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THE Indian Journal of Radiology

A quarterly Journal devoted
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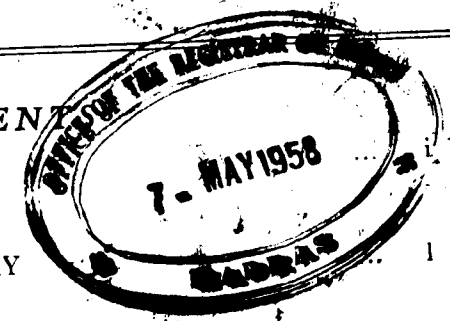
Vol. XII

FEBRUARY 1958

No. 1

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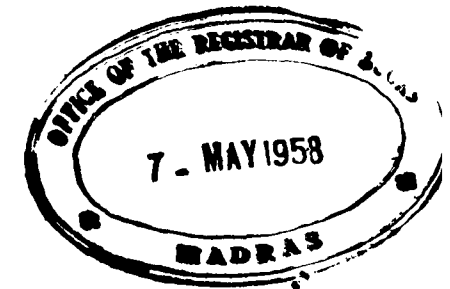
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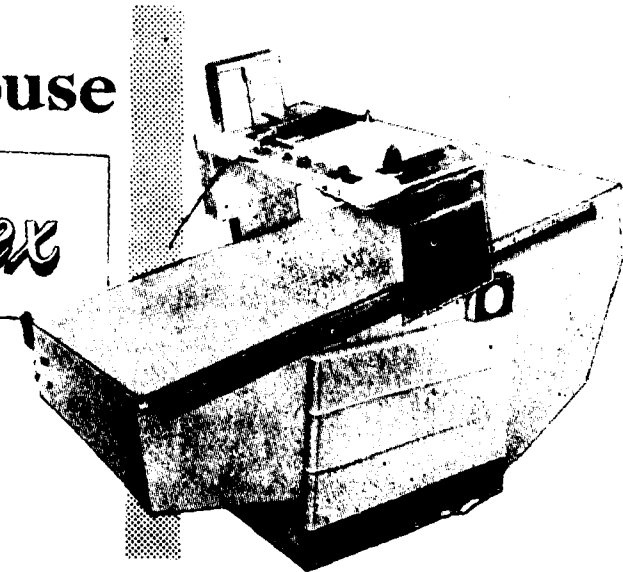
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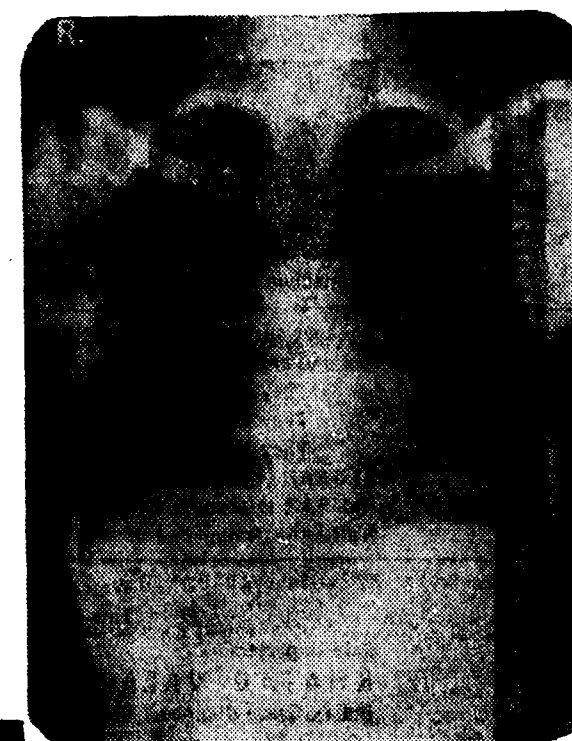
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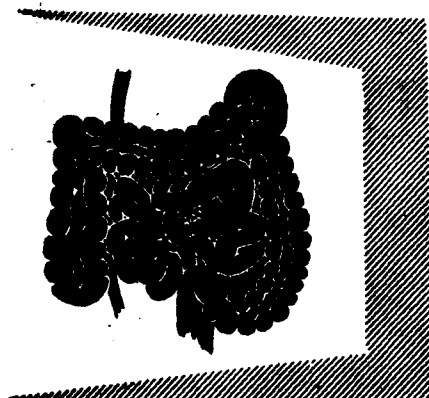
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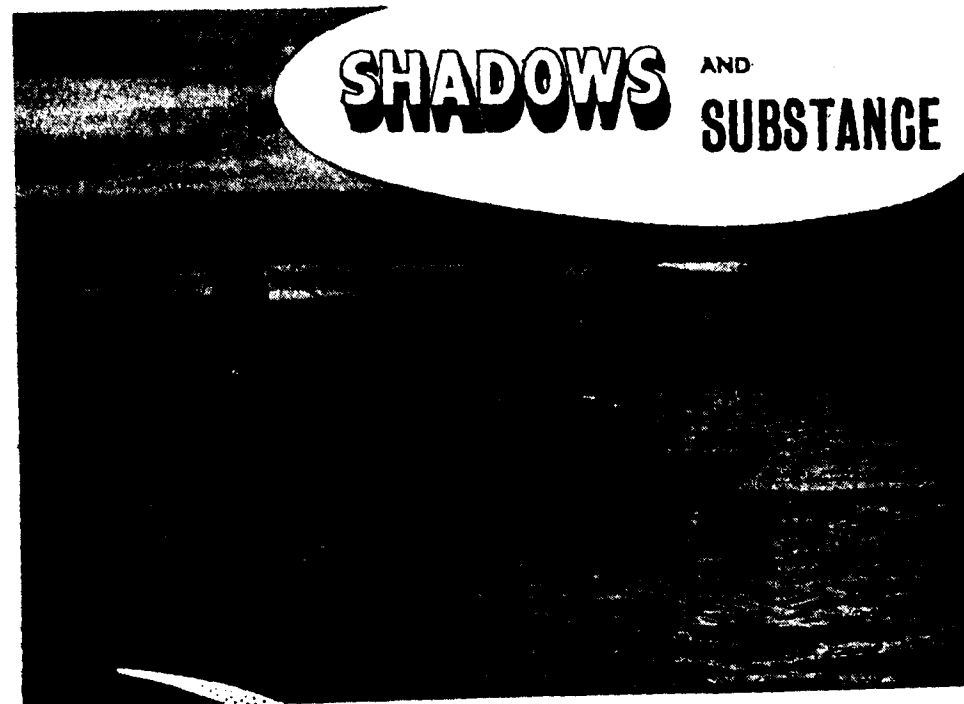
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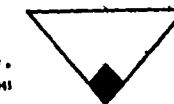
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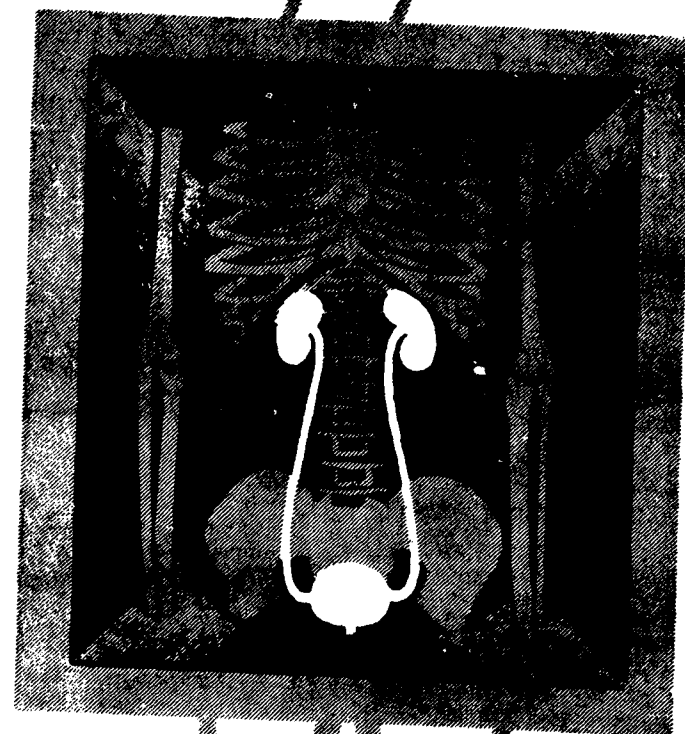
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The 12th Indian Congress of Radiology

EDITORIAL COMMENT

BY

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

144

The 12th Indian Congress of Radiology was held at Kanpur in February this year and concluded its session a day earlier than the scheduled time. This is the second time the Annual session is meeting in the State of Uttar Pradesh, the last one being in February, 1955 at Lucknow.

The State of Uttar Pradesh is one of the largest both in size and population in the Indian Union and occupies a very important place. Lucknow is a University Town, whereas Kanpur is mainly an industrial Town. A Medical College has just started functioning in this City. It cannot be said therefore that this college enjoys the same academic atmosphere as Lucknow enjoys. Even then, one must at once acknowledge that by and large, the conference was a good success, thanks to the untiring efforts of Dr. K. B. Mathur, Dr. B. N. Khanna, the two, Senior Radiologists from Lucknow and Kanpur supported by a band of devoted junior Radiologists and the unstinted co-operation of the staff of the new Medical College headed by Dr. C. B. Singh, its very energetic and understanding Principal.

The inauguration ceremony of the Congress took place on the 7th February by Dr. Jawahar Lal Rohatji, the Deputy Minister for Health of the State in the unavoidable absence of the Minister for Public Health. There was a very large gathering of Ladies and Gentlemen both from within and outside the profession in a gaily decorated Pandal. The proceedings started with an address by the Chairman of the Reception Committee, Dr. K. B. Mathur followed by the inaugural address by the Deputy Minister for Public Health. Dr. Diwan Chand Aggarwal, the outgoing President then installed

Capt. P. B. Mukerjee on the Presidential Chair as President of the 12th Indian Congress of Radiology and invested him with the insignia of the office.

In his Presidential address, Capt. Mukerjee spoke on the many problems that are facing the Radiologists and the practice of Radiology in this country. While some of the points raised by him are non-controversial, it was unfortunate that he should have dilated upon and at length on some of the most controversial points that have been agitating the minds of our colleagues in the Association for the past few years. This has given room for controversy. I refer here to the President's expression of opinion on Radiological education and the Regulation of the practice of Radiology as a speciality in this country.

While the Association has taken no objection to specialists like Orthopaedic Surgeons, the T. B. Specialists, etc. using X-rays and other Radio-Active substances in the course of the practice of their own speciality, medical men without the necessary training in Radiology and much less non-medical men should not be allowed to practice Radiology as a "Speciality". It is in this regard that legislation is being urged by the Association for the control of Radiological practice. The argument that we in this country have not enough qualified Radiologists to meet the needs of the country and therefore such controls as have been demanded by the Association are not only not necessary but are harmful has not much substance. The same argument can be put forward regarding the practice of Modern Medicine. Have we sufficient number of medical personnel with qualifications acceptable to the Medical Council to render medical aid to the 360 millions of our people? Are we therefore prepared to lower the present standard of medical education and cut down the training period to a total of 2 years instead of the present 5½ years, till we produce such numbers of these two-year trained medical men and women to meet the needs of the country? Such proposals to lower the standard of medical education have not been countenanced and we are certain in our mind that such a retrograde step will never be accepted. How then does the practice of such a large and complicated speciality as Radiology with the attendant radiation hazards differ from the practice of general

medicine? If any practice of Radiology is preferable to no practice of Radiology, then by the same token, any practice of medicine, *e.g.*, the suggested two year course of modern scientific medicine is good enough in the place of "No practice" of modern scientific medicine. Are we agreeable to the proposition? It would be very desirable that such controversial points are not raised in presidential addresses as it would appear to others as the policy of the Association.

The Scientific programme of the Annual Session presented a good fare to the visiting delegates, but unfortunately a number of members who had volunteered to read papers and take part in the discussions, failed to make their appearance at the Conference. This is very regrettable. When one undertakes such onerous duties, he should not fail the Association and the organisers of the Annual Congress unless it be for very compelling reasons. To the disappointment of many who came to Kanpur incurring large expenses from the far corners of the country, the Congress Session actually closed a day earlier than the scheduled time—as four of the lecturers did not turn up to present their papers and take part in the discussion. It is hoped that such repetitions and disappointments will not recur in the future.

In spite of these disappointments and shortcomings, one would fully endorse the view that this Congress was a great success. The highlight of the Scientific Session was the address by Dr. J. H. Bhabha —this year's Sir Jagadish Memorial Lecturer—on the "Atomic Energy Programme of the Government of India". Dr. Bhabha does not require introduction to our readers as he is well known all the world over, as one of the leading Atomic Physicists. He kept the Radiologists and others gathered at Kanpur enthralled by his very illuminating and absorbing lecture for over three hours. The lecture was fully illustrated by lantern slides, statistics and figures. One was left with the undying impression that he was physically moving through the various Departments of Atomic Energy at Trombay. Dr. Bhabha is the first Indian to receive this signal honour—The Sir Jagadish Memorial Medal—which the Indian Radiologists can confer on any one. In honouring such a distinguished son of the soil, the Indian Radiologists have honoured themselves.

In conclusion, we shall be failing in our duty if we do not acknowledge and tender our very warm thanks to Dr. K. B. Mathur, the Chairman of the Reception Committee, Dr. B. N. Khanna, the General Secretary of the Congress and his Committee, the distinguished Principal of the Kanpur Medical College Dr. Singh, and that devoted band of volunteers who greatly contributed to the convenience of the delegates in a place where taxis for hire are a rare commodity.

Last but not least, many social functions were arranged which we thoroughly enjoyed and made many valuable contacts. It was indeed a pleasure and privilege to meet the many distinguished Industrialists and others from Kanpur and Lucknow. We will cherish the pleasant memories of our visit to Kanpur for a long time to come.

Retrograde Aortography*

By Percutaneous Femoral Catheterisation

BY

DR. K. M. PILLAI, B.A., M.B.B.S., D.M.R. (D.) LOND.,

*Lecturer in Radiology, Madras Medical College and Radiologist, Govt. General Hospital, Madras
Barnard Institute of Radiology.*

Castellanos and Pereiras claim to have performed the first retrograde aortography and even name the method in 1937. At the Pediatric Assembly in Cuba in 1938, a motion picture was projected by the authors on the technique and results obtained. The results of their investigations were published in English in the Cuban Cardiology Journal in July 1939. Farinas in the October 1940 presented in Mexico an open method of introducing a radio-opaque catheter into the Aorta and forcible injection of a contrast substance. In 1946 Farinas modified this technique by direct counter method and by use of an original high pressure injection apparatus. (Gf. A. J. R., 46, 55, 448, 451). Radner in 1948 advocated the passage of uretric catheter into the aorta by exposing surgically the radial artery. Helmsworth, McGuire and Felson in 1949 described in detail the technique of catheterisation by exposure of the arteries and subsequent closure of the incision with silk sutures, in a series of 24 cases. A ureteric catheter was at first used but the "advantage of its radio-opacity was outweighed by the disadvantages of the thickness of the wall of the catheter". Subsequently Polythene tubing was used by the authors and proved more satisfactory. Pierce in 1951 described Aortographic findings in 64 cases in the first reported Series of Percutaneous Catheterisation of the Abdominal Aorta in Man. His article in Sur, Gynec. and Obstr. is an exhaustive study of the indications and contra-indications of this technique. The apparatus described by Pierce consisted of a canula for

puncturing the Artery percutaneously and a Polythene catheter which was introduced through the canula directly.

The present paper is based on the experience gained in the performance in Aortography in a series of 150 patients. The Armamentarium consists of a Trocar and a flexible Guide wire and a Polythene tubing of a suitable length. We have used the set as designed and developed by Seldinger. The Polythene is sterilised by immersion in Citavelon for 12 hours and a fresh bevel is made every time. The Bevel is cut obliquely and the extreme tip truncated to prevent injury to the Arterial Wall. The opposite end of the Catheter is pressed to form a flange to fit the adapter without slipping out. The patient is prepared as for a surgical operation of the Groin and is premedicated with pethidine or morphia $\frac{1}{2}$ hour before the Catheterisation. No food is allowed for four hours prior to the examination. A Scho-nander Serial Changer is arranged under the patient and a pilot picture is taken to check up the factors and position of the patient. The area of the Femoral Artery below the Poupart's Ligament is infiltrated with 1% Novocaine and a small incision is made in the skin with a No. 11 blade just sufficient to insert the Trocar through. The Trocar and Canula set is introduced through the skin wound over the Femoral artery. The tip of the set is held over the artery and held lightly so that the pulsations are felt on the needle tip. The artery is now firmly punctured so as to pierce it through

*Paper read at the 11th Congress of Radiology at Calcutta on February 1957.

and through. The Set is now tilted back over the thigh and gently withdrawn. On withdrawing the Stillette, the blood freely pulsates out of the canula. The flexible end of the Guide wire is now introduced through the Canula into the arterial lumen beyond the tip of the canula for an inch or two and firmly held by the fingers of the left hand. The canula is now withdrawn and the Polythene tube is slid over the guide wire into the arterial lumen. A slight resistance is felt as the Polythene slips through the arterial wall. The Polythene tube and the Guide wire can now be pushed up the Aorta to any desired level. If the tip of the Tube hits the side of the aorta, a slight resistance to the upward movement would be felt. This could be overcome either by twisting the tube a little or by forcibly injecting a little saline into the Aortic lumen when the impact of the fluid would sufficiently alter the tip to push it further up the lumen. A small amount of Contrast 2-5 c. c. can now be injected into the Aorta and fluoroscopically visualised to note the exact position of the tip of the Tube. This dose of Contrast would be another Test dose and be an additional safety factor. Once the tip of the tube is correctly placed, Serial Radiography can be undertaken to visualise the pathological circulation if any in the organ under investigation. The injection must be given rapidly 30 to 40 cc in 2 to 3 seconds. The first film is exposed when the last 5 cc still remain in the Syringe. A pressure apparatus to force the contrast into the Aorta is ideal although we have mostly relied on the manual injection with reasonably good results. We have now found by experience that upto the renal artery level it is not difficult to manually inject the contrast. At higher levels the force needed is much more and it becomes more and more difficult to use manual pressure to force the contrast into the aorta. It is at the higher levels that a mechanical injection system would help in the production

of first class films. The Polythene tube is left *in situ* and the films processed. A small quantity of normal saline is slowly transfused more with the idea of keeping the lumen patent. Lateral or Oblique views can now be taken without any discomfort to the patient. In this, the Retrograde Catheter approach has the greatest advantage over the other procedures like the Translumbar. Once the investigation is complete, the Polythene is withdrawn and firm pressure over the puncture for five minutes completely seals the wound and stops any bleeding from the artery.

We have used 70% Diodone for the series of aortograms and have mostly relied on Vasiodone, a product supplied by May & Baker. There have been no reactions observed in the series and except for the burning sensation momentarily felt in the body, patients have tolerated the Contrast medium very well indeed. In the last 50 cases, we have used the newer medium Diagnol. 70% with excellent results.

Prof. Lindgren recommends General Anaesthesia and arrest of respiration at the time of exposure of the films and suggests hypotension anaesthesia. The Nephrographic effect is certainly much better seen under the above procedures. We have used these techniques only in Translumbar Aortography in cases where both Femoral pulsations were absent. Otherwise, we have relied on the technique under local infiltration only. We use a Schonander mechanical serial changer with three films and only occasionally use a locally constructed five-film serial changer.

Most of the literature on the subject exclusively or almost exclusively dealt with aortography by the Translumbar route. Smith, Rush and Evans in 1952 (J. A. Med. Assn.) reported 668 cases. Sante described a smaller number in 1951. The A. J. R. editorially discussed in 1951 the dangers of contrast investigation in General. Certain

interesting figures were quoted. In a series of 6824 contrast investigations by angiocardiology in U. S. A., Canada, U. K. and Sweden, there were 26 deaths *i.e.*, 0.38%. A curious fact observed in this statistical review was that mortality was minimal in those series where the investigation was done with the patient upright. This, of course, referred to Angiocardiography. Weyde's illuminating contribution to the subject of renal pathology by aortography is worth detailed study. He has made a special study of the subject and has contributed a number of original articles on kidney abnormalities. Lancet (Oct. 1952) gave some interesting facts and figures and commented editorially. In an analysis of 3500 cases of aortography, there had been no death. I have given these statistical analyses to show that Aortography, properly carried out, carries no more risk than the routine Intravenous Pyelography. As a matter of fact, apart from one case where the Translumbar needle entered the Sup. mesenteric artery accidentally producing thrombosis and death, no cases have been reported so far in the literature where death was directly attributable to either Aortic puncture or to Catheterisation. On the other hand, fatalities have been more often reported due to Intravenous Pyelography. Perhaps the total world figures for I. V. P. and aortography could not stand comparison with each other in assessing incidence of complications but it must be remembered that Iodine in much higher proportions is used in aortography as compared with Intravenous techniques.

Prof. Lindgren has discussed the various techniques of aortography in 1953. (Acta Radiologica). He is a renowned authority on the subject and he concludes that Retrograde Catheterisation is the more ideal method of choice but advocates general anaesthesia and hypotension in preference to the local anaesthetic.

It is of interest in this connection to record the work of Campi and Abeatici on the histological changes in the arterial walls of dogs after large concentrations of Iodine have been injected. They could find no changes in the arterial walls macro—and microscopically.

Indications

Smith and others made an exhaustive study of 668 cases and discussed in detail the indications for aortography. Renal hypertension; Hydronephrosis; Neoplasm; cyst; anomalies; extra renal retroperitoneal masses; Hypoplasia; Atrophy and Agenesis of the kidney; vascular abnormalities of the splenic, hepatic gastric, aortic, renal, iliac, Femoral and Popliteal arteries especially aneurisms, Fistulae, thrombosis and other types of obstruction; Visualisation of the placenta and Pelvic tumours, and lastly the question of aberrant Renal arteries. In this connection, it is illuminating to read Smith's article in the A. J. R. in February 1952. In their series of 675 cases, this oft-discussed subject of Aberrant renal artery was fully analysed. The authors emphasized and illustrated uretero-pelvic obstruction by an aberrant Renal artery pre- and post-operatively in 9 cases *i.e.* 1.3% of all renal conditions investigated by them. The authors



Fig. 1. Shows the lower pole of the Left Kidney Opacified through an Aberrant Renal Artery.

have also stressed the visualisation of the contribution of an aberrant artery to the circulation of the kidney and its significance to the Surgeon in deciding whether the vessel should be divided or a Pyeloplasty performed around it. (See Fig. 1).

Weyde lays emphasis on the value of atrophy of the renal vessels paralleling the atrophy of the renal parenchyma in Hydro-nephrosis. (See Fig. 2) Solitary cysts gave a

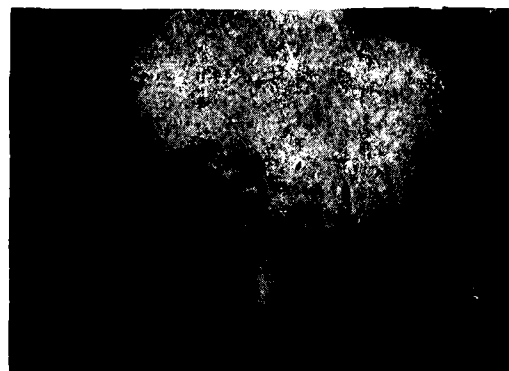


Fig. 2. Hydronephrosis Rt. and normal Nephrogram Left

characteristic picture of displaced vessels and nephrographic density around a nonfilling area corresponding to the cyst. In cases of Tuberculous renal lesions, the destroyed renal parenchyma appears as an avascularity in the Contrast-laden normal renal tissue around: it differs from the cyst in the absence of a smooth periphery of contrast and displaced but otherwise normal vessels of the latter. The author lays special mention of the possibility of, under streptomycin cover, a segmental resection of the kidney in the smaller types of renal involvement and according to him, this is one of the most important indications of Aortography.

Neoplasms of the kidney give very characteristic findings. In Hypernephroma, there is lacking of the contrast in the tumour particularly noticeable when the nephrographic effect slowly clears up; it is, therefore,

seen in the late capillary and venous phases of the series. As in the case of Cerebral Glioblastoma, areas of haemorrhage, necrosis and Cystic degeneration inside the tumour would appear as avascular areas in the centre of the "pooling" of the dye in the tumour. This is a very characteristic picture and almost pathognomonic of degenerative or haemorrhagic changes inside a hypernephroma. (See Fig. 3).



Fig. 3. Showing pooling of the Dye around the periphery in a large Hypernephroma Successfully operated. Patient still alive after 3 years.

Apart from renal pathology, aortography can give very valuable information regarding aneurisms of the aorta and branches. We

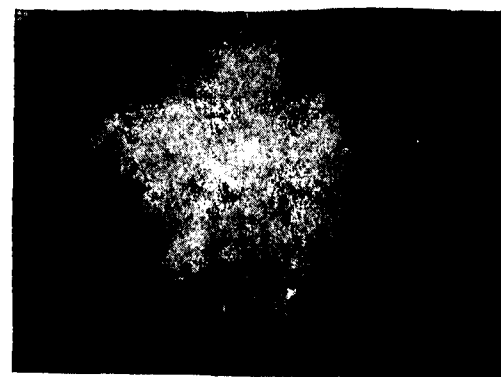


Fig. 4. Show an Aneurison of the Abdominal Aorta.



Fig. 5. Lateral view of the same patient showing the involvement of the Sup. Mesenteric Artery in the Aneurison



Fig. 6. Aneurison of the Descending Arch of Aorta.



Fig. 7. Percutaneous Inf. Vena Cavogram showing a block at the Porta Hepatis.

have seen a fairly large aneurism with a very moderate pedicle arising from the anterior surface of the abdominal aorta below the renal artery. (Fig. 4 and 5: also Fig. 6). This would be a very suitable case for a simple surgical approach and only aortography can demonstrate the size, site and the pedicle of the aneurism. It is also possible to demonstrate filling defects in the wall of the aorta caused by atheroma inside an aneurism. Aneurisms of renal, splenic and other branches of the aorta can only be demonstrated positively by this procedure. Calcification in the splenic or Renal region may only throw a suspicion of the possibility of an aneurism. Actual size and site can be demonstrated by aortogram.

Thrombosis of the Iliac vessels and Leriche's syndrome can only be satisfactorily demonstrated by aortogram. It is in this latter condition that Translumbar route is the only satisfactory one. When both Femoral pulsations are absent, the only approach is by the Translumbar route. We have been able on one or two occasions to blindly enter a pulseless femoral artery and pass a catheter up into the aorta. But this is the exception and not the rule. It was possible to demonstrate a Thrombosis of the Inf. Vena Cava by percutaneously introducing the Catheter through the Femoral Vein. (See Fig. 7).

Visualisation of the Placenta by aortography has been extensively done in Sweden and in England by Sutton and others. Sutton was, I believe, the pioneer in advocating a pressure injection in a counter-current way up the Femoral artery and he was able to demonstrate the uterine vessels in a small series at first. Later, he advocated catheterisation through the Femoral artery. This is the ideal method of demonstrating a placenta previa. So far no maternal or foetal complications have been reported in the literature. Our experience in

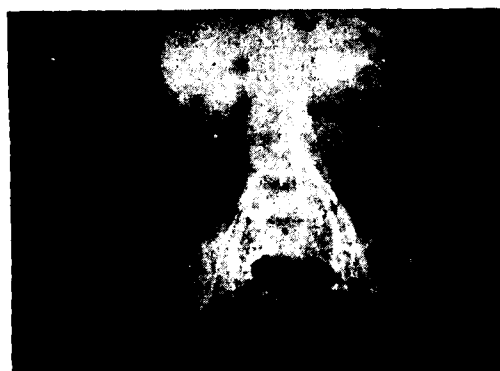


Fig. 9.

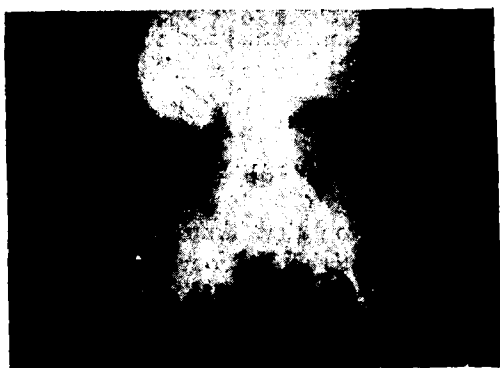


Fig. 10.



Fig. 11.

Represent the Arterial Capillary and Venous Phases and show the Placenta well filled.

the Hospital has been very limited in this subject, but we have had one case where the pooling inside an eight-week old placenta has been clearly seen. In this case, obviously no foetal parts could be seen in the plain films. (Ref: Fig. 9, 10 and 11). I would recommend the technique of visualisation of placenta to be applied in a greater measure to cases of suspected placenta previa and also to cases of suspected tubal Gestation regarding which there have been an increasing number of contributions in recent times.

As in the case of cerebral angiography, there are very few complications encountered either immediately or delayed. Iodine sensitivity and reactions to large doses are the commonest complications encountered. These can, however, be safely prevented if proper sensitivity tests are undertaken. We have relied on the intravenous dye test of the same contrast in the same proportion given on the previous day and this has been by far the best test in our experience. A haematoma at the site of the puncture is not frequent, and if it develops, usually disappears in a few days' time. We have had no other complications in our series so far. Occasional thrombosis have been reported in the literature.

I am grateful to Dr. K. M. Rai, F.R.C.S., D.M.R., Head of the Dept. of Radiology for the valuable suggestions and help given to investigate the cases in the Department of Radiology of the Govt. General Hospital, Madras. I am also grateful to Dr. R. G. Krishnan, F.R.C.S. the Dean of the Hospital for permission to publish the cases.

Ankylosing Spondylitis*

BY

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Ankylosing Spondylitis is a progressive chronic inflammatory rheumatic disease of ankylosing tendency (Romanus and Yden, 1955). The ankylosis, bony or otherwise, is, however, the end result of the disease rather than the disease itself. The original title of ankylosing spondylitis is retained on account of its common usage. The disease is characterised by limitation of spinal movements associated as a rule with pain and stiffness starting in one part and then spreading to other parts of the spine and by roentgenologically demonstrable bilateral involvement of sacroiliac joints. Thoracic expansion is usually diminished and a typical kyphosis develops. Manifestations of toxæmia, such as raised erythrocytic sedimentation rate, loss of appetite and weight etc. are noticed. 95 per cent of our 55 consecutive cases were males. The onset of the disease occurred from 15 to 30 years of age.

Soon to several years before the typical spinal symptoms appeared 65 per cent of our cases gave a history of symptoms which were not characteristic. The symptoms were:

- (1) Pain in the peripheral joints with or without swelling,
- (2) Pain in the gluteal region radiating down the back of the thigh, being a referred pain from the sacroiliac joints and, therefore, of a great diagnostic significance,
- (3) Pain in the heel,

(4) Sciatic pain in the distribution of the 5th lumbar root, and

(5) Iritis.

The period during which these symptoms occur constitutes the prodromal stage of the disease.

Two or more than two peripheral joints were usually affected, although in a few cases monoarticular involvement was noticed. The joint symptoms lasted from a few weeks to four years with or without remissions. Although the severity of the disease may be such as to cripple the patient and confine him to bed, recovery was, in our experience, as a rule, complete. These joints were involved in 50 per cent of our patients in the prodromal stage and in 44 per cent of the patients after typical spinal symptoms had developed. The commonly involved joints were knees, ankles and hips: knees being the commonest. Involvement of wrists and elbows occurred very occasionally, but was then overwhelmed by the involvement of hips, knees and ankles. This is one of the many features which distinguish this disease from rheumatoid arthritis which affects the terminal small joints, particularly of the hands.

12 of our 55 patients complained of pain in the heel lasting for a few months to several years. In 7 of these cases it occurred before the onset of spinal symptoms. This

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pain was associated with pain in the peripheral joints in all our patients.

5 patients complained of sciatic pain along the distribution of the 5th lumbar nerve root. The pain was of an intermittent character and appeared before the spinal symptoms. This kind of pain is an early sign of lumbar involvement and seems to be due to the anatomic relations of the foramen between L₅ and S₁ through which this nerve passes. This foramen is long and narrow and the 5th lumbar nerve root is large for it and is larger than the other lumbar nerve roots. Such a mono-articular sciatica may lead to a diagnosis of a protruded disc which may be operated upon and found normal. One of our cases was operated upon like this. At the time of operation his sacroiliac joints were normal on radiological examination. His symptoms were sciatic pain and some limitation of spinal movements. Typical radiological changes in the sacroiliac joints were noticed 2 years later when the patient reported back with severe spinal symptoms. Thus a case of sciatic pain must be thoroughly examined to rule out ankylosing spondylitis.

Three of our patients suffered from attacks of iritis lasting for a few weeks. In one of these paracentesis had to be done. In one case the iritis preceded and in the other two it was associated with the spinal symptoms.

Although it is universally recognised that radiologically demonstrable bilateral involvement of sacroiliac joints is a very early feature of the disease, clinical manifestations of such an involvement are not well known. According to Forestier et al (1951) and Romanus and Yden 1955 a careful history almost invariably reveals occurrence of symptoms referable to these joints. The patient complains of pain which is localised

at the level of these joints or is referred to the buttocks and to the posterior aspect of the thigh as far as the popliteal fossa. The pain never reaches the ankle or the foot and is not accompanied by paraesthesia. The pain is deep, dull, moderate, sometimes lancinating in character. Most of our intelligent patients gave a history of such a pain. One of our patients suffered only from an annoying, deep and dull pain in both buttocks. Examination of his pelvis revealed bilateral involvement of sacroiliac joints. His spinal movements were quite normal. Examination revealed marked limitation of thoracic expansion which was the only evidence of spinal involvement and of which the patient was completely unaware. His spine was radiologically quite normal except for changes in the sacroiliac joints. A very early diagnosis of ankylosing spondylitis was thus possible in this case.

Although symptoms occurring in the stage of onset are not characteristic, whenever they occur possibility of their being very early manifestations of ankylosing spondylitis should be kept in mind. Radiological examination may reveal typical changes in the sacroiliac joints, when a diagnosis can reasonably be made even in the absence of obvious spinal involvement.

When the disease has established itself limitation of spinal movements occurs. Lateral flexion is the first movement to be lost and later on as the time passes all the movements may be lost. This limitation of movements is practically always associated with pain and stiffness from which there is no relief, but which instead gradually spread to involve the rest of the spine. Continuous pain and stiffness exhaust the patient. By the further addition of symptoms of toxæmia, such as loss of weight and appetite the patient becomes a miserable wreck. He cannot attend to his work. He

feels worse in bed and has often to get up during the night and perform some movements which give him some relief. If in the early stages of the disease he got remissions from spinal symptoms he looks for them but in vain and finally gives up hope. As if this was not enough appearance of pain in the peripheral joints, severe pain in the heels, girdle pains and attacks of iritis add further to the miseries of these most unfortunate patients in the prime of their life. When the disease heals after following a natural course, pain and symptoms of toxæmia disappear, but the patient is often left a helpless cripple on account of the permanent and severe deformities which develop.

As the disease spreads upwards from the lumbar spine to involve the dorsal region, the costovertebral joints are affected leading to marked limitation of thoracic expansion and when this is associated with a feeling of tightness due to involvement of intercostal nerves the patient may find it difficult to breathe. Sometimes this complaint may be the presenting symptom of the disease. In one of our patients limitation of thoracic expansion developed before the limitation of spinal movements and pain in the spine.

When the lower dorsal nerve roots are involved pain may be felt in the abdomen. Diagnosis was made in two of our cases referred for examination of gastrointestinal tract and urinary tract from changes in their sacroiliac joints in their roentgenograms. Pain may radiate like a girdle pain from the back along the distribution of intercostal nerves. When the brachial nerve roots are involved pain may radiate down the upper extremity, but this is very uncommon.

As a result of inflammation of the spine the erector spinae muscle atrophies over the involved segment. The lumbar convexity is first flattened by the action of the normal flexors of the spine. The patient develops a

kyphosis which is very characteristic. It consists of a lower rectilinear segment and an upper segment which is bent forwards: it is not a regular curve. The head and neck stoop forwards extending in a straight line with the axis of the back (Fig. 1-A). The centre of gravity shifts forwards and the patient uses the support of a stick to prevent himself from falling or he balances himself by flexing his knees to compensate the kyphosis (Fig. 1-B). As the dorsal spine is involved its normal concavity is accentuated by the gaping of posterior parts of dorsal intervertebral discs. Ultimately the cervical curve is flattened and the kyphosis then becomes extreme (Fig. 1-C). Resolution of inflammation by treatment by deep x-ray therapy restores the muscular balance and if the treatment is administered early the kyphosis quickly improves and the patient soon discards his stick. If, however, the kyphosis lasts for a long time it gets set by ankylosis of the spine.

In some cases limitation of spinal movements may not be accompanied by pain and a feeling of stiffness and the diagnosis is made when the spine is clinically examined for the associated symptoms such as, abdominal pain, tightness in the chest, pain in the peripheral joints and heel and iritis etc. The patient may have been aware of his spinal ankylosis for several years, but he never bothered to consult a physician because it did not interfere with his activities. Such cases have an unappreciable or no kyphosis.

One of our patients had pain in the back without limitation of spinal movements, but his sacroiliac joints were bilaterally involved. His chest expansion was normal.

Nature of the disease

Clinical, radiological, histological and laboratory features associated with the disease leave no room for doubt that the



A
Shows typical kyphosis. Head and neck stoop forwards extending in a straight line with the axis of the back. The patient had to use the support of a stick to balance himself. This degree of kyphosis often disappears if treated early

B
Same patient flexing his knees to compensate the kyphosis to prevent himself from falling forwards

C
Extreme kyphosis in an untreated case

Fig. 1. Kyphosis

disease is anything else than a chronic inflammatory process. There appears to be no evidence of traumatic, metabolic, allergic or endocrine aetiology. The assumption that the overwhelming preponderance of men is due to hormonal factors has nothing to support it.

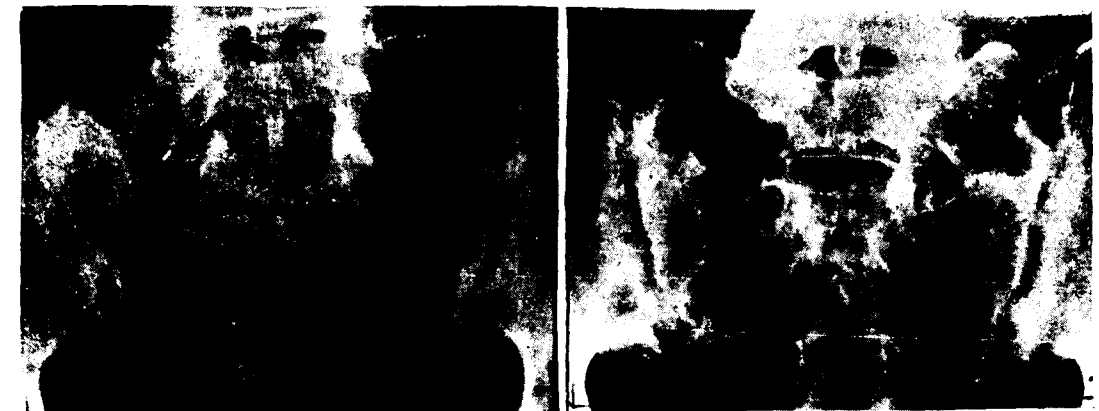
Pathological changes and radiology

Until adequate histopathologic material is available we have to depend upon roentgenologic changes which can reasonably be expected to reflect the pathology of the disease.

The joints show erosions of articular surfaces of the member bones, but the joint space is not, as a rule, narrowed which shows that articular cartilage remains intact and is not destroyed by the inflammatory granulation tissue. This may be due to a more or less pronounced endarteritis demonstrated by Cruickshank (1951) and Romanus and Yden (1955) in the inflammatory tissue which prevents the removal of the articular cartilage. Histological studies by Professor Rutishauser quoted by Forestier et al showed hypertrophy of the articular cartilage of a posterior spinal joint by the

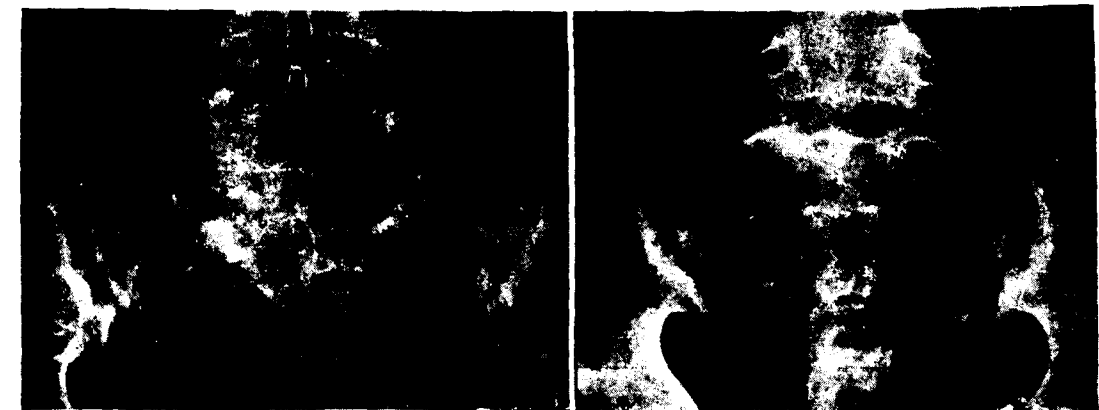
multiplication of its cells instead of its destruction and atrophy. The joint surfaces may be deeply eroded producing pseudo-widening of the joint space. (Fig. 2-C, 4-A)

The bone deep to the eroded joint surfaces shows condensation which may be slight (Fig. 2-A) or quite marked (Fig. 2-D and 4-A).



A
Surface erosion of articular surfaces. Joint space is intact and condensation of underlying bone is minimal

B
Slight widening of joint space and increased density of underlying bone



C
Considerable widening of joint space (pseudo-widening)

D
Marked condensation of underlying bone

Fig. 2. Sacroiliac joints. Notice bilateral involvement

It appears that as the disease starts healing metaplasia into bone and cartilage takes place so that the inflammatory tissue is replaced by bone either directly or by endochondral ossification. This results in bony ankylosis of the joint. The articular

cartilage may be playing an important role in bringing about bony ankylosis of diseased joints by hypertrophy and endochondral ossification. Cartilage is best developed at younger ages and osteogenic processes are also active then. Table 1 shows that

incidence of bony ankylosis in sacroiliac joints was high when the spinal symptoms started below the age of 20 years and fell significantly when these symptoms started later in life after 40 years of age.

Table 2 shows relationship of radiological appearances in sacroiliac joints to duration of spinal symptoms. Comparison of this table with table No. 1 shows that bony ankylosis is affected more by the age of the

TABLE—1

Showing relationship of radiological appearance to age of onset of disease.

Onset in Age groups	Surface erosions	Uniting	Bony union	Total
1—10 ...	1	0	0	1
10—20 ...	4 (31%)	1 (8%)	8 (61%)	13
20—30 ...	14 (64%)	4 (18%)	4 (18%)	22
30—40 ...	7 (64%)	2 (18%)	2 (18%)	11
40—50 ...	5 (83%)	0	1 (17%)	6
Total ...	31 (59%)	7 (13%)	15 (28%)	53

TABLE—2

Showing relationship of radiological appearances to duration of Spinal symptoms.

Duration	Surface erosions	Uniting	Bony union	Total
0—2 years ...	12 (63%)	1 (5%)	6 (32%)	19
2—4 years ...	10 (63%)	2 (12%)	4 (25%)	16
4—6 years ...	2 (33%)	1 (17%)	3 (50%)	6
6—8 years ...	3 (43%)	2 (28·5%)	2 (28·5%)	7
8—10 years ...	2	0	0	4
Over 10 years ...	3	1	0	4

patient than by duration of disease. 2 (13·6 per cent) patients showed bony ankylosis amongst 15 patients who had symptoms for more than 6 years and 10 out of 35 (28·5 per cent) who had symptoms lasting less than 6 years.

The joint space gradually fills up by trabeculae of bone stretching across it (Fig. 3-A, 4-A, 4-B).

Sometimes a mottled appearance may be produced by patches of calcium which are seen amongst the bone fibres stretching across the joint space (Fig. 3-A). Condensation of bone may still be seen. Presence of these patches of calcification can be explained by assuming them to be a stage of provisional calcification in endochondral ossification.

When bony union of the joint is complete, the zone of condensation of bone disappears,

its density returning to that of the surrounding normal bone. The original cavity of the joint can often be made out through the bone trabeculae that stretch across it. (Fig. 3-B) Condensation of bone appears to be an active reactive process to limit the disease and hence a sign of its activity.

The roentgenologic changes described above are seen best in the sacroiliac joints which are bilaterally involved in practically all the cases of ankylosing spondylitis. (Fig. 2 & 3). These changes may be seen in any other joint such as posterior spinal, costovertebral, manubriosternal, and acromioclavicular joints and the symphysis pubis (Figs. 4, 5, 6). We noticed such changes in calcaneocuboid joints which shows that some peripheral joint involvements are due to the same disease process as ankylosing spondylitis.



A

Left joint space gradually filling up by trabeculae of bone stretching across it. Patches of calcium are giving the joint space a mottled appearance

Fig. 3. Sacroiliac joints



B
Shows bony ankylosis of sacroiliac joints

Fig. 3. Sacroiliac joints

Angular Erosions

As in any chronic inflammation of a joint, granulation tissue may erode the non-articular bone in the neighbourhood of the articular surface. Such erosions are called angular erosions which may sometimes be quite extensive and deep (Figs. 7 & 8).

Erosion of bony prominences

Surface erosions of the prominences of bones are often seen. These are often associated with condensation of the underlying bone. The prominences usually involved are the ischial tuberosities, spinous processes of vertebrae, greater trochanter of femur, iliac crest, tuberosity of calcis, tibial tubercle and the greater tubercle of the upper end of humerus. (Fig 9 & 10) The inflammation may extend into the surrounding soft tissues so that when healing

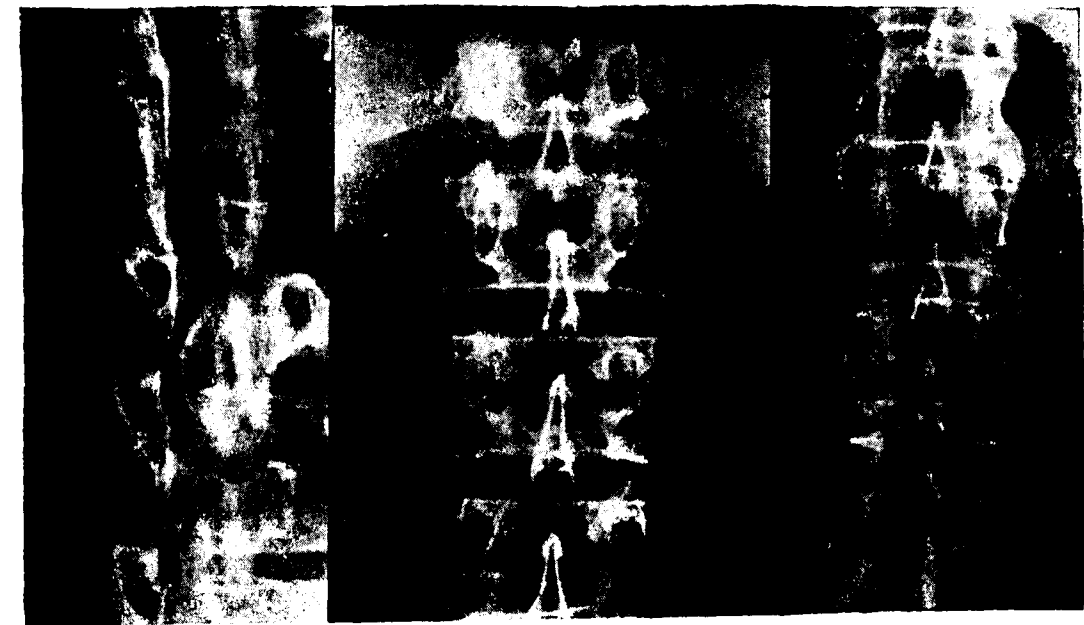
by transformation into bone takes place masses of bone are seen to project from the prominences into the soft tissues (Fig. 11).

Changes in the spine

As is the case with inflammation of bones and joints elsewhere, when clinical examination reveals extensive involvement of the spine, no radiologically demonstrable change may be present except some osteoporosis due to disuse.

Posterior spinal joints

In our experience the earliest evidence of spinal involvement was seen in the posterior spinal joints. These joints showed all the changes described above which were present even before the appearance of syndesmophytes. (Fig. 4 A-C)



A
Shows from above downwards (i) Zone of condensation with minimal surface erosion, (ii) pseudo-widening of the joint space, (iii) obliteration, presumably by endochondral ossification of the periphery of the joint with a normal space in the centre and (iv) zone of condensation, surface erosion and space undergoing obliteration by bone fibres

B
Arrows point to surface erosions with trabeculae filling up the joint space. The joint above shows condensation surface erosion and bone trabeculae

C
Shows "Tram-line" effect produced by bony ankylosis of posterior spinal joints

Fig. 4. Posterior spinal joints

Syndesmophytes

A band of fibres stretches from the lower third of the vertebra above, to the upper third of the vertebra below and intervertebral disc, on the anterior and lateral aspects of the vertebral bodies. Calcification followed by ossification occurs along these fibres and the outer fibres of the intervertebral disc so that bridges of bone are formed giving the spine the well known bamboo appearance. (Fig. 4-C). At an earlier stage tiny calcifications or ossifications may be seen to involve only portions of these fibres so that they may be seen to project from

the angles of the bodies or may be seen opposite to the discs. (Fig. 12). These ossifications were termed "syndesmophytes" by Forestier (1939). They may be seen anywhere in the spine but are seen typically at the lower dorsal and upper lumbar regions. Syndesmophytes are not difficult to distinguish from osteophytes. Syndesmophytes are directed vertically, usually start at a distance from the vertebral angle, are usually fluffy in outline and the width of the vertebral plateau is normal, whereas the osteophytes start at the angles, are directed



Fig. 5 Shows surface erosions and pseudo-widening of the first costo-transverse joints

laterally, have a sharp outline and the vertebral plateau is widened.

Syndesmophytes form quite early in the disease and some workers attach great importance to their diagnostic significance. We have, however, seen similar appearances during routine roentgen examinations without there being any other evidence present, clinical or roentgenological, of ankylosing spondylitis. We have also seen syndesmophytes in typhoid spondylitis, but then they were associated with reduced intervertebral disc, whereas in ankylosing spondylitis the intervertebral disc remains intact when its outer fibres show syndesmophyte formation. In our opinion syndesmophyte formations are a strong supportive evidence in favour of a diagnosis of ankylosing spondylitis in the presence of other features, but they cannot be considered to be a diagnostic feature of the disease by themselves.

Intervertebral discs

The disc space may sometimes be reduced (Fig. 13), but when syndesmophytic bridges are present it, as a rule, remains intact. The portions of vertebral bodies adjoining the narrowed discs may sometimes show



Fig. 6

Shows typical changes in manubrio-sternal joint

surface erosions and sclerosis of varying degrees (Fig. 14). The intervertebral disc may be destroyed resulting in bony union of the adjacent vertebrae (Fig 15).

Vertebral Bodies

Surface erosions may occur on the anterior surface of the lumbar vertebra. The inflammation is prevented from spreading anteriorly by the anterior longitudinal ligament

and spreads backwards into the body producing an excavation. When the inflammation spreads the space behind the ligament gets filled up by the transformation of the granulation tissue into bone so that the anterior concavity of the vertebra is lost giving it a square appearance. The excavated border of the anterior surface can sometimes be made out. (Fig. 16).



Fig. 7. Hip joint. Joint space narrowed. Notice deep angular erosion of the neighbouring bone merging with the erosion of ischial tuberosity

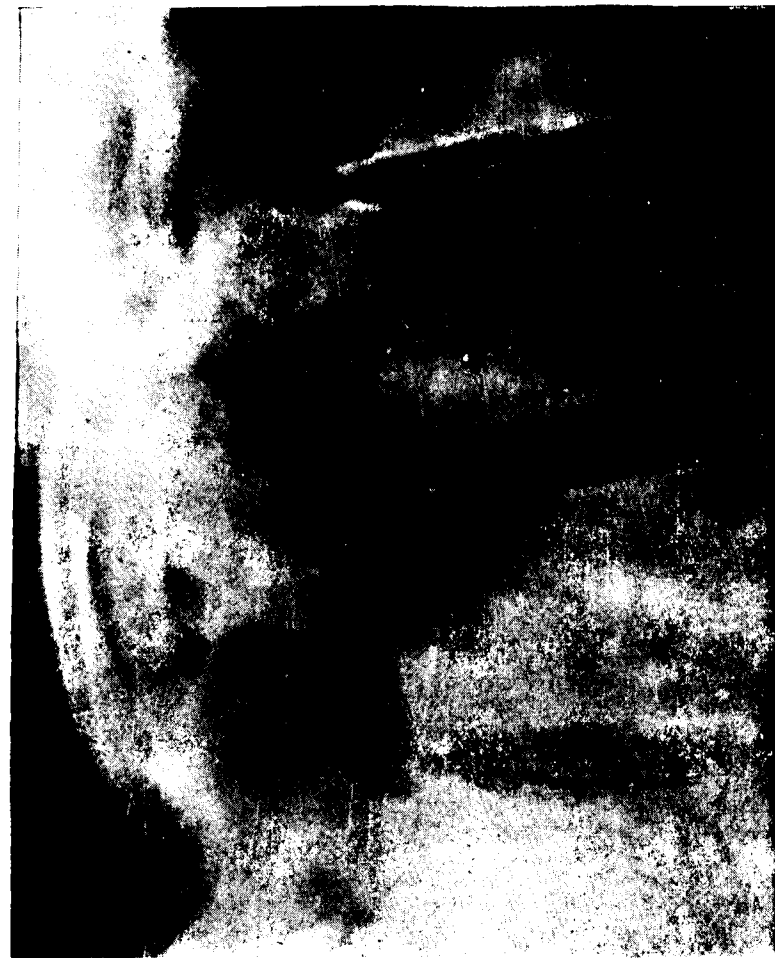


Fig. 8. Notice extensive destruction of a pedicle below the middle intervertebral foramen in the neighbourhood of an involved posterior spinal joint

Calcification of ligamenta flava

Histological studies have shown that the calcification of spinal ligaments is apparent. The ligaments in fact remain intact, whereas the soft tissues lying along them are calcified. Calcification along the ligamenta flava is seen as sheets of fine linear strands stretching across the spaces between the laminae.

Hip joints

The joint space is usually reduced. Well marked erosion of the neighbouring non-articular portions of member bones (Fig. 7)

and bilateral involvement of sacroiliac joints are features which distinguish this disease from tubercular and rheumatoid arthritis without difficulty. Bony ankylosis may be seen with a normal or reduced joint space.

Calcaneo-cuboid joint

Three of our cases complaining of pain in the heels showed the following typical changes in the calcaneo-cuboid joints :

(1) Erosion of the lower part of the articular surface of os calcis and

condensation of its neighbouring under surface. (Fig. 17-D).

(2) Surface erosion of articular surfaces of both bones with widening of joint space and without condensation of underlying or neighbouring bone (Fig. 17-B).

(3) Destruction of articular surfaces of both bones extending deep into their substance. The joint space was lost and there

was no increased density of the underlying bone present. (Fig. 17-A).

These joint changes were not associated with any soft tissue swelling.

Changes in these joints are of considerable importance and show that essentially the disease is a chronic arthritis which may involve any joint of the body.



Fig. 9. Shows erosion of the anterior part of the iliac crest.



Fig. 10. Shows erosion of ischial tuberosity. Hip joint space is narrowed. Sacroiliac joint shows typical changes.



Fig. 11. Shows erosion of right ischial tuberosity, mass of bone projecting into the soft tissues from the left ischial tuberosity and surface erosion with subarticular condensation at the pubic symphysis

Diagnosis

Diagnosis of ankylosing spondylitis should not be difficult on clinical grounds alone. Clinical changes in the sacroiliac joints on both sides will often remove any doubts. In one of our cases we made a diagnosis on clinical grounds in the absence of any radiological changes and the patient who was a cripple has since been rehabilitated after deep X-ray therapy.

In a roentgenogram, diagnosis has to be made from tuberculosis and condensans ilii of sacroiliac joints. In tuberculosis the patients are usually females and the involvement is unilateral, whereas in ankylosing spondylitis the patients are usually males and the involvement is bilateral. In condensans ilii, there is no erosion of the

joint surfaces present as is the case in ankylosing spondylitis.

Ankylosing Spondylitis and Rheumatoid Arthritis

In the States ankylosing spondylitis is considered to be rheumatoid arthritis of the spine and they call it rheumatoid spondylitis, but clinical, radiological, histological and serological features in the two conditions are quite different. Ankylosing spondylitis is a disease of the males, whereas rheumatoid arthritis occurs, as a rule, in female patients. In ankylosing spondylitis medium sized joints of the lower extremities are involved; in rheumatoid arthritis terminal joints of the hands and the feet are affected. Radiologically, the joint space as a rule remains intact and surface erosions are



Fig. 12. Shows early syndesmophytes

associated with condensations of the underlying bone in the active stage, whereas in rheumatoid arthritis the joint space is lost and there is no zone of condensation of bone in the active stage, but instead, the bone ends forming the joint show marked osteoporosis. Bony ankylosis of a joint is never associated with an intact joint space in rheumatoid arthritis, whereas in ankylosing spondylitis a normal joint space can often be seen to shine through a bony ankylosis. Histologically granulation tissue in ankylosing spondylitis shows more or less pronounced endarteritis,

whereas in rheumatoid arthritis the inflammatory tissue shows no such endarteritis. Serologically, sheep cell agglutination is positive in 30 to 40 per cent cases of rheumatoid arthritis, whereas it is negative in ankylosing spondylitis. Therapeutically arthritis in ankylosing spondylitis responds to radiotherapy, whereas in rheumatoid arthritis it does not.

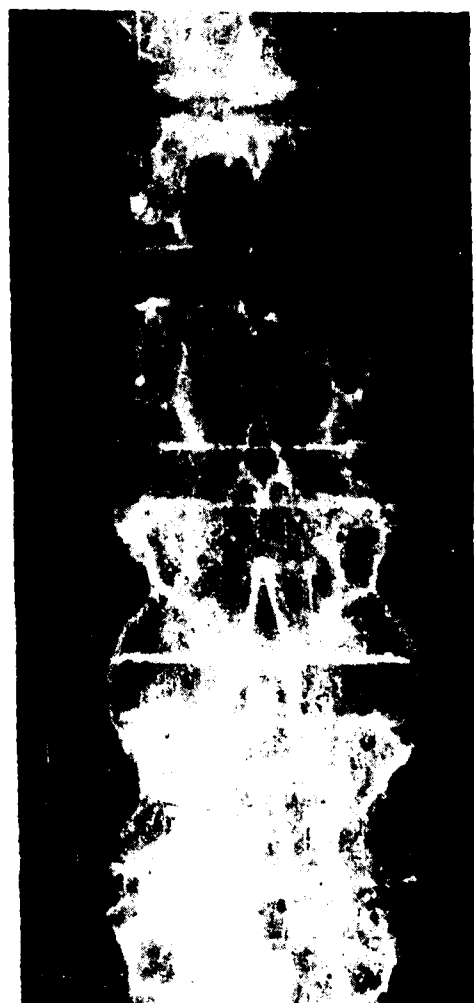


Fig. 13. Intervertebral discs at the top and the bottom of the figure are reduced and show no syndesmophytes: other discs are intact and show syndesmophytic bridges

Tuberculosis and Ankylosing Spondylitis

Two of our 55 patients had active chronic lesions in the lungs and one had old healed pleurisy. Also radiological changes of surface erosions with intact joint space and erosions of bone prominences are features common to both diseases. Absence of cold abscess formation and tendency of the inflammatory tissue to be transformed into bone are points against any relationship between the two conditions.

Genitourinary infection and Ankylosing Spondylitis

Romanus and Yden (1955) claim that they could demonstrate chronic non-specific urogenital infection (prostate-vesiculitis, utriculitis, Cowperitis) in practically every case of ankylosing spondylitis. They say that if one did not depend upon history alone as

is usually done, but if an objective examination was made in every case such an association would be often met with. They have also stated that their patients benefited by treatment of the infection. The fact that ankylosing spondylitis preponderates in males strengthens their hypothesis because venous drainage of prostate and seminal vesicles communicates with veins in the vertebral canal, whereas that of the ovaries and the tubes which are usual sites of infection in females does not drain there.

Summary

1. Ankylosing spondylitis is a progressive chronic inflammatory rheumatic disease of ankylosing tendency. It is characterised by pain and stiffness in the spine, diminished thoracic expansion, a typical kyphosis and roentgenologically demonstrable bilateral involvement of sacroiliac joints.



Fig. 14. Shows a reduced intervertebral disc with erosion and sclerosis of adjoining bone surfaces

2. 95 per cent of consecutive patients were males. Onset of the disease occurred from 15 to 30 years of age.

3. 65 per cent of the cases gave a history of pain in the peripheral joints, in the gluteal region, and in the heels, sciatic pain and iritis.

4. Clinical, radiological, histological and laboratory features associated with the disease leave no room for doubt that the disease is anything else than a chronic inflammatory process.



Fig. 15. Shows a destroyed intervertebral disc and bony union between the adjacent vertebral bodies



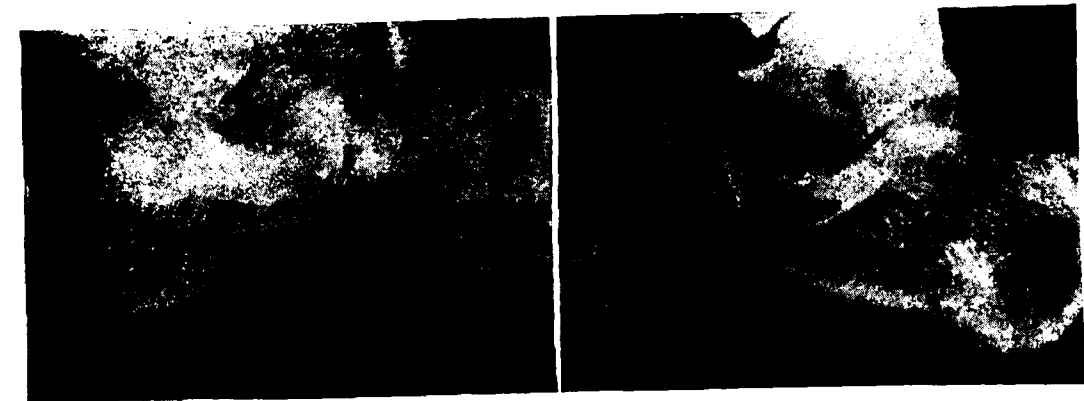
Fig. 16. Shows squaring of vertebral bodies

5. Joints show surface erosions with increased density of underlying bone. The joint space as a rule remains intact. Pronounced endarteritis in the inflammatory tissue is probably responsible for an intact joint space on account of its inability to destroy the articular cartilage. Bony ankylosis was seen more often in the young patients than in the older age groups which lends support to the hypothesis that articular cartilage plays a role in bony ankylosis of joints by endochondral ossification, because cartilage is best developed and osteogenic processes are more active at younger ages. Transformation of inflammatory granulation tissue into bone is also responsible for bony ankylosis. Angular erosions were seen as in any chronic inflammation of a joint.



A

B



C

D

Fig. 17. Shows changes in calcaneo-cuboid joint (See text).

6. Some strong resemblance with changes seen in tuberculosis is noticed in this disease. Absence of cold abscess formation and occurrence of bony ankylosis in ankylosing spondylitis are features which are against any relationship between the two conditions.

7. There is no evidence to support the view that ankylosing spondylitis is a

rheumatoid arthritis and therefore should be termed "rheumatoid spondylitis".

8. Reference has been made to the view expressed by Romanus and Yden that genitourinary infection plays an important role in the causation of ankylosing spondylitis.

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* Taken from the summary of the sixth Sir Jagadish Chandra Bose Memorial Lecture given by Ross Golden, M.D. at the tenth Indian Congress of Radiology, Bombay (see Indian Journal of Radiology, May 1956 issue).



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Welcome Address

BY

Dr. K. B. MATHUR,

Chairman, Reception Committee, The 12th Indian Congress of Radiology, Kanpur, 1958.

Dr. Jawahar Lal Ji, Dr. H. J. Bhabha, Capt. P. B. Mukerji, Ladies and Gentlemen,

It is my proud privilege to extend to you all on behalf of the Reception Committee as well as on my own behalf a very cordial welcome to the 12th session of the Indian Congress of Radiology. This is for the second time that the Radiological Congress is being held in the State of Uttar Pradesh and we are proud to have been given this honour for the second time within three years.

It is perhaps an unconscious tribute to the progress we have made in providing X-Ray facilities in the State. Almost all the district hospitals in the State are equipped with suitable diagnostic X-Ray equipment. Radium therapy is available at Agra and Allahabad while a much more ambitious plan has been chalked out for the establishment of the J. K. Institute of Radiology and Cancer Research at Kanpur due to the magnanimity of Sir Padampat Singhania, to whom not only the people of this State but of the whole country would feel indebted. The proposed institute is estimated to cost about Rs. 10 lakhs and will have a 100-bed hospital attached to it. It will have the most modern equipment for an ideal Cancer Research Centre, including Radium, Cobalt 60, Isotopes, etc. The plan and its other details have been chalked out by the most eminent authorities in this speciality. The building is proposed to have 30,000 sq. ft. floor area and will be a suitable adjunct to the Ganesh Shankar Vidyarthi Memorial

Medical College building. It will not be out of place to mention here that the J. K. Trust administers several other useful charitable institutions. We are really proud of this charitable trust in Kanpur.

We are sincerely grateful to Dr. H. J. Bhabha for accepting our invitation to deliver the 'Sir Jagdish Bose Memorial Lecture'. We assure him that we are fully conscious and appreciative of the great honour which he has done to us in accepting our invitation.

It is our regret that our dynamic, ever vigilant and versatile Health Minister, Thakur Hukum Singh Visen, is not able to be present on this occasion due to his many other occupations connected with the session of the legislature. We are very grateful to him for all the assistance and co-operation we have had from him in connection with the Congress.

Not less grateful are we to our Deputy Health Minister, Dr. Jawahar Lal Rohatji, whose activities in connection with the Uttar Pradesh Tuberculosis Association are so well known. His appointment as Deputy Health Minister is a fitting recognition of the valuable service he has rendered during his long and distinguished career in the medical profession.

We are particularly fortunate in having Capt. P. B. Mukerji, our new President, who I am sure, is regarded by hundreds of my colleagues as their Guru though we may not have actually received any formal training

under him. I have been practising Radiology for the last 22 years, but I have many a time during this period sought his advice on difficult and ticklish skiagrams. His reputation as a top-ranking radiologist of international fame is of a very long standing. We are proud to welcome him as President of the 12th Indian Congress of Radiology. I am sure he will lend vigour, tone and distinction to the deliberations of the Congress for the advancement of the Science of Radiology. I am sure, with his assistance, we will try to bring into line the standards of Radio-diagnosis and therapy with those prevailing abroad and to make our own original contribution to the subject.

I hope that your stay in this large industrial city of ours will be pleasant, enjoyable, and fruitful. It will be our endeavour to look to your comforts, but if we fall short of your expectations, I hope you will forgive us.

Unfortunately we do not have many suitable hotels in this city. We are grateful to the Berkeley House Management for their co-operation in accommodating some of our delegates. We are also grateful to Dr. C. B. Singh for having made arrangements for the stay of our delegates in the new hostel.

Kanpur, as you must be aware, is a city of mills, factories and the business community. I am glad to mention that we have received co-operation from every quarter, including the industrialists. In this connection I would mention only a few who are here, Sir Padampat Singhania, Seth Sita Ram Jaipuria, Seth Ram Ratan Gupta.

To an audience so distinguished as this, it would be presumptuous on my part to suggest any problem for solution. Even so, there is one which stares the whole world in the face and in which the entire mankind is equally and vitally interested, apart from ourselves to whom as specialists is entrusted

the task of finding a solution. I am referring to the problem of cancer research. When one remembers that radio-therapy short of operative treatment, so far, is the only method available for the cure of this disease, the duty of the radio-therapist attains a higher level of moral obligation and is the sole source of hope to the patient just as the lone star is to the ship-wrecked mariner. In this context, the radiologist's speciality acquires a unique position in medicine. A competent radiologist has to be a first class clinician in the widest sense. He should be able to understand the difficulties and the requirements of the physician and the surgeon. Radiological examinations and therapy are essentially clinical in nature and not just a technical laboratory procedure.

More important than the machines thus become the men behind those machines. It is one thing to possess a good **X-Ray** plant, quite another to make effective use of it. Experience counts here as much as in any other field of human activity.

It should be the policy of the State Health Ministry to entrust specialist work to those who are best suited for the job, whether they are whole-time Government employees or private practitioners. It is true a senior private practitioner cannot spare three or four long hours a day for honorary work in district hospitals. Preparing of skiagrams is not so much the task of radiologist as it is to interpret them. I know of several big hospitals in the country which employ whole-time junior radiologists to carry on routine work in the department and keep the difficult skiagrams for interpretation by a senior honorary radiologist. In such cases the hospital gets the benefit of the services of an experienced radiologist without in any way affecting the routine working of the department.

The present system of asking the honorary specialists to devote the best part of their day to honorary hospital work is bound to fail. Either the senior practitioners will not be forthcoming or they will find it impossible to give the required time to the department. It is high time we faced the realities and saw the thing in its true perspective. There should be no discrimination between an honorary and a paid employee of a hospital. If anything, an honorary employee is entitled to greater respect and regard. He works in the true missionary spirit and does not receive any wages for his work.

Day in and day out from every variety of platform we hear so much about the missionary spirit in which the doctors are advised to work. To my mind, the real meaning of missionary work is not understood by most of the preachers themselves. I believe, if one charges a certain fee for a certain work the real missionary spirit lies not in doing it free but in seeing that the patient gets the maximum benefit out of him and he should consider the patient a person in distress requiring his sympathy and professional assistance. It is rubbish to talk of a doctor doing work absolutely gratis for all people and at all times.

We all believe in charity, but charity has two aspects—one monetary, to which only the needy are entitled and the other is human touch and sympathy, which every sick person deserves, whether rich or poor.

While on this subject, may I mention here that in our State charges for all types of Radiological examinations and for all classes of patients in Government-controlled hospitals, are placed at Rs. 7/-, a figure, which in the present state of higher prices of materials, is ridiculously low. It means a sort of cut-throat competition for private

radiologists. I do not mean that the rates may be raised and the poor deprived of this modern aid to diagnosis, but certainly there should be discrimination between one who cannot and one who can afford. My humble suggestion to the Minister for Health is that there should be no charges for the really poor and needy. After all, it is the duty of the State to provide free medical aid for all and particularly for the poor. The charges for others who can afford to pay should be raised to those prevailing in the Medical College at Lucknow.

Another problem, to which I may refer here in passing, is the acute shortage of X-ray apparatus and accessories in the country. This has been brought about by the stringent import restrictions imposed by the Government keeping in view the requirements of the Second Five Year Plan. While some hardship is inevitable in a situation like this, it should be our endeavour to face it manfully and realistically. There is no point in shutting our eyes to the fact that we in this country do not manufacture X-ray films. At the same time we cannot afford to do without them. It is painful to note that while the Government have, during recent days, increased the import quota of photographic films, they have not done so in the case of X-ray films. This is a policy which baffles understanding. X-ray films are a necessity; the same cannot be said about photographic films.

Even so, the success of the Second Plan should be the paramount consideration, with every patriotic Indian. We as Radiologists can do our bit by reducing the consumption of X-ray films or, rather making use of every bit of the X-ray film that we have. We should import only such X-ray plants and accessories as have potential value and not those which have only an academic value. Instead of having too many X-ray plants at

Inaugural Address*

BY

Dr. JAWAHAR LAL,

Deputy Minister for Health, Uttar Pradesh.

Mr. Chairman, Ladies and Gentlemen,

I have great pleasure in inaugurating this Scientific Session of your conference where Radiologists not only from our country, but from outside have taken great pains to come in order to make this 12th Indian Congress of Radiology a success. We are fortunate in having Dr. Sir H. J. Bhabha in our midst of this session. Just now you will be having a symposium, wherein some notable advances in the patho-genesis and Radio-diagnosis and therapy of Bronchogenic-Carcinoma will be discussed and that will give a good opportunity to learn more about this fell disease, which is claiming more of human lives as years go by.

Bronchogenic-Carcinoma, as you all know, is coming into the limelight and more so, after the 2nd World War and I may sound a note of warning here by saying that the association of cigarette smoking with lung cancer, is coming more into prominence. Some research work with regard to lung cancer with the non-cigarette smokers and the cigarette smokers has been undertaken in America and the American Journal of Medical Association has published an article wherein it has been stated that the number of cancer of the lung in the cigarette smoking group was on the higher side as compared to the other group. The conscientious of opinion in the Scandinavian countries and Soviet Russia on this issue vary and from a glance at the works published in those countries, it shows that

no definite relationship has been established. I had an occasion to see the British Medical Journal and some of the other journals on the subject, and in a big editorial note in the British Medical Journal, it is concluded that Bronchogenic-Carcinoma is more in association with the smokers group. Though medical opinion is conflicting so far, but I may say here with an emphasis that there is a definite association of the two; therefore, the cigarette smoking should be reduced to the minimum. More light will be given on this by the speakers in the symposium and I will not venture to tread the path to be indicated by them. But I may be allowed to say here that there seems to be more reasons to believe that there is an association of the two and it will be wise for the cigarette smokers to reduce smoking to the minimum and take warning.

Not less important than the Pathogenesis of Bronchogenic-Carcinoma is the symptomatic and Radio diagnosis and the modern therapeutic surgical approach with early chances of recovery. It has been stated times out of number, and experience has proved it to be correct that if you have an aged man with a peculiar cyanotic colour in the area of alar nasi with a little dyspnoea; it is a very early case for investigation and the chances are that early involvement of the Broncho pulmonary segments of the middle lobe has taken place. This peculiar change of colour in the alar nasi area is due to a deficient aeration of the blood which is

visible in its incipient stage in the patient and its full explanation is not very clearly mentioned in books. The famous "Cannon Ball Shadows" in the lungs depict the secondary metastasis and the clinician will do well to find the original focus in the system.

I would like to say few words about the Radio diagnosis of the Bronchogenic-Carcinoma, though I do not want to transgress on this subject, for the specialists over here will throw more light. I may say that our doctors would do well if they have in their mind the various Broncho pulmonary segments of the lungs. These segments can give one an idea in the X-Ray picture of the lung as to where the diseased focus is. This help is very valuable for the surgeon, who will be in a better position to decide as to how much diseased lung can be removed.

Coming to the Pathological diagnosis, I may say that special emphasis must be given for a thorough search for the cancer cells by special "papanicollou staining" of the sputum; and if no sputum is available, but there is a doubt about cancer of the lung then by taking the Bronchial secretion through a Bronchoscope and after special staining search for the cancer cells.

At the Ganesh Shankar Vidyarthi Memorial Medical College, Kanpur we are having a full-fledged Cancer Institute through the philanthropy of Sir Padampat

Singhania where we shall have a Cobalt therapy plant, which is necessary now-a-days from therapeutic point of view. In our State another institution in the shape of the Kamla Nehru Cancer Unit is being established and one already exist at the Agra Medical College, where special treatment for the Cancer patient is available. The public of the State will be much more benefited by these cancer institutions where free treatment will be available for this fell disease. We are also having Deep X-Ray therapy established at Meerut and Naini Tal and few more cancer wards will be opened. It is time that our young Medical Graduates, after passing out should take up specialised training in this branch of medicine, so that we shall not lag behind others for the advancement in research and other works.

I have just tried to touch a few of the important aspects which struck my mind and I am sure the speakers who will follow will throw light in more details on the various problems emanating from Bronchogenic-Carcinoma.

And lastly I must thank you all ladies and gentlemen, for the patient hearing you have given me and I must congratulate Dr. K. B. Mathur and his team of colleagues for arranging this conference in Kanpur and for all the pains that they have all taken to make it a success.

JAI HIND.

*The Scientific Session of the 12th Indian Congress of Radiology February 8, 1958.

X' Rays in the fields of diagnosis. The introduction of High Tension Switch Tube to produce ultra-brief X' Ray exposures points to what may be expected from the judicious application of new developments in the field of Electrical Engineering and Physics. Exploration of the potentiality of Isotopes as a source of useful radiations for diagnosis, the continued improvement in roentgen cinematography and devices directed towards perfection of body-section radiography, may be mentioned as some of the other important technical developments in radio-diagnosis. In the *field of Radiation-Therapy*, a great deal of fundamental and corroborative work has been done on three important subjects which has outstripped all other; these are clinical and experimental uses of radioactive Isotopes, Radiobiological animal experiments on the effect of total body irradiation and methods of protection against radiation and Physics, Dosimetry and Treatment Technics. It is well-known that despite numerous experiments that have been performed and a large volume of clinical information resulting therefrom, our knowledge of the mechanism of radiobiological effects is still far from perfect. There is still much to be learnt on this fundamental subject although recent works indicate that the role of the blood vessels in the response of tissues is rather uncertain. Much valuable work is being done on fundamental biological effects of radiation at the cellular level, including chemical, bacterial and genetic studies. This field of work is wide open and should attract the attention of our young Radio-therapists who are fired with the zeal to undertake fundamental research in their special line of work. The advantages of Rotational Therapy at almost any voltage have been fully established and a number of rotational methods, both in vertical and horizontal planes, have been made available, all of which are claimed to yield good

doses with satisfactory homogeneity in the tumour-bearing volume. The manufacture and availability of Hectocurie Telecobalt unit utilising rotational devices with a large opposing counterweight-baffle, which greatly reduces the scattered radiation, has solved the problem of high cost to a very great extent for those Hospitals and Clinics which were prevented from giving the benefit of Supervoltage installations to those patients who are better treated with this type of equipment. Previously, the available Generators, such as, the 2 million or higher volt machines, the Betatrons, the custom-made Linear Accelerators and the Cobalt units were of such high cost that they were not within reach of any but the very rich Hospitals and Clinics. The Hectocurie Telecobalt units mentioned above not only permit a smaller Cobalt source to deliver an effective dosage in a reasonable treatment-time but significantly reduces the amount of protection required in the walls. This has resulted in substantial saving in weight and cost.

While recounting these lines of original investigation in the fields of higher Electrical Technology, as applied to medicine and its ancillary branches, one feels depressed in the thought that no contribution to this long list of advanced studies has been made by any Institution or worker of India. I refuse to believe that there are no talents in our country which, given proper opportunity, scope and facilities for work under suitable guidance, could produce work of similar high standard. It is my firm conviction that a country which has produced, amongst many others, Sir Jagadish Chandra Bose, Acharya Prafulla Chandra Roy, Sir C. V. Raman, Dr. Meghnad Saha and Dr. Homi Bhabha, can certainly give a good account of itself in the field of first rate original workers on fundamental research in all branches of

science, if a well-thought-out and planned scheme is formulated and put into operation for attracting medical and engineering graduates of merit and promise and placing them in National Laboratories under teachers and workers of established eminence and reputation.

I consider it unnecessary to emphasise today the important role that Radiology has come to play in the field of medicine. Radiology has attained a very high position among the medical specialities and it can be confidently asserted that no branch of medicine can do without its aid just as they cannot do without the aid of Pathology and Bacteriology. In fact, Radiology can be described as a pivotal speciality to which every other speciality turns for aid when it is in difficulty. This pre-eminent and honoured position of Radiology carries with it, however a very great responsibility for those who practise this speciality and on whom rests the obligation of maintaining this high and honoured position. Let us examine for a moment how this great responsibility and obligation is being discharged by us in our daily life and work and what impediments and obstacles have come our way, preventing us to rise to our full stature and satisfying all requirements of the high academic standard that is expected of us. Some of you, who have recently been abroad and have visited Radiological Departments of the great Teaching Centres and University Hospitals on the Continent, the U. K. and the U. S. A. and Canada, will bear me out when I say that the quality and standard of radiological service that is produced at those centres are of a very high order compared with the average output of work of our country. I do not mean to imply by this that there is no centre in India which produces work of comparable value; there are certainly Hospital departments, Teaching centres and

some private clinics in our country, which stand on an equal footing with those of their counterparts in any country in the world but their number is very limited. It is necessary for us to critically examine the reasons which have tended to create this sorry state of affairs in our country and encourage their persistence. The reasons to my mind are threefold: some of which we, the radiologists of India, are responsible; and some which entirely lie beyond our control. Let us take the first category of reasons first and try to analyse them. We claim, and rightly so, that Radiology occupies a pivotal position among the specialities of medicine; it follows, therefore, that those who practise this speciality must be super-specialists, that is, possessing intimate knowledge of the disease-processes that fall within the jurisdiction of the other specialists who would turn to their Radiologist colleagues for solution of some of their knotty and complicated problem which they cannot solve without the aid that Radiology offers. It is not un-common for the Head of a busy Radiological department of a Teaching or a General Hospital, whether diagnostic or a therapeutic, to meet in succession, in one morning session, a Neuro-Surgeon who is worried over the nature of a suspected space-occupying intracranial lesion, an Oto-Rhino-Laryngologist who wants to know whether a chronic persistent aural discharge is due to a Cholesteatoma or a septic Antrum, a Chest surgeon with a suspected case of early Bronchial Carcinoma, a Gastro-Enterologist with a case which simulates a volvulus of the Coecum but with ill-defined signs and symptoms, and a Bone Surgeon with a young lad who has a swelling in the lower part of one of his thighs and in whom the diagnosis of an early Sarcoma of Femur has to be established or negated for institution of early and proper line of treatment. This Radiological chief should, therefore, be a person of the calibre

of a consultant to other specialists *viz.* the Surgeons, the Physicians, the Gynaecologists, the E. N. T. specialists etc. with whom he should be able to talk in their own language and to discuss their diagnostic problem at their own levels bearing in mind the pathological processes underlying all sorts of diseased conditions and possible lines of treatment for all obscure cases which are brought to him for his special investigation and opinion. It, therefore, follows that the standard of training and education, the extent of knowledge of all branches of Medicine, the quality of technical skill attained in his own speciality and, above all, the ability to apply his extensive knowledge to the elucidation of obscure problems from findings derived by his own special examinations should be of the highest order; he would then command the respect and confidence of his colleagues and would be treated by them as one belonging to their own status and a peer. Now, let us pause here and examine how many of the Radiologists in India today come up to this high standard of technical training and academic, eminence covering a wide territory of clinical medicine and surgery. The number, as far as I could gather from statistics supplied to me by the Hon. General Secretary of the Association, is not very heartening or encouraging. There are, certainly, some who are very highly qualified with high academic distinctions besides their specialist diplomas; but the majority of the members of the speciality have remained satisfied after finishing their diploma courses and not gone for acquiring higher degrees to widen their horizon of clinical medicine and surgery. Some of my very valued friends differ from me on this point: but I hold that, in order to be a competent Radiologist of the type we find as Heads of Departments in U. K., U. S. A. and the Continent and in order to claim equality of status with specialists in other branches of Medicine, one must undergo,

after qualifying, a period of clinical training in Medicine and Surgery for at least two years, during which period he should obtain his M.D. or M.S., and then enter upon his specialist training and spend, at least, another three years in a first class Radiological Department during which period he should complete his Diploma course, followed by a year of intensive Residency training under direct supervision of his departmental chief. One may argue what about the many older and senior Radiologists in the country who have been in the practice of the speciality for 20 to 30 years and have acquired fame and reputation as first-class consultants without undergoing the period of training outlined by me above. My answer would be that Radiology in the year 1958 is not what it was in 1925 or 1920 and the success of these eminent members of the profession has been due to their untiring zeal and intensive and extensive self-education and study throughout their professional career in order to keep abreast of the very rapid developments that have taken place in this new speciality of medicine during the last four decades. I have given this advice to all my young colleagues who intend to take up Radiology as a career and have urged them to equip themselves well with as wide a knowledge as possible of the basic medical sciences of Anatomy, Physiology, and Pathology, and the clinical sciences of Medicine, Surgery, Gynaecology, Obstetrics, E. N. T. etc. before beginning the study of Radiology or even after they have completed their diploma course. Similar intensive period of training is insisted upon at present in U. K., America and Western European countries for those who aspire to become specialists and consultants in Radio-Diagnosis or Radio-therapy. Let us now examine the reasons which lie beyond our control and which stand in the way of Indian Radiology coming upto the standard of Radiology as seen in the advanced

countries of the West. The chief among these reasons are poor financial allotments to the Departments of Radiology attached to the Teaching Institutions and General Hospitals, reluctance on the part of the authorities concerned to equip these departments with adequate number of upto-date high power machines, great paucity of trained and qualified staff, large number of patients to be attended to in these departments during working hours every day, and absence of pressure on authorities from other departments for opening up of special units in the Radiological Departments for undertaking the newer and higher types of radiological investigations, as a matter of routine. Public opinion in the country is also not educated, enlightened and strong enough to demand equipping and staffing of these departments on a scale which will enable them to discharge their functions as well as in other countries. The unfortunate part of the whole matter is that Hospitals and Institutions meant for catering to the sick and relieving human suffering, are regarded as spending and not revenue earning departments and so financial stringency is always advanced by every State Government in our country as an excuse for not effecting timely improvement in equipment and staff of hospital departments. It is unnecessary to mention here that, in other advanced countries also, Hospitals and Institutions for the sick are not revenue-earning units and yet the lavish way in which these Institutions are equipped with the latest and most upto-date instruments and staff, is amazing and will command every body's respect. The reason for this enlightened policy towards Hospital administration in those countries lies in the fact that preservation of the health of the nation at the highest pitch of efficiency is considered as a sacred duty of the Governments concerned and the irresistible forces of an awakened public opinion

arrayed in war against disease, do not allow the Governments of those countries to be slack and indifferent in this respect. I know the financial resources of our country are limited and there is necessity for tempering enthusiasm with a sense of reality; but I feel I can safely assert that national health is the foundation on which any plan of reconstruction must be based, if it is to yield optimum results; and that a nation's wealth, prosperity and advancement, whether in the economic or the intellectual sphere, are conditioned by the state of its physical well-being.

The third adverse factor that has begun operating in this direction lately, is a more formidable one and would require our very careful consideration for its solution. We are finding it increasingly difficult to induce any of the bright and brilliant graduates of our Medical Colleges to take to Radiology as a career. This is, pre-eminently, due to the prohibitive cost of modern upto-date X-Ray apparatus, both diagnostic and therapeutic, which are necessary to equip a first rate clinic and without which no radiological service of satisfactory standard can be produced. An investment of near about a lakh of rupees is required to start a new chamber either for Diagnostic or Therapeutic work; and what is the return expected of an investment of this magnitude? With Radiological Departments of State and other hospitals being progressively better equipped and better staffed and the general population of the country becoming increasingly more hospital-minded. It is apprehended that the future of private Radiology is not very rosy, except in the few metropolitan cities, and that the major part of radiological service in the country will very soon be concentrated in Hospital X-Ray Departments. Medical graduates of outstanding merit are therefore, not being attracted to this speciality because of the high financial investment

required at the start of their career and, secondly, because other specialities offer better material prospects with much less investment. We are, therefore, faced with a dilemma and do not know where to find a ready solution. The speciality requires bright boys and girls who are graduates of good academic record to join its ranks in order that the pivotal character of its work among the other specialities may not suffer in quality and standard, and also to create a band of intelligent and enthusiastic research workers who would maintain the steady progress of Radiology by discovering newer lines of investigation and newer techniques of therapeutic applications in treatment of diseases which are amenable to irradiation therapy. I have given a great deal of anxious thought to this knotty problem and, to my mind, it seems that the remedy lies in the hands of the Government of the country. The Government should come forward and offer handsome stipends, scholarships and fellowships to the right type of medical graduates who will accept Radiology as a career in order to enable them to undergo, in recognised Institutions, the requisite and prescribed course of training necessary for becoming a Specialist; and, on completion of their prolonged intensive and extensive training, to offer them a subsidy for purchase of necessary equipment to start a clinic in a place which should be selected for him by the Government, if he chooses to remain in private practice; or to absorb him in the cadre of State Health Services as a Specialist on terms and conditions suitable to his attainments, if he prefers to join service. I would request the authorities concerned to consider my suggestion for what it is worth and to implement it, if they find that it is a workable proposition.

My predecessors in office have, at previous sessions of the Congress, dealt with fully the questions of fuller and more extensive

training in Radiology in the undergraduate course and the desirability of having a uniform syllabus and curriculum of study in the Postgraduate Diploma courses under the different Universities in the country. I endorse their views fully so far as training in Radiology in the under-graduate course is concerned. What training is given at present in this subject in the Medical Colleges, is of a perfunctory character and does not meet the needs of the situation. In common with many teachers in general and Teachers of Radiology, in particular, I am convinced that the method of allotting a certain number of hours during one session to cover the entire diagnostic and therapeutic field of Radiology, is not adequate. When instruction on the subject is concentrated in one year, the student is unable to understand the subject as a branch of fundamental medical science because of its complex nature and is unable to grasp the full significance of its application to the pre-clinical and clinical branches of medicine. If, however, radiological instruction is begun with Anatomy and Physiology in the pre-clinical years and continued in relatively brief courses, each year, throughout the clinical period of study, the student will gradually build up a complete and sound conception of this branch of medical science. In the detection and study of disease-processes, diagnostic radiology has attained a position of great importance comparable to that of Pathology, with the added advantage that the roentgen method reveals the disease process in the living. From Anatomy and Physiology to Medicine and Surgery, Radiology is always in evidence as an aid and a guide. Radiology has thus attained the position of a major branch of medicine rather than a speciality. I think I am voicing the opinion of all my colleagues here when I say that we are convinced that the teaching of Radiology should be largely clinical and carried out with

bed-side instruction during ward rounds as well as the Out-Patients Department, in Clinico-Pathological conferences and in routine medical and surgical lectures and demonstrations. But I believe that a certain amount of instruction in "pure" Radiology is necessary to lay a foundation and to prepare the students for an intelligent application of Radiology to Clinical Medicine. Such instruction in "pure" Radiology is not to be given at the bed-side nor in connection with a single specific patient. I fully appreciate that the aim of an undergraduate radiological course is not to make specialists but to give sufficient instruction for the needs of the general practice of medicine and "to make the students familiar with the help they may expect from Radiology in their future practice of medicine", as was very aptly put by my esteemed friend, Captain M. Mukerji, in his Presidential Address in 1951. The undergraduate course of training in Radiology should, therefore include demonstration of the normal anatomical relations of the skeleton and of the organs of the chest and abdomen and fluoroscopic and skiagraphic demonstration of functions of the different systems of the body during the pre-clinical years: and Radiological Pathology and interpretation of X-Ray films in medical and surgical diagnoses and in special Branches of Medicine together with General Radiology in clinical years. The course in General Radiology should comprise brief courses on Physics of X-Rays and Radium, Biological effect of X-Ray and Radium and Radiotherapy.

With regard to the plea for a unified syllabus and curriculum for Post-Graduate Teaching in Radiology in the different Universities, I am afraid, I cannot agree fully with this view-point for the following reasons. Post-graduate teaching in all subjects is now conducted, practically,

throughout the country as a University function; and to limit the scope and character of teaching of a particular subject at the Post-Graduate level within the four walls of a rigid syllabus and curriculum for all Universities, would tantamount to curbing the autonomy and individuality of the Universities in this respect, which is one of their valued privileges and which would not be to the ultimate good of University teaching itself. Universities are expected to make enduring contributions to studies in different fields of human knowledge and to inspire their alumni to undertake deeper studies in different branches of knowledge. I have no objection to prescribing a minimum standard below which no course of Post-Graduate instruction should fall; but the Universities should be left with sufficient powers to add to the contents of the Syllabus in any particular branch of study according to the facilities locally available to impart higher instruction in that particular branch. For instance, Bombay University may include in its Diploma course higher training in Nuclear Medicine by arrangements with the staff of the Atomic Energy Establishment, a rare facility which is available there. The Lucknow University, on the other hand, will not be able to include this training in its Diploma course even if it desires to do so, for want of this facility.

With these preliminary observations on the standard of radiological service that we want the X-Ray Departments of our Hospitals and the Private Clinics to produce; the qualifications, training and depth of knowledge that we desire to see in those who will take up the speciality of Radiology as their professional career; the nature and scope of Radiological teaching at undergraduate and post-graduate levels and the obstacles and impediments in the path of Radiology developing in India as a speciality of high standard, as in other

Radiologist, one effect of such recognition being that no person who did not hold a recognised radiology qualification would be entitled to be enrolled in any Register to be maintained by the States nor to practise the profession of Radiology or to hold an appointment in any dispensary, hospital or other institution. The Bill also proposed to establish State Radiology Councils and Joint State Councils whose chief function was to prepare and maintain Registers of Radiologists for the States and to issue certificates of registration to the persons whose names were entered on the Registers. It was also provided that a person not possessing the qualifications required for entry on the first Registers could have his name entered on the first register for a period of three years, if he was practising Radiology as his principal means of livelihood for 2 years; but, for retention of his name on the Register permanently, he must pass such an examination within a period of three years from the publication of the Register. Qualification for subsequent registration was the holding of a recognised qualification in Radiology.

Secondly, the Central Government was empowered by notified order to provide for regulating or prohibiting the production, manufacture, sale, distribution and use of any irradiating apparatus or radio-active substance and such an order may provide for (1) regulating by licenses, permits or otherwise the production or manufacture of any radioactive substance or irradiating apparatus and the storage, transport, distribution, disposal, acquisition, use or consumption thereof and (2) the entering and search of premises, vehicles, vessels, aircraft and the seizure by a person authorised to make such search of any articles in respect of which such person has reason to believe that a contravention of the order has been, or is being or is being, or is about to be committed, etc.

The proposal for the establishment of a Central Council for the regulation of the profession of Radiology was not acceptable because Radiology was not a separate profession but a part of the profession of Medicine for the regulation and control of which there is the Medical Council of India and the various State Medical Councils. If a separate council was considered necessary for the regulation of the practice of Radiology, why should it not be considered necessary to have separate councils for the regulation of the other specialities of medicine viz. Ophthalmology, Surgery Orthopaedics, Paediatrics, etc.? Where was this craze for separate Councils to lead us to and where would it end?

The proposal for having Radiology Regulations to prescribe the minimum standard of education and training required for qualification as a Radiologist on the analogy of Education Regulations under the Pharmacy Act of India, was wholly unnecessary, as the courses of study, including the period of practical training and the examinations to be passed for obtaining a radiological qualification, are governed by the regulations of the Universities which grant such qualifications and there is no reason to believe that these regulations fall short of the standards which the proposed Radiological Council was to prescribe. The maintenance of a uniform minimum standard in this respect by the Universities granting Post-Graduate Diploma in Radiology, has now devolved upon the Medical Council of India, the Post-Graduate Committee of which has been entrusted, under the Indian Medical Council Act, 1956, with the task of maintaining proper standards of all Post-Graduate Degrees and Diploma in Medical Science granted by Indian Universities. The periodical inspection of the medical Institutions, providing training for all

Post-Graduate courses of studies, by the University Inspectors and Inspectors of the Medical Council of India, would ensure maintenance of the standards prescribed by the Council. Where is then the necessity of establishing another Council to do the same job?

I was a member of the Medical Council of India for ten years from the time of its first constitution in 1934. I was a member of the Senate, the Faculty of Medicine and the Board of Studies in Medicine of the Patna University for two terms of 5 years each. I have been a member of the Senate, the Academic Council and the Faculty of Medicine of the Calcutta University for the last nine years. I am associated as a member of the State Medical Faculty of West Bengal and the West Bengal Medical Council for the last 10 years and I am at present the President of the W. B. Medical Council. From my long association with these academic bodies, I can assure you that the maintenance of proper standards of the Post-Graduate courses in all branches of Medicine, has always engaged the serious attention of the Medical Council of India and of the Medical Faculties of the Universities and there is no reason to doubt that any reasonable suggestion for improvement in the Syllabus and curriculum of studies of the Post-Graduate Courses in Radiology made by the Indian Radiological Association or this Congress, will not receive their most careful consideration.

The proposal of creating separate Register for entry therein of names of physicians who were in exclusive practice of Radiology was considered unnecessary since the names of these physicians were already borne on the State Medical Registers with entry of their radiological qualifications as additional qualifications against their names, if they so

desired, and because there were no separate Registers for physicians practising other specialities of medicine.

The proposal of regulating the acquisition and use of irradiating apparatus and radioactive substances by physicians and radiologists by the issue of licenses, permits or otherwise, and the conferring of powers upon officers of the State to enter and search premises and to seize any articles in respect of which such officers had reason to believe that a contravention of a notified order had been or was being or was about to be committed, was most objectionable from the point of view of the honour and dignity of the medical profession. This proposal was tantamount to reducing the position of the profession to that of a tradesman.

I now come to the main principles underlying the recommendations of the Indian Radiological Association and the Bill which was drafted on those recommendations. This main principle took it for granted that the time had come to enact legislative measures to control and regulate the profession and practice of Radiology in India on the ground that some physicians not properly qualified or not having proper training in Radiology were practising as Radiologists or using X-Ray apparatus in examination and treatment of patients along with their general practice of medicine; and, secondly, because such misuse of X-Ray apparatus was likely to endanger the patients' health. Nobody in his senses would support the practice of Radiology as a speciality by people who are not qualified by their education, training, experience and skill to do so nor would any body deny that inexperienced use of irradiating apparatus or radioactive substances was full of hazards. The question that has to be answered in this connection is how many such

unqualified and untrained physicians or even non-medical men were practising as Radiologists or X'Ray Specialists throughout India. What is their actual number in relation to the qualified and properly trained Radiologists and in relation to the actual needs of radiological service in the country? And, secondly, is misuse of X'Ray apparatus the only source of danger and hazard to patients? The misuse of many of the paraphernalia of a doctor, e.g. A Scalpel, A curette, a set of Hegar's dilators, a chloroform-mask, a tube of Morphia tablets, to mention only some, may be attended with risk to patients' life and limbs. We know now the Uterine Curette and the Dilators are grossly misused by some of our qualified physicians for a certain type of obstetrical operation; but should we, because of that put forward a demand that the sale and possession of Hegar's Dilators and Uterine Curettes should be regulated by the issue of permits and licenses? For the removal and gradual disappearance of these malpractices, we must depend upon enlightened public opinion and the development of a high sense of ethical standard among the members of the profession. Legal enactments cannot remove these blemishes because no law can be foolproof. Some loopholes are sure to be found out by subtle legal brains in all man-made laws and defeat the main objectives of such enactments.

Reverting to the question of the overall radiological needs of the country and the number of qualified and trained Radiologists available to meet those needs, on the basis of which alone the very important question of control and regulation of the profession and practice of Radiology in the country can and should be tackled, may I inform this house that today the total number of Radiologists available in the country does not exceed 400 to 500, according to figures supplied to me by the Hon.

General Secretary of the Indian Radiological Association. This figure is based upon the total membership strength of the Indian Radiological Association plus a guess-work regarding the number of physicians doing some kind of X'Ray practice in the country who are not on the Membership Roll of the Association. Now, what ratio does this number bear to the total population of the country which is a little over 38 crores (approximately)? This ratio works out at one Radiologist to 1 million or 10 lakhs of people. I put it to you, my friends and colleagues, is this the time to think of control and regulation of the profession and practice of Radiology in India? Is it not time for us to sit up and concentrate all our energies in finding out the best and quickest way of producing as many properly-trained and qualified Radiologists in the shortest time possible to meet the radiological needs of the country, and, until that desired goal is attained, to get as many other physicians in the country interested in X'Ray work and give them some training so that the teeming millions of our countrymen throughout the length and breadth of the country may get some radiological service in place of no such service at all? I know some of you will at once say that no radiology is better than bad radiology; but I belong to that school of thought which maintains that some radiology is better than no radiology and, in support of my stand, I shall present before you some figures and tables from the very informative article of Dr. Donaldson on "Practice of Radiology in U.S.A." which appeared in the "American Journal of Roentgenology and Radium Therapy" in its issue of December, 1951. I am intentionally quoting the figures of U.S.A. because India, in her area and population, resembles the U.S.A. more than she does the U.K., Sweden, Germany, France or some other small continental countries and their needs run on parallel lines. Some of my

predecessors in office gave a lurid picture in their Presidential Addresses of conditions that prevail in this respect in these small but vastly advanced countries where the practice of Radiology is controlled by legislative measures and where a Radiologist, after he has undergone an intensive course of training in Radiology for 3-5 years and passed the necessary examination, has to apply to the authorities for permission to open an X'Ray Clinic. I wish my esteemed friends had also mentioned in this connection the number of Radiologists available in those countries and the total population whose radiological needs they were serving. The figures would have been highly instructive and informative for the purpose of our present discussion. Donaldson's figures are based upon a survey carried out by the Professional Bureau of the American College of Radiology between 1946 and 1950 on the distribution of radiological services in the U.S.A. The Bureau collected figures from publications of the United States Public Health Service, of the American Medical Association, of the National Radiological Societies and a few other sources, including the files of the Bureau itself which has been maintained by the American College of Radiology since 1937. The following are some of the figures to which I would draw your serious attention:—

Population of U.S.A. in 1950	150,697,361 (over 15 crores)
Total Number of practising physicians	151,267
Physicians : Population	1 : 1000
Certified Radiologists (full specialist)	3000
Non-certified Radiologists (Special interest)	500
Second and Third Year Residents	600
Total of Radiologists, Assistants & Residents	4,100 (full-time)
General practitioners and other Specialists owning their own X'Ray equipments	31,000 (part-time)

These figures give one full-time Radiologist to 36755 population (in 1931, this was 1 to 122000); and if whole-time and part-time Radiologists are counted, it works out at one X'Ray worker to 4293 population.

The proportion of Radiologists to practising physicians would work out as follows:—

Full-time certified Radiologists : Physicians	= 1 : 50
Total Physicians rendering X'Ray Service : Physicians	= 1 : 4.3

Of 250,000 patients seen each day by the Physicians in U.S.A., about 83000 are referred to Radiologists for investigation, i.e. 1 of each 30 patients seen is referred to a Radiologist for investigation and opinion.

From the above figures, we can draw the following conclusions with regard to the requirements of our country:—

No. of physicians required for 36 crores of people, according to U.S.A. standard i.e. 1 per 1000 population	... 360,000
The Bhor Committee, however, considered this standard too high and, therefore, recommended 1 physician for 2000 people; according to this, our requirement would be	... 180,000

In U. S. A., there were 4.3 physicians rendering radiological service to the patients of 1 physician; according to this ratio, we should have 41860 physicians rendering X'Ray service to the patients of 180,000 doctors. This number is nearly half of 83857 X'Ray worker per 4293 population, as in U. S. A. Since this ratio is too high for our country, we should be satisfied with 1 X'Ray worker per 10000 population i.e. 36000 for the 36 crores of our people. I am very glad to observe here that one of our past Presidents, Dr. S. N. Deboo, also suggested, in his Presidential Address delivered at the Bombay session of the Congress in 1952, that India should have, at least, 1 Radiologist to 10000 of her population.

I would next draw your particular attention to the following Table in Donaldson's article.

Table 25

Physicians owning their own X'Ray Units in U. S. A. in 1951.

Type of Practice	Total Physicians	Physicians owning X-Ray apparatus	Percentage of total physicians owning X-Ray Unit
General Practitioners ...	73079	19680	61%
General Surgery ...	19976	3000	9.3%
Internal Medicine ...	12079	2200	6.8%
Radiology ...	3559	1300	4%
E. N. T. ...	10788	1050	3.4%
Dermatology ...	2110	1050	3.3%
Industrial Medicine ...	2122	840	2.6%
Orthopaedic Surgery ...	2532	810	2.5%
Paediatrics ...	6321	750	2.3%
Urology ...	2869	700	2.2%
Cardiology ...	916	290	0.9%
Gastro-Enterology & Tuberculosis ...	2277	200	0.6%
Obstetrics & Gynaecology ...	6798	180	0.6%
Allergy ...	703	160	0.6%
Total ...	146129	32250	100%

These figures are highly instructive; they show that, even as recently as 1951, of the total number of physicians owning X'Ray equipment, the Radiologists formed only 4%, and the remaining 96% of X'Ray apparatus were owned by Non-Radiologists.

Table 26

Distribution of Physicians owning their own X'Ray equipment.

City size	General practitioners	Specialists	Total
Under 5000 population.	6490	NA	6490
5000 to 25000	4530	1890	6420
25000 to 50000	980	2150	3130
50000 to 100000	1770	1740	3510
Over 100000	2000	6790	12790
Total ...	19680	12570	32250

This table shew that, in cities below 25 thousand population, radiological service is rendered mostly by general practitioners.

Let us now compare the conditions existing in India today with those that obtained in the U. S. A. in 1950-51. We have in our country one X'Ray worker to ten lakhs of people, as against one full-time Radiologist to 36755 population, and, if all X'Ray workers were counted, one X'Ray worker to 4293 population of U.S.A. I have already shewn previously that, basing our requirements on one X'Ray worker for 10,000 population, instead of 1 for 4293 as in U.S.A., we require 36000 X'Ray workers for the whole country. I put it to you again, friends, can we, with this state of affairs, contemplate legislative measures to control and regulate the practice of Radiology as it exists in India today? The U. S. A., a country vastly advanced in every sphere of life compared with ours and no less a champion for radiological services being rendered by properly qualified and intensively-trained Radiologists, had in 1950-51, 3000 General practitioners and specialists other than Radiologists who owned their own X'Ray equipment to help the 4100 full-time Radiologists to render radiological service to her 15 crores of population. Can we, with barely 400 X'Ray workers in the country or say, 500 or even 600 such workers and a population of 36 crores, think of recommending any measures to be taken by Government which will have the effect of severely restricting this number for the Radiological needs of the nation? Will any administrator, who is charged with the duty of providing adequate medical relief to the millions of our people, hood us with respect and recommendation. We need 36000 X'Ray workers today and we have barely 500 to 600 such persons. The output from the three Indian

Universities, which run Post-Graduate Diploma courses in Radiology, does not, I believe, exceed 50 to 60 per year; and the number, who secure this training in foreign countries and return to India with a Post-Graduate qualification in Radiology, will hardly exceed one or two dozens a year. I am subject to correction, if I have underestimated these numbers. It is easily understood that, at this rate of production and addition to the rank of properly-qualified Radiologists viz. at about 70 to 80 or even 100 per year, as the maximum limit, we shall require nearly 360 years to reach our target. It will not, therefore, do nor will it meet the needs of the country, if we were to suggest in any manner that the radiological service in India must be rendered by none but full-time, properly qualified, certified Radiologists, as were contemplated in the Draft Radiology Bill. We shall have to make a compromise with our idealism and face facts as realists. We must, in the larger interest of the country and of the teeming millions who require radiological service, suggest ways and means by following which the number of X'Ray workers in the country may be speedily increased. This can be done, in my opinion, if we recommend to the authorities concerned the adoption of the following measures:—

1. To request those Universities, possessing Medical Faculties and where adequate facilities are available in the Medical Colleges affiliated to them, to open Post-Graduate Diploma courses in Radiology.
2. To request State Governments to offer inducements to medical graduates to take Radiology as a specialist career.
3. To increase the number of admission to the D.M.R.E. courses in those Universities which run such courses.

4. To get general practitioners and other specialists interested in X'Ray work and arrange a shorter course of training for them, say, of six months, so that they may render part-time radiological service in outlying hospitals and to their own patients.
5. To arrange Refresher Courses for the part-time and full-time Radiologists at suitable times of the year.
6. To start Mobile X'Ray Units with their own Generators and Processing Rooms which will move from place, from one Union Health Centre to another, and, if necessary, from village to village, to render travelling and domiciliary radiological service, on the same lines as Mass Chest X'Ray Survey Units.

I would conclude discussion of this subject by saying that the question of regulation comes when there is saturation or super-saturation or near-saturation in a profession. In India today, the facilities for radiological service are so hopelessly inadequate that we cannot think of regulating the practice of this speciality for many decades to come. I would request those of my very valued friends who have accused me of advocating quakery in Radiology, not to misunderstand me. I yield to none in my zeal for seeing the speciality, which I have made my life's vocation for the last 40 years, practised by none but those who are properly qualified and have been adequately trained in the art and science of Radiology upto the highest standard; but, in my zeal and enthusiasm, I cannot be blind to facts and ignore them. My long association with the premier professional organisation in the country, viz. the Indian Medical Association, for nearly 30 years and of which I have been a founder-member, the Hon'y. General Secretary for several years and, lastly, its President for

1946-47, has taught me to look at every question of this nature from the broader aspect of the interests of the nation and not from the narrower aspect, affecting the interests of a smaller group. I believe that inexpert use of X-Ray or quackery in Radiology, by whichever term you may call it, will die a natural death with the rise in number of properly-qualified and certified Radiologists, just as quackery in Medicine is fast disappearing in those States where the number of qualified medical practitioners is approaching the number required for meeting the health needs of the people. No country in the world, comparable with India in size, population and its medical manpower, has attempted to control unqualified practice in any branch of medicine by legislative measures. In the U.S.A., as I have already shewn, and even in U.K., there is no legislation prohibiting the use of X-Ray apparatus by a General practitioner.

There are other yard-sticks also, besides the one I have used above, based on American figures, which may be applied in determining the requirements of the country in Radiological personnel and other connected matters. "In U. K., during the post-war period, the demand for X-Ray services in hospitals and clinics throughout the country, had increased considerably and, in most X-Ray departments, the number of patients and the complexity of the examinations and methods of treatment had continued to increase. In consequence, most departments had to extend and improve their facilities, instal new apparatus and augment their medical, technical and clerical staff. These demands brought in their wake problems concerning administration, equipment, care of apparatus, protection of personnel, radiographic technic and clerical work. In many departments, the resources available were not sufficient to meet the demand for the

service. Besides above, many hospital Management Committees decided upon improving clinical facilities by the addition of new beds, more clinical consultants, opening of new departments and instituting and extending Specialist Outpatient Clinics; these departments necessitated making the radiological departments adequate to meet the inevitable new demands. In order, therefore, to give guidance in these important matters, the Faculty of Radiologists of U.K. suggested certain general principles which were to be regarded as a guide to the basic requirements of Radio-diagnostic and radio-therapeutic departments". I am quoting below some of the figures and recommendations from the Memoranda which were published in 1953 by the Faculty on "The Radio-diagnostic Service in Great Britain" and on "Planning, Staffing and Equipment of Radio Therapy Centres in Great Britain".

- "1. A Radiologist, doing general work whole-time in the X-Ray Department of a non-teaching hospital, can deal with about 10,000 investigations per annum. In specialised Hospitals or units where thoracic, neurological or other involved techniques are extensively employed, the number of investigations which one Radiologist can deal with will be greatly reduced. A Radiologist should not undertake Screen Examination for more than 10 hours per week.
2. Every Department should have at least one qualified Radiographer in charge of the radiographic work under the Radiologist. If the work of a Department does not warrant a whole-time Radiographer, a part-time Radiographer should be employed. X-Ray Departments doing general work in a non-teaching hospital require a technical staff on the following minimal scale:—

No. of investigations per year	Superintendent Radiographer	Senior Radiographer	Radiographers	Population (millions)		
				1	2	3
Under 1000	...	...	1 (part-time)	New cases of cancer per year 2300	4600	6900
Upto 2000	...	...	1	New cancer cases for radiotherapy 1200 2400 3600		
Upto 5000	...	1	2			
Upto 8000	1	1	2			
Upto 10000	1	1	3			
Upto 15000	1	2	3			
Upto 20000	1	3	5			
Upto 30000	1	4	7			

Besides above, most departments doing heavy work, have to employ Dark-Room Technicians, Nursing Staff and Clerical Staff.

3. With the more extensive use of X-Ray examinations for diagnostic purposes, the hazards of exposure to X-Radiation increase and the need for supervision of protective measures is greater. The practice regarding protection in any department should be in accordance with the current code on radiological protection.
4. The minimum population which would justify the establishment of a fully-equipped radiotherapeutic centre is one million. Ideally, all radiotherapy should be carried out at the main centre; but, in certain exceptional circumstances, it may be necessary to establish treatment-centres for smaller population-groups.
5. It is probable that, in each million of the population, there would arise each year between 2200 and 2500 new cases of cancer; of these, more than half will require radiotherapy, either alone or in combination with surgery. Radiotherapy will also probably be required for at least 1000 non-malignant patients for each million of population and about 2/3 of these will be dermatological cases.

The above figures are given so that planning may be undertaken in relation to the ultimate requirements for the radiotherapeutic service of the region.

6. There must be a full range of equipment so that the appropriate type for special purposes is available e.g. Superficial Therapy apparatus, 200-300 K. V. apparatus, Megavolt Units and an adequate supply of Radium for interstitial, surface and cavitary treatments.
7. A first-class Physics department is essential for radiotherapy, and an adequate record-service is equally vital, if accurate work is to be done and progress made through assessment of results.
8. It is generally agreed now-a-days that a radiotherapy department should have its own beds, while working in complete co-operation with the Physicians and Surgeons concerned. It is suggested that about 75 beds per million of the population may be required.
9. The staff of properly-organised Radiotherapeutic department should consist of Consultant Radiotherapists, Assistant Radiotherapists (trained), Trainees, House Officers, Physicist, Assistant Physicist, X-Ray engineer, Workshop fitter, X-Ray Technicians (Radiotherapy), Mould Room Technicians and Radium custodians, besides Nursing and clerical staff".

In U. K. it is estimated that, in General and Teaching Hospitals, about 60 radiological investigations are carried out per bed

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per year. In our country, because of comparatively longer stay of patients in hospitals, this figure may be taken as 40 to 50 radiological investigation, per bed per year.

I have presented the above extracts from the Memoranda of the Faculty of Radiologists of Great Britain to serve as a guide to those of you who may be called upon to give expert opinion on the basic principles governing the requirements of Radio-Diagnostic and Radio-therapeutic departments or Clinics. Unfortunately for us, no Indian statistical figures, based on Surveys of the kind carried out in U.S.A. and U.K., are available and we are compelled to make use of the data supplied by these countries for determining our needs as they affect our speciality. It is high time the Government of India instituted an India-wide enquiry on the lines indicated in Dr. Donaldson's article.

There are a few other subjects of very great importance to the profession of Radiology to which I would like to draw the serious attention of the authorities who are in charge of the Health portfolio in the Centre and the States. The first of these subjects relates to the opening up of Training Centres in the various parts of the country for Radiographers and Technicians in Radio-Therapy. Except for one such centre in Bombay and another in Madras, I do not know if satisfactory arrangements are available in other places for imparting systematic instruction to persons who are willing to take up these lines as their life's career. I need not emphasise the great importance that should be placed on this matter because good radiological service cannot be rendered unless the Radiologists have well-trained and skilled technical assistants to help them in the routine non-medical part of their work. It is, therefore, necessary that every State in India should

have a Radiographer's and Technician's Training Centre started in the Radiological department of the premier Hospital of the State and all such centres should have a training programme based on a uniform syllabus and curriculum of studies on the same lines as those of the Society of Radiographers of U. K., with modifications necessary to suit the special needs of our country. Much has been said by my predecessors in office in their Presidential Addresses on the desirability and urgent necessity of developing within the country an X-Ray and Electro-medical apparatus manufacturing industry; but, in this matter, we stand exactly where we did ten, twenty or thirty years ago. The solitary instance of the Radon House of Calcutta which has been built up by the untiring energy, unflagging zeal, and self-confidence of Mr. Bhowmik of Calcutta, stands out as a shining example of what can be done by the efforts of a single person who is inspired by high idealism and is prepared to meet and overcome all obstacles that come his way in the fulfilment of his ambition to lay the foundation of an X-Ray Industry in India. This pioneer venture of Mr. Bhowmik is, however, on a very small scale and the output of his factory is too small to meet even a fraction of the needs of the country. What we really need is the establishment of an industry on a big scale by collaboration between the Union Government and some one of the foreign firms who have already established themselves in this line for decades and supply the world needs of these apparatus, such as, Siemens, Phillips, Picker, International General Electric, Watsons, Newton-Victor etc., on the same lines as the Union Government proposes to do for the manufacture of drugs, chemicals and pharmaceuticals in India. A Press report in the "Statesman" of 26th ultimo announced that a comprehensive 51 crore programme

for the manufacture of drugs, chemicals and pharmaceuticals in the country was understood to have been approved by the Union Government, subject to foreign collaboration being available on suitable deferred payment terms. I would appeal to the Union Government to formulate programmes of similar nature with regard to the manufacture in India of X-Ray and Electro-Medical appliances without the aid of which the practice of modern medicine is impossible and, with the availability of which in the country, a large saving will be effected in our foreign exchange resources.

As I have already taken an unusually long time in placing before you my views on several controversial subjects and have thus taxed your patience to its limit, I do not propose to deal with some other subjects of equal importance which usually find a place in a Presidential Address of the Congress. These subjects refer to the lifting of the high customs duty on X-Ray and other electro-medical apparatus and accessories imported into India, the exemption of X-Ray films and chemicals used in radiological practice from the operation of Sales Tax and the raising of the ceiling of rebate on the price of X-Ray and other appliances necessary for equipping a clinic by a Radiologist while calculating his assets for the purpose of determination of Wealth Tax etc. I endorse whole-heartedly all that has been said on these subjects by my predecessors in office and in official communications sent by the Head-Quarters of the Indian Radiological Association to relevant departments of the Central and State Governments. I would appeal to the authorities concerned to accord their favourable consideration to the suggestions made by the ex-Presidents of the Congress.

Before I conclude, I would like to say a few words to my young colleagues who

have adopted Radiology as their life's career and who are the future hopes of India in this special branch of Medicine. It gives me immense pleasure, at almost the end of my professional career, to notice in your beaming faces the radiant glow of youth's vigour and enthusiasm and it fills my heart with joy to contemplate that the future of the speciality will be safe in your hands. May I advise you, as the result of my experience of 40 years' association with this speciality, that, whenever you enter upon your task of examining or treating a patient, be not perfunctory in your work. Be thorough in your investigation of each patient who is referred to you for your specialist opinion and do not stop in your investigations until you are sure you have obtained the maximum informations possible which will be helpful to the physician who has referred the patient to you. You should go carefully into the clinical history of each case whose investigation you undertake, remembering always that you are, primarily, a physician and then a Radiologist. In this respect, I shall advise you not to be a seller of celluloid by inches but play the role of a true consultant. You should take advantage of every opportunity of educating your colleagues in other fields of medicine regarding the possibilities and limitations of Radiology, both in Diagnosis and Therapy, and you should always try to dispel from the minds of the uninformed among them the erroneous belief that diagnostic X-Ray examination is like the opening of the lid of a box, looking inside and then telling them what you have seen. You should keep up the habit of reading up-to-date text-books and monographs on special subjects and professional journals, not only of your own speciality but of general medicine, surgery and other specialities also, in order to keep up-to-date and abreast of advances in the whole field of medical science,

remembering, that, we have to be students throughout our life. It would pay you rich dividends, if you invest some part of your income on good books and journals. Those of you who are or will be attached to Hospitals, should make it a point to attend the Operation-Theatres and Post-Mortem Room, as often as possible; these are the places where we learn our mistakes and the reasons why we committed them. Attend all Clinico-Pathological conferences and take part in discussion at all clinical meetings of the professional Associations of which you are a member. And above all, observe the high ethical standards of the profession and those enjoined upon you by the speciality

which you practise and always keep in mind that the interests of your patients are always paramount and above all other considerations. Another sacred duty which you should never lose sight of, is to utilise your leisure hours and the opportunities which are placed in your way to work for the advancement of the art and science of Radiology by engaging in some original work and by making some worthwhile contribution to the store of world knowledge in the speciality of your choice which will place Mother India in the map of World Radiology.

I thank you all for giving me a patient hearing.

JAI HIND.

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Abstracts of Radiological Literature

"Exfoliative Cytology as an Aid In the Differential Diagnosis of Gastric Lesions Discovered Roentgenologically". Rubin, C.E., and Nelson, J. F. Amer. Jour. Roentgenol. 1957, Vol. 77, Page 9.

Under normal circumstances epithelium is continuously shed from the surface of the gastric mucosa. This exfoliation of cells increases in malignant growths on account of decreased mutual cohesiveness. The exfoliated cells are collected by various techniques and their examination is called exfoliative cytology by which the authors made a correct preoperative diagnosis in 88 per cent cases of proved gastric cancer. They collect the cells by gastric lavage with a buffered solution of the enzyme chymotrypsin. The patient has to be properly prepared to ensure a clean stomach which is free of food and detritus. Cells are collected before they become digested. They quote cases to show that gastric exfoliative cytology gave a more accurate preoperative diagnosis regarding the malignant or benign nature of a lesion than gastroscopy or radiology. If an ulcer looking malignant is not associated with malignant cells on cytological examination the experience of the authors shows that one would be justified in waiting for the results of medical treatment for peptic ulcer. Similarly the nature of heavy gastric folds and a narrow pyloric antrum can be determined. They refer to the importance of diagnosis of gastric lymphoma. If it is confined to the stomach it may be curable by surgery even if it produces a huge tumour mass. Diagnosis of lymphoma was made in a case showing a typical roentgenogram of an ulcerated carcinoma: it was proved to be correct on operation.

The authors recommend exfoliative cytologic studies besides roentgenologic and gastroscopic examination of all patients with pernicious anaemia which is associated with a high incidence of carcinoma of stomach. These studies may uncover premalignant polyps and curable gastric carcinoma.

In the rare type of infiltrative malignancy cells may not reach the lumen and will, therefore, not show in a cytological study. Similar cytologic failures are to be expected in an occasional advanced ulcerated carcinoma covered by an unpenetrable necrotic membrane, but such a lesion will easily be diagnosed on roentgenologic or gastroscopic examination.

M. L. Aggarwal.

"The Value Of Fast Angiocardiography In the Early.....Diagnosis of Patent Ductus Arteriosus. "Lind, J., Rach, M. & Wegelius, C. Amer. Jour. Roentgenol. Feb. 1957, Vol. 77, Page 235.

Patent ductus arteriosus should be surgically corrected in early childhood. A preoperative diagnosis in the absence of a continuous murmur is difficult and was made by heart catheterisation, thoracic aortography and exploratory thoracotomy. Although patent ductus arteriosus can be directly demonstrated by retrograde aortography, this method fails to give full information about the presence of other associated congenital malformations of the heart, so necessary in assessing the operability of the actual case. It is surprising that intravenous angiocardiography is not mentioned by other workers since it may be of value in the

preoperative assessment of a patent ductus arteriosus by helping to rule out associated congenital defects.

Intravenous angiocardiology when carried out with precision is a very valuable method which can be used successfully in those infants who have manifest heart disease and in whom diagnosis is not obvious after employing the routine methods of examination. By this method patent ductus may be directly visualised in tetralogy of Fallot, transposition of the great vessels and in conditions in which pulmonary arterial pressure is raised.

The authors used fast biplane angiocardiology synchronised with electrocardiographic recording by which it was possible to correlate the roentgenologic appearances with haemodynamics and to avoid errors in diagnosis. By this method indirect signs of the presence of patent ductus arteriosus could be accurately assessed and a correct diagnosis made even in the absence of its direct visualisation.

The important indirect signs of patent ductus arteriosus are: (1) aortic infundibular dilatation, (2) dilatation of the pulmonary artery, (3) elevation of the truncus-conus pulmonary artery and its left main branch, (4) increased pulmonary artery output evidenced by increased filling of the central pulmonary blood vessels, (5) dilution of the contrast medium in the pulmonary artery, best seen during ventricular diastole, (6) prolonged circulation of the contrast medium in the pulmonary vessels, (7) enlargement of the left atrium and ventricle and (8) refilling of the pulmonary artery in the later phase of angiography.

M. L. Aggarwal.

"Roentgen Manifestations of Unperforated Aortic Sinus Aneurysms." Steinberg, I. and Finby, N. Amer. Jour. Roentgenol. Feb. 1957, Vol. 77, P. 263.

The aortic sinuses (of Valsalva) are three small dilatations at the root of the aorta immediately above the aortic valves. Because of their intracardiac locations, they are invisible during conventional roentgenography. Aneurysms of these sinuses are rare and are either congenital or acquired. The acquired types are mostly due to syphilis or bacterial endocarditis. The congenital are believed to be due to a developmental defect in either the aorticopulmonary septum or the elastic tissue of the aortic sinuses. These aneurysms can only be diagnosed definitely by retrograde aortography or by cardioangiography: they can not ordinarily be visualised on conventional roentgenography on account of their intracardiac location. A syphilitic aneurysm of these sinuses may be diagnosed if its walls are calcified because calcification of ascending aorta is seen as a rule in syphilitic aortitis. One case was diagnosed by the authors in this way.

Presence of a congenital aneurysm of the aortic sinuses should be suspected when harsh systolic murmur over the heart, especially to the left of the sternum, is heard and is associated with coarctation of the aorta, anomalies of the aortic valves or arch, or arachnodactyly. Confirmation can then be had by angiocardiology.

Since the aortic sinuses of Valsalva are in close relation to all the cardiac chambers, particularly the right atrium and ventricle, an aneurysm arising from these may rupture into them. Congenital and mycotic aneurysms of the aortic sinuses are paper thin and prone to rupture. Syphilitic aneurysms usually become very large and laminated before they perforate. When perforation of an aortic sinus aneurysm into right cardiac

chambers occurs, there are usually classical symptoms of sudden onset of chest pain and dyspnoea, soon followed by relentless heart failure. On physical examination a high pitched continuous musical murmur can be recognised.

Repair of a ruptured congenital aortic sinus aneurysm should be attempted. Repair of a ruptured syphilitic sinus aneurysm seems unwarranted, because of the additional burden of long standing aortitis, aortic regurgitation and left ventricular hypertrophy.

M. L. Aggarwal.

"Hemangioma of the Stomach with a Roentgenologic Diagnostic point". Flannery, M. G. and Caster, M. P. Amer. Jour. Roentgenol. 1957, Vol. 77, P. 38.

The authors report a case in which a correct diagnosis of hemangioma of the stomach was made by the presence of phleboliths in a gastric mass on roentgenological examination. They claim that the presence of phleboliths within gastric mass, is a roentgenological sign not previously described for the diagnosis of gastric hemangioma.

M. L. Aggarwal.

"A New Hepatolienographic Agent: Tin Oxide". Fischer, H. W. Amer. Jour. Roentgenol. 1957, Vol. 77, P. 64.

The author observed uniformly excellent and extremely dense shadows of normal liver and spleen following rapid intravenous injection of colloidal tin oxide in doses of about 500 to 700 mgm. per kg. of body weight in 9 rabbits and 4 dogs. Liver and spleen shadows appeared to reach their maximum density from four to six hours after the injection. Visible fading of the shadows was not observed during the observation period. Gross anatomic and

histologic studies of rabbit liver and spleen which had contained tin oxide for as long as 3 days, and of the dog for 110 days, did not reveal any evidence of cell damage, proliferative reaction, or fibrosis. tin oxide could be demonstrated intracellularly in liver and spleen. The placentae were visualised in one attempt in a pregnant rabbit by similar dosage.

The clinical applications of colloidal tin oxide can be envisioned if further studies now in progress confirm its total lack of immediate toxicity.

M. L. Aggarwal.

"Perforation of Rectum". Slater, M. Amer. Jour. Roentgenol. 1957, Vol. 77, P. 66.

It is of great importance to recognise and accurately diagnose rectal perforation. Mortality rate varies from 20 to 50 per cent and it increases with the delay in diagnosis and early definitive surgery. The diagnosis may be made roentgenologically by the demonstration of free air. However since a large part of the rectum is extraperitoneal, air leaks from the tear extraperitoneally in a linear streak of air bubbles in the pararectal tissues in the periphery of the pelvis lateral to the rectum. This linear collection of gas tends to be convex outward and its distribution appears to follow the contour of the pelvic wall, coursing towards the midline as it approaches the anus. It may be unilateral or bilateral and more often than not, is unilateral. It does not correspond to any known normal anatomic part, is more radiolucent than gas within the rectum, does not change in appearance with change in position and unlike gas in the colon, has the same appearance from hour to hour. A mistake was made once in a patient who was shot in the buttocks and the wound became contaminated with fecal material producing a similar streak.

M. L. Aggarwal.

"Water Intoxication. Report of A Fatality Following a Barium Enema" Peterson, C. A. and Gayler, G.G. 1957, Vol. 77, P.

A patient was given barium enema and the examination revealed a normal large bowel. An hour later he was given a tap water enema. Previous to barium enema his intake was poor and he vomited several times. About fifteen minutes after tap water enema he became comatose. His right limbs were more rigid than the left, respirations were irregular at a rate of 120, pupils were both widely dilated and did not react to light. The jaws were tightly clamped. The heart and lungs were essentially normal. Fundus was normal. The abdomen was flat and soft. Lumbar puncture showed clear fluid. During the procedure patient became much worse. He became limp, cyanotic and

began to froth at the mouth. All attempts to save him such as glucose saline infusions, oxygen, suction, artificial respiration, intravenous and intracardiac adrenalin and intravenous hydrocortisone failed and he died about an hour later. The clinical features resembled those reported by Hill in a similar case. The immediate serum chloride was 83 meq/l (normal being 98-106). It was felt that the cause of death was hypovolemia and hypoelectrolytemia. The poor intake and the vomiting preceding the barium enema undoubtedly contributed to his susceptibility to water intoxication and fatal electrolytic disturbances from the absorption of large amount of hypotonic enema solution. The authors stress the importance of using isotonic solution for routine enemas.

M. L. Aggarwal.

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