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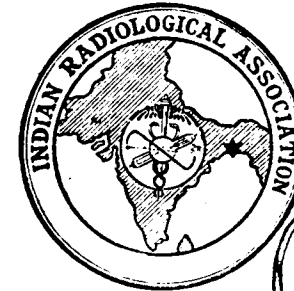
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Vol. XI

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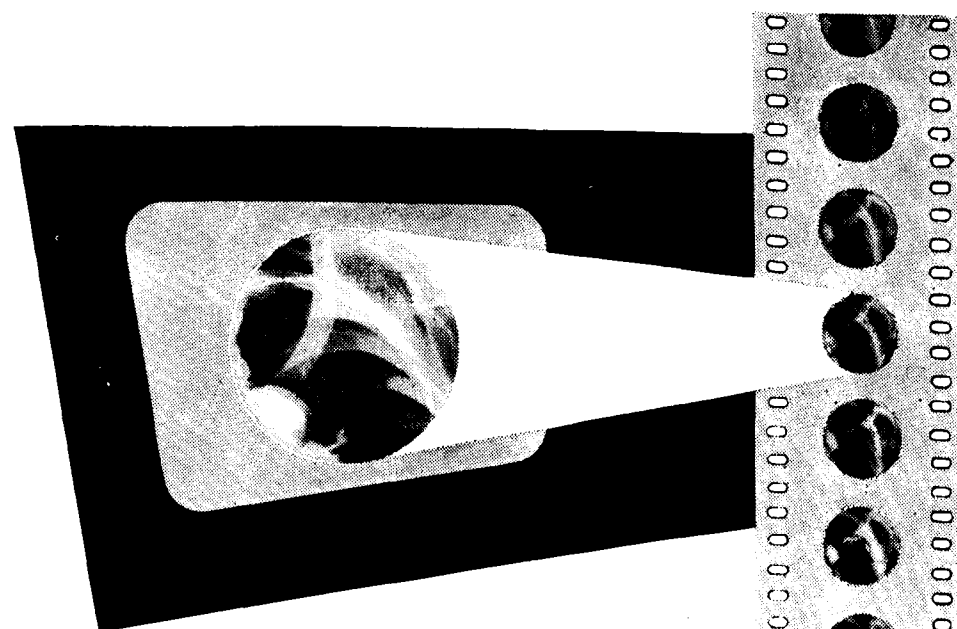
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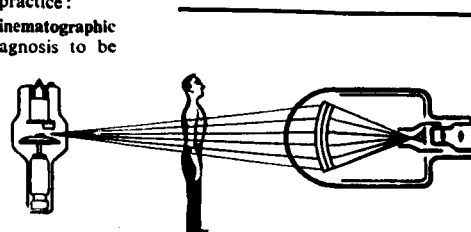
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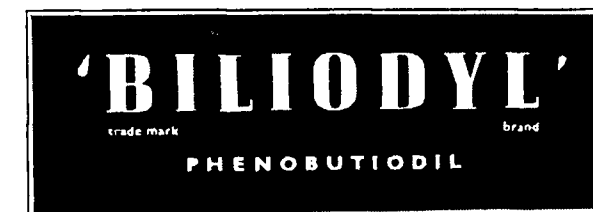


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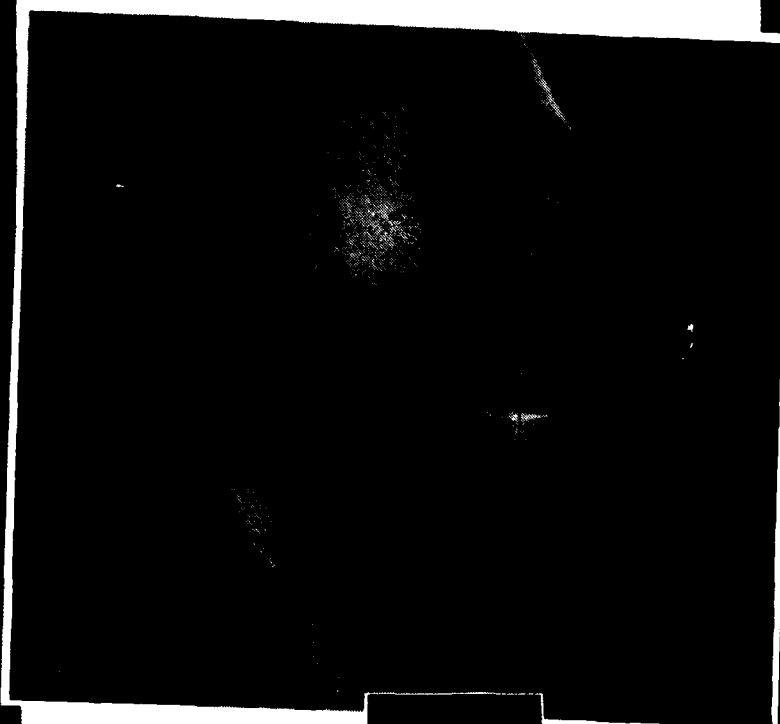
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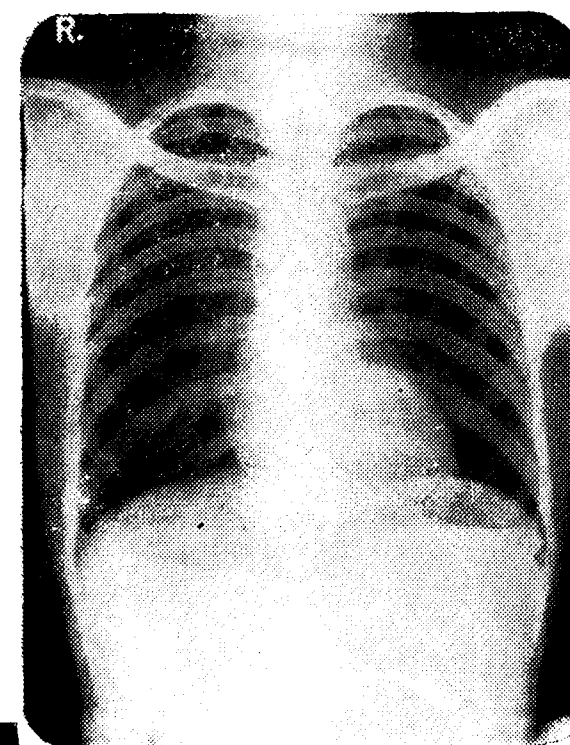
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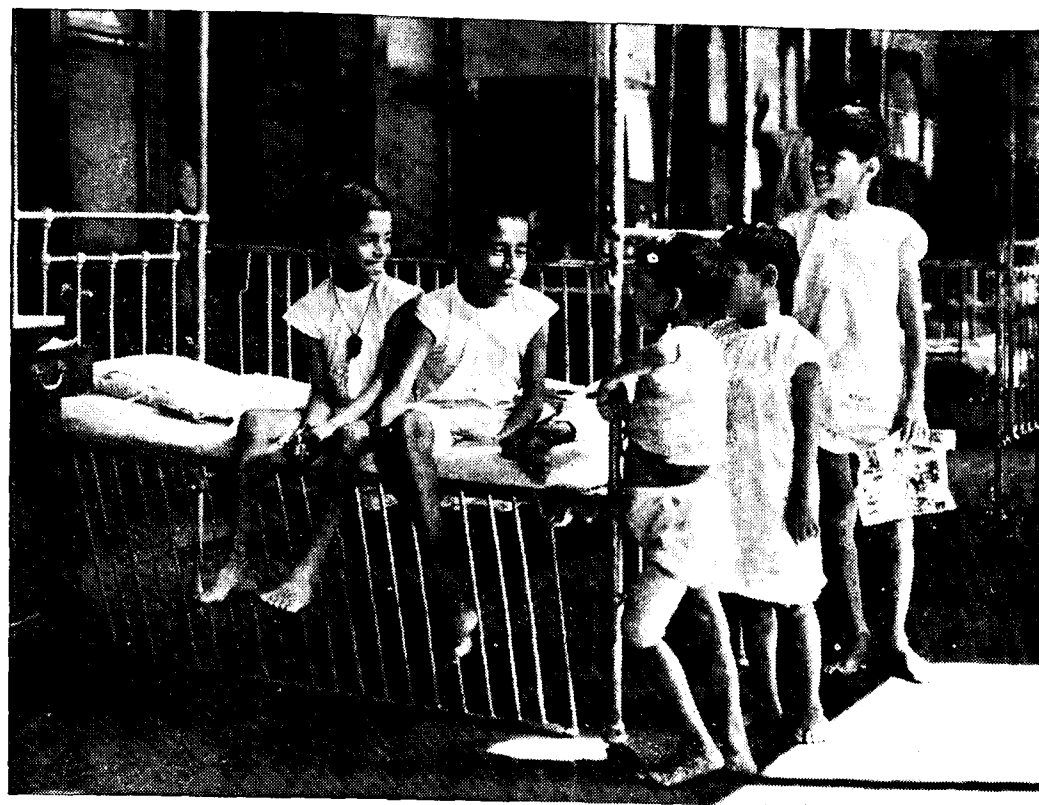
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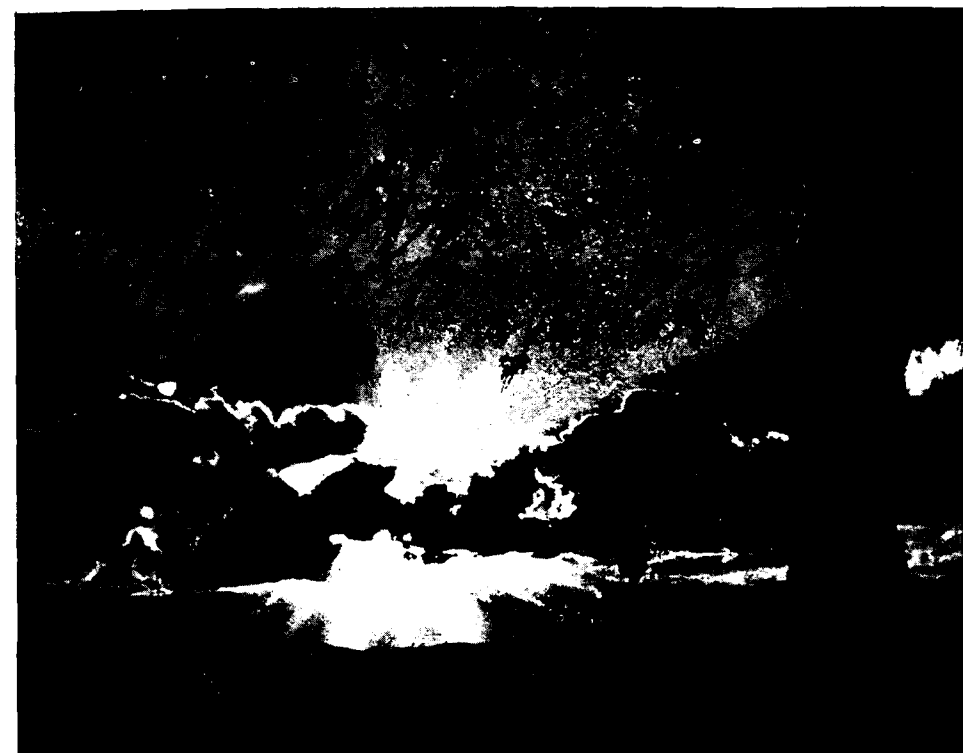
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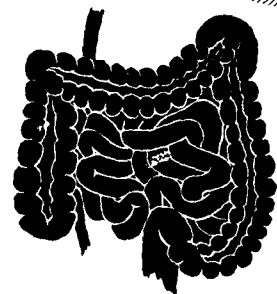
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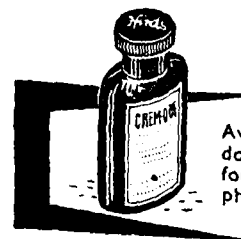
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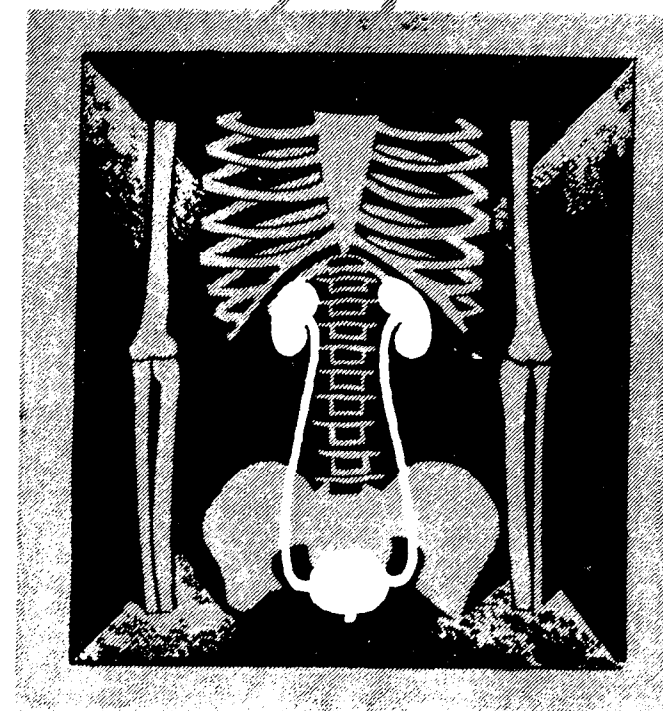
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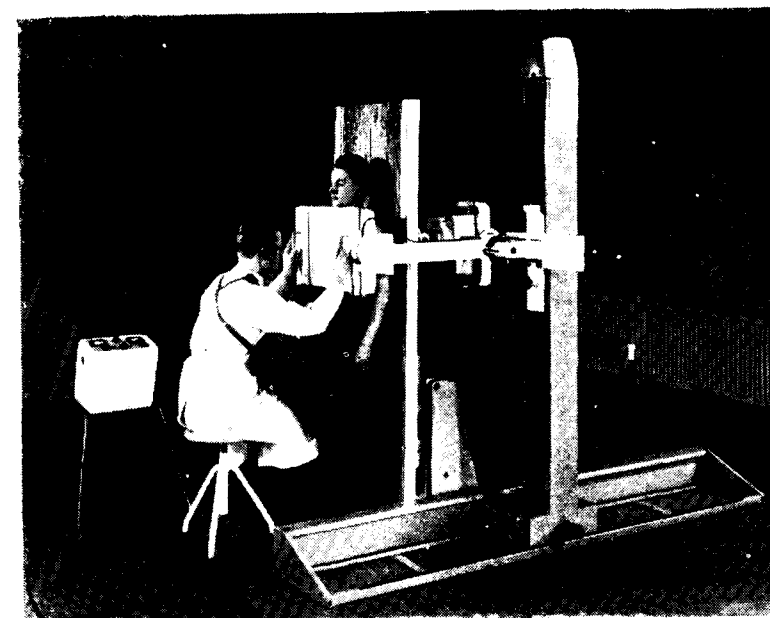
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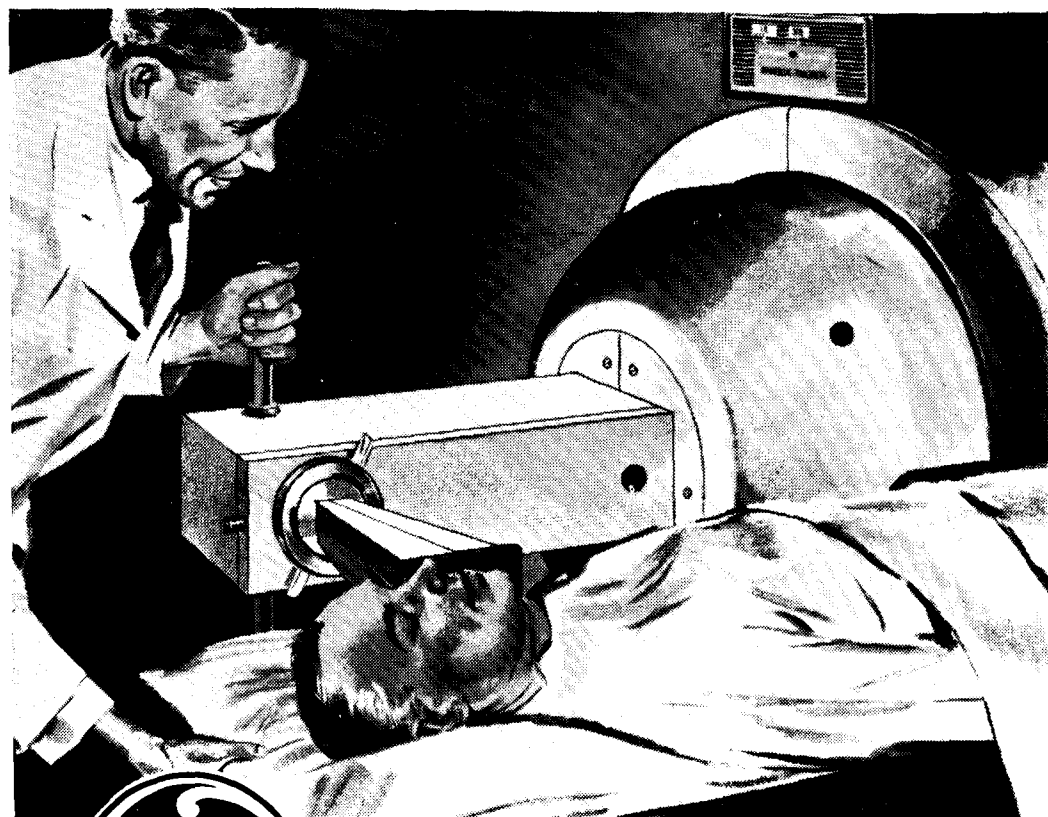
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EDITORIAL

GRADUATE TRAINING IN RADIOLOGY

BY

DR. K. M. RAI, M.B.B.S., F.R.C.S., D.M.R. (LOND.)

The Science of Medical Radiology holds a unique position in Medicine. The two main fields are Radio-Diagnosis and Radiotherapy. No one disputes to-day that the speciality of Radiology though fairly young, is the corner stone in the practice of modern medicine in its widest sense. Such being the case, it would be readily realised that the Radiologist should be able to play the role of the key-man in a team of specialists, be they physicians, surgeons, gynaecologists, Neuro-surgeons, Oto-laryngologists, pediatricians, etc. to enumerate only a few among the fast growing number of specialists. To be a competent Radiologist, and be able to command the respect of his colleagues, therefore, his attainments should be such that he must be able to talk to each of them in their own "language", understand their difficulties and be able to assist them in the solution of their problems. It will be no exaggeration therefore to say that a Radiologist is a consultant to consultants or a specialist and among specialists. Stated in other words; (1) the Radiologist should be a top-class physician, (2) he is an important member of a modern medical team, and (3) that the Radiological examinations and treatments are essentially clinical in nature and not technical laboratory procedures. If we accept the above premises, then he should have good clinical experience and it is necessary he should see and examine the patients if he should perform a real clinical service.

Status of Radiologist :—In our relationship with the hospitals, it is therefore vital that Radiological practice be clearly recognised as the clinical practice of medicine and this cannot be brought more forcibly to the attention of the authorities concerned or the public, that those who are in charge of the department make certain that every patient is seen and examined by one of the staff. The patient must go out of the Radiological Department that he or she has been seen and examined or treated by a doctor and not by a technician. Therefore in the words of an internationally reputed Radiologist—"We must act like doctors, look like doctors and talk like doctors, if we want to be recognised as doctors". To be able to attain this

standing in the profession, I would like to emphasize that a few years in general practice and a higher degree either in Medicine or Surgery should be a pre-requisite before entrance to Radiological training. To be a teacher, or to entitle one to be in independent charge of a large X-Ray department, he must have further experience under a master. This is so in U.K., Sweeden or elsewhere. The Madras University insists on a higher medical or surgical qualification plus a recognised specialist qualification and a minimum of 8 years teaching experience before one could be accepted as Professor in any speciality. This is so for Radiology also. There has been no difference in the status, emoluments or privileges between any of the Professorial chairs, be it Surgery, Radiology or any other speciality.

What then is the present trouble? Dr. Sethna has brought out in his Paper published in the present issue of the Journal, the lamentably low status of Radiology in our country. What are the causes contributing to this state of affairs and what are the remedies to cure the malady? Does it necessarily be in the bifurcation of Radiological teaching into two branches - Diagnostic and Therapeutic as advocated by him or are there more suitable methods? Like good physicians, let us diagnose the cause of the disease first before we attempt to treat the condition.

It is quite obvious from the experience of many of us who have been teachers and some of us have taught Radiology for over two decades, that too early specialisation after graduation without sufficient clinical experience is the root cause of the poor practice of Radiology in this country. We started teaching Radiology to graduates who had only one year's house-surgeoncy to their credit. Most of these were ill-fitted to make the best use of the opportunities that were available to them. The blame is not entirely theirs; some part of it should be apportioned to the teachers as well. Much of the time of the teachers is taken up by routine work in the department. The quality of teaching, personal contact with the students, daily discussions, weekly seminars are therefore sacrificed for want of time. There is also another factor, which - I consider is a very important factor - why the right type of candidate, *i.e.* a graduate with a few years of experience in general practice, and with a higher medical qualification like an M.D. or M.S. does not take up Radiology as a speciality? There is no doubt that this is largely due to the economic condition of our people. Medical education is the costliest education that one could have both in the matter of money spent and the number of years the student has to spend.

An average student takes not less than seven years after the intermediate examination to complete his basic medical studies - *i.e.* M.B.B.S. plus an year's house surgeoncy. There is also the consideration of the emoluments of the Radiologist either in service or in private practice. He has to invest a large sum of money on the equipment if he has to set up a private clinic. In this regard there is no other speciality which is so expensive as the practice of Radiology.

In a large country like ours, whose present economy is mainly based on agriculture, with marked difference in economics, people and methods of education we have to plan education to suit these varying conditions. This has particular reference to post-graduate education.

The programme of teaching should be such that it meets with our present needs and conditions of work and it should be possible to carry out the programme in a successful manner and in as large a measure as possible. It is no use hitching our waggons to the skies, simply because such countries as U. K. Sweeden, Japan, etc. have been able to carry out a much more ambitious scheme. They are very prosperous countries, much smaller in area and population and factors influencing education are quite different from ours. Let us be realists instead of being idealists. The realists are not necessarily diehards. It will be readily agreed that it is very hard to die. Therefore let us try to live and progress. If a country like the U. S. A. is still hesitating to introduce the bifurcated courses in Diagnosis and Therapy for the post-graduate, in spite of the enormously better economic condition prevailing in that country, we here in India have to pause and think deeply about such a course. I have absolutely no doubt in my mind that a separation between Diagnosis and Therapeutic Radiology will certainly come in the future as the next natural step in Radiology; Madras has already effected this division in practice in the Barnard Institute of Radiology, nearly two decades ago. But has it been possible to do it in every Medical College of which we have two others in this State? No, definitely not. Because of our present economic conditions, it has not been possible to have different, well-equipped departments for diagnostic and therapeutic Radiology, as the cost of the equipments is enormous and they have all to be imported. Added to this, there is paucity of well-qualified and experienced teachers. Therefore in the present stage of development of the speciality in this country we have neither well-equipped departments for Radio-diagnosis or Therapy, nor have

we sufficient number of well-qualified and experienced Radiologists as compared to U. K. when the bifurcation in teaching took place in that country.

Having said so much, let us now examine the evolution of post-graduate Radiological education in our country during the last two decades. There are only three post-graduate teaching centres in this vast country : Madras, Bombay and Lucknow.

In 1939, Madras Government started a Government Diploma of 9 months' duration on the lines of D. M. R. E. (Cambridge) but admission to this course was open to both licentiates and graduates of medicine with a minimum of one year's clinical experience as House-men. After a few years of experience the period of training was extended to 12 months. This course was continued upto 1956-57 session. The conditions and period of training at Bombay and Lucknow, I am informed, were no better if not worse. In the meantime, the Indian Radiological Association being dissatisfied with the type of post-graduate Radiological education imparted in this country appointed an expert committee to go into this matter and submit their report to the main body at their next Annual Session. In response to this, sub-committees were appointed at various teaching centres and after a great deal of deliberations by the sub-committees and the main and expert committee, a syllabus for a combined diploma in Diagnostic and Therapeutic Radiology of two years' duration was drawn up and submitted to the Association at its next annual session which was accepted by the general body. Although this recommendation was forwarded to the various Universities and State Governments as early as 1952, none except the Madras University and Government have given effect to this scheme. Thanks to their enlightened outlook this extended University Course has been running at Madras from the Academic year 1954. Bombay and Lucknow have not till now given effect to this recommendation. Bombay has still its one year course and Lucknow the 9 months' course. All these three courses are University Courses, while Calcutta one of the oldest Universities has not even thought of starting a diploma course, much less the other Universities.

It will be noted that all the three existing centres award University Diplomas—D. M. R. and in the eyes of the public and the Governments all the three diplomas have the same face value, although the Madras University Diploma is of two years' duration. This has had its repercussions on the number of candidates seeking admission to the Madras University Diploma where the

initial qualification for admission to the course is also higher than at the other two Universities. The number of applications for admission to the course from private candidates has considerably fallen down and in fact one of the candidates from Rajasthan admitted to the two year course, left the course after one month and joined the Bombay course on the plea that he could ill-afford the expenses of a two year course while he could get the same diploma from Bombay in one year. I am informed by one of the Professors from Bombay that he has 20 candidates under training for the diploma in Radiology during the present year—a record number of candidates.

The explanation for such a large number was that there was a rumour that from next year Bombay too might start the two year course and hence the rush for admissions to the shorter course. This is very revealing.

Further let us compare the conditions prevailing in U. K. at the time bifurcation in training took place, and the advances that took place in these two sections—Radio-diagnosis and Radio-therapy—leading to that event. This bifurcation in teaching took place in U. K. about a decade ago and it was possible due to the tremendous advance that took place in the practice of these two branches. Who were the people who were responsible for such advance and what were their qualifications? To one and all of us these names are familiar—They are known internationally. In the field of Radio-therapy the names of Dr. R. Patterson, Sir Standford Cade, Prof. Windeyar, Prof. McWhirter, Prof. Smithers, Dr. Foulton in addition to several other names flash across one's mind. Similarly in the field of Diagnostic Radiology, the names of late Prof. Barclay, late Prof. Woodburn Morrison, Dr. Cochrane Shanks, Dr. Peter Kirley, etc. dominate the field to mention only a few. How was it possible for them to advance the science of Radiology to such a high degree in the U. K. which in due course brought about the bifurcation in the teaching as well. It was not done over-night as we want to do here. They and their compeers, numerous in numbers, had to work for the best part of their life before they could achieve the above result. They were people who had only either six months or 9 months' training in Radiology. It is their high attainments in general medicine or surgery that was responsible for their very high attainments in this speciality. Therefore if we want to upgrade our diploma under the existing economical and working conditions, we have to very carefully look at the type of candidates we select for the speciality and we must have a uniform good diploma embracing both branches of the speciality. I would like to emphasize that the Diploma is only a basic qualification in Radiology

and with this as foundation, the Radiologist should work according to circumstances and his inclination either in Diagnosis or Therapy exclusively or in the majority of cases he may have to work in both branches in smaller departments until this country reaches the same status and conditions of working that were prevalent in U. K. when the bifurcation in teaching took place.

Therefore it is felt strongly by me and with me several others who have had the privilege of long experience in teaching and conditions under which we have taught for over two decades, that the establishment of independent Radiological Specialities at this stage of development of the speciality in this country however logical their separation may seem, would be premature, impracticable and not realistic. A great majority of Radiologists either by choice or necessity are, and our successors will probably continue for some time as general practitioners in Radiology. Most hospitals and teaching institutions in our country require their Radiologists to practice and teach the speciality as a whole for reasons already mentioned above. Finally the Radiologists who are already practising both branches of the speciality will refuse to give up their work in either branch. For the above reasons few graduates will confine their study only to one branch of the speciality whether they expect to work in an institution or as private radiologists. If we bifurcate the teaching of the speciality at this stage, I have no doubt in my mind that the science in general will suffer badly and more so Therapeutic Radiology, for few will have the chance of practising this speciality exclusively. The time for bifurcation of teaching will be when we have sufficient number of well-equipped and staffed bifurcated departments, spread all over the country. The practice of Radio-Diagnosis and Radio-Therapy as separate specialities should precede the bifurcation in teaching. It is only then we will be able to reach the ideal without sacrificing Radio-therapy—a major branch of the speciality.



S. COCHRANE SHANKS

Jagadish Bose Memorial Lecture

BY

S. COCHRANE SHANKS, M.D., F.R.C.P., F.F.R.,

Director, X-Ray Diagnostic Department, University College Hospital, London.

My first and pleasant duty must be to express my warmest thanks to the President and Council of the Indian Radiological Association for the great honour they have done me in inviting me to give the Jagadish Bose memorial lecture for this year and for awarding the Jagadish Bose Gold Medal to me. The latter I shall treasure for the rest of my days. The former I approach with some trepidation, lest I fail to pay an adequate tribute to the great scientist whose memory we cherish to-day. For indeed, Acharya Jagadish Chandra Bose was a great Indian and a great man. Most of you are familiar with his scientific work and how it fell into three epochs, from 1894 until his death in 1937. In the first period he was engaged in researches into the physics of radiation and succeeded in producing an electro-magnetic radiation similar to that used, 50 years later, in the radar system during the last war. In his second period he studied the fatigue effect in metallic coherers and the response of various inorganic substances to stimulation, from which he evolved his famous generalisation on the similarity of response in the living and non-living. In his last and perhaps most important phase, plant physiology, particularly the response of certain plants to stimulation, was his chief study.

The subject that I have chosen for this lecture, the X-ray diagnosis of early cancer of the stomach, is one that engages the anxious attention of you all. Among the most urgent problems that face us as doctors is the early diagnosis and successful

treatment of cancer of the stomach. For this was, until recently, the commonest site for cancer—exceeded only recently by the bronchus—and the rate of cure is appallingly low.

Pathology.—Primary carcinoma of the stomach may be composed of spheroidal, cuboidal or columnar cells. Each type may undergo colloid degeneration. Depending upon the amount of stroma present, the growth may be scirrhus, or medullary (encephaloid or fungous are other descriptions of the medullary form).

Ewing describes the following 6 types:—

1. *Adenocarcinoma.*—This is a bulky proliferative type and forms the typical cauliflower masses.
2. *Colloid carcinoma.*
3. *Ulcer cancer.*—i.e., a primary cancer which breaks down and ulcerates.
4. *Medullary cancer*, composed of soft round ulcerating masses prone to necrosis and haemorrhage and metastasizing early. The cells are spheroidal and may simulate a lymphosarcoma.
5. *Scirrhus carcinoma* and
6. *Sclerosing carcinoma* (or leather bottle stomach), a later and more widespread stage of a scirrhus growth.

Radiologically these pathological varieties resolve themselves into three groups, scirrhus cancer, localised or diffuse, medullary or fungous cancer, and malignant ulcer.

The investigation of a case of suspected cancer should follow certain definite stages:—clinical examination, radiological investigation, gastroscopy and exploratory laparotomy. Patients presenting with cancer of the stomach fall into three clinical groups; those with a short gastric history, those with a long history, with perhaps a recent change in symptoms, and those with no gastric history at all, but with genuine symptoms of ill health such as anaemia. According to Stanford Cade these three groups comprise 65, 32 and 3 per cent of all cases. The clinical investigation should include tests for occult blood, and a test meal with a search for cancer cells.

The problem of early diagnosis

The first problem is how can cases be brought to the diagnostic centre at an early stage? It is a melancholy fact that there occurs, on an average, an interval of three months between the onset of a patient's symptoms and his first visit to his family doctor. There is a further interval of three months—and this is truly deplorable—between the first visit to his doctor and full investigation. When you add to these six months the earlier months during which the cancer was silent, it is clear why we so often find a developed or advanced cancer at the first X-ray examination. At present 75% of gastric cancers are detected too late for resection, let alone cure.

A second problem is how an early suspected case should be investigated. Stanford Cade outlines three stages:—

Stage I.—The history and clinical examination.

Stage II.—Radiological examination. The result of this examination will be one of four. A malignant lesion, a benign lesion, no lesion, or a lesion the nature of which is doubtful.

Stage III.—The last group, in which the nature of lesion is uncertain, should be gastroscopied. This sieve will leave but few cases undecided. There are two further resources, re-examination by X-rays after three weeks of medical treatment, and laparotomy. Cade points out that the patient must be persuaded to submit to full investigation when the symptoms are trivial. Laparotomy and gastroscopy are in greater and lesser degree ordeals for the patient and many will not submit to either. The barium meal is, therefore, the principal diagnostic measure, but in the doubtful case it may be necessary to use every other available method of investigation. What a boon a serological test would be, similar to the Wassermann.

The X-ray features of developed gastric cancer are well known; the filling defect, the aperistalsis, the disturbed or destroyed rugal pattern, the rapid emptying, the gaping pylorus associated with the achlorhydria, the diminished gastric capacity, the reservoir dilatation of the oesophagus and the rest. No X-ray diagnosis could be easier in this stage, one in which the patient is doomed.

There are certain types of cancer of the stomach which may be very difficult to detect. Such as:—

- (a) The very small lesion.
- (b) The unusual type of lesion: e.g., a plaque.
- (c) Cancer in a site difficult to examine completely.
- (d) Cancer of the pylorus.
- (e) Cancer superimposed on a pre-existing deformity such as cascade stomach or hiatus hernia.
- (f) Ulcer-cancers.

(a) *The very small lesion.*—This is the type we search for so anxiously, and find so rarely. Obviously a growth in its beginnings may be very difficult to show radiologically, but that is not why we so rarely detect them. As in that stage they are symptomless, they are never sent for examination. In malignant degeneration of a simple peptic ulcer the cancer element gives no evidence of its presence at first, but persistence of the ulcer despite treatment may suggest the diagnosis. But as these are in any case rare, how helpless we are to entice early symptomless cancers into our X-ray departments. Russell Morgan, of Boston, U.S.A., has launched a scheme for mass miniature barium meal

examination of the population over forty years of age. Already he has picked up a number of symptomless early gastric cancers, but I have doubts whether this is a practical scheme. To be an effective method, the examination would have to be repeated every six months for the rest of the subject's life, which would need a huge organisation to cover the whole population over 40 years of age, at a cost which the national economy of most countries could not bear.

If we are to detect these early lesions there are some points in technique that should be mentioned. The barium-filled stomach will mask many an early lesion;



Fig. 1—Early carcinoma of the stomach verified at operation. The only sign in this picture is the irregularity of the greater curve in the pars pylorica, at first mistaken for a pressure defect from gas in the transverse colon.

only if it is viewed in profile will it then be seen. Berg's aphorism "The less you give, the more you see" is undoubtedly applicable here, and the study of the mucosal pattern becomes of supreme importance. With a conveniently controlled motor-driven tilting table it should be possible to demonstrate the mucosal pattern of almost every part of the stomach. The stomach must be quite empty beforehand, the emulsion must be one that is not agglomerated by the gastric juice and the examination must be painstaking, with compression pictures of the parts of the stomach accessible to compression, and supine, prone and oblique pictures of the rest of the stomach.

(Fig. 1) is a case in point. The small irregularity of the greater curve was discounted by a very expert radiologist; on being shown the film I agreed. Yet it proved at operation to be malignant and a detailed study of the mucosal pattern would have probably shown the growth.

(b) *The unusual type of lesion.*—The carcinomatous plaque is an example of this. It may be discovered only after painstaking search, and may closely simulate a localised patch of hypertrophic gastritis; and it may not be possible to distinguish between the two (Fig. 2). You should search closely for peptic ulcer, which is the commonest cause of a coarse rugal pattern. If no ulcer is visible, only reluctantly and after repeated critical search, should you label the lesion a hypertrophic gastritis. (Fig. 3), is a case in point. The patient is a high powered business executive of 45 years, highly strung, hard working and hard drinking. I have examined his stomach for ten years and the issue is not now in doubt. The antral ulcer and filling defect suggested a growth, but the coarse fundal pattern indicates a gastritis. Schindler states that a hypertrophic gastritis cannot be diagnosed by X-rays.

This may be true of some cases, but in many the X-ray appearances are typical.



Fig. 2.—Carcinomatous plaque high up on the greater curve.

The reverse picture is shown in (Figs. 4 and 5), which looked superficially like a healing lesser curve ulcer, except the rugae were interrupted. I suggested that it might be malignant, but the patient refused any further investigation or treatment. Four years later she came back with a midgastric obstruction from the growth and died of starvation a few weeks later.



Fig. 3.—Hypertrophic gastritis.

(c) *The site difficult to examine.*—In this group I give pride of place to the cardia and fundus. It is a region inaccessible to radioscopy palpation and an exhaustive study of the mucosal pattern is often not possible. Add to that normal irregularity of the mucosal pattern, compared with the ordered symmetry of that of the lesser curve, and the difficulty is obvious. The cardia and surrounding fundus are blind spots to the gastroscope, and so an important corroboration may be lacking. Time was when missing a cancer in this region wasn't all that important. The patient was doomed, anyway. Now, with transthoracic oesophago-gastrectomy a satisfactory operation with a reasonable mortality risk, it is supremely important to recognize growths of and near the cardia in an early stage, when surgical removal is possible.

The classic signs of established carcinoma of the cardia and surrounding fundus are well known: the delay at the cardia, with loss of the normal intermittent spurt, the splitting of the barium stream, the coating of the tumour mass and absence of a regular mucosal pattern: the outlining of the

tumour by the gas bubble, and by the barium in the supine view, and the thickened diaphragmatic shadow above the fundus.

In the early case few of these signs may be present, and it may be extremely difficult to differentiate between an early growth, a hypertrophic gastritis, and an anatomical variation. Rarer causes of difficulty in the differential diagnosis are indentation of the fundus by an aberrant spleen, or by an enlarged spleen in congestive cardiac failure. In one case seen by the writer fibrinous deposit in the left cupola following perforated pyloric ulcer caused a very suspicious fundal filling defect.

(d) *Pyloric Cancers.*—These are notoriously difficult to disentangle. It is a common site for hypertrophic gastritis and also for cancer. Often we can show the lesion quite clearly, but be uncertain of its precise nature unless by serial radiology month by month or by gastroscopy.

Fig. 6 shows a filling defect of the pyloric antrum, which is typical of a carcinoma, yet the operation and biopsy

findings and the after history proved it to be simple. The case illustrated in (Fig. 7), showed an ulcer crater on the pyloric antrum



Fig. 4—Carcinoma simulating a healed lesser curve ulcer: operation refused (*vide* Fig. 5)

near the greater curve. This case was gastroscopied and the suspicions of malignancy confirmed. At operation there were no signs of malignancy, but gastrectomy, was performed on the radiological and

gastroscopic appearance. On section a few carcinoma cells were formed in the adjacent muscle coat and in a lymph node.

(e) *Pre-existing Deformity*.—An example of this is a carcinoma in a herniated gastric fundus (Fig. 8). Another is the contracted pyloric antrum after posterior gastro-jejunostomy (Fig. 9).

(f) *The Ulcer-Cancer Problem*.—A carcinomatous ulcer can arise in two ways: (i) ulceration of a carcinomatous nodule or plaque, and (ii) malignant degeneration of a simple peptic ulcer. Much controversy has raged around the frequency of the latter. C. H. Mayo, Wildon and MacCarty (1924) of the Mayo Clinic propounded the view that many cancers supervened on simple peptic ulcer. This view is supported by Moynihan, Sherren, Pauchet and Maingot. Ogilvie and Schindler hold the contrary. The last mentioned states that in the long series of simple gastric ulcers he had gastroscopied serially over years, he has never met one that became malignant. The weight of pathological evidence is against the theory. Although the pathologists at the Mayo clinic stated that 68% of apparently simple ulcers showed microscopical evidence of cancer, such authorities as Ewing, Dible, Spilsbury, Cameron and Newcomb have placed a different interpretation on the histological appearances. As Spilsbury put it: "There are commonly found at the edge of the ulcer, gland cells which have penetrated deeply into the scar tissue and are cut off from the regenerating glands. They may exhibit an atypical glandular arrangement, or may form narrow columns of cells: isolated cells are also seen. It is these cells detached from the regenerating epithelium and buried in the fibrous tissue of the ulcer which are sometimes referred to as precancerous, and which, from their



Fig. 5—Same case as Fig. 4 four years later, showing almost complete midgastric obstruction and reflex oesophageal dilatation.

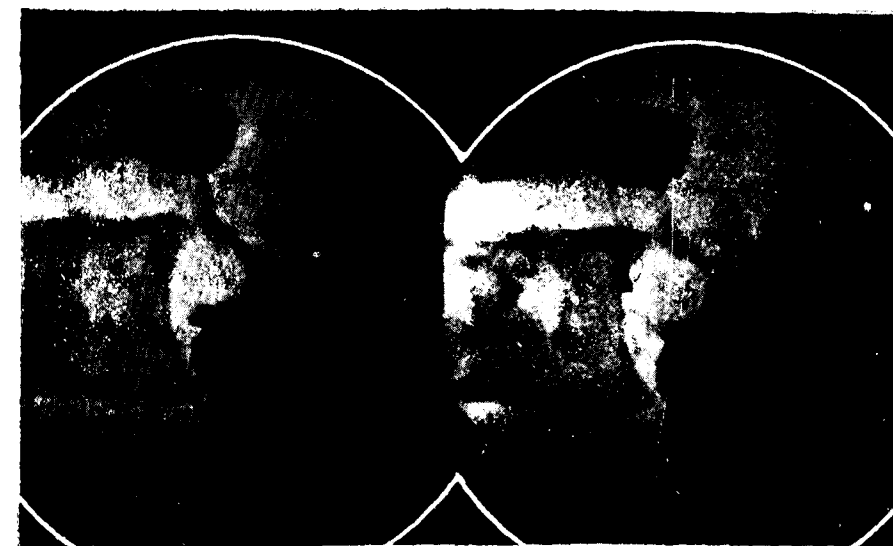


Fig. 6—Spasm and gastritis of pyloric antrum simulating stenosing carcinoma. (For details see text.)



Fig 7.—Malignant ulcer (For details see text)

position and irregular arrangement, are regarded by others as indicating malignant transformation of the ulcer". Newcomb's criteria for the pre-existence of a simple peptic ulcer in an ulcerating carcinoma are as follows: (1) Complete destruction of an area of muscle corresponding to the floor of the ulcer; (2) the presence of a large area of dense fibrous and granulation tissue in the floor; (3) the presence of endarteritis obliterans in the surrounding vessels;

(4) fusion of the muscularis mucosae with the muscular coat at the margin of the ulcer. Of these by far the most valuable is the last, and it is the only certain evidence that a cancer has arisen from a previous simple ulcer. Using this criterion, Newcomb found that only 13% of cancers showed evidence of an antecedent peptic ulcer, and that 3-3% of ulcers showed a malignant change. Matthew Stewart's figures (table 1) are of interest in this connexion.

TABLE—1

Analysis of 733 stomachs surgically excised for chronic gastric ulcer or cancer 1921-1940 (Matthew Stewart).

Independent chronic gastric ulcer		459	+
Independent cancer		230	+
Ulcer cancer		51	

Incidence of Ulcer-Cancer

Total stomachs with chronic ulcer		510
Ulcer-Cancer 51 (10%)		
Total stomachs with cancer		281
Ulcer-Cancer 51 (18%)		

+ In 7 instances, unrelated ulcer and cancer were present in the same stomach.



Fig. 8—Hiatus hernia and carcinoma of the fundus. Transthoracic oesophago-gastrectomy successfully performed.

Certain clinical evidence is also against the peptic ulcer cancer sequence being a common one. The average history of symptoms in peptic ulcer is about five to seven years; in cancer it is about six months. If the majority of cancers supervened on simple ulcer one would have expected a longer history in the cancer groups. Again,

the great majority of simple gastric ulcers are on the lesser curve, while the pyloric antrum is the site of election for a cancer.

It seems, therefore, that the theory of frequent degeneration of a simple ulcer into a cancer should be abandoned. That it does occur, as in chronic ulcers elsewhere, is



Fig. 9—Contracted pyloric antrum following posterior gastro-jejunostomy, simulating scirrhus carcinoma.



Fig. 10—(a) Large simple ulcer, which healed in 3 months.
(b) Large malignant ulcer, penetrating liver and pancreas, confirmed by operation and biopsy.

undoubted, but most authorities believe that not more than 5% of chronic ulcers become malignant, and that not more than 10–15% of gastric cancers arise from chronic ulcers. Curiously, it never seems to occur in duodenal ulcer, a much more chronic type.

Carcinomatous ulcer.—To determine whether a gastric ulcer is simple or malignant may be one of the most difficult of radiological problems. Often it is impossible to say from the X-ray features alone.

If ulceration occurs in an already existing tumour mass of some size, the signs of the mass itself will make the diagnosis clear, and it is in the cases of malignant degeneration of simple peptic ulcer, or ulceration of a small tumour, that the chief difficulty arises.

In making a differential diagnosis, the following points should be considered:

Size.—Any ulcer larger than 2.5 cm. in diameter should be suspected as malignant until it has been proved to be simple. The larger the ulcer the greater should be the suspicion. Many large ulcers will, in fact, turn out to be simple, but the maxim is none the less a sound one. (Fig. 10a & b).

Shape.—The simple ulcer tends to be hemispherical, regular in contour and sharply defined. Malignant ulcers tend to be irregular.

Meniscus sign.—Kirklin has drawn attention to an appearance, named by him the meniscus, seen in many malignant ulcers on and near the lesser curve. It is a translucent zone a few mm. in width, separating the



Fig. 11-a.

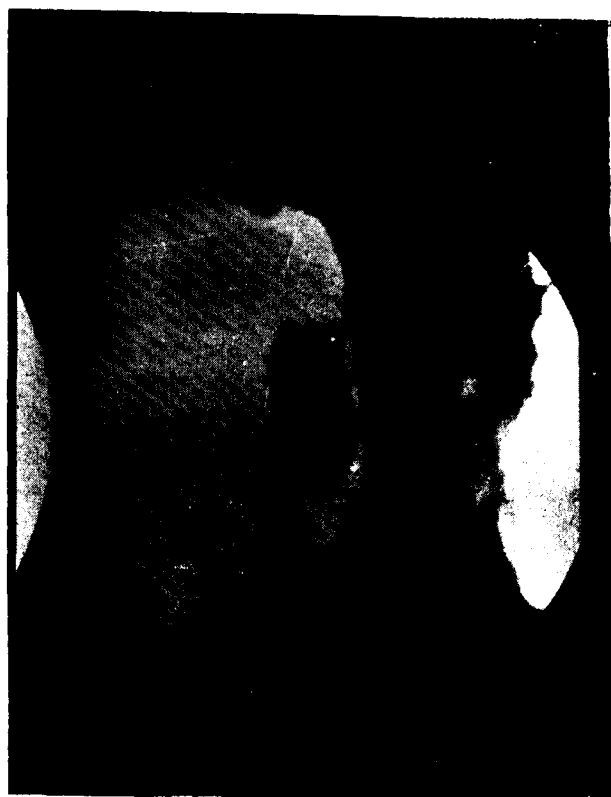


Fig. 11-b.

barium-filled crater from the main barium mass in the stomach, and is due to the hardgrowing malignant edge of the ulcer. Some chronic simple ulcers show the same appearance, if they have a very raised oedematous edge. (Fig. 11a) shows a meniscus sign in a malignant ulcer, and (Fig. 11b), an almost identical appearance in a simple ulcer. Some say that the malignant meniscus is intra-luminal, while the meniscus of simple ulcer is on the contour line.

This is by no means invariable. A simple ulcer on the posterior wall close to the lesser curve may produce an intra-luminal meniscus.

Site.—This is of importance. Simple ulcer is usually on the lesser curve, distant from

the pylorus. A malignant ulcer is variable in site, but most commonly on the lesser curve near the pylorus. Those on the greater curve—they are uncommon—are nearly always malignant.

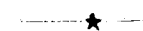
Therapeutic test. This is of great value in differentiating the two types. A simple ulcer should heal in a few weeks under medical treatment, a malignant one will not. Again there is a reservation. A malignant ulcer may also, for a time, get smaller during treatment for peptic ulcer. Hellmer records four such cases. He ascribes the diminution to resolution of mucosal oedema, scirrhus contracture, and/or filling of the crater by tumour tissue. The serial X-ray examinations should therefore continue till the ulcer has disappeared and for some weeks after, to make sure that it does not reappear.

Rugae.—In simple chronic ulcer these tend to converge to the crater. In malignant ulcer they are said to be interrupted without converging. This again is not always the case. In simple long-standing chronic ulcer which has undergone malignant degeneration the rugae may converge to the crater, as a result of scarring.

If, after careful survey of all the above X-ray features, there is little doubt (and there often is), the radiologist should not hesitate to say so. The anamnesis, the clinical features and gastroscopy will all afford further evidence, and as a last resort surgical exploration may be necessary. It is far better to cure a simple ulcer by partial gastrectomy than miss a carcinoma.

What conclusions would I suggest from these observations? Firstly, that radiology is the simplest and easiest method of showing an organic lesion in the stomach, and should have first place after clinical examination in the investigation of a suspected gastric carcinoma. In the majority of cases, alas, the diagnosis is all too clear, for the majority of cases are not investigated till

the disease is advanced. In many of the early cases, however, radiology can show the lesion, but not its nature. And in these cases, I would make a strong plea for the routine use of gastroscopy. Were the gastroscope easier to swallow than the barium meal? I think it might take first place in the investigation of gastric cases. If all these methods, clinical, radiological and gastroscopic, fail to give the answer, surgical exploration is the last resort, and biopsy. But “*Quis custodiet ipsos custodes?*” Who is there to reveal the mistakes of the biopsy? While I am convinced that the X-ray method remains the most important method of examination in the investigation of gastric cases, it is, nevertheless, only one weapon, and by itself liable, in some cases, to mislead. The final decision must remain with the clinician, who in his gastric clinic must have available all ancillary methods at his disposal, radiology, gastroscopy, clinical pathology and the weighing machine, if he is to be successful in dealing with this most difficult problem, the detection of early cancer of the stomach.



Presidential Address*

BY

Dr. DIWAN CHAND AGARWAL, New Delhi.

Venue: Medical College, Calcutta.

Distinguished members of the medical profession, fellow delegates, ladies and gentlemen.

I feel overwhelmed by the honour you have bestowed on me by electing me the President of our Association for the year. Since the revival of our Association in 1946, I have been a quiet follower and an observer of its activities, attending most of its Sessions at different places, except when the circumstances resulting from displacement, as the result of partition forced me to be absent. While I gained considerably in knowledge, experience and friendship, I sometimes felt depressed and unhappy as well about some of the occurrences. I do hope, for the remaining years of my life, and with your co-operation for the good of our Association and the Science of Radiology such occasions for depression and unhappiness will not arise.

I feel if we could all develop a habit of asking our ourselves as to whether our actions are in the highest interests of our Association, and for the advancement of Radiology for service to our patients and for the sake of science, or whether they are an outward reflection of our personal likes or dislikes, it will make all the difference for advancement of our Association.

It is, to my mind, unfortunately our national weakness to waste time in minor irritations and analyses and interpretations of rules and regulations and in magnifying overlookable shortcomings out of proportion

to our functions as radiologists. I beg to be excused if I may say that sometimes such analyses and interpretations are mere cloaks to hide our likes and dislikes.

I am sorry to refer to these points in a presidential address. I do so because I feel so strongly. I most sincerely appeal to our members of the futility of such bickerings, in the interests of our Association.

Since we restarted our full activities in 1946 we have a well-run Journal. Publications of a Souvenir Number which is a first rate compilation of works of recognised authorities on the subject of radiology deserves our sincere praise of those who worked for it. Another regular feature of great importance has been the annual Sir Jagdish Memorial Lecture. Eminent radiologists of international reputation have graced the list of Sir Jagdish Memorial Lectures. Some of them came in person for which we are very grateful. Much has, however, yet to be accomplished. Many important resolutions passed at our Annual Congress need our sustained efforts to get them implemented. I shall briefly refer to some of these, beginning with the Radiology Act.

Radiological Act

Although there was an unfortunate setback in the withdrawal of bill due to unexpected opposition by the Indian Medical Association, not realising the necessity for such a legislation, it is hoped that the recent editorial in the Journal of

Indian Medical Association for July 16, 1956 will help the main Medical Association to co-operate with the Radiological Association in having a legislation enacted and to their retracting the wrong already done in this direction. Due to advances in medicine as the result of isotopes and radiation hazards, besides vast and fascinating advances in radio-diagnosis and therapy, no country in the world can afford to remain without control over the use of various types of apparatus for radiations. Dr. Mody in his editorial of our Journal for November 1956 has once again drawn pointed attention to this aspect both of the Indian Medical Association as well as that of the Government. I understand legislation already exists in several countries that no one can start radiological practice without proper training. There is no reason why there should be no such legislation in our country.

With regard to the manufacture of X-Ray equipment and X-Ray films, in spite of the commendable pioneer efforts of one or two individuals I feel the manufacture of modern X-Ray equipment is dependent on development and co-ordination of a number of basic industries. Individual efforts cannot and will not succeed in the manufacture of complete up-to-date equipment. Our Government aiming at a socialist society, should have realised long ago that it is a fit and vital line for development in the public sector. Modern medical, especially surgical needs of the country, cannot be fulfilled without the Government's full attention to this matter. Even small countries like Denmark, for example, are manufacturing X-Ray equipment besides industrially well advanced small countries like Sweden and Japan.

Customs duty on surgical, medical and electro-medical equipment, which are vital for the health of the nation, I feel should be at par with duty on Industrial machinery.

A combination of the simplest all round unit *i.e.* a 100 M. A. unit costs nearly Rs. 25,000 -. And a single deep therapy unit of conventional type costs from Rs. 60,000/- to over one lakh. Modern equipments for modern routine examination of gastro-intestinal tract, along with their accessories, cost almost a lakh of rupees. These prices are out of all proportion to costs of medical and surgical equipments for any one to start treating patients. I feel it is a fit case for representation to the Government that customs duty on X-Ray Equipment should be reduced and brought in line with that of machinery for Industrial purposes.

In this connection, it is desirable to note, that, whereas the duty on surgical and electro-medical equipment is at present 20%—which as indicated above should be less and in level with that on industrial machinery—the customs duty on X-Ray films is 34%. Representation should be made for an early removal of this anomaly.

To add to the unrealistic approach of the authorities, the sales tax on X-Ray films has been further raised to a high level than on several other items, as X-Ray films are grouped under luxury goods, at least in Delhi. This is evidently most unjust.

I am sure that sustained efforts during the year will be directed towards achieving these ends by our Association.

Next I would like to deal with the status of radiologists. In Madras, in 1954, we passed a resolution that the status and emoluments and privileges of the staff of the department of Radiology in hospitals and Institutions should be at par with those of the surgeons and physicians.

I do not know what our efforts and their result have been during these years. This matter needs our constant attention so that supply of brilliant personnel for this speciality

*Eleventh Indian Congress of Radiology, Calcutta, 1957.

is not hampered as is already the case in certain places, and also as is the case for finding suitable personnel for basic subjects like anatomy and physiology.

I would like to deal with this subject somewhat in detail so as to focus the attention of the Government, our medical colleges, our medical colleagues and indirectly the public on the subject.

The respect and status of radiologists depend to some extent on their own selves. We have to remove many misconceptions among our medical colleagues, the Government and the public. For this we have to undertake a good deal of pioneer work in establishing and bringing home to them the vast knowledge required for the proper functioning of our speciality.

For a long time, to come, most of the Government hospitals in big cities and even some of the teaching hospitals will have to be staffed with Radiologists trained for both, radio-diagnosis and radio-therapy though in some places we have already separate chairs for radio-diagnosis and radio-therapy.

To be efficient in radio-therapy an upto-date knowledge of physics as applied to this speciality is a necessity. This knowledge of physics has to be of a more comprehensive nature than it is to be for any other branch of the medical science. There is the ever widening field of Radio-therapy in the utilization of radiations produced at 1-3 and even several million volts.

And in passing, I would like to say a few words in this connection, because of the tendency in certain quarters for the acquisition of mega or super-volt therapy equipment, such as radio active cobalt, etc. Such equipments are too costly for this stage of development of our country. There is no doubt about certain advantages in favour of super or mega volt equipment, such as,

depth effects, less damage to skin, fewer fields, less injury to tissues, better dosage calculations even in the regions where bones intervene. But even a recent symposium of workers in the field of mega or super voltage therapy do not indicate any very marked improvement of results other than those indicated above over cases where conventional deep therapy has been used. Even in specially selected tumours for which super and mega volt therapy is indicated the percentage of improvement is stated to be 10 to 15%. This increase does not represent improvement in the total number of cases treated with super voltage therapy, and refers only to specialised lesions such as tumours of testis for which this treatment is more useful. For most other conditions conventional deep therapy is safer, much more economical and has to be the "work horse" of radiation therapy, and as a basis of teaching radio-therapy to younger people. In the absence of well-trained personnel, super and mega volt therapy will be a source more of harm than good. The cost of treatment of individual cases will be prohibitive for the government hospitals. With the same amount of money several centres could be maintained with conventional deep therapy equipment.

The radiologists have of necessity to be good clinicians without which planning and guidance for diagnostic and therapeutic procedures and their proper evaluation will be impossible, and without which it will be impossible for them to discuss their cases with the clinicians and specialists practising in various medical and surgical specialities, both for diagnostic and therapeutic purposes.

Then there is the ever increasing field of gastroenterology specially of oesophagus and small intestines hitherto not considered much amenable to radiological diagnosis, spleno-graphy, aortography, cardioangiography,

etc., which put further demands on the scholarship and knowledge of those practising radiology. The fascinating field of future trends in the way of cardiac radiology for diagnostic purposes such as cinerentgenography with very high frequencies of 500 to 1,000 frames per second, with image intensification techniques and some other techniques. Even for diseases of bones usually considered most easy, the knowledge of pathology on several occasions has to be very upto-date. I sometimes find their interpretation more difficult than those of roentgenograms of other regions. Therefore, efforts are essential to make this speciality attractive for people of high calibre. There is no doubt, need for further specialisation in various branches of radiology without which it will be difficult for us to raise our heads in adding to Medical Research.

To have these specialists within a speciality and at the same time fully utilize their training and knowledge will not be possible till the general economic level of the country rises, so that we are able to have suitably equipped hospitals with facilities for the ever advancing means of investigations. Till then the general radiologists both in service and in private practice have to equip themselves to discharge the functions of specialist in different fields of radiology with extra hard labour with sound basic knowledge of anatomy physiology, pathology clinical medicine, etc.

A few words about what in my opinion stand in the way of radiologists to have the same status as the practitioners of other branches of medicine and their remedy.

I shall in the first instance blame the radiologists themselves for not educating their medical colleagues about the great advances already made and which are in the course of being made. Even some of

our distinguished medical and surgical colleagues are not made fully conversant with the scope of help and assistance of often a vital nature that we can give them. I can say from personal experience that some times our colleagues are impervious to what we tell them, but when they hear the same things from visiting dignitaries they show their surprise. In comparison with the younger age of our speciality it has expanded and is expanding very rapidly as a result of new discoveries which have given us equipment with a wider scope of usefulness and as a result of hard work of radiologists all over the world. I have no doubt that if we keep our knowledge of the subject up to date and continue to render efficient help in the diagnostic and therapeutic problems by careful and hard work undeterred by rebuffs, our medical colleagues in other specialities are bound to listen to us. Unfortunately it will be difficult for us for some time to interest the administrators in our important speciality because of its highly technical nature and because we are not able to oblige them as much as the physicians and surgeons can. But ultimately, I am sure we can succeed if we work hard to raise our professional standards. Our administrators should, however, realise that advances, both in surgical and medical treatment have been contributed to a very major extent by advances in radiology. Unfortunately the existing circumstances are such that the requisite type of medical men are not being attracted to this speciality which must be made attractive if medicine is to advance in this country. In case such young men do feel fascinated by an insight into the possibilities of the future of radiology they are soon disillusioned when working in radiology departments of Government and public institutions. They do not find opportunities for fulfilling their ambitions.

Creation of a number of ill-equipped centre which are manned by ill-trained staff in Government, charitable and private institutions, in my opinion, are a great set back for respect of radiologists in the minds of the Government, our medical colleagues and the public.

As in case of all other scientific advances "X-Rays are also in the air". Every district board, municipality, tehsil headquarter and charitable institution try to have an X-Ray unit. They want it because the modern means of dissemination of knowledge makes them feel that no hospital is complete without an X-Ray unit. As the funds of most of these hospitals do not allow installations of modern X-Ray equipment to fulfil the requisites for which "X-Rays have come on the air", they get 10 to 50 M.A. units and all sorts of X-Ray investigations are attempted with them, even in some of the Government hospitals. Because of lack of personnel the so called radiologists in such hospitals part-time doctors who took their training for two to three months in X-Ray department of bigger hospitals. Such a brief training in my opinion only makes matters worse, unless strict instructions are issued that only fracture and medico-legal cases are handled by people so trained. For other examinations, patients should be referred to well equipped and well staffed hospitals. Such inadequate arrangements are a great impediment to the realisation of proper status of radiology and radiologists by the public, our medical colleagues and the Government, because defective arrangements are more often a cause of misleading instead of helping the patient.

Factors of Costs for X-Ray Examination

(Both in Hospitals and in Private Clinics)

Daily we hear lectures from our politicians and sometimes from some of our

health ministers that modern medical treatment and modern diagnostic aids are beyond the reach of our average countrymen. I would go perhaps even further than them. Even in well to do countries like America there is the same problem. The reason is that with the rise of economic level of any community and advancement of knowledge as a result of modern teaching in medical colleges, the demand for specialised services and super-specialised services cannot be prevented from increasing. The costs are rising, no doubt, but diagnostic and treatment possibilities are also rising.

The rise in costs is inevitable because of the rising cost of living and the rising cost of medical education, and because the time and money required for this specialization and further the rising costs of further super specialization in various specialised branches of different subjects.

The substitution of the so called cheaper systems of medicine can only be an expedient for some kind of propaganda of having opened so many hospitals, and treated so many patients in these hospitals, most of them ill-equipped and ill-staffed for the alleged large number of patients treated.

The analysis of some of the official figures will indicate as to what type of treatment could have been possible with the type of staff and material supplied in these hospitals. These figures are good perhaps for propaganda value, and perhaps for giving some mental satisfaction to people treated in these institutions. In the same way as people get mental satisfaction by spiritual healers like sadhus and sellers of quack medicines.

Making medical education absolutely free not for their favourites, but for the most brilliant material that may be selected for medical education and absolutely no nomination, assuring a decent living

after graduation will be the right step towards gradual development of socialisation of medicine and cheap treatment for the public. But then the cost to the state will be tremendous. The rise in costs is inevitable because of the rising cost of living and the rising cost of medical education, and because of the time and money required for this specialisation and further because of the rising cost of additional specialisation in various specialised branches of medicine as I have already pointed out. In England the cost of maintaining one hospital bed is between £ 24 to £ 30 a week, that is about Rs. 55/- per day. It is much higher in America where everybody has to pay in accordance with his or her income.

Future of Private Practice in Radiology

Now I come to the subject of the future of private practice in radiology. I would request you to excuse me for referring to my personal experience in support of my conclusions.

Graduating in 1920, I started to practise in this line early in 1924 after the then available two months course in the only teaching centre—the Government X-Ray Institute of India, Dehra Dun, starting with induction coil, gas tubes and mercury interrupters purchased from the Government stores surplus after the first great war. Looking back I feel had there been even a remote indication of the scope and expensive nature of the line, I would never have given up my general practice. Even at that remote time, private practice in Radiology was not easy and lucrative, because in Lahore the richer type of patients were far fewer than in places like Bombay, Calcutta and Madras and the well established Mayo Hospital was patronised by the teaching staff who were allowed private practice. In spite of the difficulties I was lucky in establishing myself.

Having been uprooted from Lahore I had to restart in new surroundings and with new worries and difficulties which were unlike the ones which one came across in normal life, difficulties which should have disappeared after Independence but are unfortunately still continuing because of Independence with partition.

Thus I have watched the progress of Radiology in private practice when the field was apparently quite raw, and now when the field looks saturated and its shape is daily changing because of the tremendous advances in equipment and their costs and the technique of modern investigations. The rising cost of equipment and the difficulties of getting fair returns for the money invested, there is no bright future for private practice in our country, in spite of the fact that good radiologists in private practice will be required for a long time till our economic conditions improve and socialisation of medicine is possible.

Laying aside the expectations and notions of the lay public, I am sorry to say many of our medical colleagues unfortunately do not know the vastness, costliness and limitations of the field. They think that the practice of radiology is a gold mine. Even some of the radiologists in service consider that practice of radiology is a gold mine. I can assure them that though this practice has given some name and reputation to me, from the monetary point of view it is not as it is considered by our colleagues. Modern radiological as well as surgical practice, especially in big cities with lot of competition and expensive and elaborate equipments and their maintenance is not and will never be a moneymaking line.

The figures given for cost of free treatments on a single hospital bed in well-equipped and staffed hospitals in England and other reasons given in this address

should make our esteemed medical colleagues and the public, besides the Government that X-Ray examinations in private practice have to be very costly for a well-equipped and well-staffed private clinic.

The time for humble start with portable machines as equivalent to my humble beginning with an induction coil and gas tubes purchased from Government surplus stores with the object of making radiology as one's special subject in big cities to make a decent living is now past. I have actually noticed a number of failures. It will become even more and more difficult when newly qualified medical graduates accustomed to see advancement of radiological knowledge in their curricular grow older and demand higher type of radiological knowledge and technique. I use the words "grow older" as unfortunately their guidance in the first few years of their professional life is not trusted.

Factors contributing to this State of Affairs and Some Remedies

The first, as I have also said previously, is lack of knowledge of our medical colleagues about the greatly widened field of radio diagnosis as well as the limitations of the same. For this state of affair as already pointed out, we are mainly to be blamed. It is for us to enlighten them about the great advances, not only those that have already been made, but also the future trends of radio diagnosis and therapy. We have to prove to them that radiotherapy is not delivering so many "rs", and radio diagnosis is not merely taking of pictures. Their ability to make their own judgement from mere skiagrams is in most cases limited. Our medical colleagues sometimes attempt to make diagnosis even from hopelessly defective and shaky skiagrams. And sometimes they are even satisfied by the interpretation conveyed on such defective skiagrams.

Besides, their lack of appreciation of expenses involved to the radiologists in undertaking some of the procedures possible in private practice with modern tools and training makes them exhibit misplaced sympathy for even those patients who can well afford to and even desire proper investigation.

If these factors were absent, I am of the view, that at least in very big cities many more well-equipped clinics could be run than are at present, even hardly maintaining themselves well. I would not like to waste your time in further elaborating these views.

I would not like to refer again to the extremely widened field of radio-diagnosis but refer to the limitations and difficulties of the practising radiologists. I refer to this matter in particular because some of our medical colleagues are liable to ignore what help they get from us and think only of limitations, which are sometimes inherent in both radio-diagnosis and radiotherapy.

In the Cancer Seminar of August 1956, a few cases are cited with illustrations and photos of microscopic sections. I briefly refer to one case to indicate that sometimes the best known radiologist can differ even when supplied with clinical material. Even after operative removal of a mass the microscopic interpretation submitted by various pathologists on the same section are not unanimous.

A mass was felt upper abdominal quadrant in a routine insurance examination. On pycelographic examination it looked like a benign relatively innocent cystic lesion in the lower lobe of the kidney with some calcium deposit in the periphery of the lesion. Radiographic impressions submitted by mail on the skiagrams, and the pathological report on the sections give very interesting data.

Histopathologic Diagnoses Submitted by Mail:

Clear-cell adenocarcinoma	...	66
Hypernephroma	...	50
Adenocarcinoma	...	40
Renal cell adenocarcinoma	...	17
Tubular adenocarcinoma	...	8
Papillary adenocarcinoma	...	5
Adenoma	...	4

Radiologic Impressions Submitted by Mail:

Benign renal cyst	...	62
Pancreatic cyst	...	21
Echinococcus cyst	...	15
Mesenteric cyst	...	6
Malignant tumour	...	24
Others	...	3

In spite of such limitations modern advancement in medicine specially surgery would not have been possible without advancement in radiology.

Secondly, I refer to the creation of overnight radiologists by representatives of manufacturing firms. I quite agree that as business concerns have to sell equipment to whomsoever pays. I do not question their right, I only refer to the state of things.

Such overnight radiologists either in private practice or semi-charitable institutions are a great menace to the advancement of radiology, for they set false values among the public and unfortunately even among our medical colleagues. The remedy will lie in properly worked out Radiology Act, and in our guidance of our medical colleagues.

I understand that in some of the Western countries where private radiologists are dependent on references by Insurance Companies, these Companies insist, for example, that a chest examination or a G. I. examination has to be undertaken with particular output of their equipment in clinics with properly qualified personnel.

In this connection I like to quote in full from a letter received to fully explain the conditions in those countries:—

"The Insurance Companies which are members of the Health Insurance Scheme in Germany have decided to honour only the bills submitted by the various radiologists for certain type of examinations under the conditions that they have suitable X-Ray plants for the examination. In order to explain this more in detail I would like to mention that for a lung picture a certain minimum M. A. at a certain minimum K. V. is required and only in case the radiologist possesses a plant of this minimum output he can submit bills for lung radiographs taken on patients to the Insurance Company. This applies also for stomach examinations, extremities, etc. The idea of this regulation is that radiologists with plants of very low output are then not recognized and the Insurance Companies can be sure that a proper examination of a patient is carried out.

"I also understand that various other countries in Europe have also certain restrictions as regards opening of X-Ray clinics. The radiologist concerned has to prove that he has a minimum qualification by passing certain examination in medicine as well as radiology. They have further to undergo a minimum practical training of three years in a recognized teaching institution (Institution attached to the University). After this practical training only a doctor has the right to become a radiologist and he can then apply to the authorities for permission to open an X-Ray clinic. This again means that the authorities concerned (Government authorities as well as Medical Association) have to verify the qualifications of the candidate and the necessity for opening a new X-Ray clinic. The idea is that first of all only highly qualified radiologists are allowed to open

X-Ray clinics and secondly the number of X-Ray clinics will not increase disproportionately and heavy competition will force the various radiologists to reduce their rates in an unhealthy way. As far as I know, this practice is in force since quite a number of years and has proved to be useful to both radiologists as well as the patients".

Another hindrance is the unrestricted availability of X-Ray examinations in Government and charitable or semi-charitable hospitals for patients not undergoing treatments in hospitals. Some of these patients manage to get themselves admitted only for the sake of getting the examination done. There being no arrangements for almoner or arrangements for a form to be signed on oath, very well-to-do patients get these investigations done free. Whereas, the poor and really deserving patients find it difficult to have such investigations done. I can well understand specialised examinations being done in hospitals for which proper facilities are not available with the private radiologists. But I cannot understand why even cases of fracture, or examinations of chest or pyelography or cholestography, etc., should be done in hospitals for patients not getting hospital treatments, or getting admission only for such examinations especially when such examinations could be efficiently done outside hospitals. But, there can be cases who will prefer to have examination in hospitals because they are better equipped or better staffed. Such patients must pay in full, and no concession should be allowed on the basis of the lower income.

Now I would like to refer briefly to a somewhat ticklish question for your consideration as to whether radiologists, especially in private practice should charge for a particular type of examination or on the basis of number of films taken.

There is no doubt, let me be permitted to say at the outset, that the proper method is to charge for an examination. But then, you have to understand the inherent difficulties of this system and you have to see whether one or the other or a combination of both has to be adopted.

As I should indicate my views, I feel that a combination of the two systems is the only possibility for radiologists in private practice.

Perhaps people who advocate charges without any consideration at all of the number of skiagrams do not realise the difficulties of private practitioners.

I shall illustrate my point by a few examples.

Take the comparatively simple case of chest examination. Your knowledge tells you that a large number of all cases should be examined in both views. Then you feel that at least for some early suspicious cases in the upper parts of lungs, you may have to take lordotic views as well and sometimes even oblique views. Again some points may have to be clarified by the use of different penetration. Now one radiologist fixes his charges considering all possibilities, and other one just takes one view and does perhaps screening as well, and in the majority of cases that is enough. Again take the spine - the two views A. P. and Lateral are considered and quite well known. But then for several cases your knowledge requires that oblique views may also have to be taken specially in cases of sciatica or low back pain. Similarly for examination of gall bladder, you feel that besides a control film, examination after the contrast medium may in a good many cases need examination in supine slightly oblique, standing or P. A. views, with patient in lateral position. After fatty meal, you may need to examine till the gall bladder is empty, etc. And then,

if the examination by mouth fails to visualise the ducts or the gall bladder you have to proceed with intravenous examination, so on and so forth.

Of course there is one field in which this method of lump charges is practical such as examination of oesophagus alone or for gastroduodenal region peptic ulcer or growth, or for ileocaecal region or for a general survey of G. I. track with emphasis or particular areas suggested by clinical examination.

Perhaps the protagonists of lump charges will say that charge for the examination and the cost of film for any subsequent examination, as if there is no expense in time, labour and the cost in depreciation and cost of equipment, staff and other items.

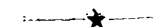
I hope my younger friends who are attracted to the possibilities of this line will not be disheartened. For I believe if they could so train themselves as to work for the love of the subject, no amount of money, praise, publicity or recognition will compensate for the joy that they will derive from such work. Running after publicity or recognition, I agree is also an incentive and

one is tempted to stop and listen to ones praise, which according to Einstein is the personal praise of corruption which has to be avoided like other forms of corruption, otherwise, we shall be entangled in making all kinds of efforts, to be praised out of all proportion to what we even may deserve. Mere listening to one's praise unsolicited is also corrupting if we aim the highest form of pleasure.

Ladies, gentlemen and fellow delegates, I have given you somewhat disconnected views on the development of Radiology in our country. I have conveyed my observations made as a quiet and unknown observer. If I have raised my feeble and humble voice in conveying any criticisms, it has been done only with the object of seeing that radiology which is one of the vital points in the advancement of modern medicine is accorded a status which is its due.

I feel I have taken too much of your time and tested your patience too long and I apologise for it. My grateful thanks are due to all of you who have listened to me so patiently.

JAI HIND.



Planning of Radiology on a National Basis

PART—II

BY

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(Contd. from page 52)

Role of Radiology in the Clinical Period of Study

The Predominant role of Radiology in diagnosis has been undisputed and further stress is unnecessary here that it should play an increasingly predominant role in medical study during the under-graduate training.

If we analyse the present status of under-graduate training impartially, we arrive at the definite conclusion that the instruction imparted by a majority of us has been meagre and superficial. The result of that has been that majority of students do not realise the true significance of the important function of radiological investigation in medical diagnosis. The students, on the other hand, pay scant attention to Radiology as it plays an insignificant role in the qualifying examination. The fact is made vividly patent to those of us who come in daily contact with recently qualified medical graduates holding house-posts, possessing very limited knowledge of the subject.

The other major contributory factors to this unfortunate state of affairs are the following:—

1. Small number of didactic lectures and small period of attendance in the Dept.

2. Perfunctory attention paid to teaching and in some instances poor quality of teaching for which the "Honorary System" and inexperienced teachers are mainly responsible.
3. Low estimation in which Radiology is held by some clinicians and administrators of medical institutions.
4. Indifferent attitude of some teachers who are members of the Faculty of Medicine in taking measures to introduce vitally necessary reforms.

I realise that it may be extremely difficult to convince the august medical pundits who control the destiny of medical education to the urgent need of early revision of the present under-graduate syllabus. Challenge begets progress and therefore the remedy lies with us. We must make a concerted effort in that direction, otherwise the situation is bound to deteriorate still further.

The training should be given during the last two years of clinical studies. The students should receive training so that they are wellversed in the fundamental principles of X-Ray Diagnosis, its important functions,

and limitations and in the elementary rules regarding the importance of protection against excessive radiation. The latter training is necessary, especially the dangers of excessive radiation during "screening" as we still occasionally come across young and enthusiastic interns with radiation dermatitis of hands.

The first step in that direction would be to ask for increase in number of didactic lectures from 12 to 24 divided into two periods of 12 lectures in 4th and final years. These twelve lectures were introduced in the syllabus about 20 years ago, but at present, that number is too insufficient since the science has made such rapid strides. The same holds true for the period of attendance in the X-Ray Departments which is limited to fortnight should be raised to a month's duration divided equally during the 4th and 5th year terms.

The quality of the work done by the teacher in Radiology in the Department and his proficiency in teaching will be important contributory factors, which will create healthy respects for the great importance of Radiological investigations in the field of medical diagnosis. Other factors that are equally important are the close collaboration with colleagues in medicine, surgery and pathology in all work and the respect with which his radiological findings are received by them, especially during ward clinics.

The X-Ray Department is not the only place where it is practicable to impart radiological training. Wherever radiological investigations have played an important role in a patient in arriving at a conclusive diagnosis should be discussed in co-relation with clinical findings. Basic radiological instruction in the ward is as important as that given in the department.

Wherever, each department has worked in isolation, Radiology has undeservedly gained a bad name, as a result of unjustified and destructive criticism. The student brought up in such an unhealthy atmosphere towards specialist departments carries on in the same tradition as his teachers when he reaches that coveted status.

Radiologists should remember that old proverb "If the mountain will not come to Mahomet, Mahomet must go to the mountain", and so strive in every possible way to secure co-operation and change the highly critical attitude of recalcitrant clinician into one of respect for this speciality.

If these minimum increase in the number of didactic lectures are not implemented early and there is no improvement in Radiological education in the department and in wards, the future outlook for Radiology will be very bleak indeed.

Post-graduate Education in Radiology

The first most important, fundamental and urgent problem facing us is that of drastic revision of the completely outmoded syllabus of post-graduate diploma in Radiology of one year's duration.

The two years' diploma course of Madras University in Diagnosis and Therapy also requires revision if we propose to separate Radio-diagnosis and Therapy, which highly essential reform is now long overdue, since both these branches of Radiology have made phenomenal progress during recent years. The question of divorcing Radio-diagnosis and Radio-therapy in post-graduate training and hospital service has now passed the highly controversial stage except for a few die-hard Radiologists in U. S. A. and this country, and is now an accomplished fact in U.K. Experience has shown that the

separation of the two in post-graduate training and health service has proved an unqualified success.

I feel it my bounden duty to make a strong attempt to convince some of our highly respected veteran Radiologists who honestly believe that time is not still ripe in this country to separate the two subjects for post-graduate education, that such separation is the only panacea for the low status of Radiology.

The most outstanding contribution on the subject was made by late Prof. Gosta Forsell in his opening lecture to the Fifth International Congress of Radiology in 1937, remarked: "The innermost cause of this cleavage of medical radiology is to be looked for, however, in an essential difference which exists in the scientific basis of each branch of Radiology. Although the Roentgen rays are the common source of roentgen diagnostics and roentgen therapy, still, in regard to their scientific character and their practical employment, they are so widely different from each other as are histology and helio-therapy. The one employs the optical properties of light in the service of medicine, the other makes use of its biological effects. Roentgen diagnostics is a branch of anatomy. It is the science of men's normal and pathological structures as it appears in the roentgen picture. Radio-therapy, on the other hand, is a branch of physiology. It is the science of the action of the different rays on the organism in conditions of health and sickness. Roentgen diagnostics and therapy demand different scientific training, and the investigation of each belongs to different sphere of medicine. The conditions necessary for their practical utilization are also very different".

Another eminent American authority Dr. W. Edward Chamberlain, who speaking to the Seventh International Congress of

Radiology—London 1950, in a symposium on "Developing relationships of Diagnostic and Therapeutic Radiology from the viewpoints of Teaching, Practice and Research", remarked that "Not only has it repeatedly been shown that such a development would be beneficial, to patients, students, radiologists and medical science; there is available also a somewhat negative argument. It can be shown that where the diagnostic and therapeutic functions are closely bound together, in a single, so-called "specialty", the union is an artificial one, troubled with all sorts of incompatibilities, based upon habit and inertia, or, in other words, upon considerations that were at one time valid but which have become quite meaningless with the passage of time".

And lastly, I quote two very eminent British Radiologists, Dr. Ralston Paterson and Dr. S. Cochrane Shanks, who require no introduction to the Indian Radiologists, and who also contributed to the above-mentioned symposium. Dr. Paterson remarked: First: "In no important medical centre in Great Britain are therapy and diagnosis now practised by the same person". Second: "I remain fully convinced that this decisive splitting off of radiotherapy, so characteristic of British practice, has been of itself a major achievement which has yielded substantial dividends in mature development of that specialty".

This is what Dr. Shanks has to say on the subject: "In conclusion, may I urge that the pattern established in Great Britain be adopted throughout the world. I am quite certain—quite certain—that the outstanding advances in the radiotherapy of cancer in Great Britain would not have been possible without the split in radiology, a division that has not only founded a new specialty in my country, but has also brought great benefits to the practice of roentgen diagnosis".

Most of the existing X-ray Departments in teaching institutions are over-burdened with both therapy and diagnostics. When faced by special tasks they have been frequently found wanting due to lack of time, staff and technical knowledge, which has resulted in disruption of hospital work and general dissatisfaction amongst the surgical and medical units. A concentration of various branches of roentgen diagnosis to a central department under a fully qualified Radiologist, relieved completely of therapy work will lead to greater co-operation between various hospital units and greatly improved radiological service to the patients.

Since Prof. Gosta Forsell's time, the progress of Radiology both in diagnosis and therapy has been phenomenal. Radio-therapy is employed in treatment of about two-thirds of cancer patients alone or in co-operation with surgery and also in a great measure in benign lesions. From a practical point of view, it is impossible for one and the same man to direct satisfactorily both diagnosis and therapy unless he is a genius.

With the advent of Super-voltage and other types of radiation therapy, especially radio-active Isotopes, it is a fond delusion to believe that a medical man, however eminent, is competent to practise radio-therapy without an intensive course of special training. It has often been proved that in the hands of the inexperienced, radiation therapy in any form is dangerous leading to gross destruction of the tissues and extensive ulcerations of a most painful and intractable type. It would be therefore nothing short of criminal if we in India let loose on the unwary public, a set of in-experienced Radio-therapists with imperfect knowledge acquired in this country if Radio-diagnosis and Radio-therapy are not divorced completely.

There is no question of over-specialization in separating these subjects, as previously mentioned they are separate entities. Over-specialization would be there, if we tried to separate Angio-cardiography, Neuro-radiology etc., and form distinct sub-divisions.

Realising the importance of these main divisions, Medicine and Surgery have formed distinct specialities in the University's post-graduate training and in practice which has resulted in much improved medical service to the general public.

It is an established fact, that qualified Radiologists of Bombay University except where they hold hospital appointments, since the post-war period, are all practising Radio-diagnosis only. Some of them, as is well known to medical men, are not of a high calibre that would bring lustre to this speciality. Why should we not therefore give them intensive training in only one branch, so that wherever they work, they would be credit to the medical profession and prove a great boon to the general public. The superficial and mostly theoretical knowledge of therapy they get at present is of no use to them. It is equally true, that at present very few or practically none, will specialise in Radio-therapy for the next few years at least in this country. It is problematic whether facilities for such intensive training in Radio-therapy exists in this country or that fully qualified teachers are available to do a through job of it, i.e. practical and the theoretical radiation training.

We have to turn to a very small number of therapists trained in foreign countries so as to be able to create a body of fully trained teachers in Radio-therapy. To expect any appreciable progress in Radio-therapy, we have to create an efficient staff of teachers and that at present can only be done if some willing recruits preferably surgeon with interest in research, are sent to foreign

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countries for at least a three year period of training. But for all that, the progress of Radio-diagnosis should not receive a check.

Flying visits by Surgeons to chief Radiation therapy centres do not make efficient Radio-therapists. Also the bogey of increased expenditure and over-specialization does not give medical man licence to let loose on the public semi-skilled Radio-therapists.

The Bombay University, due to the vigorous efforts of the newly-constituted Board of Radiology, has been successful in convincing the Medical Faculty of keeping abreast of the prevailing high standards of Radiological Education in Europe and U. S. A. and the Regulations governing the D. M. R. D. and D. M. R. T. granted by the Examining Board of the Royal College of Physicians and The Royal College of Surgeons.

The minimum period of post-graduate course of study in U. S. A. extends to three years including both diagnosis and therapy and in the University of Pennsylvania (Dr. Eugene Pendergrass) to four years. In Sweden, Germany and Japan, the period of study to qualify as a full-fledged Radiologist extends to five years. It is no use making piece-meal changes in the syllabus if we wish to keep abreast of the rest of the world. We have to face an obligation and also fulfil a grave responsibility and be always up-to-date to meet changing circumstances and meet new challenges as the science makes such rapid progress. For that purpose, nothing short of drastic revision is absolutely essential.

Radiological Departments

It is taken as granted that wherever post-graduate training is given, the X-Ray Dept. will have been equipped with modern X-Ray apparatuses capable of fulfilling all

requirements of X-Ray investigations according to the latest advances this science has made. An epidiascope, a diascope, a cine-film projector, graphs, charts and a fully-equipped library of books and radiological journals are equally important for a department which qualifies for a post-graduate teaching institution.

There is great dearth of recent books on radiology and of radiological journals in a great majority of our medical colleges due to very meagre budget allotment for that purpose which requires urgent replenishment. The importance of well-stocked X-Ray film library is undisputed, and this material should be obtained from foreign countries, till each institution builds up his own comprehensive collection of films for teaching purposes, and it should be laid down that no X-Ray Department would be recognised for post-graduate teaching unless all the requirements of full-equipped library of books, journals and X-Ray films are fulfilled.

The Teaching Staff

This article would not be complete if we do not consider the quality of teachers and students upon whom ultimately rests the sole burden whether we in this country attain a high standard in Radiological service to the nation. All that has been previously said about the teaching in the X-Ray Department in the under-graduate period and the wards assumes greater importance here and should be obligatory.

There has been a great paucity of mature qualified teachers since the post-war period. This is reflected in the appointments of recently qualified inexperienced Radiologists to the highly responsible posts of tutors and lecturers in the subject. This has definitely resulted in poor quality of radiological training in some institutions in the country. One

great consoling factor has been that we have at present an increasing number of enthusiastic young Radiologists who after their initial training in this country and further training in foreign countries with fresh outlook on the present status of Radiology, are sure to fill up in a short time the vacuum created during and immediately after the post-war period. The teacher, whether in a large or small institution should show great aptitude for and zeal in teaching to inspire his students to greater efforts in their study and a lively interest in the subject. Merit should be the only criterion for appointments in the Department.

If we are seriously concerned in improvement of standard of post-graduate teaching this principle is vitally important and should be strictly observed. It would be ideal if we should insist on a higher qualification, like M.D. or M.S. with a qualification in Radiology or preferably a Fellowship to fill the posts of Professors and Lecturers in the subject. I believe that Madras University now insists on such a condition to fill the posts.

This brings us to the consideration of the present system of "Honorary" teachers in some states. There is no doubt that the system has failed due to various circumstances. The main causes of failure, though it is an unpalatable truth, are that a majority of us are more concerned with our private practice and we lack honesty of purpose in fulfilling our duties to the hospital by a short period of attendance and perfunctory attention to teaching. This is not only my experience but I believe that eminent foreign Radiologists have also observed the difference between the "Honorary" system and the full-time Radiologists working in different institutions all over the country.

To insist on retirement of medical men of mature experience from Teaching and

serving the hospital patients at the age of 55 years is I believe sacrilegious. Medical men reach their best at that age onwards and all are firmly of the opinion that the age limit of retirement should be extended to 65-70 years as obtained in U. K. and all other western countries and Japan.

The fatuous argument advanced that the younger generation will not get a chance to reach the coveted high status is untenable and illusory, as ultimately they will secure the same rights and retire at 65-70 years if they prove themselves fit mentally and physically. The interest of the patients should be paramount in a welfare state and should not be sacrificed for any other purpose.

At the first opportunity therefore, I strongly recommend:—

1. Retention of mature Radiologists and even calling back to duty those who are willing to serve the country in all teaching institutions on a full-time basis with emoluments and status on par with that obtained with clinicians.

2. Retirement age to be extended to 65-70 years depending upon fulfilling the test of fitness before a Medical Board.

The post-graduate students

During the last few years, the quality of students who have taken up post-graduate training shows distinct improvement and I believe this statement will be corroborated by some of my colleagues. The trends are unmistakable that more and more medical graduates from distant places, desire to and have taken post-graduate training in Bombay and I firmly believe there will be no dearth of students if more medical colleges qualify for post-graduate training.

Here is a scheme adopted by me to attract good class students towards this

speciality which has met with considerable success. Majority of them have held a House-post before joining the Department as Resident Radiologists for a term of two years. After working in the Department for about a year, they are allowed to join the Diploma Course in Radiology with the small incitement of exempting them from tuition fees of the institution and allowing them to attend lectures in different medical colleges. After qualifying as Diplomates in Radiology, some of them have visited foreign countries for further training and experience and have returned as fully-trained Radiologists. Since the institution has now four Resident Radiologists and five "Honorary" Radiologists on the staff, we propose to permit two senior Radiologists to attend the training course. In order that the post-graduate students have full facilities to attend to the practical side of the work during working hours in the X-Ray Department it is highly desirable that the didactic lectures should be arranged in the afternoon sessions.

Since last year, seminars have been arranged at the teaching institutions. To be efficacious and acceptable method of instruction, the teachers are mainly responsible, but if, the teachers consider them as unnecessary added burden and do not conduct them intelligently, no useful purpose is served and a very frustrating effect is produced amongst those students who have taken great interest and expended their energies to prepare a case for presentation and discussion. The students should also be compelled to attend surgical and medical staff meetings and clinico-pathological conferences, encouraged to take part in the discussions. The attendance during post-mortems in cases where radiological investigations have been performed should be made mandatory.

These long overdue reforms in training are only possible if full-time staff is appointed or the "Honoraries" agree to deliver didactic lectures in the afternoon and display a high sense of duty at the cost of a small sacrifice of their private practice.

The students should also be assigned the responsibility of continuous check on the progress of ward-cases in which radiological examination has played a predominant role and should give a report to the class once a week at least. They should be assigned some work in the Department under the supervision of a senior member of the staff and taught the correct method of writing an X-Ray Report. During their visits to the ward, they must be guided in the correct approach in dealing with various idiosyncracies of the Clinicians and to quote Dr. Robert Newell,⁷ "If your consultant is wrong, try not to make him change his mind in public—it's as hard to take as changing one's pants in public".

At present, I shall close with a brief reference to the highly complex problem of Radio-therapy, which has assumed much greater importance since the advent of Radio-active Isotopes. I must however confess that very few Radiologists qualify as teachers in Radio-therapy and practically none in Radio-active Isotopes.

The problem is highly complex and deserves detailed study and planning, which has not been possible to set forth here. However, I close with the following cryptic remarks from Dr. Howard Hunt :—"No one physician can hope to be fully competent in all aspects of the diagnosis and treatment of cancer, covering as it does nearly all the specialities and sub-specialities in medical practice. The omniscient cancer specialist is either a genius or a fraud".

Summary

The article stresses the importance of early formation of the National Board of Radiology in India, to advise on all questions, educational and health service, relating to Radiology. The composition and functions of the Board are outlined. The importance of Anatomico-Radiological education in health during the preclinical period is emphasised and the plan of teaching outlined.

The present low status of under-graduate education in Radiology is discussed and the ways and means suggested for radical change in methods of instruction for its improvement.

A strong plea in favour of separation of Radio-diagnosis and Radio-therapy is advanced with quotations from eminent foreign Radiologists. A syllabus on the pattern of Royal College of Physicians and the Royal College of Surgeons all over the country is strongly advocated and methods of instruction in the X-Ray Department and wards discussed.

Arguments are advanced in favour of relaxing the present age-limit of retirement from 55 years to 65-70 years and appointment of Radiologists on a full-time basis is declared highly beneficial to Radiology.

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Radiological Diagnosis of Tumours of Spinal Canal

BY

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Radiological Diagnosis of Spinal Cord Tumours

The X-ray examination of patients suspected of suffering from a space occupying lesion in the spinal canal should be divided in two parts (a) examination of the bones of the spine (b) and visualisation of the spinal canal by means of injecting contrast material (myelography). The skeletal changes which may be found by radiology of the spine are likely to be as follows:—

1. Widening of the spinal canal as seen by measuring interpediculate distance. Elisburg and Dyke found that the width of vertebral canal can be accurately determined from the skiagram by measurement of shortest distance between the medial borders of pedicles of each vertebra. In the upper cervical spine the measurement is about 3 c.m. The distance rises to 3.3 c.m. at the fifth cervical body and then it steadily decreases until it reaches 2 c.m. at the fifth thoracic. It remains at approximately 2 c.m. until it starts to increase again at the tenth thoracic body and increases to 3.5–3.9 c.m. at the fifth lumbar. Instead of relying on these standard average measurements the better way is to measure interpediculate distance of a few vertebrae in the suspected region and any sudden increase is suggestive of pathology.

A chart is now available giving interpediculate distance. The pedicles may change their shape due to continuous progressive pressure.



Fig. 1

Fig. 1. Shows that interpediculate distance is increased at C 6 while a vertebrae above and a vertebrae below show lower measurement in addition the pedicles themselves are thinned out.

2. Bone destruction. The most common osseous change in the vertebral canal by these new growths is bone destruction as a result of the continuous pressure of the lesion on the osseous structure which undergo atrophy which manifest as (a) increased depth of the concave posterior surface of the vertebral body (b) erosion of the bases of the neural arches (c) enlargement of intervertebral foramen.



(a)

Fig. 2

(b)

Fig. 2. S. B. Age 20 years, female. Clinical notes—pain in middorsal spine with spastic paraplegia—for two months. X-ray shows destruction of posterolateral surface of 8-9 the bodies, left neural arches and head of 9th rib. There is a soft tissue tumour in the paraspinal area. Intervertebral disc normal, in lateral view. Suspected as hour-glass tumour of spinal cord. Laminectomy showed—tubercular granulation tissue in epidural space pressing on the cord with destruction of vertebral bodies and the rib.

posterior pressure erosion of the bodies of second, third, and fourth lumbar vertebrae:



Fig. 3.

Fig. 3. K. L. Age 14 years. Male.

Clinical notes—parasthesia-sacro-perineal region and difficulty of micturition for last 6 months. Operated about three years previously for vesical calculus.

Plain skiagram shows extensive spina bifida starting from second lumbar region to lower sacral. The lateral view shows marked

inter vertebral foramen are enlarged specially one between second and third.

Opinion—Intra spinal tumour occupying an extensive area and of long duration. Myelography was advised but not done.

Exploration—There was an intra spinal meningocele pressing on the nerves as well as the wall of the spinal canal.

3. Calcification and ossification is rarely seen in cases of spinal cord tumours.



Fig. 4

Fig. 4. B.K.S. Age 53 male. Pain along the sciatic nerve first on the right side and then on the left, wasting of leg muscles. Completely recovered after 7-8 months. Note the posterior spur on the body of second lumbar of vertebra projecting in the spinal canal. This was a case of lumbar disc lesion.

4. The distortion of paraspinal tissue. Some primary intra-spinal tumours frequently project through the space between the adjacent vertebrae and displace the tissue laterally, when this happens a localised bulge is seen.



Fig. 5

Fig. 5. G. B. Age 38 years male. Shows a round well defined shadow left upper zone. The distance between 3-4 ribs on the left is increased compared to the right side. There is erosion of left pedicle of 4th-T. This was a case of neurofibroma in connection with the root of fourth dorsal nerve, an hour-glass type of tumour.

5. Bone proliferation—Spinal cord tumours generally do not cause bone proliferation, however there is one form of growth, Haemangioma, affecting the bone and meninges, in which case the bone becomes dense.

6. Abnormalities of intervertebral disc—Intervertebral disc is rarely affected by spinal cord tumour.

7. Kyphosis and scoliosis—unless there is a localised bone destruction this deformity

has no value in diagnosis of cord tumours. But sometimes myelography is done in these cases to determine the site for corrective operation. Here is a case as illustration ;



Fig. 6.

Fig. 6. D. R. Age 16 years. Male. Scoliosis 10 years, progressive paraplegia 2-months. Surgeon wanted to know the site of pressure on the cord. Myelography shows partial block at 9th D. V.

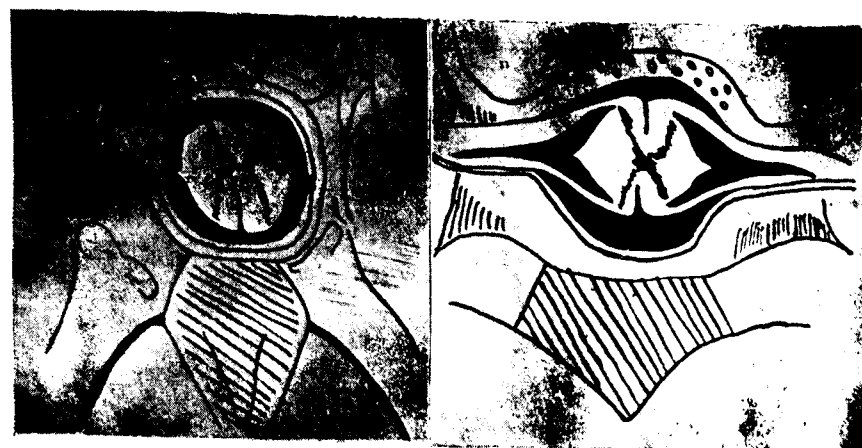
These bony changes if any, when seen, give a good deal of information about the level of the lesion and the extent of the process. These changes are seen in slowly growing benign tumours. In malignant tumours the bone changes are less characteristic. It is frequently impossible to determine whether the bone destruction results from the neoplastic lesion arising from within the spinal canal or from the

surrounding skeletal tissue or perhaps from a solitary metastasis from a distant unknown primary.

These osseous changes develop rather at a later stage. As a rule however, early localising diagnosis is only obtainable with myelography, which also affords most exact information with reference to extent of the lesion in the spinal canal.

Fig. 7. Illustrates the anatomy of the spinal cord.

Before proceeding with the methods of visualisation of spinal canal, it would be advisable to go over its anatomy. The epidural space lies within a wall, composed of vertebral bodies, intervertebral disc, neural arches and the connecting ligaments. This space contains, blood vessels, nerves and fat. The epidural space is limited inwardly by spinal dura-mater. Inward from the dura lies the outer layer of arachnoid. Between the two membranes lies the subdural space. The dura is connected with the arachnoid only in places, specially at the site of emergence of spinal nerve roots. The inner-layer of arachnoid lying in contact with pia-mater envelopes the spinal cord. The cerebro-spinal fluid flows in the space formed by two layers of arachnoid, the sub-arachnoid space. Through this space pass the anterior and posterior spinal roots enveloped in a sheath of arachnoid. In lumbar region these out-pouchings are long and narrow and have a longitudinally directed course. Higher up these out-pouchings are shallower, wide-based and laterally directed. Topographically the sub-arachnoid space is divided by the spinal cord and ligamentum denticulatum; this structure is formed by fibrous strands which connect the spinal cord with outer layer of sub-arachnoid membrane. In this way the movement of the cord is



(a) Cross section cervical region.

(b) Cross section lumbar region.

Fig. 7.

limited. Traversing posteriorly and connecting together the inner and outer layer of arachnoid are a number of bands and membranes and the posterior septum in the midline posteriorly.

Sub-arachnoid Myelography. In the visualisation of spinal canal it is possible to employ either a positive or negative contrast media. William Nosik lays down the characters of an ideal contrast medium for intraspinal use. The medium should be (1) non-toxic (2) of sufficient atomic weight to cast a clear cut shadow (3) non-irritating (4) miscible with the cerebro-spinal fluid and (5) readily eliminated. So far no such medium having all these combined virtues have been found.

The types of media which so far have received consideration are five in number (a) gases (b) oils (c) colloidal suspensions (d) aqueous solutions and (e) radio-active isotopes.

(a) Gases—As early as 1919, Dandy proposed use of air and in spite of harmlessness of the procedure, this method is practised less since Sicard and Forstier in 1922 introduced iodised oil for diagnosis. Sven Oden (19) discusses the advantages

and disadvantages of iodised oil in myelography and comes to the conclusion that there are more disadvantages than advantages with this procedure. He gives an account of 800 gas myelographies containing 115 cases of positive findings. The correct diagnosis was attained in 95% of the cases. The advantages of gas myelography, are that oxygen and air are non-toxic and produce no sequelae e.g. arachnoiditis or adhesion or granuloma. Repeated examinations can be made. The advantages of air-myelography as enumerated by Camp (5) are as follows (1) there are no contraindications to its use except increased intracranial pressure (2) complete absorption (3) there is no irritating effect. The various disadvantages are (1) the medium is usually unsatisfactory for demonstration of non-obstructive lesions specially cervical and dorsal region (2) the air shadow and defects are less obvious than with opaque media and liability of error is increased (3) Radioscopic verification of a questionable defect by repeated manipulation of the medium is not possible (4) a negative or positive finding is not as reliable as in an examination made with radio-opaque media (5) inconclusive or unsatisfactory

examinations are more frequent than with radio-opaque media (6) most patients complain of severe headache that follows examination.

Myelography with iodised oil. In 1922, Sicard and Forstier who had been injecting iodised poppyseed oil into lumbo-sacral epidural space for treatment of sciatica, by accident introduced a small amount into the sub-arachnoid space. They observed, it moved freely and were quick to recognise its value for localising the space occupying lesions of the spinal cord. From that time on, the development of myelography has been marked by a succession of new techniques in a constant search for and perfection of media which would enhance the value of the examination. There are various media in this category which are used. Lipiodal was first one to come in this field. It was considered to be rather too viscous and slow to move. This was followed by various other preparations Pantopaque is largely used in American institutions. Etheodon has been used and Myodil is one of the popular preparation used in U. K. and in this country. The site of injection depends on the site of suspected lesion. In lower dorsal and lumbar lesions the injection is made *via* the lumbar route while in upper dorsal and cervical lesions it is preferable to inject by a cistern puncture. The amount injected should be sufficient unless the myelography is done with a view to localise a complete block. Usually the amount used should not be less than 5 c.c. The fundamental principle of the examination is to use sufficient medium to fill completely the subarachnoid space, at any desired level and thereby reveal the location of tumour and its characters. Leonard Malis (16) and his colleagues advocate use of 5-10 c.c. of pantopaque for lumbar disc myelography. Brierre and Colclough (3) use a technic which they call Total Myelography, where

they use 21 cc. of pantopaque. This does not require more than 40-45° tilt of the table thus saving the patient from uncomfortable position.

The common errors encountered are as follows (1) insufficient amount; unless the amount is sufficient, non-obstructing-multiple or atypical lesions are likely to be missed (2) improper injection and pseudo-defects due to epidural injection and leakage of medium should be avoided.

Fig. 3. Epidural injection.

(3) Inadequate scope of the examination occurs usually in investigation for lumbar disc protrusion. By limited examination one may miss these lesions which are likely to be sometimes multiple (4) Handicaps due to condition of the patients, deformities of spinal canal or inadequate apparatus. In certain instances the examiner may be handicapped because of pressure of painful lesions, kypho-scoliosis or paralysis may prevent many manoeuvres required for adequate myelography examination (5) other errors may be due to defects produced by tip of lumbar puncture needle, anatomic variation of culdesac, laterally placed or concealed protruded discs, dilated epidural veins, deformities resulting from previous laminectomy.

Myelography with colloidal suspensions

Various attempts were made, following observations of Rodovici and Meller in 1932, to study the subarachnoid space by means of thorotrast. Because of intense meningeal reaction and radio-activity of the medium, this method was abandoned. Nasik (18) revived the idea in 1938 by advocating subsequent forced drainage. In spite of prompt drainage residual inflammatory reactions were observed and this procedure is abandoned.



Fig. 8

Myelography with Aqueous Solutions

Abrodil myelography was devised by Arnell (1) and Lidstrom in 1931 and carried to subsequent perfection by examination of the lumbar region by introducing 10 c.c. of Abrodil-water dye and taking skiagrams in routine six positions. Jean Lange (11) and Hookan O'degaard, in a publication in 1951, have reviewed previous record of Abrodil myelographies starting with work of Arnell. They have based their conclusion on 208 myelograms and they think that Abrodil is particularly useful in location, of disc prolapse in lumbar region and in visualisation of nerve roots and root sleeves. The procedure is applicable only to visualisation of lumbar canal and requires spinal anaesthesia, involving all the disadvantages of

examining a patient with paraplegia. Complications are headache for many days, shock usually within 30 minutes after injection, temporary lumbar pain and spasm of leg muscles.

Myelography by means of I-131

A new technic of myelography by using iodinated human serum Albumin (I.H.S.A.) is described by Bauer and Yuhl (2). It is claimed that the results compare very favourably with iodised oil myelography. Myeloscintogram has several advantages in that a foreign irritating contrast medium is avoided, since I. H. S. A. has not to be removed, saves a great discomfort to the patient. The scanned area is visualised during the procedure. The examination may be repeated since no trace of I. H. S. A. is left after 24-48 hours.

Indications for myelography. (1) to localise a lesion where the clinical level is doubtful (2) to show or exclude multiple lesions either neoplasm or protruded discs. (3) to afford evidence as to the extent of the space occupying lesion or whether it is likely to prove intra or extramedullary at operation.

The procedure which is followed at Irwin Hospital is as follows:- 6 c.c. of Myodil is injected usually by lumbar route, unless where upper limit of a complete block is under investigation, when the injection is made by cistern puncture. The patient is placed on the tilting table and whole of the spinal column is examined under fluoroscopy and films taken on spot film device. The patient can be tilted practically 90° either way in both supine or prone position or any of the lateral positions required.

The total number of patients on which myelographic examination was done at Irwin Hospital is 96 during last four years:

Table - I

Positive finding	...	53
Normal	...	31
Faulty Technic	...	8
Inconclusive examination...	...	4
Total	...	96

Positive finding :-

Intraspinal Tumours	...	36
Prolapsed discs	...	15
For injuries	...	2
Total	...	53

Out of 36 cases, of positive myelographic findings records of 3 cases are not available. The remaining 33 cases with positive findings are divided as follows :-

Table - II

Intra-medullary Tumours	...	4
Extra-medullary intra-dural	...	16
Extra dural	...	5
Arachnoiditis	...	2
Arachnoid cyst	...	1
Tumours of adjacent bones, pressing on spinal cord	...	4
Metastatic Tumours	...	1
Total	...	33

Fig. 9. Diagram to show the effects of tumours compressing the spinal cord on the subarachnoid space (in black).

- (a) normal cord.
- (b) extra-dural tumours.
- (c), (d) two types of intradural extra-medullary tumours.
- (e) intra-medullary.

The intra-medullary tumours produce an increase in volume of spinal cord at the site of the tumour. The larger the tumour wider the displacement of contrast medium until finally the contrast medium passes in the form of narrow streak on either side of the tumour. In absence of complete obstruction, it causes a fusiform filling defect in the contrast medium.

Case No. 1. L. R. Pain in the neck and lumbar spine-1 month. Gradually increasing weakness all four limbs-15 days. (Sensation of tightness all over the trunk-15 days). Clasp-knife rigidity. Touch, pain, temperature diminished below the nipple-line.

Plain skiagram-spondylosis in cervical and dorso-lumbar region. Myelography by lumbar route-complete block at the level of 5 c.v. There is some expansion of the cord and lower border of the defect appears lobulated.

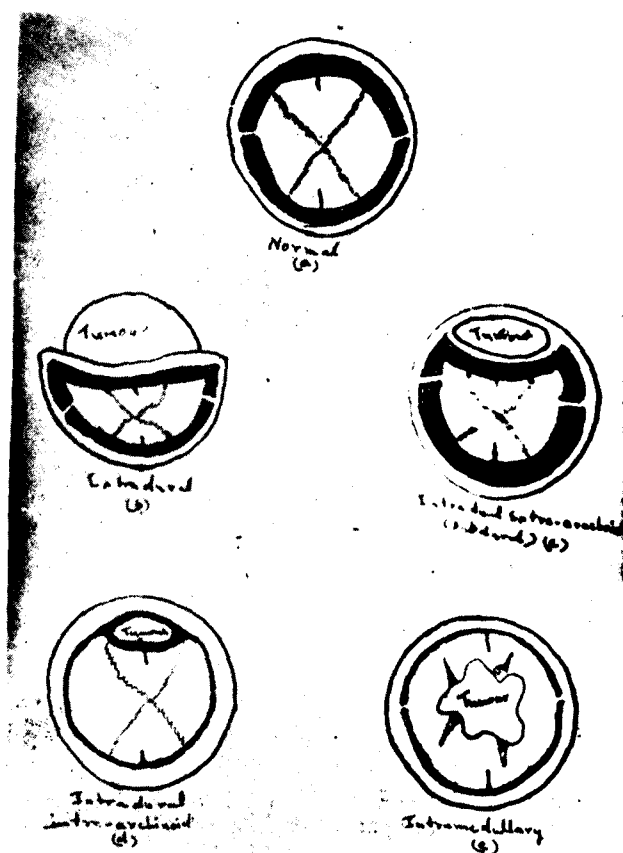


Fig. 9.



(a) (b) (c)
Case No. 1 (a & b) Myelography by lumbar route. (c) Myelography by cistern route.

X-RAYS DIAMOND JUBILEE SOUVENIR NUMBER

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Myelography by cistern route—Obstruction at the level of 3rd c.v. with expansion of the cord and irregular border.

Opinion—Intramedullary Tumour.

Operation—A blood clot of about 3 c.m. long and 2 c.m. diameter was found pressing on the cord which was degenerated. No histopathology.



Case No. 2

Case No. 2. J. S. Paraplegia of spastic type. Blood S. T. S. — Negative. C.S.F. : S.T.S. — Negative.

Plain x-ray —no abnormality seen.

Myelography by lumbar route—was unconvincing but the bifurcation of the dye at the level of 12 D. V. and 1st L. V. was persistent and possibility of intramedullary tumour was considered. Exploration adhesion between dura and cord — between 12 D.V. and 1st L. V. on the left side. There is a hard nodule at level of 11th D. V. in the cord. Cord not opened.



Case No. 3

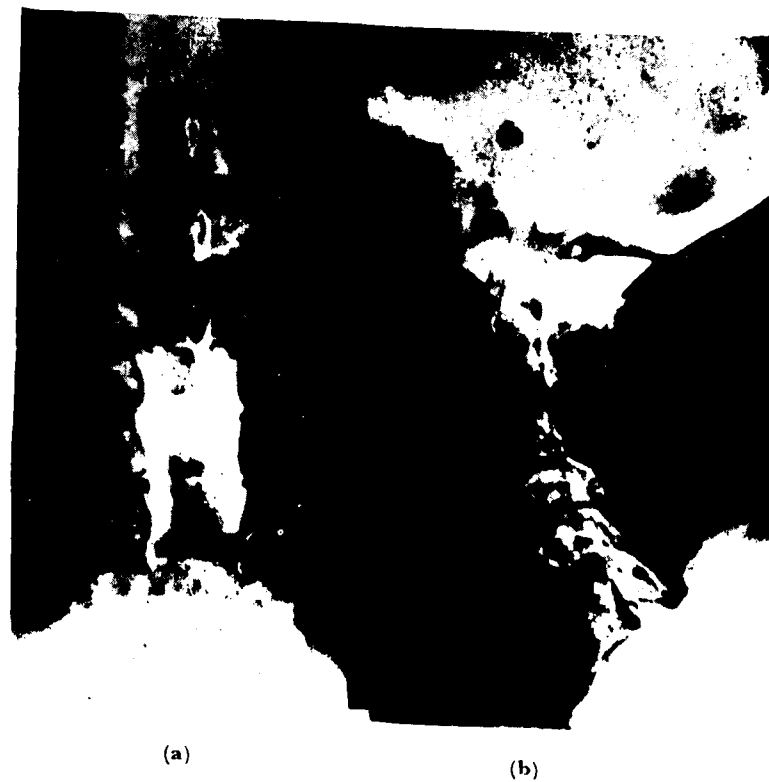
Case No. 3. M. L. Age 29. Gradual increasing stiffness and difficulty in walking — 4 years. Girdle sensation round lower abdomen — 4 years.

Positive findings—Spastic paraplegia with increased tendon jerks, ankle clonus and up-going plantars. Abdominal reflexes absent. Patchy sensory impairment below the umbilicus.

Lab. Investigations: Hb. 14 grm. W.B.C. 8600, P68, L27, M1, E4, Blood Kahn—negative. C.S.F. Pressure normal. Xanthochromic Fluid. WBS 11/c. mm, pr 1100 mg%, Sug. 69 mg%, glo $\pm \pm$, Kahn negative, Coll. Metric curve 000.....0000.

Diagnostic procedure—Manometric studies show almost complete block. Myelography almost complete block between T-10 & T-11. Defect has a rounded margin? Intramedullary Tumour.

Operation—exploration—no extra medullary tumour. A blunt needle put into the buldge in the cord, brought out dark yellow fluid.



Case No. 4

- (a) Skiagram taken in head down position after the dye has all trickled down.
 (b) Skiagram after cistern puncture.

Case No. 4 B. N. Age 41 years.

Gradual progressive weakness of all limbs 2 yrs. Inability to walk four months. Lack of control of micturition and defaecation. Cranial nerves normal.

Motor function—diminished both upper and lower extremities. Tone decreased, co-ordination impaired.

Sensory—Post. col. intact. Touch—pain, temperature normal.

Reflexes—Knee—brisk, Ankle clonus—ill sustained.

Plantars—extensors, abdominals—absent.

S.T.S.—negative.

Plain skiagram no abnormality seen.

Myelography by cistern route—practically complete block at the level of upper border of 2nd C.V. There is slight trickle by the side. Cord appears to be swollen. The whole of the Myodil trickled down in about two hours. The patient was tilted and the block was seen at the lower border of 3rd C.V. and filling defect caused by swollen cord is seen.

Diagnosis—Intra-spinal tumour, suggestive of being intra-medullary extending to the length of 2nd and 3rd C. V.

Not Operated.



Case No. 5

- (a) Myelography by lumbar route.
 (b) Myelography by cistern route.

Case No. 5. Female 24 yrs. Clinical notes—Compression paraplegia two years duration. Clinical level of compression seems to be upper dorsal region.

Myelography by lumbar route.—There is a central filling defect in the region of 12th D. V. and 1st L. V. The dye is displaced laterally and anteriorly. Practically no dye passes beyond this region even with 80° tilt of the table. The dye shows impressions of the nerves.

Myelography by cistern route—the upper level of the block is the upper margin of 9th D. V.

Opinion—The tumour occupies quite an extensive space from the upper margin of 9th D. V. to lower margin of 1st lumbar and is suggestive of being intra-medullary. Possibility—syringomyelia should be considered. Exploration—cord was swollen and degenerated small tissue was pricked up

for section. Histopathology—Glial tissue with cystic spaces.

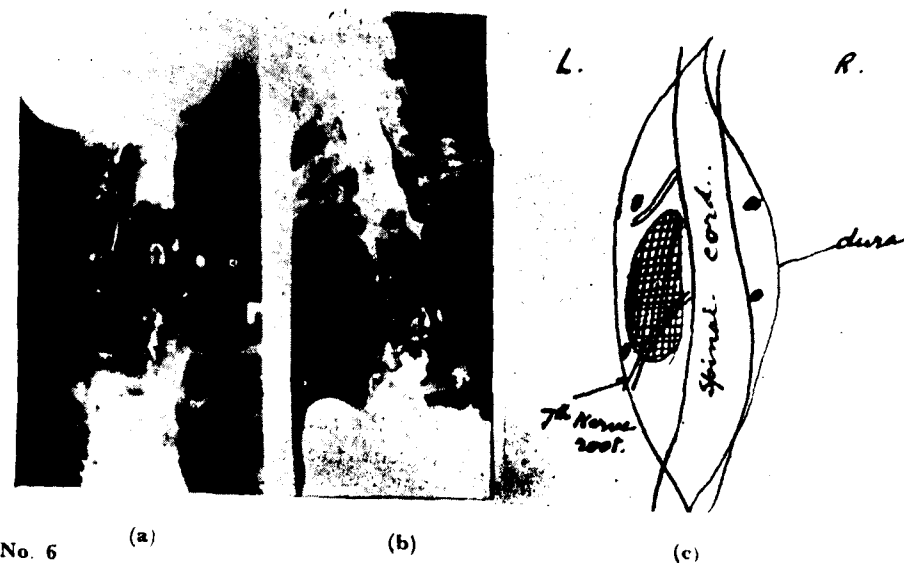
Peiper describes a sign helpful in differentiating the intra and extra medullary tumours. It consists in alteration of normal pattern of root pockets. Normally these pockets are small in cervical region and gradually increase in size caudally, usually they show good filling in cervical and lumbar region. The swelling of the cord in intra-medullary regions, while gradually obliterating the sub-arachnoid space, separates and widens the space between anterior and posterior nerve roots opening out the root pockets, so that they appear larger than normal while the extra-medullary tumours obliterate the root pockets.

Extra-Medullary but intra-dural Tumours: displace the spinal cord so that a large free space develops above and below. During myelography the contrast medium rests on the tumour like a cap. In addition there is a second smaller collection of contrast medium on the opposite side. This is due to displacement of the cord by sufficiently large tumour and narrows down the sub-arachnoid space on the opposite side, when non-obstructing, these tumours show a round sharp filling defect but it is rare to catch them at this stage.

Case No. 6. M. B. Female Age 35 years.

Paraplegia and sensory loss over abdomen and lower limbs of gradual onset since 5 months. Pain left shoulder five months.

Micturition and defaecation control not lost. Knee and ankle jerks exaggerated, ankle clonus positive. Plantar absent. Blood S.T.S. negative, C.S.F.—Chlorides 710 mgm/100 cc. Protein 55 mgm/100 cc. Sugar not diminished 2—3 cells per cc. S. T. S.



Case No. 6

- (a) Myelography by cistern route, note the displacement of the cord to right.
 (b) Myelography by lumbar route, note the displacement of the cord and thinning of root pockets.
 (c) Line drawing by the Surgeon after the operation.



Case No. 7

- (a) Myelography by cistern route.
 (b & c) Myelography by lumbar route.
 (d) Line drawing by the surgeon after operation.

Negative. B.S.R. 5 mm. 1st hour. Myelography by lumbar route. There is a practically complete block at the level of the upper border of 1st D.V. except a small trickle on the side of the cord which is displaced to right. Tumour is on the left side of the cord. The tumour has a lower rounded border and is about 1 cm in diameter and extra-medullary.

Myelography by cistern puncture. The upper border of the tumour is at the lower level of 6th c.v. There is practically complete block. The upper pole of the tumour is also rounded. The tumour is about 3 cm. long and 1.5 cm. in diameter.

Operation—Intra dural tumour removed in connection with the left 7th c. root.

Histopathology—Neurilemmoma.

Case No. 7. K. R. Age 50. male. Gradual onset paraplegia 1 year. Complete loss of sensation below the costal margin.

Jerks lower limbs exaggerated.

Plain skiagram—no abnormality seen.

Myelography by lumbar route—There is complete obstruction to contrast medium at the level between 7-8 D. V. cord is pushed to right side and filling defect on the left side shows upper crescentic border, suggestive of extra-medullary tumour.

Myelography by cistern puncture—upper level of the tumour is middle of 7th D. V. The tumour also shows an upper crescentic border.

Opinion—The extension of intra thecal tumour is about 2 cm. long.

Operation—There was an extra-dural growth in connection with left root of 7th Dorsal nerve. This was removed and nerve root cut. Then it was found that growth was extending intra-dural which was opened and growth removed which was in all 3 cm. long.

Histopathology—Neurilemmoma.



Case No. 8

Case No. 8, M. Age 21. Clinical notes—Quadruplegia 3 years. Myelography by cistern route—shows a complete block at C-2 only a few drops trickled down in 48 hours.

Operation—An Intra-dural Extra-medullary growth extending into posterior cranial fossa was removed.

Histopathology—Meningioma.



Case No. 9

Case No. 9. B. N. Age 28.

Admission—10-8-55.

Pain left arm and shoulder joint and around the back of shoulder for one month. Weakness in left lower limb for 3 weeks—progressive increase in weakness first in left limb. Weakness in right limb 12 days.

Cranial nerves—normal.

Motor-system—left upper and lower limbs wasted, clasp-knife rigidity lower limbs.

Reflexes—Plantars—both extensors.

Jerks—lower limbs exaggerated both sides.

Upper limbs—normal.

Ankle clonus—present.

Sensory—Touch and pain diminished lower limbs.

Plain skiagram—Inter pediculate distance increased at C-6, thinning pedicles.

Myelography—There is a complete block at the lower border of 7c.v. cord is displaced to right.

Operation—A tumour 2 cm. long and about a cm. in diameter in the region of c-6 was found. It was extra-medullary but intra-dural in connection with a nerve root on antero-lateral aspect of spinal cord.

Histopathology—Malignant Schwannoma.

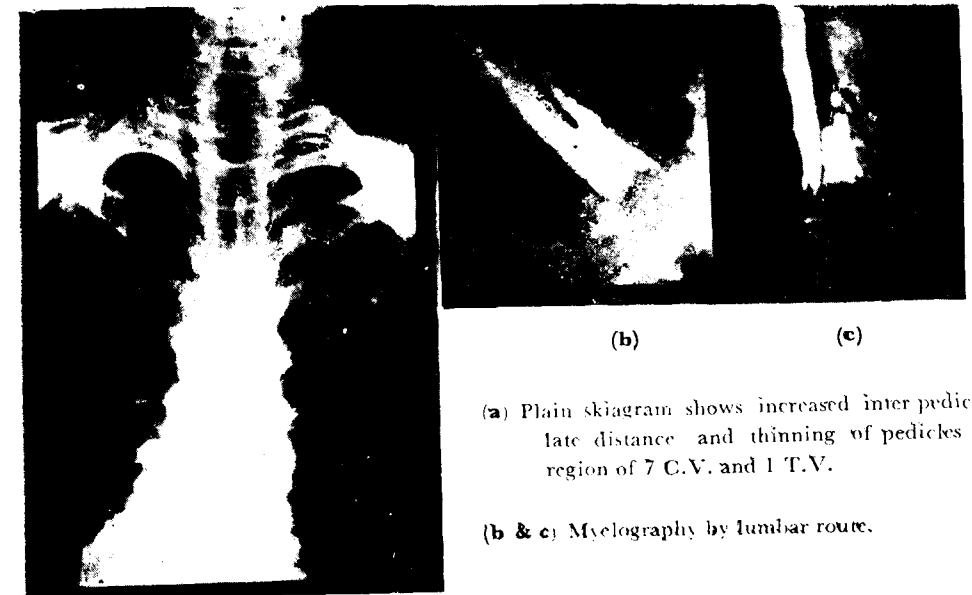


Case No. 10

Case No. 10. P. K. Age 28. Paraplegia of gradual onset for last 6 months.

Myelography by lumbar route shows complete block at the level between 12 D. V. and 1st L. V. demarcating the nerves of cauda equina, suggestive of tumour in this region. Patient did not agree to undergo operation and left against medical advice.

? Cauda equina tumour.



(b)

(c)

(a) Plain skiagram shows increased inter pediculate distance and thinning of pedicles in region of 7 C.V. and 1 T.V.

(b & c) Myelography by lumbar route.

(a)

Case No. 11

Case No. 11. G.B. Age 45 female.

Admitted with commencing paraplegia and inability to walk.

Neurological examination—muscular weakness of left lower limb, exaggerated jerks both lower limbs, plantars extensor.

C.S.F. Protein above 100 mgm. Chlorides 720 mgm.

Plain Skiagram—increased inter pediculate distance at the level of 7 c.v. and destruction of right pedicles of 7 C.V. & 1st T.V.

Myelography by lumbar route shows block at the level of 1 T.V.; cord displaced to left, the tumour has rounded lower margin. Suggestive of being extra medullary intradural tumour.

Operation—Extra medullary intradural tumour of 1.5 cm. 1.0 cm. dimensions removed.

Histopathology—meningioma.

Post operative result—uneventful recovery.

Case No. 12. R. S. Pain in both legs with swelling—3½ months.

Pain back and lower abdomen followed above, accompanied with gradual progressive constipation.

Incontinence of urine—2 months.

Hyposthesia both buttocks. Motor-system—normal. Loss of touch, pain, temp left and right gluteal region.



Case No. 12

Both ankle jerks absent. Anal reflex absent. C. S. F. n. a. d. plain skiagram no abnormality seen.

Myelography by lumbar route—There is a block at the mid-level of 4th L.V. demarcating the nerve roots. There is a slight trickle of dye anteriorly and on the right along the spinal cord. Suggestive of intra-dural tumour lying posteriorly and pressing the nerves of cauda equina anteriorly.

Operation—A greyish tumour was found on the cauda equina which was removed and some nerve roots cut.

Tumour histology—Ependymoma.

Patient was discharged in fit condition.



(a)

(b)

(c)

Case No. 13

(a) Myelography by cistern route.

(b & c) Myelography by lumbar route.

Case No. 13. R. S. Age 50.

Spastic paraplegia, loss of sensation upto nipple-line.

Micturition and defaecation control—present.

Blood S.T.S.—negative. C.S.F.—normal.

Clinical lesion at 4 D.V. Plain skiagram no abnormality seen.

Myelography by lumbar route shows a complete obstruction at T-2 even with practically 90° tilt.

Myelography by cistern route shows block at the level of lower border of 2nd c.v.

Diagnosis—lesion being so extensive, the diagnosis suggested was meningioma or syringomyelia.

Due to such an extensive lesion the case was thought to be inoperable.



Case No. 14

Case No. 14. H. L. Age 45 years.

Paraplegia—3 months—no sensory loss.

Plain skiagram shows that posterior portions of 6 and 7 ribs on the left side show more spacing, the size of intervertebral foramen between 6-7 dorsal vertebrae is increased. There is a soft tissue tumour of about an inch in diameter adjacent to this inter-vertebral foramen.

Myelography done through lumbar puncture shows a partial block at upper border of 7th D. V. The filling defect has a smooth surface as shown by contrast medium passing over it. After sufficient waiting the whole of the contrast medium can be taken above the tumour and back again. Upper border of 5 D. V.

Diagnosis—Hour-glass tumour of nerve root.



Case No. 15

Case No. 15. B. R. Age 50.

Spastic paraplegia of gradual onset.

Clinical level—mid-dorsal-region.

Myelography by lumbar route—shows complete block at the level between 8-9 Dorsal. Cord is displaced forward. Suggestive of intra-dural tumour.

Patient refused operation.

**Case No. 16**

Case No. 16. M. L. Age 60.

Difficulty in speech—3 years.

Weakness both lower extremities and inability to walk—2 months.

Tingling of whole body below the umbilicus—1½ months.

Motor—Slightly diminished upper limbs markedly in lower limbs.

Tone—Clasp-knife rigidity in lower limbs.

Sensory—Pain, touch, temp., joint and muscle sensibility diminished in lower limbs.

Reflexes—abdominal absent. Plantar extensors; knee and ankle positive.

Clonus present both sides.

Blood Hb. 75% W.B.C. 7,200 cm. C.S.F. and blood S.T.S. negative.

Myelography—There is a block at the lower border of the base of 2nd-T. There is displacement of cord to the left. Suggestive of intra-dural tumour. Patient refused operation and left against medical advice.

Extradural tumours are usually disclosed because of their effects on paravertebral soft tissue and their destructive action on adjacent bones.

**Case No. 17**

(a)

(b)

(a) Well defined extra-pulmonary tumour seen after pneumo-thoracic.
(b) Myelography by cistern route.

Case No. 17. G. M. Age 38. Male.

Pain in left shoulder and back, hoarseness of voice. Cough and vague neurological symptoms for last 4-5 months.

Plain x-ray shows a round well defined shadow upper zone left lung.

No destruction of ribs seen. Skiagram taken for spine shows that distance between 3-4 ribs left side is more than the corresponding distance on the right side. There is erosion of left pedicle of 4th D. V.

Pneumothorax done shows that the tumour is extrapulmonary.

Myelography done by cistern route shows a complete block at the lower border of 2nd D. V. with displacement of cord to right. No enlargement of the cord seen.

Diagnosis—Extra-medullary tumour ? Hour-glass type of tumour of spinal root.

Operated and large tumour of left 4th dorsal root removed.

Histology—Neurofibroma.



(a)

(b)

(c)

Case No. 18

(a) Plain skiagram showing erosion of spinous process of 7 D. V.
(b & c) Myelography by lumbar route.

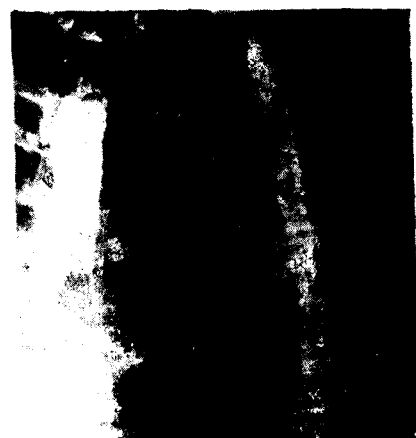
Case No. 18. P. W. 23 years.

Spastic paraplegia of gradual onset and pain in mid dorsal spine 4 months.

Plain skiagram—The spinous process of 7th, dorsal shows erosion.

Myelography by lumbar route shows block at the level of 7 D. V. cord not displaced ? Extra-medullary tumour.

Operation—Laminectomy; there was erosion of spine of 7th D. V. The spinal cord was surrounded by tubercular granulation tissue.



Case No. 19

Case No. 19. R. R. Female.

A case of paraplegia with Tubercular lesion at 4th D. V. Neurologically lesion at 7th Dorsal segment.

Myelography—6 cc. of Myodil injected with lumbar puncture; on the tilting table oil flowed from lower lumbar segment to cervical without any obstruction but in reverse direction, it showed an irregular filling defect and oil column surrounding. No displacement of cord seen.

Diagnosis—Intra—thecal tumour.

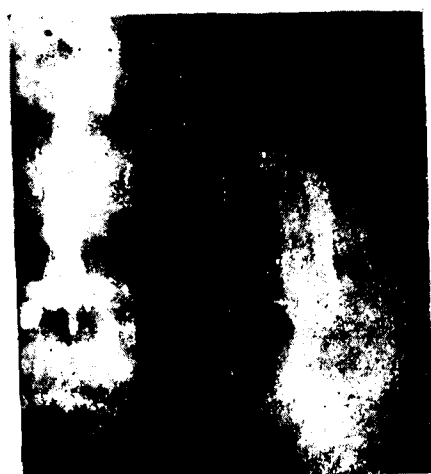
Operation—Laminectomy done tubercular granulation tissue removed.

Case No. 20. M. S. Age 20 years.

Loss of control on defaecation and micturition—4 years.

Loss of sensation and ulcer on the feet—2 years.

This patient had a lumbar puncture previously in outstation hospital and also operation done supposed to be for a protruded disc.



Case No. 20

Ankle drop bilateral ankle jerks absent. Cutaneous sensation lost in S 1, 2 and 4.

Myelography shows a complete block at the level of 4 L. V.

Operation—No signs of previous laminectomy.

Two inches of cord at level of 4 L. V. was surrounded by thick fibrous band over the dura. It was not possible to remove the same completely.

There was no satisfactory improvement seen.

Arachnoiditis in another type of spinal lesion which may show localised or extensive pathology.

Case No. 21. B. L. Age 50 years. Fever and expectoration 8-9 months was treated at T. B. Hospital. History of lumbar puncture at T. B. Hospital. Sudden onset of paraplegia and also loss of sensation below the umbilicus within 24 hours of lumbar puncture. C. N. S.—higher function and cranial nerves normal. Abdominals—upper



Case No. 21

present, lower absent; knee and ankle jerks diminished—plantars extensors.

Upper extremities—motor and sensory—normal. Lower extremity: Complete loss of power. Complete anaesthesia below the umbilicus. Myelography by lumbar route—Parallel streaks like filling of upper lumbar region. Dye does not go beyond 12 D. V. even with more than 70° angulation.

Myelography with cistern puncture—There is a partial block at the level of 6 D. V. Some dye sticks at this place which shows a irregularly roundish filling defect on the cord in the centre.

Suggested diagnosis of adhesive arachnoiditis.

Operation—Extra-dural tissue in the region of 6th D. V. looked granular Spinal cord was thickened in this region. Dura was adherent. Arachnoid was adherent and thickened.

Arachnoid Cyst, a very rare type of spinal tumour:



Case No. 22

(a) Preoperation Myelography.
(b) Myelography 13 months after operation.

Case No. 22. L. R. 40 years.

Had progressive flaccid paraplegia.

Myelography showed an oval 24 × 10 mm. size arachnoid cyst displacing the spinal cord to left at T-12 level.

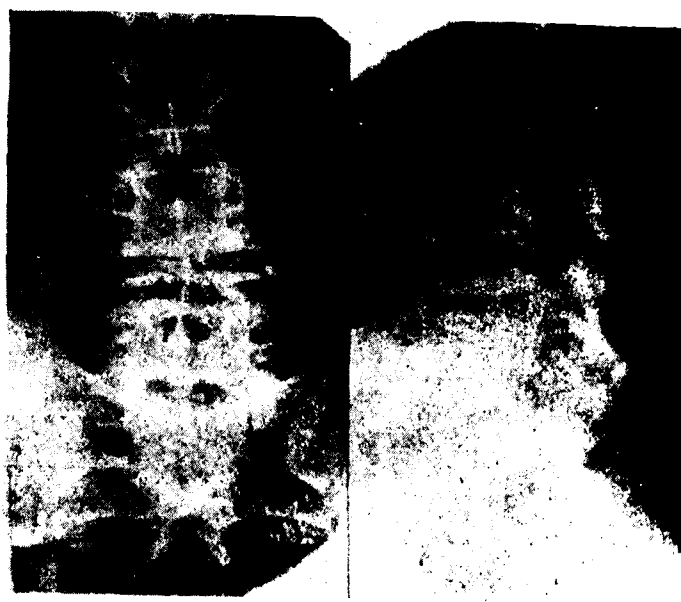
17-12-54 Exploration showed a small intra-dural subarachnoid cyst on antero-lateral surface of the cord. Some of the nerve fibres were spreading on the cyst. In two weeks patient showed marked improvement in his paralytic condition.

Recently the patient has returned with recurrence of symptoms.

Myelography shows a well defined sharp filling defect at the level of 1st and 2nd L.V.

Tumours of Adjacent Bones pressing on the cord

These tumours are usually diagnosed by the bony changes when present. Myelography is sometimes required to know the intra-dural extension of the lesion. The commoner varieties of these tumours are osteoclastoma and haemangioma.



Case No. 23

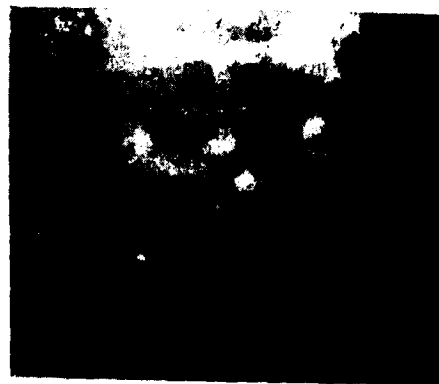
Case No. 23. G. R. Female. Age 41.

First seen December 1952. 11 months previously patient got pain in her lumbar region. X-rayed and diagnosed as caries spine and put in plaster for one month. Then admitted in another hospital and there diagnosed as collapse of 4th L. V. due to ? secondary and there treated for a few days with x-ray therapy and then referred to Irwin Hospital. This patient considerably improved, weakness and other pressure symptoms disappeared after therapy. The lesion is supposed to be primary tumour of the vertebra? osteoclastoma. Patient when seen in September 1954 was developing spondylolesthesis and was referred to Orthopaedic Department. Last seen in July 1955.

Case No. 24. W. P. B. Age 35.

On 17th January 1950 he jumped over a drain and got a jerk in the spine. Early hours of the next morning he got severe pain and burning sensation in the spine in

lumbar region with progressive weakness of both limbs. X-ray examination done 28-6-50, after admission show collapse of 5th L.V. with bone destruction of the body and left transverse process. Suspected of



Case No. 24.

bone Secondary. In spite of all investigation no primary was detected. Deep x-ray was started as a palliation procedure. Within a few weeks patient showed improvement. Patient was able to resume his normal duties within 6 months. Last seen June 1955.

Believed to be a primary benign tumour of vertebra.

Haemangioma was first reported by Virchow in 1863. The associated roentgen appearances was brought to our notice first by Perman. There is diminished density of vertebral body with uneven absorption of all trabeculae except those running in vertical plane. This gives the appearance of parallel vertical striae in semitranslucent body.

Case No. 25. J. Age 22. A case of paraplegia.

Haemangioma of 4th D. V. Laminectomy done. Biopsy—Haemangioma.



Case No. 25



Case No. 26

Case No. 26. A. N. U. Age 28 years.

Paraplegia 3 months. positive findings continuous flexor spasm both knees. Exaggerated ankle jerks both sides, bilateral plantar extensors. Abdominals lost. Pain and touch lost below the costal margins. Position and vibration sense lost. Lower limbs motor power lost. Cranial nerve and

upper limbs normal. Fundi—normal. B.P. 100/70. Lab. Data:—Hb. 13.75 gram. W.B.C. 6000 E.S.R. 35 mm. Kahn—negative. Diagnostic procedure—Lumbar manometric study showed incomplete block, x-ray suggestive of Haemangioma of 6-7 D.V. and medial end of 6th rib left. Myelogram—apparent partial block at L-1.

Therapeutic procedure—Laminectomy D-5—8 with partial removal of tumour. X-ray Therapy—considerable improvement.

Histopathology—Haemangioblastoma.

Metastatic Tumour. The first sign of metastasis or even the first indication of presence of malignancy may be due to spinal root compression. The symptoms of

root compression often point to intra-thoracic or intra-abdominal organ as the offender. In most cases the defects are not specified and the differentiation from other extra-dural and intra-dural tumours may be difficult. Metastasis of spine may be first evidence of malignant disease. Early myelography and laminectomy are indicated when there is clinical evidence of cord compression even in presence of known primary tumour.



Case No. 27

Case No. 27. B. M. Age 27. A case of multiple skin neurofibromas starting progressive paraplegia of gradual onset. Plain skiagram of lumbar spine shows that alignment between 1st and 2nd L. V. is displaced. There is destruction of left lateral and posterior part of the body of 1st L. V. with some compression. Left pedicles of 1-2 L. V. have lost their oval character and are medially eroded. Inter-vertebral disc space is reduced. Chest—Lungs show multiple secondaries.

Diagnosis—In view of skin and lung lesion the spinal lesion is suggestive of secondary with pressure on the spinal cord. After exploration an extra-dural tumour was removed and a gland from neck was also removed.

Biopsy—Neck gland—Neurofibroma.

Extra-dural tumour—Sarcoma (Neurogenic).

Case No. 28. A girl aged 9 years was admitted to the hospital with paraplegia of gradual onset duration 3-4 months, fever and dyspnoea for 15 days and backache 15 days.

X-ray chest—shows marked lymphadenopathy suggested diagnosis as malignant lymphoma.

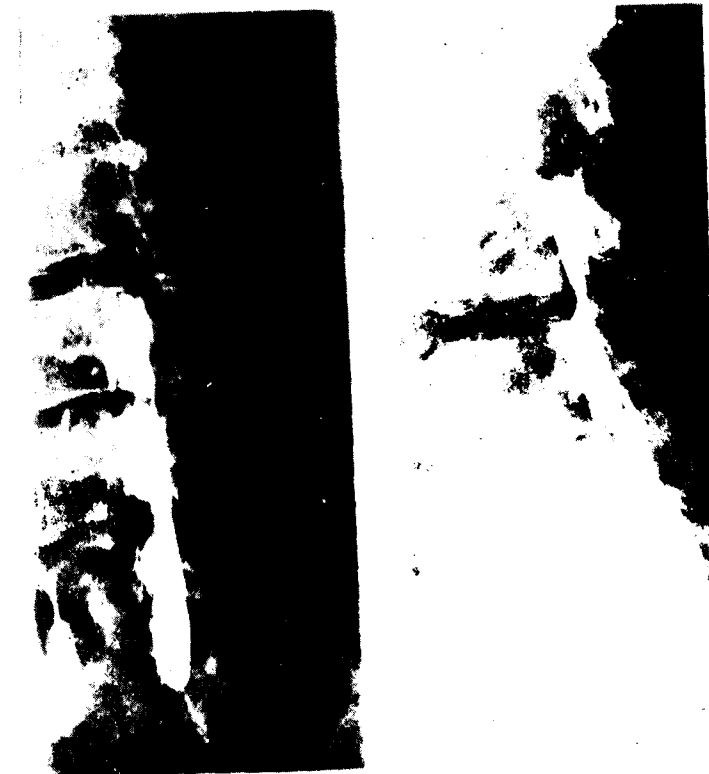
X-ray of the spine taken shows erosion of the 3-4 D. V. and sclerosis.

On account of fever and high W. B. C. count an alternative diagnosis of osteomyelitis of vertebra was also considered.

Post mortem—large tumours arising from 3-4 C. V. extending into mediastinum and also pressing on the spinal cord.



Case No. 28



Case No. 29

Histopathology—dysgerminoma of the ovary.

One cannot close this paper on investigation of spinal cord tumours without mentioning disc protrusion which is perhaps the commonest cause of lower back pain, sciatica and brachial neuritis.

The common discs to be affected are the lower lumbar specially 4-5 and 1st S and those above and below the 6-C. Plain skiagram usually shows diminished inter-vertebral disc and spondylosis.

Myelography should be done in these cases as these lesions are sometimes likely to be multiple.

Case No. 29, C. Age 40.

Pain in the back and radiating downwards to the lateral side of leg for last 3 years. Tenderness Lumbar and Sacral Spine. Movements-limited.

Knee and ankle jerks absent right side.

Rest n. a. d.

Myelography—There is posterior protrusion of inter-vertebral disc at L 3-4, L-4, 5 and L-5 S-1.

Summary

The procedure of radiological diagnosis of space occupying lesion of the spinal canal

has been discussed in short. The advantages, as well as disadvantages of various types of myelographies have been enumerated since Dandy in 1919 advocated use of air for myelography and Sicard and Forstier in 1922 introduced iodised oil, by accident, in the subarachnoid space. The various indications for myelography are given and pitfalls are explained. The analysis of myelo-graphic examination done at Irwin Hospital is given. The radiological findings of different types of Tumours are discussed and various types are classified according to these findings. An attempt has been made to include skiagrams and illustrations of as many types as possible of these lesions in all segments of spinal cord.

My thanks are due to Dr. Chandy, Christian Medical College Hospital, Vellore ; for permission to include two of his cases (No 3 and 26) which were referred to Irwin Hospital for X-ray therapy. I am grateful to all my colleagues for their kind and willing co-operation and to the Medical Superintendent of the hospital for permission to publish this paper. My gratitude is due to Dr. M. V. Sirsat, Pathologist, Tata Memorial Hospital, Bombay, for examining the biopsy material of some of the cases. I thank my daughter Kumudini for the drawing of illustrations and typing of the material.

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CASE REPORT

Ainhum's Disease

BY

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The purpose of this paper is to report a case of Ainhum's Disease which was noticed during the routine Roentgen Investigation in the Department of Radiology, S. C. B. Medical College Hospital.

Case note

N. B. a man aged 32 years was admitted to the S. C. B. Medical College Hospital on 18-12-56, with the complaints of a ring like ulcerative constriction on the left little toe and burning pain over that area. While tracing over the past history he states that the duration of that ring-like constriction is 15 years. At the start it was bilateral and the right little toe was spontaneously amputated a year back. Physical examination reveals good health and average build. There is little paraesthesia at the distal part of the left little toe which was bulbous. The constriction ring is at the level of the digito-planter fold. No abnormality is detected in stool and urine examination. Blood for Wassermann Reaction is also negative. other Laboratory investigations exclude Leprosy and Diabetes.

On 2-1-57 skiagrams of both the feet (antero-posterior) view were taken. Skiagram shows narrowing at the waist of the 1st phalanx of left little toe and a constriction

ring of the soft tissue little above the digito-planter fold. The skiagram of the right foot shows the amputated right little toe along with the remnants of the 1st phalanx. Figs 1, 2 & 3.

Review

The description of the above case rightly fits to the description of Ainhum's disease. This disease is of unknown etiology. It is peculiarly common in Negroes but also found with other nationalities of Tropics. It is unknown to the whites. It has a predilection for the little toes. It is often seen in males between 30 to 35 years. It may involve one or both little toes together or successively.

Summary

One case of Ainhum's disease with the Radiological findings is described.

Acknowledgments

I am thankful to Dr. G. C. Pattanaik, Superintendent-cum-Principal, S.C.B. Medical College Hospital, for his permission to publish this case. My thanks are also due to Dr. G. B. Mohanty Radiologist (Diagnostic Section), S.C.B. Medical College Hospital for his guidance and keen interest he took in this case.

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Fig. 1.—Skiagram of the left foot showing the narrowing at the waist of the 1st phalanx of the little toe.

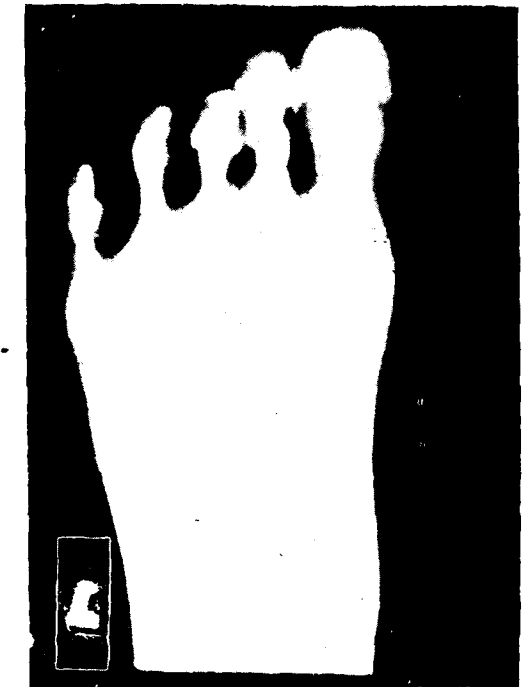


Fig. 2.—Soft tissue radiogram of the left foot showing the cutaneous constriction just above the digito-planter fold of the little toe.



Fig. 3.—Skiagram of the right foot showing the autoamputation of the phalanges of the little toe, due to previous similar constriction.

Abstracts of Radiological Literature

Ottoman, Richard E, and Woodruff, John, H. Jr. Polypoid diseases of the stomach. *Radiology*, Jan. 1955, 64: 34-44.

The phrase "Polypoid disease" is purely descriptive, signifying a manifestation of gastric disease by the appearance of something polyp-like, ranging from a sessile configuration through complete pedunculation. Conversion from a wholly sessile plaque to a pedunculated polyp is brought about chiefly by the muscular movement of the stomach. Histologically, these lesions may be divided into several categories.

I. Inflammatory (a) specific (b) non-specific.

II. Tumours (a) benign (b) Malignant.

III. Miscellaneous.

Symptoms produced by polypoid diseases are vague, until complications arise. Due to their high incidence in the antrum or prepyloric area, these tumours are prone to prolapse into the pylorus, producing intermittent partial or complete obstruction. Once the mucosa becomes adequately thinned over the lesion, ulceration may occur. With ulceration, haemorrhage may ensue, with or without haematemesis. With malignant change, symptoms may gradually increase, as the clinical picture of inanition is superimposed on the findings described above.

The frequency of polypoid diseases of the stomach varies according to the examiner, the types of examination, and the types of patients selected or studied. Golden indicates that approximately 25 per cent of gastric carcinomas may be of the exophytic or polypoid type. The importance of the discovery and identification of polypoid lesions lies in the tendency for the benign gastric tumours to undergo malignant change, or in many cases, in an association of these lesions with an existing malignant growth.

Polypoid lesions are more frequent in the antrum and pyloric areas. The differentiation between benign and malignant polypoid diseases is not absolute, but certain characteristics, when present, tend to favour the one or the other possibility. A static lesion is usually benign, as is a very slowly growing

one. The borders are regular, smooth, and occasionally nodular, rounded, and sharply circumscribed, *A Stalk* is frequently present. Rugae are generally normal, but may be thin over the tumour surface. Rapid growth is characteristic of malignant lesions. Margins are more apt to be irregular and less well defined. Pedicle is infrequent. Most significant is the absence or reduction of peristalsis, and loss of pliability of the gastric wall at the site of involvement. Stiffening and thickening of the rugae with or without nodularity, and/or irregular destruction of the mucosal folds are rather characteristic of malignant disease.

Polypoid carcinoma is by far the most common, with polypoid sarcomas second, and benign adenomatous polyps third in frequency. The incidence of malignancy in polypoid gastric lesions is high.

7 radiograms. 5 tables.

S. N. Deboo, Bombay.

Steinbach Howard, L.; Rosenberg Robert, H.; Moses Grossman; and Nelson Thomas, L. The potential hazard of enemas in patients with Hirschprung's disease. *Radiology*, Jan. 1955, 64: 45-50.

Severe reactions and deaths have occurred in patients with Hirschprung's disease during or immediately following an enema. 5 cases are reported of megacolon, in which there was sudden death from unknown cause, and 1 case in which a shock-like state followed an enema but the child recovered.

It appears to have been established that enemas can precipitate severe and fatal reactions in these patients. The mechanism by which this is brought about, has not been adequately explained. Hiatt believes that death is a result of water intoxication and proved experimentally that the essential disturbance producing reactions in megacolon patients was a state of low Sodium shock. Some features of these reactions are however not explained by this theory. Why are the reactions produced in some patients and not in others? Why will a child be able to take daily 2 enemas for 11 years without any ill effects, and then suddenly

go into shock and die, following a procedure that was similar in all respects. The possibility must be considered that some or all of these reactions are a result of mechanical distension of the colon. It is well known that reflex inhibition of the heart and shock can be induced by appropriate stimuli to the afferent nerves, and as the disease is primarily a neurologic disturbance, it is conceivable that an altered or exaggerated reflex could be produced that would cause cardiac arrest and shock.

It is important therefore to make an attempt to prevent these reactions. It is wise to use a saline solution for the enema. In performing a barium enema study, it is usually not necessary to fill the entire colon to diagnose Hirschprung's disease. The diagnosis can usually be made by demonstration of narrow rectum and rectosigmoid associated with a pronounced dilatation of descending colon and varying lengths of the sigmoid colon. The hydrostatic pressure of the fluid into the colon should not be excessive. A height of 2 feet is usually sufficient, and 3 feet should not be exceeded. Following an enema, as much fluid should be recovered as possible. This may require a rectal tube and syphoning or suction, if a large amount remains in the colon. If in spite of these precautions, a reaction occurs, the patient should be treated symptomatically for shock. Normal saline, plasma and blood should be given intravenously.

5 cases. 2 radiograms. 1 table.

S. N. Deboo, Bombay.

Roentgen diagnosis of small polyps in the colon and rectum. Lars Andren, Sture Frieberg, and Solve Welin. *Acta Radiologica*, March 1955, 43: 201-207.

There exists a very close connection between cancer and polyps of which 70 per cent are adenomas in the digestive tract. The majority of carcinomata of colon arise from a polyp. Not less than 17 per cent of all deaths from cancer originate in malignant growths in the colon and rectum.

The authors describe their technic. They use a combination of the 3 methods:—namely (i) double contrast method

(ii) mucosal pattern examination after addition of tannic acid (iii) high voltage technic. The contrast enema is allowed to flow only as far as the middle of the transverse colon, when the usual anteroposterior, postero-anterior, oblique and profile views of the rectum and sigmoid colon as well as the splenic flexure are obtained. The patient is then directed to evacuate the enema, and it is decided by fluoroscopy whether the evacuation has been sufficient for the mucosal relief pattern film. Before insufflation, more contrast medium is injected, so as to fill the bowel as far as the middle of the sigmoid colon. Air is now blown into the bowel by means of a clysto pump. The patient is rotated fully to the left, preferably several times, in order to equally distribute air and contrast medium over the entire intestinal wall. The contents of the rectum are then drained off by means of an enema pipe with the patient in the prone position.

For radiography, a long focus film distance of 1.5 metres is used, with a fine focus tube of 1.2 mms. in diameter.

Using the technique described, they found one or more polyps in 159 patients. 90 per cent polyps demonstrated were less than 1 cm. in diameter. 60 per cent polyps were less than 5 mms in diameter, and some of those verified were as small as 1 to 2 mms. Of the polyps removed, 12 per cent were undoubtedly carcinomata. In the opinion of the pathologist, 30 per cent in all were clearly precancerous.

A material of 1274 cases were examined with the so-called double contrast enema method, and polyps were found in 12.5 percent, of these approximately 90 per cent were under 1 cm. and 60 per cent under 5 mms. in diameter.

7 radiograms in series.

S. N. Deboo, Bombay.

Subluxation and deformation of the Cervical Apophyseal Joints. Akos Kovacs, *Acta Radiologica*, Jan. 1955, 43: 1-15.

Behind the vertebral artery and vein, the spinal ganglion is seated in the sulcus nervi spinalis and posterior to the ganglion lies

the superior articular process of the corresponding vertebra. The distance between the artery and the apex of the articular process running upwards and forwards is hardly more than 2 to 3 mm.

The artery and nerve (vertebral sympathetic plexus) are rather frequently affected by the deformities of adjacent bone borders.

Subluxation may be due to chondrosis or traumata. The chondrosis may result in functional disorder of the unit termed motion segment (Bewegungs segment) by Junghanns. The accompanying muscle defence will result in spinal deformity. Later, the capsule ligament of the small joint becomes overloaded and the superior articular surface begins to slip slowly downwards and backwards on the oblique inferior articular surface, and subluxation arises. The backward displacement is limited by the arch of the vertebra. Frequently, impaction of the slipped superior articular surface leads to an atrophic excavation or hole made by the lower extremity of the articular process. In other cases the site of the impaction is surrounded by an elevation, that is to say, an osteophyte. A similar buffer-osteophyte may arise on the lower margin of the transverse process. These changes are of a compensatory character.

It is well known that the pulsation of vessels adjacent to bones results in the destruction of its substance (impression of the meningeal arteries, aneurysms of the aorta, etc.). In the cervical vertebrae a bony excavation of similar origin not infrequently occurs on the anterior surface of the superior articular processes and is due to pressure exerted by the vertebral artery in cases of subluxation. This arterial impression was seen in 5 of the 54 cases.

The broadening due to spondylarthrosis of the articular surface is essentially the result of failure of repair, and aims at restricting the increased mobility and instability beyond the earlier limits by means of the broader joint surface.

Apart from diseases of the intervertebral roots, secondary irritation of the cervical ganglia may also lead to organ lesions and functional disorders, the significance of the representation of the foramina has greatly increased.

The antero-posterior roentgenogram or tomogram may sometimes show the broadening of the uncovertebral borderline (Bartschi-Rochaix).

Tomography may, in doubtful cases, eliminate errors due to incorrect projection.

We believe that headache radiating from the top of the skull and the nuchal region as well as the upper cervical sympathetic syndrome described by Barre-Lieau, is more frequently produced by pressure exerted on the vertebral artery and nerve by the superior articular process than by other conditions. The unco-vertebral changes do not affect the artery unless they extend laterally and exceed 3 to 6 mm. This view is supported by the statement of Bartschi-Rochaix who found that unco-vertebral changes are frequently unaccompanied by clinical symptoms.

28 Radiographs, 5 diagrams.

S. N. Deboo, Bombay.

Richard Spitzer and M. I. Robinson, Radiological changes in teeth and skull in mental defectives, Br. Jour. Radiol., March 1955, 28: 117-127.

A series of 55 patients, 28 mongols and 27 feeble minded patients of both sexes were submitted to a radiological examination of the skull, hands, wrists, jaws and teeth.

In the feeble minded groups, few dental and still fewer osseous changes were found. Congenital absence of the 3rd molar was seen in 5 cases and in 3 cases the 3rd molar was missing in one case only.

The mongolian idiots showed a very high incidence of developmental dental lesions and absence of frontal sinuses. The maxilla and mandible were under developed, the mandibular angle was obtuse, the ascending ramus short, and the horizontal part showed lack of vertical height. There was hypodontia of one or 2 tooth groups, general affections of tooth structure, deficiency of growth and delayed eruption of the permanent teeth. Bone age is consistent with the chronological age, but the dental age showed marked deviation from the normal. Microdontia and malformations of shape resulting in hypodont stunted teeth were

seen. The unerupted teeth exhibited the initial stage of an anomalous development.

An analysis of the findings suggest that the dental and cranial lesions in the mongolian patients are due to factors operating antenatally. With this in view the concept of a casual relationship between these anomalies and mongolism seems reasonably well supported.

16 radiographs, 2 tables.

S. N. Deboo, Bombay.

A method of Preoperative Roentgenotherapy by high doses followed by Radical Operation for Carcinoma of the Breast (Showing Survivals upto 10 years) F. Badlesse. Jour. Fac. Radiol. January, 1955-6: 145-163.

From a period of 1935 to 1946, a total of 77 patients were treated at the Foundation Curie, on the principle of administering much higher doses than are given in classical pre-operative radiation of breast cancer. A radical mastectomy was performed in all except 5 cases of simple mastectomy and the operated specimen was then examined. This paper reports 5 and 10 year results.

For preoperative irradiation 2 segments may be distinguished, those of surgery and radiotherapy. The surgical segment concerns the breast and axillary fields, that is to say, the zone on which the operation will be performed. The doses must be subordinated to this and remain below the tissue tolerance level. The radiological segment comprises the internal mammary chain and supraclavicular fossa. These regions, not being included in the operation, must be irradiated with higher doses capable of "sterilising" the glands.

The surgical segment:—2 breast fields, medial and lateral, are treated strictly en profile, right and left alternately, the patient lying in the lateral decubitus position, and each field is taken to a maximum total skin dose of 4000 r. It is advisable for a start, and until fully experienced in the technique to stop at 3000 + 3000 r skin dose. The administration of the dose must follow a certain rhythm, where the maximum dose

at the end of the 6th week does not exceed 2000 r per field nor 2400 r per field at the end of the 7th week to reach 4000 r maximum at the end of the 10th week. The axillary fields, one direct with the arm raised and the other anterior with the arm abducted at a right angle, are irradiated to a maximum dose of 2000-2200 r each over 6 weeks, and 2500 r in 7 weeks giving two treatments per week of 200 to 250 r each.

The Radiological segment (internal mammary and supraclavicular lymph nodes) receives high doses, 6000 r for the internal mammary chain, and 4000 to 5000 r for the supraclavicular field. Fractionation is of the order of 12 weeks at a rate of 2 treatments a week (200-250 r per treatment). The fields are irradiated alternately following a regular cycle. Using this system, the irradiation of the surgical area is stopped on an average at the end of 10 weeks, whilst that of the radiological segment is continued until the higher dose is achieved. Then surgery is performed 2 months afterwards or even later, after completion of the irradiation of the surgical segment.

The results followed up were found to be 44 per cent 5 year clinical cures, and 35.5 per cent 10 year clinical cures. All the Stage I cases have been eliminated from this work.

13 figures, 16 tables.

S. N. Deboo, Bombay.

D. W. Smithers. Carcinoma of the Bronchus. A radiotherapeutic view point Jour. Fac. Radiol. Jan. 1955, 6: 174-181.

To the Radiotherapist, carcinoma of bronchus presents itself in the form of a long procession of ill patients with distressing symptoms who have been already rejected for surgery. Nearly two thirds have undifferentiated tumours, constituting 62.5 per cent, the adenocarcinoma 11.6 per cent, and squamous carcinomas forming 25.9 per cent. Of the undifferentiated tumours, 80 per cent have metastasized rapidly by the blood stream before death. Despite the fact that most of them will die within a year, a few may live for several years without any treatment.

In these circumstances, the first duty to his patients is to bring them as much comfort of mind and body often with the help of the Lady Almoner and to see that he does not add to their difficulties or distress. The outstanding service the radio-therapist can give is the relief of superior vena caval obstruction. Though the obstruction may return and cannot be relieved a second time, it does not usually do so if a tumour dose of 3000 r has been given. Pain due to blood-borne bony metastasis can be relieved, but pain deep in the chest, and pain from superior sulcus tumours is seldom relieved for long. When there is direct extension to involve the ribs, irradiation may bring relief of pain and local tenderness with recalcification of ribs involved, only for the pain to return again in a few weeks or months as severely as before.

For some patients, in a good general condition, radical treatment may be started cautiously, with antibiotics, and carried on to tumour doses of between 5000 to 7000 r in 5 to 6 weeks. Supervoltage therapy can now be given without adding to the patient's distress at all.

For prevention therapy, a reasonable assessment of tobacco risk is now being presented so that young people can be actively dissuaded from becoming heavy smokers.

Earlier diagnosis is essential, more patients might be rendered operable by preoperative irradiation. The use of radioactive gold for the control of malignant pleural effusions is an addition to our palliatives. Those submitted to thoracotomy and found inoperable might there and then receive a radioactive gold-grain implant.

The author advocates a plan (1) Patients with undifferentiated tumours to be treated by radiotherapy whether operable or not. (2) Most patients with squamous-cell tumours to be explored if thought operable, resected if possible, and implanted with radioactive gold if not. Palliative x-ray therapy for the inoperable. (3) Some patients with adenocarcinomas to be treated

by radical radiotherapy with a view to operation whenever possible within 2 months of completing the treatment. (4) Greater efforts to be made to establish the diagnosis and the exact nature of the tumour.

6 figures, 3 tables.

S. V. Debnar, Bombay.

E. Barnett, Ovarian radiation during Hysterosalpingography. Jour. Fac. Radiol. Jan, 1955, 6: 186-188.

Different views have been expressed, regarding the use of screen control in hysterosalpingography. At Hammersmith Hospital, the factors for screening ~ 82 kV, 3 ma, Maximum, aperture 6 cm. square, No filter. Focus table top to distance 53 cms. For radiography: A.P. 80 kV, 75 mA seconds. (Lateral 85 kV, 150 mA seconds) No filter. Overcouch tube, with focus table top distance 82 cms. Standard films and screens with Potter bucky. The dose was estimated by taking measurements in a tissue equivalent phantom made of mix D wax, 16 cms. deep. The measurements were made with a bakelite-graphite ionization chamber connected to a d.c. amplifier. The radiation was calculated both under screening and radiographic conditions.

(1) Results Under screening: During screening, the radiation to the skin surface was 9.5 r per minute, and 1.6 r per minute at the depth of the ovaries. (2) Under radiography: 2 anteroposterior films are taken in the majority of cases. In some instances a further film is taken in the lateral position. The radiation to the skin surface in anteroposterior position was 4.3 r, and in lateral position was 17.2 r. The radiation to the ovaries was in anteroposterior position 0.45 r, and in lateral position 1.5 r. The maximum dose received was estimated to be 3.6 r for a patient whose examination required the taking of 4 films.

They therefore conclude that by using the screening technique described, no additional radiation hazard is introduced into the examination for hysterosalpingography.

S. V. Debnar, Bombay.

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