Indian Journal of Radiology.

May 1961

Vol. XV, No. 2 MAY, 1961

THE Indian Journal of Radiology

The Official Journal of the Indian Radiological Association

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Yearly Subscription (4 Numbers) Rs. 16/- Single Number Rs. 4/-

INDEX TO ADVERTISERS

When replying please mention the Indian Journal of Radiology

THE INDIAN JOURNAL OF RADIOLOGY

(QUARTERLY)

The official Journal of the Indian Radiological Association

THE INDIAN JOURNAL OF RADIOLOGY

OFFICIAL ORGAN OF

THE INDIAN RADIOLOGICAL ASSOCIATION

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Subscription for India Rs. 16/- per annum;
Single copy Rs. 4/- plus postage.
Foreign subscription £ 1/6 per annum.
Free to members of the Indian Radiological Association.
Annual subscription for Membership Rs. 18/-.

Editorial

THE FIFTEENTH INDIAN CONGRESS OF RADIOLOGY

The Fifteenth Indian Congress of Radiology which met in New Delhi from the 25th to 27th February 1961 constitutes another milestone in the onward progress of Indian Radiology. The salubrious climate of our capital city during this season (February) lent colour and stimulus to the whole session. As befitting the occasion, Hon'ble Karmarkar, the Central Health Minister inaugurated the Conference in the Nurses' Lecture Theatre, Irwin Hospital, after eloquent welcome address by our respected elder Radiologist Dr. Diwan Chand Aggarwal, the Chairman of the Reception Committee. In his address Dr. Aggarwal emphasised the world of difference that exists between cheap medical attention and medical attention cheaply available He also brought home to the Minister's attention that the most widely utilised component in radio-diagnosis, the X-Ray film is taxed as a luxury item and that the X-Ray equipment and appliances imported for medical use are treated and taxed exactly like things as beauty aid. The Hon'ble Minister speaking in a humorous and a Lighter vein touched on the Public Health Problem in our country and socialisation of Medical Services: He however promised to take the necessary steps in consultation with his colleague, the Finance Minister, to reduce the heavy taxation on X-Ray films and equipment. It is hoped that something helpful and tangible will result from the Hon'ble Minister's promise to lighten this heavy and unjustified tax burden. The immediate past president Dr. N. B. Roy then installed the new president Dr. L. H. Athle after a short and sweet speech and adorned the new president with the insignia of office.

Dr. L. H. Athle, our popular and beloved president then delivered the presidential address which was listened with rapt attention by the whole assembly. His speech was a model of simplicity, brevity and dignity and

covered all the burning topics that confront the different branches of Radiology at the present day. After briefly discussing the various advances in the different divisions of radiology, he discussed the possible advantages of the introduction of automation in diagnostic work. While emphasising the necessity of every protection of the radiologists and patient from the ionising radiations, he warned against panic existing in some quarters about the adverse effects of radiation especially in inducing malignancies as leukaemia etc. He was a firm believer in the necessity of teaching both radiodiagnosis as well as radiotherapy in every postgraduate course in radiology. After a brief recess for Tea, the radiologists again assembled in the same hall to hear Sir Jagdish Bose Memorial lecture by the world famous radiotherapist, Professor Windeyer, Dean of the Middlesex Hospital and Medical School, and Professor and Director of Myresteen Institute of Radiotherapy, Middlesex Hospital, London. His oration on "Radiology and Radiologists" was a master piece, giving new light and direction in the difficult and less known problem of ionising radiation. Since we are publishing full this learned and instructive thesis, further comment is not called for. We are very grateful to this great savant of Radiotherapy, in personally gracing the occasion and delivering the Memorial Lecture. The annual general body meeting in the night was very lively and long and the majority opinion favoured a two years course leading to postgraduate degree in Radiology without bifurcation instead of three years including one year for the postgraduate diploma. Miss Engineer's amendment that there should be a diploma course of one year, mainly diagnostic with some Therapy and a degree course of 2 years without bifurcation was accepted by the majority of the House. The highlight of the whole session of the Fifteenth Indian Congress of Radiology was the scientific session which was inaugurated on 26th February by Dr. S. C. Sen. The standard of the various papers read in these sessions were of a very high order and compare favourably with similar sessions in the foreign countries. The symposia on Peptic Ulcer in Northern India, as well as Cancer Breast in radiotherapy were greatly appreciated for their wealth of material and the method of presentation and the high level discussion which followed. Those

who contributed the various papers are to be congratulated for their quality. Dr. Gadekar who organised the Scientific Session deserves all thanks and praise from all of us. The Congress banquet which was conducted at the Ashoka Hotel was a glittering occasion full of glamour and colour. The Scientific Exhibition of interesting radiographs organised by the radiologists as well as the exhibition of X-Ray apparatus and dark room accessories and films by our colleagues in trade, were very instructive and popular.

The organisers of the Fifteenth Indian Congress of Radiology deserve the thanks and grateful appreciation of every radiologist in India. On the whole the Fifteenth Indian Congress of Radiology held in New Delhi in February 1961 was a momentous session, worthy of the tradition of Indian Radiological Association, the mouth piece of Indian Radiology and Indian Radiologists.

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Dr. L. H. ATHLE

D.M.R.E. (ENG.), M.A.C.R. (U.S.A.)

President.

Presidential Address

BY

Dr. L. H. ATHLE,

15th Indian Congress of Radiology, Delhi—1961.

The Hon. Shri Karmarkar, Prof. Windeyer and other Honoured Guests, Colleagues, Ladies and Gentlemen,

I am deeply grateful for bestowing upon me the privilege of serving the Association in the capacity of a President. I wish it were not the customary duty of the President to address the inaugural meeting but as it appears to be so, I must submit to the call.

Ladies and gentlemen, you are all well aware of the rapid strides made by Radiology in all its branches including Radio-diagnosis, Radio-therapy, Technology, Nuclear Medicine, Physics and Radio-biology. It will not be out of place to take a bird's eye view of some of these achievements and take stock of the problems raised, incidentally.

In the field of Radio-diagnosis the foremost advances have come through the use of angiography which has resulted in the demonstration of many types of cardiac and vascular lesions and opened the way for newer surgical techniques. Cine-radiographic studies have resulted in better understanding of the dynamics of the heart in health and disease. It has also become possible to study the coronary arteries and circulation of the heart itself. Selective angiography of the aorta and its various branches, have led to the discovery of various conditions related to hypertension, apart from elucidating pathology that had remained undemonstrable with hitherto common methods. The wide use of Splenoportography has resulted in a similar widening of the horizon with regard to hepatic disorders. To these have been added, venography and lymphangiography which promise not only to help in the diagnosis of various types of obstructions related to these structures but also help us understand the spread of tumours in the human body.

With newer techniques, such as Cine-radiography, the physiology and pathology of the oesophagus have been made clearer. We now understand more about various types of pulmonary disorders which were hitherto regarded as a miscellaneous group without any finer distinctions. Pulmonary fibrosis, Pneumokoniosis, Mycosis, Proteinosis and Micro-lithiasis have been studied in much greater detail and more definite criteria have been established of late.

We are making greater headway towards understanding of disease of the pancreas, although it is not comparable with the progress made with regard to the diseases of the brain and spinal cord, with the help of Angiography and Myelography. Newer contrast media have been developed. Intravenous cholecystography has enamoured the Clinicians so that most of them have begun to place absolute reliance upon it inspite of the fact that Radiologists find the oral method more suitable for the diagnosis of cholecystitis. It also appears to me that the somewhat rare but sudden and un-predictable reaction to the contrast medium has not been properly appreciated by the profession as a whole. I myself had three such emergencies in a total number of 105 patients.

In the field of radiotherapy, the use of super-voltage and high energy particles upto the magnitude of 22.M.e.V. of Cobalt 60 and Cesium 137 has been well established and observations of the biological effect of different types of radiation have been made available from a number of countries. The treatment of malignant disease by the use of Isotopes has not lagged behind and the newer methods of perfusion of small parts by radio-active agents, and chemicals promises results not achieved so far by any type of external radiation.

In the field of Technology, advances have been made not only by way of improvement in the existing apparatus but newer things such as Cine-radiography, Image intensification and Television have revolutionised the trends in recent years. The use of image intensifiers gives a brighter image and more useful information in many conditions in addition to reducing the x-ray exposure to both patient and Radiologist. Television has all the above advantages and in addition facilitates group study and teaching. Many types of tomographic machines which are capable of movements in various directions have been perfected and offered to the Radiologist.

Another remarkable phenomenon is the growth of "automation" in diagnostic work as Van Der Plaats said at the Munich Congress, "the idea behind automation is to spare routine manipulations by the Radiologist and make it possible for him to concentrate on the patient". Automatisation of x-ray exposure has been achieved by various methods which are being perfected so as to become completely dependable. This has been done with the aid of radiation detectors, fluorescent screens, photo-cells or electronics. The many associated procedures such as carrying cassettes to and fro, the marking of the films etc. have been mechanised. Automatic development by a machine which presents a completely processed film within about 6 to 8 minutes is an achievement of this trend towards automation.

In our country where there is no shortage of manpower, these advantages do not have the same significance as in some other countries but if we take into account the constancy and uniformity of performance and the speed with which the results are made available to the waiting Surgeon, we must admit that automation will also have a place in our radiological departments.

It seems to me that the greatest advantage of automation is the minimisation of x-ray exposure to the patient as well as the Radiologist. In the light of our present knowledge of radiation biology, this is bound to be a matter of great interest to all of us.

In the field of Radio-Biology recent studies have brought out and stressed the hazards of exposure to diagnostic radiation. The writings of pure Physicists and Biologists have so increased the interest in and concern about radiation that it has become incumbent upon the Radiologist to take serious notice of these observations and statements not only for the benefit of the patients but for his own profession. The hysteria created by these writings has cooled down considerably but the embers of the fire still continue to glow. The dangers of diagnostic radiation to the patient have been unduly magnified. That small amounts of such radiation cannot lead to any serious consequences in the life-time of a patient is obvious to all those who care to study the available data. There is sufficient indication however to minimise the exposure. The Committee for International Protection has recommended the use of high voltage, fast screens, small fields, protective diaphragms and cones and minimum use of fluoroscopy with greater reliance on radiography, as measures towards this end.

The minute attention nowadays given to the question of protection of the Radiologist and his assistants deserves our most careful consideration. I must however stoutly oppose statements such as "one 'r' reduces the life of a man by one day". If this were true, I should have been dead long ago, somewhere in 1857—years before I was born.

One study of longevity and causes of death is supposed to show an increase in the incidence of leukaemia and carcinoma of skin among the Radiologists. These statistics incidentally show that carcinoma of sites other than skin and lung, coronary disease, myocarditis, hypertension, cerebral haemorrhage, septicaemia, broncho-pneumonia, tuberculosis and other "unstated causes" are more common among Physicians not exposed to radiation. You can yourself make an intelligent appraisal of the nature of such statistics.

What really does matter is the genetic effect of radiation which has no known threshold. The exposure of the gonads to radiation during diagnostic work, unless when absolutely necessary, is therefore rightly condemned.

I should here like to refer to the question of injury to the foetus caused by x-ray examination during pregnancy. It must be admitted that in very early stages of pregnancy radiation is likely to produce some abnormalities of the foetus and in some cases foetal death but pelvimetry towards the end of pregnancy does not result in any known damage to the foetus. Reports of an increased incidence of leukaemia based on statistics which are in themselves faulty, must be treated with caution and suspicion. In one report where about 330 cases of leukaemia in children were studied, 42 mothers had x-ray examinations as against 24 controls and the results were extrapolated to signify the danger from x-ray examinations. The unknown factors which cause leukaemo-genesis in 88% of these cases are clearly forgotten and their role completely missed in accounting for the slight discrepency between the radiated and non-radiated groups. If x-ray examination during pregnancy has something to do with leukaemia in children, there should have been a vast increase in the incidence of leukaemia, in certain communities and great discrepancy between places where x-ray examination is commonly made and where x-ray examination is seldom resorted to. No such figures are forthcoming at present.

Most observations about the dangers of radiation therapy can well be discounted because of the very small percentage of incidence of malignancy in the treated cases. It is only seen with very large doses of radiation capable of causing permanent tissue damage. This can only occur in modern times, in cases which are treated for malignancy. It is a matter of one's choice whether radiation should be withheld from a patient suffering from a condition which will cause death in a comparatively short period, in order to save him or her from the small possibility of the development of a second post-radiation malignancy after a period of years. No wise clinician or Radiologist will withhold radiation-therapy because of such a theoretical possibility.

I must here make it clear that even for a non-malignant condition like Ankylosing Spondylitis the treatment in our hands has not led to increased incidence of leukaemia.

Above all one thing is clear and that is that the Radiologist should be fully aware

of the possible somatic and genetic effects of radiation so that he can counter-act mischievous propaganda on one hand and on the other, give and take full benefit of the measures of protection against the hazards of radiation.

Now we naturally come to the question of the training of a radiologist who is to shoulder the responsibility of this vast and ever-expanding field of his speciality. It is conceded that the radiologist must primarily be a clinician conversant with the symptoms and signs as well as with the common laboratory data found in various diseases that afflict mankind. Only such an individual can take upon himself the responsibility of a specialist diagnostic or therapeutic approach to the problem of medical aid in diverse conditions. It follows that a thorough general grounding is essential as a prerequisite for specialisation.

It is my humble opinion that there is too much preoccupation with the number of lectures and theoretical training in general. Practical experience is the back-bone of specialisation and that any course or curriculum which does not take cognizance of this fact is bound to fail. A student, who sees and comes into direct contact with a large amount of material in a teaching department of Radiology and is able to observe the method and manner in which problems are approached by the teaching Radiologists, will be a far better Diagnostician or a Therapist than a person who has attended a prescribed course of lectures. A prolonged period of active participation must therefore be the basis of any specialised teaching. In the light of this observation, the length of the course for a Diploma or Degree is a matter of secondary importance. Naturally, longer the duration of practical training the better will be the chances of real education. It will not be out of place here to touch the controversy regarding the bifurcation of post-graduate training for diagnosis and therapy. Some puerile arguments have been advanced against inclusion of radio-therapeutic training in the syllabus of the post-graduate diploma. As for example, the complaint of the students about the extra burden of therapeutic studies, 9/10ths of all curricula will have to be scrapped if this is accepted as a valid reason. There is more complaint about the Physics part of the curriculum than about the therapeutic section. The argument that very few qualified persons practice therapy also is meaningless. It can be compared with the dispensing of surgical, gynaecological or ophthalmic teaching for the undergraduate because he will have few occasions to use his knowledge in his practice. We shall thus have to reorient the entire conception of teaching of the medical graduate and break it up into many categories, one for the general practitioner and several different ones for the would-be specialists in different branches. That many of the qualified Radiologists will not practice therapy is a lame argument. Why not abolish the elaborate teaching of radiation physics because most of the radiologists will not repair their faulty machines or will not measure the output or bother about depth dosages?

I am a firm believer in the necessity of teaching the elements of radio-therapy as part and parcel of every course in Radiology as this is the only way to acquaint the budding Radiologist with the biological effects of radiation, its normal reactions and its undesired immediate or late effects, especially when the problem of radiation hazards has become so important to us. The radiology student must be able to see for himself the effects of radiation, the protective measures required and the immediate and late results of radiation on tissues in general.

The student is also brought into close contact with the manifestations, symptomatology and pathology of tumours, when he is working in a department of Radio-therapy. Imagine what an advantage this is when he tackles the problems of malignancy in Radio-diagnostic work.

If we fully understand the implications of these advantages, we cannot but insist upon an alround training of the radiologist. There is no place for a bifurcation of diagnosis and therapy for a preliminary Diploma or Degree in Radiology. It is open to those who are interested in further specialisation to pursue radio-therapy. In Sweden, Germany, Switzerland and the United States, there is no separation or bifurcation. My advice therefore is not to rush in where angels fear to tread nor be the victims of unintelligent imitation. We should pick and choose what is best for the situation that confronts us in India and how the demands of medical relief, education and research can be met within our own climate.

Our educational system will be a mockery if we were to copy verbatim, commas and semi-colons included, the curricula of foreign universities. I congratulate the universities of Madras and Lucknow who have started a two-year combined course. If sufficient facilities are available to train students in radio-therapy, in the real sense of the term, I have no doubt that such further specialisation will be promoted at these centres.

Coming to things that interest us directly as members of the Association of Indian Radiologists, I should like to mention a few important ones.

The dearth of properly trained technicians is a problem of increasing magnitude. All of us who are concerned with the working of large departments must strive to organise proper courses and participate in the training of technicians. A combined effort sponsored by the Association is well worth considering.

It is a matter of gratification to see the Health Physics Division of the Atomic Energy Commission participate in the monitoring service, routine check-ups and post-graduate training. Their recommendations ought to be followed by all concerned insofar as they are practical.

It is well known that x-ray apparatus is to be manufactured in India in collaboration with some foreign concerns and that the production will start at not too distant a date. Some of us are afraid that the apparatus of small power will be made available at a disproportionately high cost to Radiologists and other persons engaged in radiological work. In that case the quality and progress of Radiology are bound to suffer. Attempts must be made to supply sufficiently powerful units at a reasonable cost, if good Radiology is to be the order of the present times.

In the matter of x-ray films, I feel that it is impracticable to charge high customs duty and to rigidly restrict the quantity of quality films imported in the country to 75% of the quota for the year 1956-57. The demand has actually doubled in the last 3 years. X-ray films cannot be included in the category of luxury goods by the highest stretch of imagination. Many other countries in the East faced with similar problems have adopted a more sensible attitude in this regard. The vagaries of sales tax on films have been repeatedly referred to in presidential speeches,

resolutions and memoranda on innumerable occasions.

These have failed to evoke any response from the powers that be. We must however continue our efforts to convince them.

Now let us turn to more pleasant things.

I shall be forgetting my duty if I do not mention our gratitude to the Trades Association which has closely collaborated with us and kept up the show. I mean the technical exhibition, in spite of great difficulties.

I sincerely thank the chairman and Members of the Reception Committee of the Delhi Branch for their invitation and splendid organisation of the Annual Congress here.

The labours of the Honorary General Secretary preceding the Annual Meeting usually go un-noticed and I should like to make a mention of the sustained efforts of Dr. Ved Prakash, our Honorary General Secretary, in keeping the clock of the Association ticking all round the year.

I am confident that we shall have a very successful Scientific Session, an outstanding Jagdish Chandra Bose Memorial Lecture, a very peaceful Annual General Meeting and joyous social functions. Above all, we shall not be found lacking in abiding faith in the future of Radiology and a spirit of friendliness and fellowship amongst ourselves, for these alone will lead the Association towards the fulfilment of its cherished aims and objects.

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SIR JAGADESH BOSE MEMORIAL LECTURER

Professor B. W. WINDEYER

F.R.C.S., D.M.R.(E.), F.F.R.

Dean, Medical School, Middlesex and Professor of Radiotherapy, University of London.

Radiations, Radiologists and the Human Race*

BY

Professor B. W. WINDEYER, F.R.C.S., D.M.R.(E.), F.F.R.,

Dean of the Middlesex Medical School, Professor of Radiotherapy, University of London.

Mr. President, Ladies and Gentlemen,

I am greatly honoured by your invitation to me to visit you at your Annual Congress in New Delhi and to deliver this Sir Jagadesh Bose Memorial Lecture. I trust that the great Physicist and Physiologist, who did so much in the study of radiations, would have approved my choice of subject.

It is with great pride that I have come here to represent British Radiotherapy and in addition to strengthen the strong personal ties which I have had for many years with the radiological profession in India. It is a constant source of gratification to me that many former pupils and associates are now holding positions of influence and responsibility and are helping to develop the pattern of the radiological services of your great nation.

This Congress of the Indian Radiological Association is the annual opportunity for radiologists practising either diagnostic or therapeutic radiology or both, to come together to discuss clinical and pathological problems, and problems of technique and organisation, which are of importance in the development of the use of ionising radiations in the course of their work as medical radiologists.

For nearly half a century following Roentgen's discovery of X-rays the use of ionising radiations was principally, if not entirely directed to medical purposes. During the last two decades however, their use has been rapidly expanded and has extended to all spheres of peaceful activity in everyday life, so that at the present time they make some impact on every member of every type of society.

In the title which I have chosen for this address I have intended to convey the wider responsibilities which we as radiologists, and indeed the medical profession as a whole, must assume in this new era.

In the medical field the use of ionising radiations, both for diagnostic and therapeutic purposes, has increased progressively since the beginning of the century and has now extended far beyond conventional radiology, with the development of different types of both sealed and unsealed sources of radioactive isotopes. These have provided a unique tool, the use of which has opened up the development of new techniques, new avenues of thought and a wide horizon of diagnostic and therapeutic possibilities. There has been a reorientation of methods of research, not only in medicine and biology, but in agriculture and every type of food production. In pure science the use of ionising radiations is invaluable, as for example, in X-ray crystallography and in radioactivation analysis.

The results of research have already been adopted for routine practical procedures and industry today is making extensive use of radioactive substances and other methods of producing ionising radiations. In Britain

*Indian Radiological Association Congress, February 1961, Sir Jagadesh Bose Memorial Lecture.

there are several hundred firms, and the number is increasing, which use them for a variety of purposes, for radiography of welds in heavy industry such as shipbuilding or locomotive manufacture, for the surveillance of pipe lines, for the detection of leaks, for the measurement of cylinder wear, for liquid level indication, for thickness measurements, for static elimination or as tracers in mixing techniques.

For power production, nuclear reactors have now progressed far beyond the experimental stage and will soon be able to compete on an economic basis with the older conventional methods in use in Britain. In the next four years the Central Electricity Generating Board proposes to commission five new nuclear powered stations.

In transport, nuclear power for ships is already an accomplished fact. The astounding voyage of the American submarine under the North Pole, the commissioning of a Russian ice breaker and the submarine building programme in Britain, point the way to its undoubted future widespread use. So far the technical difficulties of nuclear power for aircraft have not been overcome, but it is a future development which may be anticipated without undue optimism.

There are a great number of miscellaneous uses of apparatus with tiny radioactive sources which have now become part of our everyday life. Luminising, by the use of radium in solution, has been an industrial process for many years and the number of luminous dials and meters has greatly increased. At the present day the amount of radioactive substance, usually Strontium 90, in each clock or watch dial is minute, but the total number in use is very great and their increase is obvious to every one of us. Illuminated exit signs for theatres, possibly using Krypton, and signs to demarcate gangways are under consideration, and X-ray pedoscopes have considerable popularity for shoe-fitting, despite the doubts as to whether their possible advantages are not outweighed by the potential but very small hazard to both customer and staff.

The uses of ionising radiations which have been indicated mean that almost all Government departments, from the Ministries of Health, of Labour, of Power, and of Housing and Local Government to the Ministry of Transport and the Post Office are implicated with regulatory or other responsibilities. They mean also that it is essential that there should develop throughout the community, a greater knowledge of the properties and hazards of such radiations and that there must be an expansion of education in this field extending from the senior forms of secondary schools through technical colleges and colleges of technology up to the Universities. The Universities have a particular responsibility to weld this new development into the various undergraduate and post-graduate curricula in engineering and the physical, chemical and biological sciences. They also have the duty of producing the responsible leaders who will ensure that these powerful agents are used with maximum efficiency and minimum risk. The amount of thought and energy which is being devoted to the development of the Peaceful Uses of Atomic Energy can be judged by the size and scope of the second International Congress in this subject, held in Geneva in 1958. The officially sponsored membership was in excess of 3,000 and the communications to it filled 27 volumes.

There are, in addition, the military uses which in the public mind have tended unfortunately to overshadow their peaceful exploitation and, by the programme of weapon testing, have given rise to special problems in the form of radioactive fall-out. The problem of fall-out must be kept in

perspective by adequate instruction, as it is probably not of anything like the same immediate importance as the proper control and disposal of radioactive wastes.

We have now certainly entered the "Nuclear Age", or the age of the use of ionising radiations, and we have entered this new age just as surely as mankind once lived in a stone age or a bronze age or an age of steam or an age of sail. If we do not take our full part in the development and the safe use of these new tools we shall undoubtedly fall behind in the progress of civilization.

As radiologists, our whole lives have been bound up with the development of a new science, but now with these vast developments another vista has suddenly opened up, with new problems and new opportunities.

Our training surely gives us a chance of getting away to a flying start, but the rest of the medical profession and, indeed, the whole community, is now involved in the race. It is time that we all accepted the challenge and prepared to meet it. It may, therefore, be valuable to define some of the responsibilities which we as doctors must accept.

Diagnostic Radiology

The importance of diagnostic radiology was recognised almost immediately after the discovery of X-rays, and it has grown continuously with improvements in technique and the accumulation of clinical and pathological knowledge and experience. Today almost every single organ or tissue in the body can be investigated with benefit by radiological procedures. Every department in a hospital, with the exception perhaps of the dermatological department, relies increasingly on diagnostic radiology for the elucidation of its problems. To such an extent has this tendency developed that, in new hospital construction, the department of diagnostic radiology has become a nucleus around which the various other clinical facilities must be developed.

The obvious benefits of these diagnostic advances have, however, been accompanied by the possible danger of over-exposure of individuals or of the population as a whole.

Radiotherapy

Therapeutic radiology has also made spectacular advances from its first tentative beginnings when treatment by the newly discovered x-rays delivered from a gas tube or by the rare and mysterious radium was attempted for almost every disease yet diagnosed.

Gradually it became apparent that the value of radiotherapy lay principally in the treatment of many forms of malignant disease and of a restricted number of inflammatory and other non-malignant conditions, mainly those involving the skin.

Its scope in non-malignant conditions has been gradually reduced with the introduction of new, safer and more effective remedies, but there still remains a hard core, principally dermatological, but including such conditions as ankylosing spondylitis, for which no effective substitute has been evolved. With our present knowledge, of not only the immediate but the more remote biological effects of ionising radiations, it would appear to be good practice to avoid the use of radiotherapy in non-malignant conditions if any other simpler and less hazardous method of treatment is effective.

In the treatment of malignant disease, however, the place of radiotherapy has become more firmly established and there seems little immediate prospect that it will

be displaced by the development of some new remedy, though long sought and universally desired, which could be given systemically to destroy cancer even when widely disseminated. This is of importance, as successive generations of recruits, including myself over thirty years ago, invariably are warned by someone in authority that radiotherapy will soon fold up and that their skill and training will be wasted.

Radiotherapy, at the present time, is used in Britain in at least fifty per cent of all cases of malignant disease as a part or the whole of treatment. As it is estimated that there are approximately 2,400 new cases of malignant disease per annum per million of population, there is a considerable problem for radiotherapy in our population of over fifty millions, and a vast field of usefulness in the population of India.

Apart from technical advances in apparatus and those facilities which have been common to all countries, radiotherapy has developed in Britain partly through the close collaboration there has been with clinically trained physicists resulting in better understanding of dose distribution and dose estimation, and partly through the accumulation of specialised clinical and biological knowledge which was made possible by the division of radiology at an early stage into the two distinct specialties of x-ray diagnosis and radiotherapy. To these factors must be added the National Radium Commission's progressive policy of creating a limited number of well equipped centres which set the pattern in the formative years.

The problems of each country are different, and vary according to geographical area, the distribution of population, the numbers of specialists and other doctors and the availability and degree of training of medical physicists and other supporting personnel.

The best arrangements for one community may not be the optimum for another, but I believe that the maximum benefit will not be obtained from radiotherapy unless there are a number of centres, devoting full time to its study, which are equipped with a full range of modern apparatus. Of equal importance is that they should be allowed to develop on individual lines, but with the benefit of the mental stimulus of close co-operation with other departments of clinical medicine and surgery, and of the basic medical sciences.

Perhaps the most important present problem which faces radiotherapy is one which is equally important and equally applicable to all other methods of cancer therapy. Radiotherapy is an expensive method of treatment which needs highly specialised equipment and, year by year, more powerful and more expensive apparatus is being developed. It has become a matter of national importance to determine the true therapeutic value of these new machines and whether it is necessary for them to be purchased and installed.

At present it is not possible to make an accurate appraisal of the value of one technique as against another or, even more important, to evaluate the results of radiotherapy for a particular type of cancer in comparison with surgical procedures, or even to compare the performance of one clinic with that of a second. This is a long-standing problem, the comparability and validity of medical statistics, and in no field is it more difficult than in cancer therapy where ethical problems are continually raised, when there is the question of the division of patients into comparable groups.

In other diseases great service has been rendered to medicine by demonstration of the feasibility of accurate clinical trials. An

even greater service will be rendered if similar trials for the evaluation of methods of cancer treatment can be devised.

Methods of Research

Radiotherapy and diagnostic radiology have shared in the advantages which have been gained by the discoveries of the nuclear age, but the most spectacular advances which have come from it have been in methods of diagnosis and research in a wider field of clinical medicine and of the basic medical sciences. Physical, biochemical, physiological, anatomical and embryological problems are now being approached by new experimental methods using radioactive isotopes. Problems as diverse as blood flow, blood volume, red cell survival, placental site, thyroid function, calcium and fat metabolism, vitamin B. 12 metabolism and the blood C. S. F. barrier are examples of some of the clinical research problems which are being successfully tackled by these new tools. In my own medical school the discovery of Aldosterone was made with the help of isotopic methods.

Subjects for Research

The national and international reports published in the last four years on the assessment of radiological hazards have summarised the data available on both the somatic and the genetic effects of radiation. It was apparent that, though much knowledge had accumulated, there remained many gaps in our understanding of all the processes involved and this was particularly so with regard to genetic effects which, prior to these reports, were largely unappreciated outside the thin ranks of the professional geneticists. The report of the special scientific committee of the United Nations in particular, repeatedly drew attention to the urgent need for more research into a variety of aspects of both somatic and genetic effects. At the time of these publications a major effort had already started in many countries and this has been intensified since then. Its importance can be gauged from the activities of the British Medical Research Council in this field. Among other groups and units with allied interests are its Radiobiological Research Unit, Experimental Radiopathology Research Unit, Radiotherapeutic Research Unit, Group for Research on the General Effects of Radiation, Radiological Protection Service and there is the Council's Committee for Protection against Ionising Radiations, which sifts the evidence from a variety of sources and advises on basic levels of dosage and contamination. The Atomic Energy Research Establishment and a large number of University and other research departments have also extensive programmes.

This vast volume of work directed towards the biological actions of radiations must overlap with, link up with and open the door to the solution of other fundamental medical problems. The work of C. E. Ford of the Radiobiological Research Unit, with his technique for chromosome study leading to the discovery of an extra chromosome in mongols, is a stimulating and exciting example. The discovery that total body irradiation will destroy antibody formation and allow successful bone marrow transfusion may have the most far-reaching rusults and may provide the key to successful organ transplantation.

Radiological Health and Safety

The immediate and urgent reason for the intensification of radiobiological research is, however, to give a sound foundation on which measures for the maintenance of Radiological Health and Safety can be based.

The report of the United Nations Scientific Committee showed clearly that there is much more certain knowledge about the doses received and their distribution in various parts of the body than there is about the biological effects of such doses. It was therefore necessary to attempt to define the most likely upper and lower limits of dose to produce such effects rather than a most probable value for each. Inevitably it is the effects at the lowest dosage levels about which least is known, and in order to make sure that health is safeguarded, it has been necessary to take the worst assumption where known facts were inadequate. It may well be that with more known facts there may be some relaxation and less rigidity in the safety standards prescribed. The key to the whole question appeared to be whether there is or is not a threshold value of dosage below which no overt damage will occur. This threshold concept must, however, be erroneous because all the evidence which has been obtained shows that even the smallest quantities of ionising radiation produce some degree of damage in a biological system. Living tissues do, however, have powers of recovery, and these recovery processes are at different rates for different tissues. The threshold concept should therefore be modified to envisage a rate of recovery varying in different tissues and organs which is adequate to compensate for a certain dose and dose rate delivered.

The presence or absence of a threshold is important because the most serious potential hazards to the community from excessive irradiation appear to be the somatic hazard of increased incidence of leukaemia and of other types of cancer, and the genetic hazard arising from an increased rate of gene mutation. There is considerable evidence of the leukaemogenic and cancerogenic effects of radiation from the recently published study of the population exposed to irradiation from the atomic bomb in Japan, from the work of Court Brown and Doll on irradiated cases of ankylosing spondylitis, from Alice Stewart and others. It is now known that relatively large doses of radiation, given in a short time, can cause increase in the incidence of leukaemia and of cancer, but it is not known whether such dosage, spread over a long time, will also cause such increased incidence, and still less is it known if much smaller doses, given over long periods of time, will have any harmful effect.

As regards genetic effects, it has been assumed from the evidence so far available that the effects of radiation in causing gene mutation are cumulative, irrespective of the rate at which the radiation is delivered, and that any small increment of exposure at any time from intra-uterine life up to the end of reproduction is of importance in this regard. At the second Congress on the Peaceful Uses of Atomic Energy it was, however, reported by Russell of Oak Ridge, after experiments with mice, that the mutations produced were much less at the lower dose rate of 12 roentgens per week than at 80 roentgens per minute with the same total dose given. This finding, which has been supported by work in Britain, may cause a reorientation of ideas about genetic effects from small doses of radiation and may show that there are recovery processes in genetic material, but for the present, until we have more knowledge about chronic low dose exposure, we must keep on the side of safety and maintain the former assumption.

Radiological Health and Safety has become almost a catch phrase, and it is of value to attempt to define what it means. The International Commission on Radiological Protection has been concerned in

the past with producing recommendations to safeguard the health of those occupationally exposed. By determining the interrelationship of different types of radiation it has been able to draw on experience accumulated over many years and to recommend maximum permissible levels which it considers " involves a risk which is small compared with the other hazards of life ". Certainly, up to the present, occupational exposure to ionising radiation has not represented as great a risk as that involved in other occupations such as mining, quarrying or motor driving.

The work of Court Brown and Doll shows that there has been no increase in the general death rate of British radiologists, and no apparent increase in the incidence of leukaemia or cancer in those who entered the profession since the formation of the British X-ray and Radium Protection Committee in 1921 although the member involved were insufficient to show small statistical difference. There is no reason to consider that occupational exposure will bring greater risks in the future provided that there is adequate training and that safety standards are adhered to.

The new problem is the health of the population. The general public is particularly sensitive to the idea of hazards from radiological exposure, mainly because they are associated with the thoughts of nuclear warfare. There is particular sensitivity with regard to genetic hazards, not previously published and only vaguely understood.

While occupational exposure can be related to the ordinary risks of civilised industrial life (and it is inevitable that there will be some accidents over a period of time), the protection of the population; as a whole, from damage from radiological exposure must be made as absolute as possible, and there are the new factors of possible environmental hazard associated with radioactive effluent, the disposal of radioactive wastes and even reactor accidents. It is also equally important that the public should realise and have confidence in the safety measures if there is to be continued progress in the use of ionising radiations and an expansion of the many benefits this can bring to the community.

Obviously the major responsibility for the maintenance of Health and Safety must rest with the Government department which is primarily concerned with any particular activity. Experience has shown that it is not possible to have a single general Code of Practice covering the multifarious uses of ionising radiations and therefore separate codes have been drawn up; these must be supplemented by local rules for the guidance of staff and they will vary according to particular working conditions and local geography. Although there must be different codes they are all directed to the protection of human beings who have the same tolerance levels whatever their occupation, and therefore it is important that the codes should be co-ordinated and that they should vary from one another only where particular working conditions and responsibilities demand it.

In Britain, the first of the Codes of Practice was that produced by the Ministry of Health for the Protection of Workers in Hospitals. This is now being revised with a rather wider reference, to apply to medical and dental practice, and will include sections referable to the protection of patients as well as staff. The Ministry of Education has produced similar instructions for the safe usage of ionising radiations in schools, technical colleges and colleges of technology. The Ministry of Labour has drafted Regulations for the Use of Sealed Sources in Factories and is working on a draft for Unsealed Sources. In the use of factories,

these documents have had to take the form of Regulations because of the Ministry of Labour's statutory responsibilities in factories. At present work is proceeding, under the aegis of the Ministry of Labour, which is the Ministry responsible, on the production of a Code of Practice for Research Laboratories. This will include the Universities, Medical Schools, research in industry, the Government Research Councils, the Atomic Energy Authority and in fact all those activities which have not been included up to now.

The Advisory Committees which have been charged with the task of drawing up these various Codes are all set up as Panels of the Radioactive Substances Advisory Committee and in this way, effective coordination is achieved. In addition, most Universities, medical and other colleges, individual hospitals and individual research laboratories and industrial establishments have their own rules working within the framework of the relevant code. The Atomic Energy Authority, of course, has a thoroughly perfected and complete organisation. These codes and rules are essential, but they do not cover the whole problem of radiological health and safety. It is necessary to have an adequate complement of trained personnel who can undertake and supervise their implementation and a body of experts who are capable of taking responsible decisions, perhaps in case of emergency. The number of such trained personnel is at present inadequate. It is necessary also that the community as a whole should have greater knowledge and understanding of the problems involved.

Radiological Hazards to Patients

All the reports on radiological hazards have estimated that medical diagnostic radiology is the largest single contributor to exposure of the population to doses of ionising radiation in excess of that from natural sources. Until recent months there was insufficient data to estimate the dose from radiotherapy, but the presumption was that, with further development of the nuclear age, these two together would be the most important factor in producing a genetic hazard. An investigation was therefore started by a committee set up by the Ministry of Health under the chairmanship of Lord Adrian. Its task included making a nationwide survey to determine the doses which are actually received from diagnostic and therapeutic procedures. On completion of the work on mass miniature radiography the Committee made an interim report for the following reasons : " Because the hazards of ionizing radiation have been widely publicised and there is some danger that radiological examinations and radiotherapy of every kind will be received with unnecessary suspicion by the public at large so that the individual patient may come to harm through his reluctance to be X-rayed. In particular, the value of mass miniature radiography is so great that it must not be curtailed without good cause, and we think it important therefore to state now that these examinations, properly conducted, make a negligible contribution to the total radiation to which the population is exposed."

The final result of the survey and the genetic doses received have been the subject of a second report of this Committee. It has given for the first time a comprehensive figure for the genetically effective dose to the population from all kinds of medical radiology, including diagnostic radiology, radiotherapy and the use of radioactive isotopes. The genetically effective dose to the gonads from all these sources, estimated by the Committee as 19·3 mr., is somewhat less than a previous estimate, at least 22 mr., given by the Medical Research Council in 1956 for diagnostic radiology alone. The Committee consider that this could be reduced to 6 mr. if greater consideration were given to improvements in technique. This reduction in dose could, in their view, be accomplished without any curtailment of essential radiological services.

Conclusions of Adrian Report

The Medical Research Council in a further report recently published on "Hazards to Man of Nuclear and Allied Radiations" makes the following comments :—"We recognise the great value of medical diagnostic radiology, radiotherapy and the many uses of radioactive isotopes for research, diagnosis and treatment. We recognise also that the needs of patients and advances in medical knowledge may well call for an increase in the use of all forms of medical radiology, and we are in accord with the opinion of the Committee on Radiological Hazards to Patients that 'much individual suffering would follow any unnecessary curtailment of these services'."

"The present figure of 19·3 mr. for the genetically effective dose from medical radiology is still, however, the greatest single contribution from man-made sources, and we recommend that the position should be kept under periodic review."

The Committee drew attention to the necessity for reducing exposure wherever possible. It pointed out certain technical procedures which could be adopted without detriment to the quality of the examination, but which would considerably reduce the dose delivered. Of particular interest was the recommendation that there should be clear cut indications before any X-ray examination is requested and that there should be consultation between clinician and radiologist before any examination involving a considerable dose to a young individual.

This recommendation might with advantage be expanded. Undoubtedly the radiologist has the prime responsibility and must always be on the alert to reduce exposure wherever possible without detriment to the investigation of the patient. There is also a considerable responsibility on the shoulders of his colleagues, who demand an increasing number of examinations, not always essential and sometimes unnecessarily repeated and unnecessarily complicated. This responsibility is not adequately realised, because the average medical practitioner and, indeed, the consultant staffs, in the hospital service, have insufficient knowledge of the effects of exposure to radiations and do not appreciate that they have a part to play in the maintenance of radiological health and safety.

The medical profession as a whole is insufficiently instructed in all the problems concerned with the use of ionising radiations and their impact on health. These are considered difficult problems for which they were not trained, and to be the concern of the radiologists or of the health physicists.

Health physics has developed as a most important and essential service in the maintenance of Radiological Health and Safety, but the health physicist by his background and training cannot be expected to deal with the many medical problems involved. He should not be considered as the final and only arbiter in Radiological Health and Safety and it is essential that the medical profession should not abdicate from this important aspect of preventive medicine. It is difficult to define the relative roles in what must be a partnership, but it does not appear that adequate preparation has been made by the medical people to enable them to step in and take over what must be their province, namely the supervision and the treatment of people who have received or are suspected of having received excessive irradiation.

Organization of Isotope Services

The pattern of organization which is necessary for the proper exploitation of radioactive isotopes in medicine is a further problem which has appeared and which needs a solution in the near future.

For more than two decades radiology in Britain has developed as two distinct specialties, diagnostic radiology and radiotherapy. With the advent of radioactive isotopes a new situation has arisen. At first, radioactive isotopes were generally used under the direction of the radiotherapists and the physicists, who were the people who had most knowledge of their properties and the health hazards involved, and permission for their use is still dependant on the collaboration of radiotherapist and physicist. Gradually it became apparent that the interest of the radiotherapist was in only a small fraction of their total uses and that any continued control by the radiotherapist might result in retarding the development and wider use of this diagnostic and research tool. Because of the possible dangers to health and because of the risk of contamination of laboratories which would vitiate the accuracy of any experimental results obtained, it is necessary to have some continued control and to have an adequately equipped headquarters where any major concentrations can be dispensed with proper discipline and knowledge. In many institutions this headquarters has been the Physics Department and a physicist has been in charge, but there are so many clinical and other medical problems involved that it has become impossible for a physicist to continue to direct such a service.

It would appear that the time has come when the radioactive isotope service should be branched off from the physics and radiotherapy departments, and formed into a new organisation of its own. In my own medical school we are hoping in the near future to make such a change, with the idea that eventually a new school department will be formed under the title of "Nuclear Medicine", and that it shall have at its head a specially trained medical man. This new unit will include :—

(1) The clinical group whose primary purpose is to provide a routine service to the Staff of the hospital requiring clinical investigations involving the use of radioactive isotopes.

(2) A Research and Development Group, mainly concerned with the study and development of new and more refined techniques, having immediate or potential clinical applications.

(3) A Radiochemical laboratory engaged in the production, use and assay of labelled compounds and with a research programme allied to these activities.

(4) An Adrenal Steroid Group, continuing the work of bioassay of adrenocortical hormones.

It must work in the closest association with the hospital and school organisation for Radiological Health and Safety and with the older established School departments, particularly its parent, the Department of Physics, the Department of Biochemistry and the Department of Biology as applied to Medicine. Perhaps this new development may be compared with the branching off of biochemistry from the Department of Pathology more than 30 years ago.

The selection and training of medical men to staff and control such a department may mean the development of what will amount to a new discipline in medicine.

Finally there is the question of training in Radiological Health and Safety. A special Committee has recently reported on the national needs and has made far-reaching recommendations. Special University courses are recommended and some have been started, for the training of full time Health and Safety personnel, who should be capable of managerial responsibility and of taking executive decisions. It is hoped that they will help to augment the pathetically small number of these who are attempting to devise our national pattern moving from one official committee to another with scarcely time to draw breath.

Training is advocated at the level of colleges of technology for other full time staff with more routine duties and at technical college level for technicians up to the present. How many of the newly established laboratories for isotope work have had the good fortune to have a technical staff which has had some semblance of training?

The Committee has also recommended some training for the medical profession other than those with definite radiological commitments. In particular it is envisaged that some instruction should be given in the use and hazards of ionising radiations in the medical undergraduate curriculum. The instruction need not be elaborate, but should give a clear picture of the scientific principles involved and the significance of the effects. I am well aware of the overcrowding of the undergraduate curriculum and of the difficulty in finding time for all those subjects which are essential, but I believe that this is an important recommendation and should be implemented. The whole medical profession and not only the radiologists, should have some knowledge of the use and hazards of ionising radiations, and it is very difficult to teach new subjects to those already in practice.

In the next generation this whole problem will undoubtedly be a much more simple one. The children who receive some instruction in nuclear physics and allied subjects while still at school will be brought up with an understanding of the whole subject. It will seem to be relatively simple to them, while to those of an older generation it may be difficult to comprehend, and needs much hard work.

The radiologists, by their training, have the background knowledge, and they could well take a more definite lead than they are doing in promoting general interest and understanding.

The nuclear age has presented many problems to the community. It has also given enormous opportunity. It is an age of high adventure in which new discoveries are continually being made, and they will be of inestimable benefit to mankind if they are used with skill and prudence.

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Spleno-Venographic Appearances in Portal Hypertension and their Co-Relation with Portal Pressures*

BY

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Introduction

The manifestations of portal hypertension, like gastro-intestinal haemorrhage, splenomegaly, anaemia, haemorrhoids and ascites had attracted the attention of clinicians more than a century ago, Stahl (1748), Power (1840) Fauvel (1858). The portal pressures were, however, measured for the first time in human beings by putting a needle in the splenic vein at laparotomy in 1936 by Rousselot and in 1937 by Thomson et al. They demonstrated that the pressure in these cases was elevated many times the normal value. With the advent of porto-caval and lieno-renal surgery, for the relief of postal hypertension, it has become imperative to outline the portal venous system, in addition, to measurement of the portal pressures. It is only in recent years, that it has become possible to demonstrate the portal venous system radiologically. In 1945, Blakemore and Lord at Whipple's spleen clinic passed a catheter into one of the tributaries of the portal vein at laparotomy and injected a radio-opaque dye. A skiagram was taken at the end of this injection and this was the first porto-venogram done. While both the measurement of portal venous pressure and demonstration of portal venous system radiologically were first done, on patients after opening up the abdomen, with the advance of knowledge, both these procedures can be undertaken without laparotomy. Portal pressure can be accurately measured by introducing a needle into the splenic pulp or by wedging a catheter into a small hepatic vein after right heart catheterisation. Leger in 1951 performed transsplenic porto-venography by injecting 20 c.c. of 70% Diodone into the spleen after laparotomy, without any ill effects. In the same year, Boulvin et al, recorded for the first time, the percutaneous injection of contrast medium directly into the spleen, outlining the portal venous system. Since then, the procedure has been widely used and conflicting reports have appeared in the literature regarding its correlation with portal pressures. This study was primarily undertaken to see, if severity of collateralisation, as seen in the spleno-venogram, had any direct correlation with the portal pressures. In addition, the spleno-venographic appearances in the normal cases and in cases of portal hypertension both intrahepatic and extra-hepatic have been described. An attempt is made to evaluate the diagnostic value of spleno-venography, its fallacies and its complications.

Material and Methods

Only cases with palpable spleens were selected for the study. 50 cases have been studied so far.

*Paper read at the 15th Indian Congress of Radiology, 1961, New Delhi.

Table I—50 cases Studied

1.	Intrahepatic obstruction	...	40 cases (80%)
2.	Infrahepatic obstruction	...	4 cases (8%)
	(*a*) Portal vein block ... 3		
	(*b*) Cavernomatous formation of the portal vein ... 1		
3.	Supra-hepatic obstruction	...	1 case of constrictive peri carditis (2%)
4.	Cases of splenomegaly without portal hypertension or cirrhosis	...	5 cases (10%)

After a careful clinical review of the cases, Barium Swallow, spleno-venography, splenic pressure and wedged hepatic vein pressure studies were made.

The Spleno-Venography was done by the method described by Sherlock (1958). After preliminary sedation, with 50 mgms. of Pethidine, the patient was put on the x-ray table and explained the procedure. After local anaesthesia a No. 18, 8 cms. long needle was introduced into the left 10th inter-costal space, in the mid-axillary line in apnoea. 40 c.cs. of 76% urografin was injected under manual pressure within 20 seconds. 4-5 films were taken, the first film was exposed after 20 c.cs. of the dye was injected, after which quick manual changes of the films were made, as we have no rapid cassette changer.

Splenic-pulp Pressures were measured by introducing a number 18, 8 cms. long needle in the spleen and attaching it to transdusor system with polythene tubing and pressure was recorded on single gun cathode ray electronic device. Splenic pressure recorded in normal individuals under similar conditions was found to be 8-10 mms. of mercury. Mid-thoracic line at the level of 2nd costal cartilage was taken as the zero line of reference (Roy, 1957).

Wedged Hepatic Vein Pressure was measured after right heart catheterisation in the Cardiology Laboratory of the Institute. The pressure recorded in normal individuals was between 6-8 mms. of mercury. Same base line was used as for splenic pressure measurement.

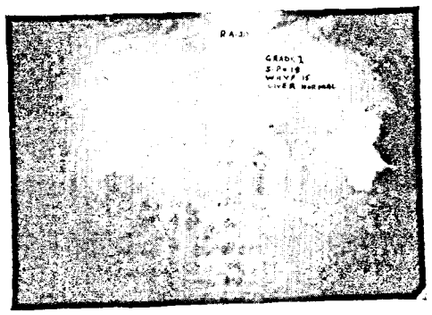

Fig. 1

Case No. 20. Normal Spleno-venogram.

Splenic vein, portal vein and its intra-hepatic radicles are well visualised. Diameters of the splenic and the portal veins are up to 2 cms. No evidence of collaterals. Splenic vein is tortuous.

Spleno-Venography.—In the splenomegaly group studied as control, all the contrast medium passed from the pool in the spleen, into the hilar veins which joined to form the splenic vein. The splenic vein joined the superior mesenteric vein, in front of the 1st lumbar vertebra to form the portal vein. A clear area was often seen in the dye-filled portal vein, where the superior mesenteric blood meets that from the splenic vein. Most of the contrast media entered the right lobe of the liver. The branches in the

left lobe, were less often filled. The intra-hepatic vessels ran a straight course and showed a regular diminution in size with each successive division. This is the vasculogram phase. When the contrast medium reached the sinusoids, it gave a uniformly, diffuse, homogeneous opacification of the liver, the hepatogram phase.

Intra-Hepatic Obstruction.—In cases of intra-hepatic obstruction, some of the dye was diverted into the collateral channels. In 18 cases of cirrhosis; established by biopsy, collateral channels were visualised in all cases, thus indicating definite portal hypertension. In 16 cases, although the liver biopsy failed to show definite cirrhosis, splenovenography demonstrated the presence of intrahepatic block by visualisation of Collateral channels.

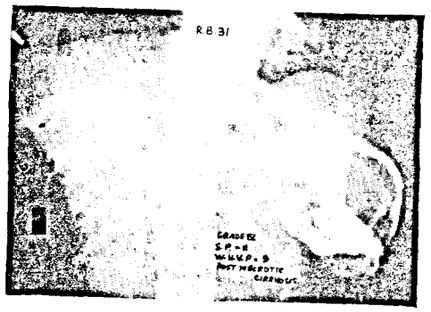

Fig. 2

Case No. 31.—Intra-hepatic block, coronary and short gastric collaterals seen. Withered-tree appearance in Vasculogram phase.

In 35 cases of intrahepatic obstruction, vasculogram and/or hepatogram phases were visualised. The abnormalities seen in the vasculogram were irregularity of branching, distortion of intrahepatic vessels and pooling of the dye. A typical withered-tree appearance was seen in one case only. The abnormal pattern seen in the hepatogram was mottled translucency in an opaque background. These abnormalities were seen in 7 cases only (18%). In case No. 18 the liver on post-mortem examination was markedly shrunken and nodular, while the intrahepatic pattern in spleno-venography was normal. In case No. 15 the appearance of the liver on post-mortem was similar to that of case No. 18, but the spleno-venogram in this case showed definite abnormality of the intrahepatic pattern. Thus we find no correlation between the abnormalities in the intrahepatic pattern as seen on the porto-venogram and the naked-eye appearance of the liver. Cases of advanced cirrhosis with nodular and shrunken livers may have normal intrahepatic vascular patterns as seen by splenovenography. Intra-hepatic vascular pattern and portal vein were not visualised in 4 cases of cirrhosis. Simultaneous measurement of splenic pressure and Wedged Hepatic Vein Pressure confirmed the diagnosis of portal vein thrombosis in one case while in another case the diagnosis of portal vein obstruction was confirmed at operation. In the remaining two cases the splenic vein was continuous with a coiled and tortuous vessel. The exact termination of which could not be made out.

Fig. 3

Case No. 30.—Splenic vein continuous with a huge, tortuous coiled vessel, the exact termination of which could not be made out.

The gradient between splenic pressure and wedged hepatic vein pressure was less than 5 mms. of Hg. Non-visualisation of the portal vein in these cases was perhaps due

to diversion of the dye from the splenic vein into the coiled and tortuous vessels. Portal vein thrombosis was thus seen in two cases (10·5%) of established cirrhosis. A filling defect due to entry of the blood from the superior mesenteric vein was seen for a short distance in the portal vein in 20 cases (50%).

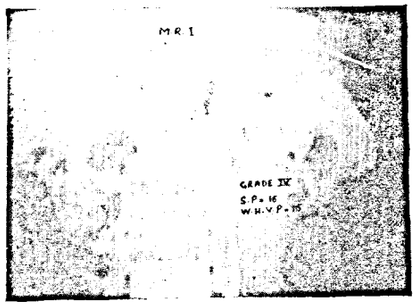

Fig. 4

Case No. 1.—Tortuous splenic vein, forming a U with limbs close together. Case of intra-hepatic obstruction, coronary short gastric and inferior mesenteric collaterals seen.

Tortuosity of the splenic vein was observed in 13 cases (32·5%) of intra-hepatic obstruction. The size of the spleen in these cases was 16, 15, 11, 10, 10, 9, 9, 8, 7, 6, 6, 6, and 6 cms. below the costal margin respectively. In no case it was less than 6 cms. Portal pressure in these cases varied from 5 mms. to 26 mms. of Hg. Tortuosity of the splenic vein was also observed in two cases of the splenomegaly group. The size of the spleen in these cases was 10 cms. Thus we find that the tortuosity of the splenic vein can occur in cases of splenomegaly without any evidence of portal hypertension and has no correlation with the portal pressure in the intrahepatic group. It was associated with moderate or marked splenomegaly. It is reasonable to presume that the tortuosity is due to medial shift of the splenic hilum because of splenomegaly. 7 cases out of 13 who had tortuous splenic vein had histopathologically normal livers. Their main feature was splenomegaly for years and evidences of portal hypertension. Out of 6 cases of cirrhosis who had tortuous splenic vein 3 had splenomegalic cirrhosis (splenomegaly preceding the other features of cirrhosis by many years). It is thus observed that tortuosity of splenic vein occurred in prolonged and huge splenomegaly with or without portal hypertension and/or cirrhosis. Tortuosity was associated with dilatation of splenic and portal vein in 8 cases of intrahepatic group and in 1 case of the splenomegaly group. The diameter of splenic vein varied from 1·2 to 2·4 cms. while that of the portal vein varied from 1·4 to 3 cms. Cases with dilated splenic vein also had dilated portal vein. Splenic vein was considered to be dilated if its diameter was more than 2 cms. at its widest point. The splenic vein was found dilated in 12 cases (30%) of intrahepatic obstruction and in 1 case of the splenomegaly group. All these cases had spleen enlargement of more than 4 cms. below the costal margin. 11 out of these 12 cases had splenomegaly for years before the other symptoms developed. These were the cases of so called Banti's syndrome. All of these had evidence of portal hypertension while only 4 had definite cirrhosis by liver biopsy. The liver biopsy of the remaining 7 cases was normal. In one case the onset was with ascites, spleen was 5 cms. and liver biopsy showed post-necrotic cirrhosis. This case might also have started with splenomegaly which was not observed by the patient. Thus the dilatation of the splenic and the portal vein was seen in cases of splenomegaly with or without portal hypertension and/or cirrhosis. It was not seen in all the cases with huge spleens or in all cases with tortuosity of the splenic vein. It is therefore possible that the increased blood flow from markedly enlarged spleen may have been responsible for splenic and portal veins dilatation.

Spleno-Venographic Appearances in Extrahepatic Obstruction

We had 4 cases of extra-hepatic obstruction.

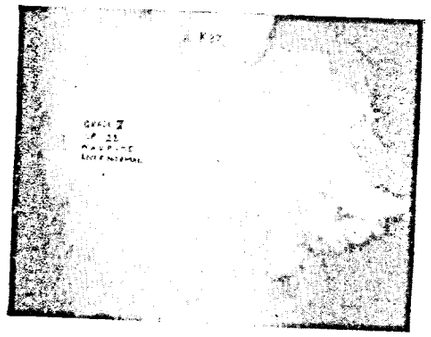

Fig. 5

Case 37.—Extra-hepatic obstruction. Portal vein and its intrahepatic radicles are not visualised. The splenic vein is replaced by a markedly tortuous and coiled vessel, the ultimate termination of which could not be traced. Inferior vena cava was however visualised suggesting that this coiled vessel drained ultimately into the inferior vena cava. Inferior mesenteric vein was also visualised; histopathology of the liver was normal. W.H.V.P. was 7·5 mm. Hg. and splenic pressure was 22 mm. Hg. A diagnosis of portal vein thrombosis was made. This was confirmed at surgery.

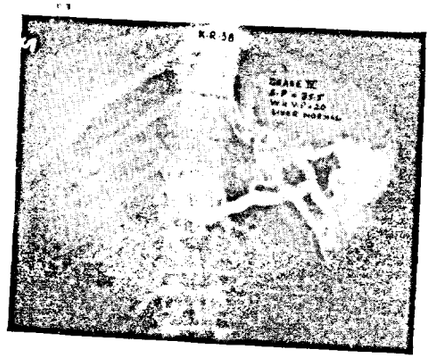

Fig. 6

Case No. 38.—Extra-hepatic Obstruction. Portal vein and its intrahepatic radicles were not visualised. Splenic vein was visualised upto the point where it joins the superior mesenteric vein. Coronary vein, short gastric vein, inferior mesenteric vein and splenic collaterals to the abdominal wall, diaphragm and lumbar veins were visualised. Inter-costal veins were also seen. A small vessel draining the oesophageal plexus of veins into the inferior vena cava was also seen. Histopathology of liver in this case was normal. Splenic pressure and W. H. V. P. confirmed the diagnosis of portal vein thrombosis.

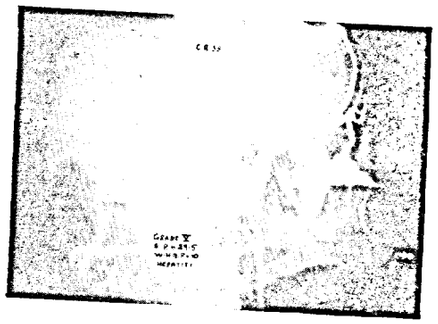

Fig. 7

Case No. 39.—Extra-hepatic Obstruction. There was cavernomatous transformation of the portal vein. Large number of collaterals were visualised, coronary, short gastric, inferior mesenteric and splenic collaterals to the diaphragm, abdominal wall and lumbar veins were seen. Intrahepatic radicles were also seen. Liver biopsy showed non-specific hepatitis. Splenic pressure was 29·5 mm. of Hg. and W.H.V.P. was 10 mm. Hg. A diagnosis of portal vein obstruction with cavernomatous transformation was made.

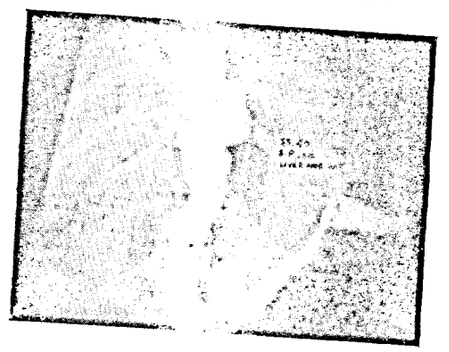

Fig. 8

Case No. 40, Extra-hepatic Obstruction.—Portal vein and its intrahepatic radicles were not visualised. A large vascular channel continuous with the splenic vein was seen. The exact termination of this vessel could not be made out. Coronary vein, short gastric vein, diaphragmatic vein and inter-costal veins were also seen. Splenic pressure was 30 mm. of Hg., but W. H. V. P. was not done. Liver biopsy was essentially normal. A diagnosis of portal vein obstruction was made.

Supra-Hepatic obstruction

In one case of supra-hepatic obstruction, splenovenography was done. The splenic vein and the portal vein were of 1·2 cm. diameter each. The intra-hepatic vascular pattern was seen normally. No dilatation of the intra-hepatic vessels could be demonstrated. There was no evidence of collaterals. The absence of collaterals suggests that the portal hypertension is not a marked feature in supra-hepatic obstruction.

Incidence of Different Collateral Channels

Retrograde blood-flow into coronary vein and/or short gastric vein could be demonstrated in 33 cases (75%) of portal hypertension. Barium swallow examination demonstrated the presence of oesophageal and/or gastric varices in 18 cases (41%) only. Thus barium swallow could demonstrate the presence of gastric or oesophageal varices in 54% of cases in which splenovenography demonstrated the coronary and/or short gastric veins. Spleno-venography is thus a much better method of demonstrating oesophageal and/or gastric varices. Coronary and short gastric veins were the commonest collateral channels demonstrated by spleno-venography in cases of portal hypertension. Short gastric vein was visualised in 29 cases (66%) coronary vein was seen in 27 cases (61%) both were seen in 33 cases. Inferior mesenteric vein was seen in 17 cases (38·6%). Other collateral channels seen, were diaphragmatic veins, splenic veins to chest wall and abdominal wall veins, splenic veins to lumbar veins, intercostal veins, paraportal veins and a small vessel draining the oesophageal plexus of veins into inferior vena cava. Large embryonic channels connecting the portal and systemic venous circulations were seen in 3 cases (6·9%). The final site of termination of these channels could not be made out. In one case a large embryonic channel was seen to arise from the portal vein near its hilum and then making a loop with convexity upwards, descended along the spine upto the 4th lumbar vertebra. It could not be traced further in the films taken. It is presumed to be patent umbilical vein draining into the iliac veins in the pelvis. This patient had an audible bruit over the umbilicus. This patient was of Cruveilhier-Baumgarten syndrome.

Complications

The only serious complication observed was intraperitoneal or subcapsular haemorrhage. It occurred in 2 cases out of the 54 procedures performed on 49 patients. The haemorrhage in both the cases was treated by blood transfusions. It occurred on the day of splenic puncture. Pain in the left hypochondrium and left shoulder lasting 24 to 48 hours was complained of by majority of the patients. In a few cases it lasted for more than 48 hours.

Perisplenitis with pain in the left hypochondrium and an audible friction sound was observed in another 2 patients, 3 patients, had fever for 2-3 days following the procedure. In 5 cases spleno-venography had to be repeated. In one case the dye went into the stomach, and in another case into the colon. In 3 cases the dye went into the subcapsular region and very little of it went into the splenic vein. No reaction occurred after injection into these abnormal sites.

Barium Swallow.—Revealed presence of oesophageal or gastric varices in 16 cases (40%) of intrahepatic obstruction and in 2 cases of extrahepatic obstruction. Splenovenography confirmed this, and showed varices in additional 17 cases, *i.e.* in all, in 89% of the cases of intrahepatic obstruction and in 75% of all cases of portal hypertension in the series.

Correlation of portal pressures with spleno-venographic findings was done in 38 cases, these include 32 cases of intrahepatic obstruction, 2 cases of intrahepatic obstruction with portal vein thrombosis and 4 cases of infrahepatic obstruction. In the analysis of results, an arbitrary criterion for increasing collateralisation was used. Depending on the width, each collateral channel was given signs of +, ++, +++, etc. One + sign was given for distorted intrahepatic pattern. Depending upon the total number of + signs, each porto-venogram was graded into the following 5 grades.

Grade I	No	+ sign (5 cases)
Grade II	+, or ++	(13 cases)
Grade III	+++, or ++++	(8 cases)
Grade IV	+++++,or +++++	(9 cases)
Grade V	++++++ or more	(3 cases)

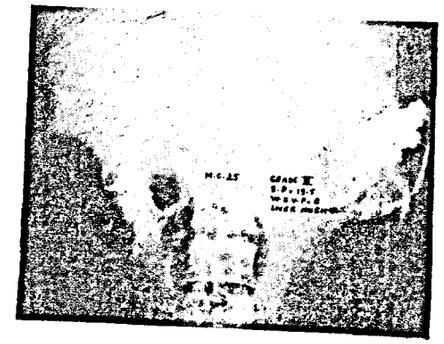

Fig. 10

Case No. 25.–Grade III. Collaterals.—Coronary +, short gastric ++, in all +++.

Fig. 11

Case No. 31.–Grade IV. Collaterals.—Coronary ++, short gastric ++. Inferior Mesenteric +, in all +++++.

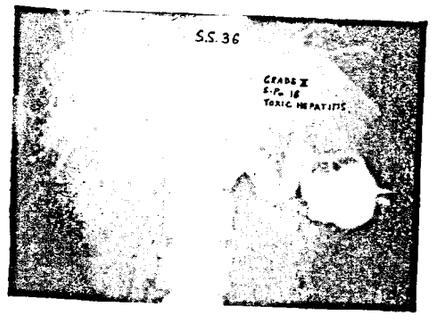

Fig. 9

Case No. 36.–Grade II. Collaterals.—Coronary +, short gastric +, in all ++.

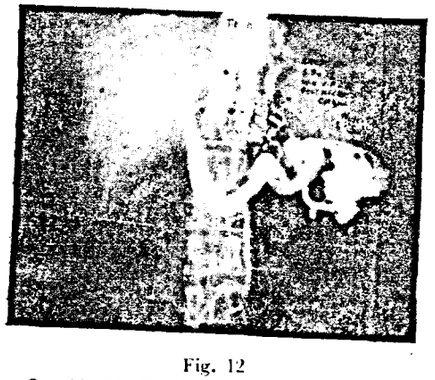

Fig. 12

Case No. 15.–Grade V. Collaterals.—Coronary ++, short gastric++ Oesophageal plexus +, Inferior Mesenteric+ abnormal hepatogram+, in all +++++++.

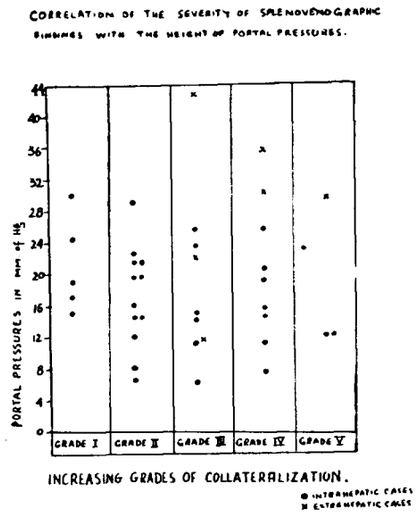

Fig. 13

Scattergram.—The portal pressures are plotted against grades of increasing severity of collateralisation. It is obvious from the scattergram, that no direct correlation existed between the severity of collateralisation as seen on the spleno-venogram and the portal pressures. The normal variations in portal pressure are very high. The range of portal pressures in cases of portal obstruction is also very wide. The diversion of blood through the collateral channels, decompresses the portal system and lowers the pressure. It is therefore impossible to predict the portal pressures from spleno-venograms in a given case. Actually both are essential for complete evaluation of any case of portal hypertension. Turner, Sherlock and Steiner (1957) also reported similar lack of correlation and stressed that the collateral channels can decompress the portal system and relieve portal hypertension.

Spleno-venography is a fairly safe procedure. No fatality occurred in 54 examinations done on 49 patients in the study. Haemorrhage into the subcapsular region of the spleen occurred in 2 cases only (3·6%). It was however controlled with blood transfusions and splenectomy was not required. Haemorrhage requiring transfusion has been reported in about 20% of cases by almost all the workers in this field. Walker, Middlemiss & Nanson (1953) & Reynolds, Mikkleson and Redeker (1955) also reported cases in which haemorrhage occurred 2 days after the spleno-venography and splenectomy had to be performed. It is therefore important to take all the necessary precautions to avoid a serious haemorrhage. False puncture into the stomach and colon did not produce any ill effects. Tran-splenic venography is an extremely useful procedure before surgical operations are undertaken on the portal venous system and venogram obtained determines both the nature and the practicability of the operation. By demonstrating the patency and the size of portal and splenic veins, it helped to decide and plan the nature of operation in 3 cases in this study. In experimental animals intrasplenic injection causes only a very small rise in the portal venous pressure (Dreyer 1954). Therefore the filling of vessels other than the splenic or the portal veins at transplenic portal venography implies that the flow in these channels is actually retrograde and not simply reversed by the force of injection. Visualisation of collateral channels by the spleno-venography is therefore a definite indication of portal obstruction. In this study, 4 cases had splenic pressures of less than 10 m.ms. of Hg. while the spleno-venography demonstrated the presence of collateral channels. On the other hand portal pressure in 4 cases was more than 15 m.ms. but the spleno-venogram failed to demonstrate the presence of collateral channels. For complete diagnosis of portal obstruction, both spleno-venography and portal pressure measurements are therefore essential. Spleno-venography demonstrated presence of collateral channels in 10 cases in which needle biopsy of the liver did not show any abnormality. Thus the splenovenography helped in picking up early cases of intrahepatic portal obstruction in which needle biopsy of the liver failed to show significant histopathological changes and cases of intrahepatic portal obstruction in which due to collateral circulation the portal pressure had fallen. It is thus one of the best methods in the diagnosis of portal hypertension.

By establishing the diagnosis of portal hypertension, it proved extremely useful in cases of idiopathic splenomegaly and haematamesis.

The maximum use of spleno-venography has been in establishing site of portal block. Cases of infrahepatic obstruction in this study were clinically indistinguishable from those of intrahepatic obstruction. Spleno-venography helped to diagnose these cases of infrahepatic obstruction and differentiate them from cases of intrahepatic obstruction. In cases of intrahepatic obstruction, splenic vein and portal vein with its intrahepatic radicles were outlined. A proportion of the dye by-passed the liver through the collateral channels of which the coronary vein and short gastric veins were the most commonly filled. Inferior mesenteric vein was next in frequency.

The normal regular branching and gradual tapering of the portal vein radicles is replaced by irregular branching, distortion of vessels and pooling of the dye giving a withered-tree appearance in some cases. When the dye reaches the sinusoids (hepatogram) the normal homogeneous opacification may be replaced by mottled areas of translucency in an opaque background. This is because the regenerating nodules do not receive blood from the portal vein. Normal intrahepatic pattern was seen in 70% cases of intrahepatic obstruction. Only one case showed typical withered-tree appearance. Comparison of gross appearance of liver at laparotomy or at autopsy with venographic findings was surprising. Markedly nodular and shrunken liver (case No. 18) and typical hob nail liver (case Nos. 33, 5 & 8) produced strikingly normal intrahepatic patterns in the venogram. It is likely that in such cases the venogram showed only the large dilated vessels and the minute distorted vessels were not visible. Abnormal intrahepatic pattern was seen in cases of cirrhosis and non-cirrhotic intrahepatic portal hypertension.

In cases of infrahepatic obstruction no dye is seen beyond the obstruction. The collaterals showed almost the same pattern as in cases of intrahepatic obstruction. Lumbar veins which drain into inferior vena cava forming natural protosystemic anastomosis, were seen more often in cases of infrahepatic obstruction. Although splenovenography is an excellent method of demonstrating the presence and site of infrahepatic obstruction it presents some fallacies specially if serial films with a rapid cassette changer are not taken. Non-filling of the portal vein may be due to insufficient films or excessive collateral channels drawing away the contrast medium completely.

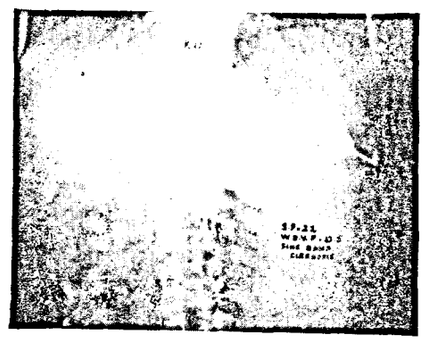

Fig. 14

Case No. 17.—Splenic vein continuous with tortuous vessel. Intrahepatic radicles not seen.

In this study non-filling of the portal vein in 2 cases was due to these reasons. The presence of infrahepatic block in these cases was ruled out by simultaneous splenic pressure and W.H.V.P. measurements. In case of suprahepatic obstruction, the splenovenogram was essentially normal. Dilatation of intrahepatic portal vein radicles has however been described in such cases.

Spleno-venography is an excellent method of demonstrating oesophageal varices. It revealed the presence of varices in 89% of cases of cirrhosis and in 75% of all cases of portal hypertension studied. It is much better than Barium Swallow examination in this respect. Atkinson et al, (1955) found it to be superior than even oesophagoscopy for demonstration of oesophageal varices.

The blood flow in the portal vein is said to be streamlined (Serege 1901). The contrast media injected into the spleen however reached both lobes of the liver. The right lobe was visualised more often than the left, showing clearly that no streamlining of blood occurs in the portal vein. Small filling defect, in the dye filled portal vein described by Dreyer (1954) was observed in 50% of the cases. This is due to superior mesenteric blood mixing up with the splenic vein blood. Stream-lining presumably occurs at the origin of the portal vein, but the two streams mix up before reaching the liver.

Tortuosity of the splenic vein was always associated with marked splenomegaly and had no relation with the height of portal pressure or histopathological changes in the liver. It was seen in cases of cirrhosis, of splenomegalic cirrhosis and in cases of splenomegaly with or without portal hypertension. The only definite association was with marked splenomegaly. It was not always associated with dilatation. It is thus reasonable to conclude that tortuosity of the splenic vein is due to the medial shift of the hilum of spleen as a result of splenomegaly. Every patient with marked splenomegaly however did not have dilated veins. Tortuosity was accompanied by dilatation in 9 cases, while in 4 cases tortuosity alone was present and in 3 cases, only dilatation was present. Dilatation was also associated with marked splenomegaly. 11 out of 12 cases in which dilatation of the splenic and the portal vein was present had splenomegaly for years before other symptoms developed. The twelfth case also presumably had splenomegaly before other symptoms developed, although it was not observed by the patient. One patient of tropical splenomegaly without any evidence of cirrhosis or portal hypertension had dilatation of the splenic vein. Dilatation of the splenic vein had no relation with the histopathological changes in the liver. It is reasonable to conclude from these observations that dilatation of the portal and splenic vein occurs only in cases of tropical splenomegaly which has lasted for years with or without portal hypertension or cirrhosis. Increased blood flow to the splenic vein for many years is perhaps responsible for this dilatation.

Summary

50 cases have been studied so far by Barium Swallow, spleno-venography and portal pressure studies. Spleno-venographic appearances in normal cases, cases of intrahepatic, infrahepatic and suprahepatic obstruction are described. An attempt has been made to co-relate the severity of collateralisation with the height of portal pressures. Ba swallow and spleno-venographic results in the demonstration of oesophageal varices have been compared.

Acknowledgements

We are grateful to Prof. S. B. Roy and Cardiology team for carrying out the hepatic wedge pressure studies. We are also thankful to the Technical Staff of the Radiology Department specially Arjun Singh and M. R. Chawla for their willing co-operation.

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Early Ankylosing Spondylitis: Its Diagnosis and Treatment

BY

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Soon to several years before typical spinal symptoms appear cases of ankylosing spondylitis give a history of symptoms which taken by themselves are not characteristic of the disease. This period has been called the period of onset of the disease and the symptoms have been labelled 'prodromal symptoms'. If a patient with any one of these symptoms is carefully examined clinically as for ankylosing spondylitis we may often find enough evidence to make a diagnosis of this disease during this early stage. As in any other disease institution of correct treatment can be expected to offer greater chances of a permanent cure in its early stages with less drastic measures.

These early non-specific symptoms are:

1. A low back-ache,
2. Pain in the gluteal regions and posterior parts of the thighs,
3. Inflammatory involvement of peripheral joints,
4. Pains due to involvement of spinal nerve roots,
5. Pain in heels, and
6. Iritis.

When a patient presents with any one of these symptoms a past history of the other symptoms must be enquired into. For instance if a patient presenting himself with inflammation of joints gives a history of sciatic pain on one or both sides or of pain in the buttocks and thighs, he may be suffering from this disease and so on.

All the movements of every segment of the spine should be bery carefully tested and any limitation noted. Lateral flexion of the lumbar and cervical spine is lost very early and besides other movements limitation of this movement must be carefully looked for. Lateral bending of the lumbar spine is masked by lateral rocking of the pelvis. The pelvis must be fixed when testing this movement. In the cervical spine the lateral flexion is masked by the rotation of the skull. When a patient is asked to perform this movement he rotates his skull to bring the chin or the occiput near the shoulder giving a false impression of a normal lateral flexion. While testing for this movement the skull should not be allowed to rotate. Limitation of expansion of the chest is an evidence of involvement of the dorsal spine. Two of our patients who presented with the symptom of painful heels were diagnosed on careful examination of the spine. In one the lateral bending of the cervical spine was restricted and in another, a medical man, lateral flexion of the lumbar spine was markedly limited and his chest expansion was very little. In a patient who presented with an annoying pain in both buttocks the chest expansion was markedly limited.

It has for long been recognised that bilateral roentgenologic involvement of sacroiliac joints is a very early and diagnostic

feature of this disease. Forestier et al and Romanus and Yden have shown that a careful enquiry almost invariably reveals occurrence of symptoms referable to these joints. The patient complains of pain which is localised at the level of these joints, or is referred to the buttocks and to the posterior aspect of the thighs as far as the popliteal fossa. The pain never reaches the ankle or the foot and is not accompanied by paraesthesia. The pain is deep, dull, moderate, sometimes lancinating in character. This pain may sometimes be the presenting symptom and make the patient quite uncomfortable. When the radiological appearances in the sacroiliac joints are doubtful, occurrence of this pain is of great diagnostic importance. One of our patients who presented with swelling of his ankles suffered from a fairly severe pain in the buttocks.

Sciatic pain in the course of the 5th lumbar nerve root is sometimes due to this disease. One of our patients was operated for prolapsed disc. Before operation his sacroiliac joints were normal. Three years later he presented with a typical picture of ankylosing spondylitis and his sacroiliac joints developed the well known changes. A study of his pre-operative case notes showed that his spinal movements were limited. A proper clinical examination of this patient would have saved him from an unnecessary operation. One patient was diagnosed when he presented with the complaint of difficulty of breathing and tightness of the chest due to involvement of upper dorsal nerve roots. Another patient was diagnosed when he was referred for investigation of his G. I. tract. A plain abdominal examination showed bilateral changes in sacroiliac joints typical of ankylosing spondylitis. His pain was due to involvement of lower dorsal nerve roots.

This disease produces a characteristic kyphosis even at an early stages. It consists of a lower rectilinear segment and an upper segment which is bent forwards: it is not a regular curve. The head and neck stoop forwards extending in a straight line with the axis of the back. The centre of gravity shift forwards and the patient uses the support of a stick to prevent himself from falling forwards or balances himself by flexing his knees to compensate the kyphosis.

Erythrocyte sedimentation rate must be tested in every case with complaints of low back-ache, sciatica and pain in the heels. A raised rate will rule out the diagnosis of prolapsed discs, lumbosacral strain, osteoarthritis and osteoporosis of the spine.

A radiological examination of the spine will settle a diagnosis of caries and primary or secondary malignant processes. It is difficult to distinguish between caries of sacroiliac joint and a joint involved in ankylosing spondylitis. Caries occurs unilaterally and is not associated with many other features of ankylosing spondylitis described above.

When we are considering a diagnosis of ankylosing Spondylitis in patients presenting with symptoms listed above we must remember that this disease is not a common cause of their production and we must not overlook the commoner causes in our enthusiasm to make a diagnosis of ankylosing spondylitis. We believe that reports of high incidence of ankylosing spondylitis in patients complaining of pain in the heels and iritis are exaggerated.

Most of our early cases present the well known clinical picture and we label them as early cases when the radiological changes in the spine are minimal. We will be prepared to make a diagnosis of this

disease even in the absence of any radiological changes in the spine when a patient presents the clinical features described above.

Treatment

Cases of ankylosing spondylitis can be divided into two groups to decide upon treatment policy.

In the first group the patient is worried about pain and stiffness of a part or the whole of the spine, or suffers from pain due to involvement of roots or is found on examination to have appreciable restriction of chest expansion.

In the second group the patient comes with symptoms of pain in the heels, pain in the joints, iritis or a mild intermittent backache and a diagnosis is made on a thorough clinical examination.

To the first group of patients we give deep x-ray treatment to those portions of the spine which are involved on a thorough clinical examination. A dose of 1000r is given in 3-4 weeks. The risk of a very small number of patients developing leukaemia following treatment with deep x-rays is worth taking because this treatment offers a definite chance of cure to a large number of these patients who would otherwise be doomed to a miserable life. Evidence has been produced to show that rheumatic disease like ankylosing spondylitis have by themselves a tendency to produce a higher incidence of leukaemia even when no radiation therapy is given.

Recent researches have shown that radiation induces leukaemia and other malignant conditions by disturbance of the internal environment of the host rather than exclusively by a direct cellular effect. Of late we have been taking pains and spending more time to improve the anaemia and nourishment of our patients before treating them by radiotherapy in the hope that by doing so we may be stabilising their internal environment reducing thereby the chances of their developing leukaemia. We have also reduced our dosages from 1600r to 1000r in 4 weeks and now treat only the involved portions instead of the whole spine.

We have noticed that those of our patients who followed the rules of postural and orthopaedic hygiene and took deep breathing and other suitable exercises did far better than those who did not. To follow these general measures is as important as a course of radiotherapy; it results in more lasting cures and fewer recurrences of the disease.

In the second group the patient is not aware of the involvement of his spine or suffers from an intermittent low back-ache which does not bother him very much. We advise these patients to take suitable exercises and instruct them with the rules of postural and orthopaedic hygiene, they are given analgaesics for their pain. We have given radiotherapy to the painful heels and joints of some of our patients with some success but we avoid it as far as possible. Patients with iritis are given the appropriate ophthalmic treatment. A close watch has to be kept on these patients and we would not hesitate to give them radiotherapy if the spinal disease shows progress.

Summary

A diagnosis of ankylosing spondylitis is possible in some cases in the prodromal stage if these cases are carefully examined as for ankylosing spondylitis. Examination of these patients leading to a diagnosis has been described.

It is suggested that before the treatment by radiotherapy is started an attempt should be made to build up the nourishment and treat the anaemia of these patients with a view to improve their internal environment in the hope that it may reduce the chances of development of leukaemia.

It may be possible to cure some of the patients by general measures in the early stages of the disease. However, careful watch must be kept and if these measures fail, radiotherapy should not be withheld.

The spine should be carefully examined and only those parts given radiotherapy which are involved.

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Radiological Observations in Malabsorption Syndrome

BY

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Radiology plays a very important role in the diagnosis of malabsorption syndrome or deficiency state caused by a variety of conditions exhibited often by steatorrhoea. When steatorrhoea is the only sign radiology cannot always differentiate between the underlying pathological conditions. Various names have been given to this condition, *e.g.* sprue, coeliac disease, tropical sprue etc. Patients are admitted with chronic diarrhoea, anaemia, sore mouth, indigestion, anorexia and other digestive disturbance Acton and Knowles (1928) called this condition as 'pre-sprue'. Chaudhuri and Rai Chaudhuri (1944) renamed this syndrome more appropriately as 'para-sprue' and studied in detail the clinical features, effect of treatment etc. in respect of twenty-two cases but roentgenological investigation could not be carried out due to some unavoidable reasons. Basu (1957) described the radiological features of this malabsorption syndrome by opaque meal study in respect of a good number of cases admitted into the hospital attached to the School of Tropical Medicine, Calcutta. Booth (1960) has given a very good classification of malabsorption syndrome depending on the causative factors. A more detailed description has been given by Badenoch (1960) as regards causes, pathological features and X-ray appearances of the small intestine in malabsorption syndrome with steatorrhoea.

Technique

Non-flocculating barium *e.g.* Raybar or Micropaque barium was used in all cases of barium meal examination. In addition to the usual follow up study for 24 hours, the small intestine was examined after ½ hour in erect position and the rest at 1 hour and 2½ hours and 5 hours in supine position. Barium enema was done after thorough cleaning of the large bowel after castor oil and enema. The barium emulsion had one drachm of tannic acid per pint of water for better evacuation.

Material

The radiological findings in respect of five cases of malabsorption syndrome admitted into the Carmichael Hospital for Tropical Diseases, Calcutta, during the current year, are enumerated below because of some unusual features :—

Case 1.—S. C., age 33 years - female, was admitted for loose motions 4 to 5 times a day, impaired appetite and palpitation in the morning. She had undergone abdominal operation on four occasions previously, thrice for intestinal obstruction and once for ovariotomy. She had one ileo-transcolic and another ileo-ileal anastomosis attended with resection of 18" of ilium (Fig. 1). Findings on admission : Blood picture - Hb. 11·02, R. B. C. 3·55, M. C. V. 95·7, M. C. H. 31·1 : Total protein 7·2, Alb. 3·0, Glob. 4·2 : Stool - negative.

Radiology - Opaque meal showed a deficiency state of small intestine with coarse mucosal pattern and exaggeration of spaces. In addition a blind loop in the ascending colon, a chronic obstruction in the ileo-caecal

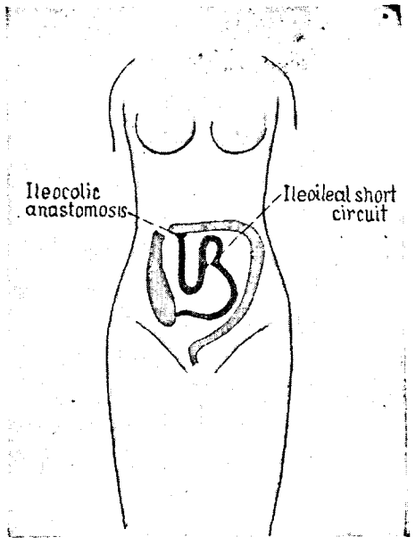

Fig. 1
Shows ileo-colic and ileo-ileal anastomosis.

Fig. 3
Shows a 'bald head' of the fundus of the stomach.

Fig. 2
Shows distension of the terminal ileum and 'ileitis' of the transverse colon.

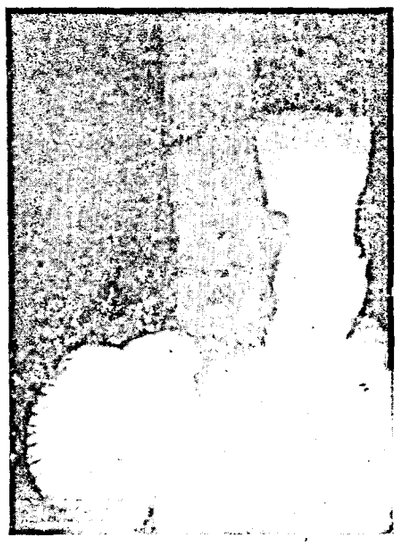

Fig. 4
Shows partial gastrectomy with posterior gastrojejunostomy and coarse mucosal pattern of the small intestine.

region with distension of the terminal ilium, a condition of ileitis in the transverse colon were seen. Ileo-ileal anastomosis could not be visualised (Fig. 2).

Case 2.—N. C. P., aged 15 years, male - was admitted for treatment of three to four bulky stools mostly in the morning, change of colour of hair from black to pink brown, crazy pavement dermatosis, anorexia and wasting of four years' duration. Laboratory findings on admission : Blood picture - Hb. 10·44, R. B. C. 3·26, G. T. test showed a flat curve, gastric analysis showed absolute achlorhydria, fat balance study showed p.c. of fat in dry faeces 19·2, total excretion of fat in 24 hours 1·3 gm., total protein 5·7, Alb. 2·1, Glob. 3·6.

Radiology - opaque meal showed a loss of mucosal pattern in the fundus of the stomach simulating a 'bald-head' as seen in pernicious type of anaemia and a coarse mucosal pattern of the small intestine with bolus formation (Fig. 3). This was diagnosed as a case of adult Kwashiorkor.

Case 3.—S. B. S., aged 34 years, male - was admitted for the treatment of squamous and ulcerative lesion over dorsam of the left ankle and pain in the epigastrium and diarrhoea. Previous history - operation for peptic ulcer 12 years back.

Radiological examination - opaque meal study showed evidence of partial gastrectomy with posterior gastro-jejunostomy, coarse mucosal pattern of the small intestine and stasis (Fig. 4). There was initial hurrying of the meal and the stomach was empty within one hour.

Case 4.—D. R. C., aged 35 years, female - was admitted for the treatment of frequent swelling of feet and legs, extreme weakness, lethargy, giddiness, and loss of appetite. There was amenorrhoea for one year. Examination on admission revealed an enlargement of spleen and liver. She was suffering from moderate degree of anaemia. Laboratory examination on admission : Hb. 6·09 gm. %, P. C. V. 20, Serum protein 7·4, Albumin 3·2, Globulin 4·2, Gastric analysis - high acid curve, B. P. 165/105 mm. Hg.

Radiology - opaque meal examination showed a deficiency pattern of the small intestine. Straight X-ray of abdomen showed calcification of the pancreas and also of the mesenteric lymph nodes (Fig. 5).

Case 5.—M. M., aged 19 years, female - was admitted for the treatment of loose stools with mucus and streaks of blood 7 to 8 times a day, depressed appetite, acidity and other disorders of digestion. These symptoms started after a child birth 3 years back. Lab. exam. on admission : Blood picture - Hb. 12·2, R. B. C. 3·12, M. C. V. 107·5, M. C. H. 32·8. Stool - giardia cystic and trophic form, gastric analysis - hyperchlorhydria, P. C. of fat in dry faeces - 27, Total excretion of fat 3·9 gm.

Fig. 5
Straight X-ray of the abdomen shows calcification of the pancreas and also mesenteric lymph nodes.

Radiology - opaque meal showed a coarse pattern of the jejunum at 1 hour and scattering effect at 2½ hours (Fig. 6).

Fig. 6
Shows coarse pattern of the jejunum.

Discussion

Opaque meal study with non-flocculating barium in malabsorption syndrome demonstrates the gas and fluid level in erect position and clumping and pool formation in the small intestine in the subsequent examinations in supine position. The appearance is often described as loss of 'herring bone' appearance. The spaces are exaggerated. There is initial hypermotility but later on followed by hypomotility. The presence of gas and fluid level is due to inability of the mucosal layer to absorb the same (Ross Golden, 1945). The changes in motility and tonicity are due to defects in the neuro-muscular mechanism involving the Auerbach's plexus (Rao, 1942). The damage may be permanent and the condition is often irreversible. In this series the alternations in the fat content of stool has not been a constant feature, although the radiological, haematological and other clinical features simulated sprue. Chaudhuri (1957) described that achlorhydria and hypochlorhydria were common. One of our cases had absolute achlrohydria on repeated examinations. One had low acid curve and the other two hyperchlorhydria. The one with achlorhydria had a bald fundus of the stomach in addition to the deficiency state (Laws and Pitman, 1960). Ross Golden (1945) thought that hypoproteinaemia often produces an oedema of the intestinal wall and concomitant deficiency pattern of the small intestine. In our series, the total protein was below normal in one and albumin-globulin ratio altered in all three. Basu (1957) observed an association of ileo-caecal inflammation in deficiency state. He also noticed coarse mucosal pattern of the stomach and duodenum in hookworm infection and a return to normal after treatment.

Summary

Radiological observation and brief case notes in respect of five cases of malabsorption syndrome are described.

1. Radiological changes in the stomach and small intestine in a case of adult Kwashiorkor are presented.

2. Similar small intestine changes are observed in case of partial gastrectomy, Crohn's disease, blind loop formation and resection of the ilium, protozoal infection and chronic pancreatitis with calcification.

I am grateful to Dr. J. N. Mondol, M.B., M.R.C.P., D.C.H., Associate Prof. of Tropical Medicine and Dr. J. B. Chatterjee, M.D., F.N.I., Prof. of Haematology, School of Tropical Medicine, Calcutta for allowing me the opportunity to study the reports of cases admitted under them.

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Co-Arctation of Aorta at Unusual Sites

BY

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Coarctation occurring at classical site is easily recognised as symptoms and clinical signs are well established. Coarctation occurring at unusual sites such as lower thoracic and abdominal aorta are difficult both for diagnosis and localisation of the site of lesion. This falls under the type 3 group of Sloan and Cooley's classification varying widely as to location. The abdominal variety forms a minority in this. The adult type of coarctation of aorta is a rare condition and is reported as one in three thousand in autopsy by Reifenstein et al. Still more rare is the coarctation of abdominal aorta and about thirty cases have been reported so far. The line of thought in these are Thrombosis, Aneurysm or coarctation (Swan & Cooley). In our series of 8 cases of coarctation of aorta in a period of two years 4 cases showed coarctation at unusual sites in long segment of Aorta. In addition, one set of Angiocardiographic films kept at museum showed coarctation above the dome of the diaphragm distal to the Ductus arteriosus. Coarctation distal to Ductus arteriosus are small in number, and occur at any site in the whole course of the vessel with stricture of varying length or hypoplasia of distal part of aorta.

Power reported one case in the year 1861. A case of Coarctation of aorta below the ductus 6 cm. in length was reported by Hickl in 1931, and probably this was inflammatory in origin. Schleckat in 1933 showed one in autopsy in a 44 year old man which has been diagnosed as aortic insufficiency during life. Maycock has published his observation in 1937 in a 18 year old patient for a period of 5 years where the coarctation was situated, 1·5 cm. below the renal artery. Though the coarctation was below the renal artery the blood pressure was 200/88 mm. and in the leg occasionally unobtainable; otherwise read 130/110 mm. Sixteen cases supra-renal and eleven infra-renal were reported and infra-renal showed moderate hypertension. The murmur was heard best over the level of the xiphoid process and on the back from the level of 10th DV to 12th DV and along the 12th rib. Steele's case in 1941, in a white woman showed the coarctation at and above the level of renal artery. This in addition revealed Characteristic rib notchings.

Bahnson et al in 1949 reported one with occlusion of aorta at the level of 1st lumbar spine. Kondo et al described in 1950 one in a Japanese girl of 12 years with hypoplasia of the subclavian artery on the right side in addition to the abdominal coarctation of the aorta. One of our cases revealed stenosis of the right subclavian artery at its origin along with the coarctation of abdominal aorta. Goldzieher et al had a case in 1951 in a forty five year old woman with the stenosis at the origin of renal artery. Abanese reported one case in 1953 and Martin and Yount one in 1956.

Cerebral haemorrhage is one of the complications of coarctation of aorta. In a series of 304 cases of Adult type of coarctation of aorta only 10 cases had cerebral

haemorrhage. There has been no cerebral haemorrhage in 10 cases of coarctation in lower thoracic aorta and in 8 cases of abdominal coarctation. Fisher demonstrated two aneurysms in cerebral vessels in a boy of 14 years with coarctation of abdominal aorta. Kaufman et al published a case of cerebral haemorrhage in abdominal coarctation in a man of 77 years of age. This case showed the circumference of aorta as 1·6 cm. with a lumen of 5 mm. at the site of coarctation above the bifurcation of aorta, at autopsy. The common iliacs were normal in this case. This is the second case reported of rupture of cerebral vessel in coarctation of abdominal aorta.

The clinical features of coarctation of aorta at unusual site are in no way different from that of coarctation at classical site. Systolic murmurs are present and are heard best over the area of constriction. The maximum intensity in abdominal coarctation is over the xiphoid process anteriorly and on the lower dorsal region posteriorly. This site of systolic murmur is not necessarily typical of stenosis of aorta in the region. For similar murmurs may be heard in even in coarctation at classical site, in aortic regurgitation, aneurysm of aorta and even over atheromatous aorta having varying calibre. Diagnosis is by angiocardiography or by aortography. Most of these are diagnosed in autopsy, or by angiocardiography or aortography. The collateral circulation is well established in these cases which may not be made out clinically.

Maycock describes three different anatomic pathways in these occurring at unusual sites. (1) The 7th to 9th intercostal arteries with Internal Mammary arteries. (2) Internal mammary arteries with epigastric arteries. (3) The subscapular with intercostal arteries. Probably these may be detected with closer clinical observations. Poor physical development may be noted in lower extremities. Lassitude and intermittent claudications are manifestations of circulatory insufficiency.

Distressing feature in operation of the case reported by Charles B. Olim is the lack of elasticity of the lower thoracic aorta due to medial thickening of the wall of the aorta. Even with mobilisation of lower thoracic aorta with resection of intercostal arteries the cut ends of the aorta could not be opposed and so had to be closed, both proximally and distally hoping that collaterals will maintain the circulation but the patient did not survive. In the classical site it is possible to anastomose the cut ends of aorta as the arch of aorta and the left subclavian artery could be mobilised. Further the coarctation in unusual site seems to involve a long segment and therefore substitution of grafts for anastomosis or bypass is necessary. Homologous or Decron grafts have been used. Bypass is done with splenic artery also after splenectomy. In cases where renal artery is involved strip graft is used and larger aortic lumen is reconstructed successfully.

(1) *Selvakumar* admitted under Dr. C. S. Sadasivan, M.S., Thoracic Surgeon, Government General Hospital, Madras.

A boy aged about 13 years complained of headache of 6 months duration with dimness of vision in the right eye for about 1½ months. The headache started in the morning in frontal region and was occasionally accompanied by vomiting. This headache was more or less a constant feature every other day. Complained of breathlessness after exertion but was relieved on resting for few minutes. There was no history of epistaxis or intermittent claudication. His family history was non-contributory except that his brother had lobectomy done for Tuberculosis.

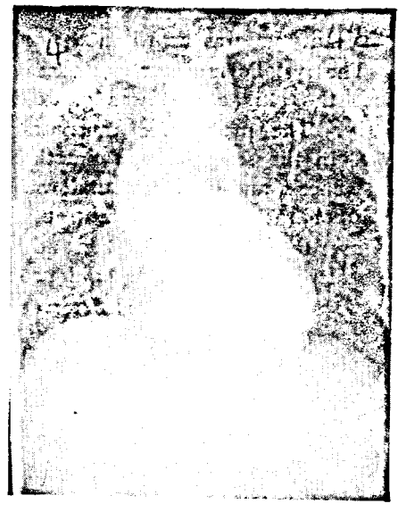

Fig. 1

Selvakumar.

A fairly well nourished boy of about 12 years with visible carotid swell on both sides. The pulse rate was 88 per minute with volume and tension high. The femoral pulse was not felt on both sides. The blood pressure in the upper limbs: Right arm 245/115; Left arm 250/130; Pressure in the lower limbs was not recordable. Fundus revealed bilateral papilloedema. Urine: Specific Gravity 1008; otherwise normal. Blood Urea 27 mg. %. R. B. C. 4·7 mil.; Haemoglobin 13 G %.

Diffuse pulsation was seen over the precordium. The apex beat was seen and felt in the 6th space outside the midclavicular line. There was suprasternal pulsations. There was a sort of continuous thrill over the precordium and a systolic thrill over the right side of the sternum over the 3rd and 4th spaces. The aortic first sound was eroded and a systolico-diastolic murmur was heard. The sounds in other places were heard but in the pulmonary area the sounds were masked by some extent by the systolic murmur. Electro-Cardiogram showed left ventricular hypertrophy in a Semi-horizontal heart.

Plain Skiagram.—Reveals left ventricular hypertrophy with prominent right vascular contour. The aortic knob was not prominent and the descending aorta appears to bend towards the spine. No break in the descending aorta was seen. No evidence of any rib notchings were seen. Deep penetration skiagram showed dense wavy paraspinal shadow in the lower thoracic spine with no bony lesion in spine.

A venous angiocardiogram was done on this patient which showed dilatation of the proximal part of the aorta with stenosis just distal to left subclavian artery with an abrupt change to 1/4th the size of proximal aorta. The narrowing extended further into the abdomen, showing gradual tapering like a rat tail. The collateral circulation through the internal mammary arteries and epigastric arteries were visualised on the right side. The right subclavian artery was larger and tortuous than the left. Collaterals through the subscapular arteries with intercostals were seen. Retrograde aortogram was suggested in this but was not done as the patient got himself discharged. The pyelogram was normal.

Comment.—The stenotic segment of the aorta was long and the lower end could not be made out. In view of the length of this segment it was thought that probably the aorta looks small in the abdomen due to lack of blood flow in it and hence an aortogram was suggested but could not be carried out. The possibility of using an aortic graft after the aortogram was thought of in this case. This is the first case of thoracoabdominal coarctation seen in the department in a boy whose disability was headache in the first instance and later on progressive dimness of vision of one eye.

(2) *Lakshmi* admitted under Dr. Sam G. P. Moses, M.D., Honorary Physician, Government General Hospital, Madras.

A girl aged 12 years was admitted for epistaxis with headache of 2 day's duration. She gave a history of giddiness with headache and roaring noises in the ears of a year duration. She also complained of intermittent claudication in the legs for the past one year. She has had swelling of joints with fever during early childhood.

She was a weak and undernourished child of about 12 years of age showing visible carotid pulsations in the neck. The pulse rate was 90 minute with volume and tension high. Pulsations were felt in the femorals but weak and delayed. The pulsations in the dorsalis pedis on the left side was imperceptible.

The apex beat was felt in the left 6th intercostal space just outside the midclavicular line. Systolic thrill was felt in the mitral area. Both sounds were heard in all the areas. A presystolic murmur and a systolic murmur was heard in the mitral area. The systolic murmur was conducted towards the axillae and was grade 4 in intensity. The pre-systolic murmur was atypical in the sense it was not that of mitral stenosis, and the first sound was not loud in character. Systolic murmur was heard over the lower dorsal spine and over the epigastrium under the xiphoid process. There were no other abnormalities seen and there were no collateral vessels either seen or felt.

The blood pressure was 230/130 in the left arm and 230/140 in the right arm. The lower limbs recorded 96/? mm. The R.B.C. Count was 4·2 millions/cmm. The total W. B. C. Count was 10,000/cmm. The differential count was 88% Polymorphs and 12% lymphocytes. The urine was normal. The blood urea was 36 mgm%. The fundus was normal. Electrocardiogram showed biventricular hypertrophy with P Mitrale.

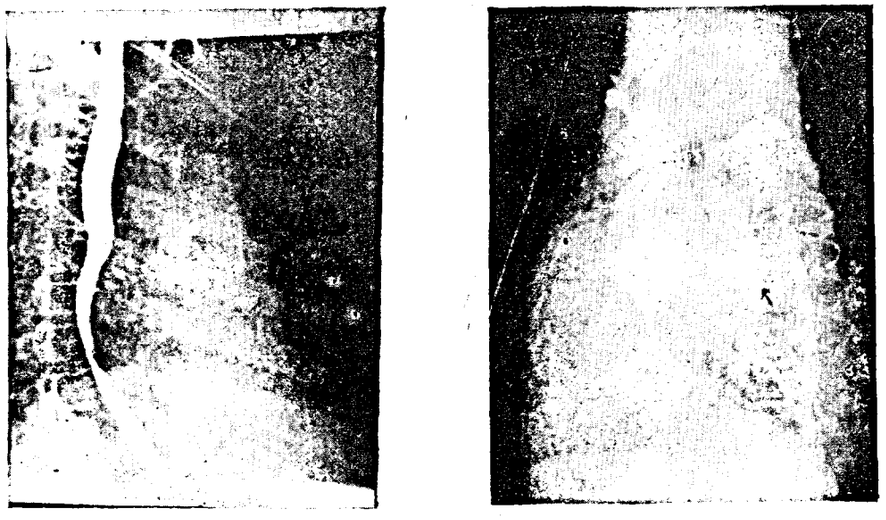

Fig. 2—Lakshmi.

Skiagram of Chest revealed a generalised enlargement of heart with a double contour on the right border of the heart and faint summation shadow suggesting a left auricular enlargement. The right ventricle was appreciably enlarged and also the left ventricle. The left auricle showed enlargement displacing the oesophagus posteriorly and to the right. The vessel area was wide and there was no evidence of any rib notchings present.

An Angiocardiogram was done on this patient on 18-10-60, with 2 films per second. The dye was held up in the right heart circulation for 6 seconds with a delay in emptying of the left auricle with increasing concentration of the dye in the left auricular chamber, suggesting mitral lesion. The left ventricle was enlarged. The aorta showed gradual narrowing from the isthmus which was more marked at the level of 7th Dorsal spine and at this point the tapering was pronounced and narrow. The left kidney was hypoplastic.

Comment.—To casual examination both clinically and radiologically the case presented features of Mitral Stenosis with incompetence but for the pulse and the blood pressure readings. With the presenting features of valvular disease of heart and a history of swelling of joints with fever a diagnosis of rheumatic heart disease would be the natural conclusion. Then was this aortic stenosis in the thoracic region of rheumatic origin? But then the left kidney was hypoplastic suggesting additional congenital anamoly. So primarily this may have been a case of coarctation of aorta at unusual site with superadded rheumatic infection.

(3) *Suraya Begum* admitted under Dr. P. K. Krishnan Kutty, M.D., M.R.C.P. (LOND.), M.R.C.P. (E)., F.R.F.P.S. (GLAS.), Honorary Physician, Government General Hospital, Madras.

Fig. 3

Suraya Begum.

A girl aged about 11 years was admitted for dyspnoea on exertion of 2 years duration. Her previous history reveals that she has had normal childhood upto the age of 9 years when the present complaint started. Dyspnoea has been worse for the past 2 months and also there has been a complaint of loss of appetite. The family history is non-contributory.

A well nourished child of about 11 years whose upper half of body appears to be well built comparatively with that of the lower half of the body. On examination the carotid swell was seen on both sides of the neck. Pulse was only felt on the left wrist and there was no pulsation in the right upper extremity both at wrist and arm and also in the lower limbs. Pulsations were felt on the back. The apex beat was felt in the left 5th space in the mid clavicular line. Both the heart sounds were heard in all the areas. A systolic murmur was heard all over the precordium and also over the back, and above the umbilicus.

A diagnosis of coarctation of the abdominal aorta with right subclavian artery stenosis was made prior to Angiocardiography.

The blood pressure in the left arm was 160/120 and could not be recorded in the right upper limb, and lower limbs. The Electrocardiogram showed left ventricular hypertrophy. The R. B. C. count was 3·8 millions/cmm. and Haemoglobin 85%. The fundus appeared normal. The other laboratory investigations were normal.

The skiagram revealed left ventricular hypertrophy with prominent right vascular contour. The ribs did not show any Rosler's notches. The barium swallow did not show any impressions. There was no break in the descending aorta thus suggesting that there is coarctation at unusual site.

A venous angiocardiogram was done on this child revealing the aortic stenosis above the level of the renal artery just at the level of the cœliac axis. In addition there was stenosis of the right subclavian artery. The aorta was also narrowed in lumen just proximal to the left subclavian artery than distal to it. The kidneys showed normal appearance.

Comments.—It was possible to arrive at a clinical diagnosis of coarctation of the abdominal aorta with stenosis of the right subclavian artery. Radiologically this too was possible from study of plain skiagram and screening, showing the descending thoracic aorta normal making one to suspect the coarctation at unusual site. These findings were confirmed by angiocardiography.

(4) *Angammal* admitted under Dr. M. G. Prabhu, M.D., Government Stanley Hospital, Madras.

A woman of 25 years of age was admitted with a complaint of giddiness and vomiting of one week duration. The patient has been breathless on exertion for sometime which she is not able to assess correctly. She gives a history of pre-eclamptic toxaemia and also complains of inability to read small letters. She has intermittent claudication too. Family history is non-contributory.

She was a fairly well nourished woman of 25 years with pitting oedema in the leg. Pulse was felt at wrists with volume and tension high whereas pulsations were absent in the lower limbs. There were no collaterals palpable on the back. Pulsations were absent over abdominal aorta. The apex beat was heaving and felt in the left 5th intercostal space just outside the midclavicular line. There was no thrill felt over the precordium. The heart sounds were normal. Systolic murmur was heard over the precordium and on the back and below the xiphoid process. The murmur was best

Fig. 4

Angammal.

heard over the lower portion. The electrocardiogram showed left ventricular hypertrophy. The blood pressure was 210/? in the upper limbs and in the lower limbs were not recordable. With these findings a diagnosis of coarctation of abdominal aorta was made.

The study of plain skiagram and also high kV films revealed a left ventricular hypertrophy and a slight bulge in the descending aorta at the infundibulum suggesting a possibility of existence of a patent ductus arteriosus but this was given up as there was no clinical evidence for it. The descending aorta otherwise appeared normal. No rib notches were seen. So a diagnosis of coarctation of abdominal aorta was made and Lerriche syndrome was not thought off because of the absence of pulsations of the abdominal aorta proximally.

A venous angiocardiogram was undertaken and the later films showed dilated proximal aorta and narrowing of aorta proximal to the left subclavian with a bulge distal to it. The medial part of the aorta in this segment showed a bulge at the classical site of insertion of ligamentum arteriosus, but there was no patent ductus arteriosus. The aorta showed gradual narrowing which was abrupt at the level of the 12th Dorsal spine with a kink. The internal mammary artery and the epigastric arteries were visualised showing the collateral circulation. The kidneys were normal.

Comment.—The diagnosis was made prior to the angiocardiogram both clinically and radiologically. An aortogram would have brought out the stenosis better in an adult but this could not be undertaken. Coarctation occurring in females are usually associated with other anamolies (Turners Syndrome). In the present case this is seen in a married woman of 25 years of age. Whether the toxaemia of pregnancy has anything to do with the stenosis of aorta at all or not is not possible to tell without a follow up of this case.

(5) *Gopalakrishnan* a search in the Museum of the department revealed one more case of coarctation of aorta both at the classical site which is rather moderate and also one at the level of the 11th dorsal spine. The case records were not available.

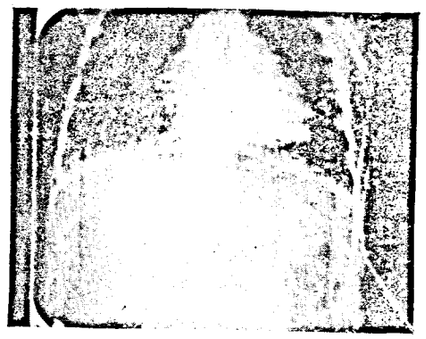

Fig. 5

Gopalakrishnan.

Discussion

The coarctation distal to ductus arteriosus has been classified as two types based on the location, appearance and probably due to the different aetiology. The first type occurs at or above the level of the diaphragm showing diffuse and elongated narrowing with evidence of para-aortic fibrosis suggesting that it is an acquired condition. Hasler believed this to be organised thrombus of unknown origin and localised inflammation. 9 out of 10 cases are seen in females. The series of cases presented here showed longer segments being involved though there is abrupt stenosis in some. The distribution of sex appears to be 2 : 3 : Male : Female. Glen in a case of long stenosis of lower thoracic

and upper abdominal aorta did a bypass using the splenic artery after resection of spleen.

The second type involves the abdominal portion at or just below the level of renal arteries, and the widely accepted theory of skodaic is not applicable in these cases as the ductus is situated too far away from the coarctation. This is localised and is believed to be congenital in origin. Maycock observes that this is unusual fusion with obliteration and loss of one dorsal aorta, or kinking of the fused aorta with consequent longitudinal tension producing a permanent narrowing of the lumen of the aorta. Glen feels that this is obliterating thrombosis as in the case of Lerriche syndrome. Inflammatory lesion has not been made out in the case reported by Charles B. Olim in 1949. Ritchie and Douglas in 1956 reported Atresia of abdominal aorta as a rare and congenital condition.

The blood pressure has been reported as variable. In some they are raised but fluctuant. In one case the blood pressure has been normal. Blood pressure has been raised where the coarctation has been below the renal arteries. So the question of renal hypertension in coarctation of aorta raises an interesting issue. In adult type of coarctation the blood pressure varies in each arm. Generally it is found that the left arm pressure is lower than the right arm due to involvement of the opening of the left subclavian artery, by obliterating process. In a series of 170 cases reviewed by King only 10 cases showed wide disparity in blood pressure recordings in both arms. Love and Holmes had a case with right arm pressure lower than the left arm. Postmortem revealed stenosis at the orifice of the right subclavian artery. This can also occur when the right subclavian artery has an anamolous origin below the site of coarctation.

Radiological diagnosis should not be difficult in coarctation of aorta at unusal sites. Visualisation of aortic arch and the continuous descending aorta without break at the site of isthmus should lead one to suspect the existence of stenosis of aorta at unusual site. The absence of rib notchings in adults in a case showing feeble and delayed or absent femoral pulse is also a valuable sign. The confirmation will be by aortography or angiocardiography.

Summary

Five cases of coarctation of aorta at unusual sites and length have been reported and literature is reviewed.

Angiocardiographic localisation is possible in these cases though aortography could have given better contrast and value, in estimating the length of the segment.

The predominance of these cases seems to be related to female lives.

Acknowledgment

I thank the Physicians of the various Units and the Thoracic Surgeon for their kind co-operation and my thanks are again due to Dr. A. Umapathy and Dr. M. G. Varadarajan for their help in carrying out the Angiocardiogram. I thank the Director, Barnard Institute of Radiology and the Dean, Madras Medical College and Government General Hospital, Madras, for the permission accorded to me to make use of the records.

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Abstracts of Radiological Literature

Rebert S. Ormond, and Andrew K. Poznanski, Pulmonary veins in rheumatic heart disease, Radiology, April 1960, Vol. 74, 542-549.

The appearance of the pulmonary veins on the postero-anterior film reflects pressure changes in the left atrium. There is a definite correlation between the size of the pulmonary veins and left atrial pressure. The upper lobe veins increase in size as the pressure rises. Spasm in these structures has not been observed. Changes in the lower lobe veins are less constant. There is an increase in the size of veins as the pressure rises to 15 or 16 mms. of mercury, so that an accurate estimate of the left atrial pressure can be made from the appearance of the pulmonary veins. The found no difference in the appearance of the pulmonary veins among the various rheumatic valvular lesions.

Anatomically, the posterior branch of the right superior pulmonary vein, in the right upper lung field can be identified as it crosses the right upper lobe bronchus, parallel to the right apical segmental bronchus lateral to the apical branches of the right pulmonary artery. In the right lower lung field, the inferior pulmonary vein has 2 divisions, the inferior and superior basilar.

The patients with the largest veins have pressures above 20 mms. of mercury, the intermediate vein group falls between 15 and 25 mms. of mercury and in the patients with the smallest veins, the pressures are below 15 mms.

No difference is seen between mitral stenosis and mitral insufficiency or between aortic lesions and mitral lesions.

Upper lobe veins are a more reliable index to elevated left atrial pressure than lower lobe veins. However the size of the lower lobe veins should be considered, as well as presence of Kerley's B lines, fluid, and distinctness of the veins. The veins in the lower lobes are disproportionately enlarged in the presence of congestive failure.

S. N. Deboo, Bombay.

Joseph, Jorgens and Norman Blank, and William A. Wilcox, Cinefluorographic detection and recording of calcifications within the heart, Results of 803 examinations, Radiology, April 1960, Vol. 74, 550-554.

Different methods are employed to demonstrate calcifications within the heart such as kymography, planigraphy besides roentgenography. Intracardiac clacification is of significance, as its demonstration in mitral or aortic valve or in the coronary arteries helps in arriving at a differential diagnosis, and may modify a surgical approach. During mitral commissurotomy cerebral embolization occurs more frequently if there is calcification in the valve. In the coronary arteries, calcification means arteriosclerosis. The deposits in a patient of forty or fifty may be taken to indicate a decreased life expectancy.

Their technic of examination consists of 6 film sequences of the heart and great vessels. In the 1st sequence, pulsations of the right cardiac border and vessels are recorded, noting calcifications in the pericardium, right coronary artery and ascending aorta. In the 2nd sequence, the left cardiac border is taken, noting calcifications

in the aorta, pulmonary artery, left atrium, left coronary artery and left ventricular myocardium. In the right anterior oblique view, 3rd sequence detects calcifications in the mitral and aortic valves, and in right and left coronary arteries. A recording of the right atrium and ascending aorta is next made in the left anterior oblique, followed by views of the mid-cardiac mass including the right coronary artery, aortic valve and left coronary artery, and record is made of the pulsation. Finally in the right lateral view a sequence is obtained of the posterior heart border upto the left atrial area to observe movement of the calcified leaflets of the aortic valve.

By means of cinefluorography, most of the calcified deposits in the heart are detected, but not all. It was remarkable, that calcification was detected in the left coronary artery in 225 cases out of 803 examinations, and in the right coronary artery in 58 cases. In 28 cases, the right coronary artery was calcified without associated left coronary artery calcification. This technique helps in detecting very small deposits measuring as little as 2 mms. in hearts that are beating rapidly or are enlarged, so that this is the method of choice. If this method is not available, a spot film taken at 150 mA and one-fifteenth of a second or less can record obvious cardiac calcifications unless the heart is extremely large.

S. N. Deboo, Bombay.

S. Holesh, Dissecting aneurysm of the Aorta, Br. Jour. Radiology, May 1960, Vol. 33, 302-310.

Dissecting aneurysms differ from other aortic aneurysms in that the lumen is not usually enlarged, but remains normal or is made smaller by the haematoma. The basic cause of dissection of the aorta, which usually starts in the ascending part, is a defective media which can be congenital or acquired. There are 2 causes of dissecting aneurysm in adults which are thought to be acquired (i) cystic medial necrosis which is the most frequent (ii) arteriosclerosis of the intima and media. This type is rare and localised. Cystic medial necrosis dissection occurs in the media and begins in the ascending aorta. Tears are usually transverse, but longitudinal, oblique and serrated or angular tears may also occur. The arteriosclerotic dissections are the result of 2 manifestations namely senile sclerosis of the media and atherosclerosis of the intima. Only a small percent of the arteriosclerotic dissecting aneurysms occur in the thorax, the majority being found in the abdominal aorta. Cystic medial necrosis rarely occurs in the abdominal aorta.

Clinically there is pain, dyspnoea, syncope. If the root of the aorta is involved there is sign of aortic incompetence, and when a coronary artery is occluded, myocardial infarction occurs. Dissection of major vessels leads to occlusion of pulsation. There may be coma and hemiplegia if there is occlusion of one or the other carotid arteries. Paraplegia is found if a spinal artery is involved. Haemoptysis and haematemesis occur. Haematuria occurs when one or both renal arteries are involved by the dissection. In the acute form, there is terminal perforation into the pericardium, mediastinum, pleura or peritoneal cavity with death in a few hours. The chronic cases have a double barrelled aorta as a result of re-entry of the dissected passage into the true lumen of the aorta. The survivors usually die later from cardiac failure. Some survive and die from other causes.

Radiologically, the whole of the superior mediastinum appears widened and the heart is considerably enlarged. The aortic arch is visible but is unsharp, and the descending aorta is invisible. A left haemothorax often obscures the left cardiac border. As recovery takes place, the aortic knuckle becomes more clearly defined and may return to practically normal size. The dissected portion of the aorta is more radiolucent than the dense central core of the aorta. The normal width of the aortic wall is 2 to 3 mms. dissection is suggestive if the thickness of the wall approaches 1 cm. and if it is 1 cm. or more, the diagnosis is not in doubt. In chronic cases, the ascending aorta is dilated and the aortic knuckle is abnormally high, overlapping the shadow of the manubrium, the heart is enlarged. The descending aorta may show an irregular conture with loss of parallelism once thought to be diagnostic of specific aortitis. The trachea may be displaced forwards and to the right. Angiocardiography is of great value in doubtful cases. Radiology is vital in determining the surgical approach. Some cases, if promptly diagnosed, can be relieved by surgery.

S. N. Deboo, Bombay.

Georg Theander, Arteriographic demonstration of stationary arterial waves, Acta Radiologica, June 1960, Vol. 53, 417-425.

During arteriography, it is occasionally observed that segments of apparently normal vessels change alternately in width in a characteristic regular manner, to which the term stationary arterial waves is given. It does not refer to the permanent wave-like arterial outlines sometimes observed at the site of mural lesions, *e.g.* in sclerosis of the media. We do not know the nature or their possible diagnostic significance.

Two hundred and seventeen consecutive arteriographies of the lower limb, performed in one hundred and sixty patients were reviewed for this purpose. The technique consists or puncturing the femoral artery, and serial films taken after injection of Urograffin 30 ml. 60 per cent (Schering). Stationary arterial waves were observed in 4 patients, of these 2 suffered from arterial embolism, 1 had arteriographic signs of thrombo-angitis obliterans and 1 had vascular lesions of obscure origin. It appears that the phenomenon was over-represented in patients under 60 years, of age and in arterial embolism.

In 3 of the 4 cases under observation, the phenomenon proved to be transitory. In all cases, the waves were situated proximal to a vascular region in which arteriographic or microscopic examination revealed lesions capable of interfering with the flow of blood and the contrast medium. The phenomenon was not observed in extremities with many wide collaterals.

Observations made in the material do not confirm the interpretation of stationary waves as a manifestation of spasm. On the contrary, the widening of vessel segments when the waves are present, seems to be against this view. The possible explanation is given as to interprete the stationary waves as standing waves amplified by resonance.

S. N. Deboo, Bombay.

J. W. Laws and R. G. Pitman, The radiological features of Pernicious anaemia, Br. Jour. Radiology, April 1960, Vol. 33, 229-237.

Seventy one patients with pernicious anaemia were examined by barium swallow and meal. Their films were compared with films from a similar number of control patients matched for age. The oesophagus showed in 2 cases a temporary hold up of barium at the lower end similar to that seen in early achalasia of the cardia. Gastric atrophy was characterised by a tubular

stomach, with absence of folds in the fundus, and a small volume, and a mucosal pattern in the body resembling crumpled tissue paper, best seen on the greater curvature and in the fundus. The antral mucosa showed in many cases the thick fleshy folds in the antrum contrasted with the thin tissue paper folds in the fundus. 38 patients showed radiological evidence of gastric atrophy, and in a further 17, the appearances were strongly suggestive of gastric atrophy. Nine control patients showed radiological evidence of gastric atrophy. Follow-through barium examination of the small bowel to the coecum was completely normal in the 47 patients with pernicious anaemia on whom it was performed.

The gastric atrophy was limited to the fundus and body of the stomach, in the patients with pernicious anaemia, but was not influenced by age. The most important radiological sign was the tubular shape of the stomach. The bald fundus was a less reliable sign, and the tissue paper folds occurred less frequently than the preceding signs.

Six pernicious anaemia patients were found to have gastric tumours, one polyp, and five carcinomata. The post-mortem incidence of carcinoma of the stomach in pernicious anaemias is three times the normal rate. The site of carcinoma in pernicious is the fundus and body of the stomach, where as usually 50 to 70 per cent of carcinomas in other patients are located in the pyloric area.

Gastric atrophy may precede the development of pernicious anaemia and subacute degeneration of the cord in their florid forms. A radiological diagnosis of gastric atrophy should make physicians watchful for the early manifestations of subacute degeneration of the cord.

S. N. Deboo, Bombay.

Irwin Bluth, Gastrointestinal carcinoid tumours, Roentgen features, Radiology, April 1960, Vol. 74, 573-580.

The subject of carcinoid tumours of the gastrointestinal tract has been reviewed, and attention has been called to the malignant carcinoid syndrome, consisting of chronic diarrhoea, flushing and cyanosis, respiratory distress and right sided cardiac disease. It has been suggested that all gastrointestinal carcinoids except those of the appendix be regarded as malignant. They differ from other malignant tumours of the digestive tract in the long duration of the disease, as long term survivals, from one to two decades, are reported, even in the presence of lymph node involvement.

The typical carcinoid tumour occurring in any part of the gastrointestinal tract from the cardia to the anus, is a small submucosal nodule arising from the Kulschitsky cells.

Carcinoids located in the appendix are not detected by x-ray methods, except in rare cases with widespread metastases.

Carcinoids of the stomach show 2 findings, (*a*) a small mass, sometimes with a shallow ulcer (*b*) a large fungating mass, simulating a polypoid carcinoma. In the duodenum, the most frequent finding has been a small polyp in the first part, simulating an adenoma, pancreatic rest or prolapsed gastric polyp, or a myoma.

The most common site of origin of carcinoids of the small intestine is the distal ileum, less frequently they arise in the jejunum. The usual site in ileum is within a few feet of the ileococcal valve. It is carcinoids in this location which most frequently metastasize and eventually lead to the carcinoid syndrome. The roentgen findings here are (*i*) intestinal obstruction:—The small primary tumour that extends through the bowel wall and produces infiltrating masses in the adjacent mesentery have led to the formation of adhesions resulting in chronic partial obstruction and less often to complete acute obstruction, implying that obstruction of the small intestine in presence of a carcinoid tumour indicates atleast local malignancy. (*ii*) polypoid filling defect within the lumen of the small intestine.

Most of the reported cases of carcinoids of the colon are in the proximal right colon. The findings are a large polypoid intraluminal mass, and a large bowel obstruction.

Rectal carcinoids are of no radiological significance, the most common site is the anterior wall of the rectum. These tumours metastasize.

S. N. Deboo, Bombay.

Henry, C. Johnson, Jr.; John R. McLaren and H. Stephen Weens, Intravenous cholangiography in the differential diagnosis of acute Cholecystitis, Radiology, May 1960, Vol. 74, 790-797.

Emergency intravenous cholangiography was performed in approximately 220 patients with acute illnesses suggesting acute cholecystitis. Subsequent data documented this latter diagnosis in 69 patients. It is commonly accepted that cystic duct obstruction of calculous or inflammatory nature is an essential feature of acute cholecystitis. On that basis, it would be impossible to opacify the gallbladder in acute cholecystitis. Acute abdominal illnesses other than cholecystitis would show absence of cystic duct obstruction and visualize the gallbladder. Acute pancreatitis may present symptoms and physical findings resembling cholecystitis.

Cholangiography shows 3 basic patterns of excretion :—

(1) *Opacification of biliary ducts and gallbladder.*—The ducts opacified in approximately two-thirds of this group, and visualisation of the gallbladder followed. On the other hand the duct system opacified in 47 per cent of patients with acute cholecystitis, and in none of these was the gallbladder visualized. Gallbladder opacification therefore reliably excluded acute cholecystitis, in this group of patients.

(2) *Opacification of biliary ducts without ensuing gallbladder filling.*—This pattern confirms cystic duct obstruction. Of the 69 proved cases, 47 per cent exhibited this pattern.

(3) *No opacification of ducts or gallbladder.*—Transient alteration of liver function is apparently the mechanism of non-visualization in these patients. This allows no conclusion as to the presence or absence of cystic duct obstruction.

(3-A) Delayed concentration of medium by the right colon but not by gallbladder at 18 to 24 hours. In each of the 9 patients showing this pattern, significant gallbladder disease was present, either cystic duct obstruction with acute cholecystitis or chronic cholecystitis with a non-functioning gallbladder.

Studies of the hepatic uptake of radioactive iodipamide frequently demonstrated impaired liver function in the acutely ill-patient. This procedure may prove useful in selecting patients suitable for emergency intravenous cholangiography.

S. N. Deboo, Bombay.

Ulf Zakrisson, Meniscography by Van De Bergh's double contrast technique, Acta Radiologica, June 1960, Vol. 53, 442-447.

The author describes a method for diagnosis of lesions of the menisci, showing detailed examination of the structures. The method was originally described by Van De Bergh and subsequently modified by the author. Cases, in which other injuries such as tears of the cruciate ligaments are indicated are outside the scope of this report.

After aspirating the fluid from the knee joint, eight to ten ml. Umbradil (Astra) and 20 to 25 ml air are injected, using in adults 50% Umbradil, and in children 30 per cent. Then passive and active movements are carried out, and the patient is instructed to walk. Best results are obtained if the exposure is made within 20 minutes. Six serial views are obtained on a 24 × 30 cm. film, and 4 on an 18 × 24 film. The tube used was a double focus tube (microfocus 0·3 × 0·3 mm.). The patient lies prone on the table. The menisci are examined separately. Ten tangential projections are obtained under fluoroscopic control during continuous rotation of the patient. In the case of the medial meniscus, the limb lies in extreme internal rotation and, in the case of the external meniscus, extreme external rotation.

Due to the microfocus of the tube, it was possible to obtain direct enlargement upto 2 × 2 satisfactorily. After the examination, the patient should rest the leg for a few days.

In their series of 280 investigations, no complications occurred. His experience suggests that arthrography should be repeated in patients suspected clinically of having a meniscus injury but in whom the initial routine examination has failed to reveal a lesion.

S. N. Deboo, Bombay.

R. A. Kemp Harper, Radiology in the diagnosis of retroperitoneal tumours, Jour. Fac. Radiologists, April 1960, Vol. 11, 69-79.

Retroperitoneal tumours may arise in organs, or primarily in retroperitoneal space, or may invade the retroperitoneal space, or may be the result of metastases from a distant organ or viscus. In his own series, the majority of cases were lymphomas, but 14 primary tumours were discovered. Of these 10 were sarcomata, 2 were neuromata, 1 was a lipoma, and 1 an angioendothelioma. During the same period 11 adrenal and 53 renal tumours were encountered.

Plain films of the abdomen, gastro-intestinal and urological studies are necessary, and in any case, tumours in the urinary and alimentary tracts have to be first excluded. In the gastrointestinal tract, anterior displacement of any of the relatively fixed points will indicate the retroperitoneal position of the tumours. A lateral displacement is also a common feature. In the urinary tract, the kidney is the organ commonly displaced by a retroperitoneal mass. The kidney can be displaced in any direction except posteriorly, and can even be displaced into the opposite side of the abdomen. The ureter may be displaced either laterally or medially, without displacement of the kidney. Mesenteric masses, displacing coils of intestines, may infiltrate posteriorly and conversely retroperitoneal tumours may invade the mesentery. In such cases, the posteriorly situated mass usually flattens rather than displaces laterally the loops of small intestines. In the upper left abdomen, tumours very closely simulate an enlarged spleen. Tumours arising in the splenic region displace the stomach medially or indent the greater curvature. They can extend over the cardia and displace the stomach downwards, thus increasing the width between the diaphragm and the gastric air cap. Resort to arteriography or retroperitoneal pneumography may be necessary in such cases. Renal and suprarenal tumours cause anterior displacement of the stomach, duodenum, small intestine or colon. Differentiation lies in defining these organs by urography, arteriography or pneumography before an origin from either can be excluded.

In children, the commonest renal neoplasms are Wilm's tumour and the neuroblastoma. Wilm's tumour destroys renal function. The neuroblastoma may interfere with function, but to a lesser extent. They cause renal displacement and exhibit calcification. Adrenal tumours in adults may cause renal deformity by flattening of the upper pole ond sometimes renal displacement, but seldom interfere with renal function. Metastases are common in renal and adrenal areas and may be recognised by retroperitoneal pneumography with nephrotomography.

S. N. Deboo, Bombay.

Colin Alexander, Erosion of the femoral shaft due to patello-femoral osteoarthritis, Jour. Fac. Radiologists, April 1960, Vol. XI, 110-113.

An analysis of eight cases showing erosion of the lower shaft of the femur anteriorly just above the knee joint is given here. The erosion was approximately 5 cms. in length and about 5 mm. in maximum depth. The erosion was bilateral in three and unilateral in three cases. Severe patello-femoral osteoarthritis was present in all knees, characterised by gross cartilage loss and marginal lipping. Erosion of the anterior quarter of one femoral condyle articular surface was identifiable in ten of the eleven knees showing shaft erosion. It was severe, with an estimated bone loss of 3 or more milimetres in all cases. None of the cases showed severe or serious cartilage loss in the main tibio-femoral joints in contrast to the gross patello-femoral osteoarthritis. 3 cases with profile views of the patella showed identical changes with minor lateral displacement of the patella and total cartilage loss between patella and lateral femoral condyle.

The erosion was caused by the chisel-like edge of the arthritic patella, but the mechanism responsible was not immediately apparent. The shaft erosion is due to patello-femoral osteoarthritis but then the question is why the erosion does not occur more often. Patello-femoral osteoarthritis is very common and is in fact the usual site of origin of osteoarthritis in the knee. The usual cause of patello-femoral osteoarthritis is chondromalacia patellae.

The only significance of the erosion of the shaft of the femur is that it might mislead the radiologist into diagnosing tumour erosion, particularly if an effusion were present in the supra-patellar pouch to simulate a tumour.

It is suggested that the lesion is probably a late result of chondromalacia patellae.

S. N. Deboo, Bombay.

I. G. Williams, Retroperitoneal tumours, Jour. Fac. Radiologists, April 1960, Vol. XI, 80-82.

When considering the radiotherapy of retroperitoneal tumours, it is essential to take into account the nature and histology of the tumour and the extent of anatomical involvement. If it is differentiated and localised, a course of Radiotherapy can be given using 250 kV or high voltage x-rays. If the tumour is more anaplastic and widespread, an abdominal bath is used.

Retroperitoneal tumours are classified as (*a*) primary (*b*) secondary and (*c*) involvement of nodes in the reticuloses. Six patients

with primary tumours are described. This group is a heterogenous group of sarcomata, arising from any type of connective tissue, muscular, fibrous, fatty, nervous, vascular or lymphatic. X-ray investigation may be carried out, but in all cases the importance of laparatomy cannot be overemphasised. The majority of these tumours are highly radiosensitive, and being irremovable, therapy is on the lines previously mentioned. Palliation of symptoms with a long survival can be achieved. 90 per cent die within 5 years. Of the 6 cases, three are alive and three are dead.

In the group of secondary tumours, the most important is the seminoma of the testis, because even if the tumour is large, complete regression and a long survival may be obtainable. Laparotomy is again important, as thereby one obtains tissue for histological examination. 3 case histories are given.

In the third group of malignant reticuloses, the commonest is Hodgkin's disease, where the patient may present himself or herself with an abdominal tumour, where the symptoms are fever and or pruritus. In such patients, where no lymph nodes are found in the superficial or mediastinal nodes, retroperitoneal nodes are the ones most commonly involved. While radiotherapy or abdominal x-ray baths are helpful with excellent palliative results, the author has been using a combination of nitrogen mustard given in one single injection and x-ray therapy. A full peripheral blood count and examination of bone marrow are necessary. Those patients with bone marrow depression from disease infiltration or previous therapy should not be treated. The whole dose of nitrogen mustard is given in one single intravenous injection, and radiotherapy is started immediately after, commencing with small doses (50r or so) and increasing gradually. Blood is examined 3 times weekly and we stop only if the total count falls below 1500 cells or 200 lymphocytes and monocytes. The x-ray therapy is given as if no nitrogen mustard was given.

S. N. Deboo, Bombay.

J. Walter, Giant-cell lesions of bone. Osteoclastoma and giant-cell tumour variants, Survey of a radiotherapeutic series, Jour. Fac. Radiologists, Clinical Radiology, April 1960, Vol. 11, 114-124.

A series of 32 cases is reviewed, all originally considered to be osteoclastoma. 15 are accepted as genuine osteoclastoma, the rest assigned to various categories of giant-cell tumour variant.

Osteoclastoma.—There is no typical radiological appearance. The classical soap-bubble appearance is far less common. The site of tumour, and changes in the cortex and age are of greater diagnostic value. 90 per cent occur beyond the age of nineteen. It is always desirable to obtain a biopsy preferably by open operation. The relative merits of surgery and radiation are still controversial. Surgery is the best treatment in areas where it does not involve disability or injury to a joint. Curettage combined with chemical cauterisation of the walls of the cavity or packing with bone chips is most acceptable method. It may be followed by radiation, though this combination has been considered undesirable and liable to promote recurrence.

Following radiation treatment, in the first few weeks there may be apparent deterioration due to decalcification, but this is normally followed by gradual healing with reossification. The full benefit is achieved in 18 months. Dosage varied between 2000r in 3 weeks and 4000r in 4 weeks, by D.X.R. The cobalt beam was used for the whole treatment in 2 cases. 3000r in 3 weeks

5000r in 4 weeks; supervoltage (2 mV) was used in 1 case - 3100 to 3700r in 4 weeks. Supervoltage or gamma -ray beams are preferable to deep x-rays at 200 to 300 kV. Summarising the effect of radiation, the author says that out of 14 treated cases, 9 have made satisfactory progress for 2 to 20 years, 3 have made good clinical but uncertain radiological progress, while 2 have failed and have come to amputation.

Simple bone cysts and Fibrous dysplasia.—Most lesions are clinically silent. Where active treatment is indicated some form of surgery is the standard method. In 6 cases, radiation treatment was used in 5, and brought about a good clinical and radiological result in 1 patient, no definite benefit in 2 other patients, while in 2 others, it was certainly negligible.

Giant-cell Epulis.—Surgery is normally preferable, but radiation is effective, as shown by 2 of their cases.

Aneurysmal bone-cyst.—Radiation is of great value in surgically awkward situations. Only moderate dose is needed. Lichtenstein suggests 1400r with 2000r as the upper limit owing to the danger of late sarcoma.

Benign osteo-blastoma.—Alternative names for this rare tumour are osteogenic fibroma and giant osteoid osteoma. Treatment should be conservative, as the lesion is benign. Surgical removal or curettage may be appropriate and even incomplete removal may be followed by cure.

S. N. Deboo, Bombay.

Sacro Coccygeal Teratoma of the Foetus with special emphasis on Prenatal Diagnosis by Radiology; Vishnu Sarma and N. Nemiraja, Brit. J. Clin. Pract., 13: 628-633, Sept. 1959, The Govt. Women and Children's Hospital, Egmore, Madras, S. India.

Sacrococcygeal teratomas arise in the tissues anterior to the sacrum and posterior to the rectum. Often they are benign but are said to have a "great propensity for malignancy".

The malformation of sacrococcygeal teratoma is so rare that seldom does the obstetrician entertain its possibility. The majority of cases are diagnosed when a vaginal examination is done to find out the cause for delay in birth. If the foetus presents by the breech, the characteristic feel of the tumour will be present and the bony landmarks of breech presentation will be recognizable above it. In vertex presentations there may be delay in the birth of the hind portion of the child, the rest of it having emerged.

The authors present films of what they believe to be the first roentgenographic demonstration of such a tumour, though actually the diagnosis was first suggested by vaginal examination following unexplained dystocia. On review of the films, the following criteria are suggested for presumptive roentgen diagnosis:

1. polyhydramnios
2. straightening of the lumbosacral spine
3. extension and anterior displacement of lower extremities
4. increased soft tissue density extending from the base of the buttocks (the tumours usually are from 10 to 20 cms. in diameter)
5. calcification in the tumour mass and
6. high position of the foetus in breech presentation as the tumour fills the maternal pelvis.

A surgical cure is usually possible.

Statement about ownership and other particulars about newspaper (INDIAN JOURNAL OF RADIOLOGY) to be published in the first issue every year after the last day of February.

FORM IV—(See Rule 8)

1.	Place of Publication	...	MADRAS.
2.	Periodicity of its publication	...	Quarterly.
3.	Printer's Name	...	Mr. R. Ravaimanickam.
	Nationality	...	Indian.
	Address	...	148, Big Street, Triplicane, Madras-5.
4.	Publisher's Name	...	Mr. R. Ravaimanickam.
	Nationality	...	Indian.
	Address	...	148, Big Street, Triplicane, Madras-5.
5.	Editor's Name	...	Dr. A. N. K. Menon.
	Nationality	...	Indian.
	Address	...	49, Poonamallee High Road, Madras-7.
6.	Names and addresses of individuals who own the newspaper and partners of shareholders holding more than one per cent of the total capital.		Indian Radiological Association.

I, Mr. R. Ravaimanickam, hereby declare that the particulars given above are true to the best of my knowledge and belief.

R. RAVAIMANICKAM,

Signature of Publisher.

Printed and Published by Mr. R. Ravaimanickam at Ravai Press, 148, Big Street, Madras-5 for the Indian Radiological Association and edited by Dr. A. N. K. Menon, 49, Poonamallee High Road, Madras-7.