

839

The
Indian Journal of Radiology

A quarterly Journal
devoted to Clinical
Radiology and allied
Sciences



Owned and published
as its Official organ by
the Indian Radiological
Association

141

VOLUME 4

MAY, 1950

No. 2

CONTENTS

SYMPOSIUM ON ABDOMINAL TUBERCULOSIS—Lt. Col. Amir Chaudhary, Delhi	41
SYMPOSIUM—INTESTINAL TUBERCULOSIS—Dr. S. K. Sen, F.R.C.S., Delhi	43
FREQUENCY AND PECULIARITIES OF THE PROLIFERATIVE TUBERCULOSIS IN INDIA—Doz. Dr. George Politzer, Delhi	54
SYMPOSIUM—INTESTINAL TUBERCULOSIS—Dr. K. Manjunath Rai, M.B., F.R.C.S. (R.), D.M.R. (Lond.), Director, Barnard Institute of Radiology, Madras	59
PLANIGRAPHY AND TRACHEOBRONCHIAL TUBERCULOSIS—Antonio Govoni, M.D., Spec. Radiology, Assistant of the Institute of Radiology, University of Ferrara	63
HEART AND TUBERCULOSIS—Antonio Govoni, M.D., Spec. Radiology, Assistant, Institute of Radiology, University of Ferrara	70
BOOK REVIEW	75

THE INDIAN JOURNAL OF RADIOLOGY

(QUARTERLY)

Owned and Published as its Official Organ by
The Indian Radiological Association

Editor-in-Chief:

DR. K. MANJUNATH RAI.

Editorial Board:

DR. K. MANJUNATH RAI, Editor-in-Chief, Madras.

DR. K. P. MODY, Bombay, (Radio-therapy).

CAPT. M. MUKHERJEE, Calcutta (X-ray diagnosis).

DR. M. D. JOSHI, Bombay (Physio-therapy).

MR. V. KRISHNAMOORTHY, Madras (Physics).

NOTICE TO CONTRIBUTORS

Contributions are to be sent to the Editor-in-Chief, THE INDIAN JOURNAL OF RADIOLOGY, Dr. K. Manjunath Rai, F.R.C.S.E., D.M.R. (Lond.), "Lakeside," 110, Mount Road, Teynampet P.O., Madras.

Contributions should be typewritten on one side of the paper only. They are accepted on the understanding that they are sent exclusively to this Journal and a statement to that effect should accompany every contribution. Illustrations will be copyright of THE INDIAN JOURNAL OF RADIOLOGY and may not be published elsewhere without permission. Rejected contributions will be returned if accompanied by a stamped addressed envelope.

All communications regarding the INDIAN JOURNAL OF RADIOLOGY should be addressed to the Editor-in-Chief, "Lakeside," 110, Mount Road, Teynampet P.O., Madras.

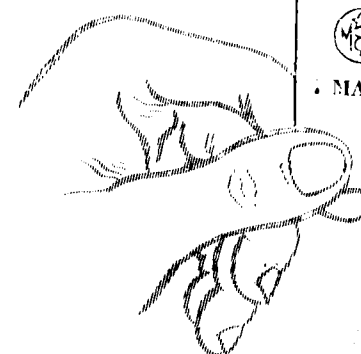
All matters concerning advertisements in this Journal should also be addressed to the Editor-in-Chief.

Subscription: Rs. 12 per annum. Single Copy Rs. 3.

„ (Foreign): £ 1 per annum.

Free to members of the Indian Radiological Association.

Annual Subscription for Membership Rs. 12.



MAY & BAKER (INDIA) LTD.

REPRESENTED BY

THE BEARER OF THIS VISITING CARD
is more than just a salesman.

He is a thoroughly trained and experienced representative who is always happy to serve you by providing information on M & B Specialities and to assist you in problems that may occasionally arise from the use of these products.

Please do not hesitate to make use of him whenever he calls on you.

MAY &



BAKER

MAY & BAKER (INDIA) LTD. BOMBAY • CALCUTTA • MADRAS • LUCKNOW

INDIAN RADIOLOGICAL ASSOCIATION

President :

Dr. S. C. Sen, New Delhi.

Past Presidents :

Dr. M. D. Joshi, Bombay.

Dr. K. P. Mody, Bombay.

Dr. P. Rama Rau, Madras.

Vice-President :

Dr. Subodh Mitra, Calcutta.

General Secretary :

Dr. M. N. Dasanna, Madras.

Treasurer :

Dr. Ved Prakash, New Delhi.

Members of the Central Council :

Dr. M. Mukherji, Calcutta.

„ S. N. Deboo, Bombay.

„ R. F. Sethna, Bombay.

„ N. G. Gadekar, New Delhi.

„ K. R. Doraiswamy, Madras.

NOTICE

All communications intended for the General Secretary may kindly be addressed to :

Dr. M. N. DASANNA,
General Secretary,
Indian Radiological Association,
No. 26/1, Pachaippa Hostel Road,
Chetput, Madras-10.

Announcement

Planned 22 years ago, in production for the last 10 years,
we now offer to the Indian Medical profession

“MADE IN INDIA”

X-RAY PLANTS

(incorporating Machlett Tubes)

FOR

Radiography, Fluoroscopy, Therapy and Diffraction.

Of these, Diagnostic (Static) & Diffraction plants
are in regular production.

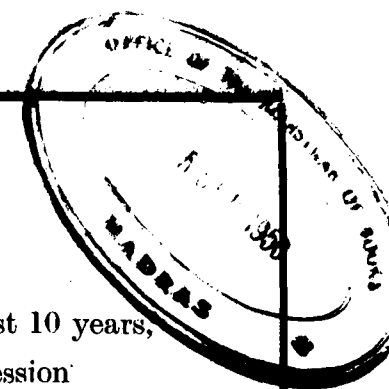
Price extremely moderate. Performance fully guaranteed.

Our products (as well as Research Dept.) are better than
many and comparable to any of the West.

**We solicit your enquiries to be of service
to you and to the country.**

RADON HOUSE,

7, SIRDAR SANKAR ROAD :: KALIGHAT, CALCUTTA-26.



**ONE SINGLE INJECTION ENSURES
RAPID EXCRETION AND CLEAR
SHARP SHADOWS . . .**

'UROSELECTAN B'

INJECTION OF IODOXYL B.P.

For Radiological Investigation of the Urinary Tract

Pyelograms having the high degree of contrast necessary for diagnosis, are provided following a single intravenous injection of 'Uroselectan B.' Free from side effects, it is well tolerated by patients of all ages, and may safely be administered during pregnancy.

The Retrograde Solution provides a simple, safe and convenient method of outlining the renal pelvis and urinary tract by catheterization.



INTRAVENOUS
15 Gm. in 20 c.c.
2.25 Gm. in 3 c.c.
(Child dose)

RETROGRADE
2 Gm. in 10 c.c.



Sole Importers: **INDIAN SCHERING LIMITED**
P.O. BOX 1125 • BOMBAY 1 • INDIA

312/1

B.D.H. CONTRAST MEDIA

for use in X-ray diagnosis

IODATOL-Iodised Oil B.P.

For bronchography, hysterosalpingography, localisation of cord tumours etc.

DIODONE B.D.H.

For intravenous pyelography and in the radiography of veins, arteries and joints.

SHADOFORM

Preparation of Barium Sulphate B.P. for X-ray visualisation of the gastro-intestinal tract.

ODOXYL B.D.H. Iodoxy B.P.

For intravenous pyelography.

Stocks of B.D.H. Contrast Media are held by leading chemists and full particulars are obtainable from

BRITISH DRUG HOUSES (INDIA) LIMITED

P. O. BOX 1341, BOMBAY.

P. O. BOX 9024, CALCUTTA.

The Indian Journal of Radiology

Vol. IV.

MAY, 1950

No. 2

Symposium on Abdominal Tuberculosis

LT. COL. AMIR CHAND,
DELHI.

141

Two kinds of abdominal tuberculosis:—1. Ulcerative; and 2. Hyperplastic.

Clinical features.—Some of the symptoms of this disease are deceptive just as clinical features of the lung disease are. The symptoms mostly pertain to the stomach or intestines. Stomach is said to be the fire box alarm with fire elsewhere. It gives rise to a number of symptoms like loss of appetite, nausea, vomiting, fullness of stomach, heart burn etc. as in so called indigestion. There may be no clinical symptoms at all. The lesion may be extremely small. Sometimes few symptoms predominate. No combination is pathognomonic of the disease. Pain and diarrhoea are the main symptoms. Pain is not

the early symptom. It is more common in the left quadrant and after meals. After meals it gets more pronounced and more frequent. To start with it comes after meals and is of varying types. Intestinal mucus membrane is not supplied with plain muscle fibres. The pain is of muscular origin. The law of intestine does not work because of the irritability of the musculature. Diarrhoea is not an early feature of the disease. There may be extensive ulceration but no diarrhoea. There may be constipation, especially when the lesion is above hepatic flexure. General symptoms due to toxæmia are illusive. There may be fever of various types.

Physical signs.—Nothing is of diagnostic importance. Certain

amount of gastric pain, a little tenderness, gurgling sound near caecum, thickening of the caecal wall in the right iliac fossa etc. Laboratory examination is not very helpful. Blood, urine, examinations do not show anything characteristic. Diagnosis is difficult in early stages. The clinical features may make you suspect the disease. Patient is losing weight, when the gastro-intestinal symptoms are persisting. It was said that the diagnosis in the early stages is impossible. When the disease is diagnosed in the early stages the outlook of the patient is not so gloomy as it was thought.

TREATMENT.—It must be continued long enough. General treatment is still the main-stay. Adjuncts like heliotherapy is an excellent example of nature-cum-faith cure. Dr. Roleo says that it must be continued for not less than 2 years. The same thing applies for Ultra-violet ray therapy. Streptomycin has greatly improved the outlook. P.A.S. may also be tried. Surgical treatment is only given when there is obstruction or perforation.

Tabes mesenterica.—Commoner than the intestinal tuberculosis.

Radiology does not offer much help for the diagnosis of intestinal tuberculosis. Tuberculosis is only one condition where calcium does do good on account of its soothing effect on intestinal neuro muscular system. Calcium is laid down in tuberculosis as in other cases but we do not know why. Administration of large doses of calcium does not increase the calcification. It is a retrograde process. Peritonitis is present in all these cases. Ultra-violet ray therapy and heliotherapy are helpful.

Renal tuberculosis.—It is a blood-borne condition:—Usually unilateral in the early stages. Early symptoms are related to the bladder first. Clinical symptom is frequency of micturition; not necessarily haematuria. Pain in the lumbar region is a late symptom. Loss of weight and emaciation are not so marked. Diagnosis is difficult in the early stages. Catheterisation and guinea pig inoculation will help.

TREATMENT.—Conservative is the best. Resistance of the patient is the main sheet anchor.

Symposium—Intestinal Tuberculosis

DR. S. K. SEN, F.R.C.S.,

DALH.

Introduction.—Intestinal tuberculosis is ever assuming more importance not only because it is the most frequent complication of pulmonary tuberculosis, not even excepting laryngeal tuberculosis but also because modern side of diagnosis and surgery offer a much better prognosis than it did 2 decades ago. Even text books of to-day give one the impression that primary tuberculosis of the abdomen is a rarity. There is no doubt, however, that a large number of cases of tuberculosis of the abdomen are secondary to pulmonary tuberculosis. Nevertheless there exists a large group of cases which are without doubt a primary infection of the intestinal tract and it is with these cases that we are concerned to-day. Although we are prepared to concede that any localised manifestation of tuberculous pathology is merely an expression of generalized tuberculopathy yet a good deal can be achieved by a vigorous localised treatment. Again in all cases of tuberculosis while treating the localised manifestation the general treatment must never be lost sight of. As a complication of pulmonary tuberculosis just as in primary tuberculosis of the abdomen it can exist for a long time without

causing symptoms. It is by no means a terminal complication of pulmonary tuberculosis. Every physician who treats a case of pulmonary tuberculosis has been perplexed by frequent digestive disturbances the cause not being difficult to discern. The treatment of tuberculosis depends on internal or vital resources. Therefore it is necessarily passive. The patient is told to take no exercise to remain in the open air and to eat as much as possible. The only indulgence he is allowed is in eating. It is no wonder, therefore, that he suffers early from digestive disturbances and there is a tendency to overlook these disturbances and label them as functional, thereby missing the early signs of intestinal tuberculosis. It is very difficult to assess accurately the cause of the disturbances. They may be due to:—

- (1) Poisons due to tuberculosis.
- (2) Poisons due to the disease.
- (3) Due to intoxication caused by overeating.
- (4) Organic tuberculous process in the intestines.

To divide it broadly abdominal tuberculosis consists of:

1. Intestinal.

2. Peritoneal
3. Glandular types.

All three may co-exist and they do so quite frequently. Out of these, intestinal tuberculosis is the most important and is most amenable to surgical treatment.

Pathological.—Intestinal tuberculosis is: (1) Ulcerative type; (2) Fibrous type; and (3) Hypertrophic type.

1. *Ulcerative type*:—The earliest lesion usually occurs in the solitary follicles of Peyer's patches. They are located on the summit of the lymph follicles and are rarely associated closely grouped or numerous but widely scattered. There may be fine ulcers which are visible after thoroughly cleaning the gut. Later the spread takes place in accordance with the usual form of the tubercular process, primarily lymphatic, and follows the lymph channels to the sub-mucosa circumventing the bowels producing the ulcer. Ulcers may become large and confluent and might completely encircle the gut. When these ulcers heal they give rise to cicatrization or might perforate and give rise to intestinal perforation, faecal fistula or without perforation might cause peritonitis.

2. *Fibrous type*:—This is not essentially a distinct type but secondary to an ulcerative lesion.

3. *The hypertrophic type*:—This type is caused by tubercle bacillus

at attenuated virulence. The size of the tumour varies inversely with the virulence of the organism. It is a most common lesion of the caecum. As a matter of fact it is one of the most common types of intestinal tuberculosis. The essential change seems to be the proliferation of connective tissue involving all the coats and extending completely around the gut. The intestinal wall eventually become stiffened and thick and gives an appearance of an irregular cylinder. The lumen progressively becomes narrow until it is almost occluded.

Peritoneal tuberculosis.—Description of primary peritoneal tuberculosis is found in the literature. That the tubercular bacillus can reach the peritoneum without reaching the intestine seems to be very remote. It is probable that the primary focus is far more commonly a tuberculous ulcer of the bowel, fallopian tube or caseating retroperitoneal gland. Tuberculous peritonitis in our opinion is in the majority of cases of two types:—

1. The ascitic type.
2. The adhesive type.

1. *The ascitic type*:—In the ascitic type the abdomen becomes distended by a fluid of yellowish colour of specific gravity of 1018 to 1024. The fibrin content of the exudate is low. The visceral and parietal peritoneum are everywhere studded

with millet seed sized tubercles. The reaction of the peritoneum varies from mild inflammation with redness to definite thickening which may be as great as half an inch. Occasionally adhesions may be found with this type but are not common.

2. *The adhesive type*:—The adhesive type begins with precipitation of fibrin. It is due to greater reaction and increased virulence. There may be some exudate where the colour is greenish and is full of fibrin flakes. In this form discreet tubercles are less likely to be seen. Bowel is less likely to be seen. Bowel is less flexible and there is a tendency to tumefaction which is due to the greater omentum becoming markedly infiltrated and lying transversely across the abdomen. The prognosis in the ascitic form specially with aspiration and pneumoperitoneum is good but the prognosis in the adhesive form is doubtful.

Clinical symptoms.—The symptoms in intestinal tuberculosis are exceedingly variable, in fact no abdominal symptoms may be noted at all even in the presence of extensive disease. Unfortunately, both for the patient and for the doctor these symptoms are of fleeting disturbances of no moment. It is a striking fact that in one of the larger clinics in America 50% of these cases were diagnosed at autopsy only. In any

case slight digestive or abdominal symptoms should put the physician on guard particularly when the symptoms persist. The patient may complain of a feeling of ill-being and that his digestion is indifferent. There may be a slight irregular temperature and a vague pain in the abdomen. Merely marked constipation with a palpable caecum may be sufficient indication to warrant a further investigation for intestinal tuberculosis. As the disease increases symptoms usually increase but not always. The point I would like to emphasize is that the onset and progress may be very insidious and indefinite, and the term latent may be very well applied to the majority of cases of intestinal tuberculosis, for unless borne in mind and repeatedly looked for they escape detection for a long period.

(a) *Pain*:—This is by no means present in all cases though it is the most common symptom. It may be absent or so slightly marked as to be overlooked by the patient. Therefore it is not an early symptom. It is usually preceded by discomfort, more marked after meals. Later some pain, first at or below the epigastrium or lower right quadrant may occur at intervals. It usually appears late in the morning or early in the afternoon and is at first transient. Gradually the pain becomes persistent, resembling neuralgia. It may be cramp-like or

stabbing in nature, aggravated by food and relieved at times by fasting or carminatives. Sharp or lancinating pain may appear after drink of cold water or a glass of milk (increased peristalsis). In some instances the pain may be so vague as to be elicited only by palpitation *i.e.*, as the disease progresses the pain increases and attacks come daily or even several times a day. The patient may feel quite well apart from the pain. Later on pain is due to involvement of the peritoneum overlying the lesion in which case it may be severe, accompanied by nausea or vomiting and there may be definite localisation. In this condition it may simulate any acute abdominal condition. As the involvement is usually in the caecal region very many abdomens have been opened with a diagnosis of acute appendicitis. Attacks of pain may be brought on by abnormal motor activity with some resistance (spasm or stenosis) to the onward movement of the intestinal contents or localised peritonitis. This pain is brought on at or immediately after eating. Involvement of the glands which is present in 50% of the cases may be accompanied by excruciating pain which is described as throbbing and burning.

(b) *Bowel movement*:—The constant association of diarrhoea with intestinal tuberculosis is fixed in the mind of the average physician. Such,

however, is far from the actual fact. Diarrhoea may never occur in a given case, rather severe constipation, or obstipation is the rule. Diarrhoea, when it comes, is a late symptom. It is unfortunate that it is with the onset of diarrhoea that the patient comes to the physician. It is in these cases that the disappearance of constipation is at first welcome and considered as an improvement. Later the stools become muddy and are passed once or twice at night. Still later diarrhoea sets in and may in the beginning be easily controlled falling back to constipation. Much later the diarrhoea becomes continuous and persistent. It is not unusual at this stage to have diarrhoea alternating with constipation and this condition is present on an average in 60% of the cases. In later stages the diarrhoea becomes profuse and the stools frequent, large and offensive. The cause of diarrhoea is either increased peristalsis or interference with the absorption of fluids. The diarrhoea is often accompanied by peristaltic unrest and loud intestinal sounds. A feeling of distension and of constipation, even though the bowel is entirely empty at the end of 24 hours, may be a persistent feature.

(c) *Rise of temperature*:—The temperature may be normal, elevated or swinging but the characteristic feature is that it is subnormal at some part of the day, usually in the

morning. It runs an irregular course, the curve varying from day to day. When the temperature is high, withholding of food for a day or two brings down the temperature, to rise again after eating. This is said to be pathognomonic of intestinal tuberculosis. The pulse rate is increased the exact cause of which is not entirely understood.

(d) *Gastric symptoms* may be absent or predominate the clinical picture. Occasionally the only symptom may be persistent vomiting of liquids. Among other digestive disturbances, disturbance of appetite, sour stomach, acid eructation, water brash, heart burning and distress after eating are common symptoms.

(e) *Loss of weight*:—In no phase of the disease emaciation progresses more rapidly than when anorexia and weakness supervene upon severe persistent diarrhoea with many stools. As a matter of fact the loss of weight in intestinal tuberculosis is one of the supreme features and it is said to be the most characteristic of all symptoms. The loss of weight is even more rapid than in malignant diseases.

(f) *Intestinal haemorrhage*:—This is a rare symptom although fatal cases of haemorrhages have been reported. According to Englesmann the second haemorrhage in a case of intestinal tuberculosis proves fatal.

In our experience intestinal haemorrhage has not been noticed. In certain cases a mass may be palpable especially in a hypertrophic type of ileocaecal tuberculosis. Occasionally the mass may be palpable over the axis of the mesentery which is mobile from side to side but not from above downward. The mass formation is not a constant feature. In our series of 268 patients operated by us in the Irwin Hospital as well as in the Tuberculosis Hospital the following is an interesting study of presentation of symptoms.

1. No symptom	37 cases
2. Nervousness irritability and depression	35 cases
3. Constipation	126 cases
4. Diarrhoea	71 cases
5. Alternating diarrhoea and constipation	56 cases
6. Anorexia	80 cases
7. Dyspepsia	56 cases
8. Discomfort after meals	51 cases
9. Excessive gas	131 cases
10. Colicky pains	136 cases
11. Nausea	15 cases
12. Vomiting and regurgitation	34 cases
13. Loss of weight	231 cases
14. Mass formation	86 cases
15. Bleeding	Nil
16. Localized tenderness	166 cases

The diagnosis of intestinal tuberculosis has undergone a revolutionary change within the last decade. The newer methods are apparently so little understood, and so feebly grasped by many excellent clinicians

that without question many patients now succumb to tuberculosis who otherwise may be saved. It appears to be wiser to discuss first the older clinical methods of diagnosis and then to deal fully with the newer roentgenological diagnosis pointing out that the latter method alone can give an accurate idea of the absence or presence of intestinal tuberculosis. Although in certain cases laparotomy may be the only means of diagnosing accurately the disease there. There are, for instance, cases in our series where we have definitely diagnosed T.B. cæcum but on opening the abdomen we have been confronted with a peculiarly disposed appendix chronically inflamed an omental mass covering it and the whole mass in a sausage fashion going round the terminal ileum and part of the cæcum producing a characteristic Stierlin's sign. There are very many other cases in our experience where we have had no radiological evidence of tubercular involvement of the intestine but the clinical judgement was so strongly in favour of tuberculosis that on opening the abdomen we have found either tuberculosis of the cæcum or a tubercular small intestines. Many cases in our experience have been opened up for subacute appendicitis where we have been surprised to see advanced tuberculosis of the abdomen or T.B. cæcum. Laparotomy in the doubtful

case as a diagnostic aid has no additional risk and in our opinion must be undertaken as a final proof before labelling a particular case unless the diagnosis is staring one in the face. The diagnosis of intestinal tuberculosis from symptoms and physical signs is notoriously uncertain and many gastro-enterologists have been reluctant to make a positive diagnosis of intestinal tuberculosis even in the presence of X-ray evidence.

The position of intestinal tuberculosis in the minds of many specialists even to-day is similar to that occupied by pulmonary tuberculosis 20-25 years ago. At that time many refused to make a diagnosis of pulmonary T.B. without finding a tubercular bacillus in the sputum, regardless of physical signs or symptoms, and the struggle to overcome this reluctance was long and hard. In our opinion, in an early case, it is impossible to diagnose accurately the presence or absence of intestinal tuberculosis without laparotomy. Intestinal tuberculosis remains therefore to-day, as difficult to diagnose by clinical methods only, as it has always been. We must persevere in our efforts if we wish to escape pitfalls and to prescribe for our patients appropriate and early treatment. Thus in our opinion a repeated X-ray examination and if necessary laparotomy are the only two means by which we can reach an accurate diagnosis.

Abdominal examinations.—A careful abdominal examination may reveal some thickening of the cæcum and in a few instances in late stages a mass in the right lower quadrant. In passing it should be noted that not only hypertrophic tuberculosis but also carcinoma, amoebiasis, actinomycosis and regional ileitis can also produce a mass in this region. On the other hand ulceration does frequently occur without thickening of the intestine.

To recapitulate briefly it seems likely that either a slight rise of temperature, anorexia, prolonged and marked digestive disturbances, regurgitation or vomiting of food, nausea, slight abdominal discomfort or actual pain, constipation or slight diarrhoea, constipation alternating with diarrhoea or an unexplained lymphocytosis should attract attention to the intestinal tract and suggest possible tuberculous ulceration. It must always be borne in mind that several of these symptoms occur only when the process is well marked. Lastly, as a complication to pulmonary tuberculosis a patient fails to gain weight or to make satisfactory progress, no matter how slight, the abdominal symptoms should be studied for tuberculous abdomen. The frequency of such symptoms in the course of pulmonary tuberculosis is well recognised; but we hold that in the presence of such symptoms a diagnosis of intes-

tinal tuberculosis cannot be made positively except by X-ray or at times laparotomy.

It has been shown by what has already been presented upon the subject of diagnosis of intestinal tuberculosis that till better X-ray examination with the barium meal was satisfactorily worked out, the diagnosis of this condition was suspected when not present and frequently overlooked even though extensively present. It is hoped that the radiological methods described by the other speakers will enable us to arrive at a diagnosis in its earliest stages. It is equally useful for advanced cases. It seems hardly necessary to note that it diagnoses only ulceration and affords no information about the causes of ulceration. In other words the differential diagnosis of the various ulcerations of the bowels must hinge upon additional data.

The details of the radiology of the intestinal tuberculosis in particular and abdominal tuberculosis in general will be explained in a more able manner by the Radiologists who are going to talk to you about abdominal tuberculosis after me. They will explain to you the significance of acceleration or retardation of flow of intestinal contents, the spastic filling defect or pseudo filling defect and their importance. They will also tell you in detail the significance of

the interpretation of pathological hypermotility and the meaning of Stierlin's sign. The radiologists are in a better position to explain to you all the relevant facts than I could hope to do. I would however like to point out that the diagnosis of intestinal tuberculosis depends upon changes in the functional activity rather than upon detection of definite ulcers and in this differs from the diagnosis of gastric ulcers.

Differential diagnosis.—The diagnosis of tuberculosis of the intestine is extremely difficult to make with any degree of accuracy yet it should be differentiated from chronic appendicitis, malignant tumours, amoebic dysentery, sprue, ulcerative colitis and diverticulitis. Chronic appendicitis though it has been mistaken for T.B. caecum usually does not produce the hypermotility with filling defects, but the adhesions that form after chronic appendicitis might easily produce severe deformity of the caecum simulating filling defects. In malignant tumours the radiological evidence rarely shows spasm, and the guts show stenosis in late stages. Amoebic dysentery or a chronic amoeboma may be impossible to differentiate from hypertrophic T.B. of the caecum without a laparotomy. Even positive evidence in the stools may be accompanied by T.B. intestine. Sprue ulcerative colitis and diverticulitis also have

the same difficulty and very often laparotomy or other circumstantial evidence is the important aid to diagnosis.

Complications.—(1) Mixed infection. (2) Hæmorrhage. (3) Stricture: (a) from healed ulcer; (b) from an excessive granulation tissue; and (c) cicatrix from excessive granulation tissue. (4) Peritonitis. (5) Abscess. (6) Fistula. (7) Perforation. (8) Amyloid disease.

Peculiarly enough perforation is a common complication in the male and stenosis is a common complication in a female. As a matter of fact the majority of the acute intestinal obstructions in women are due to stenosis of tuberculous origin.

PROGNOSIS.—Recently, the prognosis of intestinal tuberculosis has become much more favourable and surgery now-a-days offers, together with general aids to the treatment of tuberculosis, a much better prognosis.

TREATMENT.—I need not go into the details of the general measures in the treatment of intestinal tuberculosis because they are on the same lines as tuberculosis anywhere else. In the diet, however, regulation is very essential and any diet which increases peristalsis should be prohibited. Cold drinks, milk, strong coffee, concentrated juice, fruits, salads and many vegetables produce increased peristalsis. Usually a

high vitamin diet containing plenty of vitamin C and D should be prescribed.

Heliotherapy is a very important aid in the treatment of abdominal tuberculosis.

SURGICAL TREATMENT.—We have already pointed out that for a large number of cases a diagnosis can only be arrived at by laparotomy. Therefore we consider that even with a positive diagnosis of tuberculosis of the abdomen a laparotomy must be instituted both for the confirmation of the diagnosis as well as a means for the treatment. We have already remarked that the majority of cases of intestinal tuberculosis fortunately are situated in the ileocaecal region and are of hypertrophic type specially in the primary tuberculosis of the intestinal tract. Therefore in our opinion the treatment of choice is total extirpation of the diseased portion as far as possible. The treatment of choice is therefore a hemicolectomy in one or two stages. Unfortunately the majority of the patients that present themselves for treatment have gone beyond the stage of hemicolectomy. The next best choice that we fall back upon is a short circuiting operation of the uninvolved portion of the last part of the ileum with the transverse colon. There is a good deal of difference of opinion regarding the short-circuiting operation, as some authors believe that a short-circuiting opera-

tion should only be done in the presence of obstruction. We do not subscribe to that view. We believe that even in cases which are very advanced a short-circuiting operation offers good deal of rest to the affected part and gives a tremendous relief to the patient. We have short-circuited as much as 3 feet of the terminal ileum; although immediately after the operation the patients develop severe diarrhoea yet they get slowly adjusted and regain their bowel control within a month or so. There is a case on our record in which, after doing a short-circuiting operation in an extensive lesion in the absence of obstruction we followed up with pneumoperitoneum and after 18 months the patient reported to us in a much improved condition with radiological evidence of improvement in the bowel condition also. We were able to undertake a hemicolectomy after 18 months. This is the only example in our series but we believe that if many of the patients on whom we had the occasion to do a lateral anastomosis only got in touch with us or returned to us for treatment, it would be possible to treat them on more radical lines. Unfortunately the short-circuiting and following by routine pneumoperitoneum improves their general condition to such an extent that they do not think of returning to us for further radical interference. There

240625-2, N47
N 50.4-2

124024

is a good number of cases who after a laparotomy reveal such extensive involvement of the whole of the gut as well as the peritoneum that we have not been able to do anything further and were obliged to close up the abdomen. These cases we follow up as a routine with pneumoperitoneum. There is a very interesting case in our record of an apparently healthy man in whom we did a laparotomy and were shocked to see that extent of the lesion and were obliged to close the abdomen. The peritoneum was $\frac{1}{4}$ " thick studded with tubercles and we thought the prognosis would be very bad. We lost sight of the case for 2 years. He never returned to us for treatment nor for follow up. After two years he returned with an acute intestinal obstruction. We were again obliged to reopen the abdomen and this time there was another shock in store for us. This was a pleasant shock. There was not a single tuberculous evidence. The whole of the abdomen looked normal in appearance. The peritoneum had become even elastic and pliable. The only lesion we discovered was hypertrophic ileo-caecal tuberculosis with obstruction. We performed a lateral anastomosis and the patient recovered. We advised him to return for a hemicolectomy but we have never seen the patient since. The next line of treatment we follow is pneumoperitoneum with or

without laparotomy. We have found that in any involvement of the peritoneum pneumoperitoneum gives very good relief specially when there has been a fluid collection in the abdomen. Our practice is to give 300-500 c.c. of oxygen at fortnightly intervals. As the condition improves the interval is increased and ultimately we tell the patient to return to us for a filling of oxygen whenever he has any symptom such as : (1) lack of appetite; (2) pain; (3) constipation; and (4) distention. The response on the part of the patients for this particular type of treatment is remarkable. The reason, we believe, of the response to our call is the amount of relief that the patient obtains by the simple mechanism of a refill of oxygen. I have patients under my treatment who returned at 6-9 months intervals whenever there has been a little discomfort in the abdomen and insisted that a refill should be given. They always volunteer that one refill of oxygen keeps them happy and symptom free for a long time. There is a patient of mine who had a lateral anastomosis 9 years ago. She lives in Shikohabad and returns to me to Delhi like clock work once or twice a year. After a lateral anastomosis she has borne 3 children and is living a perfectly normal life.

MEDICAL TREATMENT.—I have no comments to offer on medical

treatment. I should like to make a special reference to the treatment of diarrhoea. Diarrhoea, which is sometimes a very troublesome complication, is very difficult to control in intestinal tuberculosis. We have found that sometimes castor oil in doses of $\frac{1}{2}$ -1 ounce gives good results. If castor oil fails to control diarrhoea it is wise to give Calcium Chloride intravenously. In my opinion it is probably the best remedy that we possess today far superior to any other drugs known to us even including opium by mouth or by rectum. It checks the diarrhoea, if not permanently, certainly temporarily. The usual dose is 5 c.c. of 5 per cent solution given once or twice a week in 4-5 doses. The explanation of the action of Calcium is said to be due to hemoclastic shock. The leucocytes decrease, the blood pressure falls and it is said that it forms an insoluble compound with surface protein while it is being excreted by the intestinal mucosa. Bismuth salt has been used for diarrhoea often successfully. An astringent is useful. Inert powders like Kaolin or

Talcum are said to produce coating on the mucous membrane and the influence is favourable to diarrhoea. We have found that Enemata of warm physiological salt solution with 10-20 drops of Tincture Laudanum in a pint of water given slowly and under little pressure very often helps the diarrhoea. We have had no good results with Silver Nitrate or Albergin colon wash.

Summary.—1. To summarise in tuberculosis of the intestine the best form of treatment is hemicolectomy in one or 2 stages.

2. The second best is ileo-transverse anastomosis.

3. The tuberculous fistula can rarely be successfully closed without a diversionary colostomy.

4. The patients who have active pulmonary lesions should have arrest of the lesion before abdominal operation. Exceptions to this statement are in cases of acute obstruction.

5. A large number of cases of primary intestinal tuberculosis exists in India. One has merely to expect it, suspect it, look for it and one will find it in abundance here.

Frequency and Peculiarities of the Proliferative Tuberculosis in India

DOZ. DR. GEORGE POLITZER,
DELHI.

WHILE Dr. Amir Chand considers the cases of abdominal tuberculosis as secondary manifestations deriving from a primary lung infection, Dr. S. K. Sen is of the opinion that many of the cases of the abdominal tuberculosis are primary infections of the gastro-intestinal tract. The statement of Dr. Amir Chand is surely correct for Europe but the fact that we find so often even severe cases of tuberculosis gastro-intestinal lesions without any changes in the lungs speaks in favour of Dr. S.K. Sen's opinion. I know very well that the primary symptoms in the lung can vanish without leaving behind any radiological symptoms but the fact that it happens so often in this country makes the possibility of a primary intestinal tuberculous infection a reality. This is not the only peculiarity of the intestinal tuberculosis in India but as I have no time to discuss this subject as a whole I will deal here only with the problem relating to the proliferative forms.

This disease is usually called in Europe Tuberculous Ileo-cæcal tumour, a name which contains already the statement that it is practically

only to be found in a special locality i.e., the area near the ileo-cæcal valve. The statement is surely correct for Europe, if we widen the area slightly to both sides including thus the last loops of the ileum and lower parts of the ascending colon. Here in India this localization is also found in the majority of the cases, but nearly a quarter of them is located otherwise and create such radiological appearances which were unknown to me. The part of the gastro-intestinal system in which I was encountering proliferative tuberculous changes was mostly in the flexura duodeno-jejunalis. The first case soon after my arrival in India was a thirty years old lady who was suffering from an old fibrous type of tuberculosis of lungs and complained that for many months she was able to live on liquid food only, while she was vomiting if she took to solid one. The Roentgen examination showed a normal stomach following which a child-head-sized sharply outlined body was visible which by palpation could be separated in the enormously dilated parts of the duodenum. The picture proved beyond doubt that it was a case of stricture of the

flexura duodeno-jejunalis, but I left it to discussion as to what may have been the origin of it. Usually strictures in this area are of acute nature as in the arterio mesenterial occlusions or the Treitzian Hernia. This was a chronic case and the diagnosis of carcinoma was not well to be made in view of the excessive stenosis, the young age and other reasons. So I ventured to consider the case tuberculous. The patient has not been operated but nine years later I met a relative of the patient who told me that she was still alive living on liquid food, but that her condition is now deteriorating quickly as a tuberculosis of the larynx has recently developed. A second case which I saw much later showed less pre-stenotic dilatation of the duodenum but presented a rugged canal which led into the flexura duodeno-jejunalis. The case was operated and afterwards treated by X-ray and is in good condition. A third case looked rather similar to the second as far as the duodenum and flexura duodeno-jejunalis were concerned. But it showed two peculiarities: (1) The stomach was dilated and pylorus canal mostly open. Ulcer could be excluded. (2) An interesting feature was that a similar change was found in the lower ileum. While during the operation upper stenosis was excluded by an anastomosis the lower was removed and showed clearly the fea-

tures of proliferative abdominal tuberculosis.

The small intestines are relatively rarely attacked by this disease if we exclude the lowest loops of the ileum. The following case may illustrate the radiological picture of the disease. In a relatively young patient we found two typical stenosis of the small intestines which showed pre-stenotic dilatations and a rugged mucosa on the place of the stenosis. One was in the lower jejunum and the other in the lower ileum. Dr. Joshie who operated this case found a third although less extensive tumour in the upper ileum.

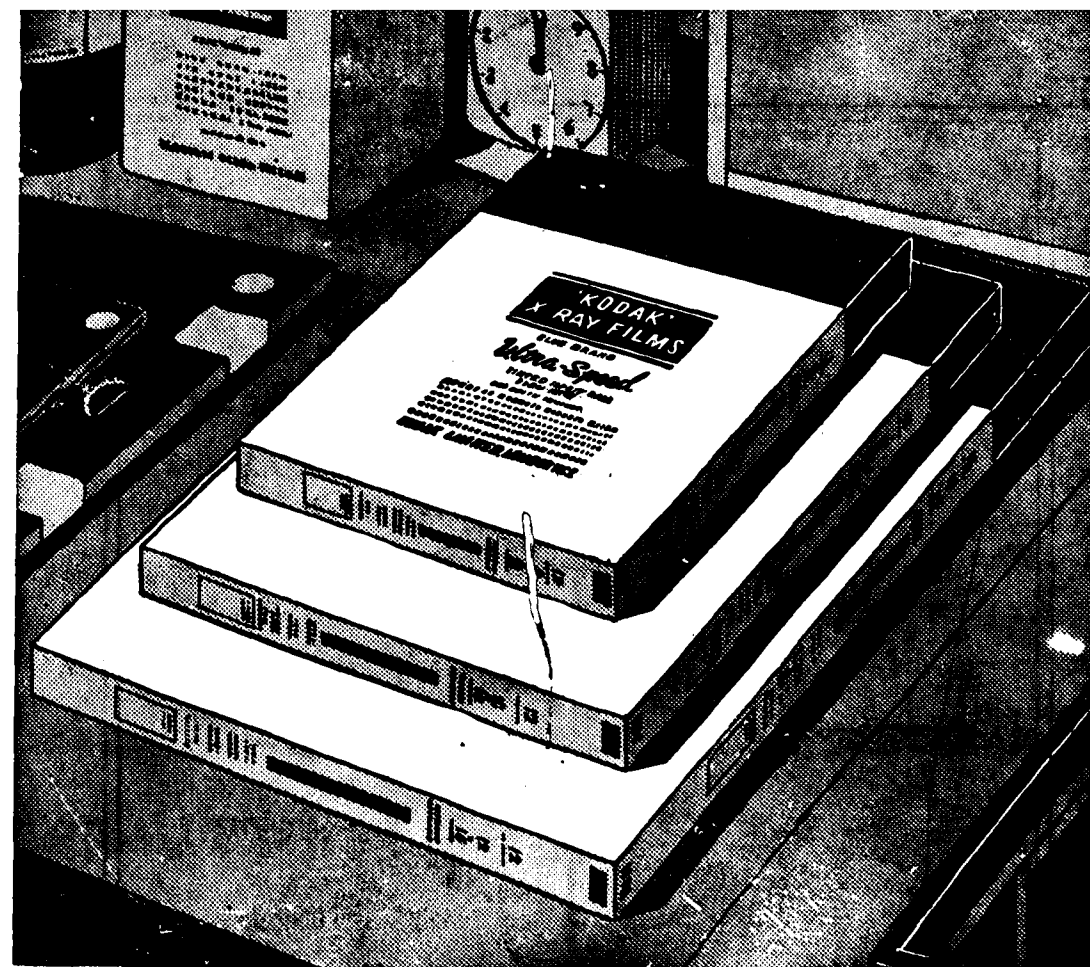
The tumours of the lowest iliac coils and the valvula Bauhinii and the cæcum want no detailed descriptions. It may be only stressed, the fact that oral administration of the barium alone gives no exact boundaries of the pathological defect. The defect is usually enlarged by spastic contraction (so-called Stierlin's defect) so that we misjudge the size of the tumour to be bigger than it really is. Here the examination by barium enema is indispensable especially if the case is to be operated. The localization in the colon transversum may be illustrated by a case whom I saw in Patiala in 1938. It concerned a young soldier which showed in the area of the umbilicus a man's fist-sized tumour which was easily movable upwards and downwards and to a lesser extent to the

right and left. The X-ray examination showed that a five inch long part of the transverse colon had an irregularly narrowed lumen. The operation proved again the correctness of the diagnosis; namely proliferative abdominal tuberculosis. An extremely big tumour of this quality which concerned the left colic flexure has been overlooked in the following case: We examined a patient showing rather vague obstructive symptoms by Barium enema and stopped the examination according to the wish of the surgeon as soon as we reached the hepatic flexure. Later the surgeon nevertheless opened the abdomen and found a huge tumour of the splenic flexure which was also tuberculous in origin. The lowest point on which I saw a tumour belonging to the same nature was the boundary between descending and sigmoid colon.

I believe that on the basis of these findings some positions have to be taken to the question of the Crohn's disease. While for instance recently in the last book of the Berg School the Crohn's disease is simply omitted, American and to a lesser extent English authors are stressing the necessity of considering the proliferative changes in the lower ileum as a special pathological entity. Crohn himself distinguishes between acute and chronic forms of the disease described by him. The existence of the acute and chronic

forms in India is out of doubt. In 2½ months, that I spent in Bikaner, I found there typical cases of proliferative jejunitis and I have seen cases of ileitis several times, the last being a few days ago. But I doubt if the chronic proliferative changes as described before have much to do with Crohn's disease. It seems that all of them or at least the overwhelming majority are tubercular in origin. In favour of this opinion speaks the fact that they are often combined with intestinal tubercular manifestations as tabes mesenterica or adhesive tubercular peritonitis and furthermore the good results of treatment with streptomycin as seen by myself and reported by others.

Finally it would be interesting to know why abdominal tuberculosis in general is more common in India than elsewhere. In Northern India, where I have worked for the last thirteen years, the intestinal tuberculosis is found at least twenty times more often than the ulcer and the carcinoma and that is still a conservative estimate. In European countries the relation is just the opposite. It is difficult to bring this in connection with the peculiarities of the Indian habits or the Indian diet, but it is possible that the gastro-intestinal tract is weakened in India by frequent infections or attacks of amoebic dysentery which lower the resistance to the onslaught of tuberculosis.



KODAK BLUE-BRAND *Ultra-Speed* X-RAY FILM

FOR maximum diagnostic value, the standardised conditions of modern medical radiography call for a film of the highest consistency, which can be relied upon always to provide identical performance under identical conditions. The exceptional speed, high contrast, and above all the consistency of 'Blue Brand' X-Ray film make it the first choice for all radiographic applications requiring a high-speed screen film.

Stored by Kodak Limited in special low temperature rooms to preserve freshness.

**KODAK
LTD.**

(Incorporated in England)

BOMBAY
CALCUTTA
MADRAS

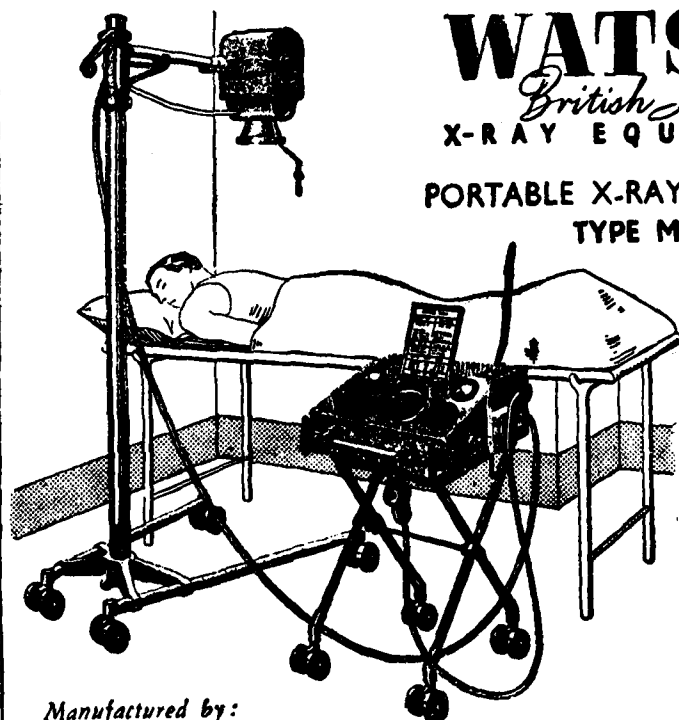
Also at:

LAHORE
KARACHI

G.E.C. PRESENTS

WATSON
British Made
X-RAY EQUIPMENT

PORTABLE X-RAY APPARATUS
TYPE MX-2



AND A COMPLETE
RANGE OF
X-RAY AND
ELECTRO-MEDICAL
EQUIPMENT

Manufactured by:

WATSON & SONS (Electro-Medical) LTD.

Selected in preference to others by the Ministry of Health, leading Hospitals and eminent Radiologists in the U.K., the demand for Watson Equipment has now spread to nearly every country of the world. A product of the brains of a team of brilliant scientists and technicians, extensive tests and experience have proved Watson X-Ray apparatus to be capable of giving the most satisfactory radiographic results both in peace and under the arduous conditions of warfare.

THE
WATSON RANGE
INCLUDES:

Roentgen IV	400 mA. 100 kVp.
Double Twin	150 mA. 100 kVp.
Mobilix Ward Mobile	60 mA. 95 kVp.
Portable Type MX-2	15 mA. 80 kVp.
XT. 1 Deep Therapy	25 mA. 230 kVp.
ST. 150 Medium Therapy	8 mA. 150 kVp.
"Kingsway" Dental Unit	

AND the Watson Service has now been extended to India by
THE GENERAL ELECTRIC COMPANY OF INDIA LTD.

Representatives of
THE GENERAL ELECTRIC COMPANY LIMITED OF ENGLAND.

CALCUTTA • KANPUR • DELHI • MADRAS • BANGALORE • COIMBATORE • SECUNDERABAD • BOMBAY.

Symposium—Intestinal Tuberculosis

DR. K. MANJUNATH RAI, M.B., F.R.C.S. (E.), D.M.R. (Lond.),

DIRECTOR, BARNARD INSTITUTE OF RADIOLOGY, MADRAS.

AN attempt was recently made in our Hospital (Government General Hospital) to review cases admitted as Intestinal tuberculosis during the decenium 1939-1948 by one of our research scholars. A total of 365 cases were reviewed out of which 125 were surgically treated. Out of this number, 125, as many as 76 were histologically proved to be tuberculous. The cases with symptoms of intestinal tuberculosis admitted into the hospital during the last two years were 102, which included a number of cases of non-specific ulceration. The diagnosis was based upon clinical findings, laboratory investigation and radiological evidence.

In this series, the youngest patient was 13 years old and the oldest was 51 years old. The average age was 29 years. The duration of the disease varied from 3 weeks to 10 years, the average duration being 3 years. The clinical manifestation of intestinal tuberculosis might be mild for months or years and the involvement may be widespread and of long duration. The ratio of females to males was about 3 : 2. Patients who had advanced pulmonary tuberculosis numbered 21. They were referred to sanatoria and their

subsequent course has not been known. A complete follow-up was possible only in 44 of the cases treated surgically.

Clinical study of the 44 cases

The predominant presenting complaint in this group of individuals was *abdominal pain*, usually intermittent in character, colicky in nature and often localised to the right lower quadrant and the periumbilical region. It was of the vague generalised abdominal type in certain cases. When the lesion was limited high up in the jejunum or proximal ileum, the pain was periodical and was related to taking food as in duodenal ulcer. The second most common symptom was *loss of weight*.

Diarrhoea and intermittent constipation were noted only in few. *Vomiting* occurred in only 7 cases. Discharging *abdominal sinuses* were found in one case. Two cases came with symptoms of *acute intestinal obstruction* and were treated as emergencies. Irregular moderate after-noon *rise of temperature*, associated with a mild degree of *toxaemia*, was present in many of the cases. Signs of *nutritional deficiency* were present. A *palpable tumour* in the

ileo-cæcal region was present in 60 per cent of the cases. *Visible peristalsis* was noted in a few, and in them *tense sausage shaped tumours* were occasionally palpable—around the umbilical region.

Roentgenological Manifestations

X-ray studies afforded the only means of confirming the clinical diagnosis to a great extent. The roentgen signs of diagnostic value were:

(1) Failure of the cæcum and the ascending colon to retain the barium in a Ba. meal series (Sterlein's sign, *vide picture*).

(2) Presence of spasm or filling defects, irregularities in contour and absence of haustrations. The filling defect was irregular in outline and corrugated in appearance—giving rise to a longitudinal shrivelling of the cæcum.

(3) Dilatation of the ileal loops.

(4) Undue delay in the emptying of barium in the ileal loops and the stomach sometimes.

(5) A wide shadow of the barium in the terminal ileum without the normal pointed appearance of the regurgitation of the barium into the ileum during an enema (Fleishener's sign, *vide picture*).

(6) Hyper-mobility associated with a deficiency state of the small gut in two instances.

(7) Multiple fluid levels in the small gut due to multiple strictures were noticed in one case.

Pulmonary lesions were found in 11 cases and the others did not show any. Skiagrams could not be taken in a few, but the clinical examination did not reveal any pulmonary pathology.

It was previously thought that intestinal tuberculosis was rare unless there was a pre-existing pulmonary disease. More than 19 cases had tuberculosis of the bowel without any clinical or radiological evidence of primary elsewhere in the body. This is in accordance with the observation made by Dr. S. K. Sen.

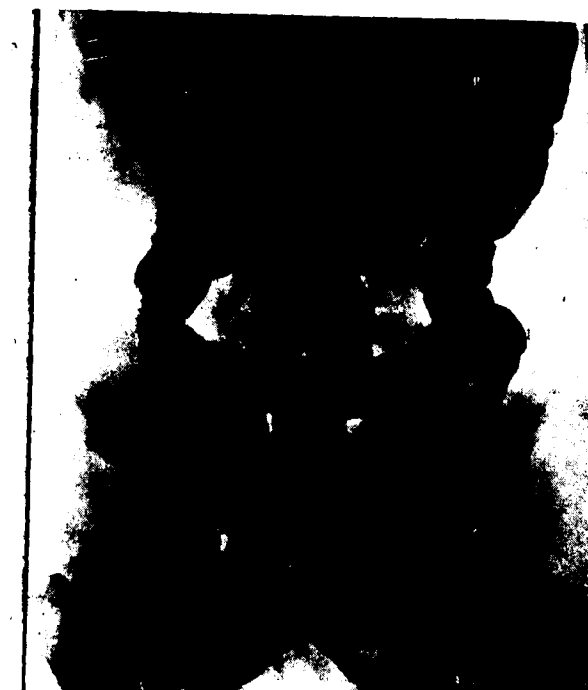
Morbid Anatomy

The peritoneum, spleen and liver were remarkably free from tubercles. The liver showed varying degrees of fatty change. The greatest incidence of intestinal tuberculosis was found in the cæcum, and next in the order of frequency being that in ileum and colon.

Extensive involvement of the jejunum and the ileum with almost absolute freedom of involvement of the terminal ileum was observed in a few cases. The intensity of the infection was noticed in the proximal ileum and as the distal portion of the ileum was reached, the lesions were few and far apart, the terminal 1 to 2 feet looking normal. Stricture formation and dilatation of the



SKIAGRAM 1.



SKIAGRAM 2.



SKIAGRAM 3.

SKIAGRAM 1.—Failure of the cæcum and the ascending colon to retain the barium in a Barium meal series (Sterlein's sign).

SKIAGRAM 2.—Failure of the cæcum and the ascending colon to retain barium as shown in Barium enema.

SKIAGRAM 3.—Shows spasm or filling defects, irregularities in contour and absence of haustrations, giving rise to a longitudinal shrivelling of the cæcum.



SKIAGRAM 4.—Shows undue delay in the emptying of Barium in the ileal loops—irregular filling of the caecum—demonstrating Fleishner's sign.



SKIAGRAM 5.—Multiple fluid levels due to tuberculous strictures.

segment of the bowel in between, strictures were observed in these cases. The mesenteric lymph nodes draining the terminal ileum in these cases showed evidence of tuberculous infection while there was no ulceration of the gut. In the absence of any demonstrable focus elsewhere in the body, it is surmised that this type of the lesion could be designated the primary intestinal complex.

Another interesting observation was regarding the location and distribution of the mesenteric fat. In cases where the resected gut was of a non-specific nature, the serosal surface of the affected segment was almost entirely obscured by the extension of the mesenteric fat.

Attention has to be drawn to the fact that it is impossible on a basis of clinical features of morbid anatomy to distinguish between hyper-plastic entero-colic tuberculosis and non-specific enterocolitis. There were more than two instances in which the condition was mistaken to be malignant, but proved to be due to tuberculosis histologically. There was a single case in which the caecum was the seat of an adenocarcinomatous process with tuberculous infection in which case the malignancy was least suspected on the operation table.

Tuberculosis of the Stomach

Tuberculosis of the stomach is comparatively rare. This condition

cannot be diagnosed clinically or roentgenologically without bacteriologic evidence of the disease.

Tuberculosis of the stomach is generally considered a secondary condition; usually associated with pulmonary tuberculosis. It may produce a gastritis, multiple erosions, ulcerations, hypertrophy, or miliary lesions. The inflammatory form is said to be common, but the ulcerative type predominates. The hypertrophic or tuberculoma variety is the least common. It may produce an annular filling defect with signs of stenosis. The pylorus and lesser curvature are the most frequent sites.

The roentgen diagnosis is most difficult. In the majority of the cases the roentgen examination will reveal some evidence of organic disease, such as gastritis, ulcer niche, or tumour filling defect.

Tuberculosis of the Intestine

Tuberculosis of the intestine, particularly in the adult, is likely to be secondary to pulmonary tuberculosis, though it may occur in its absence or when the disease is inactive. It is most frequent in the lower ileum, caecum, and ascending colon, and the mesenteric lymph nodes are usually involved also.

Roentgenologic examination should begin with the administration of barium meal and systematically following its course through the gastro-intestinal tract. The first

roentgenologic observation of the ileo-cæcal region is usually made six hours later and is followed by serial observations at intervals of thirty to sixty minutes, until the entire cæcum and ascending colon have been examined. A final observation is made at the end of eighteen to twenty-four hours.

At the six-hour examination the head of the barium column is likely to be in the transverse or descending portion of the colon, and the tail in the terminal ileum, while the cæcum and ascending colon are unfilled giving the impression that the barium meal has jumped or skipped that portion of the bowel; while the adjacent portion of the bowel appears normal. When the lower portion of the ileum near the cæcum is involved, the six-hour observation may show this portion of the bowel empty, as well as the cæcum and ascending colon. The haustral marking of the cæcum and ascending colon is usually absent. These observations, however, are not diagnostic and may occur in any type of ulcerative or infiltrative lesion involving the cæcum and ascending colon. A definite diagnosis should not be made on such findings until a barium enema examination is done. If the lesion is tuberculosis it is common to find the barium passing through the affected area very rapidly so that it is difficult to see the barium column under the screen. Repeated exami-

nations will show the lesions in the same place; but the appearance of the involved area need not necessarily be the same. Palpation under the screen will show the tenderness confined to the same segment of the bowel.

Unless its use is contra-indicated by the risk of perforation, a double contrast enema (barium, followed by the injection of air) is a valuable means of studying intestinal tuberculosis and characteristic roentgenologic signs are filling defects, spastic phenomena, irregular constrictions, and obstructions. Fistulas and intussusception may also occur, and it may be impossible to manipulate the terminal ileum because of adhesions.

Intestinal tuberculosis must be differentiated roentgenologically from certain other inflammatory diseases, such as non-specific granulomatous enteritis, which produce ulceration, infiltration, and tumour formation in the small intestine, as well as from soft mucoid carcinoma. Roentgenologically, the picture may be so similar in all these diseases that differentiation on this basis alone will be impossible. Kirklin and Weber point out that in typical instances of tuberculous enteritis the luminal contour is roughly and irregularly corrugated, whereas in typical cases of chronic non-specific enteritis it is relatively smooth and the narrowing

of the affected portion is uniform. If the changes involve fairly long segments of bowel, and if active pulmonary tuberculosis cannot be demonstrated in the patient, the changes are that the condition is non-specific enteritis. If the changes are limited to a small segment of bowel, the probable diagnosis is acute mucoid carcinoma of which the major portion has disintegrated and only the base remains.

Planigraphy and Tracheobronchial Tuberculosis

ANTONIO GOVONI, M.D.,

SPEC. RADIOLOGY,

ASSISTANT OF THE INSTITUTE OF RADIOLOGY, UNIVERSITY OF FERRARA.

TUBERCULOUS tracheobronchitis shows definite pathological pictures but unfortunately does not always present itself with symptoms of pathognomonic value.

Such condition is a rather frequent occurrence, according to the statistics of many authors as Samson⁽¹⁰⁻¹¹⁾; Warren, Hammond and Tuttle⁽¹⁷⁾; Secraton⁽¹³⁾; Steiner⁽¹⁵⁾ *et al.*, that agree on an incidence of 10-15 percent.

This T.B. localisation is shown in subjects aged from 20 to 40 years and the female sex is more susceptible while the bronchial carcinoma is more frequent in male individuals.

Subjects affected with tuberculous tracheobronchitis are generally well developed and nourished, apparently not very ill whenever the lung affection is not of a great severity.

Among the most frequent symptoms there are: the cough, sooner or later almost generally present, irri-

tative, rebel to treatment; a scanty expectoration; the frequent blood streaked-sputum and rarer true hæmoptysis. Sometimes a sudden possee of koch infected sputum in a patient, whose lung lesions of little entity can't justify this possibility, is of great diagnostic value. Fever has not a regular course and dyspnoea, if present, is not in relation to the stage of the pulmonary lesions.

From the radiological point of view the following findings can lead to a diagnosis of tuberculous tracheobronchitis: (a) the sudden showing of a lobar or zonal band of atelectasis, occasionally occupying the whole lung; (b) the persistence of a ballooned cavity not yielding to collapse therapy; (c) "migratio inspiratoria mediastini" toward the affected side (symptom of Holznecht Jacobson); (d) and lastly a diminished inspiratory transparency followed by an increased expiratory

diaphany of pulmonar parenchyma (obstructive emphysema of Steiner).

The preferred site of involvement is the inner of main bronchus or of lobar bronchi. Such localisation is bound to give a peculiar clinical course and symptomatology.

In the past few years bronchoscopy has made a markedly high contribution to the diagnosis of tracheobronchial tuberculosis, often absolutely decisive. Nevertheless there are anatomical limits to the possibilities of this research since, not infrequently, the various specific bronchial lesions cannot be reached, not even by using angular optics. The absence of the bronchoscopic instruments in many sanatorial institutes, the reluctance of patients and unfortunately the incomprehension of physicians for this new diagnostic research, are other reasons for the limited application of bronchoscopy.

The visualisation of the bronchial system by planigraphy is limited, in normal conditions, to the main bronchi and to the largest bronchial branches. In some pathological conditions also the lesser bronchi can be shown with the greater contrast. In a middle depth planigram are easily recognised the trachea as a large median light-band and the main bronchi as two light images branching out into the lobar bronchi. When a bronchus has a course parallel to the X-ray beam, it is seen as a

dark-ringed area of transparency. When a tapering bronchus image is seen one is not bound to interpret it as a pathological pattern.

The bronchial wall is seen as a thin contour and can be followed to the lesser bronchi.

It is of some use to make the planigram under a certain degree of obliquity in order to obtain dissociated images and to have a better showing of the bronchial morphology.

In the planigraphic diagnosis of bronchial tuberculosis we think that the most frequently observed patterns are:

(a) Thickenings of the bronchial contours; these can be limited to a single tract of wall and shows not necessarily homogeneous opacity.

(b) Clear and dark zones occurring in the same picture, due to vegetative and ulcerative processes.

(c) Bronchial wall showing outlines due to the shrinking and vegetating mucous membrane. The bronchial lumen assumes a dented contour and bronchus appears enlarged, deformed and presenting an irregular course.

(d) At last, the most peculiar sign is the bronchial stenosis of various entity which can reach the complete obstruction of the lumen.

Of course these findings are usually shown "in toto" or partially in

Planigraphy and Tracheobronchial Tuberculosis
Antonio Govoni.



FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.

the planigrams. An accurate analysis of these planigraphic signs can lead to the diagnosis of tuberculous tracheobronchitis. Concluding we think that Radiology can suggest to the phthisiologist useful elements for diagnosis. It is our belief, however that even planigraphy—as any other branch of diagnostic Radiology—can give only contributions and that radiological data must be always related to those obtained by other clinical and laboratory tests, with a special place for the bronchoscopy. This examination must be possibly made in every case, for sometimes the direct bronchus visualisation allows a better appreciation of early lumen lesions not evidenced by planigraphy. We rather add that the two proceedings must always go together one complementing the other. In fact bronchoscopy besides giving a direct view of bronchus lumen pathological pattern and inferences on the extrabronchial processes, allows us the picking up of biopsy material from the altered bronchial mucous membrane; on the other hand planigraphy furnishes a complete picture of the bronchial tree in its morphology and its relations with surrounding paranchyma and more over gives evidences of the lesions of the peribronchus, sometimes the only features of bronchial tuberculosis.

The following cases will illustrate a few patterns of bronchial tuberculosis.

Case Reports

CASE 1.—Fibrocaceous tuberculosis in collapse therapy which has shown a sudden atelectasis localized to the left upper lobe.

Planigraphy has revealed an upper lobar bronchus with marked stenosis; a lower lobar stenosis; a lower lobar bronchus enlarged with inner contours irregularly outlined.

Bronchoscopy has shown a catarrhal infiltration of the lobar bronchi with an upper bronchus lumen narrowing and a lower bronchus lumen vegetating and ulcerated. (*Fig. 1, vide picture*).

CASE 2.—Ballooned cavity. Pneumothorax for three years.

Planigraphy shows a cavity with marked contours, drainage bronchus visualised, with irregular course.

Bronchoscopy examination has been impossible for the patient couldn't tolerate it. Normal finding to the carina tracheæ. (*Fig. 2, vide picture*).

CASE 3.—Ulcerative and caseous tuberculosis.

Planigraphy:—Left main bronchus slowly narrowing to a funnel-like image.

Bronchoscopy:—Endobronchial vegetations and ulcerations due to stenosis. (*Fig. 3, vide picture*).

CASE 4.—Ulcerative tuberculosis of the upper right lobe.

Planigraphy:—Upper right bronchus narrowing when it is leaving the main bronchus and main bronchus and lobar bronchi normal picture deformed.

Bronchoscopy:—main bronchus presenting an extensive catarrhal infiltration with vegetations. The smear was Koch positive. (Contours of the bronchi have been underlined). (Fig. 4, vide picture).

CASE 5.—A disseminated form of bronchopneumonic tuberculosis of the left upper lobe.

Planigraphy reveals only a left upper bronchus changed pattern. Bronchoscopy reveals a reddening carina tracheæ

which appears of edematous, while an extensive layer of exudate hides a few vegetations on the main bronchus. The smear was positive. (Fig. 5).

CASE 6.—Severe ulcerative tuberculosis of the right upper lobe; the



FIG. 6.

collapse therapy had been tried but pneumothorax resulted ineffective and incomplete owing to an extensive apical adherence. Sputum was always positive.

Planigraphy shows a right main bronchus enlarged with an eccentric carina tracheæ.

The patient refused the bronchoscopy examination. (Fig. 6).



FIG. 5.

References:

1. Avallone and Vago—Indicazioni Clinico-Radiologiche alla Broncoscopia nella tubercolosi polmonare. Meeting of the Associazione Lombarda per la Lotta contro la Tuberculosis, Milano, 1949.
2. Birkelo, C.C. and Poznak, L.A.—The Radiological Findings in Tracheo bronchial Tuberculosis. Diseases of Chest, 1945, XI, 26.
3. Burgher, Littig, J. and Culp, J.—Tuberculous tracheobronchitis. Its pathogenesis, Amer. Journal of Medic. Sc., 1937, CXCI, 515.
4. Fegiz, G. and Morabito—La tubercolosi bronchiale. Rivista di Patologia e Clinica della Tuberculosis, 1948, XXI, 317.
5. Giobbi and Luzzatto—Le stenosi bronchiali. aspetti clinici e radiologici. Meeting of the Assoc. Lomb. per la lotta contro la Tuberc. Milano, 1949.
6. Gramazio, V. and Tosi, B.—Atelettasia massiva lobare in corso di Tbc polmonare. Riv. di Patol. e Clin. della Tuberc., 1947, XX.
7. Gyselen, A.—La tuberculose bronchique. Revue Belge de la Tuberculose, 1947, XXXVIII, 208.
8. Luzzatti and Vago—Raffronto dei reperti tomografici e bronchoscopici nelle stenosi tracheo-bronchiali. Meeting of the Assoc. Lomb. per la lotta contro la Tuberc. Milano, 1949.
9. Pietrantoni—La tracheobroncoscopia nella tubercolosi polmonare. Meeting of the Assoc. Lomb. per la lotta contro la Tuberc. Milano, 1949.
10. Samson, P. C.—Tuberculous Tracheobronchitis. American Review of Tuberculosis, 1936, XXXIV, 671.
11. Samson, P. C.—Diagnosis, Treatment and Prognosis in Tuberculous Tracheobronchitis, Journal of Thoracic Surgery, 1937, VI, 561.
12. Santy Berard—Stenoses des grosses bronches au cours de la tbc pulmonaire chronique tertiaire de l'adulte. Archives Med. Chir. de l'App. Resp., 1942-45, No. 6.
13. Secratan, P.—La tuberculose de la trachee et des grosses bronches peut-elle se diagnostiquer par l'examen clinique seul? Schweizerische Med. Wochschr., 1946, XLVIII, 1237.
14. Silverman, G.—Tuberculosis of the Trachea. Diseases of Chest, 1945, XI, 26.
15. Steine, P. M.—Main Bronchi Tuberculous Stenosis. Schweizerische Zeitschrift fur tuberculose, 1946, III, Sup. 1, 1.
16. Tosi B. and Cati A.—L'indagine stratigrafica dell'apparato respiratorio, Ed. Arti Grafiche Crosignani, Milano, 1942.
17. Warren, W., Hammond, A. E. and Tuttle W. M.—The Diagnosis and Treatment of Tuberculous Tracheobronchitis. Amer. Rev. of Tuberc., 1928, XXXVII, 315.



CONTRAST MEDIA
with optimum radiographic opacity

IODOBILE for Cholecystography

IODURON for Elimination and Retrograde
Pyelography, Cerebral Angio-
graphy, Venography, Arterio-
graphy and Joint Radiography

IODURON "B" for Bronchography, Hystero-
graphy and Salpinography

Supplies have arrived and will shortly be available from our Sole
Distributors:-

HIND CHEMICALS LTD., 104, Apollo Street, Bombay, 1,
or through their stockists all over India.

CILAG-HIND  LIMITED

Mubarak Manzil, Apollo Street, Bombay, 1.

NAS. 520



THERAPY OF TUBERCULOSIS WITH

PAS-CILAG

MEANS :

Intensive tuberculostatic action verified by numerous origi-
nal clinical reports—

Excellent tolerability on account of absolute chemical purity—

Exact and individual dosage with a complete range of
presentations :

Granules 65 %
Pills 0.3 gm.
Tablets 0.5 gm.

for peroral administration, containing ANHYDROUS ACID of 25%
higher therapeutic efficacy in comparison with equal doses of
Sodium Salt

Ampoules 10 and 2 cc, 20%

for intravenous and intra-thoracic application respectively

Supplies of **PAS-CILAG** have arrived and will shortly
be available from our Sole Distributors:-

HIND CHEMICALS LTD., 104, Apollo Street, Bombay, 1,
or through their stockists all over India.

CILAG-HIND  LIMITED

MUBARAK MANZIL, APOLLO STREET, BOMBAY, 1.

NAS. 517

Heart and Tuberculosis

ANTONIO GOVONI, M.D.,

SPEC. RADIOLOGY,

ASSISTANT, INSTITUTE OF RADIOLOGY, UNIVERSITY OF FERRARA.

WE do not refer in this paper to the well-known cardiac localisations of the Koch bacillus, but we are rather attempting to throw light on the possible cardio-vascular repercussions that may join with a pulmonary tuberculosis due to altered circulatory mechanics as well as to the action of tubercular toxins. To the tubercular toxins we must attribute the frequent tachycardia, for their effects on the nervous system (spinal vaso motor centers and vessel nervous terminations) or else on the thyroid gland. Arterial hypotension is a rather common finding in tubercular patients, being possibly referred to the effects of toxins on tonus and circulation of the myocardium and finally to the deficient functioning of the adrenal as frequently seen in T.B. pictures.

In order to demonstrate the above mentioned repercussions we have fixed our attention on the relations between pulmonary tubercular conditions and cardiac area modifications.

Since the first pathological researches on the heart of subjects who died due to pulmonary tuberculosis a smaller development of the cardiac area had been noticed; at the same

time had been pointed out a relation between heart and constitution.

The discussion is still open if a smallness of heart might be a coefficient to pulmonary tuberculosis (for a diminished resistance of tissues to a lesser blood supply) or if such diminution might be a consequence of the general atrophy of the organs. Others, moreover are thinking that the small size of the heart may be referred to an adaptation of this organ to the changed breathing conditions.

In order to obtain dates of some importance on the relation between cardiac area and pulmonary tuberculosis we have extended our researches to a large number of cases.

The material examined is constituted by 1,500 radiograms of subjects affected by different forms of pulmonary tuberculosis. The cardiac areas have been drawn by the proceeding of the millimetered paper. Accurate clinical and radiological analysis of the different forms has been made in order to distribute the various types in two classes: (a) Forms of pulmonary tuberculosis mostly of the fibrous-retrogressive type; and (b) forms mostly with exudative progressive processes. The

choice has been limited to those cases not showing causes which could possibly alter the morphology of the heart (pneumothorax; phrenic paralysis; adhesences; fibrous-shrinking; pneumoperitoneum; extrapleural pneumothorax; thoracoplasty; pleurisy with effusion; heart condition and so on).

Only 500 subjects present a sufficient homogeneity with regard to the following factors: age; body-weight; height and thorax circumference. The sex factor values are not homogeneous because 250 subjects belong to the male sex and 250 to the female; nevertheless these values are equally distributed. The 500 subjects of these researches were aged from 20 to 40; their weight varying from 45 to 90 kg. and their height from 1.50 to 1.90 m.

The division into two classes in accordance with the different forms of pulmonary tuberculosis is the result from a long period of radiological and clinical observation. It was suggested by the opportunity of working on classes the most homogeneous and at the same time distinguished, this in order to observe the relations existing between the two classes and the cardiac area and eventually to disclose the possible antagonism.

In the following Tables are shown the data referring to the 1,000 patients divided only in accordance with the tubercular form, and data collected on 500 subjects divided according to the evolution of the tubercular form and to the sex, provided with the indications of height, weight, thorax circumference and age.

TABLE I

Male subjects afflicted by forms of chronic productive and exudative tuberculosis.

Both Forms.	Chron-Prod. Forms.	Exud. Forms.
Ma. of the cardiac area (cm ²) 91.5	93.4	89.2

TABLE II

Female subjects afflicted by forms of chronic productive and exudative tuberculosis.

Both Forms.	Chron-Prod. Forms.	Exud. Forms.
Ma. of the cardiac area (cm ²) 83.6	88.5	80.2

TABLE III

Serial mean of data of Table I (a) and Table II (b)

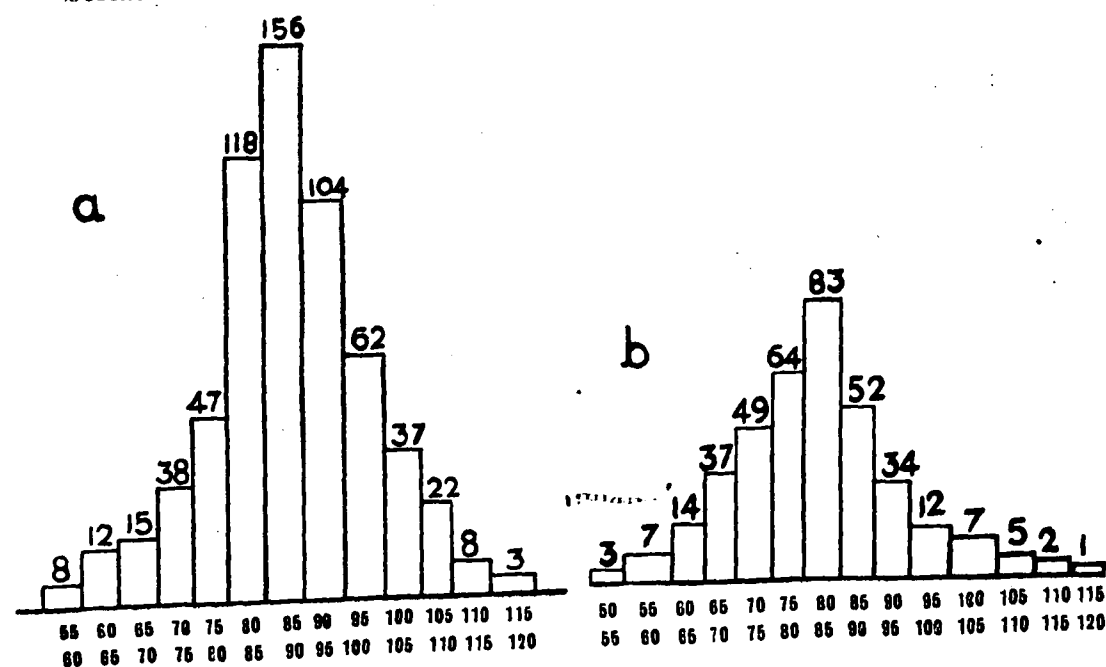


TABLE IV

Cardiac area data of 250 male subjects afflicted by forms of chronic productive and exudative tuberculosis, with the values of height, weight, thorax circumference and age.

Both Forms.		Chrono-Prod. Forms.	Exud. Forms.
Ma.	90.8	93.5	89.4
Height	1.68 m.	1.69 m.	1.70 m.
Weight	63 Kg.	61 kg.	64 Kg.
Thor. Circum.	86.12 cm.	88.5 cm.	88 cm.
Age	26	26	27

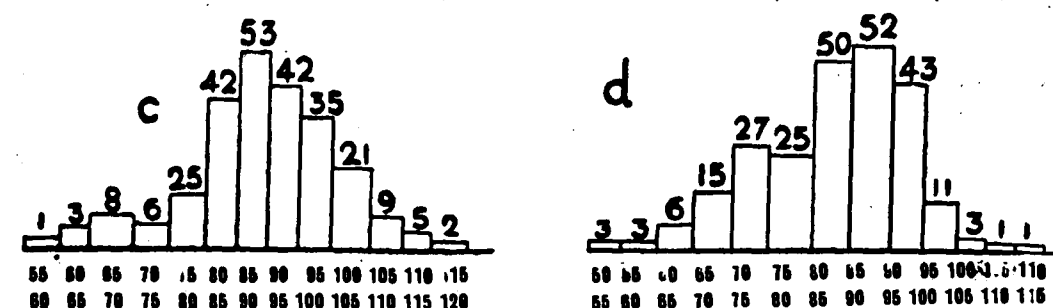
TABLE V

Cardiac area data of 250 female subjects afflicted by forms of chronic productive and exudative tuberculosis, with the values of height weight, thorax circumference and age.

Both Forms.		Chrono-Prod. Forms.	Exud. Forms.
Ma	82.9	87.8	78.0
Height	1.60 m.	1.59 m.	1.65 m.
Weight	54 Kg.	62 Kg.	54 Kg.
Thor. Circum	81 cm.	79 cm.	89 cm.
Age	27	25	27

TABLE VI

Serial mean of data of Table IV (c) and Table V (d)



Comparing our data with those observed in healthy subjects the mean value of the cardiac area seems to be at lower levels in tuberculosis affected subjects (Table VII).

TABLE VII

Govoni	Podesta	Govoni	Podesta
Male Subjects		Female Subjects	
91.5 (Tab. I)		83.6 (Tab. II)	
90.8 (Tab. IV)	89.5	82.9 (Tab. V)	89.6

Our data as shown in Tables I–II and IV–V agree with those obtained by Podesta of whom we adopted the measuring procedure (in Table VIII all forms, in Table IX the divided forms).

TABLE VIII

Govoni	Podesta	Govoni	Podesta
Male Subjects		Female Subjects	
91.5 (Tab. I)		83.6 (Tab. II)	
90.8 (Tab. IV)	89.5	82.9 (Tab. V)	81.4

TABLE IX

Govoni	Podesta	Govoni	Podesta
Male Subjects		Female Subjects	
93.4 (Tab. I)		88.5 (Tab. II)	
93.5 (Tab. IV)	95.2	87.8 (Tab. V)	85.3

Chronic Productive Forms.

89.2 (Tab. I)		80.2 (Tab. II)	
89.4 (Tab. IV)	88.1	78.0 (Tab. V)	79.7

Exudative Forms.

The values of the cardiac area observed on female subjects affected by chronic productive forms are higher than those seen in subjects, of the same sex, affected by exudative forms of tuberculosis as shown in Table I-II and IV-V. We can point out a perfect analogy for what concerns the male subjects.

Conclusions.—The comparison of our data with those obtained by others on normal subjects shows: (a) a frequently diminishing of the cardiac area in pulmonary tuberculosis patients; (b) this finding is more striking in subjects affected by severe caseo-ulcerative forms, highly evolutionary, than in subjects presenting primary or mainly fibrous forms with little general effects.

The reported observations cannot allow any definite conclusion on the relations between the cardiac area and pulmonary tuberculosis. There is a general agreement on the frequency, if not constantly, decreased

cardiac area in subjects affected by pulmonary tuberculosis forms. On the other hand it is not possible to infer whether lung tuberculosis affects cardiac area, or if diminished heart size be a primary state.

At present the most authors (Potthoff *et al*) have a tendency to recognize the existence of a congenitally hypoplastic heart as an expression of a peculiar somatic constitution, as we most frequently are used to find in subjects predisposed to contract lung tuberculosis.

It is our purpose to stress that the relation between cardiac area and pulmonary tuberculosis is more evident and constant in case of exudative progressive forms while it is less marked in fibrous-regressive or light forms.

The prognostic value of this radiological finding should not be overlooked since it adds new elements which allows to complete the clinical picture.

References:

1. Alessandrini, P.—Ricerche radiologiche e cliniche sul cuore dei tubercolosi. Cuore e Tubercolosi, 1920, No. 8.
2. Govoni, A.—Aortometria in giovani soggetti tubercolotici. Annali di Radiologia Diagnostica, 1947, v. xx, p. 52.
3. Podesta, E. E.—Cuore e tubercolosi. Rivista Sanit. Siciliana, 1936, v. xxiv, p. 1280.
4. Potthoff, F.—Tuberkulose und Herzgrösse. Beitr. zur. Kl. der. Tbk., Bd. 88, H. 3, p. 187.

BOOK REVIEW

Neuro Radiology—By DR. ALEXANDER ORLEY, M.D., F.F.R., D.M.R.E., Honorary Consulting Radiologist, West End Hospital for Nervous Diseases, London, pp. 421. Published by Mr. Charles C. Thomas, Spring Field, Illinois.

This is a well written, copiously illustrated, clearly indexed and well brought up-to-date manual in Neuro Radiology extremely useful to the Neuro Radiologist, Neurologist and Neuro Surgeon besides serving as an excellent reference book to the practising general Radiologist when confronted with a difficult Neuro Radiological problem. The author gives equal importance to the Radiographic technique and diagnostic signs. The author has made a masterly use of the clinical experience gained by him at the Hurstwood Park Neurological Hospital and West End Hospital for Nervous Diseases, London.

Normal nerve tissue being radio-parent a good percentage of the pathological changes occurring in the nervous tissue give rise to some characteristic changes in the bones of the skull and spine. As such the value of plain radiography of the skull and spine in Neuro-Radiology can hardly be exaggerated. So the author rightly begins his treatise with a chapter in the Radiography of the skull. While the illustrations including the photographs, radiographs and drawings as well as the descriptions used in this chapter leave nothing to be desired, in indicating the direction of the central ray given for the antero-posterior view of the skull (page 14, line 3) the expression as entering the edge of the hairy scalp could have been avoided. The edge of the hairy scalp varies from person to person especially when the patient happens to be a bald person. It would have been more precise if the direction of the central ray is given with reference to unmistakable and unchangeable bony landmarks

as root of the nose or external occipital protuberance etc.

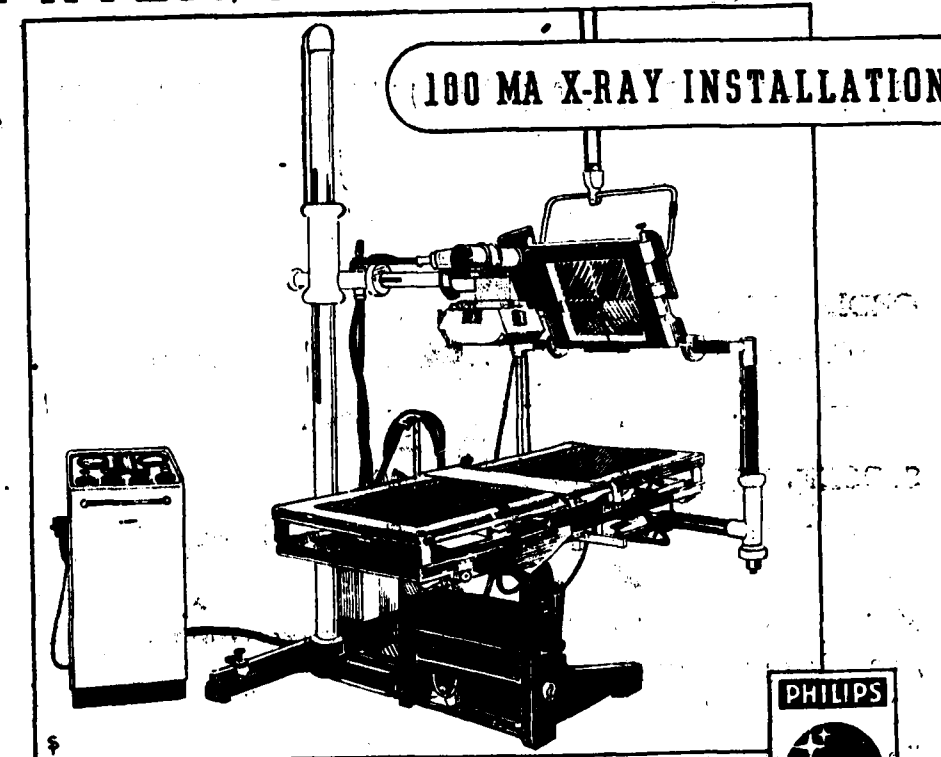
In Chapter II on 'Radiography of the Temporal Bone,' the radiographic technic given to visualise the mastoid process and the petrous bone is simple and easily understood even by a beginner in Radio-Diagnosis. The Stenver's technique which often confuses a beginner has been omitted and emphasis laid on simpler radiographic procedures. The Chapter on 'Sphenoidal Sinuses' is very instructive. The Radiography of the Sphenoid and Ethmoid sinuses by the Granger's 107° and 23° positions has been clearly described. But no mention has been made of the six standard views used by Doctor Graham Hodgson for the clear visualisation of all sinuses which is much simpler than Granger's method. The Chapter on 'Cranial foramina' is very elaborate giving details about measuring these foramina. Tomography has been given its proper place in the study of the skull with special reference to the study of ventriculogram in cases of all cerebral tumour. The Chapter on 'Cranial deformities' is brief and accurate omitting unnecessary details. Head injuries have been well classified and the radiographic appearances have been clearly described. But its value would have been enhanced if the radiographic reproductions given had been radiographic negatives instead of X-ray positives. In the chapter on 'Lesions of the Skull,' under the heading 'Other Tumours of the Skull' the place of Intradiploic epidemoids among the cranial tumour which according to Jefferson and Smalley about 17 per cent involves the diploï, has been skilfully assessed. The chapter on 'Radiographic changes in the feeble minded' is a novel but welcome addition and reveals the proportion of skeletal malformations and developmental defects among the feeble

mind. Chapters on non-pathological and intracranial calcifications constitute very interesting and useful reading. Figure 113 which is the reproduction of a radiograph of the orbit from Braisford's collections shows a case in which a calcified lens was mistaken for a calcified cysticercus in a man suffering from cysticercosis and the author advises caution before rushing to Diagnosis of intracranial calcifications. The chapter on 'Cerebral Angiography' is very illuminating and revealing. The author still uses mainly Thorotrast (25 per cent Thorium Dioxide) which is slightly radio-active while the writer has seen, equally good but not radio-active, 37 per cent Iodine compound Diodrast or Diodone being largely used with excellent results in Stockholm Serafimer Hospital and in the National Hospital, Queen's square, London. The author states that the percutaneous method of injection of the dye into the common carotid artery through intact skin is neither easy nor de-

void of dangers. But I have seen Dr. Wickbom and his assistants at Serafimer Hospital, Queen's Square, London, using the percutaneous method very successfully and without danger. In fact surgical exposure is rarely done in those hospitals. The author's device for cerebral Phlebography is very original. The author's chapters on Ventriculography, Spinal tumours and Myelography reach the highest standard in technique as well as Röntgenological interpretation. Barring a few minor defects which I am sure will be rectified in the next edition, this up-to-date text book, is a very valuable contribution in the difficult field of Neuro-Radiology. It is a distinct boon to the Neuro-Radiologist and Neuro-Surgeon. This treatise must find a prominent place in all Radiological libraries and must be in the hands of every Neuro-Radiologist. We commend this book most heartily to the Radiological world and commendate the Publishers for the excellent get up.

A. N. K. MENON.

PHILIPS STANDARD DN



Six New Features

- Improved automatic tube loading with newly designed double focus oil tube.
- Maximum tube current 100 MA.
- Maximum operating tension 100 KVP.
- Special rotating anode tube available shortly with possibility of 150 MA output.
- Synchronous electronic timer ensuring optimum timing efficiency.
- All components tropically tested.

Usually supplied with inexpensive hand crank "STANDARDOSCOPE" couch illustrated above. More elaborate "USB" couch available if serial cassette changer or Planigraph required.

APPLY FOR FULL PARTICULARS OF THIS ECONOMICAL UNIT TO:-

PHILIPS ELECTRICAL CO. (INDIA) LTD.

X-RAY & MEDICAL DEPARTMENT

PHILIPS HOUSE, 2, KEYSHAM ROAD, CALCUTTA - 20

BRANCHES: MADRAS, BOMBAY, DELHI, LUCKNOW, RAIPUR



"No More Guess-work about X-Ray Pictures.. USE

CALCULEX

• SAVES TIME
• SAVES FILM
• SAVES TUBES
• ACCURATELY SOLVES EVERY RADIOGRAPHIC EQUATION... Instantly!

• IMPROVED X-RAY TECHNIQUE FOR THE ADULT..THE AGED..THE INFANT
• BUCKY OR NON-BUCKY
• ELIMINATES HUMAN ERROR & IMPROVED X-RAY TECHNIQUE CHARTS • CONSTANT DEGREE OF DENSITY • SIMPLE TO OPERATE

The calculex is an electronically operated instrument approved by Underwriters Laboratory. By the turn of a knob it simultaneously multiplies, divides, adds & subtracts algebraically across the electrical circuit every equation used in calculating X-ray technique. Calculation of Radiography. Time consuming practices and trial and error methods are eliminated. The Calculex is designed to accurately and quickly solve every radiographic equation employed in the variation of density by the selection of any one or more of the prime factors. Radiographs that are photographically & diagnostically correct are available through the use of this instrument. Simplicity of operation is an outstanding feature. No long course of instruction is necessary. The experienced or inexperienced worker will obtain with the same ease, excellent diagnostic radiographs.

POWELLS LTD. BOMBAY

124024 2-24-25-2N4

INDIAN JOURNAL OF RADIOLOGY,

ADVERTISEMENT RATES

ORDINARY POSITION :

One Page .. Rs. 75/- per insertion
Half Page .. Rs. 40/- „

SPECIAL POSITION :

50 per cent over and above the Scheduled Rates.

Series discount of 5% and 10% will be allowed on contracts of 6 and 12 insertions respectively.

An Agency Commission of 18% will be allowed on all orders booked by Agencies.

Advertising in 'The Indian Journal of Radiology' will pay the Advertisers well. A trial order will prove the above fact.

For all matters regarding advertising in the Journal, communication may be sent to the address given hereunder :

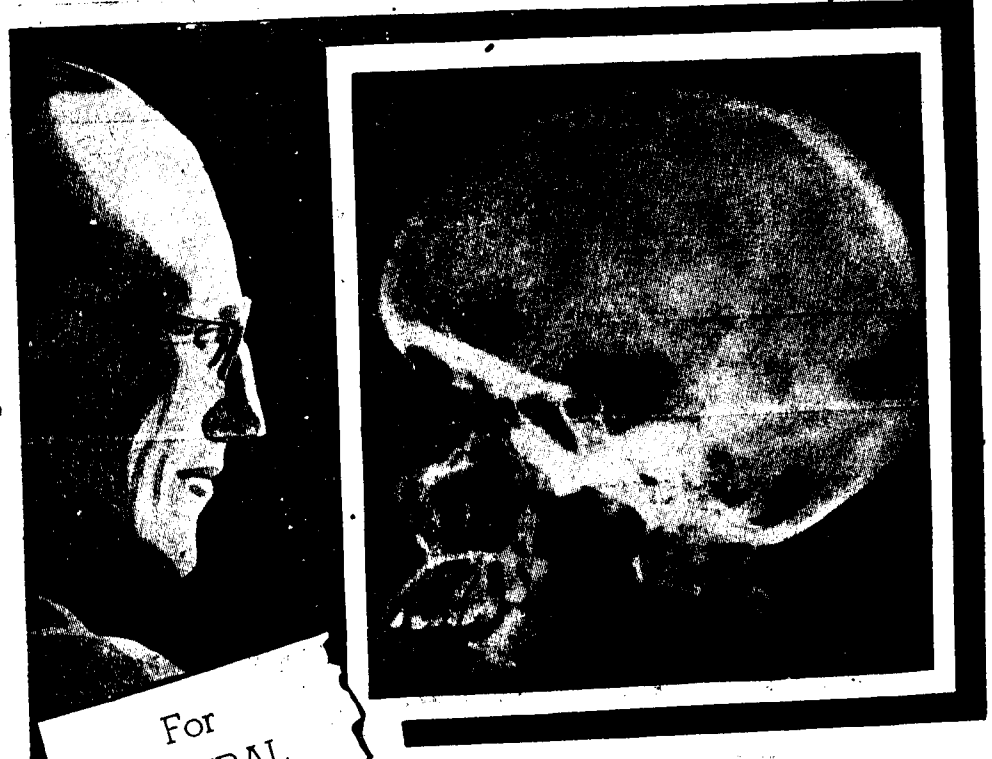
THE EDITOR-IN-CHIEF,

" THE INDIAN JOURNAL OF RADIOLOGY "

" LAKESIDE,"

110, MOUNT ROAD, TERNAMPET P.O.,

MADRAS-18.



For
GENERAL
Radiography

The Department of Radiography and Medical Photography of Ilford Limited at Tavistock House, Tavistock Square, London, W.C.1 (EUS. 2251), will always welcome the opportunity of helping with information or advice.

Ilford Standard X-ray Film

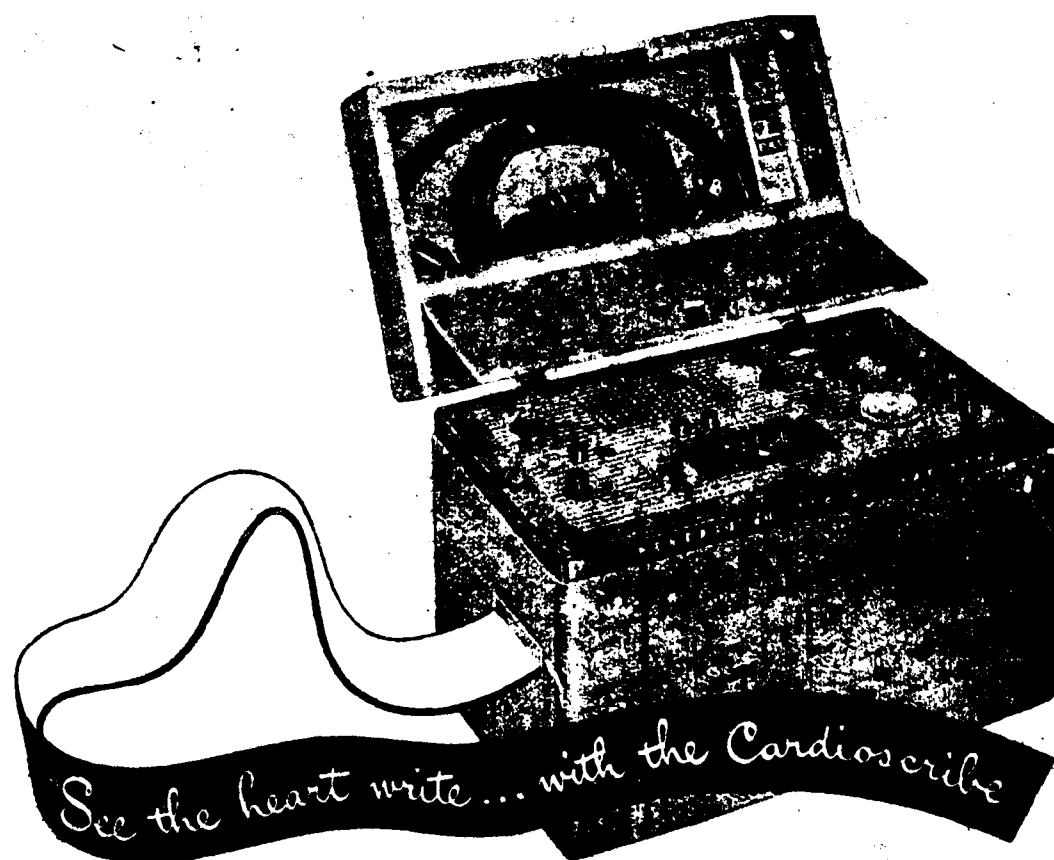
Generally, most of the routine work of the radiographic department can be done very successfully with Ilford Standard X-ray Film in conjunction with Ilford Standard (Tungstate) screens.

Because of its high sensitivity to both X-rays and screen fluorescence Ilford Standard X-ray Film has ample speed for all normal work and its excellent definition and high contrast ensure perfect readability. Special subjects are provided for by Ilford Red Seal and Ilfex, both of which for their particular uses are unequalled in quality of result.

ILFORD

Distributed throughout India by
ILFORD SELO (INDIA) LTD.

BOMBAY - CALCUTTA - MADRAS



When you use the new General Electric direct-writing *Cardioscribe*, there's none of the usual bother and delay of a darkroom. With the *Cardioscribe* you see the heart tracing as you make it.

Push-button convenience. Push buttons control standardization and selection of any of seven leads. With the *Cardioscribe* any one of these leads may be taken without regard to numerical sequence. Operation is simple. An ordinary flashlight cell provides power for standardization procedure; is easily replaceable by the operator.

Accurate. Tube amplification is in four balanced stages. The independent time marker

does not interfere with the heart tracing. A synchronous motor drives the recording paper with clockwork accuracy. Paper drive rollers separate automatically when not in use. Separation prevents rubber rollers from losing their shape and causing slippage. Line width is sharply defined even on large excursions. Readability of rapid fluctuation is excellent.

Fully portable. The *Cardioscribe*, complete with accessories in cover, weighs only 38 pounds. The luxurious blond mahogany carrying case is a welcome companion. The *Cardioscribe* operates directly from your ac lighting circuit. A differential amplifier and automatic eliminator permit its use even under interference from power and lighting circuits.

For further particulars please write to:

Victor X-Ray Corporation (India) Ltd.

Bombay: Ballard Estate, P. O. Box 992.

Calcutta: 7, Wellesley Place, P. O. Box 2007.

New Delhi: Ajmere Gate, P. O. Box 67.

Bangalore: Shri Narashimaraaja Rd., P. O. Box 9.

Lucknow: The Mall, P. O. Box 110.

Ahmedabad: Mirzapur Rd., P. O. Box 176.