the light of new observations. In the recognition of new syndromes, awareness of the occurrence of clinical indicants assumes prime importance. A clinical indicant may be defined as any piece of data or information that might be relevant to the probability that the disease in question is present (Card & Good, 1970). When a diagnosis is sought by the method of relative likelihood, weighting is based on the observed frequency of indicants of the disease under study (Boyle *et al.*, 1966).

These generalisations are pertinent to the amoebic liver abscess where awareness and recognition of clearly defined but diverse clinical syndromes become important not only in diagnosis but also in planned surgical management. With such an approach symptoms, signs, laboratory data, radiology and features in the previous

history become clinical indicants in the diagnosis of these syndromes. Milroy Paul was the first author to lay stress on the occurrence of syndromes in amoebic liver abscess (Paul, 1960). By doing so he set the stage for further appraisal of the syndromes associated with this disease.

In a study on 107 cases with amoebic liver abscess the following clinical syndromes of presentation were observed:– The 'classical syndrome' the commonest syndrome occurring in 56 per cent the silent abscess', acute amoebic colitis, acute abdomen, the external sinus, intra-abdominal lumps, renal, pleuropulmonary and cardiac syndromes, obstructive jaundice and pyrexia of unknown origin. Their relative frequency of occurrence are shown in table 1 (Ramachandran, Induruwa & Goonatillake, 1975).

TABLE 1
INCIDENCE OF THE DIFFERENT SYNDROMES IN AMOEBIC LIVER ABSCESS (RAMACHANDRAN, S., INDURUWA, P. A. C. & GOONATILLAKE, H. D.–1975 (IN PREPARATION))

Classical Syndrome	56%
Silent Abscess	1.9%
Acute Amoebic colitis	0.9%
Acute Abdomen	16.7%
External Sinus	0.9%
Intra Abdominal Lumps	16.7%
Renal Syndrome	1.9%
Pulmonary Syndrome	1.9%
Cardiac Syndrome	0.9%
Obst. Jaundice	0.9%
P.U.O.	1.9%

(Ramachandran, S., Induruwa, P. A. C., Goonatillake, H. D., 1975)

The majority of patients present with, or develop at some stage of the illness the clinical features of the classical syndrome. In a proportion of patients the features of this syndrome are inconspicuous, overshadowed by other indicants, or even absent thus leading to diagnostic difficulties. In such an event the mode of presentation would conform to one or other of the syndromes listed.

The cardinal features of the *classical syndrome* are fever, chest or abdominal pain, hepatomegaly and hepatic tenderness, elevated sedimentation rate, leucocytosis and radiological changes. The hepatomegaly and hepatic tenderness may be predominantly right or left sided indicating predominant right or left lobe involvement. As I have indicated earlier on in the lecture pus may not always be demonstrable in patients presenting with this syndrome. Thus clinically it may not be possible to demarcate with any certainty the cases where pus could be demonstrated from the cases where pus may not be demonstrable. Laboratory and radiological findings may also be of limited value in distinguishing these two groups.

However, certain indicants, developing on the background of the classical syndrome nearly always indicate the presence of an abscess, usually of appreciable size, and hence calls for therapeutic evacuation of pus. These indicants are slowly or rapidly increasing hepatomegaly, marked intercostal bulging, increasing localised tenderness, the formation of a localised lump, with or without pointing, obstructive jaundice, major pleuro-pulmonary or cardiac involvement, abdominal manifestations suggesting an intra-peritoneal rupture or a slow response to drug therapy.

A persistent mild elevation of the right diaphragm may be the only indicant of a *silent abscess*. In one case presenting in this manner, pus was obtained during percutaneous liver biopsy done in order to study the hepatic histology. This was followed by closed aspiration and the evacuation of over 2 litres of pus. It thus becomes clear that a silent abscess could be of large dimensions. The reason why a silent abscess remains silent is probably due to a finely adjusted host-parasite relationship. Pertinent to this would be the inability of amoebae to grow in the liver pus within the abscess cavity. The onset of a serious complication may be the first dramatic announcement of the presence of a silent abscess.

Although an *amoebic colitis* may be a concomitant feature of the classical syndrome, occasionally the colitis may be the dominant feature and hence hide the presence of a liver abscess. In one case, intra-peritoneal rupture and death occurred from such an abscess. Interestingly, Wilmot (1962) has drawn attention to co-existence of multiple abscesses in patients with amoebic colitis resulting in a serious prognosis. It thus becomes necessary to exclude the presence of a liver abscess in all patients with acute or subacute amoebic dysentery.

The manifestations of an *acute abdomen* due to a liver abscess belong to one of 3 types, 1. Acute with pain, tenderness and rigidity, 2. Subacute with a doughy abdomen, and 3. Subacute with abdominal distention and ileus. The majority of these patients, at laparotomy, have a rupture of, or leakage from an amoebic liver abscess. In a proportion of patients, however, there are superficial abscesses situated within the right lobe of the liver with no evidence of leakage or rupture. There are invariably flimsy fibrinous adhesions over the site of the abscess between the visceral and parietal peritoneum. This latter group of patients constitute the cases we termed having the 'syndrome of pre-rupture' as it appears to be a stage just prior to leakage or rupture of the abscess. The abdominal manifestations are probably of a reflex nature caused by peritoneal irritation from the superficial abscess. This contention is supported by the findings that the syndrome only occurs with abscesses of the right hepatic lobe where the visceral and parietal peritoneum are closely adjacent, and that even partial decompression of the abscess could lead to a loss of the abdominal manifestations (Ramachandran & Goonatillake, 1974). Clinicians should be aware of the existence of the syndrome. Not only does it simulate an acute abdomen to a nicety, but its recognition could preclude an unwarranted laparotomy with its attendant risks (Figure 4).

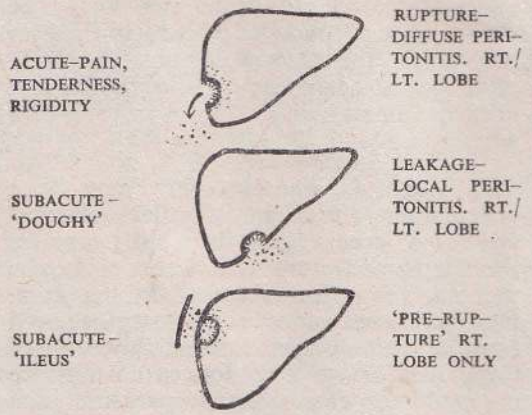


FIG. 4. The pathogenesis of 'the acute abdomen' in amoebic liver abscess: the syndromes of 'pre-rupture' and intraperitoneal rupture (Ramachandran & Goonatillake, 1974).

Of considerable interest was the occurrence of a frank *bile peritonitis due to intraperitoneal rupture* of a liver abscess. This patient had a progressively downhill course and death occurred from a Gram negative septicaemia. The presence of bile peritonitis, although very rare, worsens significantly the prognosis associated with intra-peritoneal rupture of an abscess (Ramachandran, Induruwa & Perera, 1975).

A single patient had an *external sinus* discharging chocolate pus in the right loin. A sinogram revealed that the abscess was situated in the inferior part of the right hepatic lobe (Figure 5).

An *intra abdominal lump* may follow on a classical syndrome or may be the only indicant of a liver abscess. The lump could present at different sites depending on the anatomical situation of the abscess within the liver. These sites are as follows:– Large or small right hypochondrial lumps, the latter simulating closely a mucocoele or empyema of the gall bladder, lump in the right flank – we had 2 cases of an abscess within a Reidel's lobe, lump in the right loin simulating a renal mass, the epigastric lump due to either a right or left lobe abscess and the left epigastric mass due to a left lobe abscess. These lumps, as Paul has pointed out, may be either wholly intra-hepatic or they may be formed from leakage and adhesions to adjacent structures. Our experience is that the former type is the commoner of the two processes. The presence of a lump permits more precise assessment of the anatomical situation of the abscess within the liver and hence aids planned surgical management (Paul, 1960).

Hepatic abscesses could also simulate a *renal syndrome* for example a renal lump or a renal or peri-renal infection. In these cases the abscess is situated in the postero-inferior part of the right lobe of the liver in close proximity to the upper pole of the right kidney.

Pulmonary syndromes of presentation include large pleural effusions, pyo-pneumothorax, or pulmonary consolidation. They are often the result of an upward rupture of the abscess into the right chest. *Cardiac syndromes* include pericarditis, pericardial

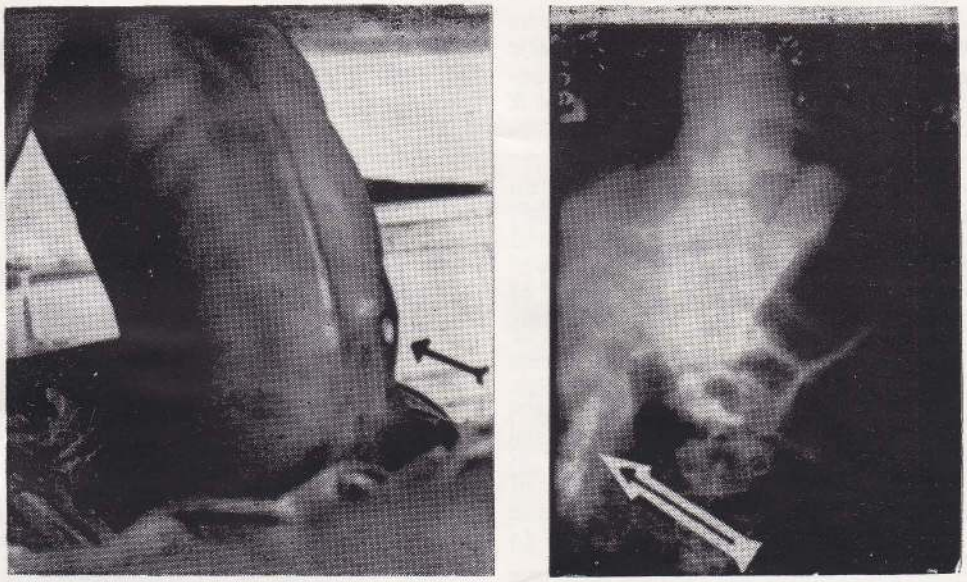


FIG. 5. An external sinus in the right loin due to an amoebic liver abscess (left). Sinogram showing the sinus tract arising in the liver (right).

effusions and rarely the clinical manifestations of congestive cardiac failure. The former syndromes are nearly always associated with a left lobe abscess and could present in a dramatic or insidious fashion (Wilmot (1962). The clinical features of cardiac failure are due to a combination of anaemia, hypoproteinaemia and the hepatomegaly.)

Although *severe jaundice* is uncommon in amoebic liver abscess we had one case with severe obstructive jaundice due to an abscess at the porta hepatis causing obstruction to the major intra-hepatic bile passages. This patient initially had the features of a viral hepatitis but with the progress of the disease and the appearance of severe jaundice intra-hepatic and extra-hepatic biliary obstruction became diagnostic considerations. (Ramachandran, Pakianathan & Aiyathurai, 1975).

Pyrexia of unknown origin due to an abscess would suggest the commoner causes for a continued fever like typhoid and paratyphoid fever and miliary tuberculosis as diagnostic possibilities. The appearance of new clinical indicants sooner or later suggests the correct disgnosis.

It becomes evident that in spite of the variegated modes of presentation of the amoebic liver abscess, the key to unity in this apparent diversity is the realisation of the chronological sequence of the disease and its progression from one syndrome to another.

The appearance of new indicants would herald the progression from one syndrome to another and hence facilitate diagnosis. This clinical progression, is illustrated – in Fig. 6.

Further, it would be noted that the clinical syndromes due to an abscess in different parts of the right lobe of the liver, and within the left lobe are to some extent distinct. It is only to be expected that syndromes hitherto not described would be recognised from time to time, thus adding to the list we are already aware of. This is exemplified by the report of a Budd-Chiari syndrome due to a liver abscess in proximity to the hepatic veins (Stoopen *et al.*, 1973). Syndromes related to the different parts of the right, and the left lobe of the liver (Fig. 7) are given in Table 2.

I shall lastly consider briefly post-treatment surveillance in these patients. It need hardly be stressed that best therapeutic results are only obtained when pus is evacuated from any abscess of appreciable dimension. In this connection it would be relevant to state that the commoner cause for *treatment failure* are:– 1. inadequate drainage of pus, 2. presence of multiple or missed abscesses, 3. occurrence of an insidious

CHRONOLOGICAL SEQUENCE

(1) **Uncomplicated Abscess**

1. No Hepatomegaly
2. Hepatomegaly — RT./Lt./Both.

Increasing Hepatomegaly → *Lump* → *pointing* → *sinus*

(2) **Complicated Abscess**

(A) *Neighbourhood* (B) *Distant*

(i) *Intra Thoracic* – Lung Abscess
- Pericardial – Brain Abscess
- Subphrenic
- Pleuro – Pulmonary

(ii) *Intra Abdominal* *Intra – Visceral*
'Pre – Rupture'
Leakage – Local; Lump, Chronic
Rupture – Diffuse Peritonitis

FIG. 6. The chronological sequence in amoebic liver abscess, and the progression from one syndrome to another (Ramachandran, Induruwa & Goonatillake, 1975 – in preparation).

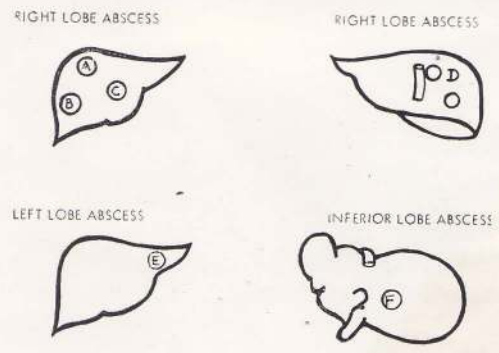


FIG. 7. Sites of abscesses in the different lobes of the liver.

TABLE 2
SYNDROMES RELATED TO THE RIGHT & LEFT LOBES OF THE LIVER

Clinical Syndrome	*A. Right Superior*	*B. Right Lateral*	*C. Right Anterior*	*D. Right Posterior*	*E. Left*	*F. Inferior*
Right Classical ..	+	+	+	+	—	—
Left Classical ..	—	—	—	—	+	—
Silent Abscess ..	+	+	+	+	+	+
Intercostal Bulge ..	—	+Right Lateral	+Right Epigastric	+Right Posterior	—	+
Localised Lump ..	+Diaphragmatic (Right)	+Right Flank, (Riedl's Lobe)	+Epigastric	+Renal Lump	+Epigastric	—
Sub-Phrenic ..	+	—	—	—	—	—
External Sinus ..	—	+Right lateral	+Epigastric	+Right Posterior (loin)	—	—
Pleuro-Pulmonary ..	+Right	—	—	—	+Left	—
Pericardial ..	—	—	—	—	+	—
Pyrexia of Unknown Origin ..	+	+	+	+	+	+
Pre-Rupture ..	+	+	+	+	—	—
Intra-peritoneal Rupture ..	+	+	+	+	+	+
Budd–Chiari Syndrome ..	—	—	—	+	—	—
Obstructive Jaundice ..	—	—	—	—	—	+

complication, and 4. the occurrence of secondary infection. With the availability of modern amoebicidals which are effective even in small doses, inadequate drug therapy as a cause for treatment failure hardly exists (Powell, 1969).

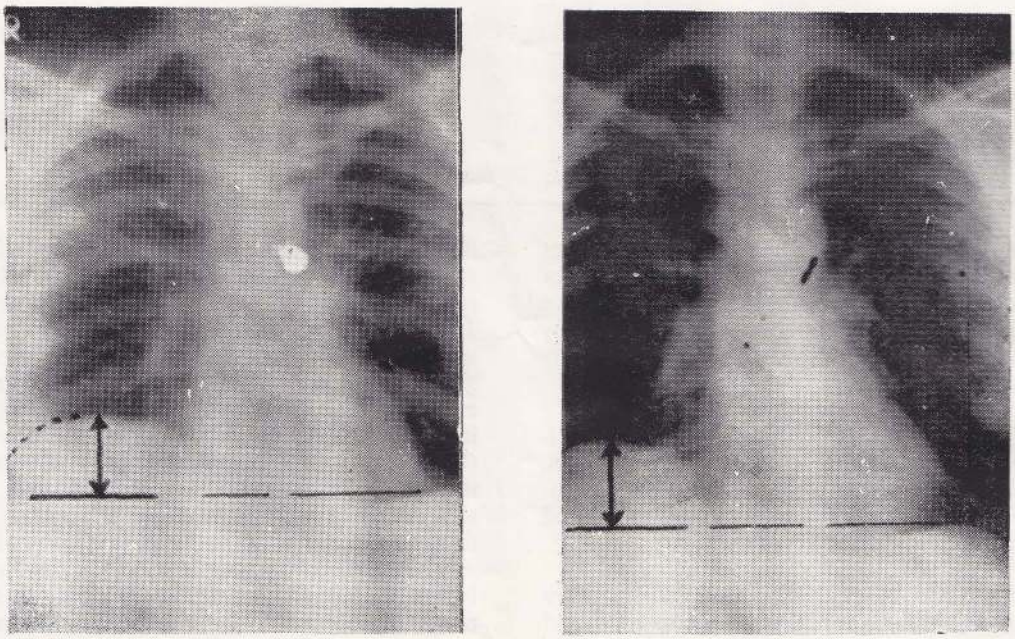
The schedule for post-treatment surveillance would include: 1. clinical examination, 2. haematological and biochemical investigations, (3). radiological surveillance and 4. immunological follow-up.

We observed that although clinical cure with a lessening or loss of symptoms and signs is often striking, abnormalities in the other parameters listed could persist. The alterations in the leucocyte counts, sedimentation rates, serum enzymes and plasma proteins before and after treatment fall into one of 3 types of change. While a type 1 or 2 change is satisfactory, a type 3 change may be an indication for long term follow-up studies. (Ramachandran, Sivalingam & Perumal, 1972b). It was noted in our studies that non-specific hepatic changes could persist even after treatment with a good clinical response. The persistence of these histological changes could explain the abnormal responses with respect to these laboratory investigations.

Similarly, radiological surveillance in our cases showed that elevation of the right dome of the diaphragm could, in a proportion of patients, persist for a variable time (Ramachandran, Goonatillake & Perera, 1975). While a minor degree of diaphragmatic elevation could be looked upon as a normal radiological response, persistent elevation for long periods is a definite indication for repeated X-ray examinations (Figure 7). In these cases, the elevated diaphragm was noted to be caused by the presence of a silent liver abscess or to a persistent reactive hepatitis probably secondary to continuing intestinal ulceration. In such cases there is an indication for repeated courses of amoebecidal therapy and even evacuation of pus, when indicated.

Serological surveillance appears to be of little importance due to the persistence of serum antibodies for long periods after the treatment of an amoebic abscess. This phenomenon is a normal response after invasive amoebiasis. Hence it could be stated that although a good clinical cure is of the greatest significance and calls for repeated clinical examinations for at least 6 to 9 months after treatment, in a small proportion of cases haematological, biochemical and radiological surveillance may become necessary.

I have reviewed and discussed some of the aspects in the wide spectrum of hepatic



Before treatment. 18 months later.

FIG. 8. Radiological surveillance – Persistence of the elevation of the right dome of the diaphragm 18 months after the evacuation of pus – (Ramachandran, Goonatillake & Perera, 1975).

amoebiasis as a whole, and the more important facets of the amoebic liver abscess. Particular emphasis has been laid on our observations of the disease as manifest in this country. It is my sincere hope that some light has been shed on many of the obscure problems pertinent to this disease, and that the mist which continued to shroud the realistic assessment of the malady has to some extent been cleared. If this aim has been realised, even in small measure, then, it would be the most fitting tribute to the man in whose memory we have, this evening, gathered.

As Homer once said, 'Light is the task when many share the toil.'

Amongst these many are my colleagues who have provided some of the clinical material and my House Officers for their unfailing support during these studies. I would be failing in my duty if I do not make special mention of the assistance so willingly rendered by Dr. H. D. Goonatillake, Surgeon, now away in Australia, Dr. P. A. C. Induruwa, Surgeon, and Dr. Merrille Perera, Pathologist, Colombo North Hospital, Ragama, by Dr. (Mrs.) S. Rajakulendran of the Department of Parasitology, University of Sri Lanka, Colombo Campus, and Dr. Senthe Shanmuganathan of the Medical Research Institute, Colombo in the investigation of these patients and Professor N. D. W. Lionel for his unstinting help in the preparation of the slides.

REFERENCES

Agarwal, S. C., Mahajan, R. C., Datta, D. V. and Chhuttani, P. N, (1971) *Indian Journal of Medical Research,* **59,** 1214.

Anderson, H. H., (1953) p. 134. *Amoebiasis,* Springfield, Charles Thomas.

Boyle, J. A. *et al.,* (1966) *Quarterly Journal of Medicine,* **35,** 565.

CanagaRetna, C., (1974) *Ceylon Medical Journal,* **19,** 18.

Card, W. I. and Good, I. J., (1970) quoted by D. A. K. Black, (1970) *British Medical Journal,* **2,** 387.

Craig, C. F., (1946) *The Aetiology, Diagnosis and Treatment of Amoebiasis.* Baltimore. Williams Wilkins.

Islam, N., (1969), *Medicine Today,* **3,** 82.

Jayewardene, L. G. and Wijayaratnam, Y. (1973) *Ceylon Journal of Medical Science,* **22,** 6.

Kean, B. H., (1955) *Archives of Internal Medicine,* **96,** 667.

Lamont, N. McE., and Pooler, N. R. (1958)., *Quarterly Journal of Medicine,* **27,** 390.

Maddison, S. E., Kagan, I. G., and Elsdon-Dew, R., (1968) *American Journal of Tropical Medicine and Hygiene,* **17,** 540.

Paul, M. A, (1960) *British Journal of Surgery,* **47,** 502.

Powell, S. J., (1969) *Medicine Today,* **3,** 41, 102, and 121.

Rajasuriya, K., and Nagaratnam, N., (1962) *Journal of Tropical Medicine and Hygiene,* **65,** 165.

Ramachandran, S, Jayawardena, D. N. W. and Perumal, J. R. A., (1971) *Postgraduate Medical Journal,* **47,** 615.

Ramachandran, S, Sivalingam, S, and Perumal, J. R. A, (1972a) *Journal of Tropical Medicine and Hygiene,* **75,** 23.

Ramachandran, S, Sivalingam, S and Perumal, J. R. A., (1972b) *Journal of Tropical Medicine and Hygiene,* **75,** 34.

Ramachandran, S, Sivalingam, S., and Perumal, J. R. A. (1973) *Journal of Tropical Medicine and Hygiene,* **76,** 39.

Ramachandran, S., de Saram, R, Rajapakse, C.N.A, and Sivalingam, S. (1973) *Postgraduate Medical Journal* **49,** 261.

Ramachandran, S., and Goonatillake, H. D., (1974) *British Journal of Surgery,* **61,** 353.

Ramachandran, S., (1974) *Postgraduate Medical Journal,* **50,** 589.

Ramachandran, S., Goonatillake, H. D. and Perera, M. V. F., (1975) *Journal of Tropical Medicine and Hygiene,* – in press.

Ramachandran, S., Godfrey, J. J., and Perera, M. V. F. (1974) *Journal of the American Medical Association,* **230,** 236.

Ramachandran, S. Induruwa, P. A. C. and Goonatillake, H. D., (1975) in preparation.

Ramachandran, S., de Mel, T. and Rajakulendran, S., (1975) in preparation.

Ramachandran, S. Induruwa, P. A. C. and Rajakulendran, S. (1975) in preparation.

Ramachandran, S. Nagarajan, S. and Senthe Shanmuganathan (1975) in preparation.

Ramachandran, S, Paikiyanathan, N, Aiyathurai, J. E. J. (1975) in preparation.

Ramachandran, S, Induruwa, P. A. C., and Perera, M. V. F. (1975) *Journal of Tropical Medicine and Hygiene* – in press.

Rogers, L. Sir (1922) *Lancet* **1,** 463, 569, and 677.

Stoopen, M *et al.,* (1973) cit. *Tropical Diseases Bulletin,* (1973) **70,** 343.

Wilmot, A. G. (1962) *Clinical Amoebiasis,* Oxford Blackwell.

Outbreak of Cholera El Tor in Sri Lanka, 1973

N. M. P. MENDIS[1], P. RATNASABAPATHY[2], K. MAHESWARAN[3], C. WIJAYARAJAH[4]

Ceylon Medical Journal, 1975, **20**, 82 - 93

Summary

The first outbreak of El Tor cholera occurred in Jaffna in October 1973, almost twenty years after the last outbreak of classical cholera. Though practically all the countries in South East Asia were affected by 1963/64, for some unidentified reason the invasion of Sri Lanka was delayed by almost ten years. Though vigorous preventive and restrictive measures were applied, the disease spread very rapidly throughout the peninsula within a month of its appearance, and subsequently spread to other parts of the country. There was definite evidence of contact spread at the beginning, but subsequently no such history could be elicited. It is likely that the further spread would have occurred through carriers probably by contaminated sources of water supply, mostly open wells. All age groups up to 60 years were equally affected while the attack rate in the age group 60+ was more than double. 60.6% of cases occurred under 35 years of age and the sexes were equally affected. Though no mass immunization programme was launched, due to the demand for vaccination, more than 80% of the population in Jaffna had been covered during the period. Because of the poor environmental sanitation prevailing in the area the disease is likely to continue, and therefore a realistic control programme has to be carried out while long term plans are drawn for improvements in environmental sanitation.

Introduction

Cholera El Tor was reported in Sri Lanka for the first time in Jaffna in October 1973. Thereafter the disease spread rapidly throughout the Peninsula followed by a spread to the rest of the island. This epidemic of cholera occurred after a 20-year period of freedom from the disease, the last outbreak of classical cholera having been in 1953.

The invasion of this country by the El Tor biotype was expected in 1963/1964 when the disease was spreading throughout the sub-continent of India, but for some unknown reason the spread of infection to this country was delayed by almost a decade. When the outbreak did occur in the north it caused much anxiety amongst people from the south of the island because of the imminent threat of spread. Though stringent measures like restriction of movement and even sanitary cordons were applied, the relentless march of the disease to the south did inevitably occur. This report gives an account of the beginning of the outbreak and its spread in the Jaffna Peninsula during the last three months of 1973.

The Pre-invasion Period

When El Tor cholera was spreading through India in 1963/1964, invasion of Sri Lanka was anticipated. In April 1966 following the detection of a suspect cholera case in Mannar, which was subsequently confirmed as due to a non-cholera vibrio, instructions were sent by the Department of Health to every institution in that District to commence bacteriological screening for cholera, of all severe diarrhoeas. In June 1967 a seminar on cholera was held in Jaffna for officers of the Health Divisions in the north to acquaint them with the treatment, epidemiology and control of the disease. In the course of bacteriological surveillance which had been established in the north, a strain of El Tor cholera was picked up in Karainagar in the Jaffna District in July 1967. This was from a bus conductor who had been admitted to Kayts Hospital with diarrhoea and was diagnosed as a case of amoebiasis. Epidemiological

1. Epidemiologist, Department of Health Services, Colombo.
2. Superintendent of Health Services, Jaffna.
3. Assistant Epidemiologist, Department of Health Services, Colombo.
4. Regional Epidemiologist, Jaffna.

investigations did not reveal the source of infection, and there were no secondary cases. The Cholera Reference Laboratory in Calcutta confirmed the strain as El Tor Ogawa, but the report added that it did not belong to any standard phage type and that it was pathogenic to laboratory animals.

In April 1968 a Communicable Disease Release on cholera was sent to all Medical Institutions. In November 1970, bacteriological surveillance was extended to Provincial and Base Hospitals, though the response was rather poor. In June 1971 a Departmental Circular Pub. 98 was issued to all Officers incorporating the Release on Cholera. Finally when on 3rd October 1973 instructions were sent to all institutions to intensify bacteriological surveillance, the outbreak in Jaffna had already begun unknown to the Public Health Authorities.

Background Information

The Superintendent of Health Services, Jaffna has an area of 998 square miles with a population of 732,000 and a population density of 733 per square mile in 1973. The area is well served with medical institutions as follows:

Provincial Hospitals	..	1
Base Hospitals..	..	1
District Hospitals	..	6
Peripheral Units	..	9
Rural Hospitals	..	5
Central Dispensaries with Maternity Homes	..	12
Central Dispensaries	..	22

Environmental Sanitation

During the census of 1971, information was obtained on a random sample of households, regarding the sanitary facilities available in housing units. Results of the survey in the Jaffna District in respect of water supply and latrines are given in Tables 1 and 2.

(i) *Water Supply*. Table 1 gives the occupied housing units by source of water supply. In the rural areas it is seen that 91.2% of households obtain their water supply from open wells. 58% of these wells are shared and are therefore considerably exposed to the risk of pollution.

(ii) *Availability of Latrines*. Table 2 gives the types of latrines available in the Jaffna District. For the district as a whole, 49% of the houses do not have any toilet facilities while the situation is worse in rural areas with 57% of the households being devoid of any latrines. Clusters of households in rural areas generally use vacant areas or defaecation yards as their toilets.

TABLE 1

OCCUPIED HOUSING UNITS IN JAFFNA DISTRICT BY SOURCE OF WATER SUPPLY (PER CENT)

Source of Water Supply	*All Sectors*	*Urban*	*Rural*
Piped Water ..	7.1	17.4	2.7
Well ..	87.1	77.3	91.2
Others ..	2.0	1.5	2.2
Unspecified ..	3.8	3.8	3.9
Total ..	100.0	100.0	100.0
..	(127,608)	(37,958)	(89,650)

(No. of Housing Units given in parenthesis)

TABLE 2

OCCUPIED HOUSING UNITS CLASSIFIED BY TYPE OF LATRINES (PER CENT)

Type of Latrine	*All Sectors*	*Urban*	*Rural*
Flush Toilets ..	3.7	5.7	2.9
Water Seal ..	18.7	18.7	18.8
Bucket ..	8.9	27.1	1.2
Pit ..	16.9	16.1	17.2
None ..	49.0	30.0	57.0
Not specified ..	2.8	2.4	2.9
Total ..	100.0	100.0	100.0
..	(127,608)	(37,958)	(89,650)

(No. of Housing Units given in parenthesis)

Detection of the Outbreak

The outbreak came to light with the detection of a focus at Thoppukadu in the southern part of the island of Karainagar (Fig. 1). Muttusamy a tapper developed diarrhoea on 8th October 1973, and died the same night. The funeral was held on the 9th and an almsgiving on the 11th. Sivakolandu, a female 9 years old who had attended Muttusamy's funeral developed diarrhoea on the 11th and died the same day. Two others Nagamuttu and Manikkan who had partaken of food at the almsgiving of Muttusamy, developed diarrhoea and died on the 12th. Judicial inquests were held on the 13th in respect of the last two deaths. On the same day about 18 people who had partaken of food at Muttusamy's

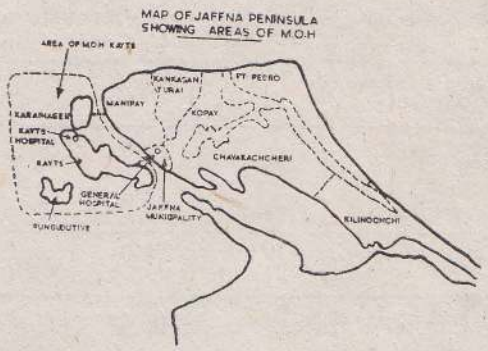


FIG. 1.

almsgiving on the 11th were admitted to Kayts Hospital with diarrhoea and vomiting.

The two sudden deaths and the large number of people admitted to hospital with gastro-enteritis created a suspicion of foul play. The people suspected that their common well had been poisoned. The District Medical Officer (D.M.O.), Kayts however suspected that it may be cholera and had despatched specimens of stools to the Medical Research Institute (M.R.I.), Colombo for bacteriological examination. On 18.10.73 the M.R.I. confirmed that four specimens were positive for Vibrio cholerae biotype El Tor and thus the outbreak came to be recognised. Immediately, a team of officers from Colombo including a W.H.O. Microbiologist and an Epidemiologist were rushed to Jaffna to assist the S.H.S. in carrying out investigations and control measures.

Organization and Methods of Control

At the beginning, the outbreak appeared to be confined to the islands of Karainagar and Kayts in the area of Medical Officer of Health (M.O.H.) Kayts. Therefore investigations and control measures were first applied to these two islands and then extended out to the rest of the Peninsula when the disease spread to other areas. In brief, the following methods were adopted:

(1) The health staff of the M.O.H. Kayts was augmented with the appointment of medical officers and public health inspectors. Initially 5 teams, each consisting of a Medical Officer, Public Health Inspector and Public Health Midwife were organised to carry out a house to house survey of the area, and identify *all cases* of diarrhoea that had occurred from the 1st of October 1973. The teams were instructed to despatch all cases of severe diarrhoea to hospital, to obtain rectal swabs from mild cases and treat them with tetracycline, immunize the people, chlorinate the wells and carry out health education. Daily surveillance of the area was carried out.

(2) District Hospital, Kayts was made a cholera hospital and all suspected and confirmed cases from the entire Peninsula were transferred to this hospital. The patients were discharged only after 3 rectal swabs were negative for cholera vibrios.

(3) All medical institutions in the peninsula were requested to notify severe cases of diarrhoea immediately to the M.O.H. by telephone. A return of diarrhoea cases treated at the Outpatients' Department and admitted to hospital was submitted daily to the M.O.H.

(4) Rectal swabs were obtained from all cases of diarrhoea admitted to the hospital.

(5) The M.O.H. carried out immediate investigations of cases notified as suspect cholera or confirmed cholera.

(6) Direct contacts of confirmed cases of cholera were rectal swabbed and treated with tetracycline. They were kept confined to their homes for five days.

(7) All cases were confirmed bacteriologically. At the commencement of the outbreak the rectal swabs and other specimens were sent to the M.R.I. Within a few days of the commencement of investigations, the microbiological laboratory in Jaffna Hospital was equipped to carry out cholera diagnosis and subsequently all specimens were processed in Jaffna. When the load was excessive, the extra specimens were sent to the M.R.I. Colombo. All the strains isolated were El Tor Ogawa.

The outbreak in Karainagar and Kayts – Area of M.O.H. Kayts

When investigations into the outbreak were undertaken on 19.10.73 it was revealed that an unusual number of *deaths from* severe diarrhoea had occurred in the two islands of Karainagar and Kayts in the first half of October 1973. The earliest death attributable to cholera was in Vikkavil in Karainagar on 27.9.73 and a total of 18

deaths were identified as due to suspect cholera.

Figure 2 gives the geographical distribution of these fatal cases. They are widely distributed in the two islands. The two biggest foci of infection were Thoppukadu and Vikkavil in the island of Karainagar. 12 of the 18 fatal cases were over the age of 50 years and the majority of these belonged to the fishing community. The contacts of these cases are a very mobile group, constantly moving from coast to coast for purposes of fishing. It was also observed that the spread during the early part of the outbreak had occurred as a result of neighbours and relations attending funerals and participating in the almsgivings held on the day of the funerals or a few days later.

FIG. 2.

Vikkavil in the north of the island appears to have been the largest focus. A retrospective survey showed that from 1.10.73 to 23.10.73 among a population of 1,214 there were 107 cases of diarrhoea giving a prevalence rate of 8.8% and a peak had been observed on 21.10.73. Most of the cases had been mild. The more severe cases had gone to Government Hospitals. It was also unfortunate that most of the deaths had occurred at home and treatment had been obtained from private practitioners, so that the early identification of the outbreak was not possible.

Thoppukadu was the second largest focus with four deaths. A retrospective survey carried out in this village showed that for the period 1.10.73 to 23.10.73 there were 84 cases of diarrhoea with two peaks, one on 10.10.73 and the other on 13.10.73. These peaks were apparently due to the participation of the people at the almsgivings following the funerals. The prevalence rate of diarrhoea in this village with a population of 1,391 was 6.0% during this period.

At the commencement when the disease appeared to be restricted to the two islands of Karainagar and Kayts, movement between the mainland was restricted and only those who were immunized were allowed to proceed. This caused much inconvenience to the public and complete restriction was never achieved.

Before the outbreak was recognised a certain number of patients from these two islands had gone to the General Hospital, Jaffna, and some private hospitals in the mainland. Scrutiny of hospital records showed that many cases of severe diarrhoea had been treated in these hospitals, without cholera being suspected and without laboratory confirmation of diagnosis.

Spread of the Disease to the Jaffna Peninsula

The first occurrence of cases in the Peninsula was seen in the municipal area of Jaffna City with a population of 130,000. The disease first affected the most insanitary slum area of the town known as Gurunagar. This is also a coastal area and the main occupation of the people is fishing The first case from this area fell ill on 14.10.73. The husband of this patient had visited the infected area in Karainagar for fishing. Thus it was evident that the disease had already spread to the Peninsula by the time investigations were commenced.

The next large focus in the mainland was at Kondavil in the area of M.O.H. Kopay. The first case here developed the disease on 16.10.73, was admitted to Jaffna Hospital on 17.10.73 and died on 21.10.73.

Thereafter the disease spread to practically all parts of Jaffna Peninsula. Although in the early part of the epidemic, some association with a case or an infected locality could be elucidated, subsequent cases were sporadic and no contact history was available.

At the beginning when the two foci of infection at Kondavil and Gurunagar were still localized, guards were placed around these foci to limit the movement of people. These measures applied did not appear to limit the spread of the disease, but caused much inconvenience to the public as well as being an expense to the Government.

In view of the potential threat from the focus in Jaffna to the rest of the island, there was much public agitation to introduce a cordon sanitaire.

The district was declared a diseased area on 26.10.73. A ban was imposed on the transport of milk and milk products, shellfish, prawns, lobsters, oysters and mussels. Fruits, vegetables and onions were also banned.

In order to curtail the movement of traffic to and from Jaffna to other parts of the island, the number of trains and buses going out was restricted. All travellers leaving the district were required to possess a certificate of vaccination and tickets were issued only to those who had been vaccinated. On the main trunk roads, barriers were placed at Visuvamadu, Mankulam, Muragandy and Mulankovil and manned by the Police and Public Health Inspectors.

On 19.11.73 the ban on chillies and onions was lifted. It was found that with all these restrictions, train travel was reduced by only 20%. Besides the inconvenience caused to the public, in addition to the larger number of personnel engaged in enforcing these regulations, these restrictions did not have the desired effect and cases started occurring in Colombo City in mid December. Therefore all bans imposed on Jaffna District were removed on 18.12.73.

Epidemiological Features of the Outbreak
Distribution of cases in time

Figure 3 shows the distribution of confirmed cases by day of onset in the entire area of S.H.S. Jaffna. Suspected cases and deaths have not been plotted. It is seen that the cases have reached a peak by about the end of October and the beginning of November and subsided thereafter. From the nature of the epidemic curve it is likely that the epidemic had actually commenced in the early part of October or the end of September 1973.

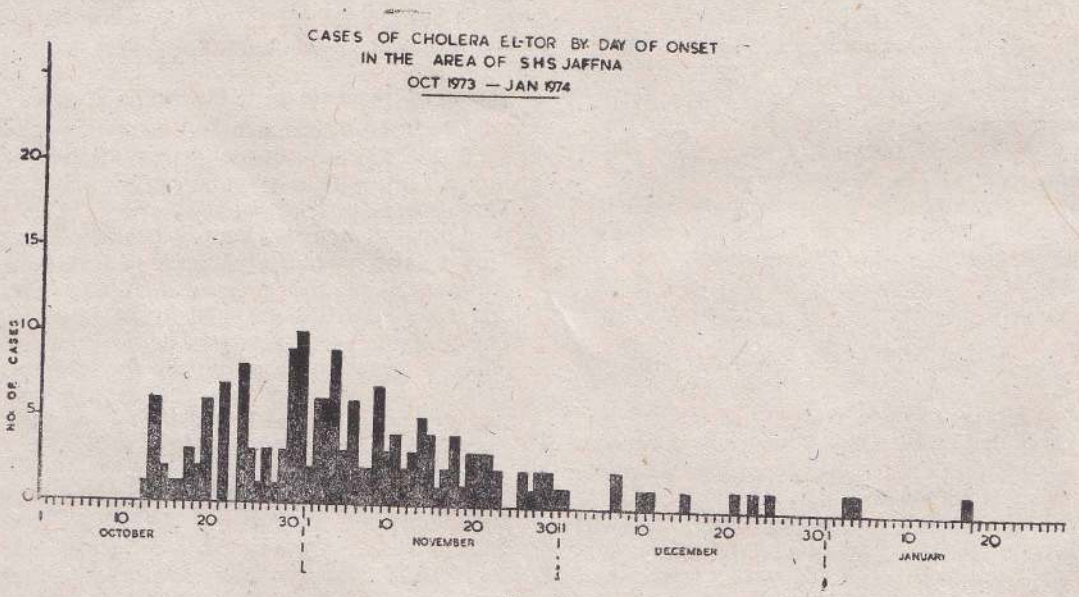


FIG. 3.

Figure 4 shows the distribution of cases by day of onset in each of the eight M.O.H. areas. The first occurrence of cases in Kayts area is not evident from this figure as suspect cases and deaths have not been plotted. The areas to be affected next were Jaffna and Kopay, after which all the other areas have been affected. It is also seen that no cases have occurred in Kayts and Jaffna municipal areas after 1.12.73.

Geographical Distribution

Table 3 shows the distribution of cases and carriers and attack rates by M.O.H. areas. The highest attack rate was in area of M.O.H. Kayts with 64.6/100,000 population, as the area was affected first and the infection had been widely disseminated before control measures were instituted. The next most affected areas were Kopay, Manipay and Jaffna municipality. Areas of Chavakachcheri and Kilinochchi had the lowest attack rates as these are rural areas with a low density of population. The high carrier rate in Jaffna was due to the fact that the area mainly affected was a slum area which was highly congested. Further the infection had spread to the Jaffna prison, where there were 3 cases and 36 carriers.

Age and Sex Distribution

Table 4 gives the age and sex distribution of the cases. During the early phase of the outbreak in the Kayts area, before the outbreak was recognized, the deaths had mainly occurred in the older age groups. It is seen that the attack rate is more or less constant up to 60 years and is more than double in the 60+ group with 48.9/100,000 conforming to the pattern observed with the new introduction of the disease into an area. The sexes have been affected equally.

Mortality

Since the commencement of the investigation there were nine deaths among confirmed cases of cholera giving a case fatality rate of 5.1%. Suspected deaths shown in Figure 2 which occurred before the recognition of the outbreak have not been included in the Table.

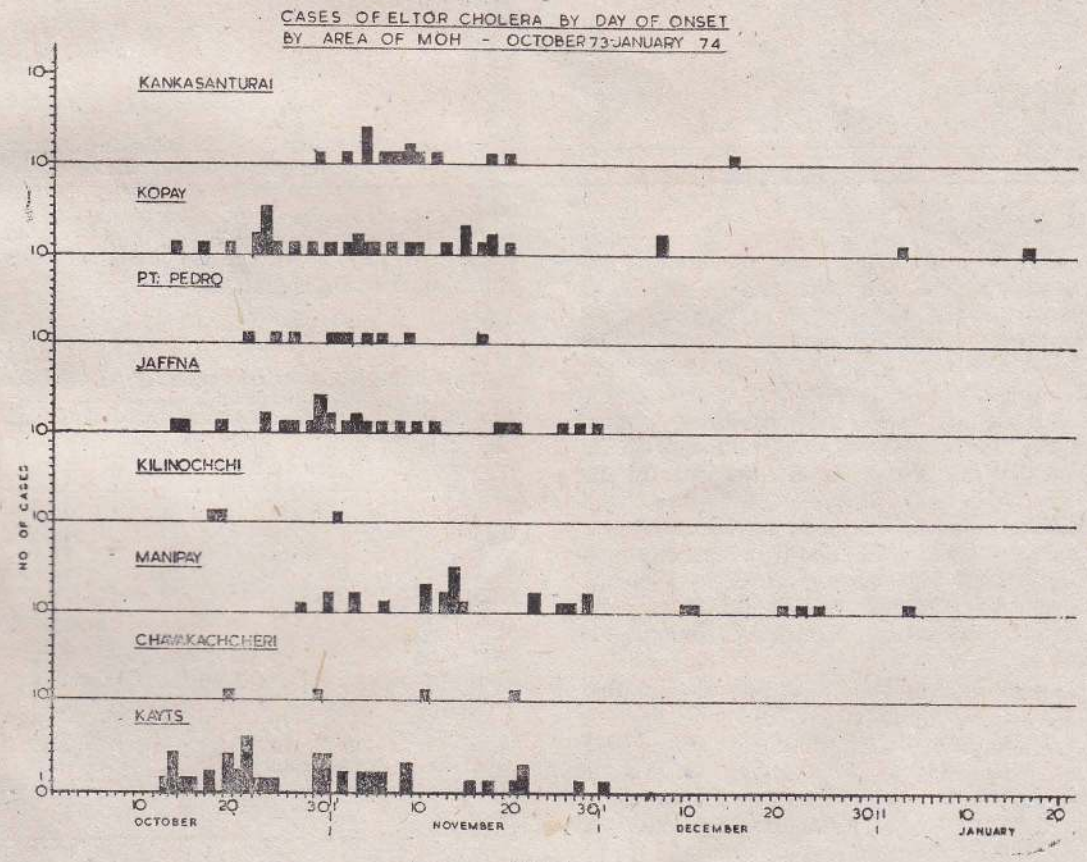


FIG. 4.

TABLE 3

INCIDENCE OF CASES AND CARRIERS IN S.H.S. DIVISION JAFFNA BY M.O.H. AREAS. OCT. '73 TO JAN. '74

Area of M.O.H.	Population x1000	No. of Cases					Rate/100,000	Carriers	
		Oct.	Nov.	Dec.	Jan. 74 (up to 15/1)	Total		No.	Rate
Kayts ..	79	32	18	1	—	51	64.6	60	75.9
Jaffna Municipality ..	130	14	14	—	—	28	21.5	99	76.2
Kopay ..	94	14	16	2	2	34	36.2	55	58.5
Manipay ..	96	3	20	5	1	29	30.2	30	31.2
Pt. Pedro ..	106	4	6	—	—	10	9.4	9	8.5
Kilinochchi ..	56	2	1	—	—	3	5.4	2	3.6
Chavakachcheri ..	60	2	2	—	—	4	6.7	5	8.3
Kankesanthurai ..	111	1	14	1	—	16	14.4	24	21.6
Total ..	732	72	91	9	3	175	23.9	284	38.8

TABLE 4

AGE & SEX DISTRIBUTION OF CASES OF CHOLERA EL TOR AND DEATHS – AREA OF S.H.S. JAFFNA, OCT. '73 TO 15TH JAN. 1974

Age	Males		Females		Total		Attack Rate/100,000
	Cases	Deaths	Cases	Deaths	Cases	Deaths	
0 — 4	21	—	21	2	42	2	
5 — 9	5	—	10	—	15	—	21.8
10 — 14	3	1	6	—	9	1	
15 — 19	6	1	2	—	8	1	
20 — 24	9	—	13	—	22	—	20.9
25 — 29	4	—	6	1	10	1	
30 — 34	6	—	8	1	14	1	
35 — 39	1	—	4	—	5	—	26.9
40 — 44	10	1	4	—	14	1	
45 — 49	3	—	5	—	8	—	
50 — 54	—	—	3	—	3	—	20.7
55 — 59	3	—	1	—	4	—	
60 — 64	4	—	2	—	6	—	
65 — 69	5	—	4	—	9	—	48.9
70+	5	—	1	2	6	2	
Total	85	3	90	6	175	9	23.9

Family Contacts

Out of the 175 cases, epidemiological investigation forms in respect of 105 index cases have been analysed regarding their contacts. All index cases were hospitalized. The direct contacts of the patients were identified within 24 – 48 hours of isolating the patient. Under the term direct contact, in addition to the family members living in the same house as the patient, others who have come into direct contact with the patient have also been included. Rectal swabs have been obtained from each contact, after which they were given a prophylactic course of tetracycline. Therefore only an initial swab has been examined in each case.

Table 5 gives the infection rates among the direct contacts in 105 index cases. Coincidentally it is observed that there has been 105 positives giving an overall infection rate of 13.1%, among immediate contacts. Positivity rate among children under 15 is 14.9% compared to 11.7% in those over 15 years of age, but this difference is not statistically significant.

TABLE 5

INFECTION RATE AMONG DIRECT CONTACTS OF CHOLERA PATIENTS

Age Group	No. of contacts	Positive No.	%
0 – 4 ..	125	21	16.8
5 – 9 ..	112	19	16.9
10 – 14 ..	118	13	11.0
15 – 19 ..	74	10	13.5
20 – 24 ..	85	14	16.4
25 – 29 ..	64	3	4.6
30 – 34 ..	36	5	13.8
35 – 39 ..	44	5	11.3
40 – 44 ..	29	2	6.8
45 – 49 ..	29	4	13.7
50 – 54 ..	21	2	9.5
55 – 59 ..	15	3	20.0
60 + ..	44	4	9.0
Total ..	796	105	13.1

When the age distribution of all the 273 positive contacts is analysed, it is found that 80% of them fall under 35 years of age, while among clinical cases 50% are under 35 years of age.

Immunization

The Department of Health carried out ring vaccination around the foci of infection and mass vaccination was not resorted to. But at the beginning of the outbreak, there was strong public demand for vaccination to an extent with which the services were unable to cope up. Therefore immunization centres were established at several central points. At the beginning, as the supply of vaccine was inadequate, 0.1ml of vaccine was given intradermally at one centre and as the supply improved the usual dosage was resumed.

Almost 590,000 doses had been administered up to the end of December in all the immunization centres, corresponding to about 82% of the total population. It was seen that 68% of the immunizations given were accomplished during the first 6 weeks of the operation.

Multiple Cases in Households

Table 6 gives the distribution of cases according to the number of cases in each family. It is seen that in 93.7% families affected, there was only one case in a family, while in five families there were two cases in each and in four families three cases in each.

TABLE 6

DISTRIBUTION OF CHOLERA CASES IN 143 FAMILIES

No. of Cases in a Family	*Families* No.	%
1 ..	134	93.7
2 ..	5	3.5
3 ..	4	2.8
Total ..	143	100.0

Discussion

The global spread of cholera El Tor commenced in 1961 from its original home in Sulavesi in Indonesia. Since then the disease spread extensively westward up to the *middle of the* African Continent by 1973. Though it spread to such distant lands, Sri Lanka which is so close to an endemic focus escaped invasion till 1973. Spread to this country was expected in 1963 when extensive outbreaks occurred in Madras State. It should be noted that by 1964, the disease was prevalent in India and most of the countries further to the East; only a few countries were spared – Sri Lanka, Taiwan and Japan. As classical cholera had been present in this country two decades earlier, and environmental conditions have apparently not changed since then, it has not been possible to explain the reason for this delay in the introduction of the disease into this country, particularly when illegal traffic between the two countries was more common a few years ago. In fact when the outbreak occurred, preparations were being made to conduct a serological survey of the population in the Mannar area in an attempt to find an explanation.

When investigations into the outbreak were undertaken on 19.10.73 the disease had already been disseminated throughout the two islands of Karainagar and Kayts with 18 suspected deaths scattered over the area. At this stage it was impossible to trace the beginnings of the outbreak. The available evidence suggested that it had probably started in the last week of September 1973. It is speculated that the infection was introduced into the fishing community by a visitor from South India or one who had returned after a visit to that country. Although the view had been expressed by some that the disease may have existed in Jaffna for some period of time, it is unlikely that the disease existed earlier without manifesting itself violently as it did in 1973. Epidemiological evidence also indicates an epidemic pattern of a recently introduced disease.

Though the Department of Health has been vigilant regarding the impending threat of invasion by cholera and had carried out surveillance activities and disseminated knowledge about the disease, it is a matter for regret that timely detection of the earliest cases had been missed and several cases had been treated as "diarrhoeas" in the Government and private hospitals without being suspected as cholera. If the disease was detected with the first few cases, early interruption of spread may have been possible.

As the island had been free of cholera for the previous 20 years, the appearance of

the disease caused much alarm and even panic. Therefore no pains were spared in taking all possible preventive measures in an attempt to eliminate the infection even though it meant an enormous amount of expenditure incurred in the campaign focussed in Jaffna District.

Though the principles of the cordon sanitaire with armed guards etc. is no longer valid (Cyjetanovic, 1970) such measures were applied on a limited scale in Jaffna District at the very commencement of the outbreak.

In the hope of preventing the possible spread to the south of the island, restriction of movement of people was enforced along with the banning of the transport of certain specified foods. It is well known that quarantine measures have failed in cholera control and introduction of the disease into clean areas is often attributable to smugglers, fishermen and others who cross borders at undesignated points (Benonson, 1971). In spite of this knowledge and often disregarding technical advice, these measures have been applied sometimes mainly because of public pressure. Our experience during this outbreak has amply confirmed the view that these quarantine measures are of no avail in the control of cholera El Tor.

The reasons for the uncontrolled spread of cholera El Tor throughout the world as compared to the spread of the classical vibrio is because of two important characteristics – the wide clinical spectrum and the capacity of vibrio to survive in the environment for a longer period of time. Table 7 gives the spectrum of illness seen in East Pakistan in an investigation carried out by Bart, Huq, Khan and Mosley (1970). It is thus seen that the infection to case ratio in El Tor is almost 10 times that of classical cholera.

This is because El Tor produces a large number of symptomless infections and mild diarrhoeas indistinguishable from cases of gastro enteritis due to other causes.

When disease caused by both vibrios were occurring *at the* same time in East Pakistan, Bart, Khan and Mosley (1970) showed that El Tor vibrios were isolated 10 times more frequently from night soil than the classical vibrio, showing its higher resistance to environmental factors.

The highest attack rate was in the area of M.O.H. Kayts where the disease had originated and spread, whereas in all other areas the incidence was lower due to the timely application of preventive measures. By mid October it was evident that the disease was disseminated throughout the two islands as well as in the Jaffna municipality and Kopay areas. All the health areas in Jaffna had been affected by the end of October indicating a very rapid spread of infection. This is quite explainable in a predominantly poor rural environment where 57% of households do not have any toilet facilities and 91% obtain their water supplies from open wells exposed to pollution. Case incidence rapidly declined because of the intensity of control measures. Another factor that may have been responsible for this rapid reduction in the number of cases was the onset of monsoonal rains after a prolonged period of drought.

When cholera spreads in previously unaffected areas, the disease characteristically affects adults (Mosley, 1970). But in Jaffna it is found that all age groups up to 60 have been almost equally affected, while the attack rate of those above 60 is more than double. It is quite evident that the oldest age group has been most severely affected as 12 out of the 18 suspected deaths in Karainagar and Kayts occurred in those over 50 years of age. In Jaffna 60.6% cases were under

TABLE 7

SPECTRUM OF ILLNESS AMONG BACTERIOLOGICALLY AND SEROLOGICALLY POSITIVE FAMILY CONTACTS

Biotype	*Hospitalized*		*Mildly symptomatic*		*Asymptomatic*		*Total*		*Infection to case ratio*
	No.	*Rate %*	*No.*	*Rate%*	*No.*	*Rate %*	*No.*	*Rate%*	
El Tor Ogawa ..	3	2.7	20	17.7	90	79.6	113	15.7	36: 1
Classical Inaba ..	7	20.0	6	17.1	22	62.9	35	47.9	4: 1

(From Bart, K. J., Huq, Z., Khan, M. & Mosley, W. H. (1970))

30 years of age while in the Phillipines during the first epidemic, 52% occurred in the same age group (Dixon, Alvero, Joseph, Tamayo, Mosley & Henderson, 1965). In contrast in the Phillipines when the disease became endemic the age distribution as seen in a cholera vaccine field trial, showed that 50% of the cases occurred under 10 years of age.

The mode of spread of the disease in the early part of the outbreak could be attributed to contact infection as seen by Tamayo, Mosley, Alvero and Joseph (1965). There was often the history of a person having visited the home of a fatal case of suspect cholera, attended the funeral or participated *in an* almsgiving following the funeral. These cases which invariably occurred amongst people of the lowest socio-economic group, with very poor personal hygiene, would have favoured extensive environmental contamination of the home including food and water. Subsequently as the disease spread further it was only possible to elicit a history of the patient or a household contact having visited an infected area. When the disease became still more widespread, even such an association could not be identified and in some instances the patient had not even been outside their areas for several weeks.

In the past, classical cholera was a disease well known for its spread through water. The organism is very sensitive to drying and it survives only under moist conditions and therefore spreads through food and water. Heavy contamination of common sources of water supply, gives rise to explosive outbreaks. But intermittent contamination and excessive dilution may give rise to a picture similar to spread by contact infection. As infection to case ratio is high, though larger numbers are infected the clinical cases are relatively few, thus obscuring the picture of a common vehicle spread.

When new localities are infected asymptomatic carriers are indeed the most important links in the chain of infection (Joint ICMR – GWB – WHO Cholera Study Group, 1970; Mosley, Alvero, Joseph, Tamayo, Gomez, Montague, Dixon & Henderson, 1965). These carriers may transmit the infection to a close contact (Bart, Huq, Khan & Mosley, 1970) or contaminate water sources from where the infection spreads to the community.

Unfortunately during the present outbreak, environmental studies could not be carried out due to the shortage of laboratory material. As the only source of water supply in these areas were wells these would have been the likely sources of infection. Phillippines Cholera Committee (1970) showed that wells formed an important source of infection to the neighbouring households.

It was seen that 6.3% of families had multiple cases taking into consideration both primary and secondary cases. In an endemic area in East Pakistan, Bart, Huq, Khan and Mosley (1970) found that 3.7% of families had multiple cases of El Tor cholera. In studies of cholera El Tor in the Phillippines, Dixon *et al.*, (1965) found multiple recorded cases in 6.7% of households. Compared to classical cholera the frequency of secondary cases is always found to be less in El Tor and this is due to the wider clinical spectrum. In Sri Lanka the secondary cases may have been further reduced as a result of prompt treatment of all immediate contacts with tetracycline.

The present cholera vaccine produces only a short period of immunity and the maximum efficacy is for a period of about 2 months while there is little protection observed after 3 – 5 months. (Asurin & Alvero, 1971). Mass vaccination is therefore never recommended as a preventive measure. In spite of this poor efficacy, mass vaccination campaigns are often undertaken partly under pressure from the public and the press and partly because vaccination is the easiest and most discernible measure (Barua, 1971). Here too, though no mass vaccination programmes were organized, vaccination had to be given to satisfy public demand. As a matter of policy only immediate contacts and neighbours were usually offered the vaccine. Even the vaccination of family contacts within 12 hours of hospital admission of the index case does not influence the subsequent rate of infection or the duration of vibrio shedding or the clinical expression of the disease. (Sommer, Khan & Mosley, 1973). This is because it takes at least 8 days to develop a significant immunological response and the largest number of secondary cases occur

during this period. Sommer and Mosley (1973) have also shown that in villages mass vaccination programmes are an ineffective public health measure. Even when vaccination is offered to the public, it is only the health conscious people that resort to immunization and are protected while those who are really at risk do not come for immunization. This has been clearly shown in several vaccine trials where morbidity and mortality was significantly higher in the unvaccinated group than in the control vaccine group or the cholera vaccine group (Azurin *et al.*, 1971).

Control of cholera in developing countries with poor environmental sanitation is extremely difficult. In practically all such countries invaded by cholera El Tor, the disease has tended to become endemic. Elimination of the disease without improving sanitation is almost an impossible task. Therefore *in developing* countries a pragmatic approach has to be adopted and priorities laid out. Benonson (1971) has laid out the following in order of priority for control of cholera in the 1970s.

1. Effective treatment of cholera as a diarrhoeal disease;
2. Bacteriological surveillance of diarrhoeal disease;
3. Chemoprophylaxis of members of the hearth group;
4. Sanitary improvements, water supply, disposal of excreta;
5. Health Education;
6. Immunization on a voluntary basis;
7. Elimination of quarantine measures.

The dreaded fear of cholera is because of its capacity to kill. If deaths from cholera can be minimized there is no need for fear and anxiety. It should be noted that as a result of diarrhoeal disease alone, Sri Lanka loses annually over 6000 lives and therefore mortality from cholera is relatively insignificant.

The case fatality rate in Jaffna from cholera was about 6% during this period though subsequently in other parts of the country it has been around 9%. The treatment of cholera has now been so perfected that effective treatment can reduce the mortality to less than 1% (Phillips, 1967). Unfortunately this standard in treatment has still not been achieved in our hospitals, though it could easily be attained by careful attention to all seemingly minor details that have been recommended.

A major advance in treatment is the institution of oral therapy for cholera (Nalin & Cash, 1968). This not only reduces the need for intravenous fluid replacement by 80% and thereby reduces the cost, but also makes it possible to prevent patients getting into a state of severe dehydration by early institution of oral therapy in the field. Moreover wide publicity and availability of oral rehydration would not only reduce the mortality from cholera but also the large number of deaths from other causes of diarrhoea.

Some have advocated mass treatment of newly affected communities to prevent the spread of cholera. Cox (1972) has claimed that the epidemic in a localized area in Kenya was stayed by mass treatment and states that mass prophylaxis is *only possible* in a small circumscribed community. The evidence for effectiveness and innocuity of drugs used in preventive medication against cholera is not sufficient to justify their indiscriminate use (W.H.O., 1974). They recommend that the preventive medication should be restricted to specific conditions such as known close contacts.

The final answer to the problem of cholera is necessarily the improvement of environmental sanitation. The magnitude of the problem is so great in terms of cost, that there is always a reluctance even to propose a programme. But it has been worked out that in economic terms sanitation is clearly an investment and is true of every element of a sanitation programme (Abel Smith, 1973). Therefore a planned programme for improvement of environmental sanitation must be established if we are thinking in terms of control and elimination not only of cholera but of all bowel diseases.

We thank all the Medical Officers of Health of the area of S.H.S. Jaffna for the data supplied by them. We are also thankful to Mr. S. Ganhewa for technical assistance and Mrs. F. Dias for secretarial assistance. Our thanks are due to the Director of Health Services for permission to publish this paper.

REFERENCES

Abel Smith (1973) *World Health Organization Chronicle*, **27**, 407.

Azurin, J. C. and Alvero, M. (1971) *Bulletin of the World Health Organization*, **44**, 815.

Bart, K. J., Huq, Z., Khan, M. and Mosley, W. H. (1970) *Journal of Infectious Diseases*, **121**, Supplement, 517.

Bart, K. J., Khan, M. and Mosley, W. H. (1970) *Bulletin of the World Health Organization*, **43**, 421.

Barua, D. (1971) *Bulletin de la Societe de Pathologie Exotieque*, **5**, 652.

Benonson, A. S. (1971) *Bulletin of the New York Academy of Medicine*, **47**, 1204.

Cox, P. S. W. (1972) *East African Medical Journal*, **49**, 440.

Cyjetanovic, B. (1970) *Principles and Practice of Cholera Control*, p. 10. Geneva; WHO Public Health Papers 40.

Department of Census and Statistics (1973) Housing Census 1971.

Dixon, J. J., Alvero, M. G., Joseph, P. R., Tamayo, J. F., Mosley, W. H. and Henderson, D. A. (1965) *Bulletin of the World Health Organization*, **33**, 627.

Joint ICMR – GWB – WHO Cholera Study Group (1970) *Bulletin of the World Health Organization*, **43**, 379.

Mosley, W. H. (1970) *Principles & Practice of Cholera Control*. p. 25 Geneva, WHO Public Health papers 40.

Mosley, W. H., Alvero, M., Joseph, P., Tamayo, J., Gomez, C. Z., Montague, T., Dizon, J. J. and Henderson, D. (1965) *Bulletin of the World Health Organization*, **33**, 651.

Nalin, D. R. and Cash, R. A. (1968) *Principles & Practice of Cholera Control*, p. 73 Geneva; WHO Public Health Papers 40.

Phillips, R. A. (1967) *Journal of the American Medical Association*, **202**, 610.

Phillipines Cholera Committee (1970) *Bulletin of the World Health Organization*, **43**, 313.

Sommer, A., Khan, M. and Mosley, W. H. (1973) *Lancet*, **1**, 1230.

Sommer, A. and Mosley, W. H. (1973) *Lancet*, **1**, 1232.

Tamayo, J. F., Mosley, W. H., Alvero, M. G. and Joseph, P. R. (1965) *Bulletin of the World Health Organization*, **33**, 645.

W. H. O. (1974) *Weekly Epidemiological Record*, **49**, 269.

Urinary Tract Injuries

A. M. L. BELIGASWATTE[1], S. SRITHARAN[2], A. VIJAYARAGAVAN[3]

Ceylon Medical Journal, 1975, **20**, 93–98

Summary

Thirty-five cases of urinary tract injuries admitted to the Accident Service over an 18 month period are presented. Renal parenchymal injuries predominated. The different methods of diagnosis and management are reviewed. At all sites a high incidence of associated injuries was found, and these contributed in a large measure to the mortality recorded in this series. The overall results as far as urinary tract injuries were concerned have been satisfactory, except in those with urethral injuries in which a more uniform approach is indicated.

1. Resident Surgeon. (Present appointment: Consultant Surgeon, General Hospital, Nawalapitiya).
2. Senior House Officer, General Hospital, Colombo.
3. Resident Surgeon. (Present appointment: Surgeon, Out-Patients Department, General Hospital, Kandy).

Introduction

Traumatic lesions of the urinary tract are less frequently encountered in patients seeking admission to an Accident Service, and the large majority of them have associated injuries of varying degrees. The latter often tends to overshadow the urinary tract lesion. In most cases the presence of concomitant intraperitoneal lesions draws attention to the necessity for exploration, the urinary tract lesion being an unexpected finding. Hence the importance of considering the possibility of urinary tract injuries in all patients with abdominal and pelvic trauma cannot be overemphasised.

Materials and Methods

During the 18 month period from 15th May 1972 to 14th November 1973, a total number of 821 patients with chest and abdominal trauma were treated at the Accident Service of the Colombo General Hospital. Of these 35 (4.2%) patients had sustained injuries to the urinary tract, and these form the basis of this report.

Renal Injuries

Renal injuries accounted for more than half the total number of cases of urinary tract injuries in this series. (Table 1). There were 20 (55.5%) cases of renal injuries, 13 being penetrating and 7 non-penetrating. Both kidneys appeared to be equally susceptible.

TABLE 1
URINARY TRACT INJURIES

Kidney (alone)	19
Kidney + Ureter	1
Bladder	10
Urethra	5
Total	35

Unlike in most other series reported where automobile accidents had accounted for the majority of renal injuries, in this series stab wounds predominated, a trend which was reflected in injuries to other viscera studied during the same period (Table 2).

TABLE 2
RENAL INJURIES – MECHANISM OF INJURY

Stab	11
R. T. A.	3
Gunshot	2
Falls	1
Railway	1
Assaults	1
Total	20

Trauma to the kidney involved predominantly male patients, there being only one female. The patients ages ranged from 10 years to 62 years.

Fourteen patients had associated injuries to other abdominal and thoracic viscera. The most frequently injured organs were the liver, small and large bowel, diaphragm and the spleen. Retroperitoneal haematomas were seen in 6 patients. The number of associated injuries was significantly higher in those with penetrating injuries as compared with non-penetrating renal injuries, the incidence being 84.7% and 42.8% respectively.

Only three of the 7 patients with non-penetrating renal injuries underwent laparotomy, so that accurate classification of the type of injury was not possible in all cases. However the injuries were arbitrarily grouped into (1) contusions or minor lacerations – 4 cases, (2) major lacerations or rupture – 2 cases, and (3) avulsion of the renal pedicle – 1 case. (Table 3).

TABLE 3
NON-PENETRATING RENAL INJURIES

Contusions or minor lacerations	4
Major lacerations or rupture	2
Avulsion of renal pedicle	1
Total	7

Twelve of the thirteen patients with penetrating injuries underwent exploratory laparotomy, allowing a more accurate classification. These lesions were grouped according to the criteria of Carlton and Scott (1960) into Type I – simple lacerations of the renal parenchyma – 7 cases, Type II – those with involvement of the collecting system with or without urinary extravasation – 5 cases (the unexplored kidney was included in this group), Type III – cases with extensive destruction of the kidney – 1 case (Table 4).

TABLE 4
PENETRATING RENAL INJURIES

Type 1	7
Type 2	5
Type 3	1
Total	13

Macroscopic haematuria was observed in only 4 patients with non-penetrating injuries and in 2 patients with stab injuries. The large majority of our patients had guarding and rigidity of either the whole or part of the abdomen. Clinical shock was present in 8 cases on admission, yet in only two cases was the renal injury the only finding. In these two cases the degree of shock did not correlate with the severity of the injuries.

Although plain radiography of the abdomen was performed in all patients with renal injuries, this investigation was of limited help in the pre-operative evaluation of the patient. We were well aware of the value of intravenous urography in the management of patients with renal injuries, yet for various reasons, we were not able to carry out this investigation in the majority of our patients. In the four patients in whom excretory urography was performed, there was delay in the excretion of the contrast medium and often poor delineation of the pelvicalyceal system in the injured kidney.

Four of the seven patients with non-penetrating renal injuries were successfully treated conservatively, the other three underwent laparotomy because of obvious intra-peritoneal haemorrhage from injuries to other viscera like the liver, spleen and the inferior vena cava. Two of these required nephrectomy because of the severity of the renal lesion, while in the other, suturing of the laceration was carried out with a good result.

There was only one death in the seven non-penetrating renal injuries. This patient had severe associated injuries to the liver and the inferior vena cava.

Eleven of the penetrating renal injuries were caused by stab wounds and two were due to gunshot wounds. Only one case of isolated renal injury was encountered amongst the 13 cases with penetrating renal injuries and this was caused by a posterior stab wound. This case was managed conservatively with a good result. In all the others with penetrating trauma, there was sufficient evidence of either peritonitis or intraperitoneal bleeding to warrant exploration. In three of these the possibility of renal injury was considered pre-operatively, either because of the presence of haematuria or because of the site of the external wound. In nine cases the renal injury was an incidental finding at operation. Eight of these patients underwent conservative renal surgery: either simple suturing or partial nephrectomy. Gelfoam packing of the laceration was used in one case with no adverse effects.

Nephrectomies were carried out in 2 instances at the initial exploration and one interval nephrectomy, two months after the primary operation. When nephrectomy was contemplated in cases without pre-operative assessment of the function of the contralateral kidney, we were forced to be content with mere palpation of the opposite kidney. The interval nephrectomy was necessitated because of a hydronephrosis and a urinary fistula following end-to-end anastomosis of a completely severed ureter in the only patient with a combined injury to the renal parenchyma and the ipsilateral ureter. In one case the renal injury was detected at post-mortem in a patient who succumbed to injuries to his heart and lungs.

There were four deaths in patients with penetrating renal injuries, three of whom succumbed to associated injuries, while in only one was the renal injury directly responsible for the fatal outcome.

Ureteral Injuries

Only one case of compound renal parenchymal and ipsilateral ureteric injury was encountered. This followed a stab wound in the epigastrium resulting in a type 1 injury to the left kidney and a complete severance of the ipsilateral ureter in its abdominal course. He developed a urinary fistula at the site of the ureteric anastomosis and subsequently underwent interval nephrectomy.

Bladder Injuries

There were 10 bladder injuries, of which equal numbers were caused by penetrating and non-penetrating trauma respectively. (Table 5), unlike most other series where blunt trauma is the most common cause of bladder injuries. The male: female ratio was 8:1, and in the only female in the series the bladder injury resulted from a stab wound. There were two children aged 10 years and 12 years. Of the rest, young adults predominated.

TABLE 5

BLADDER INJURIES – MECHANISM OF INJURY

R.T.A.	4
Stab	4
Falls (one impalement)	2
Total	10

Three of the five patients who suffered blunt trauma had associated pelvic fractures.

The injuries were grouped as follows:– (1) contusions of the intact bladder wall – 1 case, (2) extra-peritoneal rupture – 3 cases, and (3) intra-peritoneal ruptures – 6 cases. There were no combined intra- and extra-peritoneal ruptures of the bladder in our series. With blunt trauma there were three intra-peritoneal and two extra-peritoneal ruptures, whereas there were only 3 intra-peritoneal ruptures to 1 extra-peritoneal rupture in the penetrating group.

Associated injury to the bowel was found in 5 cases, 2 due to blunt trauma and 3 due to penetrating wounds. In the latter group,

two had a single penetrating wound, while the other had multiple stab wounds. Three of these patients with blunt trauma to the bladder had associated fractures of the pelvis. Only three patients had isolated bladder injuries, two due to stab wounds and one following a road traffic accident.

Signs of peritoneal irritation were observed in all patients with intra-peritoneal rupture of the bladder, the time of onset of these signs varying from a few hours to several hours after the injury. In one of our patients who was found to have an intra-peritoneal rupture of the bladder following a fall off a motor cycle, peritonitis developed nearly 24 hours after the accident. Signs of peritoneal irritation were detected as a rule much earlier in those with associated bowel injury. One patient with an extra-peritoneal rupture of the bladder following an impalement injury of the rectum, developed a urinary leak via the rectum; one developed signs of peritonitis, while in the third the injury was detected at post-mortem.

All six patients with intra-peritoneal rupture in our series had transperitoneal repair of the bladder defect and post-operative urethral catheter drainage, with good results. Two patients with extra-peritoneal rupture who survived the initial injury, were successfully managed with urethral catheter drainage, after the tear in the bladder was closed.

The two deaths amongst the ten cases of vesical injury had extra-peritoneal injuries, both following blunt trauma, and in both there were associated fractures. One had in addition a tear in the large bowel, death occurring several weeks later from peritonitis. The other patient was admitted in extreme shock from multiple fractures which failed to respond to resuscitative measures.

Urethral Injuries

Over the 18 month period under review, we encountered only five urethral injuries amongst the 35 cases of urinary tract trauma, an incidence of 14.28%. All cases occurred in males between the ages of 18 years and 38 years. All were due to blunt trauma.

The presence of urethral injury was diagnosed purely on clinical findings viz. the presence of blood at the external urethral meatus, inability to pass urine and the subsequent distension of the bladder. All our patients presented this classical triad. The one with the bulbous urethral injury had in addition a peri-urethral haematoma.

Urethral injuries are usually classified into (1) complete ruptures or transections, (2) partial ruptures, and (3) contusions. There were 4 partial ruptures and one complete rupture in this series.

The conventional division of urethral injuries into (1) anterior urethral i.e. the bulbous and penile urethrae, and (2) posterior urethral i.e. the membranous and prostatic urethrae, was employed to group our cases. There were 4 posterior urethral (all membranous) and 1 anterior urethral (bulbous) rupture. All 4 patients with membranous urethral rupture had associated pelvic fractures.

Three of our patients with posterior urethral rupture were the victims of road traffic accidents, whilst the fourth sustained his injury when falling off a moving train. In the patient with the bulbous urethral rupture, the injury was caused by falling astride a concrete post.

There was no uniform method of management of urethral injuries in our series, as was to be expected when different surgeons were called upon to treat these patients. Contrary to accepted principles most of our patients had urethral catheterisation attempted without success. In the case with the bulbous urethral rupture, supra-pubic bladder drainage was performed as the initial method of treatment. In two cases with partial posterior urethral ruptures, supra-pubic cystostomies were performed and urethral catheters were 'railroaded' using sounds. In two others only supra-pubic bladder drainage was carried out.

One patient with complete rupture of the posterior urethra and gross displacement of the pelvis, developed an impassable stricture and required urinary diversion after unsuccessful attempts at restoring urethral continuity. Three patients, one with an anterior urethral and two with posterior urethral rupture, developed strictures of the urethra which were managed by regular dilatation of the strictures. One patient developed impotence following the urethral injury.

One patient died on the day of admission from shock following multiple fractures.

Discussion

In the greater part of its course, the urinary tract lies in relatively protected positions, and this fact may account for the rarity of traumatic lesions of its component parts.

Renal injuries occur more frequently than is generally appreciated and is often overlooked by the surgeon who is busy with more serious or more apparent injuries to the intra-peritoneal viscera (Scott *et al.*, 1969). This is borne out in our series where nearly half the cases were not diagnosed pre-operatively. Unlike in most other series where blunt trauma was the commonest cause of renal injury, in this series penetrating wounds, mainly from stab injuries accounted for 65% of all cases. Though microscopic haematuria is a reliable sign of renal injury, this was seen in only 30% of the cases. The onset of haematuria, however, may be delayed by several hours by shock and even the nature of the injury. This applies even to microscopic haematuria, and hence a negative result does not exclude renal injury. Though the great majority of patients had abdominal or flank tenderness, this by itself could not be considered a reliable sign of renal injury, as in nearly half the cases the diagnosis was not suspected despite its presence. Plain X'rays of the abdomen were not helpful in the pre-operative evaluation of these patients. On the other hand excretory urography, especially done after combating shock and using a high dose or infusion technique, is valuable in assessing the extent of the renal injury and more so in assessing the function of the contralateral kidney. A normal urogram, however, does not exclude renal injury (Scott *et al.*, 1963). As in other series, the incidence of associated injury to other viscera was greatest with penetrating injuries, highlighting the necessity for exploration in this group of patients. Most patients with isolated renal injuries can be managed conservatively and the end results have justified this approach (Slade, 1971). This regime includes absolute bed rest with adequate sedation, careful monitoring of the pulse and blood pressure, examination of every specimen of urine voided for the severity of the haematuria, prophylactic antibiotics to prevent secondary infection, and a high fluid intake, apart from the treatment of shock if present. Surgical intervention should be seriously considered in those cases with persistent and severe haematuria, an expanding loin haematoma or in those not responding to measures directed at combating shock. (McCague, 1950). The exact method of treatment in these cases would depend on the findings at exploration, most cases yielding to conservative measures such as simple suture or partial nephrectomy. The retroperitoneal haematoma in relation to an injured kideny, found incidentally at exploration, should only be explored if found to be increasing in size, for an ill timed exploration of such a haematoma may lead to uncontrolled bleeding. (Mitchell, 1971). The prognosis depends largely on the severity of the associated injuries. Though a mortality of 25% was recorded in this series, in only one case was the cause of death directly related to the renal injury.

The ureter being well protected in the body is much less vulnerable to injury, than any other part of the urinary tract and by virtue of its laxity, seldom gets torn with blunt trauma. The commonest modes of external trauma causing ureteric injuries are gunshot and stab wounds. Often the diagnosis is unsuspected at the time of injury and is usually manifested later by the appearance of a urinary fistula or by extravasation and sepsis. In complete transection of the ureter, restoration of continuity either by end to end anastomosis or by re-implantation of the ureter to the bladder must be attempted in all cases. In a case seen recently but not included in this series, a stab wound in the left iliac fossa had partially severed the left ureter and the left common iliac artery. Though the ureter was carefully examined at operation, no detectable injury was noted. Yet several days later its presence was noted when a urinary fistula developed. Simple drainage of the site resulted in its spontaneous closure.

Injury to the lower urinary tract should always be suspected in patients with trauma to the lower abdomen, especially when associated with pelvic fractures, Rupture of the bladder from blunt trauma probably always occur in the presence of a full bladder. Intra-peritoneal rupture is generally associated with a blow to the lower abdomen

resulting in a sudden rise in intra-vesical pressure, while extra-peritoneal rupture of the bladder is usually associated with a fractured pelvis, a spicule of bone from the superior ramus penetrating the anterior wall of the bladder. In intra-peritoneal rupture, signs of peritoneal irritation often become manifest several hours after the onset of the injury, except in those with associated injury to other hollow viscera (Mitchell, 1971). Contusions of the bladder wall can be managed conservatively, except in those cases where normal voiding is difficult due to associated pelvic fracture, in whom urethral catheter drainage is required for some time. Intraperitoneal rupture often requires suture of the rent in the bladder in view of the fact that these are usually large tears. These could be approached transperitoneally. In extra-peritoneal rupture, the tear is usually small and seldom require to be sutured. Bladder drainage either by urethral catheter or via a suprapubic cystostomy is however essential, in addition to drainage of the perivesical and perivesical spaces. As the risk of associated urethral injury is fairly high in these patients, Mitchell (1971) advises suprapubic drainage in addition to urethral catheter drainage. Two of our patients with extraperitoneal rupture who survived the initial injury were successfully managed with urethral catheter drainage alone.

Of the different anatomical divisions of the urethra, the prostatic and penile parts are rare sites of injury. With the exception of the penile urethra, where traumatic amputation is the frequent mode of injury, blunt trauma is nearly always responsible for urethral injuries. Bulbous urethral injuries classically result from the patient falling astride an object, the urethra being compressed between the pubic arch and the external object. The commonest type of accident causing posterior urethral injuries now, are road traffic accidents, and these are almost always associated with pelvic fractures. The mechanism of injury is more commonly due to distortion of the pelvis at the time of the injury with resultant stretching and tearing of the urethra, and less often due to direct injury from a spicule of bone (Mitchell, 1968). Recent reports suggest that the large majority of urethral injuries are partial ruptures and this fact is of significance in both the management and the final outcome in these injuries. The mainstay in the diagnosis of urethral injuries is the clinical findings. The passage of a urethral catheter as a diagnostic manoeuvre can be misleading, since a partially ruptured urethra can at times be easily catheterised. Further, attempts at catheterisation can result in converting a partially ruptured urethra into a complete one, in addition to introducing infection and causing sloughing of a larger segment of the urethra and a more difficult stricture to deal with. Our experience with urethrography as a diagnostic aid in the immediate post-traumatic period is limited. In the light of our limited experience with the five urethral injuries seen in this series, we are strongly in favour of suprapubic cystostomy as the initial method of treatment of those presenting with the classical triad mentioned earlier. The decision whether to splint the ruptured urethra should be made at the time of cystostomy, this line of treatment being limited to a complete rupture with wide separation of the ends. While formation of a stricture is an invariable accompaniment of urethral injuries, impotence is a less well documented but fairly common sequel of posterior urethral ruptures, the mechanism being the disruption of the neuromuscular pathways of erection at the time of injury. (Waterhouse *et al.*, 1969).

We have pleasure in acknowledging the help of the other Resident Surgeons of the Accident Service, who have allowed us to include patients treated by them. We also wish to thank Mr. Y. R. Karunaratne for help with the analysis of the data.

This work was supported by a grant from the National Science Council of Sri Lanka.

REFERENCES

Carter E. Carlton, Jr. and Russell Scott, Jr. (1960) *Journal of Urology*, **84**, 599.

McCague, E. J. (1950) *Journal of Urology*, **63**, 773.

Mitchell, J. P. (1968) *British Journal of Urology*, **40**, 649.

Mitchell, J. P. (1971) *British Journal of Urology*, **2**, 567.

Slade, N. (1971) *British Journal of Urology*, **43**, 639.

Scott, R. Jr., Carlton, C., Ashmore, A. J. and Duke, H. H. (1963) *Journal of Urology*, **90**, 535.

Scott, R. Jr., Carlton, E. E. Jr. and Goldman, M. (1969) *Journal of Urology*, **101**, 247.

Waterhouse, K. and Gross, M. (1969) *Journal of Urology*, **101**, 247.

Comparison of Metronidazole with Emetine & Chloroquine in the Treatment of Hepatic Amoebiasis– A Controlled Double Blind Study

U. S. JAYAWICKREMA[1], N. D. W. LIONEL[2]

Ceylon Medical Journal, 1975, **20**, 99 – 102

Summary

54 patients aged 20–27 years with hepatic amoebiasis were treated with either emetine 45mg by injection for 7 days and chloroquine orally in dose of 300mg base (2 tablets) twice daily for 2 days followed by 300mg base daily for 12 days or metronidazole orally in a dose of 400mg (2 tablets) thrice daily for 5 days. 21 out of the 54 patients showed pus on aspiration. There was no statistically significant difference between the two treatments when assessed by the time taken for the temperature to become normal and the liver to become non-palpable and tender.

Introduction

Hepatic amoebiasis is a common manifestation of extra-intestinal amoebiasis and is fairly widespread in tropical countries. In the studies reported from Sri Lanka, Rajasuriya and Nagaratnam (1962) found that the incidence was about 1.5% among the total admissions for 1959 to the non-paying wards in the General Hospital, Colombo. In the series reported by Ramachandran and his colleagues (1972) the incidence was 3.5% of all hospital admissions to the Medical Unit, Government Hospital, Negombo over a period of 17 weeks.

It has been clearly established for some years that the best results in the treatment of the disease have been obtained with the use of a combination of emetine and chloroquine (Wilmot *et al.*, 1959). This combination has been shown to be more effective than either drug alone (Powell *et al.*, 1955). The toxicity of emetine has however led to a continued search for an equally effective and safer alternative.

1. Consultant Physician, General Hospital, Colombo.
2. Associate Professor of Pharmacology, University of Sri Lanka, Colombo Campus.

In 1966 Powell and his colleagues from South Africa reported that metronidazole a nitroimidazole derivative originally introduced for the treatment of trichomoniasis was also effective in the treatment of hepatic amoebiasis in a dose of 400mg orally thrice daily for 5 days. The effectiveness of metronidazole in hepatic amoebiasis has been confirmed by other studies carried out in India and Pakistan (Chhetri *et al.*, 1969; Venkataswara Rao *et al.*, 1968; Ullah *et al.*, 1971).

However no studies have been done to compare the efficacy of metronidazole with that of a combination of emetine and chloroquine in hepatic amoebiasis. Srivastava and his colleagues (1972) have compared metronidazole with emetine alone in treating amoebic liver abscess. They reported that 17 out of 18 patients treated with 400mg metronidazole thrice daily for 5 days were cured while 13 out of 15 treated with emetine 60mg daily for 10 days were cured.

We therefore decided to carry out a double blind controlled study to compare the efficacy of metronidazole with that of a combination of emetine and chloroquine which has been considered the standard treatment of hepatic amoebiasis.

Patients & Methods

The trial was carried out at the General Hospital, Colombo and the Colombo South Hospital, Kalubowila. The criteria of selection of patients were defined as follows:

1. The presence of a liver abscess proved by aspiration of typical pus and/or
2. The following symptoms and signs on admission:
   * Fever over 100°F
   * Pain in the right side of chest or abdomen
   * Enlarged tender liver

Suggestive haematological changes i.e. an elevated E.S.R. and a neutrophilic leucocytosis (> 10,000 per cu.mm & neutrophils > 70%). and suggestive radiological changes such as upward displacement of the diaphragm obliteration of the costophrenic angle, atelectasis of the right lung base and pleural effusion if present were taken as confirmatory evidence.

These criteria were selected on the basis of the findings from the 2 studies from this country quoted earlier.

Ramachandran and his colleagues reported that fever was present in 91% of cases and that hepatic enlargement was a notable feature in all the cases with a palpable enlargement below the costal margin in 96%. Hepatic tenderness occurred in all.

88% had a leucocyte count of over 10,000 cells per cu.mm and 83% had a neutrophil count of over 70% of the total leucocyte count. Similar findings were reported earlier by Rajasuriya and Nagaratnam.

Patients who had received specific anti-amoebic treatment before admission were excluded from the trial.

Chronic alcoholics who gave a history of a heavy bout of drinking a few days before the onset of the illness were excluded because of the possibility of acute alcoholic hepatitis which can simulate amoebic hepatitis as reported by Nagaratnam and Peiris in 1971.

Treatment

Patients selected for the trial were randomly allocated to the two treatment groups by the use of a table of random numbers. One group received emetine 45 mg (3/4 ml) by i.m. injection for 7 days and chloroquine orally in a dose of 2 tablets (300 mg base) twice daily for 2 days followed by 2 tablets daily for 12 days the treatment lasting 14 days in all.

The other group received metronidazole orally in a dose of 400 mg (2 tablets) thrice daily for 5 days.

In order to make the two treatment schedules as similar as possible and thus minimise the chances of the observer discovering the treatment given, the patients in the metronidazole group were administered a placebo injection (distilled water 3/4 ml) i.m. daily for 7 days and two tablets of a placebo (calcium lactate) thrice daily from the 6th day till the 14th day. Thus both groups received oral medication for 14 days and a course of injections for the first 7 days.

Oral therapy was supervised to ensure that was no default in the taking of the tablets.

All cases received luminal amoebicide therapy (diloxanide 0.5g thrice daily for 10 days) after the course of therapy for hepatic amoebiasis.

Every patient was needled but pus was aspirated only in 13 cases in the emetine and chloroquine group and in 8 cases in the metronidazole group.

Assessment of treatment

The results of treatment and the occurrence of any adverse effects were noted daily by a medical officer who was unaware of the treatment given. No indication of the treatment was given on the bed-head ticket. The treatment was indicated by the code number of the treatment assigned to each patient. The observations were recorded daily on a specially prepared results assessment sheet.

The therapeutic response was assessed by the time taken for:

(1) Fever to subside

(2) Liver to become impalpable and pain and tenderness to disappear.

We used the criteria adopted by Rajasuriya and Nagaratnam 1962 with slight modification to classify the therapeutic response.

The response was considered:

1. *Rapid* – if fever, hepatic pain, tenderness and hepatomegaly responded within 6 days of beginning therapy.

2. *Intermediate* – if disappearance of the symptoms and signs took more than 6 days and less than 9 days.

3. *Slow* – if disappearance of symptoms and signs took more than 9 days.

Results

54 patients with ages ranging from 20–70 years completed the trial. The two treatment groups contained roughly similar numbers of patients. The sex and age distribution, the duration of illness before treatment and the extent of liver enlargement were similar. The number of cases with positive radiological changes and suggestive haematological findings were roughly equal in both groups. The number of cases revealing pus on aspiration were slightly more in the emetine group (13 out of 28) compared with the metronidazole group (8 out of 26). Over all the treatment and control groups were closely similar in all relevant respects (Table 1).

TABLE 1
COMPARABILITY OF TREATMENT GROUPS

	Emetine & Chloroquine	*Metronidazole*
No. of patients ..	28	26
Sex. M : F. ..	8.3 : 1	7.6 : 1
Mean age (years) ..	43 (Range 22–68)	45 (Range 20–70)
No. with history of alcoholism ..	22	21
Duration of illness before treatment ..	7.3 days (range 3–14 days)	7.9 days (Range 2–15 days)
No. with abscesses proved by aspiration	13	8
No. with liver enlargement over 4 cm. below costal margin ..	8	6
No. with positive radiological findings ..	22	19
No. with raised ESR & leucocytosis ..	28	26
No. with jaundice ..	2	3
No. with history of amoebic colitis ..	1	2

The difference in the mean duration of time taken for the temperature to come to normal and for the liver to become non-palpable and nontender is not statistically significant with the 2 treatments if we consider the cases of amoebic liver abscess and amoebic hepatitis without demonstrable pus separately as well as together (Tables 2 – 4).

When the results are assessed on the basis of the number of patients cured by the 6th day (good response) and the 9th day (intermediate response), the results are similar when the cases of liver abscess and those with no demonstrable pus are considered separately as well as together (Tables 5 – 7). All the cases responded by the 14th day.

Only 2 cases in the metronidazole and 3 cases in the emetine and chloroquine group required a second aspiration between the

TABLE 2
ASSESMENT OF RESULTS
ALL CASES OF AMOEBIC DISEASE OF THE LIVER

Mean Duration of time for	*Days* *Emetine & Chloroquine*	*Metronidazole*
Temperature to come to normal ..	5.07	3.96
Liver to become non-palpable ..	8.75	7.69
Liver to become non-tender	7.54	6.58

TABLE 3
ASSESSMENT OF RESULTS
CASES OF AMOEBIC HEPATITIS (EXCLUDING ABSCESSES)

Mean Duration of time for	*Days* *Emetine & Chloroquine*	*Metronidazole*
Temperature to come to normal ..	4.6	3.83
Liver to become non-palpable ..	7.46	6.59
Liver to become non-tender ..	6.60	6.33

TABLE 4
ASSESSMENT OF RESULTS
CASES OF LIVER ABSCESS ALONE

Mean Duration of time for	*Days* *Emetine & Chloroquine*	*Metronidazole*
Temperature to come to normal ..	5.61	4.25
Liver to become non-palpable ..	8.15	7.57
Liver to become non-tender ..	8.92	7.13

TABLE 5
ASSESSMENT OF RESULTS
ALL CASES OF AMOEBIC DISEASE OF THE LIVER

Response	*No. of cases* *Emetine & Chloroquine*		*Metronidazole*	
Rapid ..	11/28	22/28 (78.5%)	12/26	22/26 (86.1%)
Intermediate ..	11/28		10/26	
Slow ..	6/ 28		4/26	

TABLE 6

ASSESSMENT OF RESULTS
CASES OF AMOEBIC HEPATITIS (EXCLUDING ABSCESSES)

Response	*No. of cases*			
	Emetine & Chloroquine		*Metronidazole*	
Rapid ..	8/15	12/15 (80%)	9/18	14/18 (77%)
Intermediate	4/15		5/18	
Slow ..	3/15		4/18	

TABLE 7

ASSESSMENT OF RESULTS
CASES OF LIVER ABSCESS ALONE

Response	*No. of Cases*			
	Emetine & Chloroquine		*Metronidazole*	
Rapid	3/13	9/13 (69.2%)	3/8	6/8 (75%)
Intermediate ..	6/13		3/8	
Slow ..	4/13		2/8	

3rd and 5th days of starting treatment and in all these cases symptoms and signs disappeared within 6–9 days of initiating drug therapy.

Adverse effects

The number of patients showing adverse effects during therapy are shown in Table 8. Adverse effects such as diarrhoea, numbness, muscle pain, tachycardia and breathlessness were reported only in the emetine and chloroquine group. The incidence of nausea and vomiting was also more frequent in this group. Headache was more common in the metronidazole group. Abdominal pain, bad taste in the mouth, dizziness and drowsiness were reported with roughly equal frequency in both treatment groups. In general the incidence of adverse effects were greater among patients treated with emetine and chloroquine.

TABLE 8

ADVERSE EFFECTS

Adverse Effects	*Emetine & Chloroquine*	*Metronidazole*
Nausea & vomiting ..	11	3
Abdominal pain ..	7	7
Diarrhoea ..	3	0
Bad taste in the mouth	3	2
Headache ..	3	8
Dizziness ..	4	4
Drowsiness ..	2	3
Numbness ..	4	0
Muscle pain ..	4	0
Cardiac arrhythmias ..	2 (Tachycardia)	0
Breathlessness ..	2	0

Discussion

From this study we can conclude that there is no statistically significant difference between the 2 treatments when assessed by the time taken for the temperature to come to normal and the liver to become non-palpable and tender. If patients with definite liver abscess were considered separately from those with no demonstrable pus, there was still no difference in the results with the 2 treatments.

Our study confirms the findings of other workers that metronidazole is an effective drug in the treatment of hepatic amoebiasis and also indicates that it is as effective as a combination of emetine and chloroquine in the treatment of this disease in this country. Metronidazole has the advantage that it can be given orally and adverse effects are less than with emetine and chloroquine.

REFERENCES

Chhetri, M. K., Chakravorty, N. C., Neelakantan, C., Bhattacharya, B. and Sarkar, S. K. (1969) *Journal of the Association of Physicians of India*, **17**, 681.

Powell, S. J., Macleod, I., Wilmot, A. J. and Elsdon-Dew, R. (1966) *Lancet*, **2**, 1329.

Powell, S. J., Wilmot, A. J., Macleod, I. N. and Elsdon-Dew, R. (1955) *Annals of Tropical Medicine & Parasitology*, **59**, 496.

Rajasuriya, K. and Nagaratnam, N. (1962) *Journal of Tropical Medicine and Hygiene*, **65**, 165.

Ramachandran, S., Sivalingam, S. and Perumal, J. R. A. (1973) *Journal of Tropical Medicine & Hygiene*, **75**, 23.

Srivastava, S. N., Srivastava, P. R., Singh, V. P., Vaish, S. K. and Somani, P. N. (1972) *Indian Medical Gazette*, **12**, 112.

Ullah, W., Chowdhry, M. and Sarkar, C. R. (1971) *Journal of the Pakistan Medical Association*, **20**, 120.

Venkateswara Rao, S., Satyanarayana, D. and Reddy, K. J. (1968) *Journal of the Indian Medical Association*, **51**, 450.

Wilmot, A. J., Powell, S. J. and Adams, E. B. (1959) *American Journal of Tropical Medicine & Hygiene*, **8**, 623.

Liver Injuries

A. THAVENDRAN[1], A. M. L. BELIGASWATTE[2], A. VIJAYARAGAVAN[3], RUDRA RASARETNAM[4]

Ceylon Medical Journal, 1975, **20**, 103 - 108

Summary

70 cases of liver injury treated at the Accident Service during an 18 month period in 1972–73 are reviewed. Although blunt trauma was seen relatively less frequently than penetrating injury, the incidence of hepatic injury was more common with the former, and the more severe cases of liver injury also occurred after blunt trauma. Minor degrees of liver injury require no specific treatment. In the more severe cases, haemorrhage dominates the clinical picture, and presents the most of the problems during operation. In major liver lacerations, bleeding occurs not uncommonly from the hepatic veins, and in such cases, preliminary control of the site of bleeding facilitates resection.

Introduction

The liver is one of the commonest visceral lesions in abdominal trauma, occurring with both blunt and penetrating injuries, and presenting as intra-peritoneal haemorrhage, the latter being in most cases the indication for exploration. Concomitant injury to other thoracic or abdominal viscera is not uncommon. The present paper is based on a review of 70 cases of liver injury treated recently at the Accident Service of the Colombo General Hospital. The various methods of treatment employed, ranging from no treatment of the liver wound, to hepatic resection is a reflection of the various degrees of injury.

Material and Methods

70 of the 359 patients treated at the Accident Service for abdominal trauma during the period 15th May 1972 to 14th November 1973, had suffered hepatic trauma, this being second only to the small intestine in frequency, in both blunt and stab injuries. Stab wounds caused liver injury in 44 cases, blunt trauma in 20, of whom only half were involved in road traffic accidents (RTA), and six were due to gun shot wounds (Table 1).

TABLE 1

CAUSATIVE MECHANISMS

		No.	*Died*	*% mortality*
Stab		44	5	11
Gunshot		6	0	0
Blunt Trauma		20	13	65
RTA	10			
Fall	6			
Assault	2			
Railway	2			

Most of the patients were young adults, the mean age being 29 years. Thirty of the patients were in the 21–30 year age group. 69 of the 70 patients were males.

The older anatomical division of the liver by the falciform ligament into right and left lobes was used in recording the site of injury, and as expected the right lobe was involved more frequently. (Table 2) The degree of injury varied widely from superficial stab wounds to multiple deep lacerations and stellate fractures of the liver. Fourteen of the 20 patients who had suffered blunt trauma had deep lacerations of the right lobe, and in 4 of them the hepatic veins were torn. In superficial liver wounds, haemorrhage had ceased by the time of exploration, a finding that was seen more commonly with stab wounds than with blunt trauma (Table 3).

TABLE 2

ANATOMICAL SITE OF INJURY

Right Lobe	..	..	44
Left lobe	..	..	17
Rt & Left lobes	..	..	3
Not stated	..	..	6

1. Resident Surgeon. (Present post: Surgeon, General Hospital, Chilaw)
2. Resident Surgeon. (Present post: Surgeon, General Hospital, Nawalapitiya)
3. Resident Surgeon. (Present post: Surgeon, General Hospital, Ratnapura)
4. Assistant Thoracic Surgeon, General Hospital, Colombo.

TABLE 3

HAEMORRHAGE FROM LIVER

	Blunt Trauma		*Stabs & Gunshot wounds*	
	No.	*Died*	*No.*	*Died*
Bleeding at time of operation ..	10	14	21	3
No bleeding at operation	3	0	17	0
Not stated ..	—	—	10	0
No. operation – P.M. data ..	3	3	2	2

Only 1 died of the liver injury. The cause of death was cardiac wound, and aortic wound.

Thirty-nine of the 70 patients (56%) had concomitant injury to other viscera namely the diaphragm, duodenum and small intestine, stomach and large intestine being involved in decreasing order of frequency (Table 4). The kidneys were injured not much less frequently, but splenic injuries were surprisingly few, being seen in only 4 cases. The aorta and inferior vena cava were injured in two cases. Twenty patients had associated thoracic trauma, 6 orthopaedic injuries, and 2 had head injuries.

TABLE 4

ASSOCIATED INJURIES

Diaphragm ..	14		
Stomach ..	9		
Duodenum & small int:	10	Chest Injury	20
Large intestine ..	9	Head Injury	2
Kidney ..	8	Orthopaedic	6
Spleen ..	4		
Pancreas ..	3		
Gall bladder ..	2		
Aorta & IVC ..	2		
Other abdominal vessels	2		

Diagnosis

As in all abdominal injuries, the clinical findings were assessed to ascertain whether haemorrhage or peritoneal irritation was present. In the secases the three important features were (1) the stab wound or external signs of injury, (2) signs of peritoneal irritation, and (3) hypotension. The degree of peritoneal irritation exhibited by these patients varied considerably. Generalised rigidity was present in about a third of the cases, most of whom had associated ruptures of the hollow viscera. In isolated hepatic injury, guarding was often confined to the right hypochondrium, occasionally to the epigastrium, and in 2 cases was localised on the left side of the abdomen. Right shoulder tip pain was present in only 2 patients.

Forty-three patients had systemic systolic pressures of 90 mm Hg, or less.

Local external bruising was present in 7 patients with blunt trauma. Those patients who were admitted with normal, or near normal pressures, and with signs only of low grade peritoneal irritation were treated conservatively initially, until the development of more signs and symptoms, which made laparotomy necessary.

Pre-operative X'ray examinations were performed in 15 patients with blunt trauma, mainly for the detection of thoracic trauma or other abdominal lesions. The signs of a raised diaphragm, and free fluid in the abdomen, suggestive of liver rupture, were looked for routinely, but in only one case was evidence of free fluid found on the X'ray films. Fractured right lower ribs were noted in 4 patients, left lower ribs in 2, and one patient had bilateral fractures of the ribs.

Paracentesis abdominis was performed in only 4 patients. There were three true positives, but the value of the test was diminished by the presence of other signs of intra-peritoneal haemorrhage which by themselves were sufficient indication for operation. The fourth patient who had a negative result, had only superficial laceration of the liver capsule with little blood loss, the findings being verified at post-mortem examination following death from a head injury.

Treatment

Intravenous infusions were set up in the arms in all cases of suspected liver injuries. The exploratory incision was either a paramedian or midline one, and on 5 occasions it was extended into the right chest when a right lobe liver injury could not be adequately managed through an abdominal incision. The superficial liver injuries which had ceased bleeding required no definitive treatment and were left alone, as happened in 20 cases. In 32 cases the liver was sutured and haemostasis effected, but three of these patients subsequently died. Gelfoam packing was used infrequently. Five patients

required hepatic lobectomy, and in a further 5 patients death was due to uncontrollable haemorrhage (Table 5). Suture of the liver was done with No. 2 chromic catgut on a round bodied needle.

TABLE 5
TREATMENT

	No.	Died
Laparotomy, but no specific treatment of liver ..	20	0
Suture of liver wound ..	32	3
Packed with gelfoam ..	3	1
Resections: Right lobectomy ..	4	4
Left segmental ..	1	0
Laparotomy, uncontrollable haemorrhage	5	5

Stab wounds although generally innocuous were not always free of major hazards. In one patient there was active bleeding from a deep liver wound of the right lobe, with ischaemic discolouration of its anterior-inferior segment, indicating segmental vascular injury. As these vessels were inaccessible for direct ligation, the wound was sutured with horizontal mattress sutures. In addition to a sub-hepatic drain, the common bile duct was drained through a T tube, through which he had a severe haemorrhage on the first post-operative day, with a fatal outcome. The occurrence of haemobilia indicates injury to a large bile channel. In retrospect it appears that direct ligature of the affected vessels should have been obtained by extension of the hepatic wound.

Sub-hepatic drainage was established in most cases, but in at least seven of the less severely injured cases where the wounds were either left alone or sutured, no drains were inserted, and were without complications.

Gelfoam packing was used in only three cases. It was ineffective in one, haemostasis being then obtained by direct suture.

Partial resection of the left lobe was done once for a stab wound to the left of the falciform ligament, where initial suturing, applied parallel to the wound caused ischaemia of the distal liver segments, resection being performed in the plane of the stab wound. Four patients had continuing and severe haemorrhage from extensive disruption of the right lobe in whom neither suturing nor packing seemed possible. The vessels in the free border of the lesser omentum were clamped but without reduction in the bleeding, indicating that the main source of haemorrhage was the hepatic veins. In one, an unplanned resection through the plane of the most medial of the large lacerations was performed, but bleeding continued from extensions of the wound across to the left in front of the inferior vena cava (IVC), principally from tears in the right hepatic vein, and branches of the middle hepatic vein. A lobectomy through the anatomical plane between the gall bladder fossa and the IVC was done after ligature of the right branches of the portal vein and hepatic artery. Division of the liver was by blunt dissection with the handle of the knife in 2 cases, with diathermy in one, and by the finger fracture method reported by Tung and Quang (1963) in the remaining case.

The period of hospital stay in the survivors varied between 7 and 37 days, with an average of 12.5 days.

Mortality

There were 18 deaths, giving a high mortality rate of 25.7%. 14 of the deaths were directly attributable to the liver injury, the main cause being haemorrhage (Table 6). One patient was dead on arrival, post-mortem examination revealing a penetrating injury of the heart and left lobe of the liver, the former being the cause of death. Of 4 patients who died prior to surgical exploration, one had an aortic wound, the second succumbed to post traumatic pulmonary insufficiency complicating chest injuries, the third from head injury, and the 4th from haemorrhage from liver lacerations which was diagnosed only when he collapsed 5½ hours after admission, post-mortem examination revealing tears of the right hepatic vein.

TABLE 6
CAUSE OF DEATH

Haemorrhage from the liver ..	12
Post traumatic pulmonary insufficiency ..	1
Over transfusion ..	1
Head injury ..	1
Aortic Injury – haemorrhage ..	1
Heart Injury – haemorrhage ..	2

Five patients died during surgery, four due to inability to control haemorrhage

from the liver. All four had no recordable pressure just prior to operation, but in two of them the systolic pressure on admission 3½ and 5½ hours previously was 60 mm Hg and 120 mm Hg respectively. The fifth patient had a perforating injury of the right ventricle and a cut right coronary artery.

Bleeding recommenced via the drain a few hours after operation in 3 of the patients who underwent right hepatic lobectomy. Delayed and poor clotting of the blood was noticed in two of the patients at the conclusion of the operation. The source of the bleeding could not be identified at autopsy. The fourth patient who died after lobectomy did so as a result of over transfusion.

Delayed haemorrhage occurred in 2 patients, one occurring 2 days after control of bleeding by suture of a stab wound, and the other was a patient who was treated conservatively for a suspected liver injury, and on the 7th day had severe bleeding from a half inch wound in the right lobe.

Lack of blood for replacement of severe blood loss from a stab wound of the liver which had been controlled by suture, was responsible for the death of one patient on the first post-operative day. No intraperitoneal haemorrhage was found at post-mortem.

In 4 patients the major source of bleeding being the hepatic veins, it was considered that preliminary control of these vessels prior to liver resection would greatly reduce the blood loss. To facilitate the exposure of these veins, the anatomy of the region was studied in cadavers. The hepatic vessels were emptied of blood by running in tap water, and then red lead or acidified latex were injected into the IVC and hepatic veins in retrograde fashion. The livers injected with red lead were fixed in formalin, X-rayed (Fig. 1) and then dissected. The latex injected livers were dissolved in sulphuric acid to eliminate the liver parenchyma leaving behind the cast of the hepatic veins.

Discussion

Stab wounds predominate, as in the American literature, but unlike the series reported from Britain and Australia. Diagnosis was based on the evidence of an external wound, and the signs of either haemorrhage or peritoneal irritation. A normal blood pressure on admission does not exclude significant liver injury, 2 patients with severe lacerations in this series having a normal pressure. Blood in the peritoneal cavity produces only a mild or moderate degree of peritoneal irritation, as seen by the lack of rigidity in many cases, and even the guarding being localised. Intestinal leakage causes much greater peritoneal irritation. Although patients may be admitted with normal blood pressure and without signs of peritoneal irritation, continued careful observation is necessary when hepatic trauma is suspected so that even slight changes may be detected early. Pre-operative X'ray examinations were not helpful in this series, but more recently angiography has been shown to be of value.

When there is evidence of continuing haemorrhage, operative control should be obtained simultaneously with resuscitation. Venous infusions should be set up in the arms, as fluids infused through the lower limbs may leak out through tears of the retro-hepatic IVC when present, or such blood may be impeded from reaching the heart by operative manipulation of the liver.

Blood in adequate quantities, together with fresh blood, is essential. Payne *et al.*, (1969) reported 6 right lobe resections performed at the Virginia Medical School, where an average of 6400 ml of blood was used in each case. An average of 300 ml of blood was available for the 4 cases who underwent hepatic resection of the right lobe in this series. Patients who have had almost the entire blood volume replaced need replenishment of their clotting factors or fresh blood. This deficiency was noticed in 2 patients.

Various methods are available for the treatment of liver injuries. Stab wounds or simple lacerations that had ceased bleeding were not sutured, and all had uneventful recoveries. Gelfoam packing is not always successful in controlling haemorrhage, and other disadvantages, such as infection have been reported, (Madding, 1955). Most liver injuries are suitable for suture, which is preferably applied parallel to the wound

FIG. 1. X'ray of post-mortem specimen of the liver after injection with red lead to demonstrate the distribution and drainage of the hepatic veins.

Horizontal mattress sutures tend to trap blood and bile within the wound. Deep lacerations of the liver may be controlled by simple suture, but the inherent dangers of such treatment are shown by the patients who had severe postoperative bleeding 24 hours later. In such cases, direct ligature of the deeply placed vessels is required, and for this purpose it may even be necessary to extend the incision in the liver.

The improved results in the treatment of liver injuries have been attributed to drainage of the peritoneal cavity (Madding, 1955). More controversial is the use of T tube drainage of the common bile duct. It is advocated on the basis that biliary decompression minimises biliary leak from the wound, and bile inhibits the clotting of blood (Merendino *et al.*, 1963).

The most severe liver injuries which cause either stellate fractures or disruption do not lend themselves to either packing or simple suture, and in such cases hepatic resection is necessary. Preliminary control of haemorrhage is obtained by compression of the vessels in the free border of the lesser omentum (Pringle's manoeuvre), and the plane of resection may then be determined. Where this procedure fails to control the bleeding, lesions of the hepatic veins should be suspected. Due to the close proximity of these vessels to the heart, and the absence of valves in them, retrograde bleeding could be brisk, and it is hence essential that early definition of the site of bleeding should be made. The hepatic veins have no extra-hepatic course and ligature or suture involves some dissection on the postero-superior aspect of the liver. Resection is a major procedure which should only be employed when the simpler measures are not applicable. Adequate blood, improved techniques of resection based on a knowledge of the functional anatomy of the liver, and the use of liver clamps to minimise bleeding have contributed to the greatly improved results in the treatment of major liver injuries.

We wish to express our gratitude to the Resident Surgeons of the Accident Service who cooperated in this study and have allowed us to include patients treated by them; to Dr. K. M. C. de Silva, Radiologist, Colombo General Hospital, Professor F. L. W. Jayawardena and Mr. X. N. R. George of the Department of Anatomy, University of Ceylon, for help with the post-mortem studies of the liver.

This work was partly supported by a grant from the National Science Council of Sri Lanka.

REFERENCES

Madding, G. F. (1955) *Archives of Surgery*, **70**, 748.

Merendino, K. A., Dillard, D. H. and Cammock, E. F. (1963) *Surgery, Gynecology and Obstetrics*, **117**, 285.

Payne, W. D. (1969) *Annals of Surgery*, **170**, 929.

Pringle, J. H. (1908) *Annals of Surgery*, **48**, 541.

Tung, T. T. and Quang, N. D. (1963) *Lancet*, **1**, 192.

The Testicular Feminisation Syndrome

N. PARAMESHWARAN*

Ceylon Medical Journal, 1975, **20**, 108 - 117

Summary

Two phenotypic female patients aged 23 and 21 years respectively were investigated for primary amenorrhea and the diagnosis of testicular feminisation syndrome made by the histological evidence of testes instead of ovaries, findings at laporatomy and the negative nuclear sex chromatin test. A discussion and review of the literature follows.

*Pathologist, Castle Street Hospital for Women, Colombo 8.

Introduction

The testicular feminisation syndrome owes it's name to J. M. Morris (1953) who described a form of intersexuality in phenotypic females who are genotypic males with testes instead of ovaries. The syndrome is also known by many other names and Hauser (1963) listed about twenty-two reported in the literature for example, male pseudohermaphroditism, hairless women with testes, and a form of male intersexuality with pure female sex organs and habitus, to name a few. The syndrome is described as a hereditary condition with a strong familial predisposition characterised by the following –

(a) Female habitus with normal fat depots. In some cases the build is eunuchoid with long extremities and large hands and feet.

(b) Normal female breasts sometimes with a tendency to be 'oversize' although the areolae and nipples may be small.

(c) Absence or scanty axillary and pubic hair with a normal hair distribution on the head without evidence of temporal recession.

(d) Female external genitalia although the labia may be under-developed, the clitoris small or normal, a vagina ending blindly but adequate for sexual function and a rudimentary or absent uterus and tubes and fibrous tissue for ovaries.

(e) The gonadal tissue is that of testes showing atrophied seminiferous tubules without sperm production and prominent interstitial cells. They may lie within the abdomen, inguinal canal or labia. They are often described as being immature or foetal in structure.

(f) The hormonal values are not of significant diagnostic value.

CASE REPORTS

Case 1

An unmarried female (N.P.) aged 23 years was admitted to the Castle St. Hospital for Women in October 1973 with a history of never having menstruated and lower abdominal pain said to come on about the 20th day of each month and associated with nausea and dizziness at this time. The history given was about six years in duration.

The family history revealed an elder sister who is married and had been investigated for sterility and an elder married brother with four children alive and well. There was no history of sterility in any of the paternal or maternal aunts.

She was a co-operative but shy phenotypic female of average build who appeared to be of normal intelligence. She was taller than usual (height – 156 cm) with an arm-span length taken from the midsternum of 165 cm. There was some prominence of the facial bones and her hands and feet were a little large. Her weight was normal – 45 Kg. and her voice and mannerisms typically feminine. The hair distribution on the head and body was that of a female except that the axillae and pubis were devoid of any hair and there was no evidence of shaving to have accounted for this absence. The breasts were of smaller size and easily palpable with normal areolae and nipples (Fig. 1 a).

External genitalia – small clitoris, flat labia (inner), a patent but shallow vagina ½ in. in depth and a normal urethral orifice. In the upper labial region on both sides were two prominences which were tender on palpation, one of which was removed surgically and examined microscopically (Fig. 1 b). A rectal examination did not reveal a uterus. Further physical examination was negative.

Investigations – A buccal smear was negative for the sex chromatin body (Normal 16% – 34%) and the peripheral blood for neutrophil 'drumsticks' was negative (Normal 2% – 8%). A chromosomal karyotype was performed using peripheral blood lymphocytes which was a failure due to non-reactive reagents. A tentative diagnosis of a probable genetic male (XY) or XO was made on the basis of the sex chromatin findings.

The white cell count was 8400 per cu. mm. with a normal differential count. Urine showed a trace of albumin and 6 neutrophils per high power field. Haemoglobin – 11.6 g % and a normal blood film report. Fasting blood sugar – 100 mg% and urinary 17 ketosteroids – 3.5 mg. per 24 hour sample. An examination of the vaginal mucosal smear for maturation showed a cornification index of 1% with many intermediates and parabasal cells.

The labial lump which was removed from the left side measured about 1½ ins. in diameter (see Fig. 1 c) which on microscopy was reported as having testicular tissue with partial hyalinisation of some tubules, prominent interstitial cells and Sertoli cells without evidence of sperm production enclosed within a thick cortex (see Fig. 1 d). Ovarian tissue was not seen. A laparotomy was performed after a few days to determine the nature of the internal genitalia and instead of a uterus there was only a strand of fibrous tissue with a small lumen lined by flat cuboidal epithelium and there was no evidence of tubes nor ovaries.

A diagnosis of testicular feminisation syndrome was made. The patient was discharged and readmitted after four weeks for removal of the right labial lump which was also confirmed as testis microscopically. The patient was given oral oestrogen therapy for a few days and discharged from hospital requesting her to report regularly at the out-patients clinic which she has failed to attend. In consequence of this non-attendance there is no record of her progress.

Case 2

An unmarried female (W.S.) aged 20 years was admitted to the De Soysa Hospital with a history of not having menses since a little 'spotting' at the age of 14, only on one occasion.

Her family history showed that she was the eldest of five with two younger sisters who were said to have had their normal menarche. Her parents were alive and well and there was no history of sterility in either the paternal or maternal aunts.

Examination showed a slim phenotypic female who appeared to be of normal intelligence with a feminine voice and mannerisms. Her height – 160 cm and extremities were long, arm-span measuring

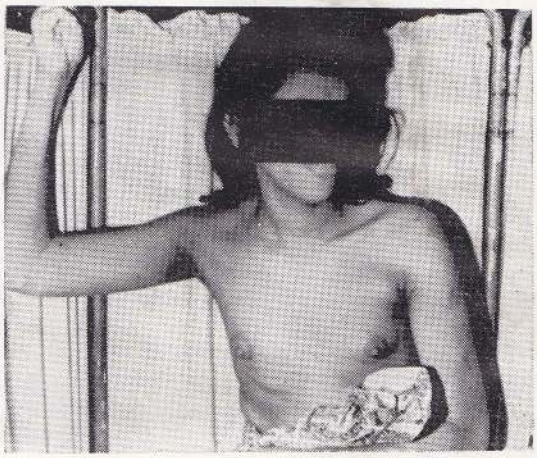


FIG. 1 (a). Prominent facial bones and normal distribution of hair on head. Flat breasts with normal areolae and nipples.

Absent axillary hair. Dark area of eczematoid rash in axillary folds. Hands larger than normal.

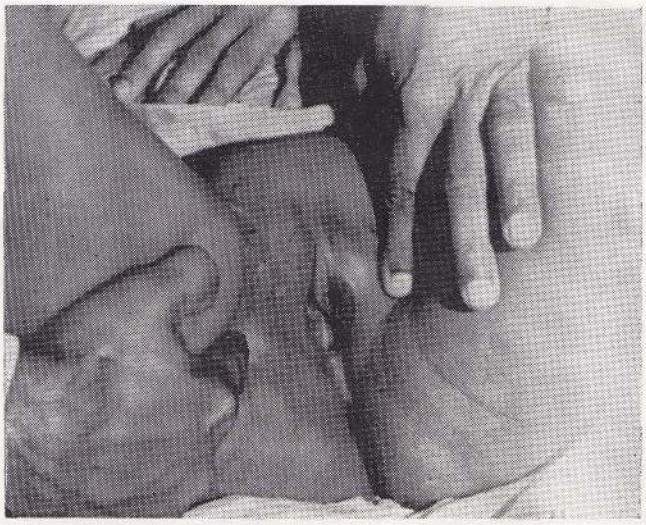


FIG. 1 (b). Absent hair on pubis and vulva. Normal clitoris, patent vagina and thin labia.

Site of incision for biopsy of supralabial lump (Right side).

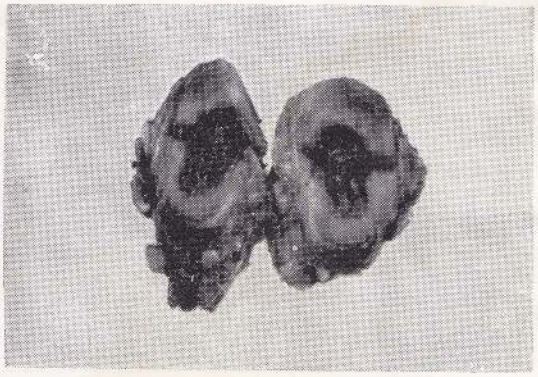


FIG. 1 (c). Macroscopic picture of removed lump showing thick cortex and central cavity.

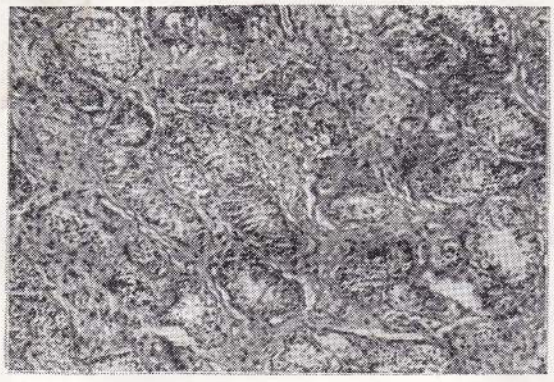


FIG. 1 (d). Microscopy (x117) – seminiferous tubules with prominent interstitial tissue.

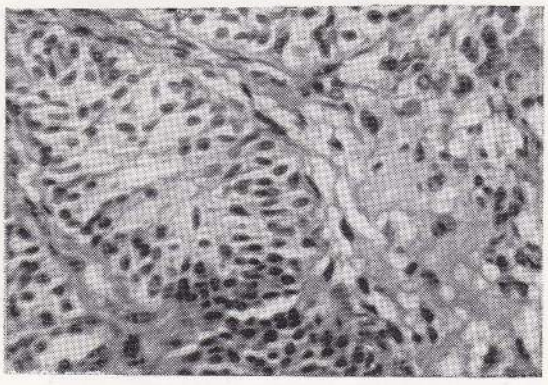


FIG. 1 (d). Microscopy (x525) – Absent spermatogenesis, prominent Leydig cells and Sertoli cells.

170 cm. Weight – 44 Kg. The breasts were poorly developed and the nipples and areolae small. The hair distribution was feminine but there was absence of axillary and pubic hair and no evidence of shaving.

The external genitalia – a thin clitoris 3cm. long, normal urethral and vaginal orifices. In the left inguinal region was noted a swelling about 1½ in. by ¾ in. which was removed for microscopy (see Figure 2 a). The right inguinal region was empty on palpation. A rectal examination did not reveal any palpable pelvic organs.

Further physical examination was negative for any abnormality. Investigations – The buccal smear was negative for nuclear sex chromatin and peripheral blood showed no neutrophil 'drumsticks'. Chromosomal analyis was not performed. On the evidence of the negative sex chromatin the probable sex chromosomes were taken to be either XY or XO. The histology of the removed inguinal lump was reported as testicular tissue showing atrophied seminiferous tubules, scanty interstitial cells without evidence of ovarian elements nor malignancy (see Figure 2 b). A laporatomy was later performed with a view to examine the internal genitalia and the findings were that of a small round lump on the right side (actual position not stated). A uterus, tubes and ovaries were not seen. Microscopy of the swelling was reported as testis with atrophied tissue resembling that removed from the left side. The patient was discharged after a short course of oral oestrogens and has not been seen since due to non-attendance at the follow-up clinic.

Discussion

Two patients aged 23 and 20 years respectively were investigated for primary amenorrhea who on external appearance showed femininity except that testes were present in both instead of ovaries with absence of axillary and pubic hair. They were by nuclear sexing chromatin negative. Both patients were then examples of the testicular feminisation syndrome. This diagnosis was preferred to that of male pseudohermaphroditism on account of the clarity of the external genitalia without evidence of masculinisation. The features common to both patients were that they were taller than usual with long extremities of 'normal' intelligence, absent menses of about six years or more duration, inadequately developed secondary sex characteristics mainly confined to absent hair formation in the axillary and pubic regions, normal but poor development of the breasts and external genitalia, absence of a uterus, tubes and ovaries with histological confirmation of 'testes' that were bilateral. Neither of the patients showed any features of masculinity. Investigations of sex at the genetic level were sex chromatin negativity.

The absence of menstrution could be explained by the absence of ovaries, a uterus, and tubes. Case 2 is supposed to have had a little 'spotting' which could not have been of uterine origin. The literature mentions that it is not unusual for a few patients to state that scanty monthly bleeds had occurred which on close interrogation were subsequently denied. In case 1 there was some indication of poor oestrogen activity on the maturation of the vaginal mucosa as shown by the low cornification index. The only hormonal estimation performed was the 17-ketosteroids in the urine of case 1 which was subnormal. There was no satisfactory reason that would explain the complaint of nausea and dizziness said to occur about the 20th day of each month in case 1 in the absence of positive findings on examination of the gastro-intestinal tract, it is probable that it could have been of a non-organic nature.

Both patients were taller than usual with long extremities and in the first patient the maxillae were prominent with hands and feet that were a little larger than normal. The latter features resembled somewhat the acromegaloid hands and feet although there was no supporting evidence of acromegaly whatsoever. In the absence of a family history of tallness, this feature common to both patients might be considered to be of pituitary origin having caused some degree of delayed epiphyseal closure from growth hormone activity at the time of puberty. There was no confirmation of this however. Routine physical examination did not reveal any thyroid or adrenal dysfunction in the two patients. The breast tissue in the two patients were poorly developed particularly in case 2 and nipples and areolae small. The breast glandular tissue increases with oestrogen activity under normal circumstances and presumably in the two patients such activity has been deficient which without hormonal assays cannot be ascribed to have been the result of either a quantitative or qualitative deficiency of oestrogens. The absence of hair formation at the axillary and pubic regions which forms part of the features of the normal secondary sex characteristics in the two sexes could only be explained either due to insufficient androgen and oestrogen stimulation or as mentioned in the review of the literature been caused by an actual

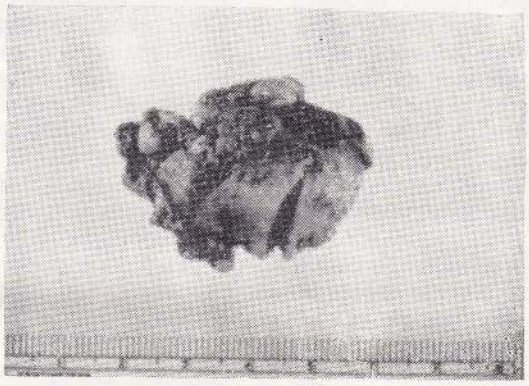
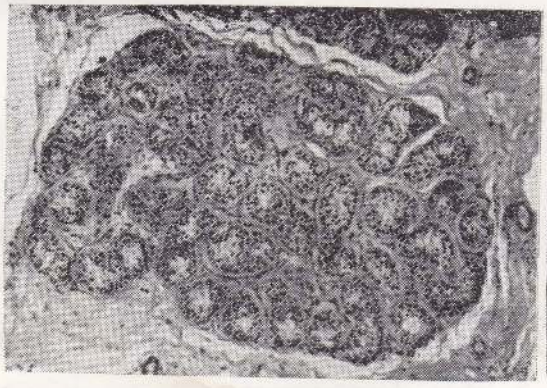


FIG. 2 (a). Macroscopic display of removed lump from inguinal region.



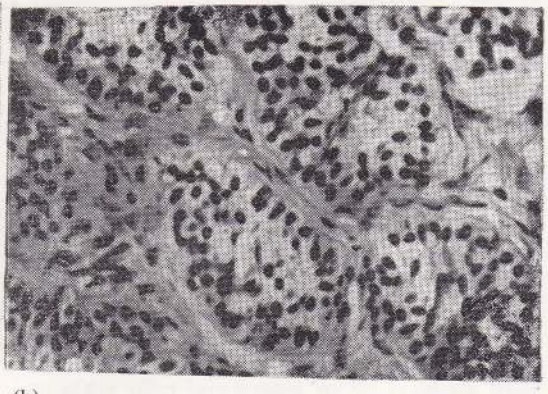


FIG. 2. (b)

Microscopy (x117) – Adenoma pattern of seminiferous tubules with capsule.

Microscopy (x525) – Absent spermatogenesis with prominent Sertoli and Leydig cells.

dysfunction of the piliferous system in these sites.

The external genitalia in the two patients have clearly been feminine without evidence of masculinisation, the uterus with tubes and ovaries were absent and the gonads 'testes'. The line of development in utero and thereafter has then been partly feminine despite the presence of male gonads. There has therefore been a suppression of development of the Mullerian system at the reproductive level and a suppression of the normal Wolffian structures except only for the testes. The gonadal tissue examined in each patient has been bilaterally represented although variable in position in case 2 where one was intra-abdominal. In case 1 the 'testes' were supralabial in position. Microscopy confirmed the nature of the swellings which were atrophied tubules without sperm formation and prominent interstitial cells. There was no evidence of ovarian elements because had there been; they would be ovotestes. The atrophied seminiferous tubules were not secondary to any particular pathology but rather from some development defect of genetic origin.

The sexing of the two patients using buccal smears stained with 1% toluidine-blue gave negative values for the sex chromatin body and peripheral blood for neutrophil 'drumsticks' also negative. These tests have been used in our laboratory for a few years and has been very useful in the investigation of patients wherever it is indicated. (Parameshwaran, 1971). The gonadal tissue in the two patients being testes, the chromosomal pattern of the sex chromosomes on the basis of the negative sex chromatin body was concluded to be XY and not XO.

The morphology of the removed lumps were reported as atrophied testicular tissue with an increase of interstitial cells without sperm formation and evidence of ovarian elements and malignancy. These testes have been non-functional as far as spermatogenesis is concerned but presumably functional in hormone production because of the presence of the interstitial (Leydig) cells although such hormonal influence towards masculinisation was lacking. The literature mentions that the testes of such patients are the source of oestrogens and androgens.

The question may be asked – Why do these patients with the testicular feminisation syndrome have testes instead of ovaries? The reason is that these patients being genetic males i.e. XY at conception, the line of gonadal formation from the primary germ layer is towards maleness (testes as gonads) determined by the Y chromosome. Their complete removal was advocated in both patients because the latter were well past the time of puberty and the fear of malignant changes. Substitution therapy with oral oestrogens was given to counteract any possible loss of oestrogens after removal of the testes. Both patients lived in the rural areas and considerable distance away and belonged to the lower income stratum which accounts for their failure to attend the clinic for follow-up which has made the case records incomplete.

In the family history of patient 1, there was a married elder sister who on physical examination and by the sex chromatin test normal but had remained sterile and been investigated. The records of the gynaecological examination were not available. This observation is only being mentioned in relevance to the discussion as patients with the syndrome have been reported having sisters with scanty hair distribution in the axillary and pubic regions and some who have remained sterile.

The testicular feminisation syndrome is a hereditary condition and more members than one in a sibship could be affected.

The number of cases reported in the literature does not make the testicular feminisation syndrome a common condition but of the forms of intersexuality encountered, Netter and his associates (1958) believes that about 15% – 20% of such cases are examples of the syndrome. The figures reported for it's incidence are very variable for Hauser (1963) quotes about 1 in 2000 males and Prader (1957), 1 in 20,000. According to Morris and Mahesh (1963), patients sought medical advice for initial complaints that varied from delayed puberty without menstruation, sterility, nose bleeds and inguinal or labial lumps. Orgasm and sexual relations have been normal except for some who complained of pain at intercourse from a shallow vagina. On examination it was noted that there were variations in the degree of femininity in relation to

size of breasts which in some cases were 'oversized', the size of the clitoris and intensity of hair formation in the axillae and pubis. Two types of the syndrome have been mentioned by Morris and Mahesh (1963) wherein it was stated that some confusion prevailed by including an incomplete form of the syndrome as examples of the testicular feminisation syndrome. The incomplete form were patients with clitoral hypertrophy even resembling a phallus with poor secondary feminine sex characteristics. This form is said to have a different aetiology to the complete form which is the subject of this paper. The administration of androgens and oestrogens produced virilisation and growth of hair in the regions where it was deficient and this response suggested that the cause could be attributed to one of insufficient androgens rather than an end-organ defect. The deficient production of androgens was attributed to an enzymatic defect of 3 beta ol-dehydrogenase that normally enters into the synthesis of androgens. In the complete form of the syndrome, the androgens and oestrogens are normal in quantity and their administration to the patients produced no effect.

The source of the androgens and oestrogens in the syndrome have been established as testicular and this finds support by the prepubertal castration results which showed failure of secondary sex characteristics to develop following removal of the testes and from the incubation studies of hormonal levels done on them. The administration of steroidal androgens to these patients did not produce any effect indicating that there is some insensitivity of the organs dependent on androgen stimulation. Wilkins and Prader (1957) therefore were of opinion that the defect in these patients is one of end-organ response. The defect is very likely to be genetically determined affecting particularly the piliferous system of the axillary and pubic sites which have made it non-responsive even to exogenous androgen and oestrogen therapy. The nature of the defect is not known. The hypothesis of this end-organ resistance to the action of testicular androgens in these patients appears to be the only tenable one so far that explains the continuation of the feminine line of development of the phenotype and failure of masculinisation. The uterus, tubes and ovaries representing the Mullerian system have not developed presumably related to some inhibitory factor produced by the testes.

The inability of the patients to have menstruated despite normal oestrogen levels could be explained by the absence of ovaries, a uterine endometrium and tubes. The breast tissue of some of the patients have been examined by microscopy and reported to have shown stromal tissue hyperplasia with poor glandular tissue suggestive of either insufficient oestrogen action or failure of such tissue to respond to adequate hormonal levels. The more or less infantile appearance of the clitoris and vulva in these patients could also be related to failure of normal response to endogenous hormones. With reference to the eunuchoid build seen in the two patients that were described, the literature mentions that the two likely explanations for this and the broad hands and feet that some show could be either delay in epiphyseal closure from growth hormone activity that had continued unabated due to lack of anterior pituitary inhibition or that some somatic factor within the long and short bones of genetic origin itself may be responsible for tallness and lengthy extremities.

The paradoxical finding of testes in these phenotypic females requires some clarification. It is an established fact that sex differentiation is determined very early in foetal life in the human and is governed by the sex chromosomal composition of the fertilised ovum. A XX becomes a female and XY a male under normal circumstances. Sex therefore prior to zygote division and differentiation is genetically determined and the presence of an active Y influences the primary germ layer through the action of chemical inductors to form testes instead of ovaries and the testes so formed thereafter by hormonal production is responsible for the male line of development in utero and after. Patients with the Testicular feminisation are XY at the chromosomal level of sex and are sex chromatin negative and have testes but for some reason have failed to become normal males. They have the phenotype of a female and there appears to be no corresponding anomaly of the same nature where XX individuals have failed to develop into females and possessing male genitalia and male secondary sex features with ovaries. The aetiology of the syndrome

has been postulated as one of end or target-organ resistance in the embryo, the androgen-oestrogen dependent tissues being unresponsive to the action of foetal androgens. By this unresponsive state, masculinisation has failed to occur and the feminine line has continued. The anatomical findings in patients with the syndrome bears evidence that the embryonic testes have been incompetent to have given rise to masculine internal and external genitalia although there has been suppression of the formation of a uterus, tubes and ovaries. Jost (1947) by his experiments on the effects of castration of rabbit male foetuses in utero showed that the development of male genitalia is androgen dependent. In patients with the testicular feminisation syndrome the androgen levels in the blood and testes have been reported to be normal. The conclusion then is that there could be some qualitative defect in the secreted androgens or that the androgen dependent tissues are at fault.

The danger of neoplasia in such testes is difficult to assess as many of them are removed early in a considerable number of patients. Hauser (1963) found that malignant change occurred in 10 out of 128 cases. Morris and Mahesh (1963) found only one malignant tumour among teenage patients and two in those of the twenty age group but of 50 reported cases over thirty years, 11 malignant tumours mostly seminomas have been reported. The risk of malignancy being high, removal of such gonads after secondary sex characteristics have formed is advised and the patients given oestrogen therapy.

Family history and mode of transmission of the syndrome have shown that more than one member in the family is affected in the sibship. (Petersson & Bonnier, 1957; Taillard & Prader, 1957). The one affected are always of male or presumptive male genotype and affected relatives are often found on the maternal side of the family usually 'sterile' aunts. It has therefore been suggested that the condition is transmitted by carrier females to affected males where such carriers are generally normal or may have had delayed menarche, precocious puberty or a relative deficiency of axillary and pubic hair. (Puck *et al.*, 1960).

The pattern of inheritance is determined either by an X-linked recessive gene or a male limited autosomal dominant one (Jacobs *et al.*, 1959, Morris & Mahesh, 1963).

The chromosome studies performed in nine patients with features of the testicular feminisation syndrome have each shown a count of 46 with XY sex pattern and were sex chromatin negative. (Jacobs *et al.*, 1959; Chu *et al.*, 1960; Grumbach, 1960; Puck *et al.*, 1960). There has been a report of a mosaic XO/XY/XX by Miller in 1964. As a rule, these patients are said to be sex chromatin negative and of 46 XY constitution.

The psycho-sexual aspects of the syndrome have been reported by Morris (1953) who states that these patients are definitely female and the incidence of psychosis and suicide high when they suspect abnormality, particularly when they fail to menstruate at the time of puberty. The adjustment to this is difficult and in a considerable number of patients regular menstruation, abdominal cramps and vicarious nose bleeds are claimed to have occurred. The sex urges are normal and the desire for childbearing strong, the married patients often seeking advice for sterility and some for dyspareunia. In the management of these patients once a diagnosis has been made it should be with held from the patient without incurring the risk of causing a suicide or psychotic casualty. The diagnosis should present no difficulty. In a child of phenotypic feminine appearance with inguinal hernia and an absent or rudimentary uterus, microscopy of the contents of the hernial sac together with a sex chromatin test, chromosomal karyotype in addition to the routine sex hormone estimation would be necessary. If a testis has been reported from an examination of the hernial contents, the contralateral gonad requires a careful search and a laporatomy performed for confirmation of the nature of the internal genitalia. A second operation may be necessary for removal of the contralateral testis if the secondary sex changes have not occurred. Following removal, substitution therapy with oestrogens would be required. In an adult, removal of the testes and oestrogen therapy is advised. The clinician would have to exercise some degree of tact and reticence with avoidance of overzealous medical attention which might create some suspicion in the minds of these patients when they feel that there

is some abnormality in their sex organs. Plastic operation for a shallow vagina would help in having the normal sexual relations.

In the differential diagnosis of primary amenorrhea which is a common complaint in these patients, uterine agenesis needs exclusion which is easy because secondary sex changes are normal for a female, the gonadal tissue is that of ovaries and they are sex chromatin positive with a normal 46 XX karyotype.

In conclusion, the testicular feminisation syndrome is a condition of delayed puberty in patients who have a feminine phenotype with testes as the gonads, absent female internal genitalia, genotypic males of 46 XY karyotype and sex chromatin negative which is inherited from female carriers who may or may not be normal and where the mode of transmission is genetically determined the nature of which is uncertain whether as a sex-linked recessive or sex limited dominant affecting the end-organs to act unresponsively to the testicular hormones.

I am deeply thankful to the Medical Superintendent and clinicians of De Soysa and Castle St. Hospitals for their kind cooperation in providing the material for this paper and the nursing staff. A special thanks must be given to two M.L. technicians – Mr. Yahampath and Mr. Vitanachi of Castle St. Pathology laboratory for their invaluable assistance in the histological and cytological examinations and to Dr. Walter Gunaratne for the photographs and Mr. Karunasena of the Faculty of Medicine for the tissue photography.

REFERENCES

Chu, E. H. Y., Grumbach, M. M. and Momispima, A. (1960) *Journal of Clinical Endocrinology*, **20**, 1608.

Grumbach, M. M. (1960) In *Clinical Endocrinology*, Vol. 1. ed. E. B. Astwood, New York; Grune and Stratton.

Hauser, G. A. (1963) In *Intersexuality* edited by Overzier, C. New York; Academic Press.

Jacobs, P. A., Baikie, A. G., Court Brown, W. M. Forrest, H., Roy, J. R., Stewart, J. S. and Lennox, B. (1959) *Lancet*, **2**, 591.

Jost, A. (1947) *Archives d'anatomic microscopique et de morphologie experimentale* (Paris), **36**, 271.

Miller, O. J. (1964) *American Journal of Obstetrics and Gynecology*, **91**, 1078.

Morris, J. M. (1953) *American Journal of Obstetrics and Gynecology*, **65**, 1192.

Morris, J. M. and Mahesh, V. B. (1963) *American Journal of Obstetrics and Gynecology*, **87**, 731.

Netter, A., Lambroso, P., Yavena, H. and Bellaisch, J. (1958) *Annales d'endocrinologie* (Paris), **5**, 994.

Parameshwaran, N. (1971) *Ceylon Medical Journal*, **16**, 39.

Petterson and Bonnier (1937) *Hereditas* (Lund) **23**, 49 (quoted by Polani, P. E.)

Prader, A. (1957) *Schweizerische medinische Wochenschrift*, **87**, 271.

Polani, P. E. (1962) In *Chromosomes in Medicine*, edited by J. L. Hamerton, London.

Puck, T. T., Robinson, A. and Tjio, J. A. (1960) *Proceedings of the Society for Experimental Biology & Medicine*, **103**, 192.

Tailard and Prader, A. (1957) (quoted by Polani, P. E.)

Willkins, L. and Prader, A. (1957) (quoted by Polani, P. E.)

Amoebic Ulceration of the Cervix Uteri and Penis

Two Case Reports

F. R. B. JAYAWEERA*

Ceylon Medical Journal, 1975, **20**, 117 – 121

Summary

A case of amoebic ulceration of the cervix in a female and that of the penis in a male is described. The way these cases can closely mimic that of carcinoma of the cervix and penis is emphasised. The likely sources of infection are discussed.

*Pathologist, Cancer Institute, Maharagama.

Introduction

Intestinal infection due to *Entamoeba histolytica* is a commonly encountered disorder in Sri Lanka and amoebic liver abscesses and their complications are well known. Reports of amoebic infection in other sites of the body are however rare. Gabriel (1968) reported a case of amoebic ulceration of the abdominal wall where the most likely source of infection was by direct access from an intra-abdominal amoebic abscess that had been incised. Paul

(1960) referred to necrosis and ulceration of the abdominal wall due to invasion of the tissues by amoebae after surgical drainage of an amoebic liver abscess. Although cases of amoebic ulceration of the cervix and penis have been reported from other countries there does not appear to be any similar reports from Sri Lanka.

This paper presents two case reports of amoebic ulceration, one involving the uterine cervix and the other, a case of ulceration of the penis.

Case 1

K.G.G., a 38-year-old Sinhalese female from the Galle district was transferred to the Cancer Institute Maharagama on 11–1–74 as a case of carcinoma of the cervix stage III. She gave a history of an offensive blood stained vaginal discharge of a few months duration prior to her seeking treatment at the provincial hospital. She had been married for eighteen years and had had eight children, the last child being eight years old. Clinical, examination showed a rather poorly nourished female who appeared ill and complained of much pain in the lower abdomen. No abnormality was detected clinically in the heart, lungs and abdomen. The only other noticible feature was that she appeared very anaemic.

There was a copious purulent blood stained offensive discharge from the vaginal introitus. Speculum examination showed ulceration of the intravaginal portion of the cervix around the expetnal os. The ulcer was approximately one and a half inches in diameter and clinically resembled that of a large carcinomatous ulcer. The parametrium was felt to be indurated and a clinical diagnosis of carcinoma of the cervix stage III was made. A biopsy was taken and as the case appeared unsuitable for intracavitary radium insertion, arrangements were made to refer her to a radiotherapist for palliative external irradiation of the tumour.

Sections made from the material received revealed no evidence of a carcinoma but showed an ulcerated area covered by a layer of purulent exudate and necrotic cell debris in and around which were seen numerous structures morphologically identical with those of the trophozoite forms of *Entamoeba histolytica* (Fig. 1). On the basis of this finding a sample of the discharge was obtained and a wet preparation examined which revealed numerous actively motile vegetative forms of *E. histolytica.*

Other laboratory reports were as follows: The W.B.C. was 7200 per cu. mm. with a differential count of 85% polymorphs, 12% lymphocytes and 3% eosinophils. The haemoglobin was 3.3 g/100ml; Blood urea was 25mg/100ml; and a sample of stools taken later on in the course of treatment showed the presence of round worm and hookworm ova.

The patient was treated with a course of metronidazole tablets and also emetine injections from 19/1/74. The patient responded well and a repeat examination of the cervix on 31/1/74 showed that the ulcer was much smaller, clean and that the discharge had lost its purulent offensive character. On 7/2/74 the cervix appeared completely healed. The patient however complained of dribbling of urine and an examination of a sample of urine showed the presence of albumin and the field full of pus cells. The culture of the urine yielded a growth of *E. coli* and an organism of the paracolon group. Although the *E. coli* was reported sensitive to nitrofurantoin, hexamine mandelate and nalidixic acid and the organism of the paracolon group to gentamicin and hexamine mandelate the response to treatment was poor and the urine continued to show the presence of large numbers of pus cells. At this stage an intravenous pyelogram was done and as this showed a non functioning left kidney the patient was transferred to the General Hospital, Colombo under the care of the genito-urinary surgeon for further investigation and treatment.

Case 2

H.P.B., a fifty-year-old Sinhalese male was referred to the Cancer Institute on 14/6/74 from the General Hospital, Ragama as a case of carcinoma of the penis. His history was that of ulceration of the prepuce of one months duration which had commenced as a small eczematous patch on the prepuce. Examination revealed a swollen prepuce which had ulcerated on the left side and the glans penis protruded through this defect while the rest of the prepuce hung to the Right and below the glans.

A diagnosis of carcinoma of the penis was made and the patient treated with a radium mould receiving a dose of 5500R in ten days. He was discharged from hospital on 3/7/74. At the time of discharge from hospital, according to the patient, there was no apparent improvement of the condition from that noted prior to commencement of irradiation. He was readmitted to hospital on 6/8/74 and as the clinician in charge of the patient found that there had been no response to the irradiation he referred him to the surgeon for an amputation of the penis. This was done on 28/8/74 and the specimen sent to the laboratory for examination and report.

The specimen consisted of the distal part of the shaft of the penis. The prepuce was ulcerated and appeared to have partially sloughed off. The raw area was covered by a thick greyish white exudate. Sections made from this showed no evidence of a carcinoma. The ulcerated area was covered by granulation tissue over which was a layer formed by pus cells, fibrin, other inflamatory cells and necrotic material. Within this area were seen numerous trophozoites of *E. histolytica* (Fig. 2).

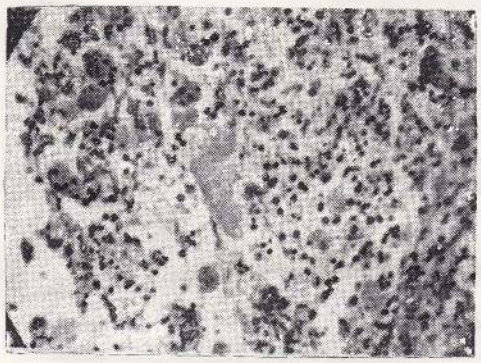


FIG. 1. Section from the biopsy of the cervix from Case 1 showing numerous amoebae in the inflammatory exudate.

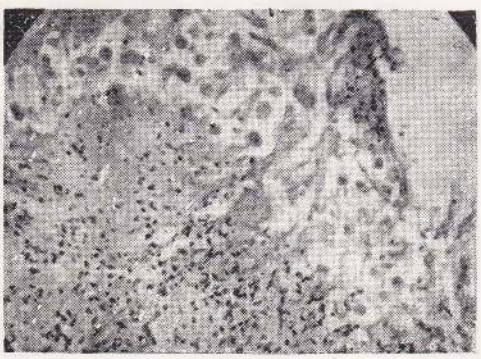


FIG. 2. Section from the penis showing the granulation tissue at the base with the inflammatory exudate and many amoebae overlying it.

In retrospect it was felt that in view of the very short duration of symptoms prior to treatment and the apparent non-response to irradiation the primary cause was amoebic balanitis, and not a secondary amoebic infection on a carcinoma.

Discussion

Amoebic infection of the female genital tract and penis although rare has been reported from several countries. Munguia, Franco and Venezuela (1966) reviewing the literature up to that time found twenty-nine publications referring to thirty-five cases of amoebic infection of the female genital tract. In their own study of vaginal smears from 100,000 women screened for cancer by the Papanicoloau technique over a five-year period, they found twenty-four cases of amoebic vaginitis and/or cervicitis. In seventeen cases the clinical diagnosis prior to availability of the smear report was that of carcinoma of the cervix. There were three cases of carcinoma of the cervix with a superadded infection by *E. histolytica*. It is therefore important to realise the fact that amoebic ulceration of the cervix can closely mimic that of carcinoma and almost all the cases of amoebic ulceration of the cervix reported in the literature were in fact first diagnosed clinically as carcinomata. It is however remarkable that although amoebic infection is a fairly commonly occurring disorder in this country this particular form of presentation of the disease either as a primary cause of ulceration of the cervix or as a concomitant infection of a carcinoma of the cervix is very rare. In over 4000 biopsies of carcinoma of the cervix examined at this Institute over the past fourteen years we have as yet not encountered this dual pathology. It would however seem important to recognise this dual pathology if present, in a case in view of the observation by Munguia *et al.*, (1966) and Carter, Jones and Thomas (1954) that all such cases treated primarily by irradiation had a fatal termination within a short space of time.

Amoebic ulceration of the penis although not earlier reported from this country has been known to occur. Cooke and Rodrigue (1964) from New Guinea, Talawalkar (1962) from Bombay and others have drawn attention to the occurrence of this condition. This condition as seen in Case 2 of this report can closely mimic a carcinoma of that organ.

One of the sources of infection both of the female genital tract and the penis quoted in the literature is by self contamination from an amoebic bowel infection even if the condition was clinically silent. In western countries the improper technique of cleansing the anal orifice after defecation with toilet paper by a movement from behind forwards in the female, has been quoted as another likely cause of infection of the vagina by *E. histolytica*. One wonders whether in Sri Lanka the practice of thorough cleansing of this area with water after defecation could probably account for the rare occurrence of amoebic infection of the female genital tract in this country. Although the patient in Case 1 gave a history of episodes of diarrhoea with blood and mucus prior to the onset of symptoms we were not able to obtain a sample of stool for examination before treatment was initiated as the patient was constipated, and an amoebic infection of the bowel therefore could not be excluded. As the patient was acutely ill, drug therapy was commenced, and stool samples examined later in the course of treatment were negative for *E. histolytica*.

Sexual intercourse has been mentioned as another source of infection where an amoebic vaginitis or amoebic balanitis in one partner could cause infection of the genital organs of the other. In view of this the patients husband in Case 1 was interviewed and permission obtained to examine him but no evidence of amoebic balanitis was found. In Case 2 although the patient was willing to have his wife examined she did not turn up for examination.

Cooke and Rodrigue (1964) were of the opinion that in their series of cases of amoebic balanitis seen in New Guinea the practice of sodomy by the male was the most likely source of infection. They did not find evidence of amoebic infection of the bowel in these cases nor did they find evidence of amoebic vaginitis in the partners of these cases. Sodomy is however known to be widely practiced by some of the tribes in New Guinea.

I wish to thank Dr. W. S. C. Fernando, Gynaecologist, Cancer Institute, Maharagama for the clinical details of Case 1 and Dr. R. Cooke Surgeon, Cancer

Institute for making available to me the case history of Case 2. I also wish to thank Dr. K. Nityananda, Director M. R. I., for permission to use the photomicrographic facilities at the M. R. I. and Mr. S. Surendranathan for taking the photomicrographs.

REFERENCES

Carter, B., Jones, P. and Thomas, W. L. (1954) *American Journal of Obstetrics and Gynecology*, **68**, 1607.

Cooke, R. A., and Rodrigue, R. B. (1964) *Medical Journal of Australia*, **1**, 114.

Gabriel, A. (1968) *Ceylon Medical Journal*, **13**, 51.

Munguia, H., Franco, E. and Venezuela, P. (1966) *Americal Journal of Obstetrics and Gynecology*, **94**, 181.

Paul, M. A. (1960) *British Journal of Surgery*, **47**, 502.

Talwalkar, G. V. (1962) *Journal of the Indian Medical Association*, **39**, 103.

The Ventous – An Evaluation

JOHN B. GNANAPRAGASAM*

Ceylon Medical Journal, 1975, **20**, 121 – 123

Summary

Out of 100 vacuum extractions performed 98 were successful and the corrected foetal loss was 1%. These results were obtained by operators ranging from intern house officers to a consultant, proving the simplicity and safety of the instrument.

The safety of the ventouse is enhanced as general anaesthetic is not required for its use. It is an ideal instrument for the management of the occipito – posterior and occipito – lateral position. When intervention is necessary in the first stage of labour it is a useful alternative to Caesarean section. The ventouse deserves a wider usage in Sri Lanka.

Introduction

James Young Simpson as far back as 1849 suggested the use of a suction tractor to assist vaginal delivery, while his contemporary Neil Arnott thought the tractor might serve "as a substitute for steel forceps in the hands of men who are deficient in manual dexterity whether from inexperience or natural ineptitude" (Chalmers, 1963). Prejudice and poor design of the original suction tractor were probably responsible for the instrument not gaining popularity. However Malmstrom (1953) introduced a a more refined and efficient instrument the Ventouse, and since then numerous reports have appeared in medical literature indicating its increasing popularity and wider acceptance. In Sri Lanka the use of the Ventouse appears to be limited. There has been only one publication on the ventouse so far (Rajanayagam, 1969).

* Consultant Obstetrician and Gynaecologist, Colombo North General Hospital, Ragama.

Material and Methods

The present review consists of 100 vacuum extractions performed at the Colombo North General Hospital, Ragama during a 16 month period from February 1973 to May 1974. The extractions were performed by Intern House Officers, a Senior House Officer, and a Consultant. During this period there were 20 forceps deliveries and 67 Caesarean sections, while the total number of deliveries was 3,830. The series included 72 primigravidae, 28 multigravidae, eight elderly primigravidae (35 years and over) and six patients with the history of a previous Caesarean section. Twenty-four extractions were performed in the first stage of labour and 76 in the second stage.

The technique used is as described by Chalmers and Fothergill (1966), but a four cm. cup is used in the second stage of labour while in the first stage a three cm. cup is used to begin with, changing over to a four cm. cup after dilatation of the cervix has been achieved. A vacuum of 0.8 Kg per cm^2 is built up in 6 to 8 minutes. The right hand exerts traction perpendicular to the cup; traction is intermittent and synchronised with uterine contractions. The left hand is used to promote flexion of the head where necessary and to make sure that maternal tissue is not trapped in the cup.

Results

Our results are indicated in Tables 1 to 6. Extractions were performed under vulval block or without anaesthesia.

TABLE 1
TYPE OF ANAESTHESIA USED

Type of anaesthesia	*No. of cases*
General anaesthesia ..	Nil
Vulval block ..	88
No anaesthesia ..	12
Total no. of cases ..	100

TABLE 2
INDICATIONS FOR VACUUM EXTRACTIONS IN FIRST STAGE OF LABOUR

Indication	*No. of cases*
Foetal distress per se ..	12
Foetal distress in a patient with a previous Caesarean section scar ..	4
Foetal distress in an elderly primigravida	1
Prolonged first stage ..	3
Maternal distress ..	1
Eclampsia ..	2
Impending eclampsia ..	1
Total no. of cases ..	24

TABLE 3
INDICATIONS, FOR VACUUM EXTRACTIONS IN THE SECOND STAGE OF LABOUR

Indication	*No. of cases*
Prolonged second stage per se ..	36
Prolonged second stage in an elderly primigravida ..	1
Prolonged second stage in a patient with a previous myomectomy scar ..	1
Foetal distress per se ..	26
Foetal distress in a patient with a previous Caesarean section scar ..	1
Foetal distress in an elderly primigravida	4
Maternal distress per se ..	3
Maternal distress in a patient with a previous Caesarean section scar ..	1
Elderly primigravida with low fertility ..	1
Elderly primigravida with postmaturity ..	1
Recent laparotomy ..	1
Total no. of cases ..	76

Our shortest traction time was two minutes while the longest was 20 minutes. All but four of our cases required less than 12 minutes of traction. The largest baby in our series was 9 pounds 6 ounces and the smallest 3 pounds 14 ounces. There was one case of cephalihaematoma and one with superficial scalp abrasions. Three still births and one neonatal death occurred in this series. There were two failures.

The first failure occurred in a 32-year-old unbooked gravida two admitted in labour at 42 weeks. She had had a forceps delivery of a six pound baby 12 years earlier. Eight hours after admission the foetal heart was slow, with the cervix fully dilated and the head in the left occipito-lateral position, at spines. There was caput and moulding. Mild disproportion was suspected and a vacuum extraction commenced under vulval block. Intermittent traction for ten minutes resulted in some rotation and descent, but the cup came off. It was reapplied and traction exerted for a further three minutes but the cup came off again. Extraction was abandoned and delivery completed with forceps.

The baby (7 pounds 2 ounces in weight) was asphyxiated and in spite of resuscitative measures, died in two hours. Permission for post-mortem was refused.

The second failure was a stage two case with the occiput anterior and at the spines. Due to a leak in the vacuum pump, the pressure could not be raised to more than 0.4 Kg per cm^2. After 20 minutes of intermittent traction during which the cup slipped twice the attempt was abandoned and delivery completed with forceps, resulting in a live baby weighing 7 pounds 12 ounces.

Episiotomy was performed in 88 cases. There were no extensions of episiotomy or vaginal lacerations. Cervical tears occurred in two cases performed before full dilatation of the cervix.

TABLE 4
EXTENT OF DILATATION OF CERVIX AT THE TIME OF INTERVENTION

Dilatation of Cervix	*No. of cases*	*Failures*
5 cm ..	1	Nil
6 cm ..	4	Nil
7 cm ..	3	Nil
8 cm ..	8	Nil
Rim of cervix ..	8	Nil
Fully dilated (stage two) ..	76	2

TABLE 5
LEVEL OF HEAD AT THE TIME OF APPLICATION OF VENTOUSE

Level	*No. of cases*	*Failures*
Above spines ..	5	Nil
At spines ..	53	2
Below spines ..	42	Nil

TABLE 6

POSITION OF HEAD AT THE TIME OF APPLICATION OF VENTOUSE

Position	*No. of cases*	*Failures*
Occipito – anterior ..	59	1
Occipito – lateral ..	37	1
Occipito – posterior ..	4	Nil

Discussion

Vacuum extractions can be performed in most multigravidae without anaesthesia. while in primigravidae a vulval block is adequate. It is felt that general anaesthesia is unnecessary and undesirable as the mother's expulsive efforts are not utilised when vacuum extraction is performed under general anaesthesia.

Our indications for intervention in stage two are similar to those for forceps delivery. Fothergill and Chalmers (1961) and Willocks (1962) have used the ventouse successfully in breach and brow presentations as well. When urgent delivery is necessary before full dilatation of the cervix the ventouse offers a safe alternative to what might otherwise be a Caesarean section, provided it is treated as a trial extraction (Inman, 1969); it must be performed in the operating theatre with the anaesthetist standing by as in a trial forceps.

The ventouse is an elegant instrument for management of the occipito-posterior and occipito-transverse position. In our series of 41 such cases there was only one failure. Thirty-seven of the successful cases underwent forward rotation, while the three remaining cases underwent backward rotation and were delivered face to pubis.

The first of our failures was due to a wrong choice of case in that the degree of disproportion was regarded as mild when it was in reality of a more severe nature. The second failure was due to a leak in the apparatus. This may be caused by a defective washer in the vacuum pump or a defective flutter valve in the front end of the pump. The ventouse should be checked for leaks before use. A third cause of failure though not encountered in our series is faulty technique. This includes too strong traction, or oblique traction resulting in slipping of the cup, a possible cause of foetal scalp trauma.

The ventouse cannot be blamed for the three still births in our series as the foetal heart was absent on admission in these cases. The neonatal death in our first failure has been attributed to the ventouse, giving a corrected foetal loss of one per cent. We would however like to add that as permission for post-mortem examination was refused, we could not establish the exact cause of death. It is probable that anoxia and disproportion also contributed to the neonatal death. Injuries to the foetus can be minimised if traction is not unduly prolonged. When delivery is not effected in spite of 20 minutes of traction the case must be reviewed to exclude disproportion, and 30 minutes should be the absolute limit for traction. Huntingford (1961) reported adverse results on the foetus with an average traction time of 40 minutes. Another cause of foetal injury is slipping of the cup and if it occurs on more than two occasions, the attempt should be abandoned.

Our series included 72 primigravidae, five secundigravidae with a previous history of Caesarean section, five secundigravidae with a previous history of forceps delivery, and four secundigravidae with a previous history of abortion or still birth, thus necessitating a high episiotomy rate. Inclusion of a part of the vaginal wall or cervix into the cup during application is likely to cause injury to maternal tissue. An extreme example of this is illustrated by Spitzer (1962) who reported annular detachment of cervix following inclusion of the cervix within the cup during vacuum extraction.

I thank the Medical Superintendent of the Colombo North General Hospital, for permission to use the case records and the house officers and ward staff for their kind cooperation.

REFERENCES

Chalmers, J. A. and Fothergill, R. J. (1960) *British Medical Journal*, **1**, 1684.

Chalmers, J. A. (1963) *Journal of Obstetrics & Gynaecology of the British Commonwealth*, **70**, 94.

Huntingford, P. J. (1961) *Lancet*, **2**, 1054.

Innman, S. E. (1969) *Journal of Obstetrics & Gynaecology of the British Commonwealth*, **76**, 354.

Malmstrom, T. (1954) *Acta obstetrica et Gynecologica scandinavica* 33, suppl, 4.

Rajanayagam, S. (1966) *Ceylon Medical Journal*, **4**, 169.

Spitzer (1962) *American Journal of Obstetrics & Gynecology*, **83**, 247.

Willocks, J. (1962) *Journal of Obstetrics & Gynaecology of the British Commonwealth*, **69**, 266.

Current Concepts in Drug Therapy

NO. 17. HISTAMINE H^2 – RECEPTOR ANTAGONISTS

Introduction

Certain actions of histamine in the body such as the stimulation of smooth muscle in the gut and bronchi are antagonised by the anti-histaminic drugs such as mepyramine, whereas they have no effect on the effect of histamine in stimulating gastric secretion.

Ash and Schild (1966) termed the receptors blocked by mepyramine, H^1 receptors and postulated that responses not blocked by mepyramine, were mediated by a second type of receptor.

Black and his colleagues (1972) synthesised a specific antagonist for the receptor which mediated gastric secretion and the receptor was termed an H^2 receptor.

Two H^2 receptor antagonists have been synthesised by modifying the histamine molecule.

METIAMIDE

The first to be synthesised was burimamide a thiourea analogue of histamine followed by *Metiamide* an analogue of burimamide which is about 5 times more potent *in vivo* than burimamide and can be used orally. Most clinical studies are now concentrated on metiamide.

Pharmacological actions

Metiamide given orally or i.v. to man has been shown to inhibit gastric acid secretion induced not only by histamine but also by pentagastrin, arecholine or vagally induced. It thus inhibits acid secretion evoked in man by the 3 major agonists – histamine, gastrin and acetylcholine.

Inhibition of acid secretion has been achieved at plasma metiamide concentrations comparable with those following an oral dose of 300 mg (Carter *et al.*, 1974).

Metiamide is readily absorbed, circulates protein bound to a small extent and 60–90% is excreted in the urine.

Its effects on acid secretion suggests that it may be of value in the treatment of gastric hypersecretory states such as those associated with duodenal ulcer.

Clinical studies

Milton–Thompson and his co-workers (1974) showed that 400 mg taken at bedtime effectively suppresses nocturnal acid secretion in patients with duodenal ulcer.

Pounder and his colleagues (1975) in a controlled study in 30 patients with symptoms of duodenal ulceration showed that there was a significant rapid remission of nocturnal pain. The metiamide treated group as a whole experienced significantly less daytime pain than the placebo group and consumed significantly less antacids. In the metiamide treated group 12 out of 15 were free of pain during the last 3 weeks of the trial which lasted 5–8 weeks. No attempts were made to assess the effects on the ulcer healing.

These results in a small group of patients indicates that it produces early remissions of symptoms of duodenal ulcer. No comparisons have been made with conventional therapy (i.e.) antacids and anticholinergic drugs.

It is available as tablets containing 200mg metiamide. The dose used is 200mg daily after meals and 400mg at bed time.

Adverse effects

Only mild adverse effects such as sedation, headache and dizziness were reported in the study by Pounder and his colleagues. None were severe enough to stop treatment. 2 cases of reversible granulocytopenia have been reported during treatment in other studies.

Toxic effects have been reported in animals with high doses. These include toxic effects on the kidney in the rat and the dog, pulmonary oedema and pleural effusion in some dogs and also granulocytopenia. Further evaluation of its toxicity is needed.

N. D. W. L.

REFERENCES

Ash, A. S. F. and Schild, H. O. (1966) *British Journal of Pharmacology*, **27**, 427.

Black, J. W., Duncan, W. A. M., Durant, G. J., Ganellin, C. R. and Parsons, M. E. (1972) *Nature (Lond.)* **236**, 385.

Carter, D. C., Forrest, J. A. H., Werner, M., Heading, R. C., Park, J. and Shearman, D. J. C. (1974) *British Medical Journal*, **3**, 554.

Milton-Thompson, G. J., Jenkins, D. J. A., Williams, J. C. and Misiewicz, J. J. (1974) *Lancet*, **1**, 673.

Pounder, R. E., Williams, J G., Milton-Thompson, G. J. and Misiewicz, J. J. (1975) *British Medical Journal*, **2**, 307.

Letters to the Editor

Gleanings from the Mahavamsa – A Comment

Dear Sir,

I read with interest the article by Dr. C G. Uragoda entitled "Medical Gleanings from the Mahawamsa" in the March issue of your Journal.

Although I am not a member of the medical profession I am interested in the subject of Dr. Uragoda's article, which bears on research I have undertaken on ola manuscripts on medicine. Dr. Uragoda quotes from the Mahawamsa on subjects of medical interest from which he attempts to draw a picture of the medical system that prevailed in ancient Lanka.

The writers of the Mahawamsa wished to rouse faith and to teach moral lessons and their work therefore contains many legends which are meant to illustrate its themes and to make the account humanly interesting. The stories quoted by Dr. Uragoda hardly provide a basis for the inferences he draws.

While references in the Mahawamsa to the building of hospitals and nursing homes are capable of verification from stone inscriptions and other historical documents and archaeological remains, much of the other information which Dr. Uragoda relies on, cannot be verified in this way. Due to lack of sufficient data we have perforce to depend largely on Indian sources and surviving ola manuscripts in this country, to obtain a picture, though incomplete, of the Ayurvedic medical system in ancient times.

Dr. Senerat Paranavitana, the former Archaeological Commissioner read a paper entitled "Medicine and Hygiene as practised in Ancient Ceylon" at the twenty-fourth quarterly meeting of the Society of Medical Officers of Health of Ceylon on 16th December 1933, in which he draws somewhat different conclusions from those of Dr. Uragoda. I quote below extracts from Dr. Uragoda's article followed by the relevant extracts from Dr. Paranavitarna's paper. I have not used inverted commas for the quotations for the sake of convenience.

Dr. Uragoda —

King Buddhadasa was known as a physician king. He appears to have been adept at medicine, surgery and midwifery, as well as veterinary medicine "Strange but impossible stories of operations are recorded of him" (Codrington, 1926), but at times, on careful consideration, one could discern a scientific basis.

Turnour's translation refers to a priest who was cured of a rheumatic affection by King Buddhadasa. In Geiger's Mahawamsa the ailment is described as "writhing disease". The patient probably had a disease of the locomotor system, such as rheumatoid arthritis.

It is mentioned how in a young man a frog's egg penetrating the nostril entered the skull when it grew into a frog. King Buddhadasa is reported to have split the skull, pulled out the frog and put the parts of the skull together. This episode could be described as a flight of fancy, but it savours of a prediction come true, for brain surgery is a reality today and parasitic infestations of the brain are well recognised.

King Buddhadasa diagnosed worms in a bhikku who had fallen ill after drinking water infected with worms which he had received on his begging rounds. The King then bled a horse and gave the blood to the bhikku to drink, when shortly afterwards he revealed the nauseating nature of the drink the bhikku vomited the blood along with the worms. In this instance a feeling of repulsion was used as an emetic to cure an organic condition.

Dr. Paranavitana —

We need not take these stories as historical facts. They are nothing but

folk tales but the fact that they were attached to the king shows that he must actually have been proficient as a physician.

Dr. Uragoda —

King Parakramabahu ordered people versed in the art of healing to seek out villages and market towns and practice their art. The effect of his order was to utilise to the maximum the services of skilled personnel, and is reminiscent of the present day compulsory employment of medical graduates.

"To discerning and skilful physicians who were quick at distinguishing various (bodily) conditions and who were versed in all the text books, he (King Parakramabahu) gave maintenance according to their deserts, recognising the merits in all of them and made them day and night practice the art in the best manner."

This undoubtedly amounted to a merit award, a system that has been adopted in the United Kingdom, and under consideration for resuscitation in Sri Lanka after a lapse of many centuries. Another fact that emerges from the reference is that physicians even then were expected to work day and night.

King Parakrambahu who was himself versed in medical lore tested the physicians as to their ability. If there was a deficiency, he "showed them the proper use of instruments by skill fully treating several people with his own hand". This indicates that the idea of maintaining standards in the medical profession existed in even ancient times.

In the battle with Manabarana, Parakramabahu left those who had received wounds to the care of physicians. Thus it is seen that his victorious armies were supported by an elaborate medical service.

Dr. Paranavitana —

In this account one may not accept as absolutely accurate the statement that Parakramabahu was himself so proficient in medicine and surgery as to be able to teach professional physicians their business. The author of this part of the chronicle has portrayed Parakramabahu as the ideal king and he may not have been so clever as he is depicted to be. Nevertheless, the fact that hospitals were founded in his reign is confirmed by contemporary inscriptions, and the description itself is of interest to show what an ideal hospital was taken to be in Ceylon in the twelfth or the thirteenth century.

Dr. Uragoda —

Some of the public health measures employed in ancient Anuradhapura were on par with those in a modern city. In the fourth century B.C. King Pandukabaya laid out a cemetery in the town. "He set five hundred candalas to the work of clearing the (streets of the) town, two hundred candalas to the clearing of sewers, one hundred and fifty candalas he employed to bear the dead, and as many candalas to be watchers in the cemetery." It is difficult to believe that sewers in the accepted sense of the word today existed in ancient Anuradhapura. This is borne out by Turnour's translation which refers to nightmen instead of clearers of sewers. Sinhala translation too agrees with this.

Dr. Paranavitana —

The number of candalas given in the chronicle as appointed for the various sanitary services may possibly be an exaggeration; but the mere mention of these in the chronicles is evidence for the fact that such services were considered essential.

Dr. Uragoda —

The picture of the state of medicine that emerges after a careful study of the Mahawamsa is one that should evoke admiration. The Mahawamsa is "one of the most remarkable histories in existence, un-rivalled – with perhaps the sole exception of the Shu King records of the Chinese Emperors" (Williams, 1950). Therefore no other country could perhaps trace a medical

set-up so far back into the recesses of time; but even if such a possibility existed it is doubtful whether any other country could speak of a comparable framework of health services.

Dr. Paranavitana —

The practice of medicine and hygiene is a necessity for any civilised community; and it is reasonable to assume that the people of ancient Ceylon who had reached a relatively high level of civilization had a system for these essentials of a cultured life. This assumption is confirmed by numerous references in the chronicles, in Sinhalese literature and in the ancient inscriptions as well as by archaeological remains.

Dr. Uragoda infers that our health services were superior to that of any other country at the time. However the ancient culture of Sri Lanka was derived from India and the health services in ancient India had developed in a much earlier period. The art of government in ancient Sri Lanka was much influenced by the Arthasastra of Kautilya a treatise on the art of government believed to have been written in the 6th Century B. C. by a Minister of Chandragupta, a contemporary of Alexander the Great. It lays down rules and regulations concerning health and safety of the population in the king's capital including sanitary and hygienic measures. Kings in ancient Sri Lanka are known to have been guided by its precepts. It was not only Indian Vedantic medicine and health services which had developed in an earlier period; so had the medical and health services of Babylonia, Sumeria, China, Greece, Persia and Israel. Older than all these was Egyptian medicine from which most other systems borrowed copiously in ancient times. From descriptions in various very ancient papyri such as the Edwin Smith Papyrus (3000 B. C.) and the Ebers Papyrus (1150 B. C.) it is evident that health services must have reached a high degree of development in Egypt 2500 years before Vijaya landed in Sri Lanka.

Dr. Uragoda has concluded from a study of the Mahawamsa that the infra-structure of the ancient Ayurvedic system which prevailed and the modern system which now obtains have several areas of similarity, and that the health service in ancient Lanka was on a sound footing. His conclusion may well be right; however there is insufficient evidence available to arrive at such a conclusion. A more useful purpose would be served by a consideration of the reasons why Ayurveda ceased to develop as this may have useful lessons for us all including practitioners of modern medicine in Sri Lanka. In ancient times in India, formal studies were made of anatomy, physiology and pathology, and the knowledge gained about diseases and the healing power of herbs is remarkable considering that this was done without the use of scientific techniques and the equipment of modern medical science. Ayurveda comprised both curative and preventive medicine as well as surgery and from the copies which still exist of ancient books, one can surmise that medical knowledge was of a very high order for that time. Ayurveda reached the zenith of its development just prior to the Buddhist period (commencing 5th Century B. C.) and shed its lustre on surrounding countries including Persia, Greece and Lanka.

Surgery ceased to develop after Susrutha (5th Century B. C.), This is said to have been because animal sacrifice ceased with the rise of Buddhism. Its prohibition is said to have led to the discontinuance of the study of practical anatomy with the result that surgery did not develop thereafter and was in time discontinued. However, there are other likely reasons. Dissection was at one time considered to carry ceremonial un-cleanliness and Mahasamhita forbids eating from the hands of a surgeon. Although sedatives, narcotics and intoxicants are mentioned, the use of a general anaesthetic appears to have been unknown and patients must have dreaded the surgeon's knife. The discontinuance of surgery and the prejudice against dissection were great blows to the development of the knowledge of the human body and the causes of disease.

The dissemination of medical knowledge was closely guarded and this contributed to the decline of Ayurveda. Medical secrets were not written down and were lost. Above a certain level, teaching was

purely oral for reasons of secrecy. The works of Charaka (7th Century B. C.) and Susrutha (5th Century B. C.) are the most authoritative of the ancient works on Ayurveda and are almost the only remains of a great body of literature coming from those ancient times which has been irretrievably lost.

The Indian genius, like the Greek was deductive rather than inductive and the concepts of Ayurveda were considered to be self-evident and in no need of experimental verification. Indian culture did not promote the experimental habit of mind and this led to an un-critical subservience to tradition. The earliest works on medicine became standard works and became sacred. Authors who followed Susrutha and Charaka are mostly servile copyists. There was a similar development in Europe where Galen dominated medical thinking for 2000 years, While theories of Susrutha and Charaka are quoted freely even to this day by Ayurvedic physicians, in modern medical science, theories are being continuously tested and changed in the light of new knowledge.

With the decline of Ayurveda, physicians gradually began to practise medicine on empirical rather than rational lines and to depend to an increasing extent on the healing power of their herbs. Their over-reliance on the deductive method of reasoning led them into the errors of "post hoc ergo propter hoc" reasoning. They tended to confuse the causes of disease with symptoms. They were also excessively prone to argument from analogy.

Although the Ayurvedic physician had done no formal study of anatomy, physiology or pathology the healing power of his herbs enabled him to continue to serve usefully even after the introduction of modern medicine to this country. If this were not so he would not have survived the introduction of modern medicine with its physical and biochemical aids to diagnosis and its scientific techniques and armamentaria.

The country looks to Ayurveda to play its part in caring for the health of the nation. However, it cannot play its role effectively unless it becomes modern, and it is scientific research that holds the key to its future. Ayurveda must use scientific knowledge and technology to test its theories and herbs, and abandon its uncritical dependence on tradition.

Lankeswara S. D. Pieris
Colombo 3
12*th June* 1975

Dr. Uragoda comments: Mr. L. S. D. Pieris' comments bear the stamp of a close study of my paper, but apparently he fails to take cognizance of the fact that my article does not attempt anything more than what its title proclaims, namely gleanings from the Mahavamsa. Therefore the bulk of his criticisms are rather off the mark though they are interesting and thought-provoking. I have prefaced my article with the statement that "some of the events described have an air of fantasy about them but by making due allowance for such infirmities one could extract much valuable information". But Mr. Pieris appears not to have noticed it, for he labours on with feigned indignation that I have accepted every statement in the Mahavamsa as literally true.

In my article I have collected most, if not all of the references of a medical nature in the Mahavamsa, and have attempted a comparison of the past with the present health services. Dr. S. Paranavitana's paper was read in 1933, but the passage of 40 years has seen tremendous advance in various fields of medicine including, for example, brain surgery. We are now equipped with new knowledge by which we could provide a scientific interpretation to some seemingly fantastic events described in the Mahavamsa. By this treatment, stories such as the episode of the frog's egg assume a more realistic guise. This type of interpretation may not be entirely correct, for such stories may have been only figments of imagination in the minds of the writers of the Mahavamsa. However, what I have tried to show is that such stories need not necessarily be consigned to the realms of fiction on the basis of their face value, but that modern interpretation could supply them with a factual streak.

Mr. Pieris asserts that Kautilya's Arthasastra influenced the art of government

in ancient Sri Lanka. Unfortunately he does not support this sweeping statement with any references. He states that Arthasastra was written in the 6th century B. C., but Shamasastry (1956) fixes the date as being not earlier than 4th century B. C. If we go by Mr. Pieris' own statement that it was written during Alexander's time, then again he stands corrected, for Alexander lived in the 4th century B. C.

Individualized medicine was well developed in ancient Egypt. Edwin Smith and Ebers papyri are collections of prescriptions and case histories (Cumston, 1926). Much more is required for a health service to be well developed.

Mr. Pieris deals at length with the decline of Ayurveda in India. This has hardly any relevance to my paper nor to Sri Lanka. He attempts to transpose the Indian scene on to the situation in this country, and thereby exposes the inherent weakness of such an exercise. He says that in India, Ayurveda reached its zenith just prior to the Buddhist period. On the contrary, our civilisation reached its heights during this period, and it cannot be said that the introduction of Buddhism had a hand in the decline of Ayurveda in Sri Lanka. The successive occupations by the Portuguese, the Dutch and the British, who brought their own systems of medicine, undoubtedly had an impact on Ayurveda in this country, but Mr. Pieris is silent on this point.

REFERENCES

Cumston, C. G. (1926) *An Introduction to the History of Medicine,* London, Kegan Paul, Trench, Trubner.

Shamasastry, R. (1956) *Kautilya's Arthasastra,* Mysore, Sri Raghuveer Printing Press.

89TH ANNIVERSARY MEETING OF THE SRI LANKA MEDICAL ASSOCIATION 1976 MARCH

PRELIMINARY NOTICE

Scientific Programme:

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6. Clinical Session
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All applications to participate in the Scientific Programme should reach the Hony. Secretary by 31st October, 1975.

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Printed by Kularatne & Co. Ltd., 732, Maradana Road, Colombo 10
for the Sri Lanka Medical Association, Colombo.