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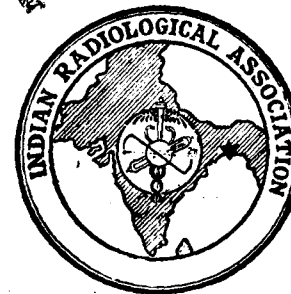
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VOLUME 4

FEBRUARY, 1950

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Notice

As the Philips organization in London wish to make adequate arrangements for the reception, hospital visits and other matters of interest to Radiologists from India, who will be attending the Sixth International Congress of Radiology in London from 23rd to 29th July, 1950, it will be appreciated if such Radiologists will be so good as to send notification of their intention to visit the Congress to the **General Manager, X-ray & Medical Department, PHILIPS ELECTRICAL CO. (INDIA) LTD., "Philips House", Heysham Road, Calcutta-20.** If known, Radiologists are requested to include a note of the address at which they will be residing in London during the period of the Congress.

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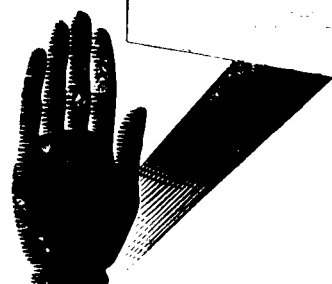


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Vol. IV.

FEBRUARY, 1950

No. 1.

Experimental Studies on the Organo-Localisation and Following Mobilisation of the Colloid Thorium-Dioxide

PROF. M. LENZI,
DIRECTOR, UNIVERSITY OF MODENA—DEPARTMENT OF RADIOLOGY,
AND
DR. G. MAGRI.

THORIUM compounds as contrast-mediums in radiology have been used since a few years.

Really in 1929 the Japanese scientist Oka observed by chance that "thordiol" (colloid thorium-dioxide), intravenously injected in animals, settled in the spleen, which assumed an X-ray opacity. A few years after, Radt confirmed this assertion, noticing that the same happened also with the liver.

In the following years it was discovered that with a compound less toxic than "thordiol", i.e., Thorotrast—the hepato—splenography in

man could be realized in the same way.

Since then, many clinical and experimental researches have been carried on about this medium of contrast, which allows not only the careful study of splenic and hepatic structure, and their borders, but on account of its peculiarity of settling in elements of reticulo-endothelial-system, allows also, to a certain extent, the functional study of the latter.

Our work about a subject like this, which has been studied in all its sides by many scientists, could

seem useless, had we not observed by new experimenting methods facts, which so far have not yet been pointed out as to some of their peculiarities.

However to explain better what results from our studies, we think that it is useful to gather shortly what we know about this subject.

All this has been derived from a critical study of the abundant literature, that we could consult.

I. *Colloid Thorium-dioxide* (Thorotrast. Th.) intravenously injected in animals and men, on account of its negative electric-power is rapidly absorbed in the cells of reticulo-endothelial system, which are numerous in the liver and spleen, but which can be found also in other organs.

There is a first stage of evident radio-opacity of the heart and large vessels (Vajano) and of the most vascularized organs, like placenta, kidney and lung (Erhard, Otell a.o.), and then a few minutes later the opacity of liver and spleen may be radiologically noticed (Baumann and Schilling, Nemours, Kadrnka and Rossier a.o.). The spleen appears opaque already after three hours and reaches the optimum visibility after eight hours, while the liver appears completely opaque only after twenty-four hours.

When used in the same dose employed for the hepato-splenography, Th. has a noticeable electivity

for the cells of the R.E. system of the spleen and liver. This electivity seems to be more prominent in men than in animals.

Using larger doses than in man, it is possible to obtain the impregnation of the cells of other organs R.E. system. These organs therefore have less affinity of colloid-thorium-dioxide than hepato-splenic R.E. system.

In rabbits, using doses of 5-7 c.c. per kilo, *osteo-myelography* is obtained; *lymphography* is possible only by local subcutaneous injections, while the general lymphography by intravenous injection can't be obtained; *kidneys* are perceptible with a dose of 12 c.c. Th. per kilo; *lungs* too are opacized with a dose of 15 c.c. per kilo: while in living animals, even with greatest doses, it is impossible to distinguish the shadow of the *suprarenal glands*.

Generally, however, there are no injuries because of reticulo-endothelial "block".

According to what has been pointed out before, Th. settlements on different organs are connected with two facts: the dose employed, and the time elapsing between the injection and the observation. However, the way of administration, the kind of animal and its biological conditions have a great importance too.

The results of experiences about the relations between Th. and

immunity are inconsistent and mostly negative (Benassi).

II. *Microscopically*, Th. granules are clearly discernible and scattered mostly in the endothelial cells. Really, in the beginning, Th. is present in many cells, especially in those with excretory function, while later the granulopexic function of R.E. system prevails. In liver, Kupfer's cells are filled up and with larger doses become swollen. The protoplasm is reduced and the nucleus is pushed to the periphery, deformed and at times going to degenerate. In the spleen the filled cells are difficult to be recognised.

According to researches carried on by Benassi, many Th. granules are present also in other cells, particularly in liver, renal tubuli, pulmonary alveoli, enteric mucosa, suprarenal cortex.

But all these not-reticular cells have rare and unstable granules, which are probably due to a small quantity of Th. going to be eliminated by the excretory structures, or leaving in the metabolic exchanges.

These experimental results will be dealt with in our conclusions.

It was noticed that histological changes produced by Th. are prominent in rabbits treated with large doses (experiments of many authors and Italians Barbieri and Romano,

Fischetti, Testa, Liverani, a.o.); while in man the doses commonly used give only slight changes and not pathologic ones.

III. The following mobilisation of Th. is a problem of the greatest interest. This condition will be examined during the development of our own researches.

Leipert and Arnell Sans first observed that the splenic shadow, in the beginning, becomes afterwards as obscure as the hepatic shadow itself. They ascribed this to the transition from liver to spleen of the hystiocytes, full of Th.

Benassi observed something similar in animals and man, but he maintains that this appearance may be often falsified by imperceptible technical changes.

Surely in animals, when many reticular cells break, there is a real removal of Th., which accumulates in large hystiocytes (Ra Venna) or in large plurinuclear giant-cells (Kadrnka, Ka Drnka and Junet). These full cells, with an active impulse, carry Th. firstly to the periphery of the lobulus, then to the portal spaces and lymphatic vessels, and partially also to the centre of the lobulus (Ra Venna).

Meanwhile in the spleen, the large hystiocytes and giant-cells, as well as Th. accumulations, increase. Therefore Th. decrease in liver and increase in spleen, because of a

circulatory transport. The same occurs also with vital colorations.

Ka Drnka and Junet tried to explain these movements with Askanazy's theory about the hematic filtration: impregnation of reticular cells and following displacement of the cells towards the lymphatic ways.

IV. Ka Drnka, Baumann and Schilling, Vajano found that in animals the opacity of hepatic and splenic shadows decreased quickly a few months after the injection. Benassi, studying Th. elimination, found a slower elimination in man than in animals, most probably because of greater affinity between Th. and R.E. system.

In a woman examined 9 years after an hepato-splenography by Th., Benassi discovered a decreasing opacity and a reticular appearance of the hepatic shadow (later of the splenic shadow too), while a distinct opacity of hepatic, lumbo-aortic, splenic and mediastinal lymphatic nodes was clearly to be noticed.

The same conclusion was drawn by one of us (Lenzi) in a series of systematic researches carried on in men, who received Th. 5-9 years ago. The disposition and radio-activity of Th. was observed in them with photographic method and ionisation chambers.

Bile is the most important way of elimination of Th. (Liverani, Benassi,

Amorosi) while others took into consideration also an enteric (RaVenna), renal, pulmonary (Ka Drnka and Rossier) elimination.

Anyhow we may think that Th. is removed from organism through the various emunctory systems more slowly in man, than in animals. The organic capacity of dissolving compounds is probably more important for this elimination than for toxic actions (Benassi).

Gilbert and Ka Drnka studying X-ray effects on liver and spleen, filled with Th., observed a forward mobilisation. Askanazy's "third phase" of hematic filtration, *i.e.*, lymphatic phase, could begin beforehand, because of X-radiations.

According to the above named authors, X-ray treatment after Th. injection could be very interesting to ease Th. elimination and to explain X-rays' antiphlogistic action.

V. *Th. radioactivity* was cause of apprehensions when it was used as contrast-medium. We can think however such radioactivity quite inefficacious, as it results also from our own observations in man as well as from others.

On the contrary, the use of Th., as a secondary radiator in roentgen-therapy, seems to have a practical debated importance.

Ca Pocaccia and Vallebona, experimenting on rabbits and guinea-pigs, determined that Th. makes animals

sensitive to X-rays, increasing their biological activities on the hemopoietic organs, *i.e.*, liver and spleen. These authors however cannot determine, whether this sensitiveness is bounded to the physical presence of secondary radiations, or whether biological and more complex factors are present.

Some favourable clinical results have been heard of, above all for some hæmatological and reticulo-endothelial diseases (Ta Ndoja, Guarini, Izar and Ca Stronuevo *a.s.o.*)

* * *

The experimental researches, which constitute the object of our work have been suggested by the purpose of exciting a specific localisation of Th. in a fixed place, eventually different from hepato-splenic reticulo-endothelial system. Such a purpose exercised a great appeal on us, because if we had succeeded in modifying the natural tropism of Th. we would have been able to make the best use of Th., as contrast-medium and, in a therapeutic way, as a secondary radiator.

Such an attempt is not new. Belonowski and Miller in 1928, trying to employ the tropism of organ-extracts for the corresponding organ, combined such extracts with various colours, and got negative results. Pezcoller gathered bacteric suspensions and organ-extracts, trying to determine a greater accu-

mulation of microbes in the corresponding organs, but the results were negative too.

Later on, Mascherpa in 1935, with a peculiar technique, associating organ-extracts to cobalt, obtained organo-metallic compounds (metallo-proteins) which showed a specific tendency to settle in the corresponding organ. Then this author and his collaborators confirmed the same thing in other works.

As we were saying before, our purpose in the beginning was to modify in every way the habitual affinity of Th. for liver and spleen. Therefore we associated Th. to various organ-extracts (lung, kidney, liver), following these techniques.

With the organs of animals (guinea-pigs and rabbits) killed by blood-letting, by the aid of a simple screw press connected with a meat-chopper, we obtained some pulps of tissue, which were mixed with physiological solution, centrifugated and filtered over and over again. Afterwards the extracts, examined by microscope, did not show any cell.

After the addition of Th. in fixed and studied proportions, the mixture was made homogeneous with a prolonged agitation. Taking care to avoid the formation of clots, which showed, by an X-ray examination, a great quantity of Th. granules.

Before using this mixture, we performed a specimen on a first group

of guinea-pigs, putting together in equal quantities (ana cc. 1) the organ extracts and some colouring substances of R.E. system: 1% Tripanblau or Isaminblau, 1% solution.

In this way we repeated the modalities of experiments of Belonowski and Miller, and the still unpublished researches of Poletti and Severi.

Our experiences are subdivided in various Series, and we refer a summary of the records.

SERIES A.—From some guinea-pigs, killed by bloodletting, we took off liver and kidneys. We prepared the extract of these organs and centrifugated it over and over again and we mixed it in an agitator with Tripanblau 1% or Isaminblau 1%.

With this mixture, we treated 3 guinea-pigs (Liver Extract+Tripanblau; Kidney Extract+Isaminblau; control serum). The animals, killed 24 hours later, showed only some diffuse blue colouring of the skin and viscera, without a specific hypercolouring of the organs corresponding to the employed extract. By histological examination, we saw peculiar regressive changes of the myocardial fibres and of the epithelium of liver and kidneys, with degeneracy of the tubuli. Some foci of cellular neoproduction, with a lymphocytic and perivascular type, lie in lungs and less in liver and kidney-cortex. Tripanblau or Isaminblau granules lie in the interstices of the heart fibres.

Neither can we perceive histologically any specific organo-tropism of the introduced colour.

SERIES B. In spite of the unsatisfying results of the first series of experiments, we undertook a second one on guinea-pigs too, substituting Th. to the colours in the following proportions: 2 c.c. of extract + 1 c.c. of Th.

In the animals, killed at intervals, we cannot see anything remarkable; the histological examinations point out, as in the previous series, a constant presence of regressive changes of the parenchyma and neoproductions of the retaining tissues.

The Th. distribution is not peculiar: the granules fill up the vascular endothelia of all organs; they lie in the septa of lungs, among the cellular rays of the hepatic lobules. In the spleen, the distribution is rather uniform, with some prevalence round the follicles.

As to the constant regressive and productive changes, they are very likely to be referred to the introduction of proteins.

Indeed this fact is always present in our experiences and was observed also by other authors, introducing in animals (rats, guinea-pigs, rabbits) several proteins (Pentimalli, Ra Venna).

Using lung-extract mixed with Th. in a dose superior to 0.5 c.c. per

kilo, we observed as well as Cesa-Bianchi and other foreign and Italian authors, among whom Mascherpa that 30"—40" after the injection the animal died. The death was preceded by strong convulsions, short breath and visible pain.

Histological examination showed Th. free in the heart cavities and in the vessels, especially of the lungs, but nothing was found which could explain the sudden death. This death is generally attributed to an anaphylactic crisis. The same phenomenon happened in a rabbit of the following series.

SERIES C.—Also in this series of experiments, carried on 7 rabbits (2 of them were used to prepare the extracts) we employed the same extracts as in the preceding series, i.e., lung, kidney and liver in various quantities, according to the toxicity of lung-extracts.

As before, the dose of Th. injected was about 0.5–1.5 c.c. per kilo of the animal.

We did not observe any "praecox death" by Th., as Montanini described, considering it as caused by a thrombosis of splenic veins; but some animals died before than expected and in these animals the splenic shadow was larger and more distinct, while the histological examination showed only the habitual regressive and reactive facts.

In this series, we were peculiarly interested in X-ray examinations, which showed in each case a specific radio-opacity of the spleen and liver.

Comparing the radiograms however, we did not notice any difference in the time of impregnation and in the degree of opacity of the two organs, in reference to the quality of the used extract.

Excepting the rabbit treated with control-serum (No. 3) in which the spleno-hepatic impregnation was delayed (13 days after), in all other cases the spleen was visible 24–48 hours, and liver 48–95 hours, after the injection.

The splenic opacity in any case was quicker as well as more intense.

The X-ray examinations in this series showed the two following facts: (1) The injection of Th. mixed with the extracts of some organs cannot determine a special tropism of the contrast medium for the same organs; (2) in rabbit and with our techniques, the splenic radio-opacity is quicker and stronger than the hepatic one.

Microscopically we observed in the most important viscera infiltration of lymphoid cells, with a few polynuclear and fibrous cells, especially in the lungs, along the septa and round the vessels and bronchi; between the heart fibres; in the liver, between the rays of cells and round

the vessels and biliary ducts; in the kidneys, between the tubuli and round the glomeruli.

We observed, too, slight degeneracy of the parenchyma and liver and kidney congestion, with some hæmorrhage.

These regressive and productive reactions were common in all animals even if injected with simple control-serum.

Using whatever organ-extract, Th. granules are visible nearly in all viscera; abundantly and regularly distributed in the spleen, less numerous in the pulmonary septa, collected in little heaps in the kidney and heart. In the spleen, which contains the largest quantity, Th. is present in the splenic pulp, free or included in the cells covering vessels or the reticulus, but especially round lymphatic follicles. In the liver, the largest quantity of granules lie round the lobular vein and the rays of cells, in the walls of vessels, in the swollen Kupfer's cells, and everywhere. In the lung—as we were saying—the granules are less numerous and lie in septa and walls of vessels; in the kidney, they are localised mostly in the cortex, around the glomeruli, while they are very rare in the medulla; in the heart, they are scattered here and there in the interestices of the fibres.

SERIES D.—Some Italian authors, among whom Cola, observed that

Th. orally supplied, gets an entero-hepatic circulation, like the biliary products. Impallomeni maintains that, mixing in a syringe tetraiodophenolphthalein and biliary salts, a quick visibility of the gall bladder (15' about) may be obtained, because a bile producing stimulation, which is due to the intestinal reabsorption of the bile itself.

Then, we thought that the bile intravenously injected mixed to Th. could in any way increase the affinity of Th. with the liver. Therefore we mixed in agitator a large amount of bile and Th. We injected the mixture in 4 animals (1 of which for control) using the same dose of Th. as in the previous series.

The X-ray examinations did not prove that by this way it is possible to modify the distribution of Th. They showed only the affinity of Th. for spleen and liver, as in the preceding series. We did not observe any peculiarity in the distribution of the granules.

Noteworthy is the fact, that all 4 animals died 4—10 days after the injection, which anyway could not be explained by the post-mortem examination.

SERIES E.—At the beginning of this work, we mentioned our present knowledge about the secondary mobilisation of Th. deposits, which is a fact of great practical and speculative importance.

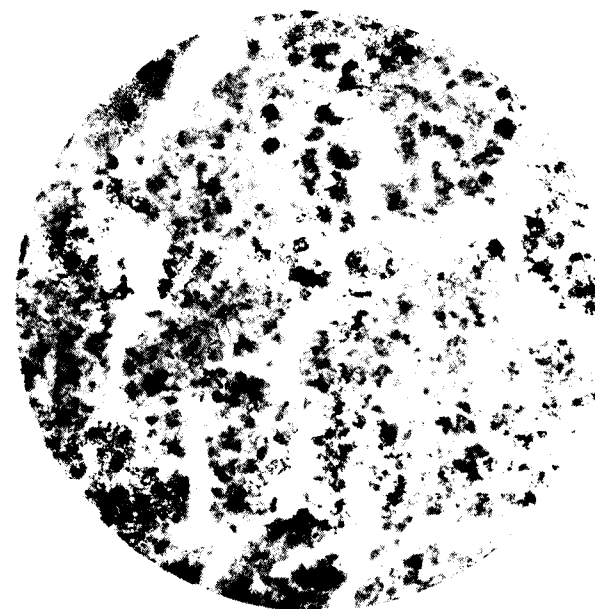


Fig. 1—Rabbit, treated with Th. + bile (liver).

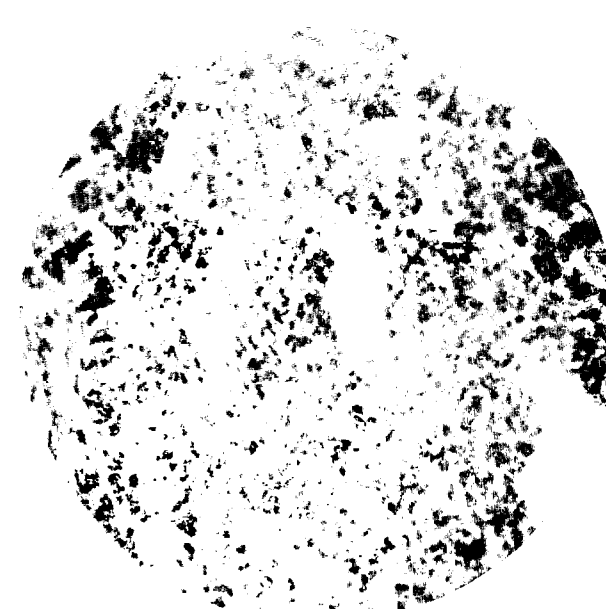


Fig. 2—Rabbit, treated with Th., before irradiation (spleen).

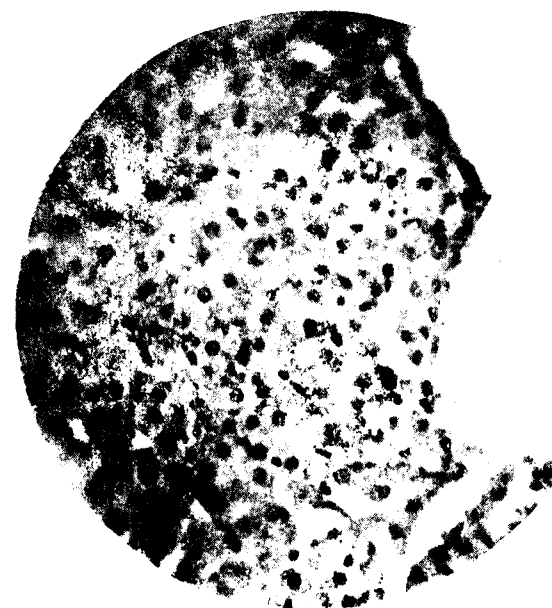


Fig. 3—Rabbit, treated with Th., before irradiation (liver).

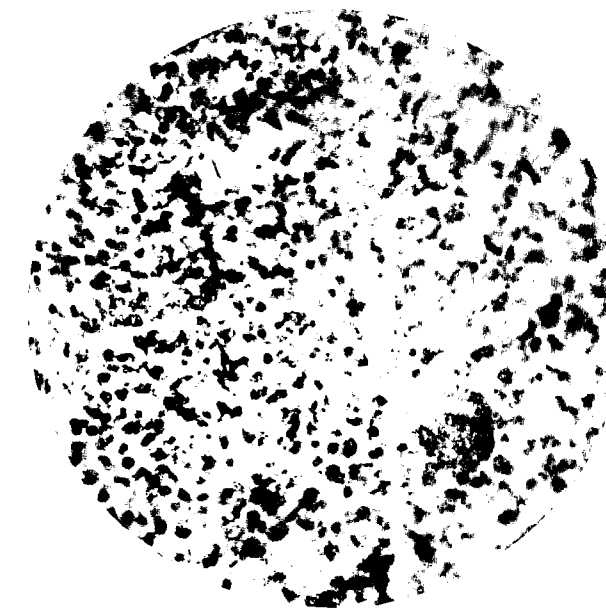


Fig. 4—Rabbit, treated with Th., after irradiation (spleen).

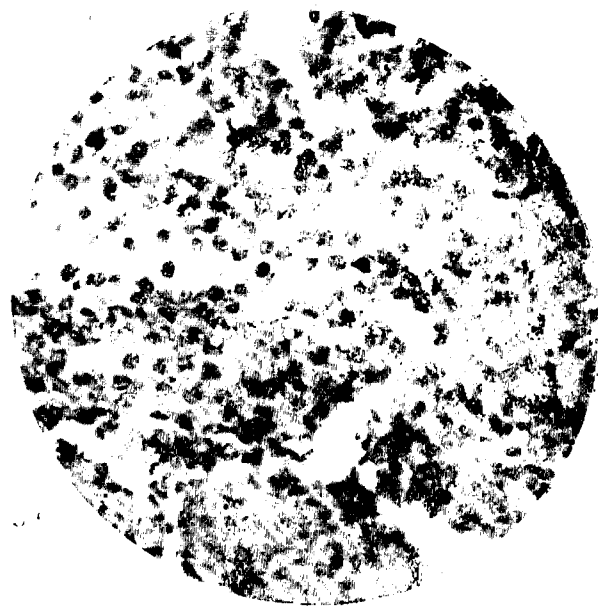


Fig. 5—Rabbit, treated with Th., after irradiation (liver).



Fig. 6—Rabbit, treated with Th.



Fig. 7—Rabbit, treated with Th.,
after irradiation.

Having at our disposal some rabbits, inoculated with the mixture of Th. and organic-extract, we thought to irradiate the opaque spleen with the purpose of exciting a mobilisation of the contrast-medium.

The technique of irradiation was the following: delimitation of the splenic area with lead; irradiation was the spleen for 3 days by dose of 500r (total 1500r); filtre 0.5 mm. Cu + 2 mm. Al; 170 kv; distance antichatode skin 32 cm.

The radiograms, taken before the experiment, after the injection of Th. and 2 months later, showed a reduction of the opacity and size of the hepatic shadow, while the splenic shadow became more opaque and restricted.

This reduction of the two organs was confirmed by autopsy, while the histological examination showed nothing new, also in as much as the organic contraction is concerned.

The distribution of granules has no peculiarities, excepting a more dense concentration in the liver and especially in the spleen, proceeding in part from the above mentioned "contraction" and excepting a relative diminution of the granules in the kidneys, heart and lungs.

This series, ultimately confirmed the experimental results of Gilbert and Ka Drnka, *i.e.*, an acceleration of the removal of Th. from the liver to the spleen by X-rays. It pointed

out also a distinct "contraction" of these organs, which is not to be referred to a forward sclerosis, not showed by histological examination.

Really, Zappala' obtained a rapid cholecistography by stimulating irradiation of liver, spleen and bone-marrow, perhaps because of an exciting action on the reticulo-endothelial system; while since 1929 Mascherpa had demonstrated that cobalt activated by radium becomes more soluble in the proteins and is more quickly expelled from the organs.

SERIES F.—To verify the previous series, two rabbits were treated with simple Th., without organic-extracts, and successively irradiated as formerly explained.

Before the irradiation, a biopsy of the liver and spleen was performed and the microscopic observation showed a good impregnation of the spleen and liver. After the irradiation of the spleen, by 500r for 3 days, the animals were killed and the histological examination of the various organs showed, besides the usual regressive and productive facts, a uniform distribution in the suprarenal glands of granules, heaped in the interstices between myocardiac fibres, in the cortical-substance of the kidneys and in the septa of the lungs. In the spleen and liver, there are accumulations thicker than before the irradiation.

Radiologically we observed also in these animals the same phenomena we described before; i.e., "contraction" of the spleen and liver, which become more opaque, the latter more evidently than the former. This contraction however is less distinct than in the E Series.

To sum up the results of our experiences, we will say that Th. intravenously injected in rabbits settles electively in the liver and spleen, giving a rise to a radio-opacity, particularly evident and forward in the latter. The union, or better the addition, of various organ-extracts, prepared in the way we described, to Th. by no means modified its commonly accepted affinity for hepato-splenic R.E. system.

At the most, we could say that the addition of proteic substances to the contrast medium has brought into evidence differences of radio-opacity favourable to the lienal shadow. From the histological point of view, the added proteic substances have increased the regressive and proliferative processes, which always follow the introduction of Th.

These however were not modified from the point of view of their qualities, nor were determined peculiar changes in the habitual distribution of opaque granulations.

Thus our researches have not reached their first aim, which was to altered or anyway to modify, by the addition of organ-extracts, the constant tropism of Th. for hepato-splenic R.E. system.

We think that the results of the second group of experiments about the secondary mobilisation on account of Roentgen-radiations are much more interesting.

Capocaccia and Vallebona, using for experiments rabbits and guinea-pigs, noticed that in animals which underwent Th. injection and irradiation, basophilic and eosinophilic cells as well as immature elements appear in the blood; the bone-marrow reveals a destruction of mature elements, that is greater than in animals only irradiated (and not injected); moreover there are intraparenchymal haemorrhages and vascular expansions in the spleen, liver and kidneys. According to these authors, Th. makes animals sensitive to the action of Roentgen-rays, increasing their biological activities on the haemopoietic organs, on the liver and spleen.

But it is impossible to establish whether and how much this sensitivity is originated by the secondary radiations.

From the radiological point of view, we can confirm the very strong action of the radiations on the hepato-splenic system, previously

impregnated with Th. It is impossible to say whether a forward mobilisation of Th., due to the hepato-splenic passage of granules, is only in question, or whether there is also a passage of Th. towards organs previously free. This passage has been pointed out by Benassi and Lenzi on subjects observed for many years, in whom the lumbo-aortic lymphatic glands became opaque late, while, on the other hand, the liver and spleen became less and less visible.

But as to us, we do not think necessary this interpretation. The most important point seems to be

the evident contraction of liver and spleen, which is more clearly to be noticed when organ-extract has been added to Th.

Side by side with this contraction, certainly of a functional kind, there is an increase of opacity on account of the concentration of the granules. This increase of opacity is more evident in the spleen, owing to the above mentioned hepato-splenic phenomena.

The comparatively forward death of the animals, however, has prevented us from observing an eventual decontraction and new expansion of the organs.

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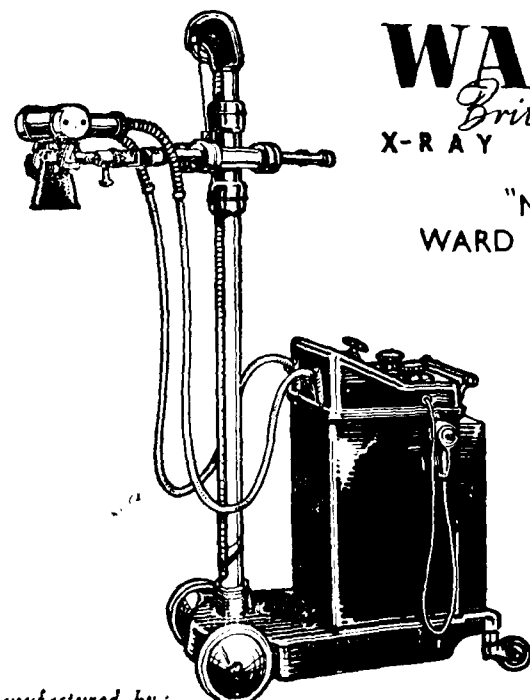
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Modern Trends in the Diagnosis of Bronchogenic Carcinoma*

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TO-DAY more and more cases of bronchogenic carcinoma are seen, there are other cases which are suspected but could not be further followed up. To me therefore the value of keeping this subject before the medical eye seems to be of paramount importance.

It is a disease which has attracted lately a great deal of attention, and there is no doubt that in recent years, there is a great increase in the incidence of this disease, whether apparent or real. Even allowing for the apparent increase due to our improved methods of diagnosis, the disease is visible more commonly than in the past.

To-day the bronchogenic carcinoma ranks second to the carcinoma of the stomach as the site of primary tumour. This increasing incidence presents one of the urgent problems facing the medical profession. Our attention is drawn to it by the steady improvement of our diagnostic methods during the past 30 years. It is the perfection of X-ray methods of diagnosis with the supplementary accessories such as

tomography, and bronchography, with the development of the technic of bronchoscopy, the recent methods of examination of the sputum and of the bronchoscopically removed secretions from the bronchi, that have improved our ability to make an early diagnosis of these cases. Besides further interest is attracted to it because of the possibility of surgical cure in early cases.

Although in the past these cases were thought to be hopeless, and we used to treat them only palliatively with X-ray therapy, to-day our modern methods of early diagnosis coupled with those of thoracic surgery bear in us hopes of saving these cases.

Clinical signs and symptoms.— Let us see what bearing the clinical aspect has on these cases. Bronchogenic carcinoma is mostly recognised when there are large primary and secondary changes, but then it is too late for a surgical cure. This late diagnosis is due mainly to many bizarre clinical signs and symptoms, and many different anatomical and pathological changes, during the

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course of this disease. In the beginning, the disease may be latent and the clinical signs may be almost absent. These cases may be treated in the beginning for pneumonia, pleurisy or mediastinitis. Some patients are mistaken for pulmonary tuberculosis, and pneumothorax therapy has been given. A simple X-ray examination may prevent all these mistakes, although in some cases the X-ray evidence may resemble other lung conditions. In such suspected cases, to avoid occasional error, diagnosis must be confirmed by other special methods of investigation. Here it may be borne in mind that Radiology is not the only method of investigation of a lung cancer, and certain clinical details may help us in understanding the possible significance of shadows in a teleradiogram, tomogram or bronchogram. I believe it is up to us to emphasise the clinical signs and symptoms of bronchogenic carcinoma, because if these patients are to have the benefit of a surgical cure, they must be suspected early, and referred to us for X-ray investigation earlier than has been the case in the past. One remembers cases which when referred to the Thoracic Surgeon, come back to us for X-ray therapy with the report that the case is inoperable, in other words the case is too late.

What are these clinical signs and symptoms?—Cough, fever, and loss

of weight are the common and principal complaints. They are seen in many lung conditions. These facts explain why the physician has to take the help of the Radiologist and subsequently of the bronchoscopist. Other complaints are more significant, they are dyspnoea, haemoptysis, general weakness with steadily increasing loss of weight, pain in the chest, pulmonary osteoarthropathy, paralysis of the diaphragm, and in some cases Horner's syndrome. Of these various signs, the only definite clinical signs are the paralysis of the diaphragm and the Horner's syndrome. There are no pathognomonic signs, but whenever there is cough, pain in the chest, dyspnoea, haemoptysis occurring in a person over forty, bronchogenic carcinoma should be suspected unless it is proved otherwise.

Physical signs are often negative in an early case, it may show a localised diminution of breath sounds. There are 2 physical signs which may be helpful, one is the clubbing of fingers and the second is a pleural effusion, which when aspirated may be blood stained and on cystological examination may show tumour cells.

The clinical signs of the apical form of carcinoma or the Pancoast tumour are more significant. Even here in the initial period there are no clinical signs and symptoms, although even in this early period,

an X-ray may show a dull shadow in the apex. Little later on when it compresses the roots of the eighth cervical and first dorsal nerves, and at times even the sympathetic ganglion, the patient complains of pains in the shoulder and the inner aspect of the arm. This pain is frequently resistant to all forms of treatment. These cases are mistaken for arthritis, for cervical ribs, and the patient begins to go from doctor to doctor for relief of his pain. The patient frequently undergoes all sorts of treatment, including diathermy and shortwave therapy and ionisation, but without any relief whatsoever. In such cases a little knowledge that such pains can be caused by an apical or superior sulcus tumour, would lead the physician to refer the case for X-ray examination of the chest. Such cases may be referred only as is often the case for an X-ray of the shoulder or for X-ray of the cervical spine for osteoarthritis or for cervical ribs, and the case may be missed. In such cases, patients should be X-rayed for a Pancoast's tumour. Of course when Horner's syndrome is also there, it is still more significant.

Early clinical signs depend upon the point of origin of lesions. For instance, we have just seen, the signs of a tumour in the apical region. A carcinoma in a large bronchus may produce only cough in the early cases, and later on may produce

dyspnoea owing to obstructive emphysema, and some weeks afterwards would show signs of atelectasis resembling clinical signs of pneumonia, or influenza. On the other hand carcinoma in a peripheral bronchus would increase to a considerably big size without producing any clinical signs or symptoms, even dyspnoea may not occur.

There are cases in which the main complaint is fever due to a localised pneumonitis distal to the tumour. Some cases are suspected, only, because of paralysis of the vocal cord.

PATHOLOGY.—Just a word about pathology.

The modern view is that the great majority of primary lung tumours are bronchogenic in origin, and that this form is by far the commonest primary tumour. The superior sulcus tumour is also bronchogenic in origin and not branchial as it was originally supposed to be.

There are three pathological types, the commonest is the epidermoid or squamous carcinoma. The second type is adenocarcinoma, and the third is undifferentiated carcinoma.

An idea of the changes and the complications that it may cause would be given by its location or site of origin. Is it in the main bronchus, or the intermediate bronchus, or the peripheral smallest bronchus,

Those originating in the main bronchi and their primary branches cause 2 types of changes. It may infiltrate and erode the bronchial wall, extend to the lymphatic glands which become involved. Thus it may appear as a peribronchial or an extrabronchial mass which may be either in the mediastinal shadow and thus hidden within it, or may disseminate into the lung, or protrude into the lung field at the root. At the same time or at any stage, the tumour may obstruct the bronchus at first partially causing obstructive emphysema, but later on a complete atelectasis. It might later still produce pneumonitis or suppuration of the lung distal to the occluded bronchus. It is to these varied appearances that the names—infiltrative growth if infiltrating, stenosing type if causing obstruction, or the cavitary type of neoplasm when suppurating are given.

Those originating in the intermediate bronchus give rise to collapse of the lobar or segmental distribution. It may form a peribronchial mass.

Those originating in the smallest peripheral bronchus take the form of circumscribed round or oval or slightly lobulated mass, do not involve the lymph glands until a late stage. This is the type which was considered in the past to be arising from the pulmonary epithelium.

An arbitrary classification like this based on the location appears to be of far more practical value than those based on histological findings, as early clinical signs depend on the origin of the lesion.

The importance of early diagnosis

As many cases are inoperable when seen first, early diagnosis is essential. Cases that are operable become inoperable within a short time, if there is any delay of operation. A complete investigation should be made commencing with simple screening and teleradiograms in different views, this may be followed by tomography and if necessary by bronchography, if necessary this may be confirmed by bronchoscopy and examination of tumour cells in the sputum or the bronchoscopically removed secretions. If there is still uncertainty, exploratory thoracotomy would be justified. The number of inoperable cases would decline if there is less delay between the onset of symptoms and the X-ray investigation. Therefore one should be constantly on the look out for lung cancer especially where there are suspicious signs of carcinoma in the lungs in a person over forty years. Only thus would we get the earliest possible diagnosis of carcinoma when the tumour is still in the operable stage.

Our modern diagnostic methods.

I. Radiological methods.

II. Diagnostic examination of sputum and pleural fluid.

III. Diagnostic examination of bronchoscopically removed secretions.

IV. Bronchoscopy and biopsy.

V. Exploratory thoracotomy.

1. Radiological methods:—X-ray examination plays a crucial role in the early diagnosis of bronchogenic carcinoma, but although it is an extremely important diagnostic procedure, unlike bronchoscopy with biopsy, it is usually not absolutely diagnostic, but is very suggestive. In the great majority of cases the lung carcinoma is first suspected because one sees an abnormal shadow in the lung either before there are any clinical symptoms or after their onset. But there are also other cases in which carcinoma is present but in an atypical form or in a very early stage as suggested by the clinical symptoms such as cough, or hemoptysis, etc., but there is no X-ray evidence of any abnormality. These are early cases with endobronchial growth, and may not be detected by a straight X-ray examination but may be seen by special X-ray methods like tomography or bronchography.

The radiological methods are mainly five:

(1) Fluoroscopy and teleradiograms.

(2) Penetrating views with Potter Bucky diaphragm.

(3) Tomography or planigraphy.

(4) Bronchography.

(5) Angiocardiography.

1. *Fluoroscopy*:—Whenever the bronchogenic carcinoma is suspected, either because of the clinical signs in a person over forty, or because the routine Teleradiogram shows an abnormal shadow, screening should not be omitted. It is not only useful for determining further positions in which an X-ray picture could be more informative, and locate the position of the tumour, but it will more clearly demonstrate the presence of emphysema or atelectasis, and a possible shift of the mediastinum. The significance of the emphysema in lung carcinoma as an early sign has been emphasised by Westermarck¹. He divided the effects of bronchostenosis into three separate stages. In the first stage there is diminution of aeration as a result of minimal stenosis, so that there is some diminished translucency of the lung, affected. In the second stage a check valve action takes place, so that like foreign bodies there is obstructive emphysema. Here the lungs appear normal in inspiration, but in expiration, the affected lung appears more translucent because of emphysema, while the normal lung shows the usual appearance thus causing a

marked difference in their appearance. The diaphragm on the normal side ascends during expiration while on the affected side, it remains in its inspiratory position. The mediastinum is displaced towards the normal side during expiration as well. In the third stage, there is complete stenosis with the resulting typical picture of atelectasis. These signs of obstructive emphysema have again been emphasised by Rigler and Kelby² and Rigler and Merner³. They recommend two films, one during inspiration and one during expiration. They think that the failure to observe this early sign is because we make all our routine X-rays by a single film at the end of inspiration. Such a film would fail to show the difference in translucency of the two lungs, while an additional film made during expiration would show the minor changes in radiability of the two lungs. Thus screening in both inspiratory and expiratory phases and films both in inspiration and expiration would be most useful in detecting early lung carcinomas.

2. In some cases penetrating views with the Potter bucky diaphragm are helpful, especially where there is atelectasis, and where Tomography is not available.

3. *Tomography or Planigraphy*:—I do not wish to go into the principles and method of Tomography.

We all know them. But as Tomography or Planigraphy plays an important role in the X-ray diagnosis of lung carcinomas, let me point out certain interesting points.

TECHNIC:—As in routine X-ray the patient should be asked to immobilise himself as movement of the patient here will have the same blurring effect on the Tomograms as happens in plain X-ray films. The arc through which the tube is moved I usually keep at thirty degrees, namely 15 degrees on one side of the perpendicular and 15 degrees on the other side. If you use an arc greater than 30 degrees, you will have to increase the exposure. The direction of the tube movements is in the longitudinal direction. The measurement of the depth should be made from table top upwards. Screening and routine X-rays in A.P. and lateral views give an approximate depth of the lesion to be tomographed. Three to five sections are usually taken at depths of 9, 11, 13 cms. The plane should be as parallel to the involved bronchus, as possible. As the Tomogram is taken in the plane of the bronchus, at least one will show the bifurcation of the trachea, the main bronchi of both sides and their branches, and will show the pathology of the bronchus even though the surrounding lung is consolidated or is hidden by an

overlapping effusion or if there is atelectasis.

Interpretation of Tomograms.—Rigler and Merner³ point out that the diagnosis of a carcinoma may be made out from a Tomogram if it shows an actual defect within a bronchus, or an irregular stenosis of the bronchus producing a rat-tail deformity or a peribronchial or an extrabronchial mass, or visualisation of a clear cut intrabronchial mass. If the Tomogram shows merely obstruction or stenosis of the bronchus, partial or complete, one can not tell definitely that it is due to a carcinoma as although there is atelectasis, similar evidence can be obtained in inflammatory lesions, in pneumonias, also in metastases. Thus it does not differentiate between a bronchial obstruction caused by an endobronchial tumour and bronchial obstruction caused by a pneumonic consolidation or by a metastatic tumour. Of course when one finds an endobronchial mass, this finding when present would be highly pathognomonic of carcinoma. But this finding is rare, at least I have not been able to see one endobronchial mass as yet. An irregular deformity of the bronchus or an irregularity and narrowing of the bronchus is however in favour of a lung carcinoma.

A Tomogram will also demonstrate a malignant lung abscess cavity

just the same as it visualises a tuberculous cavity or a lung abscess cavity. Of course the presence of cavity is not in any way pathognomonic of carcinoma as it may be present not only in carcinomas but in many other lesions and much more frequently in inflammatory lesions.

Though there is no X-ray method by which early lung carcinoma can be definitely diagnosed from lung infections or from a lung abscess, and although bronchoscopy with positive biopsy are still the only means by which absolute diagnosis can be made, this method—Tomography—may help in solving the problem. This type is probably only present in primary tumours, as we see large metastases for long periods without showing any signs of cavitation. Although we have some typical signs of a malignant lung abscess such as thickened walls, asymmetrical location, presence of air bubble in the centre instead of at the top, presence of enlarged mediastinal glands, or the presence of lymphatic strands running from the hilum (hilar glands) to the malignant lung abscess, in absence of such typical signs the malignant abscess would be a problem, in the solution of which Tomography may be of great help. The tomogram will show the outline of the cavity to be irregular with nodules projecting into the cavity. The wall of the cavity will appear

irregular, ragged or nodular and somewhat eccentric.

Such a tomographic appearance in a person over forty, with cough, dyspnoea, haemoptysis, pain in the chest, etc., would complete a clinical picture of a malignant lung abscess.

4. *Bronchography*:—As we know, it is at times a difficult matter to localise a visible intrathoracic mass, in relation to the lung or pleura. Routine X-ray shows a sharp mass occupying one of the lung fields, but one cannot tell exactly where the tumour lies. After an injection of Lipiodol, the bronchial branches are seen to stop suddenly around the pathological shadow. This abrupt stoppage is not pathognomonic of carcinomas but merely shows the state of bronchostenosis. A similar picture could be given by a lung abscess. But differential diagnosis of a lung carcinoma from a simple lung abscess would be apparent if one considers the patient's condition, the grave symptoms, the extreme rapidity of the progress and above all the expectoration of sputum which is usually foul. Here it must be borne in mind that even large doses of Lipiodol are incapable of showing every area of the lung. Pathological significance must not be attributed to the fact that not all the bronchial trunks are visible after the injection of Lipiodol. But

when an injection has been in accordance with the rules of technic, and the suspected part of the lung has been placed so that the Lipiodol must gravitate towards it, failure to fill the corresponding bronchus or its branch or the area strongly suggests that there is bronchial block. In a bronchogenic carcinoma, the shape of the terminal part of the Lipiodol shadow varies, it may show an abrupt transverse arrest without any narrowing or it may taper off to a fine point.

Comparison of the 3 methods of X-ray examinations namely routine X-rays, Tomograms and Bronchograms. A comparison of the various methods of X-ray examination of lungs for carcinoma shows definite advantages of tomography.

Tomography and routine X-rays.—Our diagnosis based on routine X-rays is based on such findings as obstructive emphysema, enlarged hilar glands, atelectasis, phrenic paralysis with a high dome, paradoxical movements of the diaphragm, mediastinal deviation, etc. But in spite of these well known findings, and this is not uncommon, a carcinoma may be present in an atypical form, or it may be in the very early endobronchial stage, where except for a suspicious emphysema, there are no other signs of the disease, or where the neoplasm is masked by a pleural effusion or a

pleural thickening, or by a secondary atelectasis particularly if massive, and thus may escape notice in routine X-ray examination. One patient when referred for X-ray investigation showed pleural effusion in the right base, there was no other pathology, evident in the routine X-ray examination. Tomograms showed a large mass of glands in the right hilum, and particularly in its lower part, and also showed a slightly high dome. The fact that enlarged glands were present helped me to establish the diagnosis of a carcinoma of the lung.

Tomography and bronchography.—The advantage of tomography over bronchography is that in certain cases Lipiodol may be contraindicated, or even if indicated it may be difficult if there is dyspnoea or haemoptysis or severe cough. Secondly besides being uncomfortable there is the danger of retention of oil in the lungs and thus increase the possibility of further secondary collapse. There is also a third disadvantage of bronchography according to Rigler and Merner³ who say that many thoracic surgeons object to it in cancer as they feel that surgery should be delayed for a period of 6 weeks or longer after Lipiodol, and such a period of waiting would increase the size of the tumour in the mean time. On the other hand Tomography could always be done

whatever the complication, whatever the stage, however ill the patient may be, and in any case Tomography should precede bronchography if possible.

May I here put in a plea for Tomography of these cases. As these cases that we see, most of them at least are in an advanced stage, some even are hopeless by the time we see, that Tomography should be used very early in its early stages, as in the late stages, the evidence is too clear, but is too late to help the patient. Do not think here of the cost of the films; nor of the time taken and there is no doubt that the method is costly and requires a number of films, and requires much longer time than routine radiography.

J. Blair Hartly⁴ assesses the value of Tomograms under 7 headings.

(1) It confirms or rules out bronchial obstruction previously diagnosed.

(2) It may demonstrate the size and depth of a cancer already diagnosed.

(3) It may reveal whether a carcinoma is of the stenosing or ulcerating type, and whether the lesion is extensive, and of the peribronchial infiltrative type.

(4) It may bring out details not evident in a plain film.

(5) It may reveal compression or displacement of air passages.

(6) It may aid in the follow up examinations determining whether the chest changes are the result of recurrence or incident to treatment.

(7) The immediate and late results of radiation therapy are best visible in this way.

As the general physician becomes aware of the clinical signs of a bronchogenic carcinoma, and appreciates the difficulty of diagnosing this disease, they will refer more and more cases for Tomography in addition to the routine methods of diagnosis. An efficient Tomogram will eliminate the necessity of bronchography in these cases. One may do bronchography however if further information is required. As we have already seen the disadvantages of bronchography, and as it may remain for comparatively long periods, it would always be best to defer bronchography till after Tomography.

5. *Angiocardiography*: The newest radiological method used is angiocardiography. It is discussed by Neumann, Sussman and Nabataoff in *Surgery*⁵ and again quoted by *Year Book of Radiology*, 1949. They compared the angiocardiograms of patients with lung neoplasms with the operative and post mortem specimens. "Malignant tumours of the main bronchi show large pulmonary vessels in the area of the neoplasm to be compressed, irregularly distorted or partially or completely

occluded. This evidence led to the correct diagnosis even though the routine X-rays showed no evidence of the tumour. Malignant tumours of small or large bronchi distort irregularly or occlude the adjacent blood vessels. Benign tumours show displacement of the neighbouring vessels but they themselves are intact. Mediastinal or extra pulmonary tumours cause no change of the normal vascular arrangement as shown by angiocardiography." I have quoted the above as I have no experience of angiocardiography. It appears to be a helpful procedure, but is hardly likely to be used much.

DIFFERENTIAL DIAGNOSIS:—The points requiring solution of the problem in differential diagnosis of the bronchogenic carcinoma are:

(1) A mass in the lung near the hilum or an opacity near the hilum or the mediastinal area.

(2) Atelectasis or collapse.

(3) Pleural effusion.

(4) Cavitation.

(5) Special features of Pancoast's or superior sulcus tumours.

1. *Mass in the lung near the hilum*; and (2) *Collapse*:—A solitary shadow in the lung is not always produced by the tumour itself, as we know that we see frequently with the tumour shadow an inflammatory process and atelectasis. Sometimes, these changes are so

marked in very small tumours, that it is very difficult to obtain from the X-ray picture a definite idea of the size of the tumour or its boundaries. We see the growth of the tumour in X-rays and observe the changes and size as the case progresses. The diagnosis is comparatively easy, where there is an opacity at the hilum, with another opacity or some infiltration in the lung. The difficulty comes in when only hilar opacity is seen. Here one should not be tempted in making a snap diagnosis. Here one has to take various views to localise the lesion, is it only localised to the hilum? or is it also involving the lung in its immediate neighbourhood? One has here to think of the similarity of picture in lymphosarcoma, Hodgkin's glands, in central pneumonia, in infarcts, lymphoblastoma, neuroblastoma. Sometimes there is nothing pathognomonic in these hilar densities to establish a diagnosis of bronchogenic carcinoma on the first examination. Follow up studies are required to make up the final diagnosis, but few cases come again for a follow up. It should be realized that the same radiological picture can be given by both neoplasm as well as inflammatory lesions. The diagnosis may have to be made from lymphosarcoma or Hodgkin's glands. Hodgkin's glands are usually bilateral, and the paratracheal glands are first involved,

whereas carcinoma is usually unilateral and bifurcation glands are first involved. In cases where there are no glands, and collapse is alone evident, phrenic paralysis or paradoxical movements may help. Tomograms might be very helpful. Total collapse is easier to diagnose with mediastinum and trachea displaced to the affected side pointing to bronchial obstruction. One has to exclude here a foreign body, and here history usually excludes it. Here I might again repeat that the growth itself may be very small and yet obstruct a bronchus and show a segmental or lobar atelectasis. If the opacity persists, there may be glandular enlargement at the mediastinum. Persistence of such an opacity is very suspicious of a bronchial carcinoma and further investigations should be carried out by Tomography, and bronchoscopy, and if bronchoscopy can not show the neoplasm, being beyond its vision as in peripheral or upper lobe neoplasms, bronchography and Tomography may be of value in showing the exact location of neoplasm and its type. A bronchial adenoma also has to be thought of, but the differentiation is very difficult. Tomography here may be helpful.

3. *Large effusion*:—A pleural effusion frequently complicates a neoplasm and obscures the growth and worse still the enlarged hilar

glands or basal lesions. The diagnosis of neoplasm is however always suggested if the heart and mediastinum are not displaced towards the opposite side. In a case of lung carcinoma, the first report was merely pleural effusion. When the patient was again investigated, the mediastinum was seen to shift towards the side where the effusion was present, instead of towards the normal side, thus establishing the diagnosis of bronchial carcinoma. Subsequently tumour cells were found in the sputum. The case was too advanced for surgery. This pleural effusion masks the neoplasm. Immediately after aspiration and air replacement it may be possible to locate the neoplasm and the mass at the root of the hilum, but in some cases even withdrawal of fluid has not been of great value, especially where there is such thickening of pleura that it is impossible to decide between the thickened pleura and the diseased lung. Here Tomography may reveal the mass.

4. *Cavitation*:—This type of malignant lesion is most often confused with infection. Usually the cavity is of a single type. Here again Tomography may show not only the malignant nature of lesion but may demonstrate a mass in and around the bronchus or may demonstrate the block in the bronchus. Here the possibility should be borne

in mind, otherwise the interpretation may be altogether wrong.

5. *Pancoast's tumours or superior sulcus tumours* are a class by itself amongst the bronchial carcinomas. The X-ray findings here are in sharp contrast to those occurring at or nearing the hilum. Whereas the cancers arising at or near the hilum resemble numerous conditions like hilar tuberculosis, atypical pneumonia, Hodgkin's disease, lymphosarcoma, actinomycosis, etc. The apical tumours have to be distinguished from tumours arising in association with the intercostal nerves, the posterior nerve roots, also tumours arising from bone or cartilaginous structures. They may be mistaken for hourglass or dumb-bell tumours. These apical tumours show a well defined homogenous shadow of increased density situated in the apex of a lung. The ribs may show at first pressure necrosis and later on malignant destruction. Costal and vertebral changes are not essential for the diagnosis, as they may not be visible in early cases. Our attention is drawn to the X-ray findings by the characteristic clinical picture with the pain in the arm and shoulder, often unbearable and quite resistant to treatment, and Horner's syndrome. One finds later on destruction of one or more of the upper 3 ribs posteriorly, and some erosion of the

transverse processes and bodies of the corresponding vertebrae.

6. *Tuberculosis may be confused with lung carcinoma*:—The symptoms and physical signs of carcinoma of lung sometimes simulate those of pulmonary tuberculosis and even the routine radiological investigation may be misleading. In case of an old man, the picture quite resembled a carcinoma. The sputum examination however revealed its tuberculous nature. That this confusion does occur is seen by the report of Ochsli and Olson⁶. They report that during 19 years among 11,752 patients admitted to the Olive View Sanatorium, 16 cases admitted were of proved carcinoma either as definite or probable tuberculosis. In such cases Tomography would be a considerable help, as it would show the form and extent of tumour mass, the portion of bronchus involved, and degree of stenosis. In tuberculosis on the other hand it would show the character of cavities, show the distribution and the type of infiltration.

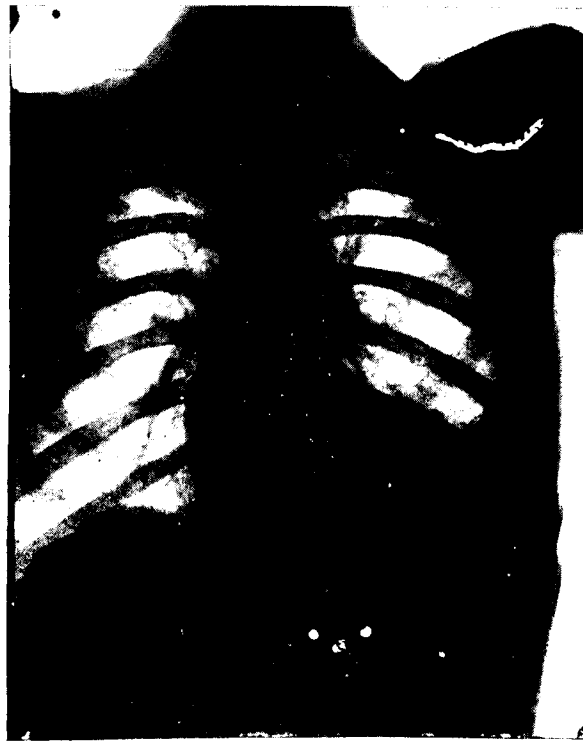
II. Beside the Radiological methods of diagnosis, there is the usual cytological examination of the pleural fluid. We know this method well, and if malignant cells are found in the fluid, they are an absolute indication of carcinoma of the lung.

III. Diagnostic examination of the sputum and the bronchoscopically removed secretions.

Examination of the sputum by the older methods has not been successful.

The work of Papanicolaou and Trout⁷ in 1943 on the diagnosis of uterine carcinoma by vaginal smears stimulated the application of this technic to material from other organs. Herbut and Clerf⁸ presented their experiences with the Papanicolaou technic applied to bronchial secretions obtained by aspiration through bronchoscope, they found positive evidence of malignancy in 89% of cases. More recently Farber, Benioff and Mcgrath (1949)⁹ have shown that results of examination of sputum are as satisfactory as those obtained from study of bronchial aspirations. This examination of the sputum is certainly an important advance in our methods of diagnosis. Therefore in any case suspected of carcinoma of the lung in which bronchoscopic biopsy is not possible as in the peripheral lesions or in the upper lobe lesions or where patient refused bronchoscopy, or where bronchoscopy fails to give a positive result in a suspected case examination of the sputum or bronchial aspirates should be done, to demonstrate cancer cells.

IV. Bronchoscopy and biopsy. —It is true that with our advanced



CASE IX.—FILM No. 5. Carcinoma left lung. Protruding at left hilum. Atelectasis in left base. Plain tele.



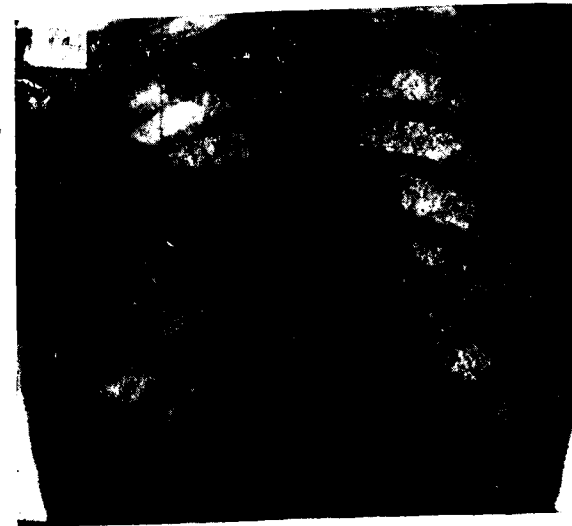
CASE IX.—FILM No. 6. Carcinoma left lung. Bronchogram showing stenosis of the left bronchus. [Vide page 29.]



CASE X. FILM No. 7. Tomogram. Section at 11 cms. Carcinoma right upper bronchus.



CASE X. FILM No. 8. Tomogram Section at 13 cms. [Vide page 29.]



CASE XI.—FILM No. 9. Routine tele. Carcinoma peripheral type.

[Vide page 29.]



CASE XI.—FILM No. 10. Tomogram. Section at 12 cms.

[Vide page 29.]



CASE XII.—FILM No. 11. Routine tele.

Dull right chest with pleural effusion. Right lung or mediastinum not visible.

[Vide page 30.]

X-ray methods, the diagnosis may still be suggestive. In order to confirm the diagnosis, and differentiate between a lung infection and malignancy we may have to resort to several X-rays and this might mean a delay of weeks, when precious time for surgery may be lost. In such cases, bronchoscopy with biopsy is still the only method by which a positive diagnosis can be made before metastases have formed, the exception being an exploratory thoracotomy. Even needle biopsy through the chest wall has been done, but has very serious limitations and has serious risks. Here may I remind you that bronchoscopy and X-ray investigation should not be looked upon in a competitive spirit, but both methods should be considered as complimentary to the other. The great value of bronchoscopy is in the fact that we can obtain a tissue for biopsy. Naturally the diagnosis is relatively easier when the primary tumour is accessible to bronchoscope. It is therefore of value in those neoplasms where they are plainly visible within the lumen of the bronchus. The biopsy specimen should be taken from the actual tumour itself and not from the superficially necrotic or angry area. It is therefore not of value in tumours of the upper lobe bronchi. The bronchoscopic picture is very variable. Commonly one finds a soft fungating tumour. Rigler³

thinks even the bronchoscopic biopsy as unreliable in early cases, as by this means, he says, positive evidence is obtained in not more than 50% of cases in which surgery should be undertaken. Where the X-ray picture shows round sharp defined areas in the posteroanterior view, very close to the midline they are rarely seen bronchoscopically because actually they are peripheral as shown also by the lateral view. Bronchoscopy is also not without its limitations. It is a procedure to which the patient is unwilling to submit, and often the poor condition of the patient prevents its use entirely. In some of the peripherally located tumours where biopsies cannot be taken narrowing and deformity of bronchi, if visible, will be valuable and helps in the diagnosis.

V. Exploratory thoracotomy.—Exploratory thoracotomy is done where doubt exists as to whether the neoplasm is still early and in the operable stage or not.

Conclusions.—The diagnosis of bronchogenic carcinoma is therefore a matter of the most careful cooperation between the radiologist, the bronchoscopist and the pathologist. We recognise a certain percentage of cases by our radiological findings. A few more could be further recognised by the aid of bronchoscope, where we are not certain as to the



CASE III.—FILM No. 1. Bronchogenic Carcinoma right lung which can be mistaken for T.B. right lung.



CASE IV.—FILM No. 2. Carcinoma left lung. Stenosis of the main bronchus.

[Vide page 29.]



CASE VI.—FILM No. 3. Carcinoma right lung. Stenosis of medium bronchus.



CASE VII.—FILM No. 4. Neoplasm in periphery of right lung.

[Vide page 2]



CASE XII.—FILM No. 12. Tomogram at 9 cms. Right lung just visible and enlarged hilar glands just visible. (Vide page 30.)



CASE XII.—FILM No. 13. Tomogram at 11 cms. Carcinoma right lung. Enlarged mass of glands clearly visible—narrowing of right bronchus—Atelectasis of right base. (Vide page 30.)

diagnosis. A few more cases will be recognised by the aid of the pathologist by the examination of sputum and the bronchoscopically removed secretions. In a very small percentage would an exploratory thoracotomy be required for cases in which the evidence is very strong that there is present a bronchogenic carcinoma in an early stage.

Cases 1 and 2 are cases which show tuberculosis, but which can be mistaken for carcinoma.

Case 3 is a bronchogenic carcinoma right lung which can be mistaken for T.B. right lung. (Film No. 1, vide picture).

Case 4 is a carcinoma of the left lung, which shows stenosis of the left main bronchus. The whole left lung shows a typical dullness like a veil or pleurisy. This is an early stage as it still shows vascular shadows. (Film No. 2, vide picture).

Case 5 is a carcinoma of the right lung, showing complete collapse, showing no vascular shadows at all.

Case 6 shows a carcinoma of the right lung, involving only the upper half, showing stenosis of the medium bronchus. (Film No. 3, vide picture).

Case 7 shows a neoplasm of the right lung, in the periphery, with enlarged glands in the right hilum. No pathological investigation. (Film No. 4, vide picture).

Case 8. Big neoplasm in the right lung. Presumed malignant as it

shows an abscess cavity. No pathological investigation.

Case 9, (Film Nos. 5, 6). Age 60. dyspnoea, pain in the chest and increasing weakness, and loss of weight. Plain film 5 shows an enlarged left hilum with slight dullness in the left base ?neoplasm ?pleurisy. Bronchography was done showing definite stenosis of the left bronchus with atelectasis of the left lower lobe. (Film Nos. 5, 6, vide pictures).

Case 10, (Film Nos. 7 & 8). Age 72. Cough. No symptoms. Plain X-ray shows a dullness in right upper lobe with a high dome and restricted movements. Tomograms show a well defined left bronchial tree, but no definition of the right upper bronchus. No pathological investigation. (Film Nos. 7, 8, vide pictures).

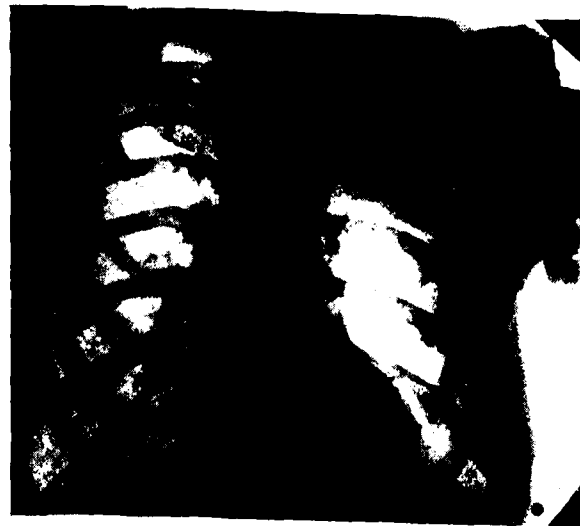
Case 11, (Film Nos. 9, 10). Age 57, patient had pain in the right chest, dyspnoea, breathless on exertion, for 3 months. Temp. 98°F, pulse 90, respirations 20. Physical signs show emphysematous chest, harsh breath sounds and rales and rhonchi on both sides. Impaired note in the middle right chest, with some tenderness over the area. W.B.Cs. 10600. Routine X-ray No. 9, shows a circular well defined shadow in the right lung, quite opaque ?encysted effusion ?neoplasm, in the outer half of the middle right lung. Lungs

show some bronchiectasis. The differential diagnosis lay between a lung abscess, hydatid cyst, encysted effusion and a neoplasm. The Tomogram No. 10 shows the circular character of the neoplasm, more well defined and more distinctly than in the routine films and shows enlarged glands and distinct lymphatic strands running from the hilum towards the neoplasm, showing evidence of a carcinoma of the peripheral type. (Film Nos. 9, 10, *vide pictures*).

Case 12, (Films 18). Mr. P., patient about 60, shows increasing weakness, shows loss of weight, and some breathlessness. Urine showed sugar, 200 mgms. per cent. Acetone was present. Blood urea was 34 mgms. per cent.

The plain X-ray No. 11 shows the whole right chest dull, with fluid in the right pleural cavity Nos. 12 and 13, (*vide pictures*). Tomograms. They show glands in the right hilum, a collapsed area in the right middle lobe region. Right lower bronchus appears irregular and shows narrowing and tapering. The right hilar glands enlarged, the tapering and

narrowing of the right lower bronchus, collapse of the lower medial lung, with fluid in the right chest showed definite malignancy. Patient died about one month afterwards.

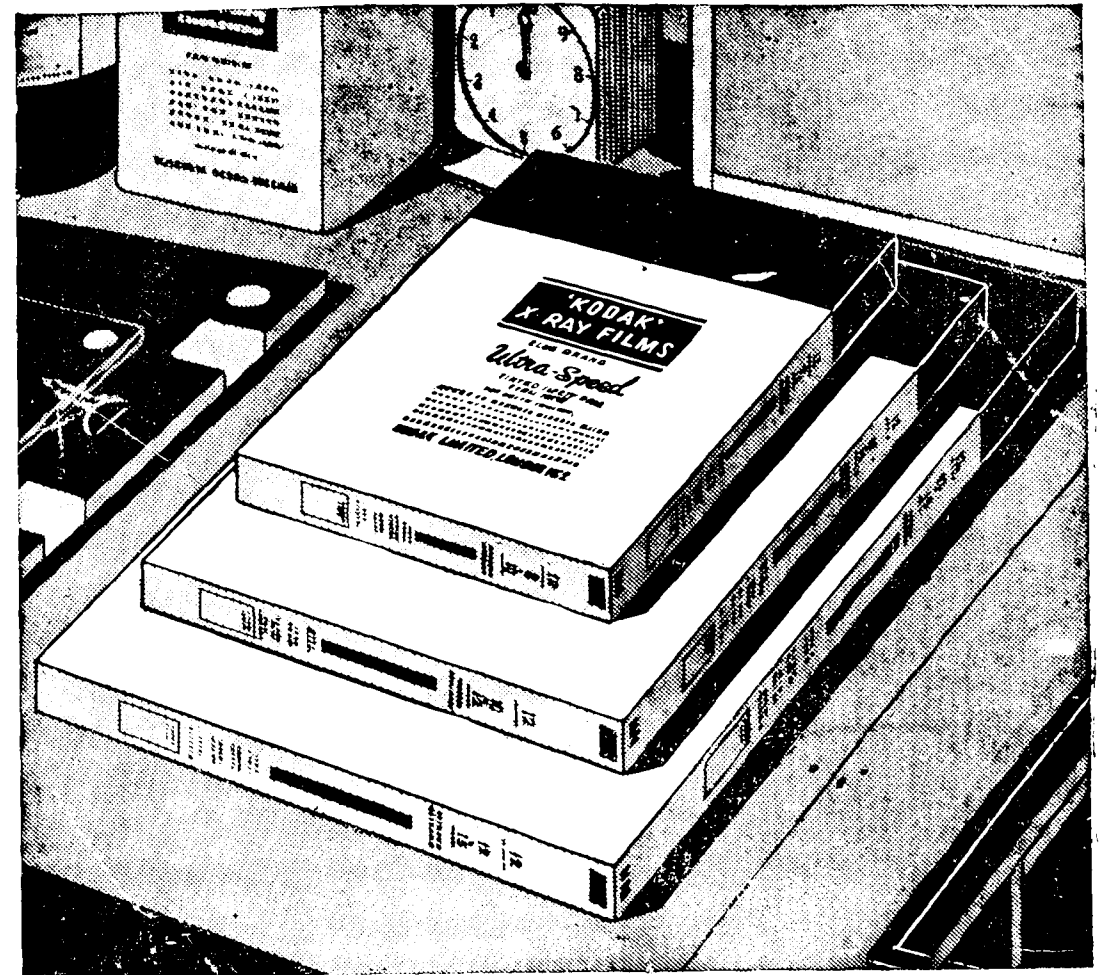


CASE XIII.—FILM 14. Pancoast's tumour left upper lobe with destruction of left upper ribs.

Case 13, (Film No. 14, *vide picture*). Patient was referred for X-ray investigation for pain in the left shoulder and inner aspect of the arm. The film shows an apical density with osteolysis of the 1st and 2nd left ribs. Superior sulcus or Pancoast's tumour.

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and thus promote the development of radiological services to our people on a large scale. In addition new avenues of employment will be thrown open to our young men for the utilisation of their talents in the development of research in this potentially rich field.

There is another matter of equal importance to which I should like to refer. The practice of radio-therapy in unskilled hands is a great danger to the community. Legislative and administrative action to control appropriately the use of radiation for therapeutic and diagnostic purposes is therefore imperative. I am glad to learn that my Director-General has been in contact with the Association for some time on this matter, that he had an opportunity of addressing the last Conference at Calcutta on this subject and that a request for suggestions from the Association towards the enactment of necessary legislation was made. I am also glad to learn that the subject has been under active discussion by a Committee appointed by the Association and that recommendations are being put forward for consideration by the Government of India. We are indeed grateful for such assistance. May I also say, on behalf of my Government and myself, that we welcome all opportuni-

ties of associating ourselves with scientists in every field for the great tasks that lie ahead in organising the man-power and material resources of the country for improving the living standards of the people, for increasing their all round efficiency and for promoting their general welfare.

In addressing an audience of medical scientists such as this it may perhaps seem superfluous that a lay person like myself should stress the importance of improved standards of training and on promoting research. I have, however, deliberately referred to such matters because the application of the science and art of Radiology to the needs of the people is as much a concern of the health administrator as of the scientist. I therefore felt that it would not be inopportune for me to refer briefly to such matters when you as a body of trained specialists in this field are proposing to take stock at your Conference of the achievements already made and of the advances that are required.

Friends I do not want to stand any further between you and your heavy agenda. I declare the Conference open and, in doing so, I wish it every success.

Retiring President's Address

Dr. P. RAMA RAO, D.M.R. (Vienna),

Director, Madras Radiological Institute, Madras.

Hon'ble Sreemathi Rajkumari, Colleagues,
Ladies and Gentlemen,

It is my privilege to call this Congress to order. This is a historic occasion for the Indian Radiological Association to meet at the capital of India, on the eve of the inauguration of the Indian Republic, and to have the blessings of Hon'ble Rajkumari who has so graciously consented to inaugurate our Congress. We look forward to listening to her inspiring Address and advice. I, on behalf of the Indian Radiological Association wish

to say how grateful we are to you for your gesture to us last when we met at Calcutta, and your continued interest in us. One who is giver of health, gives everything that follows good health in a community—prosperity and progress in everything. A mother provides all that is essential for the growth, good health and cheer, happiness and prosperity of her child. Likewise, you, Hon'ble Rajkumari, have been mothering the Indian Radiological Association and thereby stimulating advancement in the radiological sciences in our country.

Address Installing Dr. S. C. Sen as President

Dr. P. RAMA RAO.

It is customary on occasions like this for the retiring President to give an account of his stewardship during the year of his office. Dr. Mody, my predecessor, while installing me at Calcutta, expressed the feeling that the Presidential Gadi was not *all* a bed of roses. My experience has been the same. To you, my friend Sen, we, your predecessors in office, will endeavour in every way, with lessons we have learnt, to see that you *do* have the bed of roses. That stalwart Dr. Joshi, President of the First Indian Congress of Radiology and rest of the members of our Association are with you. The Association is stronger now and more active, and you should be able to guide us with all the experience and fortitude you possess.

During my visit last year to the U.K. and the U.S.A. while contacting eminent radiologists, I was impressed by the keenness with which they have observed the growth of our organisation and the good will shown. They are full of good things to say of the high standard of our *Indian Journal of Radiology* and have expressed their willingness to help and support us, in developing our contributions to the literature of Radiology. They are very appreciative of our efforts. Several British, American, German and Italian radiologists have sent contributions, and they are anxious to encourage us. Our own members, who have plenty of material, should, I think, exert more than they have been doing these three years, to see that the Journal Committee gets adequate contribution of high standard for publication.

I wanted to refrain from expressing my views on matters and subjects not acknowledged as established in the field of radio-therapy. I wish particularly, to draw attention to the race in higher voltage spheres in X-ray therapy. On discussion with colleagues during my last year's visit abroad, I gained the impression, strongly, that there is no therapeutic justification to go further than the 200, 250 and 400 k.v. For clinics not affording the cost of the higher k.v. equipments than the 200 k.v. the

heavier filter, a H.V.L. of 2 mm cu, should be adequate. Ideal will be the 250 k.v. apparatus with H.V.L. of 3 mm cu. The nearest practical approach (at its lesser cost of course) to the Radium Bomb therapy will be the 400 k.v. with H.V.L. of 5 mm cu, which will eliminate the high exit dose the million volt gives.

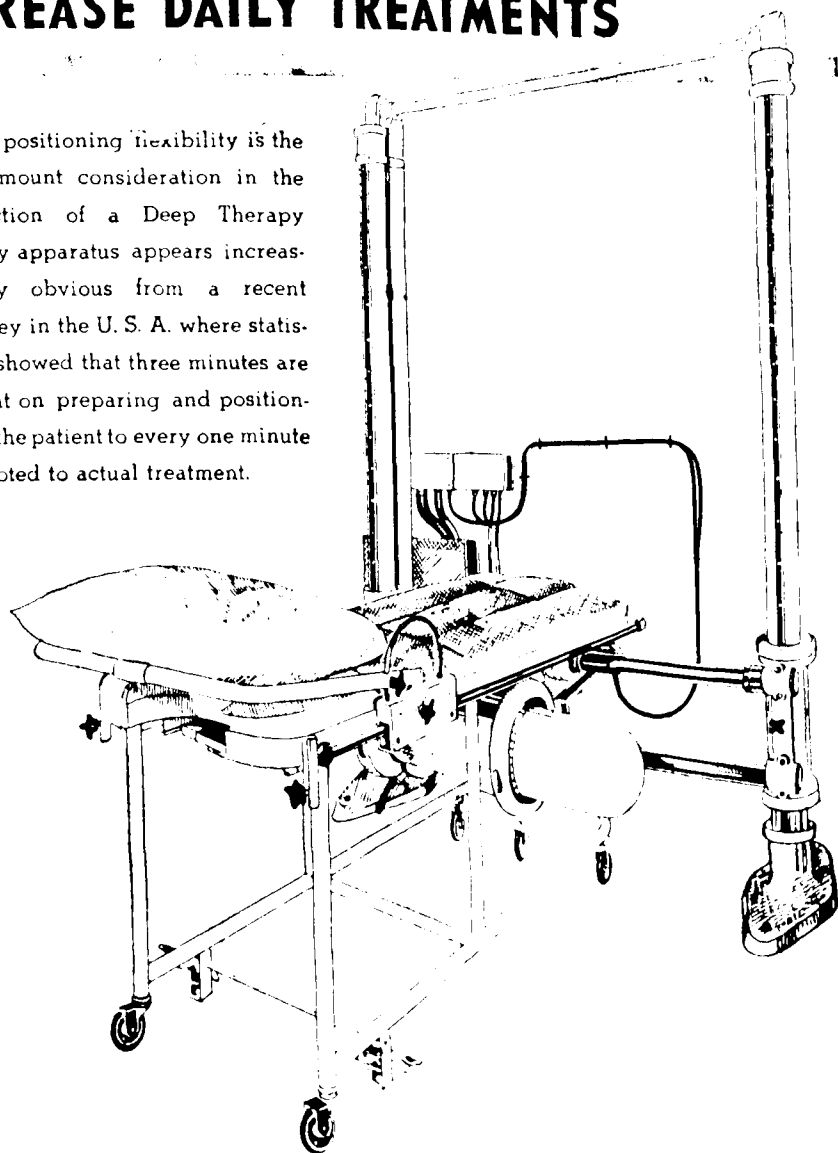
The following words of caution were recently conveyed to me by a professor of Chicago University who is working with a Cyclotron and a Betatron, the latter working at 100 million volts. He says "Though iodine and phosphorous can be bombarded either by the atomic pile or the Betatron and the radioactive isotopes obtained, it is still to be proved that these things are useful." Most of the knowledge so far gained is only on 'autopsy'; and that, 'he says' is no use at all. All those units were donated by rich people and research is being carried on. The Professor was skeptic about these new things, and said that India should not start on these lines, because we may be tempted to play with atomic energy in a field concerning the health and lives of human beings. This, may I most respectfully point out to you.

The exit dosage with the Betatron is 8 times the dosage which can be utilised. The million volt also has a high exit dosage. So, a word of caution, whether, we in India, should experiment and pursue further in spheres, where others who have been in advance of, us are inclined to go forward only with care.

It is now my pleasant duty to introduce my successor and good friend for years, Dr. Satish Sen. Satish and myself have so many things in common. He qualified his M.B. in 1920 and I, my L.M.P. in the same year. He was X-ray specialist with the R.A.F. Indian Hospital, Baghdad in 1923 to 1925, and I commenced my services in X-ray diagnosis and physiotherapy in 1924-'25 while in general practice. Since arriving in this great capital of ours in the early thirties, Dr. Sen has not only created a niche for

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Fourth Indian Congress of Radiology

Held at New Delhi from 21st to 23rd January, 1960 at Lady Harding Medical College Convocation Hall.

Inaugural Address

The Hon'ble RAJKUMARI AMRIT KAUR,

Minister for Health, Government of Indian Union, New Delhi.

I am grateful to the organisers of this Conference for giving me this opportunity to associate myself with it. As the head of the health administration in India I need hardly tell you how deeply interested I am in the development of medical science in all its branches and in raising the standard of medical education to the highest possible level. Radiology occupies such a prominent place in Medicine that no Government can afford to ignore the need for promoting its development and for placing its services as widely as possible at the disposal of the public. When I speak about Radiology I use the term in a wide sense and include the application of radiations of all forms for the diagnosis, cure and prevention of disease. With the coming of the atomic energy age, the possibilities of advance in this field for improving the well being of mankind have been enormously increased. India cannot afford to lag behind other countries either in the training of workers in the science of Radiology or in developing measures for research in this field. In the circumstances Associations such as yours have very important functions to perform. The New India that has come into its own must utilise all available resources for improving the health and welfare of our people and, in this task, it requires the wholehearted support and collaboration of scientists in every sphere. I therefore particularly welcome this opportunity to meet you this morning as it enables me to pass on a few ideas for consideration by the Conference.

I have no doubt that an expert body such as this will fully agree with me that it is essential to give the radiologist the best possible training if this science is to take its proper place as a full partner with other branches of Medicine in the diagnosis and treatment of disease. I am equally sure that we are all in agreement with the late

Dr. A. E. Barclay of Oxford in his remark that "it were better to have no radiologist at all than to have a second rate radiologist, for he does infinite harm to Radiology."

In prescribing standards for teaching in the subject I would urge that India should be content with nothing short of the highest available elsewhere in the world. I understand that the All-India Post-graduate Council of Medical Education which I had the privilege of inaugurating a few days ago at Madras, decided at its first meeting that, in order to lay down suitable standards for post-graduate training in particular subjects, the fullest possible use should be made of the special knowledge which Associations such as yours possess in their respective fields. I am therefore sure that your organisation will be called upon to assist in prescribing such standards. I suggest that earnest consideration should be given to the need for raising not only the standard of training for post-graduate students but also for undergraduates, because the value of post-graduate education will depend largely on the soundness of the foundation that undergraduate training provides. I must also stress that the need for promoting research in this field should not be lost sight of, because it is only when research is actively pursued and its results are suitably applied that the science of radiology can become a dynamic force for promoting the well-being of our people. And it must be realised, more than ever before, that the expert in radiology be he official or otherwise is an equal asset to the country.

May I also refer to the need for the speedy development of facilities for the manufacture, in this country of equipment for radiotherapy? It is only right that we should try as soon as possible to secure a reasonable measure of self-sufficiency. Further, indigenous production will help to cheapen cost

himself as an eminent radiologist with a lucrative practice, but has also endeared himself to the general medical profession in India by his enthusiasm and unreserved services to our Indian Medical Association. Of recent times, his work in International spheres and the World Health Organisation has received approbation from all sides and the services he has thereby rendered to our country is indeed laudable.

We have other assets in common, I hope! you will not deny it to me Sen! These are friendliness, understanding, honesty of purpose, tolerance to views of others and integrity.

Presidential Address

Dr. S. C. SEN, B.Sc., M.B., D.M.R.E., New Delhi.

Hon'ble Rajkumari Amrit Kaur, distinguished visitors, members of the Reception Committee and fellow members of the Indian Radiological Association.

It is my first duty, a most pleasurable one, to thank Rajkumariji for graciously inaugurating this Session of the Congress. Perhaps she will consider my thanks superfluous, as she makes all good causes her own personal affair. Indeed, we greatly appreciate her presence in our midst and we warmly welcome her. I have also to thank the members of the Indian Radiological Association for electing me as the President of the 4th Congress of Radiology and the President of the Association for the year. Whilst I am not unmindful of the honour they have bestowed on me, I am also aware that it is their responsibility as well to see that the duties attached to this office are carried on to their satisfaction. We have to work together as a harmonious team, for it is only by such co-operative activity that progress can be achieved in unbroken success.

Looking back into our brief history, I am reminded that the first Congress was inaugurated by Major-General Huban, the then

I have today, the pleasure and privilege of installing Dr. Satish Chandra Sen, my good friend and brilliant son of India, my successor in office, as President of the 4th Indian Congress of Radiology and of the Indian Radiological Association for the year 1950.

Friend Satish, I now invest you with the Collar and Jewel of your office, and install you in the Presidential Chair. May you during this historic year of the birth of the Indian Republic, also your year of office, raise the standard of radiological practice in our country and may you and yours prosper and be happy. May good health and energy support you. God bless you.

Surgeon-General of Madras and was presided over by our veteran colleague Dr. Joshi. This was followed by the Congress at Bombay, inaugurated by Dr. Jivraj Mehta, the then Director-General of Health Services of India, and presided over by our distinguished colleague Dr. K. P. Mody of Bombay. The third Congress was initiated at Calcutta by Dr. A. C. Chatterji, the then Director of Health Services of Bengal, under the Chairmanship of another distinguished and energetic colleague of ours, Dr. P. Rama Rau, the retiring President. On this occasion of the fourth Congress, we have had the rare privilege of having Rajkumari Amrit Kaur, the distinguished and untiring Health Minister of India, to launch the Conference.

All the people I have named have expressed their valued opinions, in no uncertain terms, regarding Radiology, its usefulness and its future scope in India. There is, therefore, very little left for me to say which has not already been covered. As, however, convention demands that the incoming President must make a speech, I shall endeavour to break new ground and shall reiterate only whatever is necessary.

Perhaps it is not known to many present here this morning what happened when X-ray was first discovered in 1895. I may quote a few extracts to show the kind of reception that was accorded to this new phenomenon by the communities in different parts of the world. The cartoons and skits appearing in many popular magazines and newspapers form a most intriguing part of the early printed records of the discovery and give us a good idea of the reaction of the general public. Not infrequently, they express a certain fear of the ghastly skeletal pictures and their naked indecency. As an example, we may quote from the *London Pall Mall Gazette* of that period:—

"We are sick of the roentgen rays. It is now said, we hope untruly, that Mr. Edison has discovered a substance—tungstate of calcium is its repulsive name—which is potential, whatever that means, to the said rays. The consequence of which appears to be that you can see other people's bones with the naked eye, and also through eight inches of solid wood. On the revolting indecency of this there is no need to dwell. But what we seriously put before the attention of the Government is that the moment tungstate of calcium comes into anything like general use, it will call for legislative restriction of the severest kind. Perhaps the best thing would be for all civilized nations to combine to burn all works on the roentgen rays to execute all the discoverers, and to corner all the tungstate in the world and whelm it in the middle of the ocean. Let the fish contemplate each other's bones if they like, but not us."

The same ignorance and pessimism found expression in jokes and poems, as well as in the normal outpourings of every day life. Assemblyman Reed, of Somerset County, New Jersey, introduced a bill at Trenton, New Jersey, urging the prohibition of the use of X-ray in opera glasses at theatres; and in London, England, a firm made prey of ignorant women by advertising the sale of X-ray proof underclothing. Numerous amusing poems were published, one of which reads:

"O Rontgen, then the news is true
And not a trick of idle rumor,
That bids us each beware of you
And of your grim and graveyard humor.

We do not want, like Dr. Swift
To take our flesh off and to pose in
Our bones, or show each little rift
And joint for you to poke your nose in.

We only crave to contemplate
Each other's full dress photo
Your worse than altogether state
Of portraiture we bar in toto.

The fondest swain could scarcely prize
A picture of his Lady's framework
To gaze on this with yearning eyes
Would probably be voted tame work.

No, keep them for your epitaph
These tombstone souvenirs unpleasant
Or go away and photograph
Mahatmas spook! and Mrs. B.S.t."

Today X-ray has advanced far beyond the epoch of irrational fears and public ridicule. It may not be out of place to mention here the tremendous technical advances made in the design and manufacture of X-ray apparatus since that memorable year, 1895. Perhaps, there are very few in this room who have had the personal experience of using the old type of equipment, consisting of coils, gas tubes and mechanical interrupters, worked by small engines. These very often went wrong and had to be tinkered at and put right by the Radiologists themselves. In those days, one had to use X-ray plates, which were slow and cumbersome. Contrast that situation with the present—ultra speed films, intensifying screens and modern equipment, which is almost foolproof, but requiring, in the case of a breakdown, the services of highly qualified X-ray engineers. The information about the latest type of equipment from the U.S.A. is even more revolutionary and staggering. There appears to be a race between X-ray engineers and manufacturers, instigated by the Radiologists, to make the equipment more powerful, more compact, more adaptable for general use and to reduce the number of buttons to be pressed to three or two or even one, before a film is exposed and a first rate skiagram is obtained. According

to the latest news, through the help of electronics, a machine has been developed, which is capable of solving intricate differential equations. Similar high grade scientific skill is being applied to the furtherance of X-ray equipment. Perhaps the day is not far off when the X-ray apparatus will be so perfected that it will supply ready made diagnosis as well—the machine eliminating the human factor. It is not unlikely too that Physicians, and Surgeons might also be eliminated in the same way. But till then, there will be need and pressing need, for Radiologists and other competent specialists in the medical field.

In the diagnostic line, as you are all aware, it is through Radiology that we have got new ideas and data in Anatomy and Physiology; that we are able to visualise hidden organs and observe their functions; and more important still, that we are able to study the pathology of the living in contrast to the pathology of the dead. With its aid, we can avoid guess work and give positive opinions, which would have been impossible otherwise. In the way of treatment, apart from curing many a benign condition and relieving others, radiation therapy plays a very significant part in the fight against cancer and other dread diseases.

Compared to its progress and development in the West, Radiology is, however, in its infancy in India. In recognition of the greatness of its value in the relief of human suffering, it becomes incumbent on the Indian Radiological Association to take upon itself the task of devising ways and means by which India can not only achieve the highest standards of efficiency in all branches of Radiology, but also make its own contribution to the common pool of world knowledge in this important sphere of science. It must be remembered that India is at present a backward and undeveloped country, though rich in potential resources, and she stands in need of progress in many directions. We, the Indian Radiologists, must therefore think, not in isolation, as just Radiologists, but as intelligent citizens, working towards a fuller planned development. To gain this objective and to play a more effective part in national progress, we

have to encourage the acceptance of certain vital measures.

To begin with, there should be the closest collaboration between physicists, electrical engineers and members of the medical profession. These sections of scientific knowledge are intimately inter-related and cannot develop to an adequate extent, if they are locked away in water-tight compartments. Indeed, we have long recognised the indivisibility of knowledge and the interdependence of its various branches. The theoretical knowledge of the physicist combined with the practical skill of the engineer, and these in turn modified and guided by the biological experience of the Radiologist, are the three indispensable pathways leading to the broad highway of Radiological progress.

Secondly, it is necessary to promote the establishment of the X-ray and Electro-medical industry, so as to enable our country not only to be self sufficient in so far as equipments are concerned, but to have them at cheaper prices and thus make them more widely available for public use and welfare. In this connection, I must bring to your notice the efforts of Mr. Bhowmick of Calcutta, who has been a pioneer in this direction. It is up to us to help him and others like him, who have come forward to meet this gap in our national economy. Correlated with this, is the urgency to establish a factory or factories for the manufacture of X-ray films and chemicals. Our experience during the last World War has shown how unwise it is to depend upon other countries for these vital supplies. The health of our people cannot reach the desired goal until such time as our country can guarantee the uninterrupted flow of such essential goods. I have made several attempts to persuade foreign X-ray concerns to open factories in India in association with us. They are willing to do so, as soon as certain technical and legal difficulties are removed. I am moving further in this matter, in the promotion of which, I hope, Indian capital will be forthcoming and my colleagues will take an increasingly active interest. I might mention that even in a country like Australia, with a small population, X-ray and electro medical industry is

well established and meets the needs of the profession. How much more is such development necessary in India, with its many millions of people, is only too obvious. Such an industry, when established, will also provide employment to large numbers of qualified scientists, engineers and semi-skilled labour, thereby helping to raise the standard of living and to solve a distressing economic problem.

Next I come to the question of specialisation and post-graduate education. The need for extended facilities cannot be overstressed. While it is true that a good Radiologist has to be a good Physician, it is equally true that a Physician has to be specifically trained in order to be a good Radiologist. This aspect has often been overlooked. In the more advanced countries of the West, the man, who called himself a Radiologist because he possessed an X-ray apparatus, has disappeared. This turning point was reached when the Universities began to grant special Diplomas in Radiology to those who satisfied a certain minimum standard of theoretical and practical training. If the prestige of the Radiologist is to rank with that of the Physician or the Surgeon and if the quality of his work is to reach a plane of efficiency, the Indian Radiological Association must include among its many activities the institution of a Diploma of Radiology. The standards must be high and worthy of the very best men. It is better to have no Radiologist, asserted the late Dr. A. E. Barclay, in his Sir J. C. Bose memorial lecture last year, than to have a second rate man, for he does infinite harm to Radiology. In view of what I have said, I would urge the new Council of Post-Graduate Training to give their early attention to this matter and to take into consideration the advice and suggestions of the Indian Radiological Association. Coordinated planning and concerted action, on the part of the profession and the educational authorities, are determining factors in any well thought out scheme of progress.

Arising out of this, is the attitude of our Universities and other bodies and their share in planned development. The present system based on the British tradition, of conferring a multiplicity of degrees and diplomas, thus using almost every letter of the alphabet,

tends to lower standards and create confusion. The practice followed in America and the continent of Europe, of awarding only one degree, the M. D., to medical men, is one that we should advocate and press for. In respect of specialisation, certificates or diplomas may be granted, based on a minimum and uniform standard but without authority to add extra letters after one's name. I may add that in the facilities offered for specialisation, greater emphasis should be attached to practical training. Theoretical education has held the field too long. In this regard, medical education has partaken of the ills of the general system. Happily, a new orientation is on the move and we must see to it that a more balanced programme of medical education is adopted.

Lastly, there is the problem of Research and the growing urgency for its development, particularly in Biophysics. Physics of X-ray and films and diagnostic and therapeutic Radiology. It is advisable, and imperative, to create chairs in Radiology in the Universities, Hospitals and Medical Colleges, as a further incentive to advanced thinking. But that alone will not suffice. To bring about the desired results, the appropriate departments must be suitably staffed and equipped. It might surprise you to know that not all hospitals attached to medical colleges are equipped with such an essential apparatus as a Deep X-ray unit and the Lady Hardinge Medical College is such a one. Such state of affairs must not be permitted to continue.

It is the privilege of a President, on occasions like this, to speak what he likes and for as long as he likes, without any fear of contradiction at the time. I feel, however, that I must not intrude on your kindness and patience much longer and must avoid at any cost the possibility of nodding heads and closing eyes. Few words more and I shall stop. Presidents come and go and the annual orations are seldom remembered. If we wish to achieve anything substantial and definite, our Association will have to be more active and its Central Council must meet oftener than it has done in the past. Not only the Office-bearers but all Members have to play their part. We must study both individually and collectively, the problems facing us and

work out their solutions and try our best to give effect to them. If this is done throughout this year and during the succeeding years, I am sure, that with the help of our distinguished Health Minister and other kind friends, we shall have much achieve-

ments to our credit. It is thus only that the Association will justify its existence and render the right type of service to this country and its people and to humanity at large.

I thank you all.

NEWS RELEASE

American College of Chest Physicians

The First International Congress on Diseases of the Chest will be held at the Carlo Forlanini Institute, Rome, Italy, September 17-20, 1950, under the auspices of the Council on International Affairs of the American College of Chest Physicians and the Carlo Forlanini Institute, with the patronage of the High Commissioner of Hygiene and Health, Italy, in collaboration with the

National Institute of Health and the Italian Federation Against Tuberculosis.

Physicians who are interested in attending the Congress should communicate at once with Dr. Chevalier L. Jackson, Chairman of the Council on International Affairs, American College of Chest Physicians, 500 North Dearborn Street, Chicago 10, Illinois, U.S.A., or with Professor A. Omodei Zorini, Carlo Forlanini Institute, Rome, Italy.

An Appeal

Dr. Yellapragada Subbarao, was one of the brightest sons of India. He has not been spared to us unfortunately to continue his very useful and valuable researches in medicine which revolutionised the understanding and treatment of some of the most refractory conditions and contributed greatly to the well-being of man.

Yet very little is known to the Public about Dr. Subbarao or his work and activities though the results of his investigations are well known to the medical profession.

He was an Andhra, graduated in Medicine from the Madras Medical College and took his M. Sc. from the Madras University. He did his D. T. M. at the University of London and while at London he met late Dr. Richard Strong, of the Harvard School of tropical medicine at whose instigation he went to the U. S. A. In U. S. A. he worked under the direction of Prof. Fisher, Professor of Bio-Chemistry at Harvard. His contributions in the field of Research were varied and many, well known to the profession. His investigations helped the understanding of the mechanism of muscular contraction. His

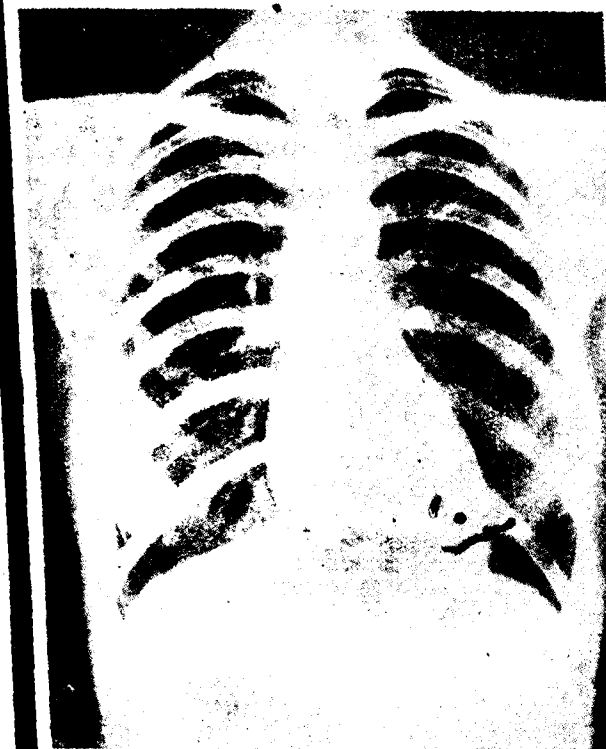
researches in the fractions of liver extracts led to a new approach to the study of cancer. His recent work led to the development of aureo-mycin another antibiotic.

The desire is but natural that such an illustrious name should never be forgotten by his countrymen. The Andhra Provincial Branch, Indian Medical Association therefore decided to commemorate his life by instituting a worthy memorial. It appeals to all the medical men and women of India through the Indian Medical Association to contribute their mite and help establishing the memorial. This branch makes a special appeal to the numerous friends and admirers of Dr. Subbarao to take an active interest and collect contributions not only from the medical profession but from the general public as well.

The contributions may be sent to the Honorary General Secretary, Andhra Provincial Branch, Indian Medical Association, Visakhapatnam or to Andhra Bank, Visakhapatnam, to the credit of Dr. Y. Subbarao Memorial Fund. Andhra Provincial Branch, Indian Medical Association, Visakhapatnam.

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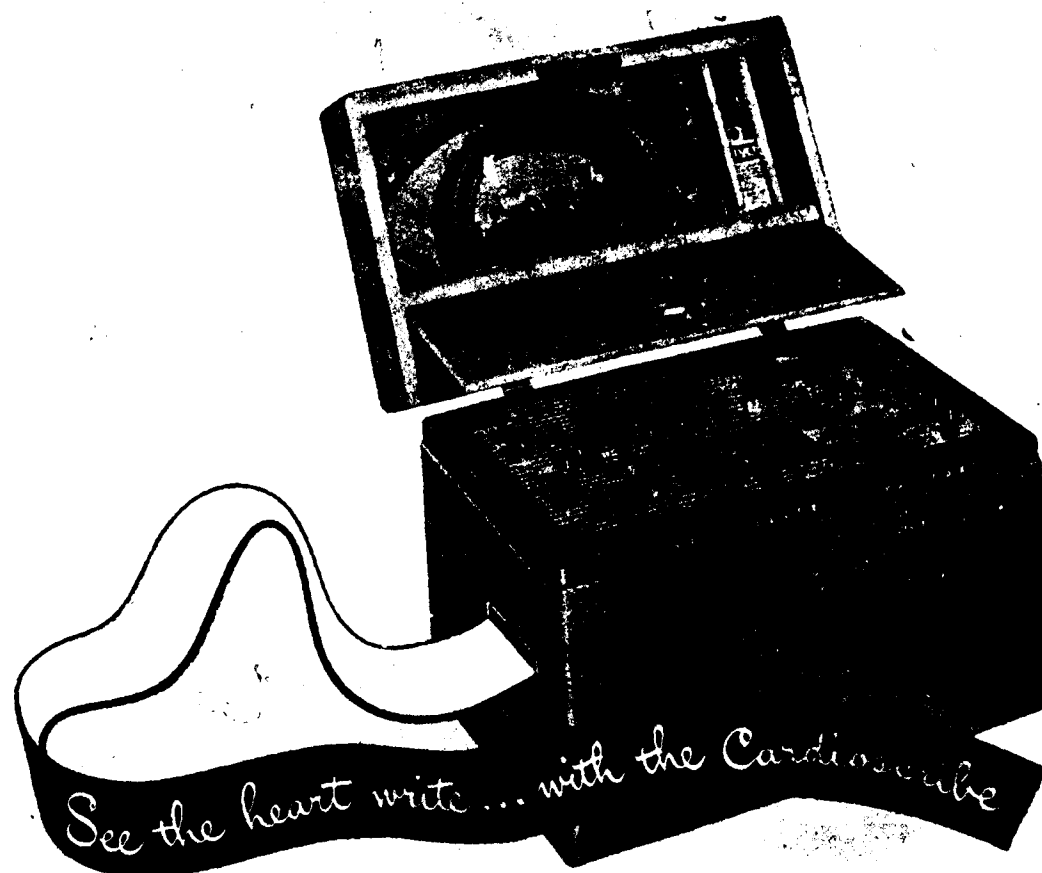
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