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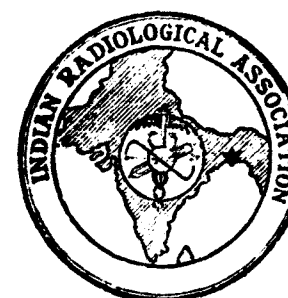
AUGUST, 1960

THE Indian Journal of Radiology

The Official Journal of the Indian Radiological Association

EDITOR-IN-CHIEF

A. N. K. MENON



EDITORIAL SECRETARY

L. R. PARTHASARATHY

152

CONTENTS

	PAGE
Editorial ...	i
Diagnosis in Oral Carcinomas. DR. V. SHANTA and DR. S. KRISHNAMURTHI.	115
Urographic Investigations Conducted. DR. T. BALAKRISHNAN	118
Myodil Ventriculography. DR. A. N. K. MENON, DR. M. G. VARADARAJAN and DR. B. RAMAMURTHI	121
Pyle's Disease. DR. ARTHUR DANIEL	126
Ewing's Sarcoma. DR. L. R. PARTHASARATHY	132
Reviews	136
Abstracts	137

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INDEX TO ADVERTISERS

Agfa India Private Limited	...	iv
Allied Photographics Private Limited	...	xvii
Amco Batteries Private Ltd.	...	ii
The Cannanore Spinning & Weaving Mills Ltd.	...	iii
CAWO Photochemische Fabrik GmbH	...	vi
Central Camera Company Private Ltd.	...	vii
Dey's Medical Stores Private Ltd.	...	i
The Doctors' X-Ray & Pathology Institute Private Ltd.	...	xi
The East Asiatic Co. (India) Private Ltd.	...	xii
Escorts (Agents) Private Ltd.	...	xiii
Glaxo Laboratories (India) Private Ltd.	...	xiv
Ilford-Selo (India) Private Ltd.	...	viii
International General Electric Co. (India) Private Ltd.	...	v
Khatau Valabhdas & Company	...	ix
Kodak Limited	...	xv
Philips India Limited	...	xviii
Picker International Corporation	...	xvi
Vaman Brothers	...	

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At the Annual General Meeting of the Faculty of Radiologists held on June 10th last, the Diploma in Radiology awarded by the University of Madras was recognised for the purposes of Membership of the Faculty of Radiologists provided the holder has obtained his Diploma following a two-year course of study. This recognition has been granted in the first instance for a period of three years i.e. June 1963.

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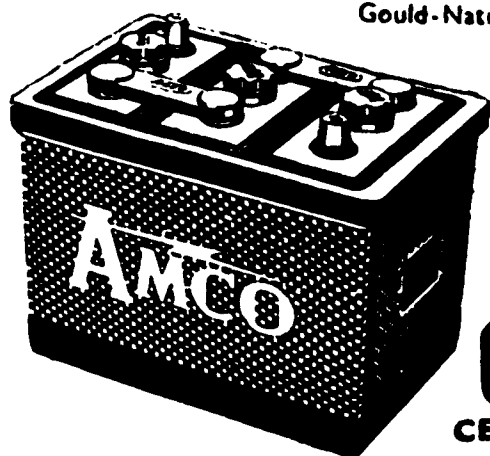


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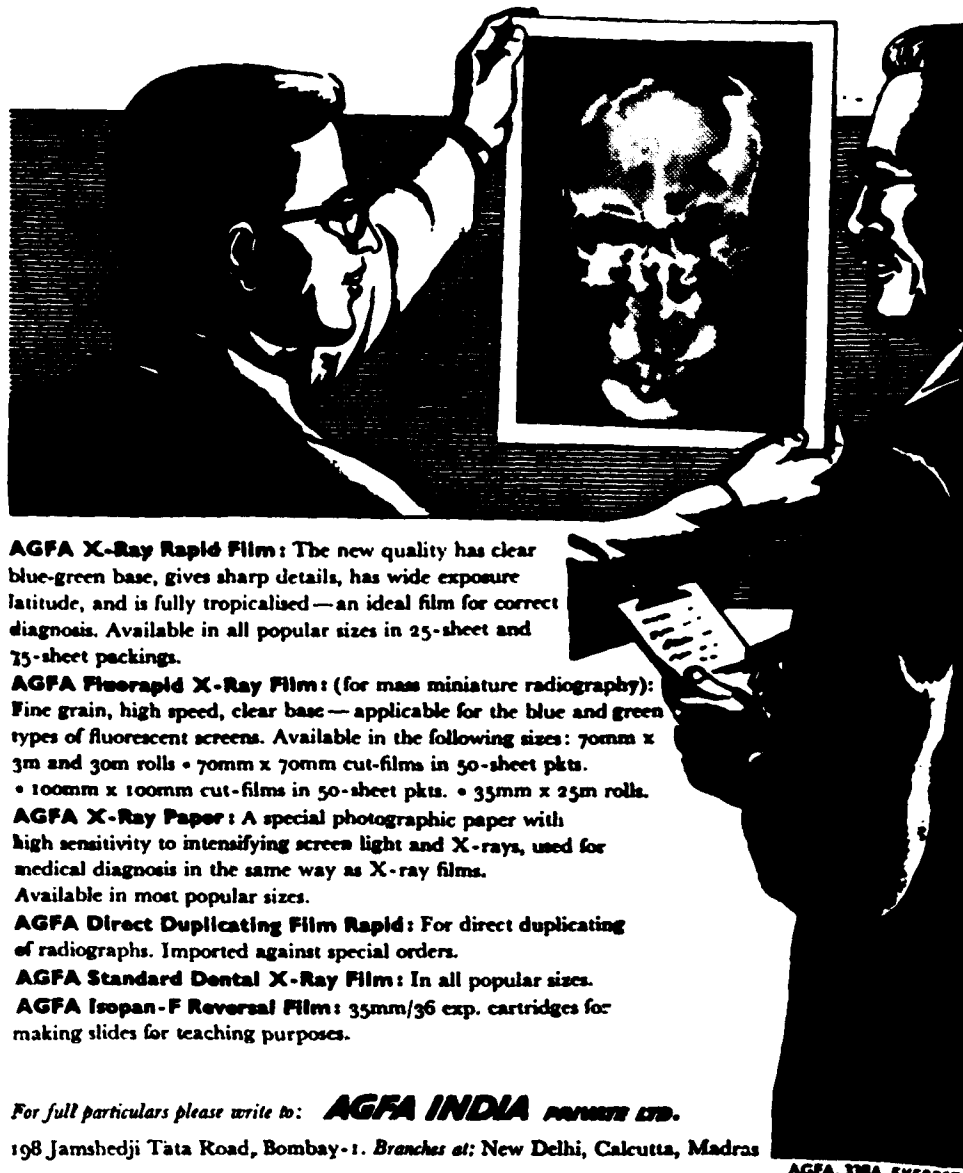
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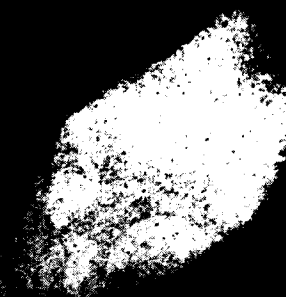
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Editorial

BY

Dr. A. N. K. MENON, Editor-in-chief.

RADIO-ISOTOPES IN MEDICINE

The discovery, production and use of Radioisotopes in Medicine forms a saga in the romantic annals of the history of medicine. The existence of isotopes has of course been known for decades. A great many isotopic elements occur in nature. Natural isotopes are stable.

The ancient alchemists, in vain, made efforts to convert all base metals into gold but did succeed in creating and advancing the Science of Chemistry. But it was the immortal Scientist Professor Rutherford who succeeded for the first time in the artificial transmutation of one atom into another. Although he did not convert a base metal into gold, he made this, scientifically possible even though economically not feasible, thus laying one of the solid foundations for the nuclear science.

The momentous discovery of artificial radioactivity was made by Irene Joliot Curie and her husband F. Joliot (in 1934). Radio-Isotopes have at present two main uses in medicine. (1) the use of labelled elements in metabolic, circulatory and other studies and (2) therapeutic use. The presence of these radioactive isotopes even in infinitesimal quantities are detected by sensitive delicate instruments as Geiger counters and Scintillation counters. Today the science of Medicine has harnessed many radioactive isotopes for the diagnosis and treatment of diseases, chief of them being radio iodine I^{131} , radio phosphorus P^{32} , radioactive gold AU^{198} , radioactive chromium Cr^{51} , Radio Cobalt 60 , Radio Caesium 137 , Radio Fe Fe^{59} , and many other less commonly used radioactive Isotopes. Reasonably cheap Cobalt 60 and Caesium 137 have practically replaced the costly and rare Radium in the treatment of malignant diseases.

In our country, the progress of the Science of Nuclear Physics and atomic energy owes everything to the foresight and vision of our beloved Prime Minister Pandit Nehru who established the department of Atomic

Energy under the directorship of the eminent scientist Dr. Bhabha, soon after the attainment of Independence. With generous patronage of Panditji Bhabha and his colleagues were able to establish in record time, the Swimming Pool type of Nuclear Reactor 'Apsara' at Trombay. This reactor went critical in August 1956 under the entire stewardship of the Indian Scientists with a gift of Uranium from Britain. Even though small, this reactor gave great prestige and recognition to India and her nuclear scientists besides producing a moderate quantity of radio-active isotopes for research and to some extent for medical purposes. India's second atomic reactor, the ten-acre Canada-India reactor and Asia's largest atomic pile, became critical at Trombay in July 10th, 1960, thus adding another milestone to the progress and development of nuclear energy for peaceful purposes. The execution of this gigantic project, the joint endeavour of Indo-Canadian Governments and people, provides "an outstanding symbol of international co-operation in the field of science and technology" and we salute Dr. Bhabha and his Canadian counterpart Mr. F. W. Gilbert for this outstanding achievement. The reactor is a high flux, slow neutron, heavy water moderated, fresh water cooled reactor, using natural uranium as fuel and is designated to be operated at a maximum power load of 40 megawatts Thermal. About 15 tons of heavy water and 10½ tons of natural uranium are used. India has one of the largest deposits of Thorium in the world in the sands and the beaches of Kerala and Kanyakumari. Under neutral bombardment, this mineral can be converted into fissionable material (Uranium 233) which can be used as reactor fuel and in the Canadian Indian reactor, provision is made for inserting 70 Thorium rods into the reactor to study the effects of neutrons bombardment on Thorium. With the successful working of this powerful reactor, India will shortly be in a position to meet all her increasing domestic needs in radioisotopes. This reactor will produce radio active Cobalt (^{60}Co), extremely useful in cancer treatment worth approximately Rs. 45 lakhs per year. Thus due to progressive outlook of the Government of India and foresight of our Prime Minister, at the end of the Second Five Year Plan, India possesses atomic reactors which compare very favourably with those at Oakridge (U.S.A.), Chalk River (Canada) and at Harwell in Great Britain.

But unfortunately it is regretted that most of our University Teaching Hospitals and Medical Colleges including the upgraded Institute of Radiology have not yet utilised the radio active isotopes in the diagnosis and treatment of diseases especially the malignant diseases, even though some of the leading

non-Government medical institutes as Tata Memorial Hospital and Adyar Cancer Hospital have utilised Radio-Isotopes in scientific research and treatment of diseases. It is hoped that this deficiency will be rectified very soon.

In U.S.A. and Europe, nuclear medicine is part of the teaching curriculum and examination in the Radiology diploma courses and examinations. In the American Board diploma examination, the candidates who sit for Radiotherapy diploma should have actually worked atleast 30 hours in a Radio-Isotope laboratory and personally attended at least 13 cases of the administration of commonly used radio active isotopes. In this matter we considerably lag behind other progressive countries. We urge the Atomic Energy Commission of India to establish an Institute of Nuclear Studies on the model of Oakridge Institute in U.S.A. and every Scientist whether in medicine, Agriculture or Industries should successfully undergo the basic course of the radioactive isotopes before he or she can use them. Besides, before a medical practitioner applies for radio-active isotopes, he or she must satisfy the atomic energy commission of India that the applicant had personally attended the administration of Radio-Isotopes in a minimum number of patients. Moreover the Institutions or Clinics who want to use the Radio-Isotopes must be inspected by the Atomic Energy Commission and certified that sufficient facilities, equipment and protection devices exist in those institutions. Unless strict control in the issue of radio-isotopes are instituted from the very beginning by the Atomic Energy Commission, a misuse of this double edged weapon may begin, which will very adversely affect the health of our people. At the same time a properly directed and controlled use of Radio-Isotope will open a new era, in the conquest of disease, in Agriculture as well as in Industries which will assist in drying away the tears of the millions of people in our over populated country. I am sure that our Atomic Energy Commission will get every co-operation from the Scientists, Medical-men and the people at large in its efforts to harness atomic energy to the great benefit of the people of this land and also in the enforcement of the necessary controls and standards without which success cannot be achieved.

A. H. K. Menon.

THE 14th INDIAN CONGRESS OF RADIOLOGY

BY

Dr. L. R. PARTHASARATHY, Editorial Secretary.

The 14th Indian Congress of Radiology was held at Hyderabad from 15th to 19th February 1960.

The Conference was inaugurated at the Jubilee Hall by Hon'ble Shri D. Sanjeeviah, Chief Minister, Andhra Pradesh, before a large and distinguished gathering. Shri Sanjeeviah, a genial personality who has won the esteem and love of the people of the Andhra Pradesh, made a humorous and informal speech touching on many medical problems.

Dr. K. N. Rao, Director, Medical Services, Andhra Pradesh, Chairman of the Reception Committee, welcomed all the delegates in his usual polished and fluent style. He spoke also about the formation of a National Council of Medical Sciences to execute the scientific progress in the field of medicine as also to raise the standards of medical care in the country. The Andhra Pradesh Director has done yeomen service and put well ahead his state in this branch of medicine.

There was an excellent speech from Dr. R. F. Sethna, the past president and the young president elect Dr. N. B. Roy, was installed, by Dr. Sethna. He is the Professor of Radio-therapy medical college university of Calcutta and Head of the department of Radio-therapy medical college hospital, Calcutta. He made a very eloquent speech worthy of the occasion and made a plea to improve the status and emoluments of the Radiologists besides controlling the practice of Radiology only to those who are qualified for the same. He also insisted that the Radiologists' equipment and accessories should only be sold under licenses to those who were entitled to practice which is of special importance. This was favourably commented upon by the leading newspapers of India in their editorial. Sir Jagadish Bose Memorial Lecture was delivered by Dr. V. R. Khanolkar, Director, Indian Cancer Research Centre and Vice-Chancellor of the Bombay University, which has already been published in our last issue.

The Scientific Exhibition and the Session was formally declared open by Shri P. V. G. Raju, the popular youngest minister for Health of the Andhra Pradesh Cabinet. He made a memorable speech in which he assured

that the Government of Andhra Pradesh is actually behind the modern progressive scientific medicine and promised every help to the progress of Radiology in that State. He actively participated in the proceedings of the Congress thus giving encouragement and dignity to the whole occasion. The Scientific Exhibition was well organised and contained many exhibits of great interest. There was an excellent collection of films on view, well arranged and classified. Several X-ray Firms had stalls, where some of the latest design of apparatus were exhibited. The standard of Scientific Session was very high and the discussions were well attended. The leading papers read on the occasion are being published in the pages of our Journal.

The Hony. General Secretary Dr. Syed Ali spared no pains to make the stay of the delegates as comfortable as possible. The delegates were well received, well lodged, sumptuously fed and graciously entertained, thus giving an idea of the lavish Moghul hospitality of the History and Tradition of Hyderabad. The entertainment side of the whole conference was very well organised by Dr. Syed Ali, Dr. Jabbar and their enthusiastic colleagues and volunteers and we had the rare privilege of seeing very exquisite dances and Pantomines. We had also well arranged excursion to the historic fort of Golconda and world famous Salar Jung Museum. The twin cities of Hyderabad and Secunderabad are linked together by the Hussainsagar Lake where the view of the sunset from the bund, conjures up features of the Bay of Naples. We had occasion to see Osmania University, Ajanta Pavilion, State Legislature, the Art Gallery, Osmania Hospital besides the river Musi. The outstanding feature of the City is the Charminar reflecting the glory of those days when Kings and Architects designed like giants and finished like jewellers. On the whole, one can see that it is one of the best session of Congress of Radiology which compares very favourably with the International gathering of Radiology.

Once again we express our greatest appreciation to Dr. Syed Ali and his enthusiastic colleagues who did so much for the success of the Congress.

L. R. Parthasarathy.

Diagnosis in Oral Carcinomas

BY

Dr. V. SHANTA and Dr. S. KRISHNAMURTHI,
Radiation Beam Research Unit, Cancer Institute.

It may appear an impertinence that in the year of Grace 1960 and that to a distinguished audience of radiotherapists I should presume to talk of such a simple subject as the diagnosis of oral carcinomas. But it is probably its simplicity that has appealed to me.

Most of our cases of oral carcinoma are so blatant in their manifestations that it is a poor man who misses them. And yet it is because early lesions are missed by the general medical practitioners that so many lives are unnecessarily lost. This, however, is not the subject of my paper today. I am more concerned with the technics that establish an undoubted diagnosis of carcinoma in a lesion of the oral cavity that is clinically suspicious but not proven.

The first procedure to confirm malignancy is, as you all know, biopsy and histological examination of the material removed. You may feel that the technic is elementary, and yet everyone of you must have had the experience where an initial biopsy material had been reported as "chronic inflammatory tissue" and where malignancy was confirmed later by indubitable and tragic clinical extension of disease. I have seen cases where medical men have been the victims of such tragedy. As Sir Stanford Cade remarks, "There is no greater tragedy than an early cancer where the biopsy is negative". In biopsying an early lesion certain fundamental principles should be observed:

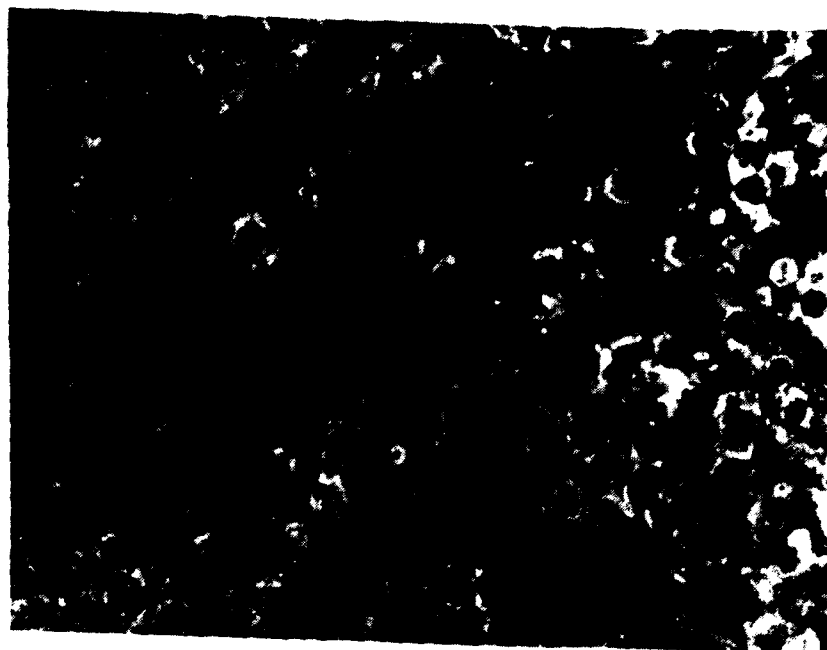
1. The biopsy should be done under general anaesthesia.
2. The jaw should be well relaxed and retained open by a mouth gag.

3. The biopsy must be taken with a sharp well designed punch from the edge of the ulcer so as to take a good bite of the supposed growth and the tissue beyond.

4. The tissue after removal must be immediately transferred to a solution of 3% formalin in normal saline and sent to a good histopathological laboratory for tissue diagnosis.

Sometimes, even with all these precautions a chronic inflammatory condition may be mistaken for a squamous cell carcinoma—grade I. The slides projected are those of a chronic granulomatous growth and those of a genuine squamous cell carcinoma. The difficulty of histologically differentiating these conditions is obvious. In case of histological doubt the clinical diagnosis should prevail. It goes without saying that a reliable clinical opinion should be obtained, preferably that of a medical team. Even in those cases where biopsy is repeatedly negative but expert clinical diagnosis is in favour of malignancy, the clinical opinion should be accepted in preference to the biopsy report and the treatment should be on that basis. This divergence of opinion, however, should be rare.

The cytological method has come more recently to supplement the biopsy to confirm diagnosis. The established method is that of Professor Papanicolaou of New York. His is a purely cytological method, which depends on the usual staining technics with differential stains to define the morphological characteristics of the nuclei, nucleoli and cytoplasm. A variety of stains are used, into the details of which I need not go in here (For details *vide* Appendix). The cytological



Vaginal Fluid, T.P.T. -- Ve



Vaginal Fluid, T.P.T. + Ve

technic is in some ways superior to the biopsy method. A rub can be taken over a wide area, the material is more representative and the chances of a geographical miss much less likely. The percentage of genuine positives with Papanicolaou is in the neighbourhood of 95%, especially in early lesions, which are the ones under discussion. By biopsy the percentage of genuine positives are only round about 75% - 80%.

The slides projected demonstrate a case where malignancy was confirmed by the cytological technic only and the biopsy was repeatedly negative.

Slide II

We have now developed a new technic—a cytochemical process. This method was first studied in Japan. The method is based on the relatively higher glycolytic rate that occurs in Cancer cells. We call it the T.P.T., technic. In this technic the T.P.T., reagent is mixed with the rub material, covered by a coverslip, the edges of which are sealed off with vaseline, exposed to diffuse sunlight for 20 minutes and then examined under the high power objective of a microscope. The cancer cells stain a deep strawberry red. This test is effective even in the presence of blood and pus, which cannot be claimed for the original Papanicolaou. We have checked this method against Papanicolaou, histopathological examination and clinical diagnosis and have demonstrated an accuracy of nearly 98%.

This method is a very simple one, is cheap, does not need the elaborate changes in alcoholic solutions of stains, does not involve the expert differentiating technic by highly trained technicians and saves a lot of time. It is a procedure which can be carried out simply on the spot in any outpatient by an instructed nurse and is thus of great value in screening. As I have already said the

presence of blood or discharge does not affect the result. Its accuracy is as great, if not higher than that of Papanicolaou.

This method has given us no false negatives, but there have been about 2% - 3% of false positives, especially in the presence of Trichomonal infection.

We feel that the method of biopsy supplemented by the cytological methods outlined should render a cent per cent accuracy in the diagnosis of oral carcinoma.

Slide of T.P.T., technic (Color slide).

Appendix

All smears are fixed in a solution of half ethyl ether and half 95% ethyl alcohol. The slides should remain in the fixative for at least half an hour before staining.

Staining Procedure

Slides are transferred directly from the fixative to :

70% ethyl alcohol	...	10 dips.
50% ethyl alcohol	...	10 dips.
Distilled water	...	10 dips.
Harris Alum Hematoxylin.	...	3 minutes
0.5% HCl.	...	5 dips.
Running tap water	...	4 minutes.
Dilute solution of Lithium		
Carbonate	...	1 minute.
Running tap water	...	1 minute.
50% ethyl alcohol	...	10 dips.
70% ethyl alcohol	...	10 dips.
80% ethyl alcohol	...	10 dips.
95% ethyl alcohol	...	10 dips.
Orange G-6	...	1 minute.
95% ethyl alcohol	...	10 dips.
95% ethyl alcohol	...	10 dips.
EA-50	...	2 minutes.
95% ethyl alcohol	...	10 dips.
95% ethyl alcohol	...	10 dips.
95% ethyl alcohol	...	10 dips.
Absolute alcohol	...	4 minutes.
Xylol	...	5 minutes.

Urographic Investigations Conducted*

(136 Cases of Cancer of Cervix—Analysed)

BY

Dr. T. BALAKRISHNAN, D.M.R.,

Radio-Diagnostic Department, Cancer Institute, Madras.

In this paper I shall present to you an analysis of the radiological changes in the urinary tract in the different stages of Cancer of Cervix, in the excretion urography investigations carried out in 136 cases of Cancer of Cervix at the Cancer Institute, Madras. By undertaking this investigation as a routine, in all cases of Cancer of Cervix, unless contraindicated by other conditions and by routine blood urea and urea clearance tests it has helped in the assessment of prognosis in operative procedures such as total exenteration of pelvic organs resorted to in some cases as well as in cases undergoing radiation therapy. A good number of cases of Carcinoma Cervix usually die due to affection of the urinary system ultimately causing uraemia.

The manifestation of radiological changes is primarily due to obstruction at the lower end of ureters by the invading primary growth and by secondary glandular involvement. The mode of spread and extension of the cancerous growth and the anatomical relation of the lower part of the ureter may not be out of place and it is shortly dealt with.

The pelvic part of the ureter forms the posterior boundary of the ovarian fossa. It runs medially and forward below the lower end of the broad ligament and passes lateral to the supravaginal portion of the uterine cervix and above the lateral fornix of the vagina. The ureter is only about 2 cms. distant from the side of the cervix of the uterus. The early extension of cancer of cervix is found in the loose areolar tissue

between the folds of peritoneum forming the broad ligament just lateral to the uterus in which run the blood and lymph vessels of the uterus. The lymphatic spread takes place along three main channels. First one drain laterally to the iliac nodes adjacent to the external iliac artery. The second group drain posterolaterally to the internal iliac and the third group drain posteriorly through the utero-sacral ligament to the sacral nodes. Apart from these a fairly large lymph node is found in the parametrium located near the point where the uterine artery crosses the ureter called the ureteral or Championnier node.

The parametrial infiltration may extend upto the pelvic wall on one side and on the other side the part immediately adjoining the cervix may only be involved or it may be completely free and hence it is seen in our investigations more number of unilateral renal and ureteral involvement. In this series of 136 cases, there were 64 cases of positive urinary tract changes of hydronephrosis, hydro-ureter and non-functioning Kidneys out of which 48 cases were unilateral and only 16 bilateral.

Chamberlaine and Payne, in their excretion urography investigations of 96 cases of benign pelvic tumours 66 showed radiographic evidence of ureteric obstruction, the changes resembling those of normal pregnancy. The ureteric dilatation was usually bilateral and was mainly above the pelvic brim. Hydronephrosis was noted only in one case and in no case was there non-function of a kidney in contrast to the findings in cases of Carcinoma of Cervix. (20 cases in our series of 136 cases).



Bilateral Hydro-Nephrosis (Early Left).



Normal Rt. and Hydronephrosis Left.



Bilateral Non-Functioning of Kidneys.



Rt. Hydronephrosis and Non-Functioning Left.

*Paper read at the 14th Indian Congress of Radiology, 1960, Hyderabad.

The high incidence of renal damage that we meet with in Cancer Cervix is due to the progressive compression of the ureteric lumen by the growing and infiltrating malignant tissue in contrast to the low incidence in benign pelvic tumours where the compression of ureter is only intermittent due to the mobility of the benign tumour.

The average age of patient in this series was 44 years, the youngest being 25 years and the oldest 75 years. 130 patients were multipara, 5 were primipara and only one was a nullipara, whose husband died 3 years after married life. It is significant to observe that no unmarried woman in this series was found to suffer from Cancer Cervix.

An interesting observation in this series of investigation was that of a patient aged

sized, thick-walled ovarian abscess with dense adhesions to the rectum and small bowel. Evidently it was a pre-clinical type of Cancer Cervix with superadded pelvic infection. Patient had an uneventful post-operative recovery and she was later given the usual intra-vaginal radiation therapy.

The maximum blood urea observed in this series was 85 mgms. per 100 ml. Patients with blood urea above 100 mgms., not due to a temporary condition which could be relieved, seldom live more than a year. It is seen that even in radiological bilateral non-functioning of kidneys, there is only moderate reduction of renal efficiency. It has, therefore, to be concluded that radiological non-functioning of the kidneys by itself, is no contra-indication to any curative treatment procedures.

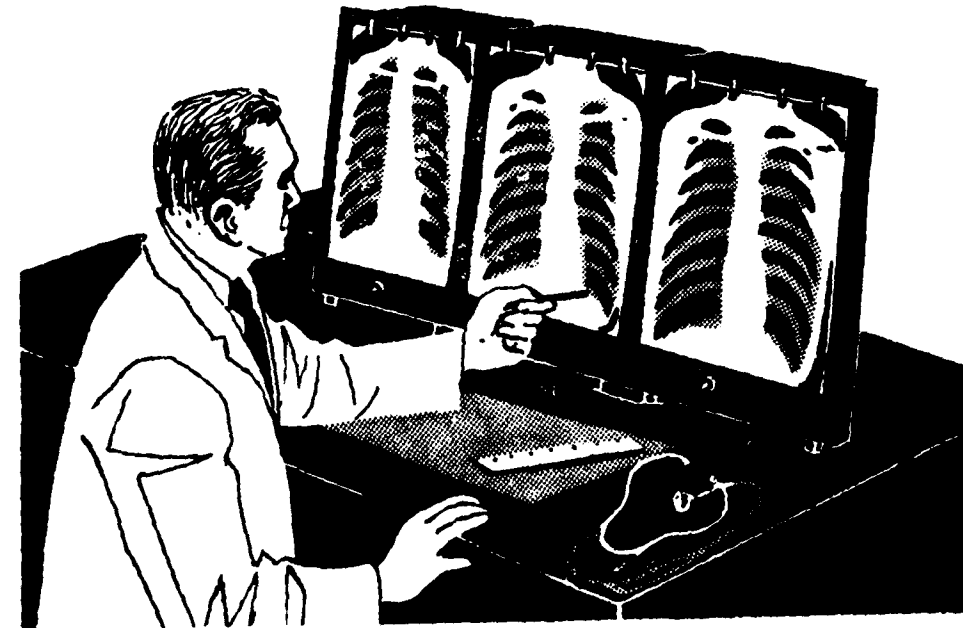
Chart Showing Details of Radiological Changes in Urinary Tract in Cancer Cervix.

Stages of Cancer Cervix.	Total No. of intravenous Urography Done	Bilateral Hydro-nephrosis	Unilateral Hydronephrosis		Non-Functioning Kidneys			Percentage of Renal involvement
			Right	Left	Right	Left	Bilateral	
Stage I	7	—	—	—	—	—	—	0%
Stage II	37	—	5	5	—	—	—	27%
Stage III	59	9	3	12	3	—	1	49%
Stage IV	33	3	3	4	5	8	3	79%
Total	136	12	11	21	8	8	4	46%

45 years. She was referred for treatment of four or five days uterine bleeding. The gynaecological report was as follows: Hard fixed mass in the right fornix of about the size of an orange. Left fornix free. Cervix appeared normal. Uterus pushed to the left. Cervical biopsy report was 'Stratified squamous cell epithelium exhibiting the appearance of intra-epithelial malignancy.' Excretion urography showed obstructive hydronephrosis and hydroureter right side. At operation it was found to be a large

A descriptive chart analysing the findings in relation to the different stages of the disease is placed before you. From the chart it is seen that the renal tract changes occur more commonly and more severely as the clinical staging worsens. In stage III, there are more number of obstructive hydronephrosis and as the stage still further advances you find more of non-functioning of kidneys due to more and more of renal damages resulting from prolonged ureteric obstructions.

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Myodil Ventriculography

BY

Dr. A. N. K. MENON, M.B., D.M.R.D., M.S., F.C.C.P.

Dr. M. G. VARADARAJAN, M.B.B.S., D.M.R.

AND

Dr. B. RAMAMURTHI, M.S., F.R.C.S., F.I.C.S., F.A.C.S.

The contributions of the science of roentgenology to neurological surgery have been innumerable. The correct interpretation of the direct evidences in the skull of various intracranial neoplasms is possible and a diagnosis of the probable pathology to be encountered at operation is also a common occurrence.

Plain x-rays of the skull is the first procedure to be routinely done in investigating intracranial lesions. It is a valuable method of investigation in that it will offer contributory evidence in the diagnosis of a large number of neurological lesions and in a few cases it also provides diagnostic evidence not available by any other means. In cases of intracranial tumour, this procedure may provide either (a) general evidence of the presence of a tumour or (b) local evidence which may identify the anatomical site of the lesion and in some cases even its pathology. An abnormal vascular channel, a minute hyperostosis, a calcified pineal gland displaced in one or both planes, an eroded dorsum sellae and so on, may give the key or at least a strong confirmatory pointer to the diagnosis. Preliminary survey of the skull may also help in choosing the proper contrast method for further investigation of the lesion. Of those patients, having brain tumours of all types, about 40 per cent will have some abnormality on the plain films and about 20 per cent will have localising findings.

In many cases, however, further information will be provided even in cases where plain x-rays are normal or equivocal, by the use of more elaborate 'contrast radiology'. The contrast methods in neuro-radiology are as follows:—

Ventriculography

The direct injection of contrast substance into the ventricular system—Two types of contrast are available (a) negative contrast—air or oxygen and (b) positive contrast—myodil.

Encephalography

Only negative contrast can be used for this method as it depends for its success on a gas. Air or oxygen is used and is injected either into the lumbar subarachnoid space or suboccipitally into the cisterna magna. The object is to fill both the ventricular system and the cerebral cisterna.

Angiography

(The injection of a suitable contrast substance into the carotid or vertebral arteries). Diodone is used almost exclusively nowadays.

In making one's choice of the appropriate contrast method, the following rules may help.

(a) If a vascular lesion is suspected angiography is the ideal method.

(b) If a supratentorial tumour is diagnosed and lateralised by clinical evidence or by plain radiological methods, then angiography is probably indicated first.

(c) If a midbrain or posterior fossa lesion is suspected, ventriculography is indicated first.

(d) If a non-vascular or non-tumour lesion, such as cerebral atrophy is suspected, encephalography is indicated first.

The value of air studies in localisation of intracranial lesions has been so great that till the advent of cerebral angiography, this was the only method of localisation of many brain tumours. Of their diagnostic value, there can be no doubt and there is no question that improperly employed, both procedures are accompanied by danger. Encephalography is more dangerous and causes a more severe general reaction than does ventriculography, particularly in cases of increased intracranial pressure. In the presence of a papilloedema, encephalography is not ordinarily employed; nor is it generally used if a posterior fossa lesion is suspected even though papilloedema does not exist. Both the procedures should be considered as surgical operations, because it may be necessary in many instances to operate upon the patient immediately following the injection of air.

Because of the above limitations, the modern tendency is to undertake air studies in intracranial tumours only when absolutely necessary. This attitude has been greatly facilitated by the advent of cerebral angiography, which has helped to eliminate the frequent use of ventriculography for supratentorial lesions.

Angiography

The introduction of percutaneous method of cerebral angiography, being safe and simple, has become a routine method of investigation of intracranial lesions. The investigation is of special value in supratentorial lesions. Pneumography and angiography are complimentary methods. Vertebral angiography may be done in posterior fossa lesions.

Posterior fossa lesions may be demonstrated by pneumoencephalography and vertebral angiography. Vertebral angiography is necessary for suspected vascular lesions of the posterior fossa. This is a more difficult procedure than a carotid angiogram. With practice, the vessel can be punctured satisfactorily through the skin but its limitations are as follows:—

1. It is a painful method under local anaesthesia as it is almost impossible to avoid striking sensory nerves in probing for the artery.
2. The petrous temporal bones cast heavy shadows in lateral view and obscure the arteries of the posterior fossa.

Thus special difficulties are encountered in midline and posterior fossa lesions, with vertebral angiography.

The midline lesions whether supratentorial or infratentorial may not show any localising signs except increased intracranial pressure. Visualisation of the ventricular outline is the only way of accurate localisation. But often a ventriculogram does not show up a posterior fossa tumour easily due to technical difficulties in filling the fourth ventricle from above. When air does not fill the fourth ventricle it may be mistaken for a third ventricle lesion. It occasionally

happens that, despite an adequate technique, good filling of the posterior fossa structures cannot be obtained. This usually occurs when the third ventricle is small and slit-like. Great and persistent effort is often required to fill the fourth ventricle. Such effort and positioning lead to great discomfort to the patient and also adds risks to the procedure. The interposition of mastoid air cells on either side adds to the diagnostic difficulties.

It is in such a situation that myodil ventriculogram has come into use.

Positive Contrast Ventriculography

The procedure adopted by us is as follows: The patient is made to sit on a comfortable stool. The head is positioned against a radiographic screen so that the side of the head is against the screen. The head is kept flexed. Under aseptic precautions, a lumbar puncture needle is introduced through the burr hole into the lateral ventricle. The burr hole is usually posterior. An anterior burr hole may be used in special cases e.g. in children. 1-1½ c.c. of myodil is introduced into the anterior end of the frontal horn of the lateral ventricle. Under fluoroscopic control, the neck is extended so that the oil runs back along the inner wall of the anterior horn until it reaches and passes through the foramen of Munro into the third ventricle. It is then allowed to run back to the posterior end of the third ventricle by further extending the neck and films are taken to show the aqueduct, the oil being kept under screen control throughout. Then the dye outlines the fourth ventricle. In tumours of the fourth ventricle, anteroposterior filling defects may be seen. In lateral tumours, anteroposterior view may show lateral filling defects. When there is no obstruction, the dye flows freely into the spinal subarachnoid space.

It has been found that equally good results can be obtained without using screen control, which is difficult with patients who are partially paralysed or who are under an anaesthetic. Screen control also subjects those holding the patient to considerable risk of exposure to radiation. The myodil is injected with the patient in a face-down position, so that the frontal horn is the lowest point of the ventricular system. Then, keeping the head well forward with the neck flexed, the patient is turned to the sitting position and the chin is slowly raised and the neck is extended. Time is given for the oil to run through the foramen of Munro into the third ventricle and then the patient is placed flat on his back and films taken in antero-posterior and lateral planes. During this manoeuvre, lateral films can be taken as a control to see progress.

Illustrative Cases

Case I.—Name: Mr. H. age 16. This case was referred to the Neurosurgeon with a history of severe headache and double vision-duration two weeks. On examination, he was found to have bilateral external rectus paralysis with bilateral early papilloedema. There was no other abnormality.



Case I- Mr. H.

Investigations

Mantoux test was strong positive.

Plain x-ray of the skull showed prominent cortical markings.

He was started on streptomycin and isonex. In spite of this, there was no improvement in papilloedema. Further investigations had to be done.

E.E.G. did not reveal any localising sign.

Hence bilateral posterior burr holes were made and the ventricles decompressed. Cerebro-spinal fluid was under high pressure.

A week later, myodil ventriculogram was done. This did not show any tumour in the posterior fossa (picture I).

At present, the patient feels better and is being treated conservatively as "tuberculous meningitis".

Case II.—Name: Miss S; age 13. Complaints: Fits, Headache, Pain in the back,



Case II—Miss S.

duration six months. C.N.S. Neurologically intact, except broad-based gait and slurring speech. Fundus—Choked disc with punctate haemorrhage on both sides.

Myodil ventriculography showed dilatation of the third ventricle with obstruction at the aqueduct of sylvius—tumour cerebellum extending to mid-line.

Operation and subsequent biopsy proved it to be "astrocytomatous cyst arising from right cerebellum and obstructing the aqueduct of sylvius.

Case III.—Mr. H; age 11. Complaint: gradual progressive blindness—both eyes—18 months. Head gradually increasing in size—16 months. On examination it was found that the patient had truncated ataxia. Right eye—primary optic atrophy; Fundus—bilateral papilloedema present.



Case III—Mr. H.

Myodil Ventriculography showed filling defect in the region of the fourth ventricle—tumour cerebellum.

Operation showed a huge tumour arising from the whole of the cerebellar hemisphere.

Conclusion

Myodil has been used in the place of air to localise and diagnose midline and posterior fossa tumours. This is useful as it does not disturb the intracranial pressure relations and thus does not carry great risks with it. Radiation hazard also can be

avoided by taking pictures without fluoroscopic control.

Myodil ventriculogram is thus an advance in the methods of diagnosis of posterior fossa tumours, midline and infratentorial lesions and is of particular value in demonstrating small abnormalities in the third ventricle, the aqueduct and in the fourth ventricle, without any risk to the patient.

(We are thankful to Dr. Balasubramaniam, M.S., Dean, Government Stanley Hospital and Medical College for the permission to make use of the chemical material and case sheets in preparing this paper).

Handwritten notes and a circular stamp are visible at the bottom right of the page. The stamp contains the text "124035" and "N60-14-3".

Pyle's Disease

BY

Dr. ARTHUR DANIEL, M.R.C.P. (E.), D.M.R.

Growth has been defined by Witzel as that fundamental property of living organisms concerned only with their change in size or number, as distinguished from correlative property of differentiation which has to do with changes in kind or type of structure. Growth and differentiation go together in the development of an organism. This process proceeds in an orderly manner for normal development of the organism. Failure in this results in abnormalities. Ever so many factors come into play in normal growth and differentiation but these factors fall under two main considerations—genetic and environment. Each may act independent simulating the other. Genetic factors produce the organism after its own kind while stress brings about adaptability of the organism to the environment.

In growth of bone stress plays a vital role in moulding the shape and contour of bone. But disturbance in growth of bone may be due to disturbance of growth cartilage and disturbance of balance between osteogenesis and osteolysis in the living organic matrix of bone and also in the disturbance of minerals of the inorganic part of bone. Any of these brings about failure of normal development of bone and osteodystrophies and deformities are the end result. In other words enchondral bone formation may be distorted by both gene and environment.

In long bone growth occurs at both metaphyseal ends with difference in the rate of growth. The ends of long bone in an infant is wider than the middle of the shaft simulating a trumpet. As the growth of the

osteoid tissue is laid down by the epiphyseal cartilage the newly laid bone will be of the same width as the epiphyseal cartilage i.e. broader than the middle of the shaft of bone. With growth the bone elongates with broader ends but simultaneously the process of resorption of excess of bone in the newly laid zone occurs to give the normal shape and contour as that of the shaft. This process of remodelling and tubulation is a normal pattern in growing bone. So failure of this remodelling and tubulation result in widened extremities of bone while the normal segment of foetal shaft remains showing a growth expansion in width. The widened extremities have been likened to *Erlenmeyer Flask* appearance. In addition to this failure in remodelling and tubulation there is also distortion of normal architecture of the bone. The cortex is thin and the shape and structure is similar to the metaphysis of any normal growing child.

Quite a few diseases like Gaucher's disease, Chronic Leukaemia and Pyle's disease show this failure of tubulation of bone. Pyle et al have reported a case of unusual bone development in 1931 in a child of five years resembling nothing which the author and his colleagues have experienced before. Bakwin and Krida in 1937 have reported similar cases in siblings as Familial metaphyseal dysplasia. Hamman in 1910 and Ingalls in 1933 have come across a Nubian cadaver showing similar appearances in the lower half of left femur and upper half of left tibia but all the bones were not examined.

Two siblings showing unusual characteristics of bone were observed simulating an appearance of osteopetrosis without increased density of bone. The earlier diagnosis was *Gaucher's disease* from a radiograph of foot taken for suspected fracture in one of the siblings. None of us had this unusual experience and so these cases are reported. Little knowledge but the ability to apply a name gives this disease the name *Pyle's disease*.

Krishnamohan.—A boy aged 16 years referred for suspected fracture of metatarsals of right foot. The skiagram showed somewhat sausaged shaped metatarsals which gave rise to suspicion of *Gaucher's disease*, and further investigation were carried out to arrive at a diagnosis. Clinically he is a well nourished boy of average build and taller for the age considering the heights of parents. He gives a history of frequently

falling down from trivial causes. History of consanguinous marriage of parents is obtained. He is the second boy of five children. The elder brother too appears to have a similar complaint but not the other children. There is no other history of similar complaints in the family according to the parents on both sides. The parents who are educated are both alive and healthy. He has knock knee which is growing worse with age and also eyesight developing high myopia with increasing age according to his parents. His intelligence and memory are good but is stated to be below the average at school. On examination the ends of long bones could be easily palpated under the tissues and were broad and flat. There is decidedly marked weakness of the locomotor system with the power and tone of the muscles weak but otherwise normal. The liver and spleen are not enlarged. The fundus is normal and there is no cherry red spot. The



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.

blood count and chemistry are normal. The bone marrow picture are repeatedly negative for *Gaucher's cells*. The blood for VDRL is negative both for the boy and parents. The parents are not willing for a bone biopsy and it is hoped that the boy could be coaxed at a future date for correction of knock knee which is not disabling at present, when the biopsy material could be obtained at the time of operation.

Skiagrams of the entire body was taken which revealed trumpet shaped expansion of metaphyseal ends in long bones with normal characteristics of bone in the middle of the shaft of bone. The cortex is thin at the expanded extremities and the medulla shows fine trabeculation. In addition there are a few linear streaks of translucency at the lower ends of femur not unlike chondromatous or leukaemic deposits. The short long bones hands and feet show similar appearance with a normal segment and expanded ends of bones. The skull, spine

and pelvis do not reveal any abnormality. The heart is within normal limits and the lung fields are clear. The epiphysis are not united.

Venugopal.—He is the elder brother of the boy who has a similar complaint but the knock knee is not marked as the previous case. Clinically the boy aged 18 years appears to be normal but the radiological picture is practically a duplicate of his brother's skiagrams. The epiphysis in this case too are not united.

The interesting features in the long bones are that there appears to be a normal segment showing normal cortex and medulla in the middle of the shaft and either ends are expanded with thin cortex and finely trabeculated medulla where the medullary cavity is not seen. The normal segment probably corresponds to the length of bone at birth and then there has been failure of normal growth of bone. The fundamental



Fig. 7.



Fig. 8.



Fig. 9.

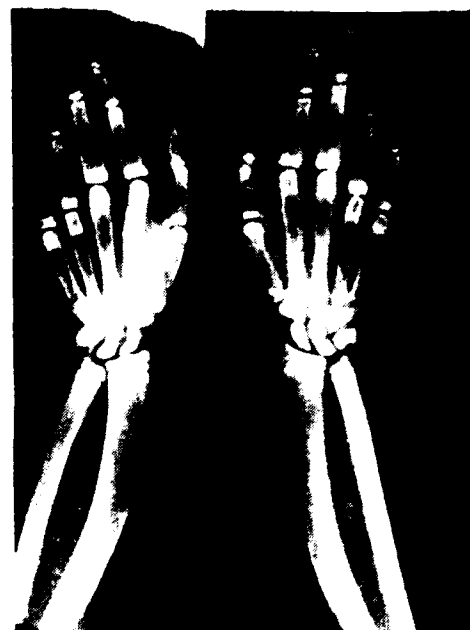


Fig. 10.

pathology is failure of remodelling and tubulation of bone behind the wider advancing terminal segment.

Summary

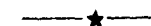
Two cases which are siblings showing unusual bone development have been reported as Pyle's disease.

A review of literature reveals so far that only four cases have been recorded and of these two are siblings.

I thank Dr. N. S. Narasimha Iyer, L.R.C.P. (Lond.), F.R.C.S. (Eng.), F.R.C.S. (Ire.), for permission to report this case. Diagnosis was established, thanks due to Dr. Whitaker of East Africa and confirmed by Dr. Eric Samuel, Edinburgh without whom this could not have been solved. Finally my thanks are due to my colleague, Dr. P. Varadarajan, M.B., B.S., D.M.R., for carrying out most of the investigation in this case.

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Case Report**Ewing's Sarcoma**

BY

Dr. L. R. PARTHASARATHY, M.B.B.S., D.M.R.,

Radiologist, Southern Rly. Hospital, Perambur.

A patient, by name O.N. Chengalvarayan, Age 29 yrs., Male, Manual Labourer, employed in the Southern Railway, has been attending the out-patient department of the Railway Hospital for fever and pain all over the body and pain over the right leg, since the 24th May 1960. He was being treated for Lymphangitis till the 12th June 1960 without improvement. He was then admitted on 13-6-1960 in the Southern Railway Hospital, Perambur, with fever, swelling middle of the right leg.

There was no history of injury.

Precious history.—Two weeks fever two years ago.

Family history.—Nil particular.

Condition on admission.—Patient febrile and swelling upper half of the right leg, more prominent on the lateral aspect, warm and tender. There was no fluctuation noticed. Edema of the foot was present. Regional Lymphnodes were not enlarged.

Investigations done.—(1) Urine - Nil abnormal, (2) Total W.B.C. Count - 10400 Cmm. Differential Count—P. 84, L. 13, E. 2, M. 1, (3) Total R. B. C. 2.92 Mill Cmm. Haemoglobin 60%, (4) E.S.R.—80 mm hour, (5) Night blood—Negative for micro-filaria.

On 15-6-60, aspiration of the swelling of the right leg done under local anaesthesia and no pus drawn. Patient was already on Penicillin from 13-6-60. On 22-6-60, under

general anaesthesia, the swelling was incised and bloodstained, gelatinous fluid drawn which was thought as pus. The smear of this fluid showed no organism and the culture was sterile. On 30-6-60 the first X-ray investigation done of the right leg showed evidence of scattered areas of destruction of the upper 2/3rd of the right fibula without any periosteal reaction. The writer reported as "Osteo-Myelitic changes seen upper 2/3rd of the right fibula without any periosteal reaction".

On 5-7-60, patient developed sudden paralysis of both lower extremities with anaesthesia of both legs and retention of urine suggestive of Cauda-Equina Lesion. Patient was seen by the Consultant Orthopaedic Surgeon, and it was thought to be an extra dural abscess pressing on the Cauda-Equina structures as the patient was running temperature with Leucocytosis.

Further investigations done.—1 Blood for V.D.R.L.—Negative, 2 Lumbar puncture done on 8-7-60, Fluid—Clear, Tension Normal, No block, Proteins 16.5 mg%, Sugar—62 mg%, Globulin—Negative, Cells—4, C.S.F. V.D.R.L.—Negative.

On 8-7-60 Myelogram was done by injecting 3 cc. of Myodil by the lumbar route and the patient was placed on the tilting table and the whole of the spinal column was examined under Fluoroscopy and films taken on spot film device. The



Fig. 1
Shows Scattered Areas of destruction upper 2/3 of the Right Fibula.



Fig. 2
Lat. view - Lumbar Spine.



Fig. 3
Lat. view with complete block of Myodil showing also destruction of Lamina.

patient was tilted practically 90°—prone supine and lateral positions. There was evidence of complete block at the level of the second lumbar vertebra which fitted in to the possibility of Tumour or an extra dural abscess producing the Cauda-Equina Lesion. Within 24 hours after the Myelogram, Laminectomy was done under general endotracheal anaesthesia, by the Consultant Orthopaedic Surgeon and during the operation the laminae of the second lumbar vertebra were found to be unhealthy and fragile and purulent matter was seen in the bone itself. A certain amount of pus-like fluid was drawn from the extra dural space and both the fluid and the unhealthy bone were sent for pathological examination. Post operatively the patient did not recover from the paralysis after the Laminectomy.



Fig. 4

Shows complete block at the Level of the Body of the 2nd Lumbar Vertebrae.

Pathology Report

Fluid from extra dural space. Smear showed evidence of malignant cells suggestive of Ewing's Tumour. On 18-7-60 biopsy of the fibula also done which showed similar polyhedral cells as was seen in the extra dural space confirming Ewing's Tumour.

Comment

In this case the pitfalls of Ewing's have been brought out at every stage :

- (1) Treating the swelling of the right leg as Lymphangitis and abscess at first,
- (2) Delay of 15 days for taking the first X-ray picture,



Fig. 5

X-ray Lumbar Spine Lat. view
After Laminectomy.

(3) Radiologist missing the possibility of Ewing's Tumour and reporting as "Osteomyelitis",

(4) When Metastatic secondary occurred in the spine it was missed totally and wrongly thought as subdural abscess,

(5) The plain X-ray of the spine showed the destruction of the lamina at the level of the block, of the contrast media, which was also missed before the laminectomy.

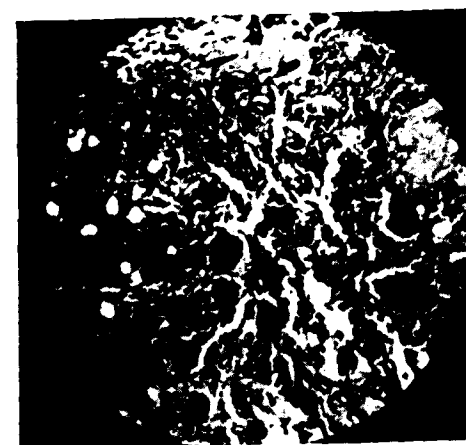


Fig. 6

Micro-photograph.

Biopsy from the Primary Lesion reveals a highly cellular tumour diagnosed as Ewings Sarcoma.

The conclusive diagnosis was made by the Pathologist when the specimen was sent for report. This is only to show that Ewing's Tumour could be missed at all stages if we don't keep in mind the possibility of this tumour when any long bone X-ray seen suggestive of Osteomyelitis.

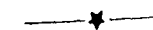
Unusual Features

- (1) In the first place the Lesion occurred during middle age,
- (2) The X-ray showed not the typical appearance of Ewing's (the onion peel appearance),
- (3) The bone metastasis in the spine is a rare occurrence in Ewing's as the common metastasis are in the lungs, Lymphnodes and skull.

(I thank Dr. N. Govindarajulu, Divisional Medical Officer, Dr. M. Natarajan, Hony. Orthopaedic Surgeon, Dr. G. S. Visvanathan, Hony. Pathologists and my Colleague Dr. S. V. Vaidyanathan for helping me to publish this case report.)

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2. Pathology for the Physicians by Williams Boyd.



Reviews

I

S. P. Basu, Radiological Appearance in the Lung Fields of Eosinophilia,
Calcutta Medical Journal, May 1960, 57: 152-156.

The author has reviewed the literature and examined skiagrams of the chest, of 400 cases, in various phases of tropical eosinophilia. Standard technic was used in all cases and in repeat studies. Tomograms and bronchograms done in few cases, did not show any abnormality unless associated pathology was present.

Radiological findings.— Showed increased bronchovascular shadows of different degrees in 67%, enlarged root-shadows in 63%, mottling of different sizes in 31%, and emphysema in 20%. Various other changes as snow-storm appearance, pleural thickening, ground-glass appearance and normal were seen in 2-5% of the cases. The author concludes that (i) probably tropical eosinophilia and Loeffler's syndrome are the same radiologically (ii) Scarring is rare (iii) Cardiac changes are transitory (iv) Severity of the clinical condition and eosinophil count are not interdependent.

7 Figures.

20 References.

II

*S. CHAWLA.

S. P. Basu & A. K. Bhattacharyya Radiological Observations in Non-Specific Colitis After Opaque Enema in Relation to Clinical Findings,
India Medical Journal, May 1960: 1-3.

The authors studied 50 cases of non-specific colitis, 31 males and 19 females, whose ages varied from 13 to 60 years. Clinically, the patients were divided into 20 cases of ulcerative colitis and 30 cases of colonic dysfunction. Only 13 cases of ulcerative colitis and 15 cases of colonic dysfunction showed positive Radiological signs.

Lack of haustrations was observed in the largest No. of cases of both groups, other changes were irregularity of the colon, distortion of the mucosal folds, ptosis and stasis, redundancy of colon and incomplete emptying after voluntary evacuation. The authors comment (i) that the radiological findings do not always tally with the organic changes (ii) X-ray findings are similar in ulcerative colitis and colonic dysfunctions (iii) changes like definite narrowing of the large bowel lumen and polyposis are only seen in ulcerative colitis (iv) Longer duration of symptoms are more liable to give positive radiological findings.

4 Figures.

4 References.

*S. CHAWLA.

*Asst. Prof. of Radiology, All-India Institute of Medical Sciences, New Delhi-16

Abstracts of Radiological Literature

The significance of post-operative pneumoperitonium in infants and children—John W. Hope and Harry R. Cramer
Radiology, Vol. 71, page 797-805, December, 1958.

In adults following laparotomy air in the peritoneal cavity is a normal finding and this air is absorbed in seven to fourteen days usually. Post-operative pneumoperitonium in two of their cases prompted the authors for this study as pneumoperitonium in infants and children was found not be a normal finding.

Infants and children were examined 24 hours after laparotomy and no air was found in the peritoneal cavity. Gradually the postoperative examination was reduced to thirty minutes following Surgery. A total of 19 patients were examined and only 3 of the patients examined within thirty minutes of surgery trace of air was seen in the peritoneal cavity and this air was not visualised after 24 hours in any of the case. Having failed to find any evidence of pneumoperitonium 24 hours after operation, known quantity of air was injected into the peritoneal cavity. Just prior to the closure of the peritoneum, about 100 cc. of air was injected in the first 2 patients and subsequently the air injected was reduced to 50 and then 10 cc. This procedure was adopted in 12 cases and even the smallest quantity of air was demonstrable by either erect or a left decubitus film. This air was absorbed in about 48 hours in 9 out of 12 cases and in the remaining of 3 only a trace was left.

The authors conclude that any appreciable quantity of air in the peritoneal cavity

24 hours after operation should be taken for a continuing leak and indicates a second laparotomy.

T. P. Bhandari.

Roentgenologic Consideration of Capillary Bronchiolitis—Donald A. Koch, American Journal of Roentgenology, Radium Therapy and Nuclear Medicine, Vol. 82, No. 3, September 1959, Page 433.

This disease is seen in infants under the age of two years being commonest during the first six months of life. The patient is usually actually ill with signs of obstructive emphysema, respiratory distress and rise of temperature of about 100°F. Some cyanosis may also be seen. No definite causative organism or agent is so far known.

In frontal skiagram of the chest the usual finding is 'too normal' in very ill patient. The author has found roentgenograms in expiration and inspiration in both P.A. and Lateral views to be very informative, though difficult to take in small infants. On skiagram in expiration the obstructed portions of the lung become apparent and areas of consolidation and collapse prominent and size of the cardiac shadow appears decreased. On lateral skiagram there is seen reversal of normal convexity of posterior part of diaphragm and increase of retro-sternal space.

T. P. Bhandari.

M. H. Jupe, Hydrocephalus, The Skinner Lecture, Jour. Faculty of Radiologists, July 1959, Vol. 10, 119-129.

Hydrocephalus can be hypertensive or compensatory. The hypertensive type can be internal or obstructive, which implies that the fluid is confined to the ventricles and is shut off from the subarachnoid space by an obstruction in the ventricular system, or Communicating type in which there is excess of cerebrospinal fluid over the surface of the brain as well as in the ventricles.

The hypertensive type results from (i) increased formation of fluid occurring in certain toxic conditions or after a head injury, or can be secondary to malformation or new growth of the choroid plexus, (ii) impaired absorption of fluid, if there is a big rise of intravenous pressure, as in thrombosis in the intracranial blood sinuses, (iii) obstruction to the outflow; this is the commonest cause.

In the compensatory type, there is an increased cerebrospinal fluid to fill up the space resulting from atrophy or scarring of brain.

The radiological appearance without contrast medium in the hypertensive type depends on whether the sutures are united or not. Before the sutures are united *i.e.* upto the age of 12 years, there is separation of sutures, greatest at the coronal suture and least at the base, with a little thinning of the bones. The sella turcica is rarely affected. When the bones are fused as in adults, the earliest evidence is thinning of the dorsum sellae. Later the pituitary fossa may be deepened, and the dorsum sella may become eroded from above downward by pressure from the anterior end of the dilated third ventricle. In such a case, the upper part of the dorsum together with the posterior clinoid processes disappears first,

important in differential diagnosis. With great increase in pressure, holes may appear in the floor of the middle fossa due to thinning. In young persons, the orbital roofs may be depressed causing proptosis, with thinning of the triangular shadow of lesser wings of the sphenoid.

Air injection is the decisive method of investigating hydrocephalus. The earliest sign of ventricular dilatation is the rounding of the upper and lateral angles of the ventricles in the A. P. view, then as dilatation proceeds, this rounding spreads beyond the ventricle until the whole ventricle has become round. The causes of hydrocephalus are malformations, parasites and infections, toxic and neoplasms and other space-occupying lesions. The compensatory type results from atrophy of brain either general or focal.

23 radiographs.

S. N. Deboo, Bombay.

Paul S. Mahoney and Bernard J. O'loughlin, Significance of calcification of the wall of the left atrium. Report of 2 cases, Radiology, September 1959, Vol. 73, 402-405.

Calcification of the wall of the left atrium was first reported in 1938, the authors add 2 new cases to the 31 reported in the literature stressing the importance of recognising calcifications of the left atrium, particularly in those cases in which some surgical procedure upon the heart is contemplated.

Calcifications of the left atrium is found in patients who have suffered from extensive rheumatic carditis and long standing valvular disease, many suffering from both mitral stenosis and insufficiency, and most

of them have involvement of other valves as well as the mitral valve. The site of predilection for the endocarditis is on the posterior wall of the atrium above the mitral valve.

The pathological findings are chiefly subendocardial plaque formation, endocardial fibrosis, connective tissue hyperplasia and Aschoff nodule formation.

The diagnosis of calcification of the left atrium is frequently made on a plain chest film. Slightly overexposed Bucky films of the chest, planigraphic studies through the left atrium or roentgen cinematography may be needed to confirm the diagnosis. Moderate amounts of calcium can always be identified on chest films of good technical quality, although the anatomical site and pathological process may not be as readily apparent. By planigraphy calcifications of left atrial wall may be discovered which were totally unsuspected in routine projections of the chest.

If calcification of the wall of left atrium is identified prior to mitral valvulotomy, the patient should be reappraised since the lesion may then be considered inoperable. The surgeon instead of doing the valvulotomy *via* the usual route may choose to go through the pulmonary vein.

The most difficult differential diagnosis is from the intramural thrombus. Intramural calcification is usually linear, non-laminated and marginal indistribution. A calcified mural thrombus is usually laminated and non-linear. Calcified coronary arteries are visualized as thin parallel lines, occupying a characteristic position, and are usually seen in the descending or circumflex branches.

3 radiographs.

S. N. Deboo, Bombay.

J. O. Reed and E. F. Lang, Diaphragmatic hernia in infancy, Am. Jour. Roentgenology, September 1959, Vol. 82, 437-449.

This paper is based on a series of 48 cases of diaphragmatic hernia, all of which were subsequently confirmed either at the operation or at autopsy. Diaphragmatic hernias in infancy fall into 3 groups.

The largest group containing 38 of the 48 cases comprises pleuro-peritoneal hernias, due to lack of fusion of pleuroperitoneal membrane with septum transversum, the abdominal contents occupying the greater portion of the hemithorax. The mortality is high in untreated cases. The roentgen findings are (i) The diaphragm is seen on the affected side in part, or not at all (ii) There are multiple radiolucencies representing loops of loops of intestines in the thorax; some may contain fluid levels. (iii) there is a shift of the heart and upper mediastinum to the opposite side of the chest, there may be associated compression atelectases (iv) the oesophagus is of normal length (v) there is a relative or complete absence of the intestinal gas in the abdomen. Variation in the apparent size and contents of the hernia is to be expected. The upright position during examination of the chest may alter the contents of the sac. Because of the possible cardiorespiratory embarrassment, in the presence of large hernias, it is important in the new-born to delay feeding and to reduce the amount of swallowed air by gastric aspiration until the hernia has been repaired.

One limitation of the roentgen examination is the failure to demonstrate the defect in the diaphragm. The size of the hernia is an unreliable indication of the size of the defect in the diaphragm. There is also uncertainty concerning the presence or absence of a hernial sac. If the abdominal

contents extend freely into the thorax, the absence of a sac may be anticipated, but if there is appearance of a membrane confining the intestines, hernial sac may be expected.

The second group (Group II) comprises of oesophageal hiatus hernias. Their occurrence in infancy is rare, and they are recognised by the identification of a portion of the stomach lying above the diaphragm. These are usually seen in the older infant. They present the same difficulties as does the diagnosis in adults.

Group III, involves the hernias through the foramen of Morgagni, occurring in defects in the tendinous portion of the diaphragm. The situation is much the same here as in adults. Often these defects assume the nature of eventrations.

The condition must be kept in mind as a possible basis for respiratory embarrassment.

14 radiographs.

S. N. Deboo, Bombay.

Thomas E. Machella, Functional disturbances of the gastrointestinal tract, *Radiology*, September 1959, Vol. 73, 379-396.

Functional motor disturbances of the gastrointestinal tract are recognised by fluoroscopy and inspection of films during the course of clinical manifestations. The motor abnormalities occur in patients subjected to frustrating stressful life situations. In general, anger, resentment and hostility cause motor disturbances similar to those following excitation of the parasympathetic division of the autonomic nervous system, while fear and sadness mimic the actions of the sympathetic system.

The functional disturbances appearing to be due to para-sympathetic influences are oesophago spasm, gastric hypermotility, duodenal spasm, and spastic disorders of the small and large bowels. Those appearing to be due to sympathetic hyperactivity or para-sympathetic under activity are achalasia of the oesophagus, gastric retention in the absence of obstruction and megaduodenum and hypoactive states of the colon including "psychogenic" mega colon.

In oesophago-spasm, radiological examination may reveal nothing abnormal, unless the patient is upset when spasm may be noted. The symptoms include not only dysphagia but also discomfort beneath the sternum, when a heart attack may be suspected. Anticholinergic and sedative drugs administered before meals will prevent the spasm.

In achalasia, a spindle shaped narrowing at the lower end of the oesophagus is seen with dilatation of the oesophagus above. When mecholyl is given to the patient, violent tonic contractions appear that are not seen in normal persons, or patients with other oesophageal lesions. There is considerable clinical evidence indicating that the disorder occurs in response to stressful life situations. Drug therapy results are unsatisfactory. Anticholinergic drugs and benzedrine are ineffective. Inhalation of amyl nitrite or absorption of nitroglycerine may cause immediate disappearance of the stenosis at the lower end of oesophagus. But they cannot be used continuously. Best results are obtained early in the course of the disease, with the discovery and solution of the underlying emotional problems.

Gastric hyperactivity.—Hostility, anger, resentment are observed to cause increase in gastric secretory and motor activity. In

such cases, the gastric emptying can be prolonged by effective dose of an anticholinergic drug before meals.

Gastric hypoactivity.—Fear, sadness, disgust cause gastric hypofunction, ischemia of the mucosa, delayed gastric emptying. Gastric retention may be prevented by Urecholine in doses of 5 to 10 mg. subcutaneously or sublingually.

Spasm of the descending limb of the duodenum is sometimes met in absence of a demonstrable postbulbar ulcer. It may be relieved by the injection of an anticholinergic drug, and when it occurs frequently, by regular oral administration of such a compound before meals.

Megaduodenum (Duodenal stasis).—In milder cases there is disturbance consisting of stasis in duodenum. In severe cases, there is marked stasis in the dilated proximal loop of duodenum attributed to compression of the junction of the 3rd and 4th parts of the duodenum by the superior mesenteric vessels. This superior mesenteric artery syndrome has given rise to doubt whether it is due to compression or to a functional change in the duodenal musculature. These observations are supported by the fact certain persons have irregular episodes of anorexia, nausea and vomiting when they are emotionally disturbed, and the failure to relief when they are lying on the abdomen, and the better results from medical management than from short-circuiting surgery. The stasis may be relieved by injection of urecholine (5 to 10 mg.).

Small intestines: Hyperactivity.—Hypermotility of the small gut as a result of stressful life situations is an important factor in the diarrhoea associated with irritable colon. Anticholinergic drugs are effective in decreasing the motor activity in the small intestines.

Small intestine: hypoactivity.—Occurs during natural sleep, after anticholinergics, in association with invasive retroperitoneal neoplasm including carcinoma of pancreas, sprue and in diabetics. Urecholine is effective in increasing motor activity and transport.

Colon.—It has been found that during anger, resentment or hostility the mucosa becomes hyperemic, engorged and hyperactive, while during calm and tranquility, it is pale and relatively inactive. In view of the differences in innervation of the 2 halves of the colon, the end reaction in the colon in response to stress stimuli may vary from person to person, so that different clinical pictures may occur. Classified according to changes in bowel habits, they are constipation, diarrhoea, and alternating constipation and diarrhoea, with or without pain.

In conclusion, they point out that before ascribing symptoms to functional disturbances, responsible organic disease must be excluded.

S. N. Deboo, Bombay.

John O. Lafferty, Duodenal ulcers in children, With notes on their etiology, *Radiology*, September 1959, Vol. 73, 374-378.

Duodenal ulcers occur in children much more frequently than has been appreciated in the past. The symptoms differ from those in the adults. Hunger pain and food relief are rare. Most often there is generalised abdominal pain, sometimes with vomiting, the latter recurs regularly at a particular time of the day, which differs with the individual. As the child grows older, the symptoms become more typically adult. A certain percentage of adult ulcers have their roots in childhood, as older persons with well developed ulcers and scarred caps give history of stomach aches in childhood.

Radiologically, a crater must be seen, as the diagnosis is not tenable, when the findings are limited to spasticity and some irritability. There will be no scarring of the cap as in adults, but often a halo is seen around the crater. Mucosal-relief roentgenograms are often of inestimable value. Meticulous fluoroscopy is necessary with spot films

The etiology of duodenal ulcers in children, as in adults is unknown. Morgan, after reviewing the various theories of etiology of ulcers, held the neurogenic theory to be the most tenable. In infants with brain damage, disturbances of the autonomic nervous system controlling centres may cause vascular change in the stomach or duodenum sufficiently great to allow erosive lesions to form. In many children, the gastrointestinal tract responds regularly to stress situations with an ulcer or ulcer-like reactions. Many of these children have deep-seated psychiatric problems and help in these will do much to bring about improvement.

The treatment of children with duodenal ulcers is the same as in the adults: a bland diet, with frequent feedings, mild sedation, antacids, and reassurance. Psychiatric help for the child and his parents is often of value in resolving an underlying conflict. The results of the nonsurgical treatment are almost uniformly good and none of his patients has required surgical intervention.

Since 1949, a diagnosis was made 15 times in children between 2 and 15 years, out of approximately 92 patients seen for gastrointestinal studies. 2 illustrative cases are reported.

4 radiographs.

S. N. Deboo, Bombay.

J. H. E. Carmichael, An evaluation of the Toe-touch position in the diagnosis of hiatus hernia, *Br. Jour. Radiology*, July 1959, Vol. 32, 479-482.

The author, feeling dissatisfaction with his attempts to show hiatus hernia in cases with a very suggestive history, yet the lesion could not be demonstrated, carried on an investigation into the value of the Toe-touch position.

In technique, he uses the left lateral position, as this brings the stomach nearer to the operator. In this position, the right dome of diaphragm is magnified and appears to be considerably higher. The importance of this lies in remembering that a small hernia will be above the left dome of the diaphragm, but will be hidden by the right dome of diaphragm, and may be mistaken for normality. It is important to screen the patients as they actually bend down, as in small hernias the hernia passes through the diaphragm during the period of physical movement. If screening is deferred till the patient is touching the toes, a hernia can occasionally be missed. When the hernia has been noted during flexion, it can usually be fully visualised by repeating the flexion manoeuvre a few times.

The author did 2,040 barium meals over a period of 20 consecutive months, and found with the routine technique 73 cases of hiatus hernias (3.6 per cent), where as with the toe-touch manoeuvre, he detected 92 cases (4.5 per cent). Thus in his series, 19 out of 92 herniae were only shown when the patient was in the toe-touch position. Cases which were the most difficult to interpret, were those where paste shows an appearance at the lower end of the oesophagus which might be either a small hernia or a phrenic ampulla. It has been stressed, in the past literature, that oesophageal

reflux is one of the main points in differentiating hiatus hernia and phrenic ampulla. The toe-touch position by visualising a hernia or reflux without hernia disposes of the need to use paste. Only when this has failed, the paste should be used. It should be stressed that it should be regarded as an essential supplement to Trendelenberg's position, when no hernia has been demonstrated even after straining with raised legs, coughing, and swallowing saliva. As in this series was a patient with a known hiatus hernia, where using the toe-touch position did not demonstrate the hernia, yet when the patient was straining in Trendelenberg's position, the hernia was visualised,—a warning to those who might regard the toe-touch position as infallible.

4 radiographs.

S. N. Deboo, Bombay.

K. Lumsden and S. C. Truelove, Intravenous pro-banthine in diagnostic radiology of the gastrointestinal tract with special reference to colonic disease, *Br. Jour. Radiology*, August 1959, Vol. 32, 517-526.

Propantheline bromide (probanthine) has a powerful depressing action on the motility of the gastrointestinal tract when given intravenously in a dose of 30 mg. It has only slight side-effects. It is a wise precaution to ensure that urinary bladder is empty when intravenous probanthine is given. One should be cautious in using it in elderly men when there is any suspicion of prostatic enlargement, and it should not be used in patients suffering from chronic glaucoma. Provided these safeguards are adopted, they believe that it is a safe method, constituting a valuable aid to diagnosis in gastrointestinal tract diseases.

In healthy patients, oesophagus loses its normal tone, appears more dilated after intravenous probanthine. Stomach loses tone with all evidence of peristaltic activity. Small intestine shows cessation of movement with dilatation of loops. The colon shows dilatation. In disease of colon, it distinguishes a colonic block due to gross organic disease from one due principally to spasm. In 7 patients in whom a block persisted after intravenous probanthine, the eventual diagnosis was carcinoma in 4 cases, and diverticulitis with marked inflammatory and fibrous reaction in the remaining 3 cases. So that a block in the course of a routine barium enema not relieved by probanthine will require surgery for its relief and carcinoma is the lesion most likely to be present. In patients in whom the block was relieved, the diagnosis was either diverticulitis with spasm or simple spasm due to a functional derangement of the colon. It also helps in diagnosing fibrous stricture from spasm and in the study of simple spastic colon.

Similarly it can be used in the diagnosis of other gastrointestinal diseases. It would be useful in the delineation of fibrous and neoplastic strictures, in recognition of oesophageal varices and in distinguishing an organic obstruction at the cardia from achalasia. In the stomach, organic strictures such as hour-glass stomach can be separated from spasm associated with peptic ulcer. It is useful in studies of the duodenal bulb and terminal ileum. As far as their experience goes, intravenous probanthine does not relax the narrowed segment of a regional ileitis. It may be useful in the study of the biliary tract, although their own experience is not yet sufficient for a systematic analysis of the results.

S. N. Deboo, Bombay.

George-Fredrik Saltzman, Preliminary experiences with peroral cholegraphy, *Acta Radiologica*, Oct. 1959, Vol. 52, Pages 282-288.

Preliminary experiences with peroral cholegraphy carried out with Bilijodan-Natrium (Leoare reported here. Seventy examinations are carried out. The majority of the patients received 4.2 to 4.5 g. of Bilijodan-Natrium in gelatine capsules, with a glass of distilled water, and the patients were instructed to lie on their right side, till the contrast medium had left the stomach. They were asked not to crunch the capsules, as the contrast medium has a very unpleasant taste. In patients who had undergone resection of the stomach, the medium is visible in the bile ducts within 15 to 20 minutes after medication. In the majority of patients with a normal stomach, the time from the administration of the contrast medium to the occurrence of optimal density in the bile ducts was between 4 and 7 hours.

A diagnostically satisfactory concentration of contrast medium in the bile ducts was obtained in most of their cases. A small dose of morphia caused contraction of sphincter of Oddi and consequently stagnation of the contrast-bearing bile in the ducts. This increased the contrast density in the ducts in the majority of their cases.

With this 4 to 5 g. Bilijodan-Natrium dose, more than half the patients had mild reactions in the form of nausea and diarrhoea. In only one case, patient had urticaria and high fever as well as slight mental confusion, but the signs disappeared completely after a few hours. The lower dose of 0.45 g. of Bilijodan-Natrium per 10 kg. body weight produced mild nausea and diarrhoea, so that a higher dose of contrast medium produces more marked reactions. But the lower dose did not give

satisfactory contrast density in the bile ducts, so that in many cases it was unsatisfactory from the diagnostic point of view.

The author concludes that peroral cholegraphy with Bilijodan-Natrium is in all essentials as good a method for the examination of the bile ducts as intravenous cholegraphy with Biligrafin. It can be used to advantage in those cases in which a test injection previous to intravenous cholegraphy has revealed evidence of hypersensitivity. It is suggested that an intravenous cholegraphic examination not producing satisfactory density in the bile ducts might be supplemented by an examination with the peroral method. It may be unjustified as a routine method in those cases in which the gallbladder has not been removed, using it as a substitute for both peroral cholecystography and intravenous cholegraphy.

3 radiographs.

S. N. Deboo, Bombay.

S. S. Schwartz, S. J. Boley and W. M. P. McKinnon, The Roentgen findings in traumatic rupture of spleen in children, *Am. Jour. Roentgenology*, September 1959, Vol. 82, 505-509.

Abdominal radiograms of 12 children with traumatic rupture of the spleen have been reviewed. The most significant finding was exaggeration of mucosal folds on the greater curvature of the stomach, which was present in 7 of their 12 cases. It also appeared however in 6 per cent of the controls. It is said to be due to dissection of blood along the course of the Vasa Brevia. Despite its occurrence in other

conditions, this was the most common single roentgen finding in their series serving as a warning beacon.

The other signs are as follows:

(a) *Stomach*.—(1) Gastric dilatation, (2) Increased gastroduaphragmatic space, (3) Stomach displaced to the right side.

(b) *Spleen*.—(1) Obliteration of splenic shadow. (2) Increase in distance between kidney and spleen. (3) Enlargement of splenic shadow.

(c) Pleural reaction at the left base.

(d) Rib fracture.

(e) *Bowels*.—(1) Widening of the space between bowel loops. (2) Distension of both large and small bowels. (3) Depressed splenic flexure.

(f) Obliteration of various shadows—of kidneys, psoas muscles and abdominal haze.

These signs occurred so infrequently as to make them of little importance. Besides the common demonstrations of these signs on the abdominal roentgenograms of the normal children nullifies their significance. Thorotrast injection has been suggested as an accessory aid, but their use should be condemned. Pneumoperitoneum has no logical value.

The triad of (1) history of trauma (2) abdominal tenderness and muscle guarding, especially when localised to the left upper quadrant and (3) abdominal and/or shoulder pain is far more typical of ruptured spleen in children. Early exploration of children presenting this picture regardless of roentgen findings will result in fewer catastrophies due to missed diagnosis and to an over-all lowering of morbidity.

S. N. Deboo, Bombay.

J. Luther Jarvis and William B. Seaman, Idiopathic adrenal calcification in infants and children, *American Jour. Roentgenology*, September 1959, Vol. 82, 510-520.

Calcification of the adrenal gland is usually an indication of pathology, being found in Addison's disease. Niemann-Pick's disease, adrenal haem-orrhage and adrenal neoplasms. There is also a group of patients with calcification in the adrenal gland who do not show evidence of adrenal disease.

A series of 26 patients with idiopathic adrenal calcification is presented, the calcification being demonstrated radiologically in 19 patients, where it was an incidental finding, in 7 cases it was discovered at necropsy. 14 or 16 living patients, initially asymptomatic, have been followed from 3 to 20 years and continue to be free of disease.

The calcified adrenal appears radiologically as a collection of irregular discrete densities, which tend to be grouped in a triangular fashion. The calcified area of the adrenal in infants appears large.

Adrenal calcification can be distinguished from that in gallstones, lymph glands, by a lateral view. Calcification of the upper pole of the kidney may be distinguished by erect and supine position radiograms, where according to Steinbach and Smith, the adrenal drops less than the kidney, the greater drop of the kidney may separate it from the adrenal image. When adrenal calcification is associated with a mass, neuroblastoma is the most likely possibility, where as the absence of a mass supports the diagnosis of adrenal calcification.

Abnormal birth histories were found in 22 patients. There was a significant association of abnormalities in the central nervous

system with birth trauma and anoxia. Birth trauma and anoxia are believed to be important in the production of adrenal calcification.

6 radiographs.

S. N. Deboo, Bombay.

James. F. Brailsford, *The Radiology of Gout*, Br. Jour. Radiology, July 1959, Vol. 32, 472-478.

Gout is an indication of constitutional disturbances of metabolism which may be associated with localised and generalised disturbances of visceral and skeletal tissues liable to mislead. Thus when the attacks affect multiple joints and are unassociated with tophi, rheumatism may be suspected.

Characteristic radiographic features are most commonly found in the region of the great toes and other parts of the feet and the hands. The urate deposits here lead to localised swellings or prominent tophi. There are definite changes in the ankles and knees. In one case described in detail here, there was little change recognised in the hip joints. Only a small deposit was seen near one greater trochanter and small cyst-like changes in the base of the other. The spine showed lipping of the dorsal and lumbar spine as is seen commonly in persons of 61 years of age, the sterno clavicular joints were irregular. The shoulder showed a multilocular cystic appearance of the greater tuberosity but no changes in the joint surfaces. The elbow showed irregular cyst-like expansion of olecranon and superficial cyst-like erosion of the ulna. The radiographs of the chest showed an enlarged cardiovascular shadow, while those of the skull showed increased thickness and density of the falx

cerebri. No changes were seen in the temporomandibular joints. The most typical changes were seen in the bones of the hands and feet. The radiographs of the index and middle fingers showed multilocular cyst like changes in the opposing ends of bones entering into the terminal joints of the index and middle fingers. The radiographs of the foot showed marked destruction of the bone endings entering into the interphalangeal joint of the great toe and metatarsophalangeal joints of the 3rd and 5th toes.

It has been established that attacks can precede any radiographic manifestations and in absence of radiographic evidence diagnosis may be difficult. Sodium urate, deposition of which is associated with development of an acute attack is little more radioopaque than the soft tissues, consequently in some cases when its borders are not defined it may escape detection until its bulk causes deformity. Even fractures may occur without bringing on an acute attack of gout. In some, extremities may undergo complete dissolution necessitating amputation.

S. N. Deboo, Bombay.

Ronald G. Grainger, *Procto-colitis and other pelvic infections in relation to ankylosing spondylitis*. Jour. Fac. Radiologists, July 1959, Vol. X, 138-150.

7 new cases of ankylosing spondylitis occurring in patients with ulcerative procto-colitis are reported. These patients developed bilateral sacroilitis in the first 3 years of bowel symptoms. The clinical association of bilateral sacroiliac arthritis in Reiter's syndrome, non-specific urethritis, gonorrhoea, paraplegia and ulcerative procto-colitis is

becoming increasingly more evident. Acute or chronic pelvic visceral sepsis may be responsible for destructive lesions of the sacroiliac joints and elsewhere in the bony pelvis. These lesions may be frankly suppurative, or there may be no pus formation.

Mason and others have recently confirmed the findings of Romanus (1953) in Sweden that 80-90 per cent of spondylitis have a chronic purulent prostatovesiculitis. It is suggested that, in some patients, constitutionally and genetically determined, non-suppurative sacroiliac arthritis, provoked by pelvic sepsis, may herald the development of classical ankylosing spondylitis.

If the causal association of pelvic infection with ankylosing spondylitis does become an accepted and established clinical fact, we still have to speculate on the mechanism of this relationship. The provoking agent emanating from the pelvic infection may be organismal—virus or bacteria—either a specific or non-specific infection—or it may be a toxic product.

One of the possible routes of spread is the vertebral venous plexus, as it communicates at all levels, particularly in the pelvis and intracranially with the veins of the vena cava and azygos systems. This venous system may well provide a satisfactory explanation for the centrifugal involvement, spreading from the pelvis which is typical for the ankylosing spondylitis. Peripheral manifestations of the disease—the anterior uveitis, the calcaneal lesions, and the peripheral arthritis—would have to be explained on another route of spread. Anterior uveitis is a well known complication of prostatic infection.

It is concluded that chronic pelvic sepsis may be a major exciting or provoking factor in the development of ankylosing spondylitis.

16 radiographs. 1 figure.

S. N. Deboo, Bombay.

Daniel O'Connell. *Ankylosing spondylitis: Results of treatment and their presentation*, Jour. Fac. Radiologists, July 1959, Vol. X, 156-157.

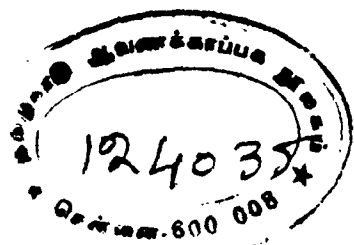
This paper presents the results of treatment of a series of 87 cases of ankylosing spondylitis. The disease 'burns itself out' naturally but not usually until an advanced stage when a large part of the spine and possibly other joints have become ankylosed.

While radiotherapy does institute an immediate remission in the majority of cases, maximum length of remission may not be obtained unless supportive measures are applied. It is difficult to interpret the response to treatment. X-ray evidence is of little value except over long periods and even then it is only indicative of gross changes. The single objective test of real value is the erythrocyte sedimentation rate.

Improvement in the series is assessed by first grading each patient into one of 3 categories of severity of diseases, and then registering the type of response in one of the four groups. Following are the 3 degrees of severity: (A) Active disease present. (B) Severe active disease. (C) Acute systemic disease present. The results are based on the degree of improvement as classed below:

(i) Complete recovery of reasonable range of movements and loss of symptoms. (ii) Disease inactive, where the attacks are transient infrequent, where the patient does not require further treatment. (iii) further treatment is necessary. (iv) failure to halt the disease. The results show that the mildest cases (Category A) generally respond well to radiotherapy and have an excellent prognosis. Of 18 cases 15 appeared to be symptom-free 5 years afterwards. Of the severer cases (Category B) 30 out of 50 were apparently cured, but the remainder recurred in the intervening years. In Category C, 12 very severely afflicted patients all had short remissions—the longest being 2½ years.

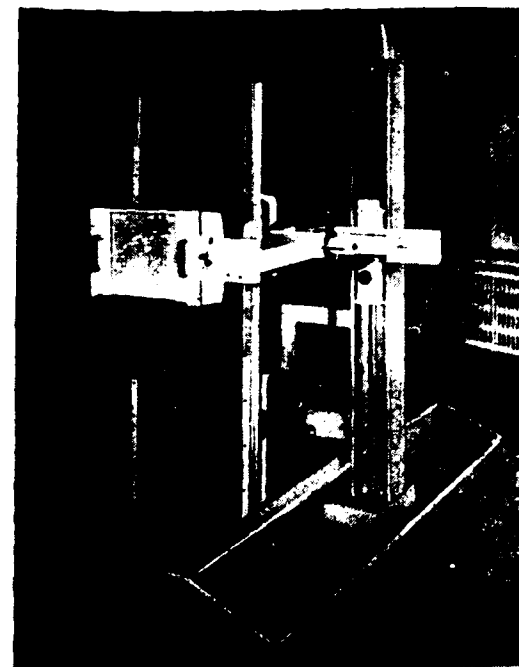
In their practice, the major treatment is with deep x-irradiation supplemented by physiotherapy and psychotherapy. The beam of x-irradiation is applied through 2 series of oblique paravertebral fields and measures are taken to prevent primary and scattered irradiation of the gonads. The dosage is limited to 600-700 r to the bone marrow and an integral dose of 5-7.5 mg/r. Second courses of irradiation are not given. When the disease becomes reactivated, other forms of treatment are (i) Steroid therapy (ii) Quinine esp. chloroquine therapy (iii) Phenylbutazone therapy. This is somewhat Toxic in large doses, and it is to be seen whether there is an effect on the genetic system.



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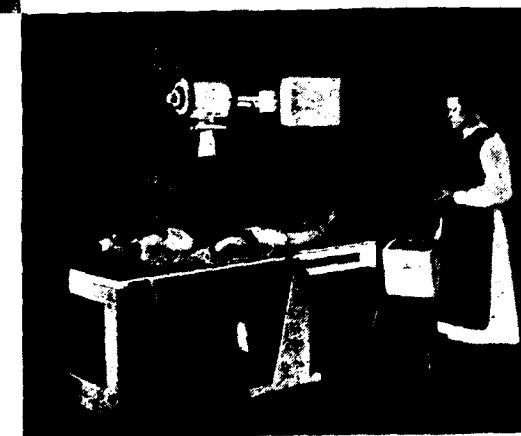
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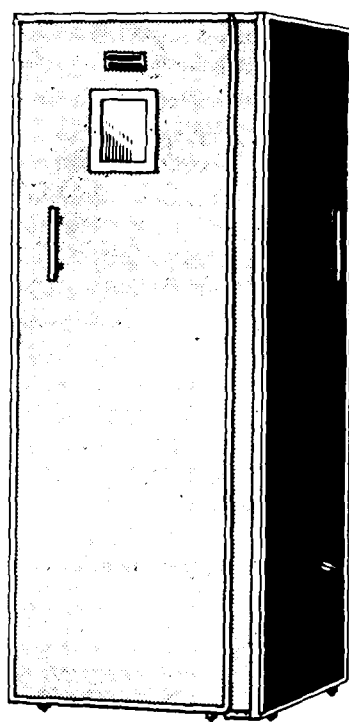
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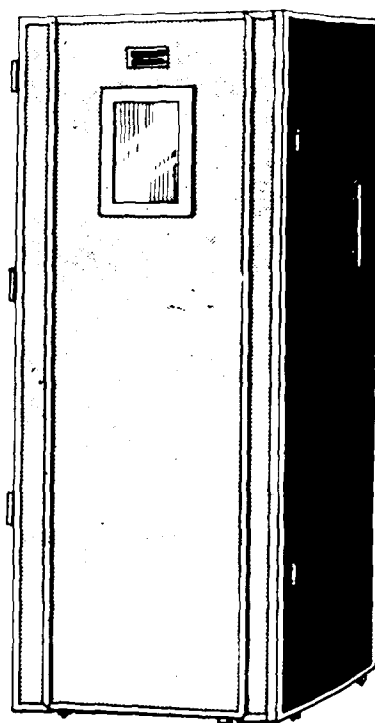
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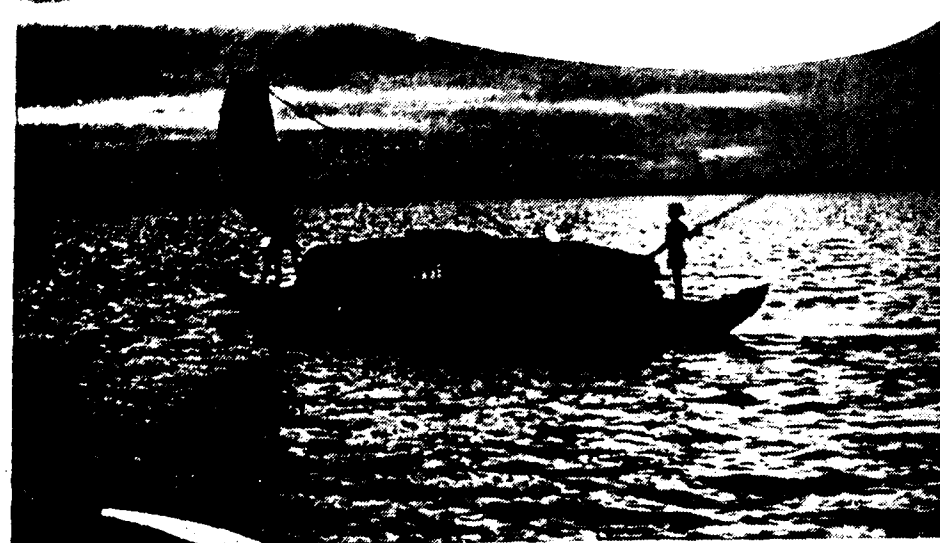
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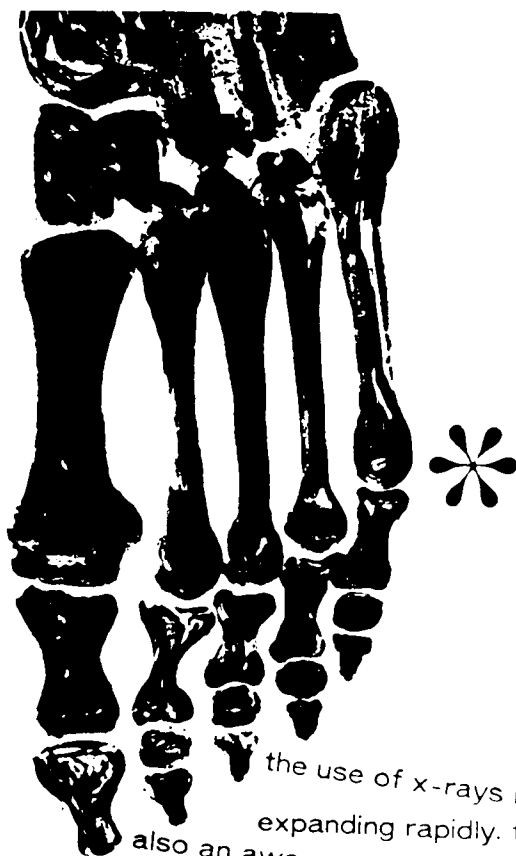
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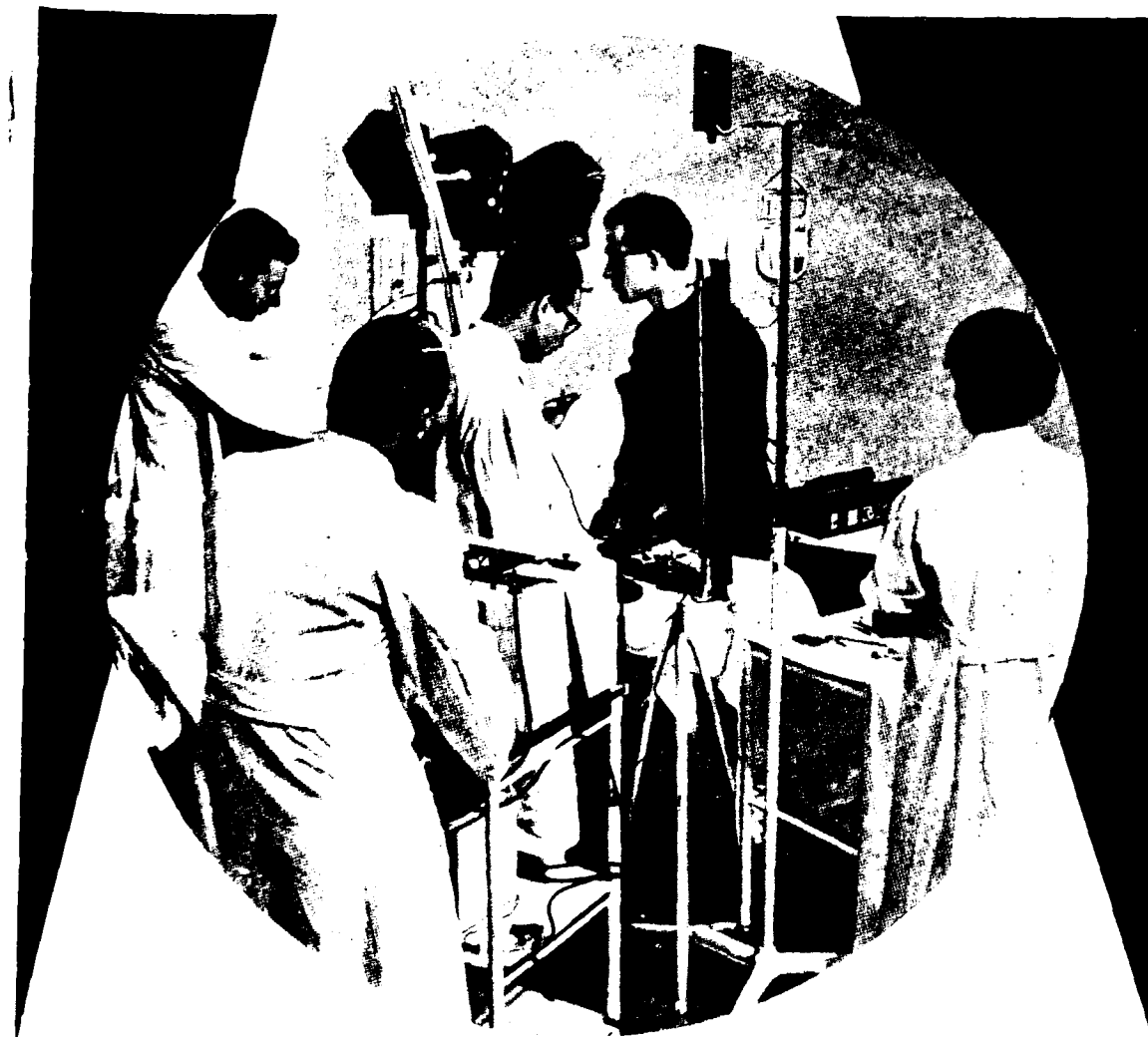
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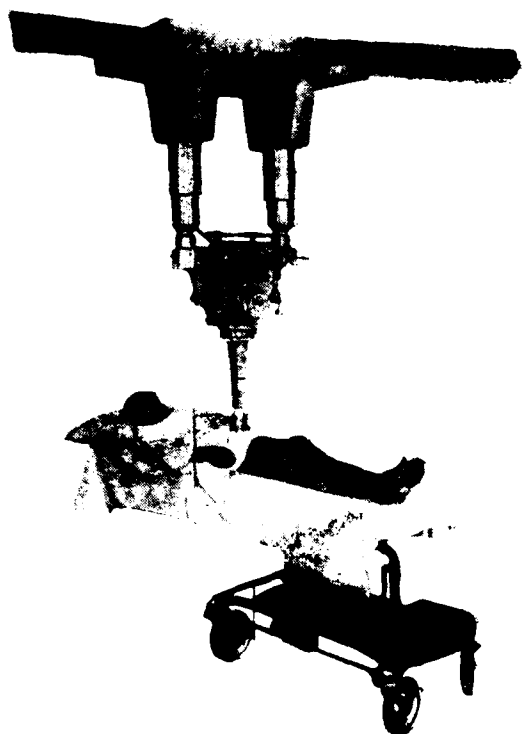
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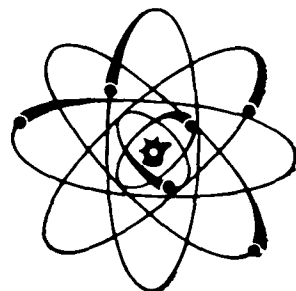
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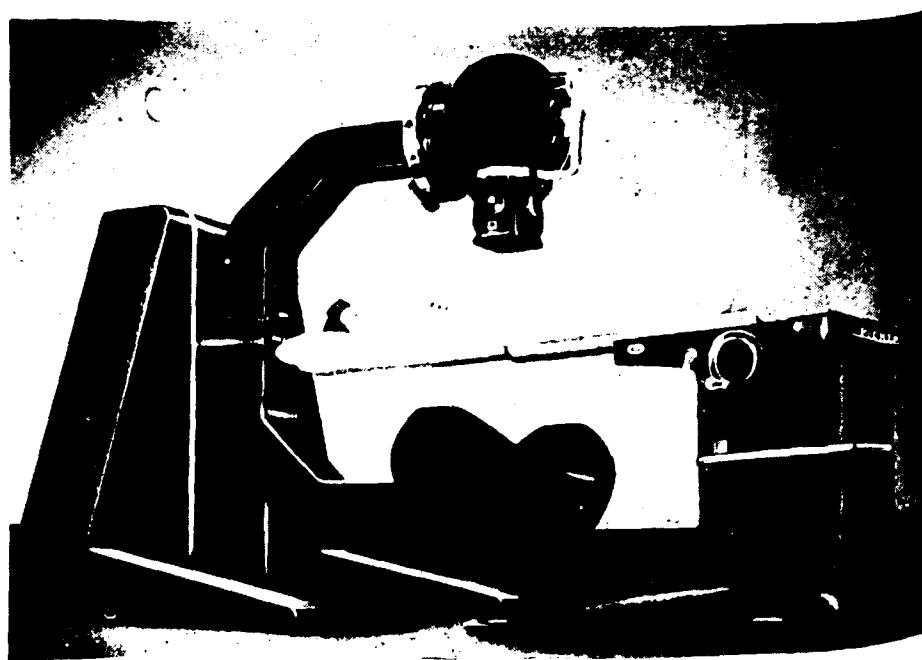


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