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THE

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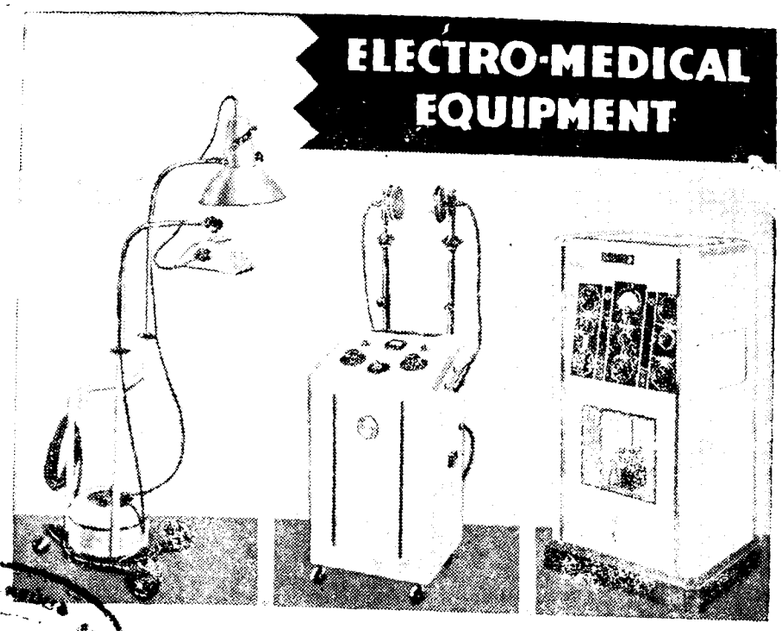

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Orthodiagraphic Measurements of Normal Indian Subjects*

DR. Z. J. JOSEPH, M.D. (Bom.), D.M.R.E. (Cantab.),

HON. RADIOLOGIST, KING EDWARD VII MEMORIAL HOSPITAL AND BHATIA GENERAL HOSPITAL,
HON. LECTURER IN RADIOLOGY AND ELECTRO-THERAPEUTICS, G. S. MEDICAL COLLEGE, BOMBAY.

THE paper I am to read this afternoon is on "Orthodiagraphic Measurements of Normal Indian Subjects." I do not claim to have done any original research on this, but it is simply to guide us as to what is the difference between the Continental figures and those obtained on our own Indian subjects, which figures I have arrived at after observation on a hundred cases.

The heart and the aorta cast a definite shadow with the X-ray. We are specially indebted to Groedel, Le Wald, Bordet, and Vaquez and others for information on this subject. Groedel in 1912, first described the normal silhouette of the heart, whereby the size and shape of the organ are readily determined.

X-rays are of great value in the disease of the cardiovascular system. From the cardiac measurements, from the darkness of the shadow, and the visible pulsations on the screen, the clinician gets a fairly accurate idea as to the increase of the various chambers of the heart and aorta, and as Dorland and Hubeny say:—"Not only as a matter of scientific interest, but as an aid in the treatment of certain cardiac diseases, it becomes desirable in many cases to ascertain the exact size of the heart. Hitherto, this has been roughly estimated by means of the precardial percussion note as first described by Auenbrueger, about the middle of the eighteenth century. The comparatively recent work of Moritx,

* This paper was read at the Second Indian Congress of Radiology, Bombay, December 1947.

Groedel and Dietlen, of Germany; Bordet and Vaquez of France; and Shattuck, Dann, Holmes and Bardeen of the United States, have amply demonstrated that the cardiac dimensions may be much more accurately determined by radiography than by percussion."

Methods.—In order to obtain the exact measurements of the various diameters of the heart and aorta, it is very necessary to understand the different methods employed. If one sees the skiagram of the chest, or screens a patient, one is at once struck with the clear picture of the heart with the surrounding lungs. As the lungs contain air, they seem as black shadows on the negative picture, while the heart and aorta remain white, they being comparatively opaque to X-rays.

X-rays arise from a small point of the X-ray tube, and are therefore divergent and come out in the shape of a cone. When the picture of the heart or any organ is taken, it will necessarily be exaggerated, and therefore the size of the heart will be found to be much larger than what it really is. This was the great difficulty that made the older radiologists think that X-rays were radically incapable of furnishing an exact measurement of the cardiac diameters, and of the changes they undergo during pathological conditions. There remain now almost no great difficulties in the radiological examination of the heart and great blood vessels. With the improvement in the technique, and with better understanding of the cardiac and aortic images, it is now possible to interpret these images much more accurately.

Since the question of technique plays such an important part here, it is necessary to describe in detail the various methods. I shall not go into the details of the apparatus which is necessary to produce the X-rays, but discuss the various methods of obtaining the image of the heart and the great blood vessels.

There are two methods:—

(1) Radiographic.
(2) Radioscopic.

1. *Radiographic method*:—Here pictures are taken of the whole chest and then the various diameters are worked out from such skiagrams.

As I have already said, ordinary radiograms taken at close distance give an exaggerated image of the heart and aorta. It has been found that if the X-ray tube could be placed at a distance of 2 meters, the size of the image corresponds more or less exactly to that of the heart. For practical purposes, a skiagram of the patient, standing 2 meters away from the tube, is taken with the X-ray film placed anteriorly. The back of the patient is towards the tube.

To take such radiograms, it is necessary to pass 200 to 500 milliamperes. As the heart is a constantly pulsating organ, the time exposure has to be somewhere near 1/20th of a second. It is only when the time exposure is a fraction of a second that a picture of the heart and aorta can be obtained with clear and clean cut margins. It will therefore be seen that a very powerful out-fit is necessary to produce such a high current. Such a picture is known as a 'Teleradiogram or a Teleroentgenogram.'

2. *Radioscopic method*: In this method the outline of the heart and aorta is traced on the fluoroscopic screen or paper. In ordinary screening, the shadow of the heart is such exaggerated as already explained. To correct the deformations of Roentgen projections, only the central rays from the X-ray tube are used. This central beam of rays, emanating from the focus, transverses the outline of the heart perpendicularly to the plane of the screen. In this way, the normal ray being tangent at a determined point, the projection of this point is real, and deformation no longer exists. To obtain only the central rays, a diaphragm with a small central circular or rectangular opening is placed between the patient and the tube.

To take an orthodiagram, the tube is placed behind the patient with the fluorescent screen in front of him. The fluorescent screen is then fixed, and the X-ray tube made movable in the horizontal and vertical planes. The current is switched on, and the diaphragm narrowed down allowing only the central rays to pass. The tube is shifted so that these luminous central rays are brought to one border of the cardiac shadow, and then the tube is moved all along the various borders of the heart and aorta, at the same time marking the outlines as seen on the fluorescent screen. The clavicles and diaphragm on both the sides should also be outlined. After having marked out the cardiac shadow on the screen, a tracing of this is made on paper for determining the various diameters and for purposes of recording. A tracing thus obtained is known as an 'Orthodiagram.'

If a seven foot film is taken, one must make sure that the tube and film are properly centred at the same height. Best results are obtained on focussing at the level of the 6th dorsal vertebra with the patient standing. The difference in the size of the heart obtained by the two methods, *viz.*, seven foot picture and orthodiagraphy, is negligible. The greatest difference in measurement is in the transverse diameter which is one centimeter greater in the seven foot film than in the orthodiagram. This difference however grows larger with the increase in size of the heart.

Therefore in large enlargements of the heart, orthodiagraphy offers more accurate results. The most serious drawback to teleroentgenogram is the fact that the apex is usually lost in the abdominal shadow, and so when exact measurements are wanted, orthodiagraphy is to be preferred.

In my investigations to determine the Normal Radiological Standards pertaining to Indian subjects, I have followed the *Radioscopic Method*. Any of these methods gives the corrected shadow of the heart with all its outlines, curves and angles, and therefore it is a real projection of the organ. It is also possible to see the relations of the heart with the lungs, mediastinum, and diaphragmatic arches, and therefore affords a valuable record to the clinician who can measure the various diameters from the orthodiagram or teleradiogram. Kohler says "We should rejoice that there exist two classical roentgen methods of determining the size of the heart and form of the heart. We ought not to play off the one method against the other. If only account is taken in every case, under what conditions the size of the heart has to be estimated, Orthodiagraphy and distance plates may be said to give equally good and equally objective results. It is common to both of these methods, that when carried out, they permit of the size of the heart being determined to a millimeter, and provided they be conducted under the same conditions, they lead to identical conclusions."

Image of the heart in the Anterior Position.—In order to work out the transverse and longitudinal diameters of the heart, and the transverse diameter of the aorta, the patient has to be placed in the Frontal or Anterior position. In this position the patient faces the operator, and the X-ray tube is placed behind him (the patient). The screen is in front of the patient in close contact with the anterior surface of the chest. In this position one obtains an orthodiagraphic tracing as in Figure 1.

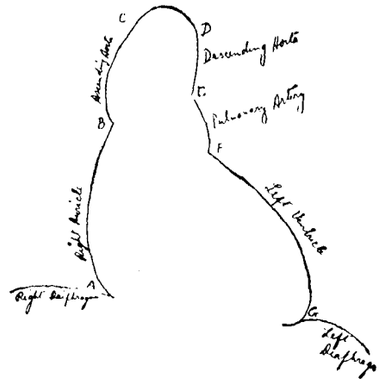

FIG. 1.

Commencing from the right, we get the upward curve of the right diaphragm. Then we approach the right border of the heart. From A to B the tracing represents the Right Auricle. Form B starts the shadow of the ascending Aorta upto C. The aortic shadow then crosses over the middle line, and descends down till E. D E is the contour of the descending part of the aortic notch. As we come lower down, we find another prominence produced by the Pulmonary Artery (E F). The curve F G is entirely formed by the Left Ventricle in normal subjects. Lastly we see the curve of the left diaphragm. The right diaphragm is always slightly higher than the left, due to the presence of the liver. Sometimes a small curve might be seen between the pulmonary curve of the left ventricle. This shadow is thrown by the appendage of the left auricle. This is found in a very small percentage of cases.

When the respirations are superficial, the apex of the heart is seen near the dome of the left diaphragm, sometimes a little below. The apex, as well as the inferior contour of the cardiac shadow is detached from the diaphragmatic shadow during movements of deep or forced inspiration. Therefore there is seen a small area between the inferior contour of the heart and the abdominal shadow. The transparency of this area is due to the thinness of the pericardial folds which are inserted in the centre of the diaphragm.

Measurements of the various Diameters of the Heart.—When the contours of the heart have been traced by the Orthodiagraphic method, the various measurements can then be estimated from the figure. The recognised diameters in relation to the heart are the Longitudinal and the Transverse.

The Longitudinal Diameter is the distance from the apex to the base of the heart. On the diagraphic tracing, the base is taken at the junction of the right auricle and the beginning of the ascending Aorta. (L D in Fig. 2). 134

For the Transverse Diameter, the sum of the two distances, from the middle to the farthest points on the right and the left of the cardiac shadow, is taken. A vertical line, down from the centre of the two sternal ends of the clavicles will represent the middle line of the body. On this vertical line two lines are placed at right angles to the farthest point on the right and left borders of the heart. The addition of the distances of these two lines will be the Transverse Diameter. (MR + ML in Fig. 2).

In the case of the Transverse Diameter of the Aorta, two similar lines are drawn from the vertical line to the farthest points on the right and left of the aortic shadow. The addition of these two distances gives the Transverse Diameter of the Aorta. (mr + ml in Fig. 2). *(Vide page 112).* From the tracing of the cardiac shadow the radiological diameters of the various

chambers of the heart can also be estimated. The distance from the junction of the right auricular curve and the aortic curve, to the cardio-hepatic angle, is taken as the size of the right auricle. (A to B Fig. 3).

The distance from the cardio-hepatic angle to the apex is the size of the right ventricle (B to C Fig. 3).

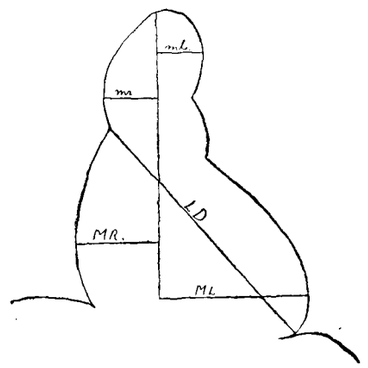

Fig. 2.

Heart { MR = Diameter of the Heart from middle to right. ML = Diameter of the Heart from middle to left. MR + ML = Transverse Diameter of the Heart. (TD). LD = Longitudinal Diameter of the Heart

Aorta { mr = Diameter of the Aorta from middle to right. ml = Diameter of the Aorta from middle to left. mr + ml = Transverse Diameter of the Aorta. (TA)

For the size of the left ventricle, the distance from the apex to the junction of the ventricular curve with the pulmonary artery, is measured (C to D Fig. 3).

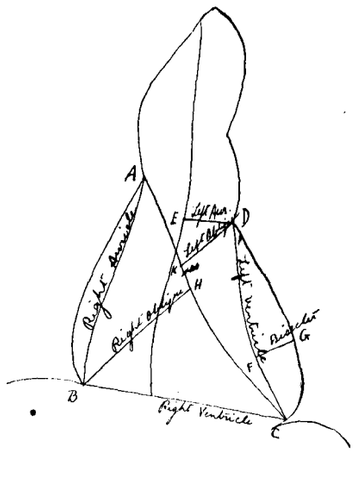

Fig. 3.

AB = Diameter of the Right Auricle.
BC = ,, Right Ventricle.
CD = ,, Left Ventricle.
DE = ,, Left Auricle.
FG = ,, Bisector.
BH + DK = ,, Oblique Diameter of the Heart.

A perpendicular to this line, erected at the point of greatest salience of the ventricular curve, establishes a bisector of its arc, with a value equivalent to the development of the left ventricular myocardium. In ventricular hypertrophy the bisector is large.

The right and left oblique diameters of the heart are taken by drawing perpendicular lines to the longitudinal diameter of the heart, from the cardio-hepatic angle, and the junction of the pulmonary and left ventricular curves respectively. The addition of these two distances gives the Oblique Diameter of the heart (BH + DK Fig. 3).

To fix the normal variations of the various diameters of the heart and aorta, pertaining to Indian Subjects, I have worked out 100 cases. In the selection of these cases, care has been taken that these belonged to different professions, such as doctors, medical students, mill labourers, farmers, mechanics, and clerks etc., different castes and also vegetarians and non-vegetarians.

A thorough clinical examination of the circulatory, respiratory, urinary, and nervous systems was done to exclude any disease. After working out the various diameters, these cases have been tabulated for comparison according to weight and height.

In Table I, *(Page 114)* these cases are grouped according to weight, and in Table II *(Page 115)* according to height of the transverse and longitudinal diameters of the heart. In Table III *(Page 115)* the Transverse Diameter of the Aorta is tabulated according to age. Vaquez says "For the Transverse diameter of the Aorta it is hardly necessary to take account of the stature and build of the patient, which give only slightly appreciable differences." However a man with well developed muscles will usually show the extreme dimensions indicated in the table. With these reservations, it is evident that the age of the patient is a most important factor in the variations of these measurements, which is the conclusion recently arrived at by a Japanese writer Twakichi Kam. He has examined systematically the caliber of the large arteries of the body on post-mortem, and has shown that the circumference of the Aorta increases progressively from birth to the most advanced age, its caliber being greater at the same age in man than in woman.

Table IV *(Page 116)* gives all the minimum, average and maximum diameters of the heart and aorta.

I am sorry to have to say that I have not worked out the heart volume measurements.

As regards the heart lung ratio figures, these have also not been studied, but I think that these would be the same for Indian as for the Europeans.

From the above observations we may conclude:—

1. That the minimum heart measurements for Indian subjects are definitely lower than those of the Continental workers.

2. That the maximum figures for the heart are practically the same, except for the diameters of the right auricle and the left ventricle, which diameters are higher than the Continental ones. These high figures

were noted by me in very tall and thin subjects where the heart was practically vertical.

3. I found the aortic measurements to be appreciably less than those of the Europeans, and this I believe is due to our average man's poor diet and low living.

INDIAN SUBJECTS TABLE I. ACCORDING TO WEIGHT

Heart—Orthodiagrams of Men in the Vertical Position

Weight in pounds		Diameter from middle to right in Cm. MR	Diameter from middle to left in Cm. ML	Transverse diameter in Cm. MR+ML	Longitudinal diameter in Cm.
80— 99	Minimum	2.5	3.8	8.6	10.4
	Average	3.5	6.1	9.0	12.1
	Maximum	4.5	7.2	11.7	13.8
100—109	Minimum	3.3	5.5	9.1	10.7
	Average	3.7	6.1	9.8	12.5
	Maximum	4.5	7.2	11.2	14.6
110—119	Minimum	3 9	4.6	9.0	10.0
	Average	4.3	6.2	10.5	12.2
	Maximum	5.0	7.1	11.2	13.6
120—129	Minimum	3.0	6.0	9.7	10.6
	Average	3.7	6.7	10.4	11.2
	Maximum	4.9	7.4	11.4	12.1
130—139	Minimum	2.5	6.0	9.9	11.0
	Average	3.7	7.3	11.0	12.8
	Maximum	4.8	7.4	13.2	14.2
140—149	Minimum	4.0	6.2	10.9	12.9
	Average	4.3	7.3	11.4	13.8
	Maximum	4.7	8.0	12.0	15.0
150 and over	Minimum	3.0	7.1	10.1	12.0
	Average	3.7	7.9	11.6	13.4
	Maximum	4.8	9.1	12.3	15.3

INDIAN SUBJECTS TABLE II. ACCORDING TO HEIGHT

Heart—Orthodiagrams of Men in the Vertical Position

Height in feet and inches		Diameter from middle to right in Cm. MR	Diameter from middle to left in Cm. ML	Transverse diameter in Cm. MR+ML	Longitudinal diameter in Cm.
5'—5'2"	Minimum	2.5	5.4	9.1	10.4
	Average	3.6	6.4	10.0	11.9
	Maximum	4.7	7.2	11.7	13.9
5'2"—5'4"	Minimum	2.5	4.9	8.6	10.0
	Average	3.7	6.4	10.1	11.9
	Maximum	4.9	8.4	13.2	14.2
5'4"—5'6"	Minimum	2.5	3.8	8.0	10.8
	Average	3.5	6.6	10.2	12.6
	Maximum	4.5	9.1	12.2	14.6
5'6"—5'8"	Minimum	3.7	4.6	9.6	12.1
	Average	4.3	6.3	10.6	12.6
	Maximum	5.0	7.5	12.3	13.4
5'8" and over	Minimum	3.0	6.2	10.1	12.8
	Average	3.9	7.1	11.0	13.8
	Maximum	4.7	8.0	12.0	15.3

INDIAN SUBJECTS TABLE III.

Aorta—Transverse Diameter of the Aorta in Men in the Standing Position

Age		Transverse diameter of the aorta in Cm.
20 to 30 years	Minimum	4.0
	Average	4.6
	Maximum	5.5
30 to 40 years	Minimum	4.0
	Average	5.0
	Maximum	5.8
40 to 50 years	Minimum	3.8
	Average	5.0
	Maximum	6.2
50 to 60 years	Minimum	4.2
	Average	5.2
	Maximum	6.1
Over 60 years	Minimum	4.1
	Average	4.7
	Maximum	5.4

INDIAN SUBJECTS

TABLE IV.

	Transverse diameter of the heart	Longitudinal diameter of the heart	Oblique diameter of the heart	Left ventricle	Bisector
Minimum	8.0 cm.	10.0 cm.	6.8 cm.	5.1 cm.	0.5 cm.
Average	10.3 cm.	12.5 cm.	8.4 cm.	7.9 cm.	1.2 cm.
Maximum	13.2 cm.	15.3 cm.	10.6 cm.	10.6 cm.	1.9 cm.

	Right ventricle	Left auricle	Right auricle	Transverse diameter of the aorta
Minimum	6.2 cm.	1.4 cm.	4.5 cm.	3.8 cm.
Average	9.3 cm.	3.1 cm.	8.1 cm.	4.9 cm.
Maximum	13.7 cm.	4.9 cm.	10.4 cm.	6.2 cm.

Table of Cardiac Measurements (Modified after Vaquez & Bordet)

	Transverse diameter of the heart	Longitudinal diameter of the heart	Oblique diameter of the heart	Left ventricle	Bisector
Minimum	9.5 cm.	11.5 cm.	9.3 cm.	6.7 cm.	0.6 cm.
Maximum	14.5 cm.	15.0 cm.	10.5 cm.	8.5 cm.	2.0 cm.

	Right ventricle	Left auricle	Right auricle	Transverse diameter of the aorta
Minimum	8.5 cm.	3.5 cm.	3.5 cm.	4.0 cm.
Maximum	14.7 cm.	5.0 cm.	6.5 cm.	7.0 cm.

Some Cases of Mitral Stenosis Treated With Deep X-Radiation

At the General Hospital, Colombo*

DR. H. O. GUNAWARDENE, M.B.B.S. (Lond.), D.M.R.E. (Cantab.),
RADIOLOGIST, GENERAL HOSPITAL, AND CONSULTING CARDIOLOGIST, COLOMBO.

Case 1.—Mrs. B., 28 years—with Ortner's syndrome. This is a very rare case, the first of its kind seen by me in Ceylon during the last 21 years. She is a married woman with three children, extremely emaciated. Now she is in the 8th month of pregnancy. She was brought to me for X-ray examination by a surgeon who had suspected a mediastinal tumour producing distended veins over the chest, and a paralysis of the left vocal cord. She also complained of breathlessness and difficulty in swallowing; there was

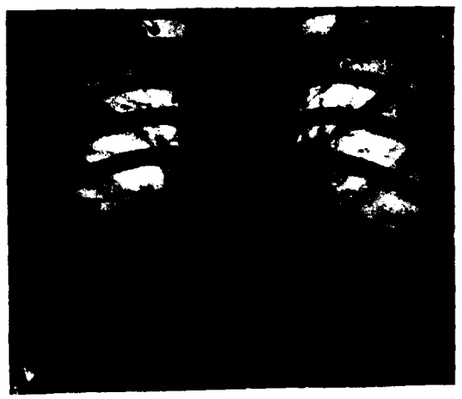

FIG. 1.

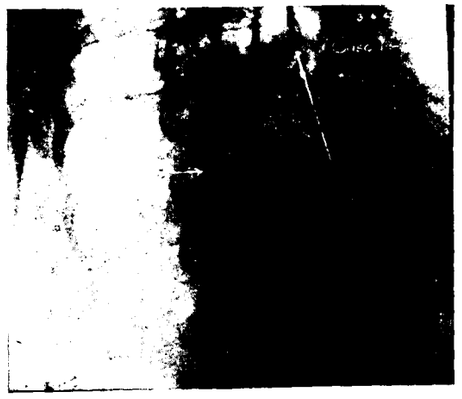

FIG. 2.

greater difficulty with liquids than with solids. On screening there was no evidence of a mediastinal tumour, but the lower part of the posterior mediastinum was not clear. During this examination I noted that this patient was pregnant. I enquired whether she had mitral stenosis, as the condition might account for this lesion. This had escaped notice. On examination of the chest, we found some enlargement of the heart, with a presystolic thrill,

* Extracts from a paper read before the British Medical Association, Ceylon Branch on 20-9-'47 with subsequent observations.

and a rough crescendo presystolic murmur, ending in a very much accentuated 1st sound. The pulmonary second sound was also accentuated. The lungs were clear. The liver was not palpable. There was no oedema of the legs. The pulse was 100. There was no history of rheumatic fever. On X-ray examination the A.P. view showed the characteristic features of mitral stenosis. *(Fig. 1 vide page 117.)* The right oblique view with a barium swallow shows that the oesophagus is pushed back by a much enlarged left auricle. *(Fig. 2 vide page 117.)* The paralysis of the left vocal cord is due to the left bronchus being pushed upwards towards the aortic arch, and pressing on the left recurrent laryngeal nerve. The phenomena associated with deglutition are easily understood in view of these facts. The electrocardiogram *(Fig. 3)* shows the wide P wave in the 2nd lead one finds in mitral stenosis, and right axis deviation. The distended veins in the chest are due to the pregnancy. Deep X-radiation was given. The factors were 1200*r*,

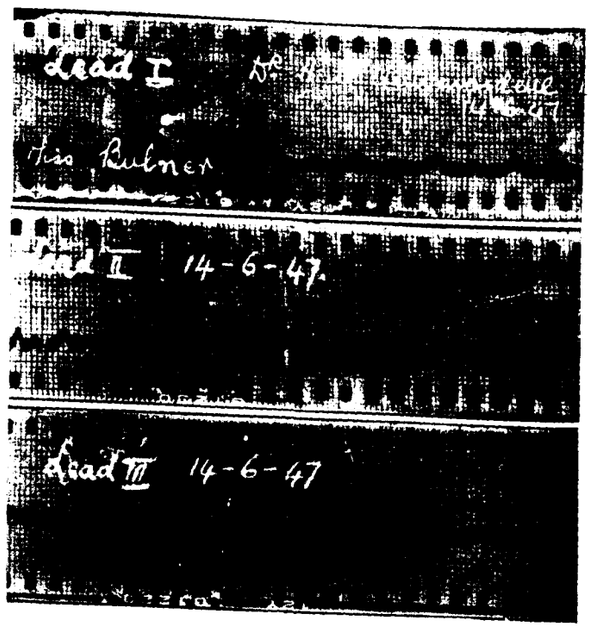

Fig. 3.

Fig. 4.

Fig. 5.

six sittings of 200*r* each, over a 4 x 4 cm. field at the sternal end of the 4th left costal cartilage. 200 k. v. 10 MA. 50 cm. distance and filtration. 0.55 mm. Cu and 1 mm. Al. Periodic X-ray examinations of the heart were made. *(Fig. 4 taken on 7-7-'47, vide page 118.)* The patient now states that she gradually got relief from symptoms, specially from breathlessness and difficulty in swallowing. She was through a full-term pregnancy (fourth child), 8 weeks later, without any difficulty associated with the heart. In her own words "For the past three years I was suffering from breathlessness, feeling tired, and at times very faint. After treatment, I am feeling much better and I am able to swallow better." Now she is able to dance without breathlessness, and also do her household work. The relief from symptoms was first noticed seven weeks after the commencement of treatment. On examination of her on leaving the Lying-in-Hospital 2½ months after the first sitting was given, it was found that there was no thrill, the presystolic murmur had practically disappeared,

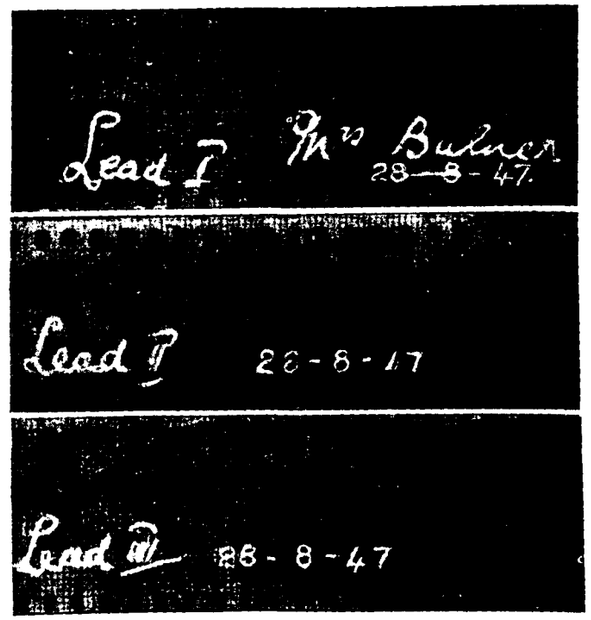

Fig. 6.

the first sound was still accentuated but less than before, and the P wave in the E.C.G. less broad. Still it was possible to elicit a faint presystolic murmur on exercise. The patient stated she had no trouble at all now, except the hoarseness which never disappeared completely. The films show the diminution of the size of the heart, the absence of pressure on, and the return of the oesophagus to a practically normal position. The physicians and surgeons who had seen her earlier confirmed the finding at the last examination. *(Figs. 5 & 6, vide page 119).*

Case 2.—Mrs. I., aged 30 years, a thin woman with well-established mitral stenosis, with a faint thrill, loud presystolic murmur, and an accentuated first sound. There is no history of joint pains or rheumatic fever. She complained of breathlessness on the least exertion, exhaustion and palpitation. There were no signs of pressure on the oesophagus nor any of failure. She states now, "Since your deep therapy treatment, I am feeling much better; I am better able to cope with my duties, and even to cycle to work and back with greater ease." On examination the murmur was found to be less loud, the first sound was still accentuated and the thrill very faint. Examination 2½ months from the beginning of treatment showed slight diminution of the size of the heart, a presystolic click in the place of the murmur and an early diastolic murmur.

Case 3.—Miss G.F., aged 20, a fat girl, admitted for appendicitis. Well-established mitral stenosis was discovered on routine examination. There was a very rough, long, crescendo presystolic murmur with a very loud flapping 1st sound—Pulmonary 2nd was accentuated—There was a definite thrill—She admitted being breathless on exertion and to having a difficulty in swallowing rice. Pointing to the sternum she said "It sticks here often and I have to swallow some water." The lungs were clear and there were no signs of failure. The case is similar to Case 1. Examined four weeks after treatment the physical signs were as before, but the murmur less loud. She states, "The difficulty in swallowing has disappeared and I feel better." X-ray examination showed no appreciable difference. Examined again on 12-8-'47. Still has a loud, rough presystolic—very slight diminution of roughness and loudness of the presystolic murmur—no difficulty in swallowing. As the girl was fat and the response was not satisfactory she was given a second course of 2400*r*. Examined on 27-10-'47 the murmur was found to be much less loud, the thrill was fainter, and the pressure on the oesophagus as seen on the X-ray film was less.

Case 4.—Mr. A., aged 25, complaints of marked breathlessness on exertion—gives a history of rheumatic fever 15 years ago, and also one year ago—pale, and very emaciated. Has a loud, rough presystolic murmur, marked thrill and a very loud first sound. He also has a faint diastolic to the left of the sternum in the 2nd left interspace (aortic reflux); lungs clear; no oedema; pulse 120. Treatment commenced on 22-10-'47 and discontinued on 12-11-'47. He was given 1900*r*. The presystolic murmur has disappeared; there is a very faint thrill; the first sound is much less accentuated and the pulse is 110. He says he is much better; not so breathless. There is less displacement of the oesophagus and no significant difference in the size of the heart.

You are all no doubt familiar with the measures usually adopted in the treatment of mitral stenosis and its complications. This method of treatment, judging by the literature has never been attempted before. The results obtained by the treatment of keloids with X-rays led me to believe that treatment of the fibrous mitral valve would soften the scar tissue, thin it out, and reduce the stenosis. In the first and the second cases sufficient time has passed to show evidence of changes in the valves and their effect on the condition. The third showed no appreciable changes except the disappearance of the difficulty in swallowing. You will see in the X-ray films of the first case the very marked changes which have taken place, with relief from symptoms, and changes in the signs. In the second case the presystolic murmur is replaced by a click before the first sound and an early diastolic murmur, and the patient reports relief from symptoms; in the third case there is very slight, or practically no difference as seen in the films, but the patient states she is better, there being no difficulty in swallowing, and the breathlessness on exertion being much less. The dose given to each of the cases was the same, an arbitrary figure of 1200*r*, that is one half the dose we give in the treatment of keloids. The depth dose is about 100*r* above that given for keloids. You will appreciate that owing to our inability to guage the degree of thickening and sclerosis, and owing to other slightly variable factors relating to treatment uniform or satisfactory results cannot be expected in every case, until the dosages are worked out from the results of treatment of the various types. But sufficient evidence, I think, has been obtained to justify the trial of this method of treatment, because it is based on scientifically rational grounds. No bad effects have been observed. The blood counts have not altered after treatment. It would

appear that the dose given to some of the cases has been insufficient. This communication should be looked upon as a preliminary one intended to encourage the study of this form of therapy.

Twenty four cases were treated in all. In six of these, namely 25%, only a very faint presystolic was heard after treatment; the intensity of the first sound was diminished and all admitted relief from symptoms. In nine cases there was very slight diminution of the loudness of the murmurs, hardly any relief from symptoms, and no diminution of the size of the heart. In the rest there was no appreciable improvement. These were cases in which clinically there was evidence of serious involvement of the heart muscle with tachycardia and marked breathlessness. The cases reported above are illustrative of the various types.

Discussion.—Before claiming any merit for this form of treatment one must be sure that the beneficial effects, or at least some of them are not due to other factors, such as rest, improvement of the heart muscle and medication. This has been considered. An auricle gaining strength as a result of these would cause the murmurs to become louder and rougher just as a presystolic murmur disappearing with the onset of fibrillation and dilatation of the auricle reappears when rest and medication are given. When a presystolic murmur in a failing heart disappears the X-ray examination will show that the auricle is larger, but in the first Case shown here, the murmur has practically disappeared with the auricle becoming smaller, with symptoms improving markedly, and the pressure on the oesophagus disappearing.

In Case 2, there is practical disappearance of the presystolic murmur and as in Case 3, there was relief of symptoms without rest or medicine. In those patients in which there has been no improvement, it is possible to try bigger doses later, specially if clinical signs and symptoms suggest that the stenosis is of a severe degree.

To summarise :—

(1) It is suggested that the beneficial effects of X-ray treatment seen when keloids are treated can be expected if the scar tissue of the stenosed mitral valve is similarly treated.

(2) Three cases are reported (one shown) in which the presystolic murmur has practically disappeared with relief from symptoms.

(3) The dose necessary for all cases has still to be ascertained by experiment and experience; the doses for the different types and degrees of valve thickening would appear to be different.

(4) Further experiment is necessary before uniform results can be obtained.

(5) It is rational to expect that prophylactic (early) treatment will give good results.

I am thankful to my colleagues at the Hospital for allowing me to treat their cases, and to my Assistants Dr. Quintus Peries and Dr. David Jayamanne for help and useful suggestions.

An Unusual Abnormality—A Case of Right-sided Aortic Arch

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THE right-sided aortic arch is not one of the most frequent congenital anomalies of the big vessels, either in autopsy examinations (Biedermann–1931–found only 8 cases in 20,000), or in routine X-ray examinations (Balli–1942–in 3 years found 2 cases; frequency 1 : 12,000).

The first description of the radiographic aspect of this anomaly is of Mohr (1913), but we can see, reading all the literature about this subject, that the aspects are different from one case to another. I briefly go into the embryology and pathological anatomy.

In the first weeks of life, from the arterial trunk that emerges from the embryonal heart, two symmetrical branches depart with an upward movement; the original aortas, right and left, having described two arches with lower concavity, go down and converge to form "aorta dorsalis descendens." (*Fig. 1*). From the

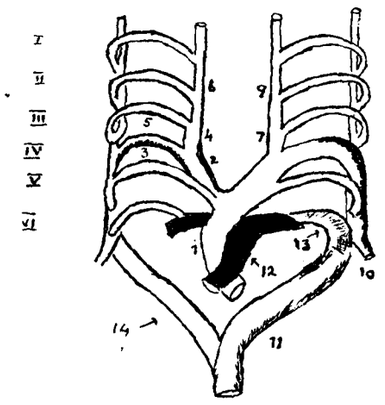

Fig. 1.
I-VI. Arterious branchial arches.
1.—Aorta ascendens.
2.—A. anonyma.
3.—A. subclavia dextera.
4.—A. carotis communis dextera.
5-6.—AA. carotides dexterae, interna et externa.
7.—A. carotis communis sinistera.
8-9.—AA. carotides sinisterae, interna et externa.
10.—A. subclavia sinistera.
11.—Aorta descendens.
12.—A. pulmonalis.
13.—Ductus arteriosus Botalli.
14.—Aorta dextera distalis.

anastomosis among the "primitivae aortae ascendentes" and those "descendentes" are formed other arches so that there are six at the right side and six at the left; at the end of the first month there are left only the 3rd, 4th and part of the 6th arch. In man, when the development is normal, "arcus aortae" forms from the 4th artery at left; "arteria anonyma" at the beginning of the 4th arterial arch at right; "arteria subclavia dextra" is formed from IV arch, 'a. carrotis communis' and 'a. carrotis externa' are formed from ventral aortae. "a. carrotis interna" is formed from the lateral parts of 3rd, 2nd and 1st arches. The remaining "branchiales" arches and the small intermediate arteries regress.

So we can see that an irregular development of the 4th and 3rd series of "branchiales" arches and of the two roots of the aortas, left and right, can cause an anomalous formation of the "arcus aortae." If the ascending roots of the aorta, the 4th series of the "branchiales arteriae", the lateral arterial spaces between the 4th and 5th arch and the roots of the "descendens aorta" remain patent, we have the formation of a "gemina aorta ascendens" or of a "geminus arcus aortae"; we also can have on the right patent ascending root of the aorta, the 4th "branchiales arteria" and at the left the obliteration of all or of a part. In this case "arcus aortae" having arched over the principal right bronchus, either crosses to the left side, or passes to the right of the vertebral column and then goes through the "aortae jatus" of the diaphragm. (*Fig 2.*)

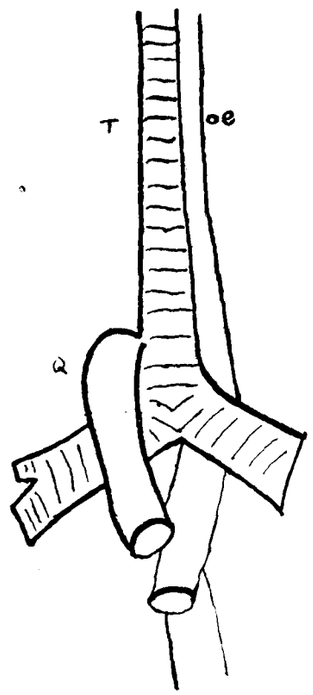

FIG. 2.
a—Aorta. T—Trachea. Oe—Oesophagus.

If on the left, the ascending root of the aorta is patent, then the arteries of the arch arise in the following order: "a. Carrotis communis laeva," "a. Carrotis communis dextera," "a. Subclavia dextera et laeva." The last one begins from a big diverticulum located either at

the end of the arch, or at the beginning of the "ascendens aorta" and passes behind the oesophagus. Then the remnants of the left root of the "descendens aorta" show as a diverticulum instead of the normal "caput aorticum."

Clinical symptomatology.—The right-position of the aortic arch is casually discovered, the patient not having any symptoms. (Hammer in 1926, Fray in 1920, Biedermann in 1931, Mucchi, in 1935, Bonamini in 1939); Assmann in 1921, Bedford and Parkinson in 1936 have discovered that this anomaly is associated with other congenital defects of the cardiovascular apparatus; in these cases where the right aortic arch co-exist with other defects, Renander (1926) Brunetti (1931) Spencer and Dresser (1936) Williams (1945) have in their cases observed "dysphagia lusoria," dyspnoea, etc.

X-ray examination.—The principal X-ray findings of this anomaly are: findings on the cardiovascular shadow; findings on the oesophagus; findings on the trachea.

The cardiovascular finding is the presence on the right side of an image semi-circular in shape, with visible pulsations which appears to be the "caput aortae." This shadow continues downwards with the convexity outwards also with visible pulsations observed in the descending aorta. The margin of the vessel can be seen through the rest of the cardiovascular image.

On the left side there is no "caput aorticum" and there is a translucent area of the pulmonary parenchyma which is normally covered by the descending aorta.

On the oesophagus there is a deep impression on the right side with displacement towards the left and forwards and on the posterior wall there is a second impression.

Saupe (1925) guesses that this impression comes from the aorta which crosses from right to left, and runs to the left of the vertebral column. Renander (1926) thinks that this is due to the middle part of the aortic arch, while Dumesnil de Rochefort (1931) and Brunetti (1931) think that it is due to the left "subclavia." The other impressions which are on the oesophagus are due to the trachea and main bronchus. The trachea, as most of the authors think, can be displaced to the left side because of the pressure produced by the aortic arch, going to the right side.

Case history.—A. Laerte, 33 years old, mechanic. In the family history the point of importance is that the patient has a sister treated at a T. B. sanatorium and his mother died with T. B. pulmonary. He is married to a healthy woman and has a daughter also healthy. Previous history: He

had pleurisy of the right side, with effusion, in 1932; again in 1943 accompanied by jaundice. In March 1947 after an attack of influenza an X-ray of the chest was taken, which revealed nothing abnormal in his lungs, but was of interest from the point of view of the cardiovascular apparatus. The patient had been examined by some radiologists and diagnosed as mediastinal pleurisy by some, a Pott's abscess by some, and by some others as mediastinal tumour. The patient came to our Institute in very good health in July of the same year. The question was to eliminate the doubt of the presence of the above mentioned diseases in a patient who did not suffer from anything. The clinical examination was practically negative. The X-ray examination of the lungs is negative excepting a "nodularis sclerosis" in both apices with a pleural reaction and adhesion in the cardiophrenic angle posteriorly as seen in the right anterior oblique view.

Fig. 3.

Cardiovascular apparatus:—In postero-anterior projection (*Fig. 3*) the aortic arch juts out more on the right side of the vertebral column, is somewhat wider and reaches as far as the root of the neck. Through the vascular bundle, is seen a double shadow: the first is like a shadow going to right and downwards, with an outer convexity and behind the heart; the second, more medially located, has two curves equally convex outwards. The first is the descending aorta, almost completely on the right side and going down to the hiatus of the diaphragm. Of the two other curves, the upper one is that of the right side of the ascending aorta, and the lower one is the margin of the "dextrum atrium cordis." High at left, in the usual place of the "caput aortae" where normally there is a semi-circular shadow with distinct borders, with the greatest radius 3 cm. from the vertebra, there is no shadow. There is also no shadow corresponding to the descending aorta, and in its usual place there is hyper-illumination due to air-filled pulmonary parenchyma. The trachea appears displaced to left.

For studying better the relations between this anomaly and the neighbouring structures a barium swallow was given. So we could see (*Fig. 4*) that the oesophagus, immediately below the root of the neck has a distinct concavity towards right, in the middle third a large concavity towards left, and in the inferior third it goes first to left and then through the diaphragm.

Fig. 4.

Fig. 5.

On the right anterior oblique position (*Fig.* 5) the cardiovascular shadow has the appearance of a left anterior oblique view of a normal patient. The oesophagus immediately below the root of the neck is displaced forward by a distinct circular impression caused by a rounded shadow with a diameter of about 35 mm., with visible pulsations of arterial type. A second impression on the oesophagus is seen below the point where the trachea bifurcates. Then the oesophagus goes on to the "hiatus oesophagi" of the diaphragm. The trachea is located in front and to the left of the oesophagus and at the level of the first oesophageal impression. Tracheal illumination is not so bright as in normal cases.

In projection L. A. O. (*Fig. 6 vide page 128*) the cardiovascular shadow looks like in the projection R. A. O.

In the oesophagus, below the root of the neck there is a distinct

impression due to a rounded shadow (diameter about 35 mm.).

The trachea at the level of the impression on the oesophagus is pushed forwards a little.

Now I give the diameters of the aortic arch and of the "caput aorticum." According to the proce-

Fig. 6.

dure of Lenzi-Pinotti (1946) the measurements are the following:

Diameter of the great aortic arch=148 mm.

Caliber of the "caput aorticum" =34 mm.

The above mentioned figures are for normal individuals but in this case the former serial mean=125–129 mm. Sigma=cm.±1,59 and the latter serial mean=29–30 mm. Sigma= mm±1,68. The orthocardiographical measurements are normal.

An electrocardiogram was taken and the result was the following: normal transit with low voltage of the "initialis complexus ventricularis" in the first lead. Balli (1947) also has not noticed modification of the rhythm and of the conduction, but only signs of a small left ventricular preponderence.

Discussion.—As regards the presence of the shadow on the left, in the place where normally is located the "caput aortae," an image which can be mistaken for a second "caput aorticum"—the first being at right—not all authors are in agreement. Biedermann (1931) thinks it is due to a diverticulum of the remnants of the left root of the descending aorta, which is large, and divided in two, one of which goes to the right and makes the arch, the second one producing the above mentioned shadow.

Brunetti (1931) thinks that this is produced by an enlargement of the aortic arch, from which the left "subclavia" arises and passes to the left. Eredelyi (1933) and Mucchi (1935) are of the opinion that this shadow is caused by the base of the 4th left obliterated arch. Saupe (1925) thinks that the posterior impression on the oesophagus already described is caused by the aorta crossing from right to the left of the vertebral

column. Renander (1926) is of opinion that the impression is due to the intermediate part of the arch.

From our experience, we think that the impression produced on the oesophagus is caused by the remnants of the left root of the descending aorta; it cannot be the arch, because this is still on the right side, and not the "subclavia" as the anomaly shows an impression is produced on the oesophagus. (*Fig. 7*).

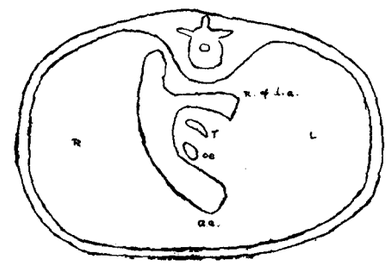

Fig. 7.

R—Right. L—Left. T—Trachea.
Oe—Oesophagus.
R. of d. a.—Root of descendent aorta.

Studying the behaviour of the trachea and its relations we agree with what is observed by the other authors that it is pushed to left and the maximum is at the level of the point where it bifurcates. In fact the trachea is pushed forwards by the oesophagus, which is also pushed by the anomaly above mentioned.

Many authors have noticed that, notwithstanding the deviation of the oesophagus, the patient (as in our case) does not complain of any trouble in deglutition, and in the X-ray examination also there is no difficulty in the passage of the barium through the oesophagus. This is contrary to other authors, who have observed in their cases difficulty in swallowing even though the pressure on the oesophagus is less, or at least not more. Bonamini (1939) says that this symptomatology is caused by a hypotonia of the oesophagus, produced by toxic, nervous or inflammatory causes, so that the oesophagus cannot overcome the obstacle of the pressure, while a normal tonicity can do so easily.

About the differential diagnosis we must remind at the end, how important are the case history and the clinical symptoms to the radiologist. From the X-ray point of view the presence, in the right side, of the cardiovascular image of the above mentioned shadow makes one to think of a mediastinal tumour but the pulsation is of a distinct arterial type; and a study after a barium swallow will reveal the relations between the oesophagus and other mediastinal organs. There is also no question of possibility of a paravertebral abscess or a mediastinal pleuritis because a study of the morphological relations of the above mentioned shadow shows that the pulsations are of a distinct intrinsic origin and not transmitted.

In our case there were no concomitant phenomena of the mediastinum, in other words, no dyspnoea or dysphagia due to compression on the trachea and of the oesophagus. There are no signs of pressure on the nerves; no brady or tachycardia due to stimulation or paralysis of the "vagus"; no cough or loss of voice due to the pressure on the "nervus laryngeous inferior"; no hiccough from compression of "nervus phrenicus"; and no signs of compression on the vessels such as cyanosis, oedema of the neck, etc., due to compression of the "vena cava superior."

Concluding and summing up all what till now has been said, I surmise this to be a case of right sided aortic arch ("aorta alta dextera"), with a diverticulum at left, remnant of the left root of the descending aorta and simulating a "caput aorticum." We believe that only through very careful X-ray examinations it is possible to diagnose this unusual abnormality and at the same time to recognise the different varieties of the same.

References:

1. Assmann—Rœntgendiagnostick d. inneren Krank. 1921 Vogel Leipzig.
2. Balli, L.—Annali di Radiologia diagnostica, 1947, VI.
3. Bedford and Parkinson—British Journal of Radiology, 1936 IX, 776.
4. Biedermann—Fortschritte Rœntgenstrah. 1931, XLIII, 168.
5. Brunetti—Rivista di Radiologia e Fisca Medica, 1921, V, 76.
6. Bonomini—La Radiologia Medica, 1939, XXVI, 525.
7. Dahm and Reuter—Fortschr. a.d. Gebiet. der Rœntgenstrah, 1938 LVIII, 214.
8. Dumesnil de Rochemont—Roentgenpraxis, 1931, III, 424.
9. Eredelyi—Fortschritte Roentgenstrah, 1933, XLVII, 264.
10. Fray—Radiology, 1936, XXVI, 27. American Journal of Roentgenology and Radiumtherapy, 1930, XXIV, 349.
11. Greineder—Fortschritte a. d. Gebiet. der Roentgenstrah, 1938, LVII, 535.
12. Hammer—Fortschritte—Roentgenstrah, 1926, XXXIV, 517.
13. Leanrduzzi—Atti della Societa Medico-Chirturgica di Padova, 1945, XXIII.
14. Lenzi - Pinotti—La Radiologia Medica, 1946, XXXII, July.
15. Milani—La Radiologia Medica, 1928, XV, 693.
16. Mucchi—La Radiologia Medica, 1935, XXII, 1097.
17. Pennington—Radiologia, 1947, X (Enero-Febrero), 7.
18. Quereilhac—Radiologia, 1946, IX, 29.
19. Renander—Acta Radiologia, 1926, XVII, 298.
20. Saupe—Fortschritte—Roentgenstrah, 1925, XXXIII, 140.
21. Sotgiu—Rivista di Patologia e Clinica, 1947, II, 105.
22. Spencer and Dresser—American Journal of Roentgenology and Radiumtherapy, 1936, XXXVI, 183.
23. Williams R. E.—British Journal of Radiology, 1945, XVIII, 323.

X-ray Diagnosis in Gynæcology and Obstetrics

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Gynæcology.—Several gynaecological conditions, particularly the shape and size of uterine cavity, position of the uterus, and condition of the fallopian tubes can be diagnosed by Hystero-salpingography. The most common purpose for which this method is used, is in cases of sterility, to see whether the fallopian tubes are patent or not. Hyperplasia of the uterine endometrium or "filling defects" in the triangular shadow of the uterine cavity, caused by polyps, cysts or sub-mucous fibroids, malignant involvement of the corpus uterii, early pregnancy before the ovum throws calcified shadows, can all be made out. To diagnose occlusion of the tubes iodine oil injection is superior to the Rubin's test. The oxygen injected in the latter procedure may not open out spasmodic occlusions; while, when oil is injected, the lubricating effect and the peristalsis may show patency of the tube where the Rubin's test has failed. The pre-war days gave us Iodipin or Lipiodol and a strength of 20% was commonly used. Today identical preparations under different trade names are available for the purpose—Iodatol, or Neohydriol.

Contra-indications for this procedure are, acute pelvic inflammatory disease, gonorrhea, intra-uterine or ectopic pregnancy, cervical carcinoma, infections, during haemorrhage and the menstrual period. In pregnancy the absorption of iodine from the oil will damage the ovum. When tubal closure is obtained on hysterography in early pregnancy, it may indicate the physiological atony of the uterus during the gestational stage, and spasm at the utero-tubal junction.

The procedure requires all aseptic precautions. The patient is prepared by an enema. The technique as we employ in the clinic is fairly simple. The actual injection of the iodine oil is made under screen control. Several colleagues inject the oil (until the patient complains of pain due to uterine contractions) at the gynaecological clinic and send the patient to the X-ray department for radiograph. Others inject 2 c.c. or so at a time in the X-ray department itself and take a series of radiographs. Still another method is to inject in the X-ray department itself on the X-ray table and make radiographs "blindly" when the patient complains of pain due to uterine contractions.

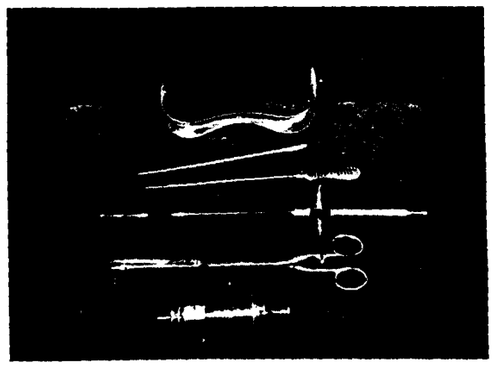


FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 1. Photograph of instruments required.

FIG. 2. The hysterogram of normal uterus and tubes. Note triangular shape of uterine cavity without any 'filling defects,' the tubes, and the spilling of oil at the fenestrated ends.

FIG 3. Shows two distinct concavities on the right margin of the triangular shadow of the uterine cavity.

FIG. 4. Same case after removal of the canula—the Iodine oil has leaked out; some of it is skirting the two polypii throwing a pattern defining the shape. (Operative confirmation).

FIG. 5. Chronic pelvic inflammation; clinically uterus bound down by adhesions—the uterine cavity appears hypertonic and uterus bound down to the right; and while injecting the Iodine oil under screen control the uterus could not be shifted from its position confirming the clinical finding of adhesions. Right tube is occluded near the cornu and left tube more distally. No oil is seen to reach the fenestrated ends.

We have been adopting the following procedure in the clinic and the instruments required are --A canula with a long stem, bent at the tip with perforations, and a pyramid shaped rubber stopper which can fit snugly on to the external os, about 4 cms. from the bent end, so that leakage of oil back into the vagina is prevented; the proximal end of the canula is threaded to fit into threaded nozzle of a 20 c.c. syringe; the other instruments are the usual vaginal speculum, a single toothed vulcellum, a long-handled forceps and uterine sound.

The patient is put at the end of the X-ray table in the lithotomy position; after putting in the speculum, the vaginal cavity and cervix are swabbed well with the help of the long-handled forceps holding the swab. The cervix is painted with tincture of iodine after which it is pulled down with the vulcellum. The uterine sound is passed to ensure patency of the internal os and withdrawn. The long stemmed canula with the syringe attached and filled with the opaque oil is then inserted into the cervical canal so that the tip may be inside the uterine cavity. (This is done after ensuring that all air in the stem of the canula has been expelled by plunging the piston of the syringe up with the whole instrument erect, until the oil is seen leaking out of the perforated end.) The vulcellum is brought down parallel to the canula getting the cervix tight against the pyramid shaped stopper. There is an arrangement on the instrument to clamp the handle of the vulcellum on to the stem of the canula to prevent leakage of oil. After fixing the positions of the canula and the vulcellum, the speculum is removed, uterus allowed to slide up and the patient is slipped up the table, the instruments being held in position. The table is arranged for "spot-film

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 6. A "filling defect" in the triangular shadow of the uterine cavity on the right side. History of menstruation delayed by two weeks (confirmed later by a D and C) the defect was caused by products of conception—a case of incomplete abortion.

Fig. 7. "Filling defect" in the uterine cavity caused by ovum six weeks old. The ovoid appearance of the uterine cavity and non-filling of the tubes indicate that in early pregnancy, there is atony and softening of the body of the uterus and no oil gets into the tubes

Fig. 8. "Filling defect" caused in the triangular shadow by adeno-carcinoma of corpus uterii (confirmed by curettage and pathological examination).

Fig. 9. Radium capsules rolled in cyanide gauze stuffed into the uterine cavity. The four smaller capsules are of ten milligrams each, fixed one inch apart and the longer capsules inserted last is of 50 milligrams. The shadow of the Michæl's clip fixing the gauze wick to the external os is seen. A dose of 2700 milligrams hours was given.

Fig. 10. Taken three weeks later showing diminution of "filling defect" on account of destruction of growth to a considerable extent.

Fig. 11. Radium capsules again inserted into the uterine cavity and cervical canal employing the same technique adjust themselves in the space available inside the uterine cavity. The second dose was 3600 mg. hours making a total of 6300 mg hours.

device", and under screen control, the opaque oil is injected with no more pressure than when an ordinary intramuscular injection is given. In normal cases the triangular shadow of the uterine cavity is seen on the screen; and if at that time the opaque oil does not pass into the tubes on either side, the patient will complain of pain due to uterine contractions. At this stage, pressure on the piston may be stopped and if the tubal opening is patent, a few more contractions of the uterus within the next two or three minutes will push the iodine oil through to the fenestrated ends; else, little more pressure may be applied and if no oil is observed to enter the tubes it determines blocking; radiographs can be immediately taken by slipping in a cassette. As a routine, the canula is then withdrawn, the cervix released and a second radiograph taken. In ordinary cases most of the oil is expelled and some of it that might be sticking to the endometrium will throw a "pattern shadow" defining the condition of the inner lining of the uterine cavity. In cases of atony, the oil may be retained for even 24 hours or longer.

The above is definitely a safer method than the "blind" injection. Recently a number of cases in which the iodine oil entered the uterine venous plexuses have been reported. The method under screen control can be no more uncomfortable than the "blind" method, and can be adopted in the radiological department itself, without the need for hospitalisation.

The amount of oil required is about 4 to 8 c.c. In an infantile

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 12. Stricture of the internal os.

Fig. 13. Localised hyperplasia in the region of the internal os.

Fig. 14. Bicornuate uterus. Radiograph made vertical through the fundus.

Fig. 15. Sagittal section through uterus and tubes of Fig. 14.

Fig. 15.

uterus smaller quantity of oil is sufficient as the uterine cavity and tubes are smaller. The hyper-tonic uterus associated with sterility or dysmenorrhoea shows the margins of the cavity concave inwards, and in atonic uterus the margins are concave outwards. The position of the uterus, anteflexed or retroverted, whether bound down by adhesions due to previous pelvic inflammatory disease can all be made out. Myomas may produce a defect in the cavity of the uterus from pressure on the cavity. Placental remains, cysts, polypii, thickened endometrium, sub-mucous fibroids—all project into the uterine cavity and show a defect in the opaque oil shadow. Double uterus and bicornuate uterus can be made out. Stricture at the internal os is also defined. When the lipiodol throws a "bunch of grapes" shadow in the tubes it is evidence of hydrosalphynx—lipiodol not mixing with the fluid in the tubes and remaining as a bunch of globules of oil floating in liquid. Tubal pregnancy can be diagnosed as the oil encircles the ovum in the distended tube. In an ovarian cyst the oil might ascend higher round the tumour in the distended tube and the uterus appears displaced in the pelvis. In abdominal pregnancy the foetal parts are seen distinct in the abdominal cavity, well away from the small triangular cavity of a normal sized uterus. In cancer of the body of the uterus irregular "filling defects" are seen producing shadow of an irregular shaped cavity filled with oil. There is no danger of the procedure disseminating malignant cells through the tube into the peritoneum because the uterine muscle itself is soft and atonic in carcinoma of the corpus uterii, and no undue pressure is applied as the injection is done under screen control. In carcinoma of cervix uterii there is danger of dissemination as the uterine cavity and tubal openings are patent. Therapeutically, in cases of chronic endometritis the iodine oil acts as a locally applied antiseptic and helps to clear up the infection. Carefully adopted, the procedure of hysterosalpingography has no danger, provided the contra-indications are borne in mind and the technique is adopted properly.

Obstetrics.—X-ray evidence of pregnancy due to calcification in the foetal parts are usually seen after ten to twelve weeks. In cases of calcium deficiency in the mother, the shadow may not be seen. It is then advisable, (if there are no other abnormal symptoms) to put the mother on intensive calcium treatment and X-ray again after four weeks or so. I have had several cases in the clinic which did not throw shadow of foetal parts when first seen. Finding there was no

Fig. 16.

Fig. 17.

Fig 18.

Fig. 16. Missed abortion in a horn of bicornuate uterus.

Fig. 17. Sagittal section through bicornuate uterus containing missed abortion in horn of Fig. 16.

Fig. 18. Double uterus. Patient had two vaginae and two cervices. Note evidence of bi-lateral hydro-salpinges.

Fig. 19. Ectopic pregnancy aborting from the distal end of right tube. Note oil drapes itself about the aborting mass.

Fig 20. Ectopic pregnancy aborted from the distal end of left tube. Note how oil drapes itself about the aborted mass.

Fig. 19.

Fig. 20.

evidence of abnormal discharges or other symptoms, calcium therapy was advised. Four to six weeks later, radiographs showed evidences of pregnancy. In some cases, when the size of the uterus was larger than the period of amenorrhoea, after calcium therapy, there was evidence of twins where there was no shadow before. Precautions to be borne in mind are, immobilisation with an abdominal band, and absence of respiratory movement by instructing the patient to hold the breath during exposure. During the later stages of pregnancy, evidences of intra-uterine hydro-cephalus (enlarged head), microcephalus (small bird-shaped), anen-cephalus (absence of vault) all these can be made out. Microcephalus and anencephalus can be recognised in the 5th or 6th month of gestation and is an indication for termination of pregnancy. Calcified myomas associated with pregnancy can be defined.

The position of the foetus whether presenting by the head or breach, or transverse presentation can be made out. In cases of head presentation, L. O. P. or R. O. P. is recognised by the position of the occiput of the foetus and nearness of the foetal vertebral column to the film. When the foetal vertebral column is nearer the anterior abdominal wall, the shadow appears a bit enlarged in the film and not so sharply defined, indicating L.O.A. or R.O.A. The relative proportions of the maternal pelvis with the foetal head can also be defined with a great deal of accuracy. Foetal death is diagnosed by the overlapping of the skull bones due to decreased intra-cranial pressure, and collapse of the vertebral column on account of loss of rigidity, giving a crumpled appearance of foetal parts. The rigidity of the spine and foetal parts is maintained in a fully live child, but the skull wall may appear to overlap if a radiograph is taken during uterine contractions when the head is actually engaged in the birth canal. In cases of mummified foetus the calcified shadows of foetal parts would approximate the size when growth of the foetus has stopped, though the period of amenorrhoea might have continued. In cases of osteo-genesis imperfecta, intra-uterine fractures of foetal bones can be made out. Placenta praevia is diagnosed by making a radiograph after filling the bladder with Sodium Iodide solution or other contrast media. Normally the foetal skull should be close to the cervical os and hence near to the fundus of the bladder. The increased distance between the foetal skull and the bladder is interpreted as space possibly occupied by the placenta if there is no hand intervening—"hand presentation." Deformities of the maternal pelvis which will determine the necessity or otherwise

Fig. 21.

Fig. 22.

Fig. 23.

Fig. 24.

Fig. 21. Bi-lateral hydro-salpinges. Note sacculated dilatation at end of each tube.

Fig. 22. Figure taken 24 hours later. Note Iodine oil retained in sacculated ends of tubes.

Fig. 23. Early pregnancy—showing crescents of fœtal skull, and vertebræ—fourteen weeks growth.

Fig. 24. Early pregnancy 12 weeks, associated with calcified myoma of the uterus. Note calcifications of the vertebral column of fœtus and the nodes in the myoma. The patient was referred for radiography on account of the large size and feel of the uterus compared to the period of amenorrhœa.

for Caesarian section, and possibility of Perthes or other coxalgias giving impression of deformed pelvis can be differentiated.

Pelvimetry and Cephalometry.—There are several methods expounded by different authors. I proceed to describe a simple, old, reliable method.

These measurements can be easily worked out from radiographs (plain A.P. and lateral views) by using the formula $A = \frac{B(C-D)}{C}$. A is the object measurement, B the film measurement, C the tube-film distance and D the object-film distance. This formula is based on the principle of similar triangles (See Fig. 29) in which the object measurement A (o-o' in the figure) is to the film measurement B (F-F' in the figure) as the tube-object distance (C minus D) to the tube-film distance C. These measurements could be arrived at with the use of an antero-posterior and lateral films only. In the lateral view all the diameters lie on the same plane i.e., mid-sagittal plane and so the height from the film would be one-half of the bi-trochanteric diameter. But in the case of antero-posterior view, the different diameters lie on different planes and so the heights of these diameters from the film will vary.

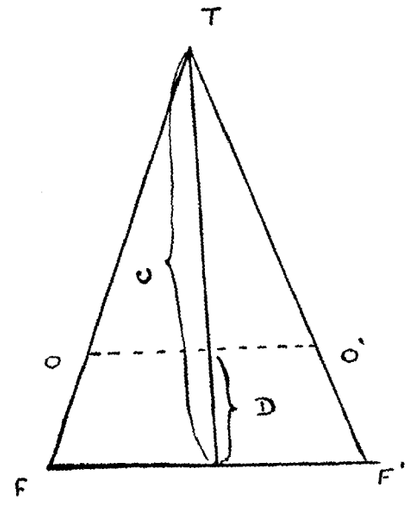


Fig. 29.

Now, for example, to determine the true conjugate in the lateral film, the bi-trochanteric diameter is measured on the patient and half the value gives the height of this diameter from the film. This diameter (G H)

FIG. 25.

FIG. 26.

FIG 27.

FIG. 28.

FIG. 25. Micro-cephaly. Note the small shadow of the skull high up in the right hypochondrium, fœtus presenting by the breach, full term.

FIG. 26. Breach presentation, seven months pregnancy.

FIG. 27. Death of fœtus. Full term pregnancy. Note the overlapping of the skull bones and crumpling fœtal parts.

FIG. 28. History of normal development and growth in size of uterus during first four months, after which there was no further advance in the size of the uterus. No abnormal discharges. Came in for X-ray in the 7th month. Radiograph shows evidence of fœtal parts not having developed after four months. Thoracic cage, limbs and crescent of the skull are seen, all crumpled together. The mummified fœtus was delivered by artificial induction of labour.

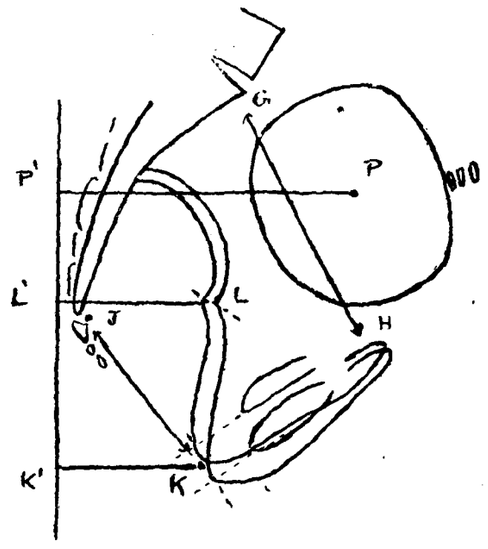


FIG. 30.

(Fig. 30) is then measured on the lateral film and with these figures the formula is applied to find the actual true conjugate. To find out the posterior sagittal diameter of the outlet, the extremes of the diameter are marked out first in the lateral film. The posterior extreme point will be the tip of sacrum at the sacro-coccygeal joint, J (Fig. 30). To find the anterior point, a line is drawn posteriorly along the inferior margin of each obturator foramen to meet the posterior aspects of Ischium, which two points are again joined by a line. The mid-point K (Fig. 30) on this line gives the anterior end of the posterior sagittal diameter, J K (Fig. 30) in the lateral film. This is measured and the posterior sagittal diameter obtained by applying the formula as above.

To measure the transverse diameters, first the heights of each of the centre-points of these diameters are obtained from the lateral view. A vertical line, 1 cm. posterior to the sacrum and parallel to the edge of the film is drawn on the lateral view. This will represent the film with the

patient lying supine for the antero-posterior view and perpendicular lines drawn to meet the mid-point of any transverse diameter as seen in the lateral film will represent the height of the particular diameter from the film. For example K-K' (Fig. 30) will be the height of Bi-ischial diameter

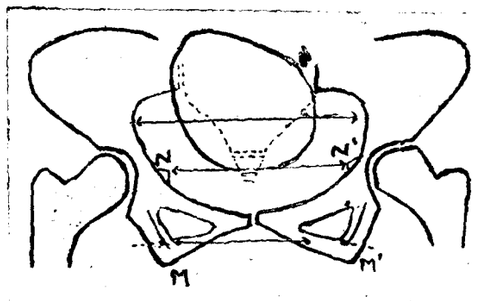


Fig. 31.

from the film and L-L '(Fig. 30) that of interspinous diameters, and the distances between the points M-M' and N-N' (Fig. 31) will be the Bi-ischial and interspinous diameters as seen in the antero-posterior view. These distances are measured and the formula applied to obtain the values of the diameters.

Foetal head circumference—The perimeter as seen in the lateral film will be in the mid-sagittal plane and its height from the film would be half of the bi-trochanteric diameter. The perimeter on the lateral view is measured by means of an adhesive tape and the foetal head circumference from the lateral view determined by the formula. To find the same in the antero-posterior view, first the centre point of the foetal skull is located in the lateral view (point P Fig. 30) and the distance P-P' (Fig. 30) gives the height from the film with the patient lying supine for antero-posterior view. The perimeter is measured in the antero-posterior view with an adhesive tape and the foetal head circumference worked out by the formula. An average of the two values obtained in the lateral and antero-posterior views gives the average foetal head circumference. Other foetal head measurements could also be worked out similarly.

Note 1.—For intra-uterine hydro-cephalus see case report *Ind. J. of Rad.*, Vol. 1, number 3, August, 1947 by M. D. Joshi.

Note 2.—For extra-uterine abdominal pregnancy see case report *Ind. J. of Rad.*, Vol. 2, number 1, February, 1948 by M. P. Joseph.

Acknowledgement.—I have reproduced Figs. 12 to 22 from the *Radiology*, April, 1937—Albert Mathieu.

INTERESTING CASE REPORTS

Dr. M. P. JOSEPH, B.A., M.B., B.S., D.M.R.,
Radiologist, General Hospital, Ernakulam.

Case 1. Calcified guinea worm in the right orbit :—Patient Mr. R., came to the ophthalmic hospital with swelling in the right superior orbital margin and was referred to the X-ray Department.

History :—Patient gave a history of taking baths in a public tank for many years and sometime back he noticed a small swelling on the upper margin of the right orbit.

Clinical examination :—Showed an indurated swelling on the inner third of the upper margin of the right orbit, discharging pus.

X-ray examination :—Revealed a coiled-up calcified worm in the roof of the right orbit below the floor of the right frontal sinus. (Figs. 1 & 2).

Fig. 1.

Fig. 2.

Coupled with his history a diagnosis of calcified guinea worm was made.

Removal was attempted twice with no success.

Case 2. Unusually large gastric ulcer :—In which partial gastrectomy was done. Fig. 3 shows the large ulcer niche after barium meal. Fig. 4 shows the specimen after partial gastrectomy filled with barium. Usually, large ulcer niche is considered possibly malignant. In

this case, the edges contiguous with the ulcer niche in the lesser curvature appear smooth in the radiograph and was confirmed non-malignant after operation.

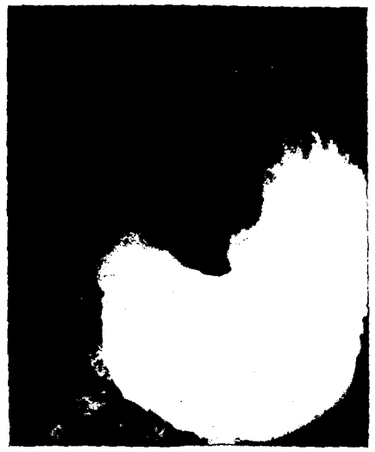


FIG. 3. Stomach after Barium meal showing large ulcer niche.

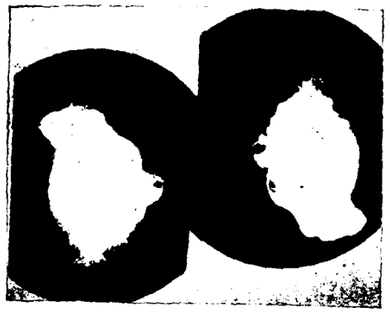


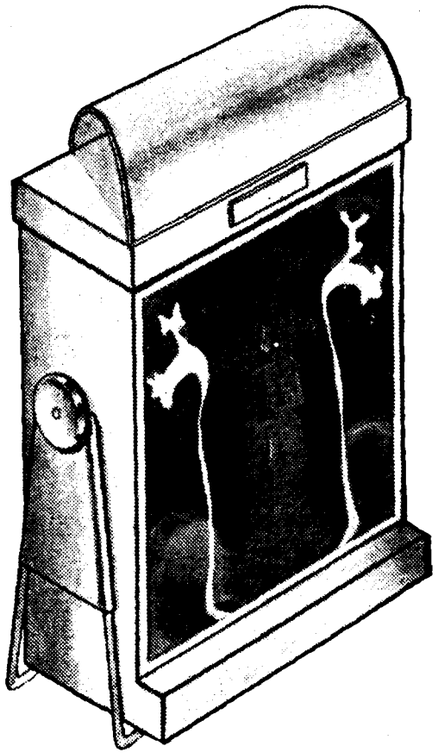
FIG. 4. Barium filled specimen after partial gastrectomy showing the niche.

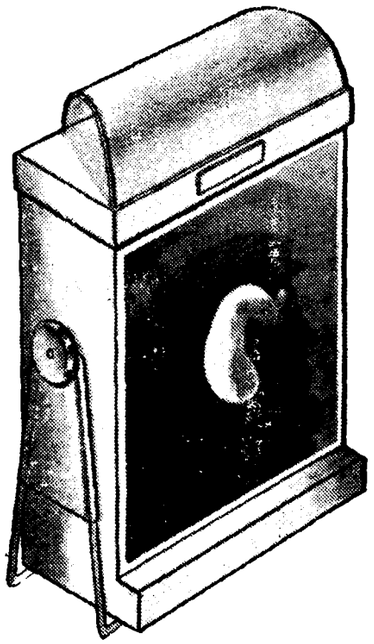
Case 3. Unusually long appendix:—Showing no X-ray evi-

FIG. 5. Showing appendix.

dences of disease, but only retention of barium for more than 48 hours after caecum was free from barium. On operation the appendix was found to be 10 inches long.

RADIOGRAPHIC CONTRAST AGENTS





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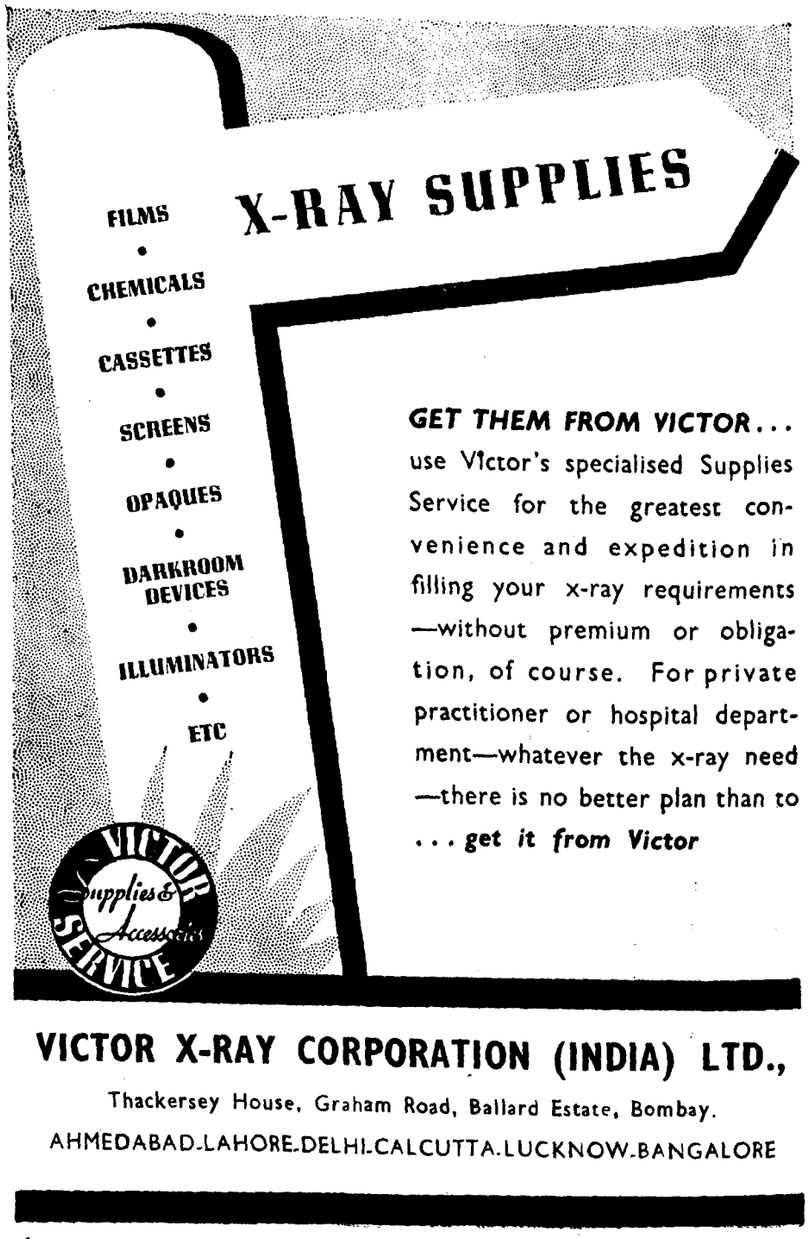

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The

Indian Journal of Radiology

Vol. II. AUGUST, 1948 No. 3.

Intra-oral Cancer—Radionecrosis—Secondary Infection

A NUMBER of cases of intra-oral growths after radium treatment, block dissection of secondary glands with or without post-operative radium implantation, and radium implantation for inoperable glands, are referred by the Surgeon to the Radiologist for Deep X-ray therapy. This happens to day in our country and the treatment of malignancy is undertaken by the Surgeon without reference to the Radiotherapist, except in a few instances. Appallingly bad end results and helplessness, one feels under the situations having to face results of trauma, secondary infection, cellular oedema with induration and radionecrosis, has made me present this problem. Radium is implanted, kept for seven days or so, and then removed, the patient passes through "whale of a reaction" and bears it patiently for dread of the disease, and then the sequelae follow in a chain. The Radiotherapist is invited at the last stages with the request 'will you do something for this poor fellow who is suffering a lot. I have done my best.'

For intra-oral lesions—tongue, floor of the mouth, soft palate, tonsil and cheek, I have been implanting radium needles or applying radium in moulds—usual methods and dosage, and at the same time irradiating lymphatic areas with 200 k.v. 1 mm. cu. + 1 mm. Al. filter. In 1938, the 400 k.v. apparatus was installed and since then I have used that higher voltage with 5 mm. cu. + 1 Al. filter for external radiation. With the installation of Chaoul contact therapy apparatus in 1935, I gradually developed a bias in favour of Chaoul contact therapy, particularly in cases of cancers of the tonsil, soft palate, cheek, and floor of the mouth and anterior two-thirds of the tongue and lips—

continuing external radiation for lymphatic areas irrespective of glands being palpable.

This was due to absence of severe intra-oral radiation reactions and complications one obtained when radium was applied. Infected secondary glands or even infected primary malignant growths are more resistant to radiation, and the infection has to be tackled first. Then the problem of radionecrosis of bony alveolus, mandible or soft tissue was apparent, so that to-day I feel, preference should be given to Chaoul (60 k.v.) or other type of contact X-ray therapy with higher voltages (100 k.v. or 140 k.v.), when lesions show greater depth infiltration than 1 cm. Growths of the lips, anterior two-thirds of the tongue, floor of the mouth, cheek, soft palate and tonsils respond well when the beam is properly directed, and combined with external radiation for lymphatic area. We have had only few recurrences in glands in our series of cases. In cases of posterior third or base of the tongue, epiglottis, advanced tonsillar growths and extensive growths of the cheek, I use 400 k.v. external radiation only—and where protection is necessary for rest of the oral cavity, fill the mouth with thick barium paste and ask the patient to spread it round, and irradiate through the side of involvement. The results have been exceedingly satisfactory and the complications like radionecrosis of the mandible, alveolar margin and even soft tissues have been minimal as compared with results from radium implantation.

With the 400 k.v. by external radiation, it is possible to deliver to the tonsil, and the base of the tongue 6000 to 8000*r*, minimum and maximum contemplated, which may be considered adequate. When 'Chaoul' or other type of contact X-ray therapy is applied locally, *one should not depend on the physical dose alone in rœntgens, but continue radiation until all tissue induration clinically disappears and lesions flatten out and soften to touch.* Where lesions involve the buccal alveolar clefts, when contact X-ray therapy cannot adequately irradiate, and radium on mould *always produces* necrosis of bony alveolus, I depend on 400 k.v. external radiation only. Protection for rest of the mouth is achieved by barium paste as mentioned before.

All of us have come across cases which return to us after what was considered as "adequate" radium or contact X-ray therapy with indurated ulcer and considerable oedema of tissues around, at the seat of the original lesion or near it. First urge in earlier years of practice was to give more radiation (fear of possibility of recurrence) which resulted in tissue necrosis. There would have been gross vascular changes due to the first irradiation, and further radiation would impair healing resulting in radio-necrosis of tissue. And when secondary infection is not attended to, no healing takes place, resulting in the necrotic ulcer, still indurated and inflamed. In cases where, after such "adequate irradiation" the patient returned with an indurated ulcer with slough at the base of the ulcer, one should consider the possibility of the scar having broken down and secondary infection producing inflammatory induration. Treatment of secondary infection with some preparation of the 'sulpha' group of drugs, or Penicillin during recent times, with local hygiene and non-irritating antiseptics like 1% watery solution of picric acid, has produced astounding results and the lesions have remained healed entirely. Sometimes a litte scraping of necrotic tissue may be necessary, and a microscopic examination of the scrapings will help confirmation of the clinical conclusions. Trauma due to hard food particles injuring the scar (the fork, fish bone or other sharp matter) and tension in the scar due to excision of growth prior to radiotherapy were some of the causes attributable. Then again, in cases of bone necrosis, surgical removal of sequestra has resulted in further necrosis and sequestrum formation. While by treating secondary infection, nature has separated the sequestra in course of weeks and lesions have healed up. *I request my colleagues to ponder over these observations and review the planning of radiotherapy in intra-oral growths. Radionecrosis may be manifest early after treatment, or years later!*

P. RAMA RAU.

12408

Abstracts From Current Literature

ABSTRACTS—by Major A. Krishnan, M.B., B S, Resident Medical Officer, The Madras Radiological Institute & Private Cancer Hospital, Kilpauk, Madras-10.

The Heberden Society

(From *Annals of Rheumatic Diseases*)

No. 1, March, 1948.

[An abstract from Summaries of papers read at a General Meeting of the Society at London in October, 1947.]

Spondylitis.—C. W. Buckley—The author in this article discusses two important questions concerning ankylosing spondylitis (i) the earliest diagnostic evidences of this disease and (ii) whether the disease is or is not a form of rheumatoid arthritis. During the World war 1914–'18 this disease was considered to be rare, but now it is known to be much more common. The late Gilbert Scott believed that this disease began

invariably in the sacro-iliac joints and named its earliest manifestation as sacro-iliitis. Borak holds the view that the primary change in the sacro-iliac region is a para-sacro-iliac osteosclerosis, shown by the increased density gradually passing into complete loss of structural details. The area of condensation is irregular, sharply defined, symmetrical on the two sides, spreading along the margin of the joints but limited to the iliac bones, the sacrum not being involed in the early stages, though it may in the later stages. The contour and width of the sacro-iliac joints are not affected at this stage. This stage soon passes to ankylosis of the joint, though the first evidence of joint affection is seen in the apophyseal joints of the vertebrae as rarefaction of the articular process and blurring of the outline of the facets with pain on pressure or movement. Progressive decalcification sets in around the joints and obliteration of the joint space goes on to complete osseous ankylosis. Pain is absent during the active stage of the disease in contrast to the sacro-iliac strain or tuberculosis of the joint, which exhibit local pain and tenderness.

Freund, on post-mortem, found that connective tissue invades the articular cartilage both from the bone-marrow and from the capsule of the joint and this supports the theory that the disease begins in the bones and that it is an infective or toxic osteopathy. Oppenheimer has stated that in a number of cases where the sacro-iliac joints appeared normal, both clinically and radiologically, the apophyseal joint lesion was seen confined to thoracic and cervical vertebrae. Kuhns of Boston and Taylor of Toronto are of opinion that sacro-iliitis is not invariably the precursor of spondylitis. Sash after 257 post-mortem examinations reported that these changes are progressive, increasing in extent and intensity with the age of the individual and common in males after the third decade of life. The percentage of bony ankylosis in males is 57% between the ages of 40–49; 60% between 50–59 and in women 0% and 14% respectively.

The author thinks that a diagnosis of spondylitis should not be made unless the sedimentation rate is raised or the characteristic spinal changes are present. Just as two types of rheumatoid arthritis, one called "atrophic arthritis" and the other "chronic infective polyarthritis" that are described in the report by the Committee of the Royal College of Physicians, there may be, two types of ankylosing spondylitis, as well; one occurring during adolescence predominant in the males, progressing rapidly in a centrifugal way, often resulting in complete rigidity of the whole spine, sacro-iliac, hip and even knee-joints and upwards the costo-vertebral, sterno-clavicular and mandibular joint. The other, not quite so predominant in the males occurs later in life, is slower in progress, and though centrifugal, not uniform; the maximum changes in the spinal column being in the dorso-lumbar or even in cervical region. In this the sacro-iliac joint is not affected to the same degree in the early stage. The ankylosis in this disease is different in character from that met with in some of the other diseases; it is an early development and is due to deposition of calcium in

the ligaments and fibrous tissues adjacent to bones with very little or no bony destruction, so that very often the unbroken outline of the bony surfaces can be seen in the radiographs. The ankylosis in rheumatoid arthritis is due to the damage and breaking down of the articular surfaces, and in spinal osteo-arthritis is due to fusion of osteophytes by synostosis. Osteoporosis is often extreme and the calcium removed from the bones is re-deposited in the fibrous tissues in the neighbourhood, probably due to the variation in the pH of the body fluids. The calcification of the fringes of the periosteal tissue along pelvic bones and the ankylosis of the symphysis pubis are striking features which are never present in rheumatoid arthritis. Tuberculous affection of the spine sometimes presents similar calcification of ligaments and in this connection it may be mentioned that tubercle skin tests are more often positive in spondylitis than in rheumatoid arthritis. The focal cellular accumulations in nerve sheaths and in muscles in rheumatoid arthritis, first described by Freund and later confirmed by others, indicates that it is a general disease, not confined to joints. So far this has not been demonstrated in spondylitis. Recently Roland Dawson found that there is a great increase in excretion of 17 ketosteroid in spondylitis, whereas no change was noted in arthritis; and this excretion was greatly reduced after X-ray treatment indicating its beneficial value in spondylitis in contrast to its effect in rheumatoid arthritis. The effect of gold on the two diseases is also different.

Ankylosing spondylitis.—Norman Capener:—The author emphasises the need for finding an adequate non-operative form of treatment, because at that stage when surgery becomes necessary the patient is so much immobilised that the results are not satisfactory. The disease starts as a local lesion in the pelvic joints but becomes a constitutional degenerative disease due to the devitalising influences of fixation and deformation of the costo-vertebral skeleton. The disease is not probably a blood-borne infection because of its peculiar origin and dissemination. The spread of spondylitis bears a similarity to the dissemination of prostatic cancer through the lymphatics to the pelvic bones and spine; and with the well-established relationship of prostatic function with phosphatase and bone-formation, further studies along these lines will prove to be of value.

Rest is important during the active phase of the disease and its purposes are to promote healing by reducing the physiological needs, by avoiding the aggravation of pathological process and by making available all the metabolic resources of the patient and to prevent deformity due to extrinsic forces like gravity and intrinsic forces like unbalanced muscular activity. The inhibition and atrophy of the extensor mechanism needs external support and in the use of rest, support and exercise, the author emphasises the need for "uncommon sense and a balanced judgement." He uses a Bradford frame or one of its modifications for immobilisation of early cases and for those requiring correction of deformity. Such immobilisation alternated with

activity as symptoms subside improves the deformity. Rigid spines with head-traction on an inclined Bradford frame show some improvement. But maintenance of the correction is difficult. Spinal supports are temporary and only assists the weak spinal muscles. With the re-education of the muscles there is improvement of respiratory movement and visceral tone.

The aim of the surgical treatment is to correct the deformity and to restore free, painless movement in the ankylosed joints For correction of deformity, osteotomy may be done. It is rarely that it is indicated in the hip but in the spine it may be more often necessary. Dr. Smith-Peterson does multiple osteotomy with resection through posterior apophyseal joints. La Chappelle of Amsterdam does a two-stage osteotomy. The failure of operation is due to the profound loss of muscle, inactivity of the lower motor reflex system and atrophy of the bone. In arthroplasty the facial flaps interposed become ossified and the movement is lost. Better results may be obtained in advanced cases of ankylosing spondylitis if mobility of the costo-vertebral joints could be produced.

Radiotherapy of Spondylitis—D. I. G. Williams.

The Radiotherapy of spondylitis is described under the following headings: (1) Technique (2) Rationale of X-ray treatment both pathological and clinical (3) Dangers of treatment and (4) lastly results.

Technique.—It was late Dr. Gilbert Scott who first used and popularised X-ray therapy for this malady under the belief that irradiation of the whole trunk with low intensity and small doses raised the defensive mechanism of the individual, just as the ultra-violet light does, only much more so. His evidence was based on the improved blood picture, lowered sedimentation rate and the gain in weight. It was his firm belief that this disease could be wiped out, if the treatment was started before the spine became involved. *After extensive trial, this method, now, is not found to be so satisfactory as the intensive localised deep X-ray therapy.* The technique used by the author is 200-250 k.v., 1 mm. cu filter, one field-covering both the sacro-iliac joints, the whole length of the spine being divided by segments 20 cm. by 10 cm, two fields treated daily, 300*r* per field, a total dose of 2,000-2,400*r* being given, the joints actually involved getting about 2/3 of this dose. For pain in odd sites or involvement of other joints additional irradiation with the same dose over localised fields are given.

Rationale of X-ray treatment.—Steinberg in 1942 described the pathological process as formation of vascular granulation tissue both over and below the articular cartilage due to the proliferation of the cells of the synovial membrane and the connective tissue elements of the bone marrow immediately below the cartilage and thus invading and destroying the cartilage. These two layers of granulation tissue are capable of formation of fibrous tissue and bone. This reaction is probably of inflammatory origin which is radio-sensitive.

Dangers of Treatment.—This form of treatment is not unattended with the dangerous effects on the skin, blood and

generative organs. Skin over the bony prominences shows a greater reaction than that over the soft tissue due to the back scattering. The skin reaction should not be taken beyond the dry, scaly, desquamative stage as some cases might need orthopædic treatment involving hard beds etc. While under treatment the skin should not be washed with soap, and should be kept dry with spirit and powder. In this form of treatment a large volume of circulating blood and bone marrow is exposed and so there is some leucopenia and fall in red cells. This can be adequately counteracted by frequent blood counts and administration of tonics, vitamins and iron. Constitutional reaction such as lassitude, nausea, vomiting and prostration may be complained of. If the vomiting is severe Benadryl (50 mgr.) oral or parenteral may be given (it is an anti-histamine substance). Unnecessary irradiation to testes can be avoided by protecting with lead sheats but to the ovaries it is unavoidable during irradiation of sacro-iliac joints in females; and the dose that reaches the ovaries is bound to produce temporary or permanent artificial menopause or at least menstrual irregularities, the symptoms of which may be severe in women under 40, though œstrogens minimise the severity. Also small doses of irradiation may cause chromosomal abnormality which may result in developmental abnormalities in later generations. Hence irradiation should not be given to young women who desire children and in others they should be warned beforehand.

Effects of treatment on the disease.—The disease is classified into three broad groups: (*a*) early with changes confined to the sacro-iliac joints, (*b*) moderately advanced with partial or complete obliteration of sacro-iliac joints and some involvement of spine, usually posterior articulations, (*c*) advanced group with ossification of the common ligaments. With irradiation pain is decreased or abolished and the paravertebral muscle spasm is relaxed, stiffness is less, spinal motion and chest expansion are increased. This enables the patient to carry out his orthopædic treatment and his mental outlook changes. The fall in sedimentation rate indicates that toxæmia is reduced. Patients gain in weight, improve in general health and return to their work. In the early group the author irradiates the whole length of the spine also and the patients regain full movement. In the moderately advanced group, pain is relieved but the range of spinal movements may not show improvement and in the advanced group, some relief of pain is obtained. The author believes that X-ray therapy arrests or at least retards the progress of the disease and assures his patients so. The treatment may be repeated once again but not before six months. He suggests X-ray therapy first, then orthopædic treatment, after which the patient should remain under medical care for a long time and further treatment may be given if he develops pain in other sites.

During the discussion on spondylitis Dr. G. D. Kersley said that equally good results are obtained with smaller doses of 800-1000 *r*. Dr. F. Boch remarked that further studies should be devoted to constitutional and psychological back-

ground and heredity. Mr. W. D. Coltart said that deformity could be prevented but doubted if it could be corrected. Mr. Buckley said that he read a statement by a radiologist in *Radiology*, to the effect that the sacro-iliac joint should never be irradiated in young women and equally satisfactory results are obtained by concentrating treatment above the lumbo-sacral junction. If good results are obtained this way, then the danger of sterility could be avoided.

[In our own clinic a maximum dose of 1200r has been adopted since 1932, local radiation only to vertebral column and joints involved, and not the 'Scott' wide field technique. A.K.].

Thrombocytopenia following local Radiotherapy.—Harry Massberg, *Acta Radiologica*, Supplementum LXVII.

Introduction.—The clinical investigation which forms the basis of this publication was carried out by the author and his co-workers during the years 1945 to 1947 at Radiumhemmet and Soderssjukhuset, Stockholm.

The investigations deal with the effects of irradiation on thrombocytes during and after local radiotherapy, with doses generally used in treating malignant conditions. The author hopes to be able to give information of some value in practical radiotherapy, with special reference to thrombocytopenia with hæmorrhagic diathesis that one may come across in such treatments.

A number of authors have studied the effects of total irradiation on the blood of man and animals and have described irradiation thrombocytopenia. Kornblum and Rud have done thorough investigation on formed elements of blood after local irradiation, but seem to have paid relatively little attention to thrombocytes, and even to the moderate thrombocytopenia found, they attached no clinical significance. This lack of interest in the behaviour of platelets to irradiation is attributed to two reasons by the author. Firstly, due to certain unsuitable laboratory methods and the great variations in the results obtained that many radiologists have lost confidence in the platelet values. Secondly, the author thinks the thrombocytes were examined in the earlier days of radiotherapy, before 1920, when more cautious methods of treatment were used, negative results made, and probably never published, which led to the general belief that platelets were radioresistant.

There now exists a general idea that local radiotherapy means opposite to total radiation. Total radiotherapy is irradiation of the whole body to radium or roentgen rays including internal treatment with radioactive substance (injections, inhalation of radium emanation, etc.). Certain methods of treatment working with large fields or a great number of small fields form a borderline group between local and total irradiation. As most radiotherapeutists have found that the biologic effects of these are more like that of total irradiations this borderline group could be classified with total irradiation. The author, in order to avoid the biologic effects of total and sub-total irradiations has laid a strict rule throughout this investigation to include only cases treated for localised

lesions or lesions found in one organ of the body.

The author had two fatal cases of thrombocytopenia with hæmorrhagic diathesis following roentgen treatment for myasthenia gravis and cancer of the œsophagus. Though, at first he put it down to hypersensitivity to roentgen rays, he thought the possibility of thrombocytopenia as a result of irradiation. This possibility and the lack of research in the behaviour of thrombocytes to irradiation prompted him to undertake this line of investigation.

Review of the literature.—Heineke (1903–1905) found that roentgen rays has dual effect on blood and blood forming organs of animals. On one hand there was a destruction of great many cells especially lymphocytes in the lymph nodes and in the lymphoid tissue of the small intestines, which began a few hours after treatment and completed within twenty-four hours. On the other hand there was a destruction of all cells in the bone marrow and in the spleen which began after two or three days and most marked when the animal was about to die. Whereas the changes in the lymphoid tissue appeared after a small dose, that of bone-marrow and the pulp of the spleen appeared only after intense irradiation. It was also noticed that these changes were reversible and that there was a drop in the leucocytes during the first two days.

Weisswange (1938) wrote that during prolonged irradiation a transient leucopenia appeared affecting all types of cells; and at the beginning of the treatment, at times, a relative increase in neutrophil or eosinophil leucocytes without total leucocytosis occurred. A relative lymphopenia may occur, but never a lymphocytosis. In these cases of leucopenia excepting some fatigue no other general disturbance was noticed. Kornblum, Boerner and Henderson (1938) observed that there was a leucopenia in which lymphocytes were chiefly affected, while the neutrophils to a lesser degree, and the monocytes, eosinophils, and basophils were least affected. Bull Englestad (1946) made the same observation.

According to a number of investigators irradiation seems to have very little effect on R. B C's and hæmoglobin. In animals after irradiation there is a decrease in the thrombocytes and in some cases a hæmorrhagic diathesis has been noted. A lot of blood investigations have been done on personnel engaged in radiological work, but very little has been said about the chronic roentgen influence on thrombocytes. The author thinks that in fatal cases the cause of death could be due to serious radiation injuries to megakaryocytes resulting in a thrombocytopenia with hæmorrhagic diathesis and anæmia. It has been proved that after total irradiation some patients may develop thrombocytopenia, often associated with hæmorrhagic diathesis, but little has been said as regards their behaviour to local irradiation.

Kornblum, Boerner and Henderson in 1938 studied the effects of irradiation on blood platelets, erythrocytes, Hb. content and concentration and W.B.C. They investigated 48 patients, mainly malignant conditions treated with superficial, deep

roentgen or radium therapy. As regards thrombocytes no significant change in either their size or staining reaction was noted. They found that 35 patients showed a decrease and 13 an increase in the platelet count and during the follow up period all 30 patients studied (18 were not followed up) showed an increase and a return to the pre-irradiation level soon after cessation of the therapy. No hæmorrhagic tendencies or other clinical manifestations were noticed. The leucopenia which occurred was independent of the changes in the platelet count and they found no evidence to attach any clinical importance to the drop in the platelets or the leucocytes. They summed up their conclusions in the following words. "We are inclined to believe that under ordinary therapeutic application of roentgen and radium therapy, it is seldom, if ever, necessary to withhold or discontinue therapy because of its effects on the leucocytes and platelets. It is emphasised that those remarks do not apply to blood dyscrasias nor to super-voltage therapy now coming into vogue."

As regards the effects of local irradiation on megakaryocytes in the bone marrow only three authors have made observations. Engelmann (1938) found that megakaryocytes were very sensitive to direct irradiation and showed marked changes in their nuclei and plasma and progressively decreased in number till they completely disappeared. The adjacent non-irradiated areas showed no change. Dahl (1935) showed that after heavy does the bone marrow appeared aplastic. Denstad (1943) said that the parenchymatous cells of the bone marrow were very radio-sensitive, the erythroblasts more than the myeloid cells. The megakaryocytes disappeared after small doses. No changes were noticed in the adjacent non-irradiated areas. Although destructive effects occurred when active bone-marrow is irradiated, Denstad considered that with a large reserve capacity of the bone marrow the hypoplasia or aplasia even if persisted, is of no practical importance. He found that there was a rapid regeneration of bone marrow after small doses and slow and incomplete one after larger doses. Heineke after experiments on animals found that regeneration began with granulated cells and giant cells, while eosinophils and mast cells were normalised later; and this finding has been confirmed by several others.

In the early days a great number of investigators believed that there was a primary destruction of leucocytes, which produced a substance called "Leucotoxin" and which had a secondary inhibitive effect on the blood forming organs. More recently it is found that there exists a direct radiation effect on the blood and an indirect influence on the bone marrow and other places of blood formation.

As regards hypersensitivity or idiosyncrasy to irradiation many radiologists have noticed unsual skin reactions, similar to allergic reactions in the skin and other places, which are caused by many different agents. Various views are held by various authors Holzknecht believed that the exanthema was due to toxins produced by the roentgen treatment. According to Barjou and Nogier a tropho-neurotic disturbance within the

fields of treatment could be the cause. Soiland (1926) attributed it to radiation idiosyncrasy. Berenstein (1930) put it down to damage to the capillaries. Schatter(1941) while writing about general injuries due to rœntgen rays said that the allergic reaction depended upon denaturalisation of albumen due to radiation influence.

Jurgens (1945) in his monograph on hæmorrhagic diathesis while discussing the hæmorrhagic conditions following physical influences mentions, amongst other factors, injuries due to rœntgen rays, radioactive substances and ultraviolet light. He writes that extensive bleeding in the skin combined with thrombocytopenia may appear after chronic radiation injury. Barnes (1941) and Adams (1942) found in animals after irradiation there was no alteration in prothrombin level even when severe leucopenia and thrombocytopenia developed. Adams found after radium therapy for malignant conditions of the female genital tract a decrease in the prothrombin level, but not after rœntgen treatment. Kaufmann (1946) noticed a prolongation of the prothrombin time in persons occupied in radiologic work.

Investigations on rabbits showed a lengthening of the coagulation time seven days after conclusion of irradiation with X-rays and on the tenth day no power of coagulation was left. A transient lengthening of the coagulation time has been noticed by Bignami (1939) both after rœntgen and radium treatment for patients with cancer uterus. Prolongation of bleeding time and impairment of clot retraction occur only after total irradiation. As regards the effect on calcium content there are no definite views.

The Material:—The material consists of 53 patients, 35 men and 18 women, of which 40 were treated for malignant tumours (including 3 cases of malignant lymphogranulomatosis) and the rest for non-malignant conditions like Disseminated Sclerosis, Spondylitis Deformans, Myasthenia gravis. All except one treated with rotation therapy for carcinoma of the œsophagus were under observations for over a month. Patients with blood dyscrasias are not included. Of these 53 patients 50 were treated with local ordinary therapy; one with teleradium, one with brachyradium, and one with rotation roentgen therapy. These patients have not had treatment on more than six fields, the size of the fields not exceeding 300 sq. cm. No case of irradiation of the whole surface of the chest or abdomen is included. As there is no generally recognised conception of the term thrombocytopenia, the author has considered counts of value below 100,000 as thrombocytopenia.

At Sodersjukhuset the factors were 9-15 milliamperes, 160-170 kilovolts, Skin target distance 40 60 cm. the filters $\frac{1}{2}$ *mm*. Cu + 1 mm Al-and 4 mm. Al., At Radiumhemmet 15-20 milliamperes, 160-170 kilovolts, skin target distance 40-60 cm., Filters Thoræus' tin filter and $\frac{1}{2}$ mm Cu + 1 mm Al. The r-output varied between 23 and 160 per minute.

The influence of irradiation on the platelet count presented in some cases a typical course with a primary decrease during and a second one after treatment

Results

Region Treated	No Influence	Uncertain Influence	Definite Influence	Thrombocytopenia	Haem. diathesis	Lethal cases
Thorax & upper abdomen—33.	6	2	13	6	4	2
Vertebral Column—12.	5	3	2	1	1	—
Pelvis and other regions—8.	6	2	—	—	—	—

(two waves of depression). In 9 cases the platelet curve was undulating, more marked than in control cases.

Five cases showed low platelet count associated with hæmorrhagic diathesis, out of which four patients showed severe skin reaction and developed purpuric spots. Two patients developed bleeding from the mucous membrane of the nose and mouth; and in one patient the bleeding after pricking for blood count did not cease until after one hour, which must be looked upon as prolongation of bleeding time.

There were two fatal cases both of whom exhibited severe skin reactions on the field of treatment and widespread purpuric spots. One case of myasthenia gravis developed hæmorrhagic cough which improved after a week, but again a month later it recurred. The lowest platelet count was 23,000. The other was a woman, a case of carcinoma and œsophagus, who received comparatively small doses developed hæmorrhagic cough and slight bleeding from vagina. The lowest thrombocyte count was 98,000.

The author has tried remedies only on a few cases in a limited scale in order to obtain as uncomplicated conditions as possible; the remedies used were blood transfusions, vitamins K, B and C and iron. In no case any influence on the number of thrombocytes could be noticed. Other investigations such as white cell count, reticulocyte count, calcium content in serum, clot retraction, sedimentation rate, coagulation time, prothrombin index, capillary resistance test showed no significant changes. Only two cases showed a prolongation of bleeding time.

The author has discussed his results under the following points:

(1) Decrease in the thrombocyte count.
(2) Shape of the curve.
(3) Region irradiated.
(4) Influence of the dose of irradiation.
(5) Unusual skin reaction.

1. A review of these cases shows a definite drop in the thrombocytes following local irradiation, the degree ranging from an insignificant decrease up to a fatal thrombocytopenia. Out of the total 53 patients investigated 29 cases showed definite decrease of thrombocytes. It is evident from literature that very few investigators have taken interest in the behaviour of platelets to local irradiation and those few do not seem to have attached any clinical importance to the change in the number of platelets after irradiation. Seven cases of hæmorrhagic diathesis including two fatal cases in a series of 53 patients can be considered as a fairly high proportion of thrombocytopenia after local radiotherapy. On account of the highly varying individual sensitivity it is difficult to predict with certainty if a slight degree of thrombocytopenia is likely to be harmless or turn to become serious.

2. The platelet curve shows a decrease by one or two waves of depression either during or after conclusion of treatment, the second one following after a short interval. In these cases the first wave may be due to either the direct influence of irradiation on thrombocytes in the circulating blood and indirectly through the bone marrow, probably, due to some noxious substance or by direct influence on both; and the second wave is due to the checking effect on the megakaryocytes in the bone marrow. In the curves of one wave depression, the second wave may be missing or added to the first phase without the intermediary period of regeneration of platelets. The undulating course seen in some cases points to a disturbance of the powers of destruction and regeneration following irradiation.

3. A notable feature of these investigations is that the influence of irradiation on the thrombocytes is most marked when the mediastinum and lungs, upper part of the abdomen or the vertebral column is exposed, than when other regions are irradiated. Perhaps this may be due to the irradiation of the large quantity of the circulating blood, though it is difficult to exclude irradiation to bone marrow. It is suggested that, due to technical difficulties in excluding the bone marrow from irradiation, animal experiments are likely to give more information regarding this.

4. The effects of irradiation on the thrombocytes are not proportional to the dose and the sensitivity of 'the thrombocytes and their mother cells' varies with different individuals. Only the two fatal cases showed a high degree of sensitivity whereas several other cases did not with the same dose and the same field of treatment.

5. Four of the cases developed more intense erythema than expected, even with comparatively small doses. The development of hæmorrhagic diathesis preceded by urticaria suggests a damage to the capillaries due to irradiation.

The author presumes that the fatal cases ascribed to acute or chronic irradiations are due to thrombocytopenia associated with hæmorrhagic diathesis. At present, more importance is attached to leucopenia though no definite leucopenia was noticed either in the fatal cases or in those with hæmorrhagic diathesis. The thrombocytes appear to be more sensitive to local irradiation than the leucocytes and therefore the platelet curve is much more a valuable indicator of the general influence of irradiation. Apart from radiation, leucocytes are influenced by other factors, such as growth or reduction of the tumour mass, infection etc., whereas there is no proof that the platelets are subjected to similar influences.

The decrease of thrombocytes is just as important as that of leucocytes. It is suggested that when irradiation is given in relatively large doses or over large fields, especially over the mediastinum, upper part of the abdomen or the vertebral column, the platelet count be done once a week during and for 2 or 3 months following the treatment.

Even though there is at present no effective remedy against radiation thrombocytopenia, it will give the radiotherapists a feeling of safety to know the thrombocyte status of his patients and this knowledge may, to a certain extent influence his decision concerning the total dosage in many cases. Hegler and Griesback in 1931, Grœdel and Lossenos in 1931, Cottenot and Sluys 1935, have described three cases of irradiation thrombocytopenia with hæmorrhagic diathesis, which ceased after splenectomy. This may be kept in mind and used as a last resort in cases of hæmorrhagic diathesis which do not respond to the usual therapeutic measures.

GENERAL-SECRETARY'S ANNOUNCEMENTS

Honorary Members—Indian Radiological Association

1. The following members were duly elected at the last Congress held at Bombay as Honorary Members of our Association:

Prof. J. M. WOODBURN MORISON,
M.D., F.R.C.P.E., F.F.R., D.M.R.E., Sussex.
Prof. G. STEAD, M.A., D.Sc., F.INst. P.
Guy's Hospital, London.
Dr. A. E. BARCLAY,
O.B.E., M.A., M.D., D.M., F.R.C.P., F.F.R., D.M.R.E.,
Director, The Nuffield Institute for Medical Research,
Oxford.
Dr. RALSTON PATERSON,
M.D., F.R.C.S., F.F.R., D.M.R.E.,
Director, The Holt Radium Institute, Manchester.
Dr. H. J. BHABHA, F.R.S.,
Director, Tata Institute of Fundamental Research,
Bombay.

6th International Congress of Radiology, Summer, 1950, London.

Formation of Indian Delegation.

On a communication received from Dr. Ralston Paterson of Manchester, the President-elect of the Sixth International Congress of Radiology, our President Dr. K. P. Mody, has formed an Indian Delegation with the following members:

Dr. K. P. MODY, Bombay (Chairman).
,, M. D. JOSHI, Bombay.
Capt. M. MUKHERJEE, Calcutta.
Dr. S. C. SEN, Delhi.
Rao Bahadur Dr. P. RAMA RAU, Madras (Secretary to the Delegation).

Members who wish to read papers on any subject pertaining to Radiodiagnosis, Radiotherapy, Radiobiology, or Radiation Physics at the above Congress are requested to communicate the title of the article to me, so that I may send the same on to the Secretary-General of the Congress Dr. J. W. McLaren, 45, Lincoln's Inn Fields, London W. C. 2.

Further particulars as received from Dr. McLaren will be published in the subsequent issues of the journal.

Bengal Radiological Association, Calcutta.

Members will be glad to learn that a Bengal Radiological Association has come into being with Headquarters at 4, Cooper Street, Calcutta 26, with effect from 29-5-1948. Capt. M. Mukherjee, M.B., D.M.R.E. (Cantab) our Central Council Member and a former President and Secretary of Indian Radiological Association, has taken the initiative in this formation and is its Secretary and Treasurer.

The following constitute the Provisional Working Committee.

President:	—	Capt R. P. BANERJI.
Secretary and Treasurer:	—	,, M. MUKHERJEE.
Members:	—	Dr. S. MUKHERJEE.
		,, B. BOSE.
		,, P. K. GUHA.
		,, S. K. BHAR.

It is hoped that this newly formed Association will soon be affiliated to the Indian Radiological Association.

Further details will be announced in the November issue of the Journal.

Annual General Meeting of the Indian Radiological Association for 1948 and the Third Indian Congress of Radiology, December, 1948, Calcutta.

On the invitation of some of our Calcutta members the venue for the 3rd Indian Congress of Radiology, has been fixed at Calcutta. A Reception Committee has already been formed. Further details as regards the exact place where the Congress Session will be held, dates, etc., will be announced in the next issue.

In the meantime, we request members desirous of reading papers, etc., at the ensuing Congress to get in touch with Capt. M. Mukherjee, M.B., D.M.R.E. (Cantab) 4, Cooper Street, Calcutta and send titles of the articles with a short summary as early as possible, definitely not later than 15th November 1948.

To All Members of the I.R.A.

CIRCULAR

Drawing attention to Rule 56(*a*) quoted below, I am to request members to kindly intimate me before the 30th September about their willingness or otherwise to serve on the Central Council or as one of the Office-bearers for 1949, to be elected at the forthcoming Annual General Meeting of the I R A. at Calcutta during X'mas week this year.

"On or before the 15th September of every year the General Secretary shall issue letters to all members eligible for election to the Central Council enquiring whether they are willing, if elected, to act as officers and members of the Central Council. The replies must reach the Secretary before the 30th September."

NOTICE TO CONTRIBUTORS

Contributions are to be sent to one of the joint Editors, 'The Indian Journal of Radiology' Rao Bahadur Dr. P. Rama Rau, D.M.R. (Vienna), The Madras Radiological Institute, 155-157, Poonamallee High Road, Kilpauk, Madras-10, or Dr. K. Manjunath Rai, F.R.C.S. (Edin.), D.M.R. (Lond.), Barnard Institute of Radiology, Govt. General Hospital, Madras.

Contributions should be typewritten on one side of the paper only. They are accepted on the understanding that they are sent exclusively to this Journal and a statement to that effect should accompany every contribution. Original Radiographic negatives should not be sent, but prints therefrom, or prints from reductions; adequate explanatory notes should be attached to each radiograph, diagram or sketch. Illustrations will be the Copyright of the 'Indian Journal of Radiology' and may not be published elsewhere without acknowledgement or permission. Rejected contributions will be returned only if accompanied by a stamped addressed envelope.

All communications regarding membership of the Association, subscription to the Journal and advertisements may be addressed to the General Secretary, The Indian Radiological Association, 155-157, Poonamallee High Road, Kilpauk, Madras-10.

THE CRUX OF MODERN RADIOLOGY

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CILAG LTD., SWITZERLAND

A UNIQUE CONTRAST MEDIUM
with 55% Iodine in stable combination

Chemical composition:
Morpholine salt of di-iodised pridone compound in aqueous solution

NEVER DETERIORATES

Potent miscibility with blood plasma. Absolutely harmless and produces even contrast effect on hardest film.

Rapid elimination from Kidneys and Bladder without liberating nascent IODINE

Painless in administration. Exquisite in results with wide range of utility.
Useful for ANGIOGRAPHY—VENOGRAPHY—CEREBRAL ARTERIOGRAPHY—RADIOGRAPHY OF JOINTS.

IODOBILE

GALL BLADDER CONTRAST MEDIA
for oral cholecystography

Chemical composition :
3 (4'-oxiphenyl) 2 phenyl-propionic acid.

No secondary reactions. No previous evacuation of Gall Bladder necessary.

During Radioscopy the gall bladder can be easily observed and palpated for mobility. The infundibulum and the collum fill up, which shows the alterations in shape and size as well as the elasticity of the walls can be easily determined.

One egg yolk emulsion will afford visualisation of contraction and evacuation as also the excretory bile ducts. Radiographs at a maximum of 55-58 KW display intense contrast effects.

Manufactured under a special process by Cilag Ltd., Schaffhouse, Switzerland.

CILAG

Literature and Samples can be had from Sole Agents for India:
THE PLASTIC & INDUSTRIAL CORPORATION LTD.
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TO ALL USERS OF

X-RAY & ELECTRO-MEDICAL EQUIPMENT

Here is an important announcement

WE are pleased to be able to announce that arrangements have been completed with the GENERAL ELECTRIC CO. OF INDIA LTD., and the GENERAL ELECTRIC CO. OF PAKISTAN LTD. for the setting up of an efficient organisation for the sale and servicing of Watson X-ray equipment throughout India and Pakistan.

The organisation—which forms the X-ray and electro medical department of the G.E.C. Offices—will be staffed by practical X-ray engineers with long experience in servicing Watson equipment.

Present-day Watson X-ray equipment is recognised to be amongst the finest in the world. Much of its success is due to the development work carried out in the Research Laboratories of The General Electric Co. Ltd. of England, with whom we are closely associated. Information concerning new X-ray equipment for diagnosis and therapy will gladly be forwarded on request.

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