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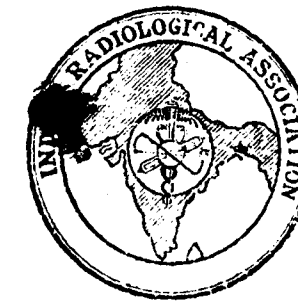
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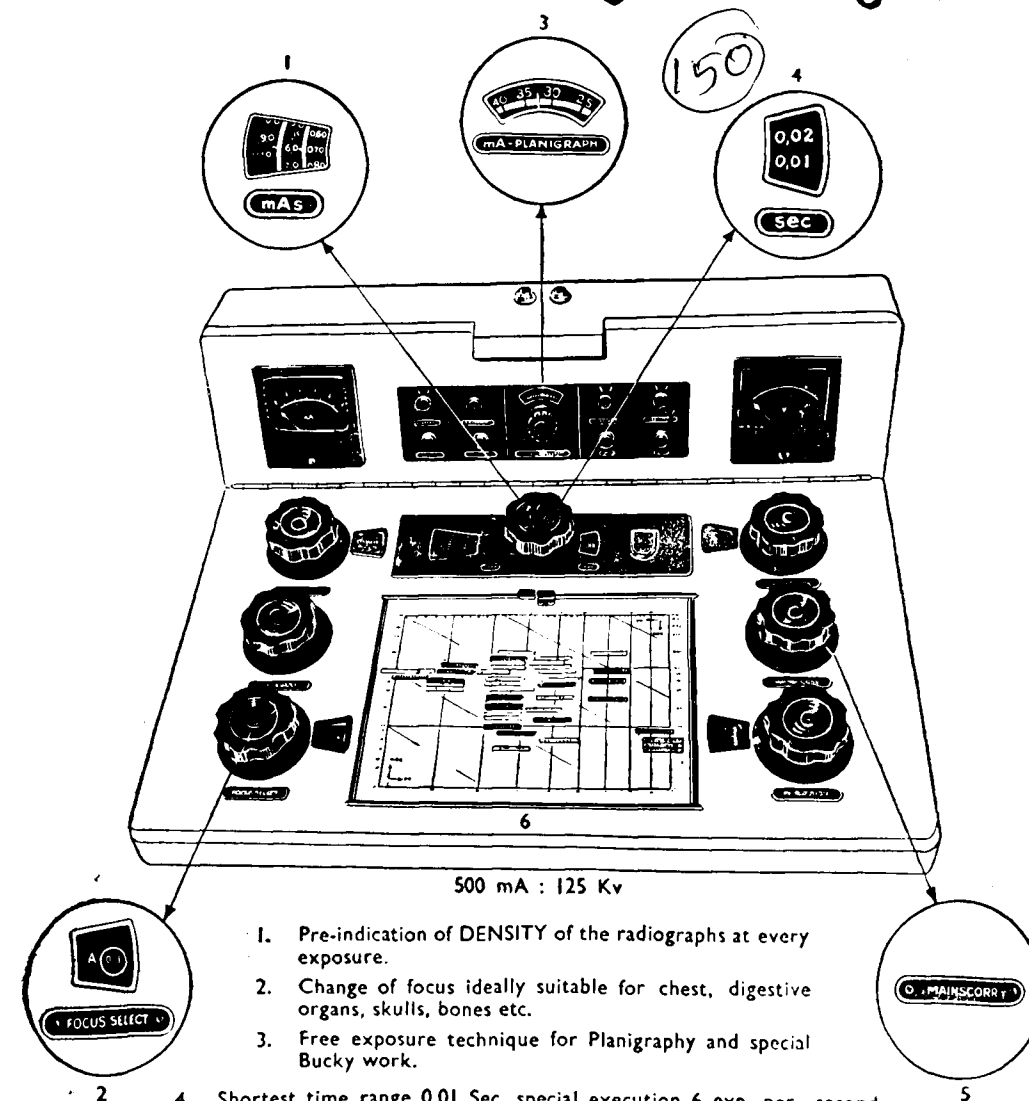
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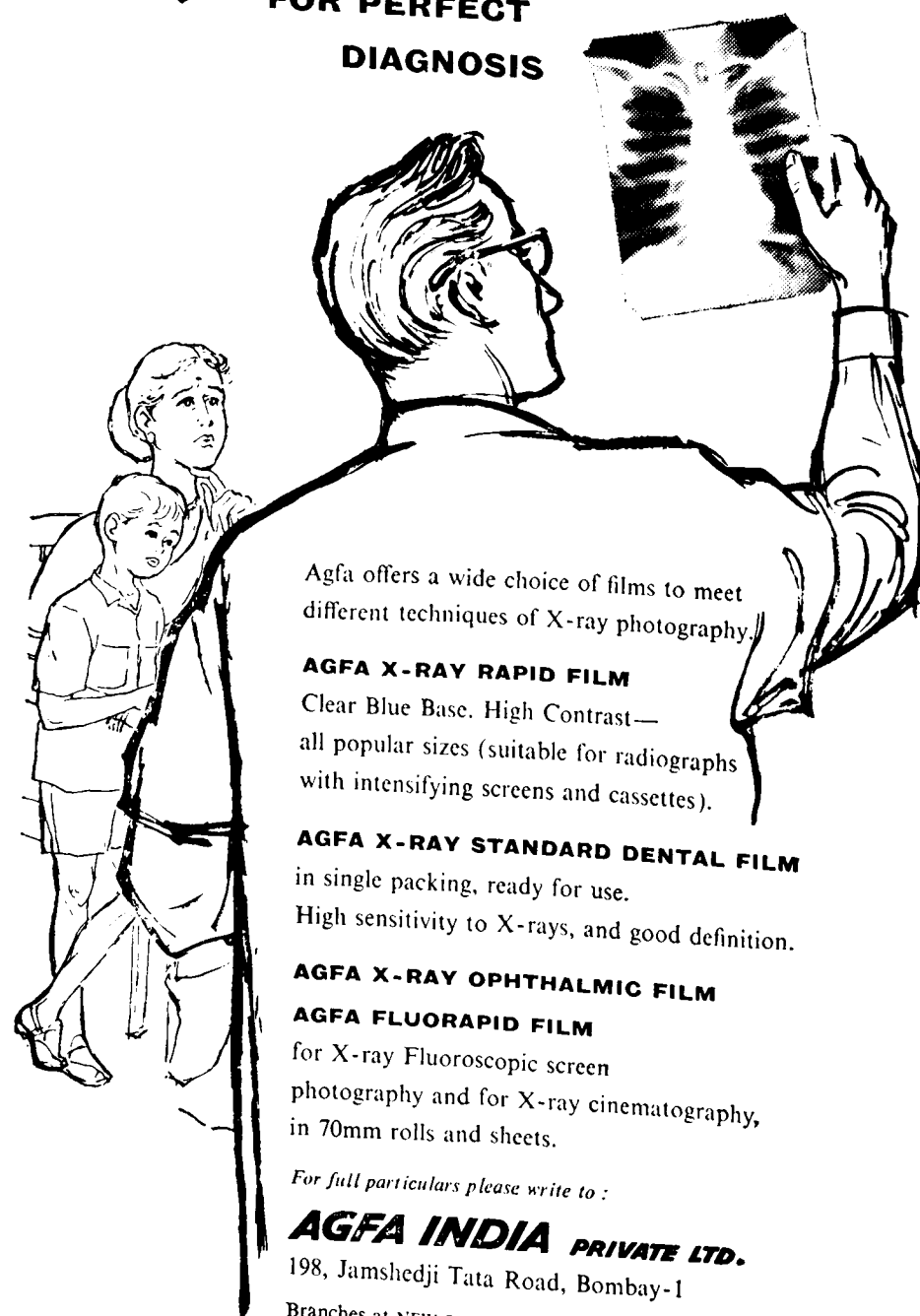
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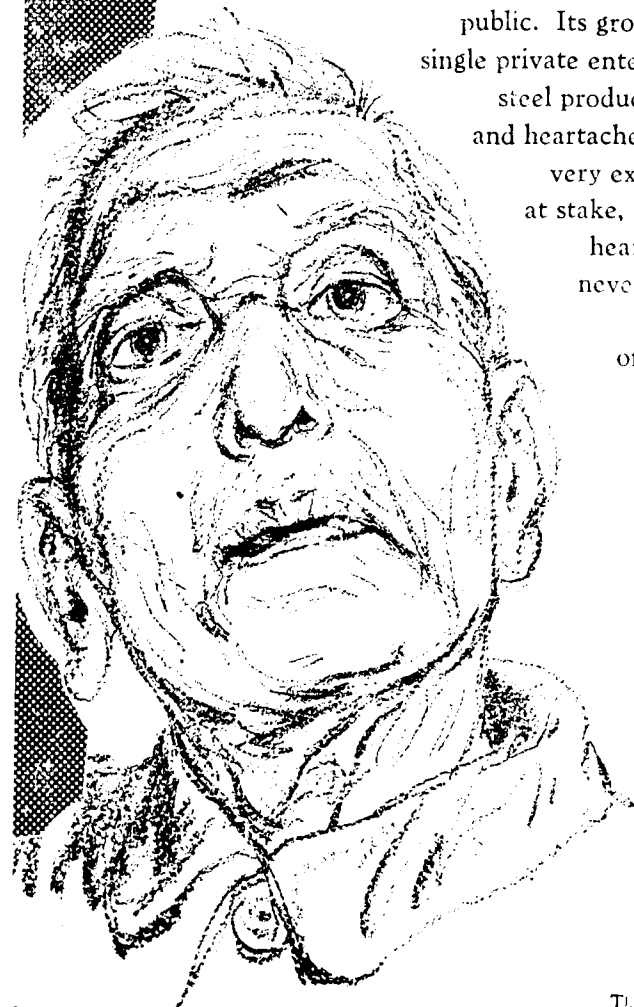
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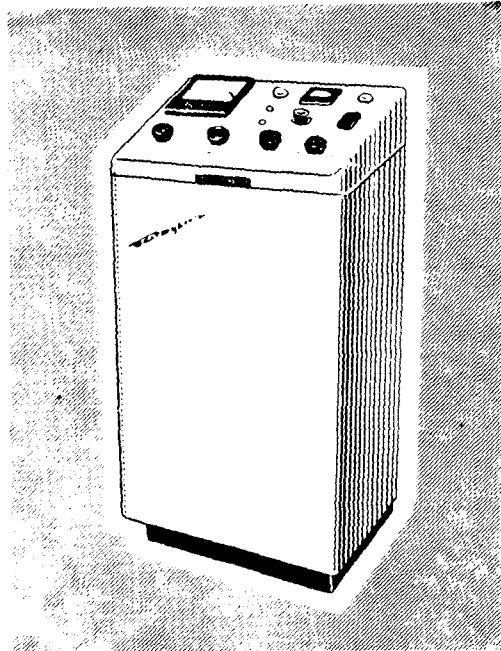
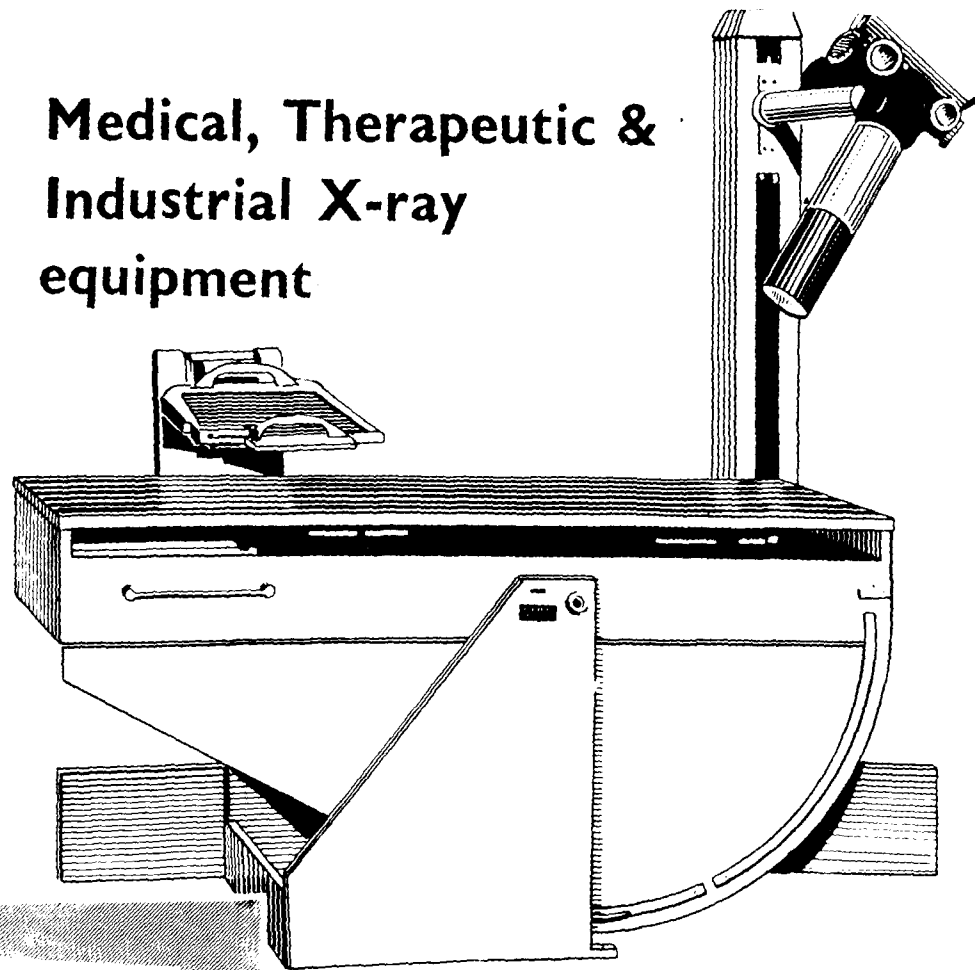
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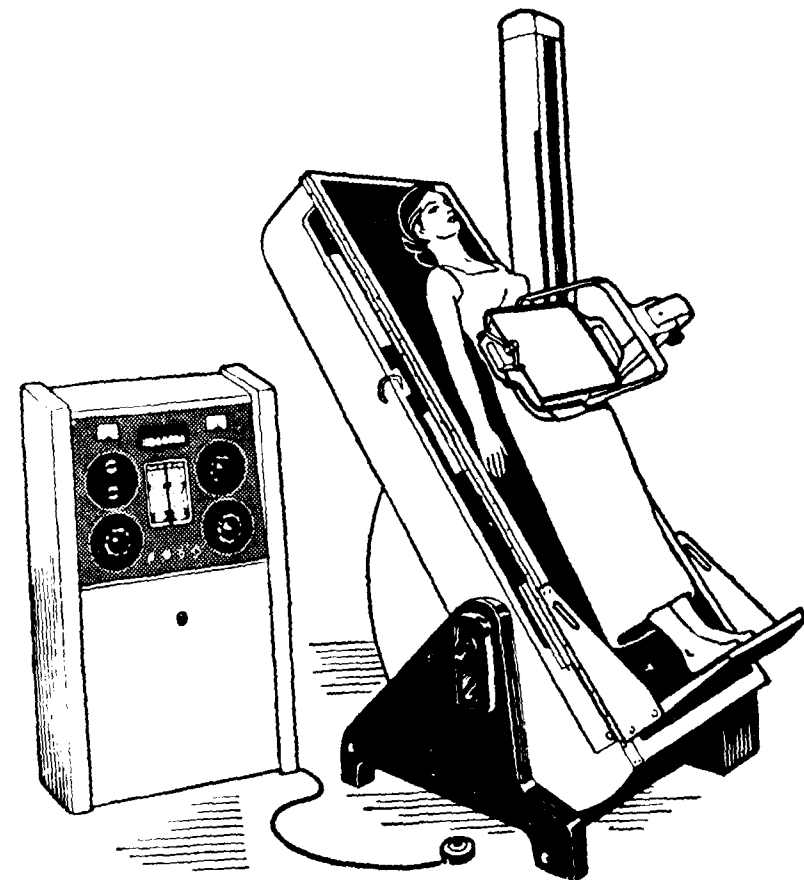
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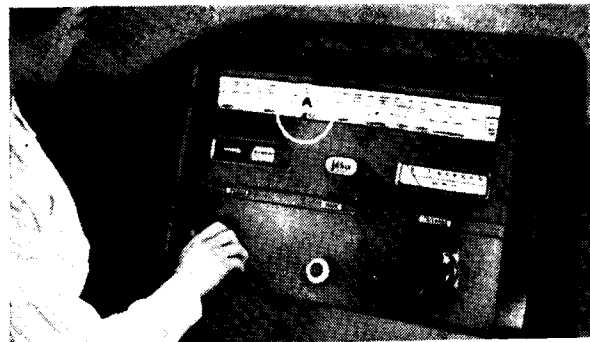
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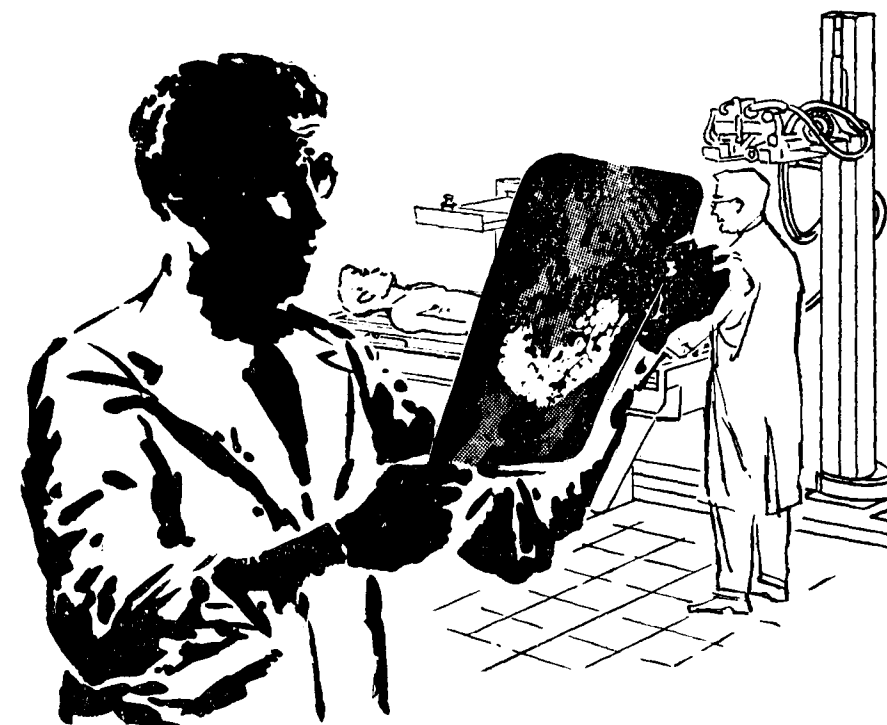
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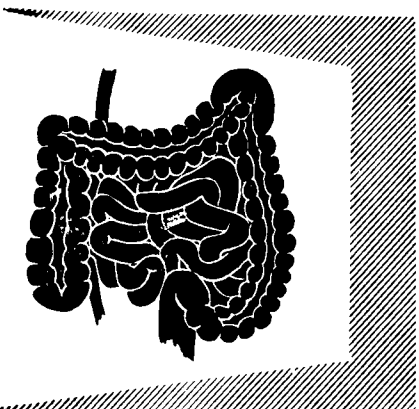
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BY

N. G. GADEKAR.

Many a time, papers in Medical and other scientific journals have been criticized as not 'good writing' because it is not 'good literature' or because it is not enlivened by 'humour'. Those who say this, appear to forget that the purpose of scientific writing is not to entertain or amuse the reader. Its main object is to place on record, accurately, clearly and as far as possible briefly, information which will be useful to himself as well as to other workers in the same field. It may also serve to stimulate interest in other workers. Medical writing should be judged solely as to how much it fulfils these objects. Attainment of these objectives, is the result of hard work, conscientious care, concentration on the subject and experience. Perfection is unattainable, but it should be one's goal and the success depends on how much one is near the goal.

It has been the experience of editors of our journal that usually there is no sufficient material of adequate density for publication in the next issue, on the contrary there is a large number of workers who come in contact, in their every day practice, with not only routine normal cases but also with cases of unusual interest. These workers in their initial enthusiasm, want to write, but some how or the other they have not been able to make up their minds to write their experiences. To such workers, the present writer would like to make a few suggestions. The main object of medical writing should be clarity and brevity and to this end, a certain technique in the preparation of the paper is necessary. The material on which the paper is based must be collected in the form of notes, case reports and various other records. This may go on for a few months or for a number of years. A mental outline is made, as to the form of presentation of these records which ultimately emerge in the shape of a paper.

Title.—The title of the paper should indicate the nature of the material. This is of importance as it catches the eye of those readers who are interested in the she subject and in some others it creates an interest.

Division of paper into headings.—The subject matter of most of the papers can be arranged under several headings. Introduction - under which background and purpose of the paper is briefly and clearly stated. This is followed by 'literature' under which previous publications on the subject

are reviewed. An extensive review of the literature is unnecessary. Only those references should be given which are necessary to give a background or to point out the facts to be presented. Sometime back the present writer was reviewing a paper. The details given about the previous literature were so exhaustive that they were repetition of so many technical details of previous authors and they were unnecessary for development of the theme of the paper.

Then comes the 'material'. Under this the substance of the paper is described. This should be dealt with in some detail, the methods, nature and results of experiments and basis of observation. This may require tabulations and charts. The whole material can be described under several sub-divisions. This is followed by 'discussion' under which significance of the material is set forth. It is compared with similar work appearing in previous publications. Here one can state how far he agrees with them, or how his observations are different and why and what conclusions one arrives at and why.

After discussion comes the summary or conclusion. Practically all medical papers require a summary at the end. This summary should give, in short, the important elements of the paper and should include conclusions, if any. Importance of summary is, that it gives an insight of your paper particularly to those who have no time for detailed reading and if they are sufficiently interested in your conclusions, they are induced to read the whole paper. The importance of good summary cannot be overemphasized.

Illustrations.—Illustrations play an important part in the presentation of radiological material. As they are expensive they should be selected with care. The different x-ray shadows are usually difficult to describe and even if described they rarely register the same meaning which the author wants to convey. An illustration should be used because it will convey to the reader the information difficult to be put into words. Every illustration should have a legend. The most effective legend consists of a topic line and a brief description. The topic line should give name of the disease and main point of illustration. The brief description should point out the main features in the illustration which the writer wants the reader to notice. A brief clinical history of the patient may make an effective addition to the illustration. Many readers after reading the summary, will look over the illustration and form an opinion about the quality of the paper.

Bibliography.—Only those articles bearing on the subject under discussion and which the writer has actually read should be included in the list of references. The references used in the article should be checked for accuracy. Each reference consists of the name of the author or authors, the title of the article, the name of the journal and the year in which the article is published.

After arranging the material, the first draft is made according to the points given above. It is preferable to write the draft instead of dictating it, as immediate arrangement and corrections can be made and unnecessary words and phrases can be easily noticed. This should be read and re-read and necessary corrections made. The second draft may be typewritten in triple space to allow for any subsequent correction and re-arrangement of paragraphs and sentences. The third or preferably fourth draft may be prepared as for sending to the editor. This manuscript may be laid away for a period of few weeks and then read again. Undoubtedly new corrections and refinements will become obvious. Then it is advisable that it should be presented to a friend or colleague who is familiar with the subject matter of your paper for his criticism. He should have sufficient interest in the author and the subject matter, to read the manuscript carefully and to offer criticism and suggestions freely without fear of offence. A good critic may point out statements which seem clear to the author but which are likely to be interpreted differently by the readers. After doing all this, the paper may be finally typed and illustrations with their legends arranged and sent to the editor and he will be grateful to the author for the trouble he has taken and the readers will find it of absorbing interest.

When a paper is to be presented before a scientific meeting it is necessary to prepare an abbreviated or abstracted version for oral representation. The manuscript prepared for publication is usually too long to be read in its entirety at the meeting. Usually most societies and associations limit the time for each presentation to 15-20 minutes and then some time must be kept for discussion which is of more interest to the audience as well to the author. This time cannot be extended without interfering with the discussion or without arousing resentment of the audience or of speakers following; besides ability of listeners to absorb and retain is not unlimited. In one of the scientific sessions one speaker started by invoking blessings of all previous workers in the subject and paying compliments to the present ones with the result that there was very little time for presentation of his subject matter and there was no time left for any discussion afterwards. One may sympathize with his sentiments, but sentiments, have no place in a scientific paper. Much detail is useless and only high points should be presented and therefore abbreviated version is necessary for oral presentation. This can be done by arranging selected sentences or paragraphs from the original paper or by summarising. The material should be arranged compactly to avoid useless repetition, though repetition of a main point or points is sometimes desirable and adds to the effectiveness of presentation. The use charts of tables on projection slides is usually very effective, as when the material is presented through both visual and auditory senses, it is more effective than through either of them singly; but this should be limited to essential requirements of bringing home to the audience the points which the

author wants to stress. Great attention should be paid in preparation of these slides. The number of slides, which can be shown is limited, by the time allotted for presentation. An average of not more than one slide per minute in allotted time can be used and hence the importance of selecting essentials as regards quality and quantity.

The rehearsal of presentation is very valuable and new entrants may repeat this several times. It familiarizes the speaker with the appearance of his slides when they are projected and it also shows him whether the material has been arranged in the proper order or not, so that it can be presented within the allotted time.

Discussion at the scientific sessions is limited to 5 or 10 minutes. The discussor should resist the temptation of making it another paper of his own. Only, the points on which one agrees may be emphasized or if otherwise, they should be brought out. The present writer had to witness a meeting where the chairman of the session took more time for his concluding remarks and showed more slides of his own than the author of the original paper.

These are some of the points which are meant for encouragement of those of the young members of the profession who wish to take part in scientific activities of the Association, but who, due to shyness or fear of being criticised, or lack of time or lack of proper guidance have been so far failing to do.

The other types of scientific activities which are best suited to new entrants to the profession are preparation of case reports. Every one comes across unusual types of new cases or routine cases with unusual features. They should review the literature on similar previous cases and prepare a summary and add their own case or cases with reports in some detail. This is not only a discipline in self-education but adds something to the professional literature and in addition it initiates them in writing of scientific papers. Other field of activity of mutual interest to members of the profession, is starting of 'Journal Clubs' where each member reviews articles from various journals and prepares abstracts. These abstracts are discussed periodically by the group. These Journal Clubs stimulate interest and create habits of regular reading, leading to great benefit. These abstracts may be sent to the Journal for publication as they form a valuable and important part of the Journal.

And so, you are writing for our Journal.

Radioactive Chromium in the investigation of Anaemia

Evaluation of Tagging Technique

BY

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AND

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Radioactive chromium 51 has been finding great use in the investigation of anaemia (Strumia et al 1955). First, it is due to the ease of tagging the red blood cells and secondly its gamma ray emission and short half-life makes it a very convenient isotope. Further, radioactive chromium emits 0.33 M.E.V. gammas which can be counted very efficiently by a scintillation counter.

As a prelude to the investigation of the decay of the red blood cells, experiments were carried out to find the most suitable method for maximum tagging by a simple technique. It is known that anionic chromium, as chromate, gets tagged to R.B.C. so long as it remains anionic. Radioactive chromium was obtained from AMERSHAM through the courtesy of National Chemical Laboratory, Poona.

Tagging Technique

Experiment 1:—Various methods were tried out for tagging red blood cells with radioactive chromium. To determine the suitability of Heparin and A.C.D. as anti-coagulants 500 units of heparin in 10 ml. of normal saline and 10 ml. of A. C. D. were taken in two separate 4 oz. bottles. Into these bottles were added 20 ml. of accurately measured and freshly drawn blood from an individual and the contents well

mixed by gentle shaking. Into each of these bottles 25 microcuries of chromium 51 were added. The bottles were then left at room temperature of 27°C for one hour agitating the mixture gently every ten minutes.

The samples were then centrifuged at 3,000 rpm. till the red cells were packed to a constant volume. This usually took thirty to forty minutes. As much of the supernatant plasma, as possible, was pipetted off without disturbing the red cell mass. The packed cells were subsequently washed with three changes of normal saline. The washing were counted for radioactivity and the total activity from these was added to that of plasma to obtain the total untagged plasma activity. The total activity in red cells was counted after haemolysing red blood cells and making it up to the original volume of 10 ml. The same experiment was repeated by keeping the blood at 37°C. Although Strumia et al (1955) have recommended incubation of blood - A. C. D. - Chromate mixture for satisfactory tagging our experiment, shows that equally satisfactory results can be obtained without incubation. The results are shown in Table I.

Experiment 2:—To determine whether the quantity of blood required for optimum tagging with 25 microcurie of Cr^{51} is critical, the following procedures were adopted.

The main work is being done by the second author and will be submitted as a thesis.

TABLE I

Showing the percent of tagged activity in Plasma and RBC under various experimental conditions

Procedure	% of activity in plasma	% of activity in red cells
1. ACD + blood + saline chromate at 37° C ...	6%	93%
2. ACD + blood + saline chromate at 27° C (Room temp. ...)	6%	93%
3. Heparin + blood + saline chromate 27° C	12%	88%
4. Heparin + blood + saline chromate 37° C	11%	89%

Ten ml. A.C.D. and 30 ml. freshly drawn blood were mixed and divided into portions of 5, 7.5, 10 and 15 ml. each. To each of these were added 25 microcurie of Cr^{51} in 0.5 ml. N/saline and the mixture left at room temperature. The mixture being gently agitated from time to time. The subsequent procedure was the same as for Experiment I above. The results are shown in Table II. It will be seen that good tagging was obtained irrespective of volume of blood - A.C.D. mixture taken.

TABLE II

Showing the actual counts of activity in RBC with different volumes of blood, tagged with 25 microcurie of Chromium 51. Counts are not proportionate to the volume of blood taken

Volume of Blood	Total Counts for RBC
5.0	2042
7.5	2430
10.0	1778
15.0	1846

In the light of above experiment, the convenient and satisfactory method of tagging was found to be as under:

Three ml. of A.C.D. were taken in 20 ml. syringe into which was drawn 9 ml. blood by venipuncture. Into the same syringe was drawn 25 microcurie of Cr^{51} contained in 0.5 ml. normal saline from a single dose sterile vial under aseptic condition. The needle of the syringe was then removed and replaced by a syringe cap made by clipping off the long end of the needle and soldering the cut end. The contents were then well mixed by gentle shaking for 1 minute. The syringe was left at room temperature under sterile conditions with the cap on for one hour, gently agitating it every 10 minutes. Ten ml. of tagged blood were directly injected from the syringe into the subject, keeping the balance of 2.5 ml. for standardisation. With this dose of 25 microcurie it was possible to get satisfactory counts in 10 ml. blood drawn from the subject even upto the 10th day.

Counting Technique

The chromium 51 (half life 26.5 days) decays by K capture and emits gamma radiation of energy 0.33 Mev. Because of the high sensitivity of the scintillation counters for gamma, all the countings were done on a scintillation counter incorporating a sodium iodide crystal (thallium activated) and an E. M. I. 6260, II stage photo multiplier tube. This was followed by a dynatron scaler on which the pulses were recorded.

For the counting samples, especially medical samples, a very high efficiency is necessary to reduce the radioactive dose administered to patients to a minimum, so as to reduce the tradition hazard without impairing the accuracy of counting. It was therefore necessary to determine the efficiency of the counting set up with a dose of 25 microcurie.

Summary

It is known (Haigh, 1954) that the efficiency of a counter can be expressed as Rs^2/Rb where Rs and Rb are the counting rates from the samples and the back-ground respectively. Rs can be obtained by subtracting the background rate Rb from total counting rate Rt. Since there are three principle variables in scintillation counting namely, the dynode potential, the amplification and the clipping voltage, the efficiency has to be determined as a function of these three. At various applied voltages, Rs^2/Rb values are plotted as a function of bias voltage keeping the amplification constant throughout. From the family of curves the optimum settings of dynode potential and bias voltage at which the value of Rs^2/Rb are maximum were selected. All the radioactive assay measurements were carried out on this setting. However, the maximum efficiency that could be obtained was only 6.4% at an applied potential of 1,700 volts and bias 5.0 volts.

1. Radioactive chromium 51 has assumed an important place in the investigation of anaemias.

2. Experiments have been described to determine the most suitable technique for tagging of R.B.Cs with Cr^{51} .

3. It was found that highest percentage of tagging was obtained by using A.C.D. as anti-coagulant at room temperature.

4. The volume of blood necessary for tagging in relation to the dose was not found to be critical.

Acknowledgements

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X-Ray Treatment of Osteoarthritis of the Spine*

BY

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X-ray treatment of rheumatic diseases has been used since 1898, but it was only after 1922 that the method became better known and more widely applied, mostly due to the publication, by v. Pannewitz, of the results obtained in 1500 cases, followed up for at least 6 years and to his study of the essentials of this treatment.

Osteoarthritis of the spine is practically present in every person over 40 years of age, but it only provokes symptoms in a smaller number of cases. Its existence is probably due to the degeneration of tissue, which accompanies age and is, without doubt, favoured by repeated traumatism.

Schmorl, in 10,000 autopsies, found osteophytes in 11% in the 3rd decade of life, 36% in the 4th decade, 78% in the 5th and 93% in the 6th.

Spondylarthritis, as a degenerative process, is different from the inflammatory disturbances in rheumatoid spondylitis. Ankylosis, being always present in rheumatic spondylitis, is not seen in osteoarthritis, whose characteristics are exostoses or marginal osteophytes, preceded by flattened borders of the vertebral bodies, narrowing of the intervertebral space and later on eburnation of the bone. Osteophytes are not pathognomonic for degenerative rheumatism, they may also develop as a consequence of consolidation of an old focus of infection. The osteophytes are probably formed in consequence of repeated traumatism of the

margins of the vertebrae or through torsion of the intervertebral ligaments. Other authors believe, that the osteophytes develop due to increased mobility of the vertebral bodies, which causes a violent extension of the intervertebral ligaments and formation of new bone from the periosteum. The aging intervertebral disks become narrower, less elastic, hard and finally deformed. The exostoses grow and may unite and so considerably reduce the vertebral mobility.

Many cases of apophysary arthritis are examples of spinal osteoarthritis. Putti, however, thinks that hypertrophic spondylitis and apophysary arthritis, because of their different etiologies, are two entirely different entities, although they may often be clinically confused. This opinion however, is not shared by the majority of authors.

There is no proportion between the degree of radiological signs of vertebral deformation and its subjective symptoms, but there is a close relationship between the intensity of these symptoms and the intensity of the radiological picture of apophysal arthritis. Even though this may not always be easy to be recognised in the early stages, it is always evident in the advanced cases.

X-rays have a sedative and probably absorptive effect on spinal osteoarthritis, increasing the mobility of the spine but without causing modifications of the earlier radiographic changes, which are definite and unchanged.

In the early stages of the disease, X-rays seem to act upon the circulatory mechanism and have a decongestive effect on the soft tissues surrounding the joints; later on, when the pains and muscular contractions become the principal clinical symptoms, radiotherapy certainly has an analgesic effect upon the tendons and muscles, reducing their irritability.

The results of radiotherapy on inflammatory rheumatism of the spine depend upon the action of the rays on the irritation and pain, which this affection provokes in all the insertions of muscles and tendons of the spinal region. In this affection the pain is not due to the compression of the roots of the nerves by the marginal osteophytes, but to the hyperfunctioning imposed on the muscular system, from which come, in most cases, the degenerative lesions in the intervertebral disks.

Pain is then a symptom of spinal insufficiency, an overworking of the dorsal muscles, and the osteophytes appear to be compensatory process of the organism, in an attempt to re-establish the stability of the spinal column.

In order to get good therapeutic results it is important under these circumstances to include all the muscular insertions as well as the tendons in the field of irradiation.

The action of radiotherapy, from our point of view, is explained by its sedative influence on the rheumatic tendinitis.

The technique of irradiation has greater importance than is generally given to it, and therefore we wish to describe the technical details of our method.

We use 160 or 180 Kv; 10 MA.; 0.5mm Cu 1.0 mm Al or 1.0 mm Cu 1.00 mm Al filters; 40 or 50 cm F.S.D.; portals, generally measuring 10 × 15 or 10 × 20 cm.

Doses of 100 to 180 r each time, up to a total of 6 to 8 applications with an interval of 2 to 3 days. A second series is sometimes necessary, but never at a shorter interval than six weeks after the first applications. We should like to call attention to the extension of the portals which should always include the insertions of the muscles.

Our observations are based on 1208 cases of osteo-arthritis of the spine treated with radiotherapy and followed up from two months after treatment to more than five years.

The segment most affected was the lumbar spine with 46% (556 cases) followed by the cervical segment with 31.5% (380 cases), the dorsal with 17% (205 cases) and the sacro-iliac with only 5.5% (67 cases). In all the segments, the right side is more frequently affected than the left. We conclude, that, contrary to what Comroe affirms, sacro-iliac lesions are not very frequent and that in our cases the lesions in right-handed people are more frequently found on the left side, but there is no reciprocity.

Among 1208 cases 59% (713 cases) were women and 41% (495 cases) males; in women osteo-arthritis is predominant in the cervical section, diminishing progressively in the lower sector; men show an inverse curve, the most common localization of arthritis being in the lower parts. We are unable to explain the reason for such divergence.

The greater member of patients that come for treatment, are between 51 to 60 years of age, 44.4% (536 cases) the number lessening progressively as age increases. In contrast to this, we see that the intensity of the radiologic process increases with age favouring the idea that the disease is a degenerative process that accompanies age.

*Paper read at the VII International Congress of Radiology, Copenhagen, 1953.

Radiations Generated at Megavolts

(A comparison with those of lower energy)

BY

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Machines capable of generating radiations of energy of the order of million electron-volts are now available in forms suitable for medical use. Although there is, probably, only one institution in our country where a high energy roentgen ray equipment exists and a few others where, recently, cobalt 60 teletherapy units have been installed, there are a number of centres in the western countries which make use of these generators in one form or other. Also, quite an amount of work has been done in the study of problems relating to the applications of these radiations to medicine and a good deal of data collected, during the last 10 to 15 years. Some of these are recapitulated here.

These highly penetrating radiations differ in certain respects, significantly, from those with which we are familiar in our normal radiological work. For instance, the surface dose, in the case of these radiations, is not the maximum dose. The dose is maximum at a distance below the surface. The depth at which the maximum dose occurs becomes greater as the energy of the radiation increases, so that an optimum value of energy is necessary to obtain the maximum dose at any desired depth. For radiations from a cobalt 60 source (or of energy 2 to 3 mev) it is about 5 mms. and it may be as great as 10 cms. or more for a 100 mev beam. The reason for this is to be sought in the fact that, as the energy of the radiation increases the electrons liberated by them

are projected more and more in a forward direction and can travel appreciable distances in soft tissue. These electrons produce maximum ionization at the end of their path. For the radiotherapist this means lessened skin dose and that skin reaction cannot be taken as a guide to radiation effect, provided no material is kept across the beam within a short distance of the skin. As the maximum ionization intensity is not on the surface, depth doses are expressed as a percentage of this maximum, instead of, the surface dose.

Because of their higher penetration, the percentage depth dose is greater for these rays. Treatment times can, correspondingly, be shortened and the integral dose, to that extent, reduced. The higher the energy of the radiation the less is the variation of percentage depth dose with the size of field. Values of percentage depth dose upto a depth of 10 cms. relating to radiations of three different energies are given below. It will be observed that in the case of the betatron the percentage depth dose is practically independent of the field size.

The intensity of radiation across the super voltage beams falls off rapidly and the beam of useful intensity is usually narrow. Increased energy for the photons makes the angle of this beam smaller. For a radiation to be of use in therapy it is desirable to have the intensity distribution across the beam as uniform as possible. To achieve

this "compensating filters" or "beam-flattening filters" are employed. Compensating filters made out of such elements as carbon and copper have been tried. Carbon, which transmits best radiations of energy about 20 mev may be used for the rays from the betatron so that loss of output due to absorption will be minimum. Copper has a more or less constant absorption coefficient from about 4 mev to about 20 to 25 mev. Therefore use of this filter for this range will not seriously alter the quality and penetration of the radiations. The intensity across a beam passed through such a filter can be even more uniform than that across a low voltage roentgen ray beam.

Radiation :—22 mev (Betatron). Cu. compensating filter. F. S. D. 105 cm. ***

Depth in cm.	Diameter of the circular field in cm.			
	6	9	12	15
0.5	48.0	48.0	50.0	53.0
1.0	68.0	70.0	70.0	74.0
2.0	88.0	90.0	90.0	91.0
3.0	98.0	98.0	98.0	98.0
4.0	100.0	100.0	100.0	100.0
5.0	99.5	99.5	99.5	99.0
6.0	97.0	96.0	97.0	96.5
7.0	93.0	92.5	93.0	92.5
8.0	89.0	88.5	89.5	89.0
9.0	86.0	85.5	86.6	86.0
10.0	82.5	82.0	83.0	82.5

Radiation :—Cobalt 60 H. V. L. 11 mm. Pb. S. S. D. 100 cm. *

Depth in cm.	Area of field in square centimetres			
	20	50	100	200
0.5	100	100	100	100
1	97.2	97.9	98.6	98.8
2	91.7	93.0	94.0	94.5
3	86.3	88.1	89.4	90.1
4	81.0	83.2	84.8	85.7
5	75.7	78.4	80.2	81.3
6	70.6	73.6	75.6	76.9
7	65.7	68.8	71.0	72.5
8	61.0	64.2	66.5	68.3
9	56.5	59.7	62.1	64.2
10	52.3	55.5	57.9	60.3

* From (11); ** From (2); *** From (7).

These radiations suffer scattering to a less degree than the standard radiations now in common use. Thus, provided the beam has a small penumbra, the intensity outside the geometrical limits of the beam will be very little and the danger of irradiating healthy tissues situated close to the main beam, but not directly within it, is less. This is another factor which reduces the integral dose on the patient. Since the extent of the penumbra depends on the size of the focal spot or source of radiation for a given set of arrangement, a very small focal spot (or source) is necessary to avoid a large penumbra. On this ground a cobalt 60 unit

Radiation :—H. V. L. 1.0 mm. Cu. F. S. D. 50 cm. *

Depth in cm.	Area of field in square centimetres			
	20	50	100	150
1	91.1	93.5	96.0	97.7
2	80.4	85.5	88.9	90.5
3	70.5	77.0	80.5	82.5
4	61.0	67.2	72.0	74.0
5	51.3	57.0	62.7	65.3
6	43.1	48.3	53.8	56.2
7	36.3	41.5	46.0	48.3
8	30.0	35.6	40.0	42.2
9	25.0	30.2	34.7	37.1
10	20.6	25.5	29.9	32.4

Radiation :—4.2 mev. H. V. L. 15.7 mm. Cu. F. S. D. 100 cm. **

Depth in cm.	Area of field in square centimetres			
	36	64	100	144
1	100.0	100.0	100.0	100.0
2	96.0	96.4	96.7	97.0
4	86.6	87.5	88.1	88.6
6	76.8	78.0	78.9	79.5
8	67.7	69.3	70.5	71.3
10	59.6	61.5	62.9	63.9

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with a relatively large source is inferior to a roentgen ray generator giving out an equivalent radiation.

The disparity between the absorption of radiation by bone and soft tissue becomes less as the energy of the photon increases. The absorption becomes almost equal for photon energies in the region of a little below one mev to about 5 mev. This, in addition to lessening the risk of bone or cartilage necrosis, enable the radiotherapist to apply the depth dose distribution data obtained for these radiations on a water phantom more appropriately to a patient than those relating to radiations employed in normal therapy work. This, obviously, is an important advantage.

It is well known that ionization in a medium like tissue caused by roentgen rays is more and more due to recoil electrons as the energy of the photon increases and at about 200 K. V. and above recoil electrons predominate. At this stage photo-electric absorption is negligible. Pair production starts gaining importance at energies of a few mev (the minimum energy of the photon necessary to produce a pair is a little over one mev) and near 50 mev pair production is the main cause of absorption. As this introduces further complications in the relative absorption of radiation by bone and soft tissue there is no special advantage, as far as its application to medicine is concerned, in increasing the energy of the radiation indefinitely.

Use of extremely high energy radiations in therapy is undesirable for another reason too. The dose on the exit side increases with the energy of the radiation, so that in therapeutic technique, this dose, rather than the entrance absorption, will have to be the limiting factor. From some of the data published recently one may infer that if one aims at reducing the dose at the entrance without creating problem at the

exit side, the most suitable energy for the radiation is about 5 mev.

Supervoltage roentgen ray generators have, generally, a higher output. With 120 r to 150 r per minute at 100 cms. focal skin distance, which is not unusual for these equipments, treatment times can be made relatively very small.

Finally, a word about the comparative merits of a cobalt 60 teletherapy unit and a roentgen ray machine generating a similar radiation may be of interest. The former need not have any complicated generating mechanism, gives an output which requires only initial calibration and require much less attention. On the other hand it has a larger source (it may be about 2 cm. in diameter) with its associated large penumbra making the irradiated region less definite. The activity of the source decreases gradually, but continuously, necessitating frequent correction for the output and periodical replacement of the source. In order not to have a replacement within five years it is better to have the initial output about twice the minimum required. Further the output from a cobalt 60 unit is less (about 40 r per minute from a 2000 curie cobalt unit). Supervoltage roentgen ray machines have a much smaller focal spot (about 3 mm. to 5 mm. in diameter), higher output and, if radiations of slightly higher energy are considered, clear advantage in the matter of skin dose, depth dose distribution and differential absorption between bone and soft tissue. In fact, for therapeutic work, if we are given a choice of these highly penetrating rays, one would be inclined to select a radiation whose energy is somewhere in the neighbourhood of 5 mev rather than one having an energy very much above or below this value, as this will provide the therapist with practically all the important advantages of a supervoltage radiation without any of its serious drawbacks or

complications. Higher energies, however, are not completely ruled out. Rotation therapy with a betatron beam appears to give very satisfactory distribution of dose, delivering a high dose to the tumour with remarkably low doses to the non-tumour bearing tissue and the skin. In this respect a cobalt 60 beam with a large penumbra seems to be only slightly better than the radiation from a 250 K. V. roentgen ray unit, except in regard to the skin reaction.

Supervoltage radiations have also been employed in roentgenographic work, although this is still in an entirely experimental stage. There has been an interval of a few years between the appearance of the first supervoltage radiographic picture (of chest in 1945) and any further serious work in this field. They have, later, been tried for the location of certain tumours, in an attempt to develop a technique "adaptable to mass screening methods, which would demonstrate the lung field and mediastinal structures" and more recently to obtain pictures required for beam alignment in supervoltage rotation therapy. Generally,

in supervoltage roentgenography relatively long exposures and low currents are the factors. Thin lead or lead-antimony screens (0.02 inch to 0.005 inch) take the place of the conventional intensifying screens. One of the interesting observations recorded is that the sharpness of the image does not depend on the size of the focal spot. This is against our experience in ordinary radiographic work and may be due to the fact that secondary radiations from the screens, and not the primary beam, are responsible for producing the picture.

As already mentioned above, at about one mev the differential absorption ratio between bone and soft tissue approaches unity. Evidently, shadows of bones on radiographs will be hardly distinguishable and the air cavities will appear clearer against a background of almost uniform density of the solid tissue. This aspect can be taken advantage of to obtain roentgenograms of organs containing air or structures which are situated close to air cavities as well as those in which air can be introduced as a contrast medium.

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Cobalt Beam therapy in Malignant Disease*

BY

Dr. S. KRISHNAMURTHI, M.S.,

Director, Cancer Institute.

Cobalt Beam Therapy in Malignant Disease

It is now six to seven years since supervoltage radiation therapy was introduced in the treatment of malignant disease. It is now finding its way into our country and is likely to replace, to a very large extent, conventional methods in radiation. Several types of supervoltage beams are available but the most useful in therapy are those between 2-10 M. E. V. In England the 4 M.E.V. linear accelerator seems to be popular while in Canada and the States, the Cobalt beam is preferred. This is merely due to the ease of local availability.

In India, Cobalt beam therapy is the one that will be largely used. Cobalt beam units are much cheaper than a 4m. EV linear accelerator and will be getting cheaper every day. The maintenance problems are insignificant compared to those of the supervoltage X-ray beam generators and at the same time the biological values of the two beams are, I should say, equal. Though the half life of Cobalt 60 is 5.3 years, the unit can be used quite satisfactorily for 10 years without a change of source. And I should imagine that within that period of time the Canada-India atomic reactor at Bombay should be able to supply us the replacement sources. On the other hand, the X-ray tubes of the linear accelerator are costly and need more frequent replacement. With improved methods of

preparing Cobalt 60 with high specific activity sources are produced that yield an output equal to that of the linear accelerator.

A Cobalt beam unit has now been working at the Cancer Institute, Madras, for nearly a year and a half and we felt that an analysis of our findings and studies would be beneficial to our brother radiologists.

Cobalt 60 is derived from Cobalt 59 by the capture of a slow neutron when subjected to a neutron bombardment in an atomic reactor. Cobalt 60 is an unstable atom and disintegrates as below :—

Cobalt 60 → gamma radiation + weak B radiation + nickel 60.

Cobalt 60 exists in two isomeric forms, one of which has a half life of only a few minutes (10 minutes) and is then converted into the other which has a half life of 5.3 years. The decay ray of Cobalt 60 is 0.109 curies per month *i.e.*, at the end of a month the activity is less by 1.1% than at the commencement of the month.

The gamma emanation of Cobalt 60 is made up of two components: one with an energy value of 1.33m. EV and the other with an energy value of 1.17m. EV so that the mean value of the beam is 1.25m. EV and the wave length is 9.9 XU. The gamma beam of Cobalt 60 can therefore be taken essentially as a monochromatic one.

The K factor of Cobalt 60 is 13.5r per hour while for radium it is 8.4r per hour.

Elemental cobalt is a hard, brittle, magnetic material with a density of 8.9 Gm. per c.c. In the Cobalt beam unit it is mounted as pellets with a source diameter of 2.5–3 cms.

The depth dose characteristics of kilo-curie Cobalt 60 sources at source-target distances of 60 cms. to 100 cms. are similar to those of a 3m. EV X-rays.

The advantage of Cobalt 60 over radium is that with the former we obtain a virtually monochromatic beam of gamma rays, the Beta Component being a very weak one (308m. EV) easily filtered out by .9mm. of unit density material (.1mm of silver), that there is no formation of gaseous products like Radon with the possibility of a leak and the need for containers, that high specific activities, as much as 40C/gm., can be obtained (Radium is only 1C/gm.), thereby reducing the size of source necessary and the degree of self-screening; that curie for curie there is a higher dose rate with Cobalt 60 than with radium (K factors); that Cobalt 60 is comparatively cheap and getting cheaper every day and is available in unlimited quantities and can be produced at will. Its only drawback is its much shorter half-life but this loses much of its significance because a Cobalt 60 source can be readily replaced.

In treatment with a kilo-curie Cobalt 60 source at one metre S.S.D. or 80 cms. S.S.D. the maximum build up occurs at 5–6 mm. below the surface of the receiving area *i.e.*, in the patient, usually in the plane of the subcutaneous fascia. This is because with supervoltage beams there is very little back or side scatter but only forward scatter resulting in an electron equilibrium being

reached below the target surface. As the energy values of the beams increase this 'peak point' moves in deeper. The dose received by the surface varies with size of the field (as given below) but rarely does it exceed 50% of the maximum with the usual field sizes employed.

Field Size,	Percentage Dose on the Skin
5 × 5cms.	30%
7 × 5cms.	35%
6 × 8cms.	40%
8 × 10cms.	40%
15 × 6cms.	40%
10 × 10cms.	45%
10 × 12cms.	50%

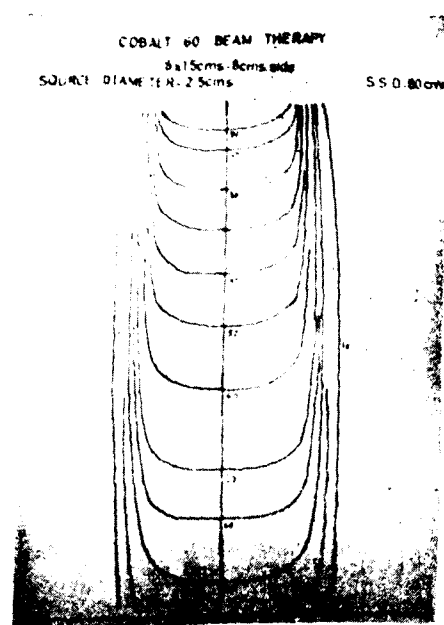
This property of Cobalt 60 beams therapy is one of its most valuable assets, because the skin saving that result radically solves the problem of subsequent surgical treatment.

The low side and back scatter also result in eliminating unnecessary radiation of tissue immediately outside the desired zone. The percentage dose distribution in the tissues takes the form of a 'U' as against the 'V' of a high voltage X-ray beam. The dose, therefore, over the desired field is, within narrow limits, uniform while it sharply falls immediately outside this zone where we do not desire it. This "saving of normal tissues" is another very important factor in both cancer resolution and in tissue repair after any subsequent surgical extirpation (Photograph of depth dose curves).

Our studies go to show that the nature and reaction of the tumour bed is a far more vital factor in tumour resolution than the direct lytic effect of the radiation on the cancer cell. The tumour bed can react vigorously only if the amount radiation injury is limited *i.e.*, the dose of radiation while inhibiting or destroying

* (Read at the 13th Indian Radiological Conference held in Poona in February '59.)

Isodose Curves

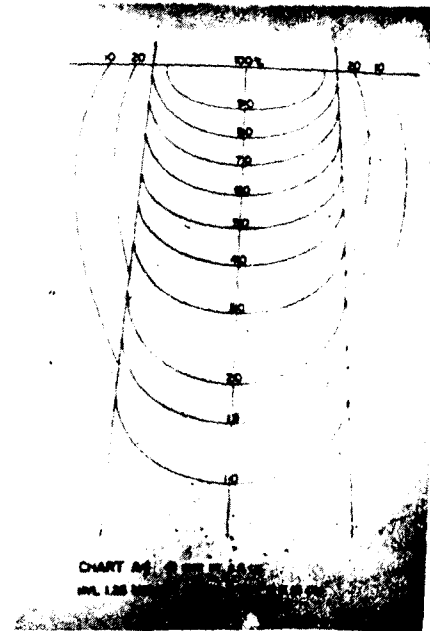


Cobalt beam

the cancer cells should act as a stimulant to the host tissues immediately surrounding the tumour. The peculiar distribution of the Cobalt 60 radiation achieves just this. The 'V' distribution of the X-ray beam on the other hand, interferes to a certain extent with the tumour bed reaction. This property of Cobalt 60 also makes for a minimal constitutional disturbance.

The much higher depth doses achieved with the Cobalt 60 beam is an obvious advantage in the treatment of deep seated tumors. It enables us to use a much smaller number of fields in achieving the necessary tissue dose and eliminates the evil of irradiation of large volumes of healthy tissues. The integral dose is thereby reduced. This also obviates the need for moving beam techniques, and reduces the time and the effort needed to treat each case.

Another advantage with the mega voltage beam is that with higher energies the differential absorption of energy by different tissues tends to disappear. For example with the 250 K. V. X ray beam the energy absorption in aqueous tumor tissue for a delivered dose 100 roentgens is 93 ergs/gm., while in bone it is 320 ergs/gm. With the Cobalt 60 beam the figures are 97 ergs/gm. and 160 ergs/gm. This has a self-evident advantage in the treatment of bone tumors, for the tumour tissue in bone has not the calcium content of normal bone and has, therefore, only the coefficient of absorption of aqueous tissues. With X rays, therefore, the tumor lethal dose or tumor suppressive dose approaches or exceeds the tolerance dose of normal bone, while this is not so with the Cobalt 60 beam. The danger of bone necrosis at levels of therapeutic efficiency is thus greatly reduced.



High Voltage X-Ray

R. B. E.

The biological efficiency of a radiation beam is measured by (i) its ability to produce a certain standard biological or chemical change in biological or chemical material or (ii) by the degree of change produced in such material by a standardised dose. All experimental factors, such as the physical distribution of dose, uniformity of dose rate per minute, uniformity of fractionation, uniformity of temperature and humidity etc., must be initially standardised. Working under such precise experimental conditions it has been found that the biological efficiency diminishes with increase in the energy of beam. This is nothing surprising because the biological effect of radiation is due to its ionising property and the degree of ionisation grows less as the energy of the beam increases. This is very obvious clinically when one compares the effect of particulate radiations like the alpha and the beta particles and 250 K. V. X-rays and Cobalt beams.

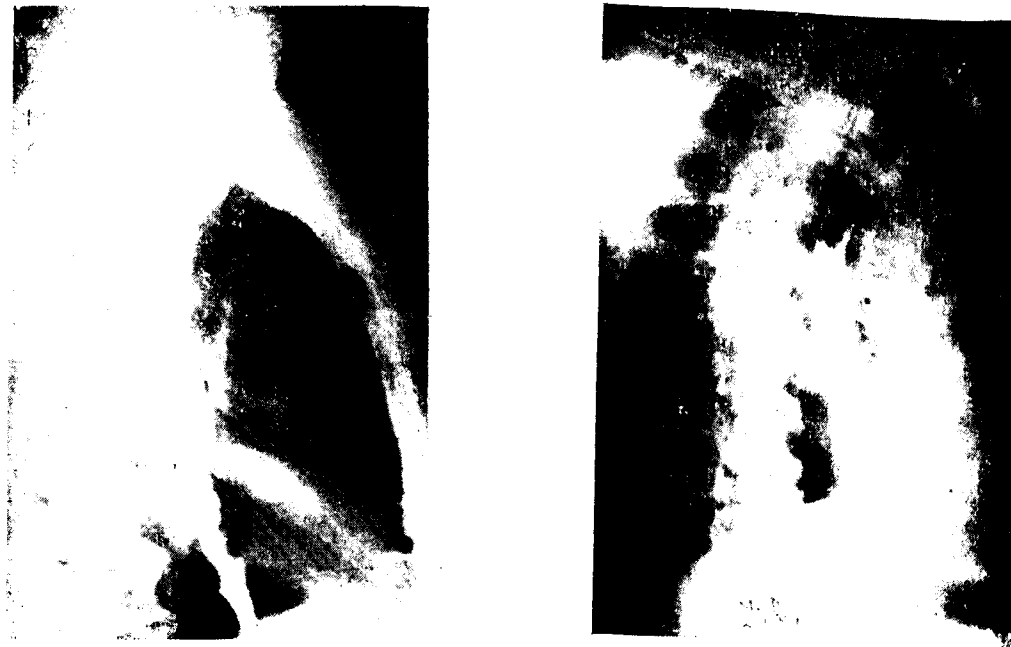
The gross experimental studies of the Holt Radium Institute at Manchester with normal tissues have placed the biological efficiency of their 4m. EV linear accelerator X-ray beam as 15% less than that of their 390 K. V. X-ray beam. Our histological studies with both normal human tissues and squamous cell Carcinoma cells and the S. E. D. studies have shown that the Cobalt beam (3m. EV) is 28% less biologically efficient than 220 K. V. X-rays.

The question arises now whether poorer biological efficiency is an asset or a disability. Everyone knows that the high biologically efficient alpha and beta radiations have high necrotising properties and have, therefore, a poor therapeutic ratio. The ideal radiation is, therefore, one that has both a good biological efficiency and a good therapeutic ratio. The 15m. EV

and 20m. EV betarons or the 375m. EV proton beam have a moderate therapeutic ratio but poor biological efficiency. 250 K. V. X-rays have a fair biological value but not so good a therapeutic ratio. The most evenly balanced radiation, therefore, seems to be in the range 2-5m. EV *i.e.*, either the Cobalt beam or the 4m. EV linear accelerator.

Conclusion

Judging by our experience there is very little doubt that Electro-magnetic radiations in the range of 3-5m. EV is, at the present time, the best type available for lesions at any site, *i.e.*, lesions which are amenable to radiation. The primary healing of extensive oesophageal Carcinomas is remarkable. The resolution of oral and pharyngeal and laryngeal carcinomas with very little local tissue morbidity or constitutional morbidity is something that I have not seen with any other form of therapeutic radiation. Subsequent excisional and reconstructive surgery of the mouth and pharynx are not prejudiced by this radiation therapy. After the advent of Cobalt 60 beam therapy we are able to undertake ultra-radical surgery in carcinoma of the female breast three days after the end of radical pre-operative radiation therapy (3,500 rads-4,000 rads in 28 days) to the breast and axilla. The period of invalidism is greatly shortened without compromising the therapeutic effectiveness of the procedure of worsening the technical operating difficulties. Parametrial irradiation following radium insertions for Carcinoma of the uterine cervix has become a simplified procedure. It is also possible to carry out a curative primary irradiation of the uterine cervix with Cobalt 60 beam alone in some cases. Cobalt 60 beam irradiation is claimed in England to have revolutionised the treatment of Carcinoma of the urinary bladder but our experience in this regard is limited.

Advanced Carcinoma Esophagus

Before and After treatment.

Inoperable Carcinoma of the Stomach

Before and After treatment.

One of the most gratifying aspects of Cobalt beam therapy is the marvellous palliative effect it has on inoperable Carcinomas of the stomach, rectum and anal canal. The tumor mass shrinks, alimentary lumen is reestablished, the gross ulcer heals, the pain and discharge disappear. Symptoms and signs of disease have totally disappeared in some cases for over a year and many have finally died, comparatively painlessly and quickly from pulmonary or hepatic metastases.

The results of treatment of primary bronchogenic Carcinoma or metastatic lesions in the lungs have been extremely unsatisfactory and in none of our cases has

there been any objective improvement. In fact, it is our opinion, that in a few cases it has promoted a pleural effusion. It has also been unsatisfactory in the treatment of peritoneal metastases with ascites. But in the treatment of local recurrent growth following primary ovariectomy for adenocarcinoma of the ovaries without ascites, it has achieved a considerable degree of palliation. It seems valueless in the irradiation of retro-peritoneal metastases from teratomata of the testis. Retinoblastomata have yielded only temporarily.

Cobalt 60 beam therapy has, in our opinion, brought osteogenic and soft tissue sarcomas (other than of lymphoid tissue)

A case of Osteo Sarcoma—Periosteal type

Before and After treatment.

within the range of effective radiation therapy. Rhabdomyosarcomas and fibrosarcomas, which have proved resistant to X-radiation, have simply melted under Cobalt 60 irradiation (slides). This is also true of certain osteogenic sarcomas. We have not been able to entirely account for this phenomenon by an analysis and study of its physical or biological properties, but the fact is, none-the-less there and has to be investigated. And the sarcomas that have resolved, have, most of them covered more than half the patients' backs.

I have here mentioned only facts that we have ourselves investigated and studied.

There are many other tumors—intracranial, endocrinal, etc., with which we have had little experience. In the treatment of lymphomas, the reticulosos and the leukemias, I do not think that there is much to choose between Cobalt 60 beam therapy and high voltage X-ray therapy. However, Cobalt 60 beam therapy is one of the greatest advances of the century in the radiation therapy of malignant disease. It has certainly taken us one step further along the road but we have yet a long way to go for the final answer.

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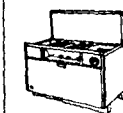
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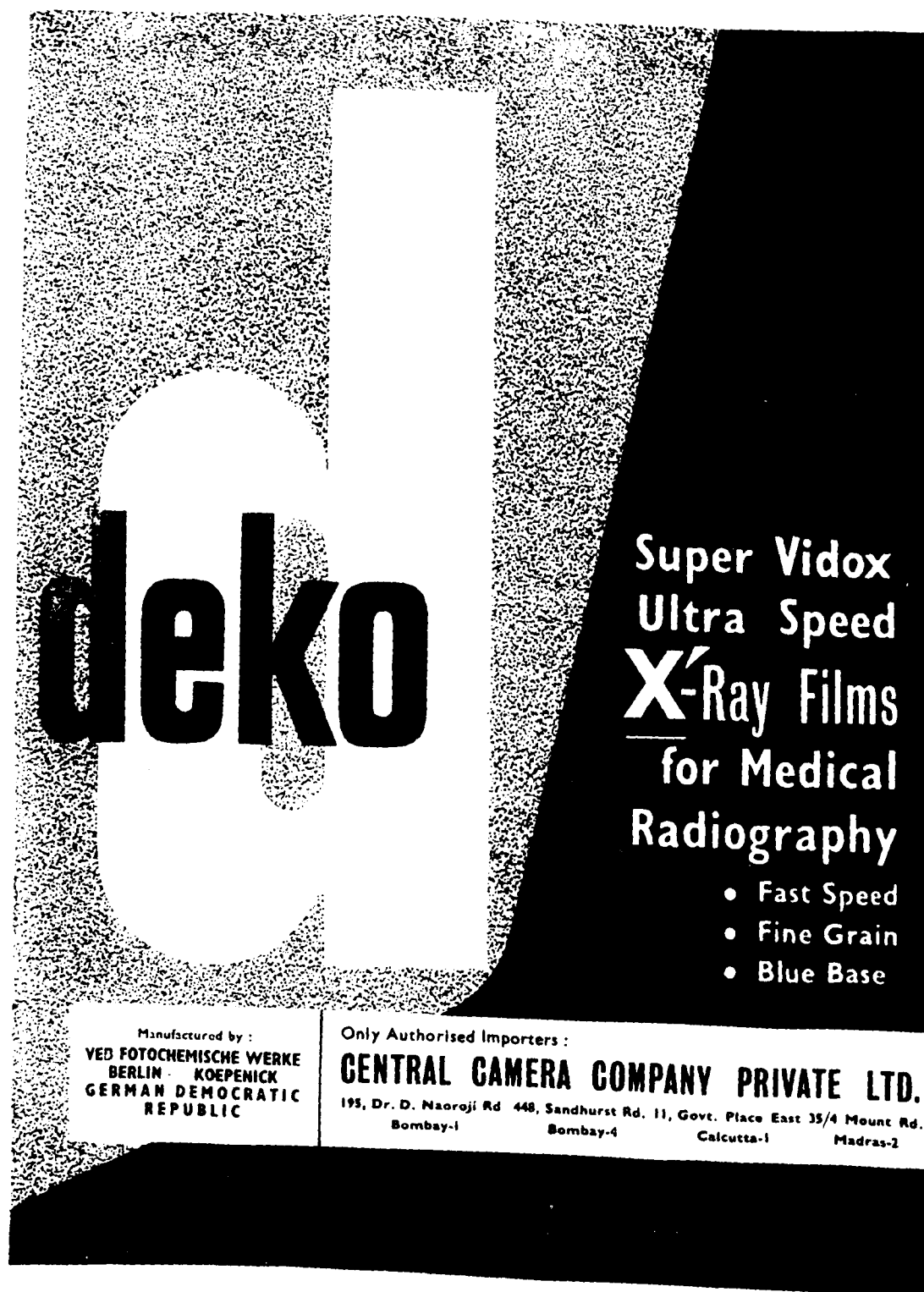
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Radiology in Geriatrics*

BY

Dr. K. P. MODY,

Tata Memorial Hospital, Bombay.

When I was asked to take part in this symposium I felt diffident of accepting the invitation as on the spur of the moment I could not think of what I could say from the radiological standpoint. On more mature consideration I came to the conclusion that Radiology has a great role to play in keeping old people fit and well. Many of the complaints from which they suffer require radiological investigations, moreover judicious radiotherapy helps in alleviating some of the distressing symptoms.

Geriatrics is an important branch of Medical Science, which is of comparatively recent development—during the last 10 years or so. During this period a great deal of work has been done and voluminous literature is already available. Societies have been formed in several centres of Europe and America for the study of the problem of old age and international congresses are now regularly held.

The practice of radiology, even before the recognition of the science of Geriatrics, always included a large number of elderly people, but it is only during the last few years that we have come to appreciate some of the subtle differences between the old and the young. The fundamental problems facing the old are to a great extent due to economic causes and psychological factors. People who have worked hard all their lives, suddenly find themselves without occupation at the age of 60 or 65, though physically fit. This brings about a sense of boredom

and isolation from society and develops an inferiority complex. These aspects of the problem are more difficult to deal with than actual physical ailments.

What are their common physical disabilities? First and foremost are the diseases of the cardio-vascular system, the heart, the aorta and the peripheral blood vessels. Radiological investigation plays a predominant part in evaluating the disease and in watching its progress from time to time. Dilatation of the Heart and Aorta, associated with athero-sclerosis, are very common findings. Here we must draw your attention to the condition diagnosed radiologically as Dilated Aorta. In over 50% of old people, this is a physiological process and is not attended with any significant symptoms. It is due to unfolding of the Aorta, a sign of advancing age and is not pathological unless such dilatation is associated with radiological evidence of sclerosis of the aorta or of calcification. Dilatation of the left ventricle is common and can be readily diagnosed and measured by radiological methods. In such cases the heart assumes a boot-shape appearance. Here again a word of caution is essential. It is not so much the extent of broadening and dilatation that is important but the state of the cardiac muscle. Unfortunately radiology cannot throw any light on this phase of the problem. The clinical history and the findings of other investigations have to be correlated. All that we can suggest is that the heart is bigger than normal and the extent of the dilatation.

*Paper read at the symposium on Geriatrics, held by the C. Ward Medical Association, Bombay.

Many specialised procedures are now available for the study of the blood vessels, such as cerebral angiography, peripheral arteriography, aortography, splenography etc. A radio-opaque solution is injected and serial radiograms are taken in quick succession. These are strenuous procedures and should not be undertaken lightly in elderly people or at all, if diagnosis can be arrived at by other methods.

Equally important is chest radiography. Chronic Bronchitis is extremely common and would not ordinarily require x-ray studies, but for the fact that very often a chronic cough may turn out to be Carcinoma of the Lung, which is very common as age advances. In a recent survey of a large group of elderly people organised by the Philadelphia Pulmonary Research Centre, it was very disconcerting to find that a large percentage of these asymptomatic cases turned out to be Carcinoma of the Lung. Since early diagnosis offers the only hope of cure, I would urge upon you all and upon hospitals and clinics the necessity for routine x-ray studies of the Chest in elderly patients particularly, just as in the younger age group mass radiography is practised in order to rule out tuberculosis. In the older age group, tuberculosis loses its sting and though we may often find old scars, thickened pleura and pleural bands and adhesions, active T.B. is not at all the problem to worry over.

The most distressing problem, as we grow older, is Cancer. Cancer is caused by the continuous and prolonged action of substances called carcinogens, acting over a long period of years. Two stages can be recognised in its evolution and development. The first change takes place in the cell, which loses its normal appearance and function and presents atypical characteristics. The second stage is the stage of

proliferation. Fortunately in the elderly group proliferative activities are slowed down, so that the lesion tends to run a comparatively slow and relatively benign course. The treatment of cancer is the same as for the younger age group but with this difference that if there is a choice of radiation as against surgery, radiation should be the line of treatment. Radiation treatment must necessarily cause reactions in the tissues, in the elderly group, however all attempts should be made to save the tissues as much as possible and it is advisable to be conservative in the doses administered. Smaller doses consistent with the effects which are sought to be produced should be aimed at.

The liability to malignant diseases increases with age, cancers that affect the adult population become more frequent as age advances, some specific differences of incidence, however, are evident. Cancer of the Uterus and Ovaries are more common in the senile group, as also Cancer of the Skin, Stomach, Lungs and particularly the Prostate. One out of every four persons suffers from Cancer of the Prostate after the age of 50. Diagnosis of this condition rests chiefly on clinical examination but very often it is clinched by the finding of characteristic metastatic deposits in bones by radiological examination. Amongst Bone Tumours, Reticulum Cell Sarcoma of bone and Multiple Myeloma more common than the other bone sarcomas which occur in the younger age group. Two important conditions are often seen in elderly people, namely Leukoplakia and Hyper-Keratoses, both pre-cancerous conditions, amenable to x-ray treatment. In malignant diseases Radio-diagnosis and Radio-therapy hold a predominant position.

A very painful and crippling condition is arthritis and its different manifestations.

There are 3 common conditions, which must be differentiated by x-ray examination:—

1. Ankylosing Spondylitis, common in the young.
2. Rheumatoid arthritis, common at all age groups.
3. Degenerative or osteo-arthritis, very common as age advances.

Radiological examination is absolutely necessary, each group has its own characteristic features. Furthermore, radiation treatment often produces relief from pain, though obviously it cannot rectify the underlying pathological changes in the bones. It is difficult to say why they improve, but that they do improve is everyday experience.

Lipping of the spine is a common condition, as also kyphotic deformities. There may be extensive x-ray changes, and yet there may be no symptoms. A few osteophytes are almost universally present in old age and one ought not to label them as osteo-arthritis. They are just an expression of wear and tear.

Dermatitis and other skin disorders are very common, associated usually with severe itching. Judicious x-ray therapy can give considerable relief but here one must guard against indiscriminate use of radiation. Owing to lack of elasticity and nutrition of the skin and its appendages, radio-necrosis and even malignant degeneration can easily occur, owing to injudicious treatment.

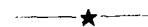
It is very interesting to record that Skin Cancer is not common in our country, on the other hand, its incidence is very high

amongst the European races. Apparently, the pigment in dark skins of the coloured races acts as a protection from the ultra-violet radiation emanating from the sun's rays which is said to be the fundamental etiological factor. Skin Cancer can be efficiently treated by radiation, by x-rays and Radium, and in the average case results are gratifying.

The skeletal system, as age advances, undergoes alteration in the density of the bony structures. Decalcification of varying degree is common causing difficulties in delineation, radiograms appear flat and lacking in details. Special technical factors are essential to bring about adequate visualisation. Fractures are extremely common and occur at the slightest trauma, particularly in the Hips and Ribs. In a good many cases, spontaneous fractures may occur. Deformities are commonly met with, particularly in the Vertebral Column. In the case of injuries and fractures the healing process is markedly delayed. Administration of calcium products do not seem to make any impression on the underlying condition.

When associated with secondary arthritis, which very often supervenes, pain is a prominent symptom. In such cases radiation treatment should not be given at all or with great caution and in smaller doses than usual.

In conclusion, may we say that radiological investigations are essential for the study of disease in all age groups, from the cradle to the grave. Furthermore, radiation therapy helps considerably in the cure of many diseases, benign and malignant, and in alleviation of symptoms in others.



Trichobezoars

BY

DR. S. V. TUNGAR, M.B.B.S., D.M.R.* & DR. H. S. D. SHARMA, M.S.**

Medical College Nagpur.

Bezoars and enteroliths have an interest for mankind. They form in the alimentary canal of mammals, birds, reptiles and amphibia; common in goats, calves and horses. A foreign body serves as a nucleus embedded in the hair which forms a stone-ball. The deposit is often arranged in concentric layers. Bezoar powder is highly priced in many countries (Bland-Sutton), musk, an animal secretion from musk deer is recommended as an anti-spasmodic for hysterical maidens, Ox-gall as cure for jaundice.

Trichobezoars and other foreign bodies in the stomach causes a palpable mass. An excellent review is given by Buckstein in "Roentgenology of Digestive tract".

Upto 1948, 48 cases were collected and since then occasional cases are described here and there.

The earliest to be diagnosed roentgenologically was by a Ramsbottom and Bareley.

Large majority of cases come with symptoms of gastric ulcer and at operation, presence of associated gastric ulcer is found in most of the cases.

The usual roentgen signs are : -

1. Negative shadow produced by the mass is centrally located with normal peristalsis.
2. Position of intragastric mass may be altered under fluoroscopic control.

If the mass is large, it may invaginate the shadow of air-bubble in the stomach.

Of these the second is the most important one and the third when present is helpful.

The differential diagnosis lies between Trichobezoar and polypoid growth.

A case report is given below :-

P. M. female aged 35, a house-wife, was admitted into the Medical Ward of the Medical College Hospital on 25-8-58 with symptoms suggestive of peptic ulcer, i.e., pain in the epigastrium after meals followed by vomiting, duration three months. Medical treatment did not relieve her and hence she was transferred to the surgical unit.

Local examination revealed local tenderness and firmness in the epigastric region. No lump was felt nor any other positive findings. Analysis of gastric contents showed somewhat high free acid and blood in all specimens.

Barium Meal

Roentgen Findings. --Showed an intragastric mass giving rise to a large filling defect. Barium meal examination was repeated after administration of effervescent mixture and showed that the intragastric lump was invaginating into the air-bubble in the fundus of stomach and the presence of a large gastric ulcer on the lesser curvature.

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Fig. I

Lateral View

Barium meal X-ray : photograph showing intragastric mass.



Fig. II

A. P. View

X-ray photograph showing intragastric lump (after effervescent mixture) invaginating into the air bubble in the fundus.



Fig. III

Photograph of Hair Ball removed.

Peripheral contours of the stomach were unaffected except at the site of the ulcer. The principal difficulty was that the position of the mass could not be altered under fluoroscopic control (Figs. I & II).

At operation, a large hair ball was removed, which was firmly adherent to the lesser curvature above and below the site of the ulcer. Fig. III shows the photograph of the hair ball removed at operation. The post operative period was uneventful. Ulcer was left as such and patient treated with peptic ulcer regime.

This is the only case so far recorded in the Radiology Department of Medical College and Hospital, Nagpur, during last six years.

Summary

A case of Trichobezoar in a female is described along with the peculiar radiological features and findings at operation.

Our thanks are due to the Dean, Medical College and Hospital, Nagpur for permission to report this case and to use the hospital records.

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Abstracts of Radiological Literature

George Fredrik Saltzman. Circulation through the Posterior Communicating artery in Different Compression Tests, a preliminary report. Acta Radiologica, Jan. 1959, 51: 10-16.

In the majority of carotid angiographies, the posterior cerebral artery is not filled although the posterior communicating artery is seldom absent on any side. Similarly the anterior communicating artery is not filled, unless the contralateral carotid artery is compressed, at the time of injection.

Theoretically bilateral compression of the vertebral artery would force the blood stream from the carotid syphons to the basilar trunk, but no report of a practical routine method of compression of the vertebral artery has appeared in the literature.

The author describes the technic of compressing the vertebral artery, to fill the posterior cerebral artery, with carotid angiograms. One finger is introduced just above the clavicle, behind the common carotid artery and directed inwards, when the finger has covered about 2 cms of a transverse process, it is firmly pressed against the process, in the same position.

First 18 experiments were made with unilateral compression of the vertebral artery. In 3 cases, posterior cerebral arteries showed good contrast filling, these had not filled or poorly filled without compression. Bilateral compression of the vertebral artery was attempted in 10 cases. In 4 of these, similar changes as above were seen. Only one compression experiment was performed in each case, in order to avoid administration of large amount of contrast medium.

The difficulties encountered with this technic are:

1. Avoiding the carotid artery compression, specially in patients with narrow necks.
2. Keeping the position of the injection needle in carotid artery unchanged during compression.

Successful vertebral artery compression will become a useful diagnostic aid in (i) diagnosing expanding processes within the area of the posterior cerebral artery and tentorial herniations which cause a characteristic displacement of the posterior cerebral artery; (ii) mapping out vascular supply of supra-tentorial arterio-venous malformations and (iii) to verify free passage through the posterior communicating artery. Passage of contrast medium through the posterior communicating artery can also be studied with vertebral angiograms, combined with compression of the carotid artery.

12 Radiographs.

* S. Grover, Delhi.

Roland Bunner. Lateral Intra-thoracic Meningocele. Acta Radiologica, Jan. 1959, 51: 1-9.

Lateral Intra-thoracic meningocele, a sacciform protrusion of the dura through an enlarged intervertebral foramen, projects anteriorly between the ribs into the thoracic cavity. This extension is similar to that of hour-glass tumour.

Such meningoceles are rare, only 20 cases have been reported in the literature so far. Only 4 cases were diagnosed pre-operatively

with myelography using different contrast media. The others were diagnosed at operation or autopsy.

The author describes in detail two cases, one a man of 36 years other a woman of 43 years. Both the cases showed Recklinghausen's neurofibromatosis clinically, were asymptomatic and picked up on "mass miniature survey". Plain x-rays showed right-sided, para-vertebral, round, homogeneous soft-tissue opacities, sharply defined in relation to the lung. The intercostal spaces were enlarged posteriorly and medially, with erosion of the ribs, enlargement of the intervertebral foramina and erosion of the posterior aspects of vertebral bodies.

Pneumo-myelography, with sub-occipital puncture of the sub-arachnoid space was done, using oxygen as contrast medium. Oxygen is better than oil as it is innocuous and rapidly absorbed. Large volume of cerebro-spinal fluid, about 180 cc. was tapped in each case and replaced by oxygen. This filled the paravertebral opacities, these accordingly were diagnosed as meningoceles. The spinal cord was seen to be intact at the level of meningoceles.

In the discussion, the author states that most of these cases are asymptomatic, though large meningoceles may produce symptoms of compression on intra-thoracic organs.

Both sexes are equally affected. Majority of lateral intra-thoracic meningoceles were detected in people above 40 years though some were seen in infants and children also. Right-sided meningoceles occurred more often than left-sided ones and few were bilateral.

Recklinghausen's neuro-fibromatosis co-existed in 14 cases out of the total 22 cases

reported upto date. Most of the cases also showed spinal deformities such as Kyphosis, scoliosis, erosion of vertebral bodies, arches and ribs, enlarged intervertebral foramina and concavity of dorsal surface of vertebral bodies. Congenital anomalies as fused vertebrae, cuneate and hemi-vertebrae are also reported as co-existing in some cases.

A review of the literature shows that neuro-fibromatosis co-exists with intra-thoracic meningoceles more commonly than with neurinomas. So an intra-thoracic meningocele should be suspected, whenever a para-vertebral intra-thoracic tumour is associated with Recklinghausen's neuro-fibromatosis and spinal abnormalities, specially enlarged inter-vertebral foramina and excavations posteriorly of the vertebral bodies. The presence of a meningocele is strongly suspected when large volume of cerebro-spinal fluid is withdrawn on tapping, but filling of the shadow with oxygen confirms the diagnosis.

Etiology is unknown but various theories are advanced, that it is due to weakness of the dura, anomalies of dural attachment in the inter-vertebral foramina, variation in C.S.F. pressure and absence of the normally present loose connective tissue, between dura and posterior surfaces of vertebral bodies.

The consensus of opinion is that surgical removal of the intra-thoracic meningocele should only be done if the meningocele is enlarging, if there is compression of intra-thoracic organs and progressive erosion of contiguous vertebrae.

6 Radiographs.

S. Grover, Delhi.

Donald L. Hutchenson and David A. Gean. Isotopic Localisation of the Placenta in Placenta Previa. Surgery Gynaecology and Obstetrics. September 1958, 107: 370-374.

Accurate placental localisation is of value in cases of ante-partum haemorrhage. Though most radiographic methods have 75 to 95% accuracy, they are special techniques difficult to execute, need manipulation of the bleeding patient and require interpretation by an experienced Radiologist. Moreover there is risk of irradiating the patient's ovaries and the foetus. Browne in 1951, reported correct localisation of the placenta in 32 of 43 pregnancies complicated by placenta previa, by using radio-active Sodium. Weinlurg and associates suggest use of radioiodinated (I^{131}) human serum albumin for localising the placenta.

With this technique, the authors studied 30 patients in whom the placental site was localized and later actually confirmed in 25 cases at subsequent caesarean section and in 5 by direct visualization or by manual removal of the placenta at vaginal delivery. 5 microcuries of radioiodinated human serum albumin are injected intravenously and after allowing 2 minutes for the isotope to mix radioactivity is measured over the abdominal surface of the gravid uterus. This surface is divided into twelve anatomical areas for counting, many readings are taken with a standard scintillation counts to detect gamma radiation. Counts over xiphoid, before and after scanning the uterus, are taken. This is used a reference point and chosen to represent 100 percent. The values in terms of counts per minute in each section are expressed as a percentage of the counts over the xiphoid. The placenta represents a relative "pool" of maternal blood in the gravid uterus and the activity recorded over the placental site is increased. In areas 3 and 4, over the lower uterine

segment, readings range between 35 and 69% in 90 percent of all patients with normally implanted placenta whereas the readings vary between 73 and 130% in 90 percent of patients with placentas in this area.

This method gave an over-all diagnostic accuracy of 100% in areas 3 and 4 for these cases. The test is simple, safe and reliable. Weinlurg estimated radiation dose to foetus as 1.0 roentgen from a soft-tissue radiograph, whereas maximum fetal dose to total decay would be about 70 milliroentgens after 5.0 microcuries of iodinated human serum albumin. If the pregnancy is terminated within 24 hours, dose be done in labour room or patient transported in her bed to the isotope laboratory, counting taken 10 to 15 minutes and results are immediately available.

4 Figures, 1 Table.

S. Grover, Delhi.

Andre J. Bruwer and F. Henry Ellis Jr. A Slow Injection Method of Aorta-Arteriography, Surgery, Gynaecology and Obstetrics. September 1958, 107: 287-293.

Study of Aorta and its main arterial branches by radio-opaque materials is indispensable before their surgery, specially in arteriosclerotic obliterative disease. The authors' technique of aortography is safe, simple and demonstrates the Aorta and arteries, of lower extremities, to a level below the knees.

Various methods of Aortography and femoral arteriography are categorised briefly:—

1. Translumbar Aortography at level of 12th thoracic vertebra, rapid injection of

artery. All efferent nerves between brain and cardiovascular system were severed. The insignificant fall in blood pressure that accompanied further injection of the contract medium suggested that the drop was due to nervous factors.

N. S. Deboo, Bombay.

Peter Kerley. Lung changes in acquired heart disease. Am. Jour. Roentgenol. August 1958, Vol. 80, 256-263.

Lung changes are of most value in mitral valve lesions and in left heart failure. These are 3 primary, and 3 secondary. The 3 primary are distension of veins, distension of lymphatics, and distention and contraction of arteries. The 3 secondary ones are hemosiderosis, bone formation in the lungs, and pulmonary fibrosis, secondary emphysema and atelectasis.

In the normal radiogram, of lungs, the upper lobe veins are either invisible or barely visible, while the lower lobe veins are easy to identify. When the mitral valve becomes narrowed, the upper lobe veins stand out clearly, and if mitral stenosis is established, the upper lobe veins remain distended and the lower lobe veins become invisible. Once the venous pressure rises above 25 mms. of Hg, the pulmonary lymphatics become visible. These transverse lines are the first to appear at the bases, have a bizarre appearance, about 1 mm. thick. A number of papers have appeared proving that the transverse lines are due to dilated lymphatic in the interlobular septa, and that they reflect raised pulmonary intravenous pressure. The pulmonary artery changes are easier to recognise. In severe degrees, of pulmonary hypertension, the main stem, the 2 main branches, and the second degree

branches are enlarged, while the peripheral branches are narrowed and tortuous. These changes are gradual.

The significance of these signs is summarised as follows:—distended upper lobe veins, contracted lower lobe veins, and marked interstitial lines mean that mitral stenosis is dominant over mitral incompetence: distended upper lobe veins, interstitial lines and small peripheral arteries indicate predominant mitral stenosis with pulmonary hypertension: distended upper and lower lobe veins indicate low pulmonary pressure.

Hemosiderosis appears as a fine granular pattern. Goodwin and his coworkers believe that it indicates pulmonary artery hypertension. Bone formation in lungs in heart disease is almost conclusive of mitral stenosis. Grosser lung changes in mitral stenosis are compression of bronchi, thickened diaphragmatic pleura, fibrosis and honey-comb areas, hypertranslucency, and lobar and segmental atelectasis, invariably localised to the bases. If a hypertensive patient with minor dyspnoea has interstitial lines and prominent left upper lobe veins, he is on the verge of failure. If there is also a lamellar effusion, impending failure can be diagnosed with confidence.

10 radiographs.

S. N. Deboo, Bombay.

J. P. Murray. Neuromuscular & Functional disorders of the Pharynx. Jour. Fac. Radiologists. Vol. 9, July 1958, Pages 135-141.

In this paper the abnormalities of deglutition in myasthenia gravis, hysterical dysphagia and pharyngo-oesophageal incoordination are discussed. A few points in technique are important. Screening and

films in the lateral projection are useful in most cases but the antero-posterior projection is also useful specially in myasthenia gravis and in paralysis of specific groups of muscles as after polio-myelitis. In myasthenia gravis repeated barium swallows may be necessary to demonstrate an abnormality of muscular disfunction, because a single swallow may appear to be normal.

Myasthenia gravis.—The abnormalities of deglutition fall into 2 groups. (1) The oral stage. (2) The pharyngeal stage. The abnormalities involving the pharyngeal stage consist of (a) stasis in the pharynx and pooling in the pharyngeal recesses. (b) loss of tone and ballooning of the pharynx after repeated swallowing acts with inability to raise the larynx and close the upper pharynx. (c) eventually cessation of swallowing usually associated with sagging of the jaw. (d) nasal reflux. In myasthenia gravis the passage of the bolus through the pharynx is symmetric and is not deflected to either side as in many cases of polio-myelitis. There is never spasm or hypertrophy of the crico-pharynx as in Plummer-Vinson syndrome, pharyngo-oesophageal incoordination, and some cases of globus hystericus.

Hysterical dysphagia.—This is a dysphagia for which no cause can be found. Most patients state that food sticks in the throat or at the level of the cricoid cartilage. It is very important not to dismiss any case of dysphagia as being hysterical or functional, without clinical endoscopic and radiological evidence to discover an organic basis for it.

Pharyngo-oesophageal incoordination.—The crico-pharynx acts as a sphincter between the pharynx and the oesophagus and as with all other sphincters its function may be deranged and it is to this disfunction that the author calls pharyngo-oesophageal incoordination. Crichton is convinced that

there is no normal radiographic visualization of the crico-pharynx and that its demonstration is of definite pathological significance but the author thinks it incorrect to say that there is no normal visualization of the crico-pharynx. The opinion is expressed that visualization of crico-pharynx muscle may occur without significance though it is frequently associated with other abnormalities of the pharynx and oesophagus and with neurological conditions in later life.

10 Radiographs.

S. N. Deboo, Bombay.

Constantine. Soteropoulos and John H. Gilmore. Roentgen diagnosis acute appendicitis. Radiology. August 1958, Vol. 71, 246-256.

A series of 25 cases in a three year study has been presented and analyzed, to evaluate the possible usefulness of the plain abdominal film survey.

A minimum survey study of the abdomen should include supine, upright and right or left decubitus (usually left) views or both, and a chest roentgenogram. The X-ray findings are as follows.

1. The most important single sign is a fluid level in the caecum, best seen in the decubitus position, occasionally associated with small fluid levels in the terminal ileum. The importance of decubitus position in the study is stressed.

2. Blurring of the right psoas muscle in its distal portion is helpful. The lower portion of the lateral border is obscured more frequently, especially when the appendix is retrocaecal or retroperitoneal. The mid and upper portion is more commonly obscured in perirenal abscess and acute cholecystitis.

3. Secondary homolateral scolioses of the lumbar spine.
4. Coarsening and oedema of the mucosa of coecum and thickening of the wall of coecum.
5. Localised ileus of the loops of terminal ileum with thickened septa between the loops of small bowel and the coecum.
6. Diffuse increased density, over coecum and terminal ileum.
7. Flocculent gas densities in the area of the appendix. Normally the appendix contains no gas. With anatomical variations in the position of the coecum, the appendix may represent the highest point of the right colon and as such may be filled with intestinal gas. In its normal position the appendix can remain filled with gas if its communication with the coecum is occluded and is the seat of gas forming organisms.
8. Faecoliths in the appendix in presence of suggestive clinical findings.
9. Widening and shortening of the extra-peritoneal fat line. The obliteration of the flank stripe is observed only when the appendix is retrocoecal and laterally placed and when the inflammatory reaction extends directly into the flank.
10. In late cases, findings on chest film, such as elevation of diaphragm, plate like atelectases and pleural effusion may be observed.

12 radiographs.

S. N. Deboo, Bombay.

Kent Ellis. Gastrojejunal ulcer. *Radiology*. Vol. 71, August 1958, Pages 187-196.

The author reviews the clinical histories and roentgenograms of 238 patients with a clinical diagnosis of gastrojejunal ulcer.

The accuracy of the radiological examination in their detection is disappointing in that commonly only 20 to 50 per cent have been found prior to surgery. The present incidence of gastrojejunal ulcer following Billroth II partial gastrectomy with resection of 50 to 70 per cent of the distal stomach varies from 1 per cent to 10 per cent and averages about 6 per cent.

In his study, 80 per cent of the proved gastrojejunal ulcers occurring in the post-partial gastrectomy groups were demonstrated on the films, in the post-enterostomy 3 group 56 per cent of ulcers were shown, times, huge ulcer craters were well demonstrated, but not recognised by the initial examiner as ulcers, presumably because of their unexpected size. The vast majority of ulcers recognised were 5 mms. or more in diameter.

Radiologically, the niche represents actual ulcer crater, and appeared to be either at the stoma or more often in the jejunum adjacent to the stoma. Typically it appeared on the dependent wall of the efferent jejunum opposite the stoma. No ulcer in his series was more than 10 cms. distal to the stoma. In the post-operative duodenal ulcer patient, the association of gastrointestinal haemorrhage with abdominal pain can be taken as evidence of a gastrojejunal ulcer and this ulcer can be detected by x-ray examination in nearly all cases. Obstruction of a previously patent anastomosis or jejunal loop is strong evidence of organic disease and in the postoperative duodenal ulcer patient is suggestive of a gastrojejunal ulcer. Spasm or oedema with narrowing of jejunum, associated with effacement of jejunal folds is frequently noted adjacent to a gastrojejunal ulcer. Tenderness over the stoma and radiation of mucosal folds from the region of the ulcer crater are helpful signs in detection of an ulcer.

In the technic, emphasis is stressed on the use of a small amount of barium mixture, which is distributed about the stomach by palpation. A balloon type pressure device held firmly over the stoma region is often helpful. Serial spot films of the anastomotic region under varying conditions of pressure and filling are helpful. Early overfilling of the stomach is particularly to be avoided.

9 Radiographs.

S. N. Deboo, Bombay.

Prof. Solve Welin. Modern Trends in diagnostic Radiology of the colon. The Mackenzie Davidson Memorial Lecture. *Br. Jour. Radiology*. Sep. 1958, Vol. 31, No. 369, Pages 453-464.

The author first discusses the literature on the subject. He then describes his method of examining the colon. 7561 patients were examined with his technique at Malmo, 8912 examinations were carried out on 7561 patients.

The patient first comes into the cleansing room, where he receives an enema containing Clysodrast Novum, the patient having received 15 c.c. Castor oil, the previous evening. After the cleansing enema, he goes to toilet. Then he receives his first contrast enema with a thick barium medium containing Clysodrast Novum, the enema should reach the splenic flexure. A lateral view is then taken, and the patient then evacuates the enema. Then the patient receives the 2nd contrast enema with Clysodrast Novum, running upto the middle of the sigmoid colon. Air is then introduced into the bowel by means of a Higginson's syringe with the patient in prone position, turning the patient over a couple of times. Then the contrast medium is drained off by an ordinary enema pipe

with the patient in the prone position, until only a contrast coating is left. Potter Bucky diaphragm is used, the film focus distance should be 1.5 metres.

Polyps were seen most commonly in children, being the most frequent cause of bleeding before adolescence. If a polypoid tumour is situated above proctoscopic level, and is less than 10 mms in diameter, a check film is taken 6 months later. If the tumour is of the same size, a second check examination is taken one year later. But if any increase in size is noted, then operation is indicated without delay. Indentation of the intestinal wall or puckered base of a growth is now regarded by the author as a definite indication for operation, no matter whether the tumour is located within or above proctoscopic level. The absence of such an indentation does not, of course, exclude the possibility of malignancy. After resection of a malignant tumour, a control examination is carried out as soon as possible after operation. Six months later the patient is again examined for any change in the outline of the intestine, that might indicate a recurrence of the original tumour.

Finally 2 questions discussed (1) whether removal of a small malignant tumour is early enough to prevent metastasis, and whether removal of such a benign polyp is prophylaxis against cancer of the large bowel. The answer to this is that their follow-up is too short being 4½ years, but judging from what they have seen at Malmo, they are inclined to be optimistic. The 2nd question is whether routine double examination is worth while. He considers the merits and demerits. The time taken is of course longer, it causes some discomfort, and the costs are higher. But the method offers possibility of revealing growths, possibly malignant or pre-cancerous, and types of colitis, that will be missed by other methods.

There are general prophylactic measures applicable to all intravenous injections, such as surgically clean needles, any syringes, uncontaminated solutions, adequate sterilisation and an aseptic technique of injection, since reactions may be due to contaminants, pyrogens or a chemical variant.

The only practical method of pretesting is the intravenous test. The intraoral, skin, eye and patch tests have all proved unsatisfactory and their use has caused undue confidence, as death has followed negative tests. With the intravenous test, a small amount (about 1 c.c.) is given intravenously while the patient is carefully watched. If there is no serious immediate reaction, the injection is completed. However even such a small dose has caused serious and fatal reactions.

The contents of their emergency kit for special examinations is as follows:—Oxygen, airway tubes, and a Hudson type mask and bag for respiratory reactions, a wedge rib retractor and scalpel for cardiac massage and a cut-down tray for cardiac reactions, and 5 per cent dextrose, hydrocortisone, Bendaryl, neosynephrine, levophed, epinephrine 1-1000, and seconal sodium for intravenous medication. The authors found that no drug will consistently prevent major reactions, and antihistamines have been unsuccessful.

In the authors' opinion, good clinical judgement and presence of a physician are important factors in the prophylaxis and treatment of severe reactions, which usually occur within 15 minutes of the end of the injection, and the patient must remain under observation during this period.

S. N. Deboo, Bombay.

George Ansell, Complications of adrenocortical therapy. A radiological survey. Jour. Fac. Radiologists. Vol. 9, July 1958, Pages 113-126.

The adrenal cortex, under the influence of the adrenocorticotrophic hormone (ACTH) of the anterior pituitary secretes hormones, the activities of which can be classified under 2 headings. (1) Mineralo-corticoid. (2) Glucocorticoid. The complications are of considerable interest to the Radiologist. They are (1) cardio-pulmonary-enlargement of the heart and pulmonary oedema. With the smaller doses used for long term therapy, cardiac enlargement is not prominent. Transient changes due to pulmonary oedema and congestion are more common, with associated evidence of oedema of the interstitial tissues of the lungs particularly of the interlobular septa, producing the characteristic "B lines of Kerley" at the lung bases.

2. *Pulmonary Infections*.—The adrenal steroids produce their beneficial effects because of their anti-inflammatory action, which may however also alter the bodily reaction to invading organisms leading to spread of infections. Acute exacerbations of pulmonary tuberculosis were reported shortly after the general introduction of steroid therapy.

3. *Pulmonary Infarctions*.—Has been encountered in the present series but spontaneous infarctions is not uncommon in any group of hospital patients.

4. *Peptic Ulceration*.—It is one of the more serious and occasionally fatal complications. Peptic complications occurring during adreno-cortical therapy may be manifested in several ways. (a) Exacerbation of a pre-existing gastric or duodenal ulcer. (b) Perforation of a recent acute ulcer. (c) Gastro-intestinal haemorrhage. (d) Colonic perforation.

5. The skeletal complications.

(1) *Rheumatoid arthritis*.—This is the commonest condition for which steroid therapy has been used, but there is no unanimity of opinion concerning the indications and effects of this therapy.

(2) *Osteoporosis*.—Pathological fractures and osteoporosis occurring during ACTH and cortisone therapy have been reported. There appears to be a greater liability to these complications in patients who were already predisposed to osteoporosis as for example post-menopausal women or patients who have been immobilised.

(3) *Infective changes*.—As with other tissues of the body steroid therapy may predispose to infective changes in the skeletal system.

An initial Chest Radiography to exclude tuberculosis and a barium meal examination should be performed as a routine before steroid therapy is commenced.

10 Radiographs, 1 table, 1 figure.

S. N. Deboo, Bombay.

Bertram. Levin. Neurofibromatoses. Clinical and roentgen manifestations. Radiology. July 1958, Vol. 71, 48-58.

A series of 12 cases of neurofibromatoses is presented with different roentgenologic findings or unusual clinical manifestations, including axioskeletal defects, optic foramina expansion, skin nodules, and intercostal masses and bony over growth.

Of the skeletal abnormalities, the most common is scoliosis, associated with neurofibromatoses, and may be even of such severity as to cause paraplegia, occurring in the lower dorsal region. It is due to destructive changes in the vertebral bodies caused by neurofibromata of the dorsal roots eroding the bone. Rib erosion secondary to neurofibromata of the intercostal nerve presents a

pathognomonic picture. Disorders of bony overgrowth and underdevelopment are also seen.

Orbital defects are usually in the superior portion of the orbit and are associated with pulsating exophthalmos. Frequent association of optic gliomas with neurofibromatoses is well known, so that any person with neurofibromatoses who has some visual disturbance should be suspected for an optic glioma.

Mediastinal neurofibromas exist as isolated tumours rather than as generalised neurofibromatoses. They occur usually in the dorsal region, originating in the spinal canal and extending through the neural foramen into the adjacent extrapleural space. Proper oblique views of the spine may disclose enlargement of the neural foramen, but frequently this can not be demonstrated. If the erosion is seen, it permits a positive diagnosis of neurogenic tumour.

Of the 12 cases, special interest applies to a case of a child with precocious sexual maturation and, another of a child with an unexplained aplastic anemia. The sexual precocity may be secondary to intracranial tumours arising in the anterior or posterior hypothalamus. There is an unduly high incidence of intracranial tumours associated with neurofibromatoses. These may be meningiomas, gliomas or other histologic types.

13 radiographs.

S. N. Deboo, Bombay.

John Caffey. Achondroplasia of pelvis and lumbosacral spine. Some roentgenographic features. Am. Jour. Roentgenol. September 1958, Vol. 80, Pages 449-457.

Slowed and irregular growth of pelvic and spinal bones produces some of the diagnostic changes in the achondroplastic skeleton.

Clinically, The thorax is flat and short. Lordosis is pronounced at the lumbosacral junction, the abdomen is short ventrodorsally. The pelvis and the spinal bones are more deeply buried in soft tissues, so that their dwarfism is more difficult to appreciate externally.

In Roentgenograms however, these pelvic and spinal changes are clearly visible. All parts of the bony pelvis are smaller, and the pelvic diameters are shortened more in length than in breadth. Of all pelvic bones the iliums are dwarfed more than ischiums and pubic bones. The 5th and lower part of the 4th lumbar often lie below the iliac crests. The 5th lumbar is frequently sacralised. There is upward and backward shift of the coccyx and lower sacral segments, and a shift forward and downward of the first sacral segment and its promontary. The greater sciatic notch is flattened to a narrow cleft, and the base of the ilium is almost as wide as its top. Acetabular angles are reduced to near zero. Excess of cartilages is evident at the I' cartilages, which are thicker. Ischiopubic synchondrosis are closed in the achondroplastic but still widely open in the normal.

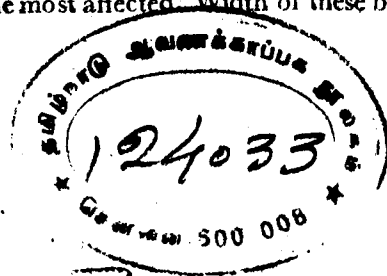
In the spine, 4th and 5th lumbar segments are the most affected. Width of these bodies

is greatly diminished and the dorsal edges of their borders are concave. Undergrowth of the pedicles is a conspicuous feature, they are shortened to approximately one-half their normal lengths. Marked transverse smallness of the lower lumbar bodies is most consistent finding. Instead of the 5th lumbar body being the widest as in normal, the achondroplastic lumbar spine shows the 5th lumbar body the narrowest. The spinal canal is narrowed transversely at the same levels. In adult achondroplasias, dorso-lumbar kyphosis, and hypertrophic osteoarthritis may precipitate early neurologic disturbances owing to narrowness of the spinal canal.

In all achondroplasts, stenosis of the spinal canal produces disproportion in which the canal is too small for its contents, so that they should be studied carefully for the appearance of any neurological deficits and in appropriate circumstances decompression laminectomy should be done early, before irreversible changes develop in the spinal cord.

5 radiographs, 2 figures, 3 diagrams.

S. N. Deboo, Bombay.



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