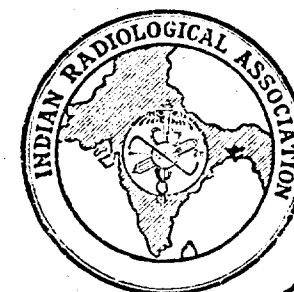


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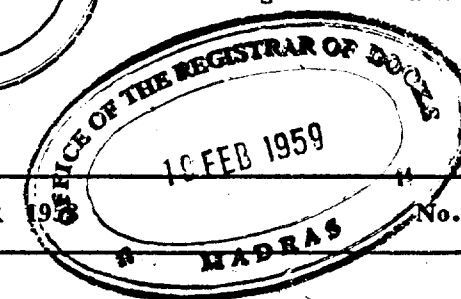
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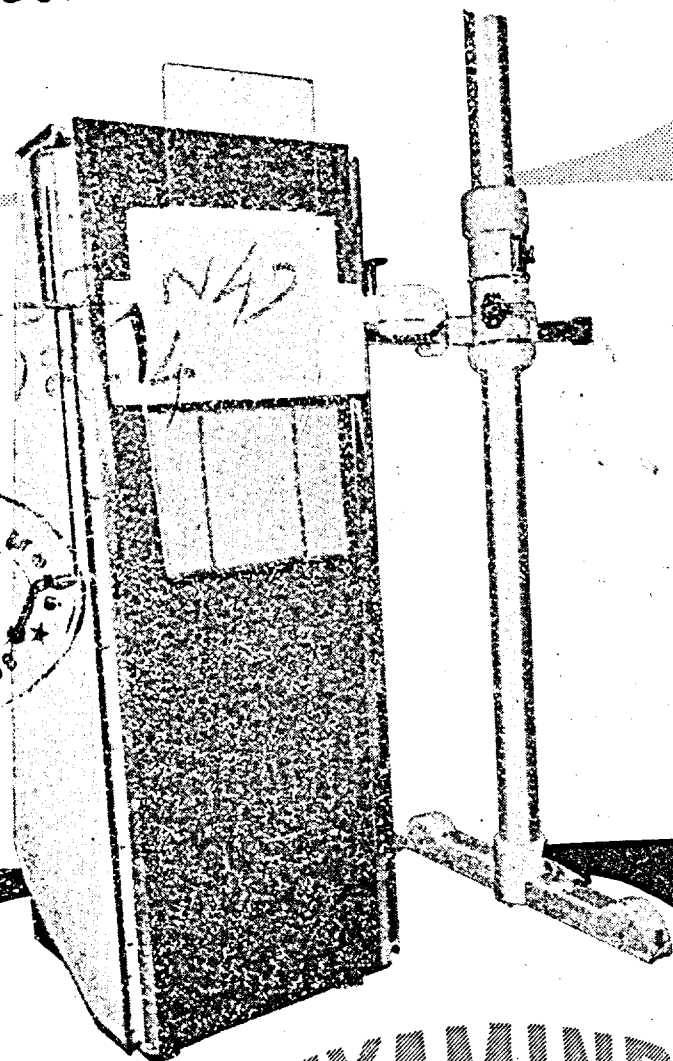
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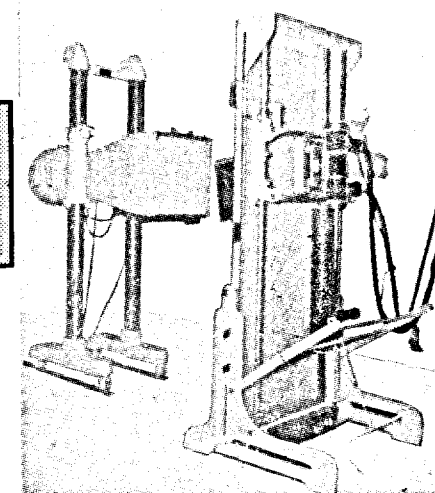
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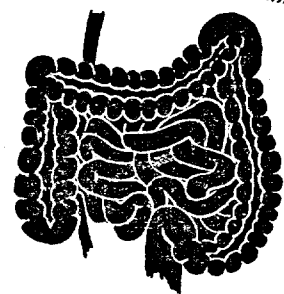
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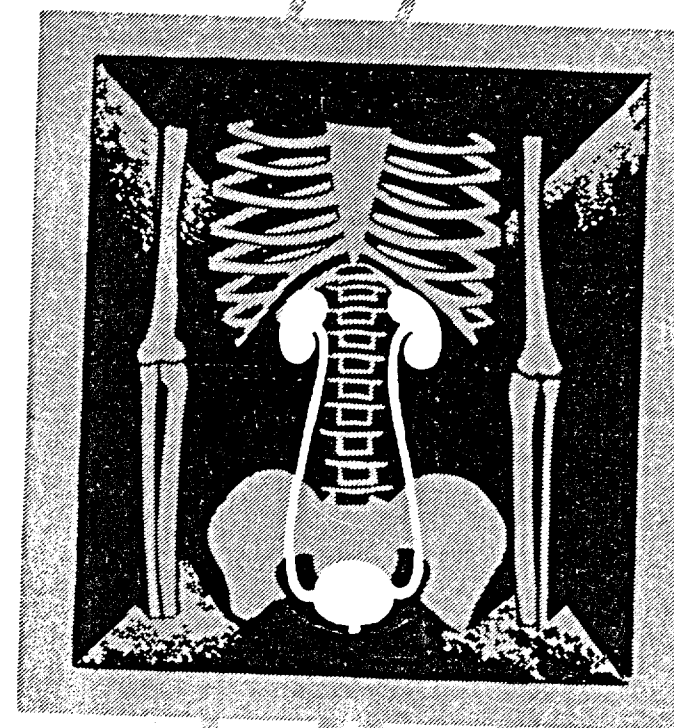
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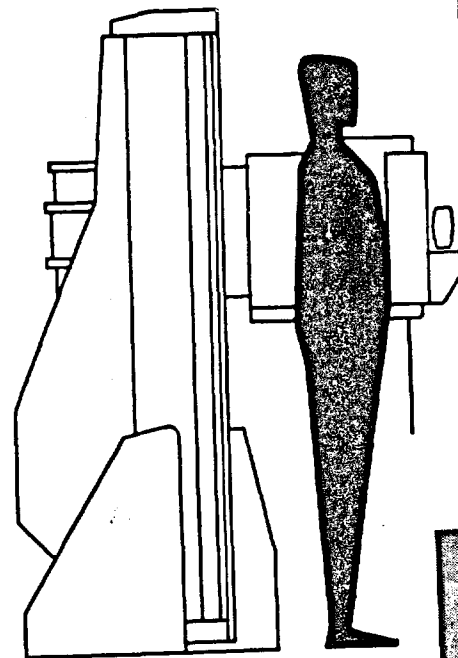


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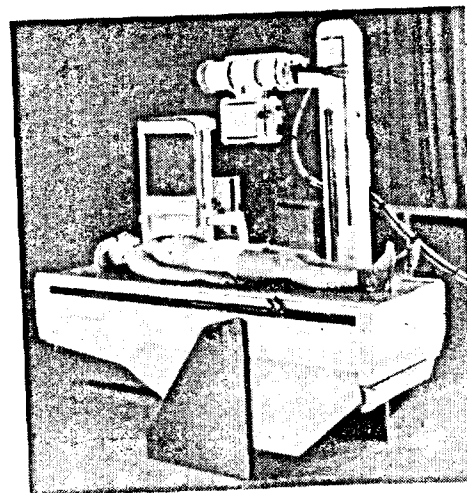


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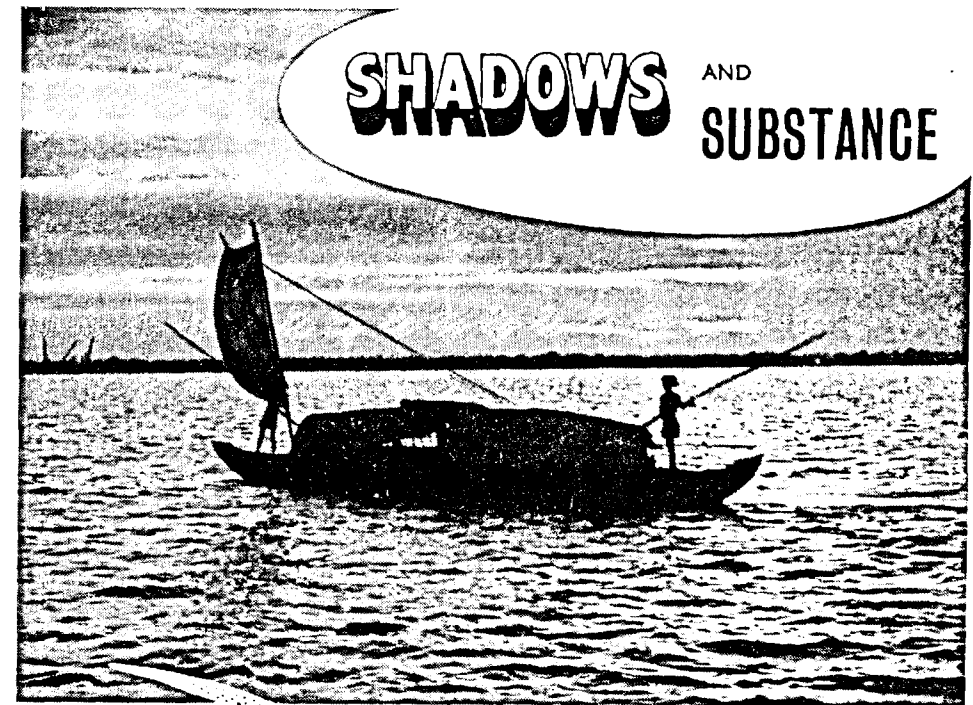
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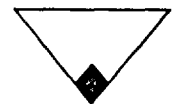
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Editorial

Post Graduate Education in Radiology in India

BY

Dr. K. M. RAI*

The Editor may be excused for reverting to this subject again as the progress of Radiology in this country depends on the quality of Radiologists we produce. What should be the contents of the Diploma, the duration of teaching, whether it should be a combined diploma or should it be bifurcated into Radio-Diagnosis and Radio-Therapy has been sufficiently discussed for nearly a decade now. After mature consideration the Indian Radiological Association finally recommended that a two year combined course in Radio-Diagnosis and Radio-Therapy may be adopted throughout the Country by all Universities as an interim measure.

The reasons adduced in support of the above recommendations were as follows:

1. Post Graduate diploma courses were conducted at Madras, Bombay and Lucknow.
2. The duration, content of teaching, theory and practice varied from place to place. While Madras gave equal emphasis to both diagnosis and therapy and had all the facilities for practical training at the Central Institute, it could not be said that the other two centres had such equal facilities. Post graduates from Lucknow were deputed to Agra for a mere two weeks' training in Radium therapy!
3. The Indian Radiological Association strongly felt that there should be a uniform standard of Post Graduate training throughout the the Country, the contents and duration of training for the diploma being equal.

*Director and Professor of Radiology, Institute of Radiology, Madras (Upgraded Barnard Institute of Radiology).

4. Although it was agreed that there should be bifurcation of the subject into Radio-Diagnosis and Radiotherapy on the lines adopted in U. K. and Sweden, the conditions prevailing in the Country precluded such bifurcation immediately.

5. Therefore as a compromise between bifurcated diplomas and the existing diplomas of 9 to 12 months' duration a two year combined diploma course was recommended to be adopted by all Universities.

6. In pursuance of this recommendation, the Government diploma of 12 months' duration was abolished in Madras and a two year University Course was started in 1954 and has been running as such since then.

What steps have been taken by other Universities to implement this recommendation? As far as the Editor knows—none. A great deal of argument is still going on about this subject at certain teaching centres—6 years after the above recommendations were made by the Indian Radiological Association, one set of Radiologists strongly favouring the combined course while the others are equally emphatic about bifurcating the diploma. Arguments are put forward in support of each view. We accept the arguments of each party. Both are correct and none could be wrong. But what has been the result!—Disastrous. There has been no work; no progress. Post Graduate Radiological Education very largely stands today where it was 20 years ago—with the solitary exception of Madras. Why not give a moratorium to these interminable arguments and start doing something and give effect to the considered recommendations of the Indian Radiological Association! No one can dispute today the desirability of bifurcating the Diploma. It is the ideal that we all look forward to and as sure as anything else in this world it is bound to come in time. We have to work for such a consummation. This was not achieved overnight in U. K. or Sweden. It was a gradual, natural evolution. One has to steadily climb up to reach the top of the tree, it is not possible to reach the top by one jump. Therefore before bifurcation of the Diploma into D.M.R. (D) and D.M.R. (T), there

should be bifurcated departments of Radiodiagnosis and Radiotherapy in all its aspects. How many such departments have we in this Country? The Editor wishes to be enlightened on this subject.

Complete bifurcation in the practice of Radiodiagnosis and Radiotherapy was effected in the Barnard Institute of Radiology about 15 years ago. A further sub-division into four subsections for specialisation in different aspects of Radiodiagnosis was effected recently after the Institute was upgraded. The subsections are (1) Vascular Radiology which includes cerebral Angiography, angiocardiology, aortograms, arteriograms, splenograms, etc. (2) Gastroenterology; (3) other contrast studies; (4) Lung Pathologies etc. On the Radiotherapy side the post graduate has abundant facilities for comprehensive practical training. The Institute has a separate Radium Ward of 36 beds with an attached fully equipped Radium Theatre at the disposal of the Radiotherapist. There are another about 90 beds for males and females in the Government General Hospital for Cancer Patients. There is no set distribution of these beds between the Surgeons and Radiotherapist. Patients are admitted into these beds by the Radiotherapist and Surgeons as they come in, but in practice a large majority of these beds are always under the Radiotherapist. Every week there is a Cancer Conference at which the Radiotherapist, the Surgeons and the Pathologist are present; the Patients are examined, discussed and a joint decision is taken regarding the treatment of patients presented. Post graduates for the Diploma in Radiology and those preparing for the Master's degree (M.S.) in Surgery and other Junior officers regularly attend this conference and discussion. The post graduates present these cases. Hence they have great opportunities to learn to be on their own. The idea is to train them into real clinicians and not merely glorified technicians in Radiotherapy. They have further opportunities for clinical training in the speciality during their posting in the radium ward, theatre and the Cancer wards.

Some detail has been given regarding the training of the post graduates for the combined Diploma in Madras—not as a matter of Egoism,

but to emphasise the fact, that even with the above facilities, neither the University of Madras nor the administration is at present in favour of a bifurcated course in Radiology—each of two year's duration as in the U. K. The obvious reason is that there are not enough facilities in the Country either to give such training or to absorb such men into service.

The Editor is firmly of opinion that before bifurcation in teaching can be effected, we should start bifurcating the departments into Radio-diagnosis and Radiotherapy. When these facilities are available, it will be time for bifurcation of the diplomas. This was the sequence of events in U. K. and Sweden. Friends who quote is in support of bifurcation forget the above. Let us follow this logical sequence—cease wrangling about this and start doing something concrete. I plead with my colleagues to accept the compromise of a two year combined course and start it at least in some of the Universities like Bombay, Calcutta, Lucknow, Andhra etc. and scrap the 9 or 12 months' course straightaway. There is no gainsaying that these short courses are doing immense harm to the progress of the speciality in this Country.

Incidence of Primary Bone Tumours in Delhi During 1956*

BY

N. G. GADEKAR (i) & G. S. SARIN (ii)

It was noticed during last few years that the incidence of primary bone tumours is not so rare as it was generally believed to be, and it was thought, it would be really worthwhile to collect these cases and correct our impression of this disease. This work was started from 1st January, 1956 in the Irwin Hospital, New Delhi, and all cases suspected of bone tumours were separately registered and examined in detail. It was not possible to have biopsy in all cases but it was fortunate to have histopathology in majority of cases of suspected malignancy.

Interesting findings made by this study are being presented :—

Table No. I

Total number of x-ray examinations during 1956	... 55000
Primary Bone Tumours	... 92
Metastatic Bone Tumours	... 26

Total number of x-ray diagnostic examinations done during 1956 is approximately 55000. Primary bone tumours both benign and malignant are 92 and metastatic bone tumours are 26.

Table No. II

Primary Bone Tumours	... 92
Benign Tumours	... 37
Malignant Bone Tumours	... 55

Malignant Tumours of Jaw	... 9
Malignant bone tumours other than those of Jaw	... 46

Table No. II shows that out of these 92, the number of benign tumours is 37. Out of 55 malignant bone tumours 9 cases were arising from the jaw and are being excluded from the present classification. Classification of benign bone tumours is given in Table No. III.

Table No. III

Osteomas	... 13
Chondromas	... 7
Osteoclastomas	... 6
Simple Bone cysts	... 5
Haemangiomas bone cysts	... 1
Haemangioma bone	... 2
Diaphyseal achlasia	... 3
Total	... 37

Out of the 55 cases of malignant bone tumours 9 were of jaw bones and are being excluded from the present classification as already pointed out. Out of the 46 malignant bone tumours other than those of the jaw, biopsies were available in 27 cases. Classification of these are given in Table No. IV.

Table No. IV

Malignant bone tumours	... 46
Biopsy available	... 27

* Read at the Annual Conference—1957.

(i) Professor of Radiology, All-India Institute of Medical Sciences, New Delhi.

(ii) Radiologist, Irwin Hospital, New Delhi.

Classification of 27 Cases

Osteogenic sarcoma	... 7
Endothelioma (Ewing's Sarcoma)...	5
Myeloma	... 5
Malignant Giant Celled	... 2
Chondro-Myxo-Sarcoma	... 2
Chondro Sarcoma	... 1
Reticulum celled Sarcoma	... 1
Eosinophilic Granuloma	... 1
Chordoma	... 1
Synovioma	... 2
Total	... 27

Table No. V gives the age, sex and anatomical distribution of osteogenic sarcomas.

Table No. V

Osteogenic Sarcomas	... 7
Sex:—Males	... 5
Females	... 2
Age:—Youngest	... 12 years.
Oldest	... 40 "

Anatomical Distribution

Lower end femur	... 3
Lower end fibula	... 2
Scapula	... 1
Rib	... 1

There are seven cases of osteogenic sarcomas proved histologically—five were males and two females, youngest being 12 years old and oldest 40 years.

Table No. VI

Endothelioma (Ewing's Sarcoma) ...	5
Sex:—Males	... 2 (14, 38)
Females	... 3 (13, 14, 35).

Anatomical Distribution

Ribs	... 2
Lower end femur	... 1
Upper end of femur	... 1
Sternum	... 1

There are five histologically positive—Ewing's Sarcoma; two males of 14 and 38; and three females of 13, 14 and 35 years. Anatomical distribution is; ribs two, lower end of femur one, upper end of femur one and sternum one.

Table No. VII

Myeloma	... 5
Sex:—Males	... 2
Females	... 3
Age—All over 40 years.	

Myelomas accounted for 5 cases, two males and three females, all over the age of 40 years.

Malignant Giant—celled tumours were two, both males, one 25 and the other 26 years old.

There were two cases of chondro-myxo-sarcoma, one male 38 years of age, the lesion was in the lower end Tibia and the other one being female 17 years old, the lesion being in the iliac bone.

One case of chondro-sarcoma of the iliac bone was a male patient of 20 years age.

There was one case each of—Reticulum-cell sarcoma in lower end of femur, male aged 27 years. Eosinophilic granuloma multiple (skull, spine and ribs) male aged 28 yrs. and of chordoma lower end of the spine male aged 40 years.

There were two cases of synovioma, included here as malignancy was suggested

by bone destruction. One male aged 46 years and other female aged 19 years, both in the lower end of humerus.

Besides these 27 cases, there were other 19 cases of bone malignancies which are clinically and radiologically positive but biopsy was not available and as such could not be included in the above classification. Their age, sex and anatomical distribution is given in Table No. VIII.

Table No. VIII

Age, sex and anatomical distribution of 19 cases of bone malignancies, not included in histological classification:—

Sex:—Males	... 7
Females	... 12
Age:—Youngest	9 years.
Oldest	80 "
Less than 20 yrs. old	... 11
Between 20 to 30 years	... 5
Above, 30 years	... 3

Anatomical Distribution

Lower end of femur	... 9
Upper end of femur	... 3
Iliac bone	... 3
Radius lower end	... 1
Tibia lower end	... 1
Fibula upper end	... 1
Tibia upper end	... 1

Discussion

Primary tumours of bone of all types are comparatively infrequent. Osteogenic sarcoma is the most common of the primary

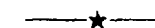
malignant varieties, Ewing's is the next followed by Myeloma. Other forms of primary bone malignancies is rarely seen.

Mortality statistics of New York City for 1945 showed that there were nearly 80,000 deaths from all causes; out of these, deaths from cancer of all forms accounted for nearly 14000 (one in six). Approximately 250 were those of cancers of bone including jaw bones *i.e.* 1.8%. Sirsat (1956) observes that bone malignancies form 1% of all malignancies. We have come across during one year only 55 cases in one hospital. Granting that majority of cases come to this hospital, still we can add another 15 cases which might have gone to other hospitals and clinics. Then, can it be assumed that there are about 70 new cases of bone sarcomas in Delhi and round about. This gives rise to another question—assuming that bone malignancies form only 1% of all malignancies then, are there 7000 new cases every year of all malignancies included in this area. Is it correct to make such an observation on periodic basis? Or is it, that as our life expectancy is about 33 years, there are proportionately more people of middle age group as compared to other age groups and as bone malignancies are commoner in the former age group we come across this disease more frequently?

Authors' thanks are due to Superintendent, Irwin Hospital, New Delhi for permission to use the hospital records and to their colleagues in the hospital for their kind co-operation.

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Some Experiences in Treatment of Primary Bone Tumours by X-Ray Therapy

BY
N. G. GADEKAR*

The x-ray Therapy Department of Irwin Hospital, New Delhi, was opened in March 1950. Since then up to the end of 1957, 112 cases of primary bone tumours were accepted for x-ray therapy. The classification of these tumours is shown in table No. 1.

Table No. 1

Osteoclastomas and other benign bone tumours	...	32
Osteo-sarcomas	...	31
Chondro-sarcomas	...	9
Ewing's Sarcomas	...	9
Malignant Giant Cell Tumours	...	4
Plasma Cell Myelomas	...	2
Neuroblastomas	...	3
Undifferentiated malignant bone tumours	...	6
Chordomas	...	5
Eosinophilic granulomas	...	3
Adamantinomas	...	2
Tumours of the vertebra	...	6
Total	...	112

Besides these 112 cases, there were 4 cases of malignant synoviomas affecting bone, but by the time they were referred for x-ray therapy, they had already developed secondaries in the lungs and more attention was paid to irradiation of lungs than the primary tumour and as such these cases are

excluded from this series. In majority of cases, the diagnosis was based on histology either by needle biopsy or by tissue section. Where such confirmation was not available, the diagnosis was accepted on clinical and radiological findings.

The results of radiation treatment of bone tumours have not been very encouraging in other published series and the present one is no exception. It should be remembered that most of the cases referred for this type of treatment are of four categories (a) inoperable, (b) where patient has refused operation, (c) where surgical risk is too great compared with anticipated result and (d) post operative recurrence. From the very nature of this clinical background it will be seen that in majority of the cases the object of the treatment can only be palliation.

The result of analysis of 112 cases of primary bone tumours, with their clinical and histo-pathological background have been presented in the following tables.

Benign Bone Tumours (Table No. 3)

Table No. 2 shows that out of 32 benign tumours, 29 were osteoclastomas and one each of xanthoma, simple bone cyst and aneurysmal bone cyst. The age, sex and regional distribution is shown in the same table while Table No. 3 gives the details of treatment and the results.

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TABLE No. 3
OSTEOCLASTOMAS AND OTHER BENIGN BONE TUMOURS

Sl. No.	Case No.	Name	Age years	Sex	Duration	Clinical features	Radiological findings	Histo-pathology	Site	Treatment			Result, follow-up and remarks
										Date	Approximate Tumour dose	Date	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	291/50	A. S.	14	M	2 months	Fr. after fall	Osteoclastoma with path. fr.	—	Humerus upper 1/3	27-11-50	HVL 1.75 Cu 3200 r	3-1-51	Shown good condensation. No symptoms when last seen in Aug. 1951.
2	195/51	H. L.	25	M	2 years	Swelling bleeding	Benign Tumour Lt. Maxillary sinus showing irregular trabeculae	Osteoclastoma	Left Maxilla	30-6-51	HVL 1.75 Cu 1st course of 2400 r. 3 interrupted courses of 1000 r each	10-6-52	Good condensation of the tumour last seen in Dec. 1953.
3	244/51	G.	8	M	15 days	Fr. due to fall	Osteoclastoma with path. fr.	—	Humerus upper 1/3	16-8-51	HVL 1.75 Cu 3600 r	21-9-57	Fr. healed, good condensation of the tumour. Pt. did not report for follow-up.
4	265/51	P. S.	21	M	9 months	Fr. due to accident	Osteoclastoma with path. fr.	—	Humerus upper 1/3	13-8-51	HVL 1.75 Cu 6000 r in two courses	28-2-52	Fr. healed, good condensation of the tumour, when last seen in Aug. 1954 was symptom free. Pt. interrupted the treatment—not traced.
5	371/51	T.	40	M	8 years	Pain, swelling	Osteoclastoma	Osteoclastoma	Tibia upper 1/3	30-11-57	HVL 1.75 Cu 600 r	—	Fr. healed, good condensation of the tumour. No symptoms when last seen in June 1953.
6	387/51	P. D.	19	M	6 months	Pain with spontaneous fracture	Osteolytic tumour ? Malignancy	Osteoclastoma	Femur upper 1/3	13-12-51	HVL 1.75 Cu 5600 r	24-1-52	Fr. healed, good condensation of tumour. No symptoms when last seen in Dec. 1957.
7	405/51	B. P.	44	M	2 years	Pain	Osteoclastoma	—	Lt. iliac bone	31-12-51 19-3-52	HVL 1.75 Cu 3200 r 3200 r	8-2-52 22-4-52	Good condensation. No symptoms when last seen in Dec. 1957.
8	52/52	S.	5	F	18 months	Pain, limping	Osteoclastoma with path. fr.	—	Femur upper 1/3	3-1-52	HVL 1.2 Cu 3200 r	9-2-52	Fr. healed, partial condensation was visible when last seen in May 1952.
9	156/52	R.	14	F	5 months	Pain, swelling	Osteoclastoma	Osteoclastoma	Tibia upper 1/3	13-2-52 3-9-52	HVL 1.75 Cu 3200 r 2000 r	18-3-52 15-9-52	Good condensation. No symptoms when last seen in May 1954.
10	520/52	A.	21	F	4 months	Pain, swelling	Expanding tumour Rt. Maxilla with pressure erosion of Zygoma	Osteoclastoma	Right Maxilla	17-9-52	HVL 1.75 Cu 4000 r	17-10-52	Pt. not traced after completion of treatment.

TABLE No. 3—(Contd.)

Case No.	Name	Age years	Sex	Duration	Clinical features	Radiological findings	Histopathology	Site	Treatment		Result, follow-up and remarks		
									Date (11)	Approximate Tumour dose (12)			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
11	318/52	K. S.	35	M	8 months	Pain swelling after injury	Osteolytic expanding tumour with path. fracture	Osteoclastoma	Femur lower end	19-4-52 19-8-52	HVL 1.75 Cu 4200 r	3-6-52 19-9-52	No improvement seen Advised Surgery.
12	638/52	J.	73	F	1 year	Pain, Swelling	Expanding osteolytic tumour with irregular bone trabeculae	Osteoclastoma	Lower end Radius	20-12-52	HVL 1.75 Cu 3600 r	21-1-53	Patient did not report for follow-up.
13	415/53	V.	18	F	6 months	Swelling	Expanding tumour with irregular bone trabeculae	Osteoclastoma	Right Maxilla	1-7-53	HVL 1.75 Cu 1600 r	—	Treatment was interrupted, Pt. did not report.
14	408/54	M.	30	F	2 years	Swelling	Expanding tumour with irregular bone trabeculae	Osteoclastoma	Metacarpal	19-5-54	HVL 1.75 Cu 1000 r	8-7-54	Pt. was very irregular in attendance and did not report later.
15	804/54	S.	50	F	7 months	Pain, Swelling	Osteoclastoma	Osteoclastoma	Radius lower 1/3	11-12-54	HVL 1.75 Cu 3200 r	5-1-55	No improvement, advised surgery.
16	168/55	D.	22	F	2 months	Swelling pain	Osteoclastoma with path. fr.	Osteoclastoma	Radius lower 1/3	25-1-55	HVL 1.75 Cu 3200 r	18-2-55	Good condensation; this irradiation was post-operative.
17	216/55	I. D.	26	F	1 year	Pain Swelling curatage done on 26-9-54. No healing seen	Osteoclastoma	Osteoclastoma	Femur lower 1/3	14-2-55 26-4-55	HVL 1.75 Cu 3200 r 3200 r	24-3-55 27-5-55	Good condensation; no recurrence when last seen in Dec. 1955. This was a case of recurrence after curatage.
18	222/55	R. S.	5	M	1 month	Pain after injury	Osteoclastoma with path. fr.	—	Humerus upper 1/3	15-2-55	HVL 1.75 Cu 1200 r	—	Patient interrupted the treatment.
19	687/55	S. R.	32	M	4 months	Pain disability after injury	Osteoclastoma	Osteoclastoma	Femur neck	11-10-55	HVL 1.75 Cu 2600 r	28-10-55	Patient did not report for review.
20	773/55	C.	40	F	6 months	Swelling pain after teeth extraction	Expanding tumour with irregular bone trabeculae	—	Mandible	6-12-55 23-2-56 30-8-56	HVL 1.75 Cu 2600 r 2800 r 2600 r	22-12-55 13-3-56 15-9-56	There was some condensation seen on 21-5-1956. Swelling was reduced and no pain but she had recurrence when seen on 27-8-1956. Another course was given in spite of that there was no sign of condensation when seen on 22-5-1957, she was advise surgical treatment.
21	104/56	J. S.	30	M	3 months	Pain after injury	Osteoclastoma with path. fr.	—	Radius lower 1/3	12-1-56	HVL 1.75 Cu 2400 r	25-1-56	Condensation seen at the end of treatment. Pt. did not return for follow-up.
22	668/56	K.	50	F	2 months	Pain, swelling	Osteoclastoma	—	Tibia upper 1/3	—	—	—	Pt. did not come for treatment after a couple of sittings.
23	771/56	S. B.	26	F	3 months	Swelling	Expanding lesion with irregular bone trabeculae.	Osteoclastoma	Base of 4th metacarpal.	—	—	—	Pt. did not come for treatment after a couple of sittings.
24	116/56	V.	14	F	6 months	Pain, swelling	Osteoclastoma	Osteoclastoma	Radius lower 1/3	17-1-56 9-3-12	HVL 1.75 Cu 2800 r 1600 r	6-2-56 23-3-56	Marked reduction in size of tumour with good condensation. Last seen in Dec. 1957.
25	180/57	M. B.	50	F	1 year	Pain, swelling, disability	Osteoclastoma	Osteoclastoma	Fibula upper 1/3	5-2-57	HVL 1.75 Cu 4000 r	2-3-57	Pt. did not come for follow-up.
26	238/57	L. C.	14	M	6 months	Pain, swelling, disability, swelling	Expanding lesion with irregular bone trabeculae.	Osteoclastoma	Ulna upper end	28-2-57	HVL 1.75 Cu 3600 r	23-3-57	On 3-5-1957 showed very good condensation reduction in size of tumour. Check up on 6-12-1957 showed recurrence at one point at present under treatment.
27	480/57	B. R.	34	M	2 years	Pain, swelling, disability	Osteoclastoma with path. fr.	Osteoclastoma	Tibia lower 1/3	13-5-57 31-7-57	HVL 1.75 Cu 4800 r 1600 r	4-7-57 17-8-57	Tumour showed good condensation and reduction in size when last seen on 16-1-1957.
28	514/57	J. D.	35	M	7 months	Pain, swelling, disability	Osteoclastoma with path. fr.	—	Femur lower 1/3	19-6-57 11-11-57	HVL 1.75 Cu 4800 r	4-7-57 3-12-57	Signs of condensation present when last seen in Dec. 1957.
29	734/57	U. S.	30	M	7 months	Pain, swelling, after injury	Osteoclastoma with path. fr.	Osteoclastoma	Tibia upper 1/3	24-10-57	HVL 1.75 Cu 4800 r	29-11-57	Seen on 20-1-1958 with good condensation of tumour.
30	105/57	C. L.	40	M	18 months	Swelling, pain after injury	Expanding Osteolytic tumour	Xanthoma	Bases of 2-3 metatarsals & 1-2-3 cuneiforms	15-1-57	HVL 1.75 Cu 3200 r	9-2-57	Swelling was reduced in size when treatment was finished. Pt. not seen again.
31	249/50	S.	14	F	8 months	Pain after injury	Bone cyst with path. fr.	—	5th Metacarpal	17-10-57	HVL 1.75 Cu 800 r	—	Pt. interrupted treatment; not traced.
32	877/56	K. S.	11	M	10 months	Pain, swelling, disability	Osteoclastoma	Aneurysmal bone cyst	Upper end ulna	28-12-56	HVL 1.75 Cu 3600 r	21-1-57	Before he was sent for radiation curatage was done and filled with bone chips which did not take and the tumour showed rapid enlargement. The tumour was considerably reduced in size when last seen in Feb. 1957.

Table No. 2

(Age, sex and site distribution of Benign Tumours).

Males 17 — Females 15.

Age 1-10 yrs., three; 11-20 yrs., eight; 21-30 yrs., ten; above 30 yrs., eleven. Duration of symptoms — minimum 15 days, maximum 8 years, average 1 yr.

Radius, lower end	...	5
Humerus, upper end	...	4
Tibia, upper end	...	4
Femur, upper end	...	3
Femur, lower end	...	3
Maxilla	...	3
Metacarpals	...	3
Ulna, upper end	...	2
Iliac bone	...	1
Mandible	...	1
Fibula, upper end	...	1
Tibia, lower end	...	1
Metatarsals	...	1

Total ... 32

In 6 cases the treatment was interrupted, the other 6 did not return for follow-up and, as such, the results are not known, the 3 patients did not respond to this therapy and were advised surgical intervention, the remaining 11 showed satisfactory results. The results of other 3 benign bone tumours are not known as the patient did not report for follow-up. The skiagrams of two illustrative cases are shown in Figs. I and II.

Osteo-Sarcomas (Table No. 5)

In this group are included osteogenic and non-osteogenic or fibrosarcomas of the bone. 31 cases have been placed in this group.

Table No. 4 shows the age, sex and site distribution of these cases.

Table No. 4

(Age, sex and site distribution of osteosarcomas).

Males-21, Females-10.

Age 1-10 yrs. three; 11-20 yrs. twelve; 21-30 yrs. six and 31 above, ten. Duration of symptoms-minimum 1 month, maximum 2 years, average 8 months.

Hip bone	...	10
Mandible	...	3
Maxilla	...	3
Scapula	...	3
Skull	...	3
Tibia, upper 1/3	...	1
Femur, upper 1/3	...	1
Femur, lower 1/3	...	1
Clavicle	...	1
Humerus	...	1
Fibula	...	1
Rib	...	1
Vertebra	...	1
Metatarsal	...	1

Total ... 31

Table No. 5 gives the details of analysis of the cases of osteosarcomas. It may be seen from this table that six patients had incomplete treatment, five others developed lung secondaries and there was no use continuing the treatment. Two cases are known to have died, one after 1 year survival and the other, only 2 months. In seven cases radiation did not show any response. Nine cases did not come for follow-up after the radiation and two cases, followed for 18 months only, showed recession of tumour.



Fig. I (a) Before treatment.



Fig. I (b) Recent skiagram taken in Dec. '57.

Fig. I (a and b) Case No. 405/51 Osteoclastoma.

(a) Skiagram before treatment (b) Skiagram taken in December 1957.

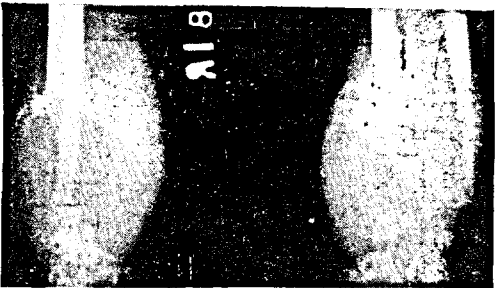


Fig. II (a) Before treatment.



Fig. II (b) After treatment.

Fig. II (a and b) Case No. 116/56 Osteoclastoma.

(a) Before treatment (b) After treatment.



Fig. III (a)



Fig. III (b)

Fig. III (a and b) Case No. 229/54

(a) P. A. and (b) Lat. view of osteogenic sarcoma of frontal bone.



Fig. IV (a)



Fig. IV (b)

Fig. IV (a and b) Case No. 147/51 Osteosarcoma.

(a) Before treatment—note the erosion on the anterior surface of upper end tibia.
(b) After treatment—note the sclerosis.

TABLE No 5
OSTEO—SARCOMAS

S. No.	Case No.	Name	Age years	Sex	Duration	Clinical features	Radiological findings	Histo-pathology	Site	Treatment		Result, follow-up and remarks	
										Date	Approximate Tumour dose		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	4/50	D. N.	14	M	6 months	Pain, tumour disability	Osteolytic lesion showing malignancy	—	Ischium	15-3-50 18-5-50 24-12-50	HVL 1.75 Cu 2000 r 2000 r 4000 r	29-4-50 21-6-50 19-2-51	On 7-9-1950 the tumour showed good condensation and control. On 14-11-1950 there was still further extension. No improvement was seen there-after and developed lung secondaries in April 1951 and died a few weeks later. The 2nd course was given on a/c of recurrence. There was no recurrence till Oct. 1952 when last seen. Pt. did not return afterwards.
2	25/51	B. L.	16	M	9 months	H/o of injury, pain swelling. Tumour in connection with periosteum removed. Swelling, pain	Erosion of the angle of the mandible	Fibrosarcoma	Mandible	25-1-51 11-12-51	HVL 1.75 Cu 4000 r 5000 r	17-2-51 9-1-52	
3	147/51	C.	26	M	3 months		Osteoclastoma	Spindle-cell sarcoma	Upper 1/3 tibia	24-5-51 18-7-51	HVL 1.5 Cu 3600 r 3600 r	15-6-51 9-8-51	Tumour spread was controlled and showed condensation when seen in Dec. 1951. Pt. not traced afterwards.
4	165/51	M.	15	M	3 months	H/o of injury, swelling pain	Osteolytic lesion of Rt. Maxilla suggestive of malignancy	Fibrosarcoma	Maxilla	6-6-52 17-7-52	HVL 1.75 Cu 4000 r 2000 r	25-6-52 22-7-52	The Pt. did not show much response after the 1st course and his maxilla was removed and given a post-operative course. Pt. did not return for follow-up.
5	342/51	B.	12	F	4 months	Rapidly enlarging swelling, pain, disability.	Osteogenic sarcoma	Aspiration biopsy blood	Left acetabulum	5-11-51	HVL 1.75 Cu 4000 r	28-12-51	Lesion was progressive radiation had no effect when seen in Jan. 1952.
6	380/51	C. S.	50	M	1 year	pain 1 yr. swelling, 2 months.	Osteogenic sarcoma	Fibrosarcoma	Lt. iliac bone	11-12-51	HVL 1.75 Cu 5600 r	29-1-52	No response — not seen after Feb. 1952.
7	168/52	F.	50	M	2 months	Swelling, pain, fungating tumour	Malignant destruction of Rt. Maxilla and Zygoma	Fibrosarcoma	Maxilla & Zygoma	20-2-52	HVL 1.75 Cu 5000 r	27-3-52	Tumour had considerably reduced in size and the wound had healed when treatment was stopped; patient did not return for follow-up.
8	522/52	D.	14	F	3 months	Swelling, pain, disability after injury	Osteogenic sarcoma	Spindle-cell sarcoma	Lower 1/3 Rt. femur	18-8-52	HVL 1.75 Cu 3200 r	8-10-52	Radiation had no effect.

TABLE No. 5—(Contd.)

Case No. (1)	Name (3)	Age years (4)	Sex (5)	Duration (6)	Clinical features (7)	Radiological findings (8)	Histopathology (9)	Site (10)	Treatment (12)		Date (13)	Result, follow-up and remarks (14)
									Date (11)	Approximate tumour dose		
9	308/53	R. R.	40	M	4 months	Pain, swelling, disability	—	Rt. iliac bone	12-5-53	HVL 1.75 Cu 3000 r	28-5-53	Treatment interrupted on a/c of bed sores; no improvement seen.
10	427/53	G.	15	F	10 months	Rapidly growing tumour & disability	Sarcoma	Rt. iliac bone	18-7-53	HVL 1.75 Cu 3600 r	14-8-53	No improvement when last seen in Jan. 1954.
11	472/53	R. L.	70	M	1 year	Pain, swelling, disability	—	Rt. iliac bone	19-8-53	HVL 1.75 Cu 800 r	—	Pt. interrupted treatment; not traced.
12	509/53	M. C.	12	M	2 months	Swelling, pain	—	Mandible	22-9-53	HVL 1.75 Cu 3000 r	10-10-53	Pt. developed skin reaction. Treatment was suspended & did not turn up. Result not known. Pt. did not return for follow-up.
13	549/53	B. R.	18	M	3 months	Pain, swelling	Sarcoma	Lt. Scapula	22-10-53	HVL 1.75 Cu 5000 r	24-11-53	While under treatment patient developed lung secondaries.
14	594/53	S. L.	7	M	2 years	Tumour operated twice, trunion of outer table of parietal bone	Fibro-sarcoma	Skull	26-11-53	HVL 1.75 Cu 4000 r	19-12-53	
15	108/54	A. D.	35	M	1 year	Swelling, pain, disability, atrophy of muscles	Fibro-sarcoma	Femur upper 1/3	14-1-54	HVL 1.75 Cu 5000 r	19-2-54	The tumour had reduced in size and pt. was comfortable when last seen on 4-5-1954.
16	229/54	J.	35	F	2 months	Pain, swelling	—	Frontal bone	10-3-54	HVL 1.75 Cu 4000 r	1-4-54	Patient not traced.
17	362/54	G. D.	55	F	1 year	Pain, swelling, headache, left hemiplegia	—	Rt. parietal bone	28-4-54 13-7-54 30-12-54	HVL 2.0 Cu 5000 r 3000 r 3000 r	11-6-54 3-11-54 21-1-55	No improvement seen till 8-7-1957; not traced afterwards.
18	422/54	B. C.	30	M	2 years	Pain swelling, disability	—	Right acetabulum	28-5-54	HVL 2.0 Cu 4800 r	2-7-54	Patient not traced.
19	774/54	P. B.	60	F	1 year	Pain, swelling	—	Right Clavicle	30-11-54	HVL 1.75 Cu 1000 r	—	Patient did not complete the treatment.
20	241/55	D. D.	16	F	4 months	Amputation of femur for sarcoma in Nov. '52	—	Right acetabulum	28-5-55	HVL 2.0 Cu 4800 r	6-4-55	Patient not seen after June 1955.
21	661/55	G.	20	F	6 months	Swelling	—	Rt. Humerus shaft	—	—	—	No treatment was possible as Pt. had secondaries.
22	220/56	S. R.	26	M	10 months	Swelling	Fibro-sarcoma	1st metatarsal	22-2-56 5-6-57	HVL 1.75 Cu 3000 r 4000 r	15-3-56 4-7-57	He was well for more than a year and did not come for a follow-up. Swelling restarted and hereported on 4-6-1957 when enlargement of tumour and path. fr. was noticed. In spite of further radiation, no improvement was noticed when last seen on 7-10-57.
23	292/56	B. L.	30	M	1 year	Pain, swelling	Fibro-sarcoma	Left iliac bone	21-3-56	HVL 1.75 Cu 4000 r	4-5-56	Treatment stopped on a/c of skin reaction. Pt. did not return.
24	382/56	U.	15	F	2 months	Swelling, pain	Sarcoma	Rt. Scapula	15-5-56	HVL 1.75 Cu 7000 r	23-6-56	Pt. died on 6-7-1956.
25	413/56	B.	10	F	6 months	Swelling, disability	Sarcoma	Rt. Maxilla	23-5-56	HVL 1.75 Cu 7000 r	6-7-56	No evidence of improvement. Patient did not return.
26	702/56	A. K.	10	M	1 month	4 months back leg was amputated for sarcoma fibula. Now pain in back	Histopathology of fibula osteogenic sarcoma	9 D. V.	27-9-56	HVL 2.0 Cu 3200 r	7-11-56	While under treatment, patient developed secondaries in the lungs and died after three weeks.
27	745/56	S. C.	30	M	2 years	Swelling, cold abscess	Osteogenic sarcoma	11, 12 ribs	18-10-56	HVL 2.0 Cu	7-11-56	Patient did not return of follow-up.
28	596/56	C. P.	20	M	2 months	Swelling	Osteogenic sarcoma	Lt. fibula lower 1/3	13-8-56	HVL 2.0 Cu 2200 r	—	Pt. developed lung secondaries while under treatment.
29	255/57	S. R.	24	M	4 months	Swelling, pain	Ossifying fibro-sarcoma	Mandible	27-8-57	HVL 2.0 Cu 2000 r	—	Patient interrupted the treatment and not traced.
30	323/57	A. S.	25	M	6 months	Pain, swelling	Osteogenic sarcoma	Left acetabulum	30-3-57	HVL 2.0 Cu 2000 r	—	Patient developed secondaries in the lungs while under treatment.
31	776/57	B.	45	M	6 months	Swelling, pain, disability	—	Lt. Scapula	14-11-57	HVL 2.0 Cu 3000 r	—	Patient still under treatment.

Chondro-Sarcomas (Table No. 7)

This group includes nine cases comprising of chondro-sarcomas and chondro-myxo-sarcomas. The Table No. 6 shows the age, sex and site distribution.

Table No. 6

(Age, sex and site distribution Chondro-sarcomas).

Males-7, females-2.

Age: 11-20 years one; 21-30 years five and 31 above, three.

Duration of symptoms — minimum 2 months, maximum 3 years average— 2 years.

Hip bone	...	2
Rib	...	2
Scapula	...	2
Femur	...	1
Tibia	...	1
Palate	...	1
Total	...	9

In table seven are given the details of all the cases coming under this heading. It may be seen that two patients did not complete the treatment and two are still under observation and in rest five cases, there is no follow-up to say anything about the result.

Ewing's Sarcomas (Table No. 9)

There were nine cases of this category. Table No. 8 gives the age, sex and site distribution, while Table No. 9 gives the details of treatment and subsequent results.

Table No. 8

(Age, sex and site distribution of Ewing's sarcomas).

Males-4, females-5.

Age: 1-10 years two; 11-20 years five and 21-30 years two.

Duration of symptoms — minimum 1 month, maximum 2 years average — 7 months.

Femur	...	7
Rib	...	2
Total	...	9

It will be seen from Table No. 9 that six patients did not report for follow-up; two died while under observation and one did not show any response to treatment.

Malignant Giant Cell Tumour (Table No. 10)

These were only four in number, two males of 15 and 20 years and two females of 20 and 57 years, and duration of symptoms was less than six months and as will be seen from Table No. 10, two interrupted the treatment, one is still under treatment and one showed some improvement while he was under observation for a short period.

Plasma-Cell Myelomas (Table No. 11)

As may be seen from Table No. 11, there were only two cases of plasma-cell-myeloma, one male of 40 years and another female of 56 years. One patient was treated with small doses intermittently over a period of years and she lived for eight years from the detection of the disease. The other patient was also treated with moderate doses and was coming for follow-up for about six months after the treatment was stopped.

Neuroblastomas (Table No. 12)

Three cases of Neuroblastomas are shown in Table No. 12. All the three are of eleven years age, one male and two females; duration of illness being less than three months.

TABLE No. 7
CHONDRO-SARCOMAS OF BONE

Case No.	Sex	Age years	Name	Duration	Clinical features	Radiological findings	Histo-pathology	Site	Treatment		Result, follow-up and remarks
									Date (11)	Approximate Tumour dose (12)	Date (13)
1	F	30	J.	6 years	Swelling and blood discharge from nose	Malignant Osteogenic tumour of hard palate extending through both Maxilla	Chondro-sarcoma	Hard Palate and both Maxilla	10-1-57	HVL 1.75 Cu 1400 r	—
2	M	35	M.L.	2 years	Tumour resected in 1952, now recurrence	Osteolytic tumour of the ant. end of Rt. 4th rib	Chondro-sarcoma	Rt. 4th rib	1-6-54	HVL 1.75 Cu 3000 r	19-6-54
3	M	28	K.N.	2 months	Swelling, pain, disability	Malignant osteolytic tumour	Chondro-sarcoma	Right scapula	11-5-55	HVL 1.75 Cu 3300 r	4-6-55
4	M	38	D.R.	3 years	Swelling	Osteoclastoma	Chondro-myxo-sarcoma	Rt. tibia lower 1/3	8-6-56	HVL 2.0 Cu 6000 r	25-7-56
5	M	30	C.R.	8 years	Tumour Rt. thigh suddenly growing during last 10 months	Osteogenic Malignant tumour	Chondro-sarcoma	Rt. femur lower 1/3	13-7-52	HVL 2.0 Cu 5200 r	16-8-56
6	F	17	T.D.	2 years	Pain, swelling	Osteolytic tumour showing irregular trabeculae and periosteal reaction	Chondro-myxo-sarcoma	Lt. iliac bone	22-11-56	HVL 2.0 Cu 4800 r	28-12-56
7	M	32	D.C.	6 months	Pain, disability	Malignant osteolytic lesion of acetabulum	Chondro-sarcoma	Left acetabulum	27-2-57 9-5-57 1-8-57	HVL 2.0 Cu 4800 r 3200 r 3200 r	3-4-57 4-6-57 28-8-57
8	M	25	R.S.	2 months	Swelling, pain	Malignant tumour 6th rib	? Chondro-sarcoma	6th rib	5-6-57	—	—
9	M	30	N.	2 months	Pain, swelling, disability	Osteolytic malignant tumour of scapula	Chondro-myxo-sarcoma	Rt. Scapula	14-11-57	HVL 2.0 Cu 3000 r	18-12-57

TABLE No. 9
EWING'S SARCOMAS

Case No. (1)	Name (2)	Age years (3)	Sex (4)	Duration (5)	Clinical features (6)	Radiological findings (7)	Histo-pathology (8)	Site (9)	Treatment (10)		Result, follow-up and remarks (11)
									Date (12)	Approximate tumour dose (13)	
1	304/51	B.K.	M	4	2 months	Pain, swelling	Intra-medullary expanding tumour with bone destruction and sclerosis	Femur mid 1/3	3-10-51	HVL 1.75 Cu 3200 r	Pt. did not report for follow-up.
2	191/53	P.	F	6	2 years	Swelling, pain	Osteolytic tumour suggestive of Ewing's	Femur and skull	3-3-53	HVL 1.75 Cu 3000 r each	Had already secondary in the skull; when seen on 29-5-1953 there were secondaries in other bones & lungs. Pt. died later. Patient did not return for follow-up.
3	401/53	K.L.	M	30	18 months	Swelling, pain	Osteolytic tumour with path. fr. ? Ewing's	Femur upper shaft	24-6-53	HVL 1.75 Cu 5600 r	Patient did not report for follow-up.
4	278/53	S.	F	20	4 months	Swelling, pain	Osteolytic tumour	Femur upper 1/3 and skull	28-4-53	HVL 1.75 Cu 3000 r each	Patient did not report for follow-up.
5	868/56	S.	F	30	2 months	Swelling, pain	Osteolytic tumour mid-shaft femur. Secondary in lung	Femur	20-12-56	HVL 2.0 Cu 3600 r each	Patient did not report for follow-up.
6	469/56	R.P.	M	14	1 month	Pain, swelling	Osteolytic tumour mid-shaft femur	Femur	19-6-56	HVL 2.0 Cu 4800 r	Swelling had reduced and disability improved when seen in Aug. 1956. Pt. did not return later.
7	539/56	P.L.	F	16	2 months	Pain	Extra pulmonary intrathoracic tumour with destruction of 6th rib	6th rib right	27-6-56 12-10-56 1-2-57	HVL 2.0 Cu 3000 r 1800 r 1600 r	Pt. had considerably improved in April 1957 and tumour reduced. Rib showed regeneration and began attending school but in Aug. of the same year, developed secondaries in all bones and soon died. Patient did not report afterwards.
8	858/56	S.	F	13	1 month	Pain	Expanding malignant tumour 8th rib	8th rib right	18-12-56	HVL 2.0 Cu 2800 r	No response when seen on 4-10-1957. It is reported that the tumour increased to an enormous size and Pt. developed skull metastasis when last seen in Dec. 1957.
9	639/57	V.B.	M	20	4 months	Pain disability	Expanding malignant osteolytic tumour	Femur upper 1/3	9-9-57	HVL 2.0 Cu 3200 r	

TABLE No. 10
MALIGNANT GIANT CELL TUMOUR

Case No. (1)	Name (2)	Age years (3)	Sex (4)	Duration (5)	Clinical features (6)	Radiological findings (7)	Histo-pathology (8)	Site (9)	Treatment (10)		Result, follow-up and remarks (11)
									Date (12)	Approximate tumour dose (13)	
1	643/52	H. S.	M	4 months	Swelling, blood discharge from nose, pain in left eye	Expanding lesion of Lt. Maxillary antrum with irregular bone trabeculae & destruction of the walls	Malignant Giant cell Tumour	Left Maxilla	23-12-52	HVL 1.75 Cu 6000 r	Pt. was last seen in Oct. 1953 when he was symptoms free and showed condensation of the tumour.
2	559/55	A.	F	6 months	Swelling, pain	Osteolytic expanding tumour	Malignant Giant cell Tumour	Right Tibia lower 1/3	29-7-55	HVL 2.0 Cu 3000 r	Patient interrupted the treatment and has not reported again.
3	688/57	B.	F	6 months	Large fungating tumour	Expanding osteolytic tumour	Malignant Giant cell Tumour	Ulna lower 1/3	1-10-57	HVL 2.0 Cu 1200 r	Patient interrupted the treatment and not seen afterwards.
4	715/57	T.M.	M	6 months	Pain, disability	Expanding lesion neck femur with irregular trabeculae extending into head of femur	Malignant Giant cell Tumour	Femur upper 1/3	10-10-57	HVL 2.0 Cu 3200 r	Still under treatment.

TABLE No. 11
PLASMA CELL MYELOMAS

1	398/53	S.	56	F	6 months	She was previously treated as a case of bone malignancy since 1947 with varying doses at various times	Osteolytic lesion Lt. ilium and sacrum. Iliac position showing sclerosis	Plasma cell Myeloma	Ilio-sacral lesion and Lt. clavicle	23-6-53	—	6-11-54	This patient was treated with small doses at various times whenever she got pain and swelling. She died in early 1955-nearly eight years after the initial lesions were detected.
2	504/56	H. S.	40	M	5 months	Pain and paraplegia	Collapse of 7 C. V. and 3rd D. V. Osteolytic lesion of the sternum	Plasma cell Myeloma	Spine, Sternum	4-7-56 5-12-56	HVL 2.0 Cu 2400 r 1600 r	4-9-56 24-1-57	Patient was able to walk and had no pain when seen on 5-11-1956 and another course was given. It was found on 12-4-1957 that 2 C.V. was also involved which was also treated. Pt. was better when last seen on 29-6-1957. He has not reported since.

TABLE No. 12

NEUROBLASTOMAS OF BONE

No.	Case No.	Name	Age years	Sex	Duration	Clinical features	Radiological findings	Histo-pathology	Site	Treatment		Result, follow-up and remarks	
										Date	Approximate Tumour dose		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	778/55	A.K.	11	M	1 month	Pain, swelling	Chr. Osteomyelitis (Feb. '55) Bone Malignancy (Dec. '55)	Neuroblastoma	Tibia and femur	7-12-55 24-3-56 16-5-56 16-9-57	HVL 1.75 Cu 3000 r 2000 r 2000 r	23-12-55 26-4-56 10-6-56 9-10-57	This Pt. was first seen in February 1955 and was suspected of Chr. Osteomyelitis upper end tibia and biopsy after curettage also suggested the same. The disease went on progressing and it was noticed in October 1955 that his femur is also being affected. At this stage a diagnosis of bone malignancy was offered and the leg was amputated at mid thigh. On section the diagnosis of Neuroblastoma was made. After amputation, he developed secondaries in inguinal gland which reduced after treatment. In March 1956, he developed secondaries in Rt. lower and Lt. upper lobes which disappeared with radiation between 16-5-1956 and 10-6-1956 he was treated for a secondary in Rt. upper zone and between 16-9-1957 and 9-10-1957 he was treated for secondaries in Lt. lower zone. Pt. is quite well except for his lost leg, when seen recently in January 1958.
2	143/56	K.D.	11	F	3 months	Swelling, pain	Osteolytic lesion of Lt. temporal bone. ? Pressure erosion	? Ewing's ? Neuroblastoma	Left temporal bone	24-1-56 25-6-57	HVL 1.75 Cu 4000 r 2000 r	19-2-56 5-7-57	The tumour had reduced after the first course and Pt. was asked to report after 4 weeks which she did not do till 25-7-1957 when she came with a recurrence in the same place. The second course of treatment was stopped on 5-7-1957; the mass had disappeared and patient was symptom free and was asked to report after 3 weeks which she has not done so far.
3	84/56	R.	11	F	6 months	Swelling, pain	Osteolytic tumour of femur	Neuroblastoma	Femur	8-1-56	—	—	Patient refused treatment after one sitting.

TREATMENT OF PRIMARY BONE TUMOURS BY X-RAY THERAPY



Fig. V (a)

Fig. V (b)

Fig. V (a and b) Case No. 440/56 Chondro-myxo-sarcoma, lower end tibia.

(a) Before treatment. (b) After treatment.

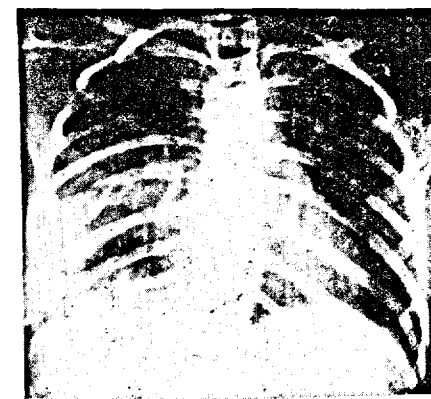


Fig. VI (a)

Fig. VI (b)

Fig. VI (a and b) Case No. 539/56 Ewing's tumour of the rib.

(a) Before treatment—note a large intra-thoracic mass with destruction of the 6th rib.

(b) After treatment—there is marked recession of the mass and regeneration of the rib.

Patient later died of secondaries in the skull and brain.

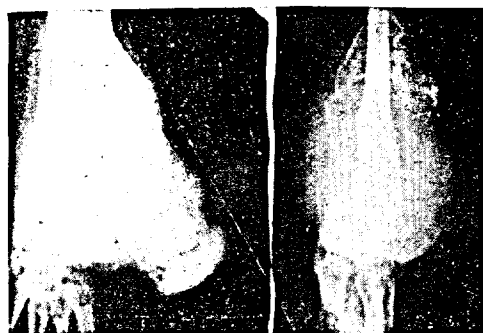


Fig. VII.

Case No. 688/57 the tumour is breaking through the soft tissue and fungating. Patient did not complete the treatment.



Fig. VIII.

Case No. 398/53 Plasma-cell-myeloma. The lesion seen after control with radiation. The patient lived for eight years with small doses of repeated radiation.



Fig. IX (a)



Fig. IX (b)

Fig. IX (a and b) Case No. 778/55.

(a) Skiagram when the case was diagnosed as chr. osteomyelitis.

(b) When it was diagnosed Ewing's sarcoma.

The ultimate histo-pathologic diagnosis is neuro-blastoma. (Please see Table No. 12 for details).

One refused any treatment; the other one was alive for more than one year when last seen and is presumed to be alive still and the third is so far doing well.

again, the second one did not come for follow-up and in the third, the result was disappointing.

Undifferentiated Malignant Bone Tumours (Table No. 13)

In this group are included those six cases which clinically, radiologically and histopathologically were diagnosed as bone malignancies, but histologically it was not possible to place them in any of the recognised groups. The other reason for making a separate group of these lesions is that these tumours have shown most encouraging results of all bone malignancies. Out of six, five were below twenty years of age and the sixth was aged 62 years; four were males and two females. In five cases the duration of symptoms was less than six months and in one, it was three years. In all these cases a high tumour dose was attempted as it was done in cases of osteo-sarcomas. It may be seen from the table that two out of six did not turn for a sufficiently long follow-up and remaining four are still alive for over six years.

Chordomas (Table No. 14)

As shown in Table No. 14, there were five cases of chordomas, all males, more than 30 years old, in one case duration of symptoms was nearly two years and in other four less than one year. Two interrupted the treatment, one died, one did not turn for follow-up and in the last case it is too early to evaluate the result of the treatment.

Eosinophilic Granuloma of Bone (Table No. 15)

There were only three cases of Eosinophilic granuloma of the bone. In one case, the treatment was suspended on account of radiation sickness and patient did not come

Adamantinomas (Table No. 16)

Only two cases of adamantinoma were referred for treatment during the period under review; both males aged 65 and 20 years. In one case, duration of symptoms was 5 months and in the other, two years. The first one showed control of primary lesion but developed secondaries in lungs and spine soon after. The second patient showed condensation of the lesion when seen three months after completion of treatment and there is no further follow-up.

Tumours of the vertebrae (Table No. 17)

These six cases are grouped specially because they showed lesions of a single vertebrae and all attempts to locate the primary in other regions failed; attempts for getting biopsy material either failed or no biopsy was made and invariably showed highly satisfactory result after radiation. Three were males and other three females. One was sixteen years of age and all others were more than thirtyfive and duration of symptoms varied from 4 months to 18 months. Except in one case, where the treatment was interrupted, all other cases show very good result.

Discussion

It will be seen from the preceding pages that in cases of benign bone tumours, such as osteoclastomas, the results can be considered as encouraging and it should be given in all cases specially where surgical excision of the tumour cannot be done for some reason or the other. The bone malignancies are usually divided into three groups according to their response to radiation—

TABLE No. 13

UNDIFFERENTIATED MALIGNANT BONE TUMOURS

Case No.	Name	Age years	Sex	Duration	Clinical features	Radiological findings	Histo-pathology	Site	Treatment			Result, follow-up and remarks	
									Date	Approximate Tumour dose	Date		
1	152/50	M. N.	16	M	3 months	Swelling, pain, clavicle resected. Local recurrence in 20 days, hard supraclavicle tumour	Pre-operative osteogenic sarcoma. Post-operative, small calcification seen in the soft tissue	Undifferentiated bone malignancy	Left clavicle	22-6-50	HVL 1.75 Cu 4000 r	14-7-50	Last seen on 9-1-56, no recurrence.
2	238/51	S. S.	62	M	2 months	Swelling, pain	Osteogenic sarcoma	Undifferentiated bone malignancy	Sternum	9-8-51 30-11-51 10-2-53 22-5-54	HVL 1.75 Cu 3000 r 2000 r 3600 r 1600 r	23-8-51 11-12-51 3-3-53 29-6-54	Pt. was to attend irregularly; whenever he used to get pain and swelling he was treated. Last time he came with secondary in sacroiliac region and was treated with a tumour dose of 3000r and when he was last seen on 15-7-1957 he was relieved of his symptoms. Tumour completely reduced, rib regenerated. Some fibrosis seen at rt. lung base. Last seen Jan. 1958, a normal healthy young boy of 17 attending school. Tumour completely reduced. Patient had no symptoms when seen in Jan. 1952. Patient not seen afterwards.
3	297/51	N. C.	10	M	6 months	Pain, haemorrhagic effusion chest	Extra pulmonary intrathoracic tumour arising from 5th rib with destruction of bone	Highly anaplastic tumour	Right 5th rib	27-9-51 11-12-51	HVL 1.75 Cu 4000 r 1000 r	7-11-51 21-1-52	Pt. was last seen in Oct. 1957. No severe symptoms. The original biopsy report is not available, the surgeon who operated says it was osteogenic sarcoma. But in view of long survival and no distant metastasis, the case is placed in this group. Patient did not return for follow-up.
4	243/51	S.	16	F	8 months	Enlarging swelling	Malignant osteolytic lesion of the zygoma	Undifferentiated bone malignancy	Right Zygoma	14-8-51	HVL 1.75 Cu 5000 r	14-9-51	
5	359/51	K.	13	F	3 years	Pain, swelling operated in Apr. 1949 and part of temporal and parietal bone removed. Now has a recurrence	Osteogenic sarcoma	Original biopsy report not available.	Left Parietal and temporal bone	20-11-51	HVL 1.75 Cu 10000 r given in various course	20-3-56	
6	436/53	T. S.	19	M	2 months	Pain	Osteogenic sarcoma with path. fracture	Undifferentiated bone malignancy	Lower femur 1/3	17-7-53	HVL 1.75 Cu 6000 r	10-9-53	

TREATMENT OF PRIMARY BONE TUMOURS BY X-RAY THERAPY

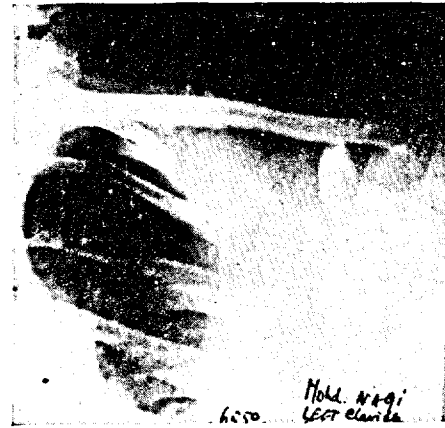


Fig. X (a)



Fig. X (b)

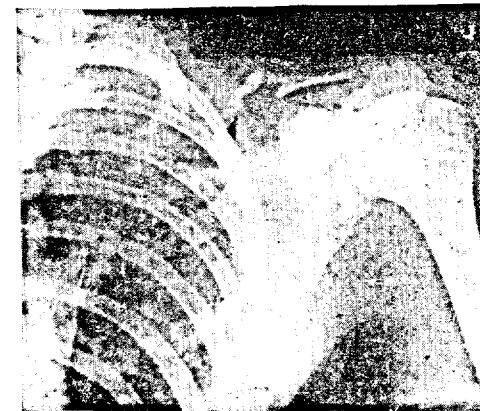


Fig. X (c)

Fig. X (a, b and c) Case No. 152/50.

- (a) Before operation diagnosed as osteogenic sarcoma.
 (b) After resection of the clavicle, the arrow points to an area of calcification with sun-ray appearance thought as recurrence.
 (c) After radiation.

Patient is alive doing his normal work. (See Table No. 13 for details).

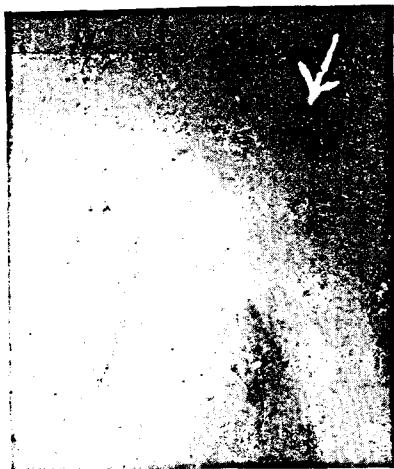


Fig. XI (a)



Fig. XI (b)

Fig. XI (a and b) Case No. 238/51.

- (a) Shows an osteolytic lesion on the anterior surface of the sternum, diagnosed as sarcoma of the bone. Histo-pathologic finding was undifferentiated tumour.
(b) Skiagram taken in 1957 about 6 years after the treatment on the sternum.

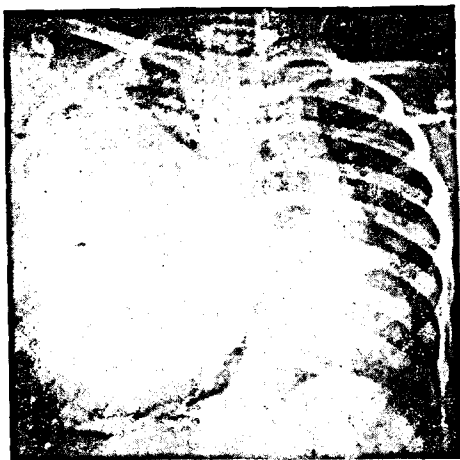


Fig. XII (a)

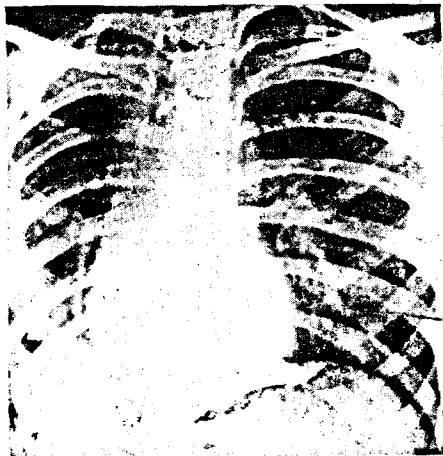


Fig. XII (b)

Fig. XII (a and b) Case No. 297/51.

- (a) A large intrathoracic extrapulmonary mass with destruction of 4th rib and haemorrhagic effusion; skiagram taken after aspiration and pneumothorax radiologically diagnosed as Ewing's tumour of the rib; histopathology—highly anaplastic tumour.
(b) Skiagram after treatment.

Patient is alive and doing normal work. (See Table No. 13 for details).

TABLE No. 14
CHORDOMAS

S. No.	Case No.	Name	Age years	Sex	Duration	Clinical features	Radiological findings	Histo-pathology	Site	Treatment			Result, follow-up and remarks
										Date (11)	Approximate Tumour dose (12)	Date (13)	
1	369/51	K.S.	60	M	2 years	Pain, dysurea	Large osteolytic tumour ? Malignancy	Chordoma	Sacrum	28-11-51	HVL 1.75 Cu	13-12-51	Patient interrupted the treatment; did not report later.
2	545/52	T.B.	55	M	10 months	Pain, swelling, difficulty of micturition and defaecation	Extensive malignant osteolytic lesion	Chordoma	Sacrum	8-10-52	HVL 1.75 Cu 1600 r	17-10-52	Patient interrupted the treatment and not seen afterwards.
3	593/56	J.S.	31	M	6 months	Fungating growth on the back extending from the level of 2 L. V. to mid. sacrum	Osteolytic lesion on the posterior surface of sacrum	Chordoma	Sacrum	11-8-56	HVL 1.75 Cu 3000 r	3-9-56	The ulcer had healed and there was condensation of the sacrum when he was seen on 15-11-1956. Patient left for his village and has not reported since.
4	294/57	J.	30	M	8 months	Pain, swelling, paraplegia	Extensive osteolytic lesion of sacrum. Suggestive of Malignancy	—	Sacrum	22-3-57	—	—	Pt. died after he had hardly received a few sittings.
5	732/57	V.L.	30	M	5 months	Pain, swelling, paraplegia	Extensive osteolytic lesion of sacrum	Chordoma	Sacrum	24-10-57	HVL 1.75 Cu 4000 r	3-12-57	Too early to give result.

TABLE No. 15
EOSINOPHILIC GRANULOMA

S. No.	Case No.	Name	Age years	Sex	Duration	Clinical features	Radiological findings	Histopathology	Site	Treatment		Result, follow-up and remarks
										Date (11)	Approximate Tumour dose (12)	
1	318/56	J. R.	28	M	5 months	Paraplegia imperfect control over bladder and rectum	Osteosclerotic lesion with some destruction of 10 DV, occiput and rt. 6th rib	Eosino-philic granuloma	10 DV, skull and rib	14-5-56	HVL 2.0 Cu 2600 r	Paraplegia symptoms were better but Pt. developed severe radiation sickness and treatment had to be suspended. Pt. did not return.
2	506/57	S. C.	25	M	4 months	Pain, swelling, disability	Expanding intra-medullary lesion about 6 cm. away from upper end	Eosino-philic granuloma	Tibia shaft	18-6-57	HVL 2.0 Cu 3200 r	Patient did not report for follow-up.
3	529/57	B.	27	F	1 year	Pain 1 year diagnosed as T. B. and immobilised paraplegia 20 days	Concertina collapse of 10 D. V.	Eosino-philic granuloma	10 DV	3-7-57	HVL 2.0 Cu 2800 r	There was no relief in paraplegia in spite of decompression and radiation. The patient went to Neuro-surgeon who did a complete laminectomy and histopathology reported to be "Eosino-philic Granuloma". Reti-culum cell sarcoma. However, patient developed glandular metastasis in the neck; biopsy of one of these glands confirmed Reticulum cell sarcoma.

TABLE No. 16
ADAMINTINOMAS

S. No.	Case No.	Name	Age years	Sex	Duration	Clinical features	Radiological findings	Histopathology	Site	Date (11)	Approximate Tumour dose (12)	Result, follow-up and remarks
1	631/52	N. S.	65	M	5 months	Pain, swelling	Expanding osteolytic lesion of the mandible	Adeno-cystic basal cell carcinoma	Mandible	17-12-52 16-4-53	HVL 1.75 Cu 6000 r 2600 r	Good condensation of the tumour was seen on 5-10-1953 with maintained improvement when it was found he had developed secondaries in lungs and spine.
2	356/56	M. A.	20	M	2 years	Pain, swelling	Expanding osteolytic lesion with irregular trabeculae	Adenoma	Mandible	25-4-56 4-7-56	HVL 2.0 Cu 2600 r 3000 r	Swelling had considerably receded and pain disappeared; x-ray showed condensation of tumour when last seen in Nov. 1956. Patient has not reported later.

TREATMENT OF PRIMARY BONE TUMOURS BY X-RAY THERAPY



Fig. XIII (a)



Fig. XIII (b)

Fig. XII (a and b) Case No. 359/51.

- (a) Skiagram taken about a year after the operation for what was diagnosed to be osteogenic sarcoma.
(b) Skiagram taken after radiation treatment.

(For details See Table No. 13).



Fig. XIV (a)



Fig. XIV (b)

Fig. XIV (a and b) Case No. 631/52.

- (a) Skiagram taken before treatment shows extensive osteolytic lesion with a pathological fracture. Histologically diagnosed as adamantinoma.
(b) After treatment, nice healing with bone regeneration.

Patient later developed secondaries in lung and spine.



Fig. XV (a)



Fig. XV (b)

Fig. XV (a and b) Case No. 125/50.

(a) Before treatment. (b) After treatment.

(See Table No. 17 for details).

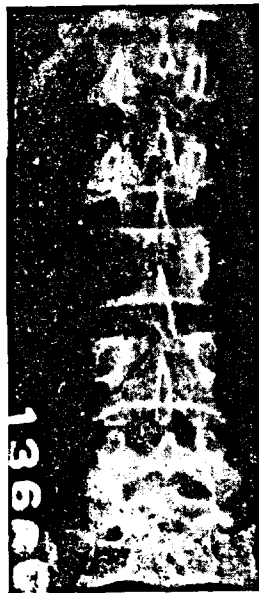


Fig. XVI (a)



Fig. XVI (b)

Fig. XVI (a and b) Case No. 450/52.

- (a) Skiagram taken before treatment shows osteolytic lesion rt. of transverse process and pedicle of 3rd L. V. Biopsy was unsuccessful.
- (b) Skiagram taken after treatment shows regeneration.

(Please See Table No. 17 for details).



Fig. XVII (a)



Fig. XVII (b)

Fig. XVII (a and b) Case No. 839/56.

- (a) Skiagram taken before treatment of a patient previously treated as a case of tuberculosis, shows osteolytic lesion of 5 C. V. with collapse and also of posterior parts of bodies of 4th and 6th; there is no involvement of intervertebral cartilages.
- (b) Skiagram taken after treatment shows progressive calcification of the lesion.

TABLE No. 17
TUMOURS OF VERTEBRAE

Case No.	Name	Age years	Sex	Duration	Clinical features	Radiological findings	Histo-pathology	Site	Treatment		Result, follow-up and remarks		
									Date	Approximate Tumour dose			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	125/50	W.P. B.	35	M	4 months	Pain in the back and difficulty in walking after injury	Concortina collapse of 5 L.V.	—	5 L.V.	23-5-50	HVL 1.75 Cu 4800 r	30-6-50	Pain completely gone while under treatment and condensation was seen. He was last seen on 16-8-1955 in good condition with no complaint.
2	450/52	S.K.	16	F	18 months	Pain	Osteolytic lesion rt. transverse process of 3 L.V.	Needle biopsy only blood was drawn	Transverse process 3 L.V.	25-7-52	HVL 1.75 Cu 3000 r	18-8-52	Condensation was first seen in skiagram taken on 25-10-1952 the last x-ray examination was done on 13-1-1955. No recurrence. Pt. is symptoms free till December 1957.
3	659/52	G.R.	41	F	11 months	Pain, paresis of lower limbs	Concortina collapse of 4 L.V.	—	4 L.V.	31-12-52	HVL 1.75 Cu 4000 r	3-2-53	She was practically symptom free when seen on 30-3-1953. It was noticed on 15-6-1953 that she was developing spondylosis and was given support. She was last seen in early 1955 in good condition.
4	790/55	H.N.	57	M	1 year	Pain with stiffness neck	Collapse of 2 C.V. with an osteolytic lesion	—	2 C.V.	13-12-55	HVL 2.0 Cu 2600 r	29-1-56	Condensation was seen early—no pain, some stiffness was present when seen on 11-7-1956. He was seen in late Dec. 1957 and still maintains the improvement.
5	329/56	B	55	F	10 months	Pain	Concortina collapse of 5 L.V.	—	5 L.V.	10-4-56	HVL 2.0 Cu 2400 r	3-5-56	Patient interrupted the treatment.
6	839/56	R.M.	50	M	18 months	Pain, stiffness	Osteolytic lesion of 4, 5, & 6 C.V. with complete collapse of 5 C.V.	—	4-5-6 C.V.	7-12-56	HVL 2.0 Cu 6000 r	15-2-57	This Pt. was previously treated as a case of tuberculosis with antibiotics and immobilization with no result. Pt. showed signs of improvement when seen on 2-4-1957. He was seen in Sept. 1957 when he showed good condensation of the lesion. It is reported in Jan. 1958 that he has resumed his normal duties.

resistant, responsive and sensitive. Osteosarcomas, chondrosarcomas and malignant giant cell tumours, are known to be radiation resistant and results of radiation treatment of these cases are discouraging with a very short survival rate. No doubt that most of the cases referred for radiation treatment are either advanced or inoperable being in inaccessible positions. From Table No. 4, it may be seen that out of 31 cases of osteosarcomas, 24 are in such positions as hip-bone, mandible, maxilla, scapula and skull etc. where surgery involves mutilating intervention. So also in cases of chondrosarcomas, out of nine cases seven are affecting hip-bone, ribs, scapula and palate. Ewing's sarcoma, though considered as radio sensitive, is also highly malignant giving rise to early distant metastasis. It is unfortunate that most of the patients of this group who received treatment did not return for follow-up; but early results were good in the sense that the tumour had receded sufficiently to make the patients comfortable, the physical function being regained. Cases of plasma-cell-myeloma being only two is too short a series to form adequate material for a general opinion. But it can be said that if there are a few localised lesions, judicious x-ray therapy may give good results with prolonged survival rate. Chordomas, eosinophilic granuloma and adamantinomas have also not given any encouraging results. The undiagnosed lesions of vertebrae which are shown under a separate group as tumours of the vertebrae have given very good response to radiation. The histopathologic nature of these tumours is unknown in the absence of biopsy. Now, coming to the group of undifferentiated bone malignancies, these tumours have given highly satisfactory results. It may be that some of these tumours, belong to the group of Reticulum

cell sarcomas. All six cases involve different bones of the body. If the benign lesions, vertebral tumours and chordomas are excluded from the present series, only 17 of bone sarcomas are left who were treated before the end of the year 1952. Out of these, only five show a survival rate of more than five years—one of plasma cell myeloma who died later and other four belonging to this group of undifferentiated bone malignancies—a significant result, though the series is too small to arrive at a percentage survival rate.

Summary

112 cases of various types of bone tumours are presented with their clinical, radiological and histopathologic background and the details of radiation treatment given with the post-radiation results. In a large number of cases, there is no follow-up, due to the present circumstances of illiteracy, poverty and out-look on life. A number of patients find it difficult to come back to the hospital for a check up; some probably do not bother; others have died of the disease. The results of radiation treatment of benign tumours such as osteoclastomas can be considered as satisfactory. The results in cases of bone malignancies have been generally disappointing except in one group which has been classified in these series as 'undifferentiated'. There is also another group of lesions of the vertebrae, where radiation has given encouraging results.

Acknowledgements

I am grateful to the Medical Superintendent, Irwin Hospital, New Delhi, for his kind permission to use the records and to all my colleagues for their willing co-operation.

Oesophageal Atresia with Tracheo-Oesophageal Fistula

BY

Om P. BHARDWAJ, M.B., B.S., D.M.R.E.*

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Oesophageal atresia with tracheo-oesophageal fistula was first described by Durston in 1670 and then by Gibson in 1697. For about two and a half centuries, the condition was completely neglected because it was seldom diagnosed during life. With recent dramatic advances in the surgical techniques, and post operative care, this anomaly has now become compatible with life, so greater interest is being taken in the establishment of an early diagnosis. The condition is relatively uncommon, but commoner than is generally realised and if recognised early, has become amiable to surgery. The radiologist plays quite an important role in the diagnosis and in the management of this condition, as it is largely by this method, the diagnosis of oesophageal atresia, recognition of its complications and results of its surgical correction are graphically recorded.

Prior to 1939, this abnormality was uniformly fatal throughout the world, in spite of the remarkable attempts on primary anastomosis by Lanman. In 1939 Ladd came out with a successful attempt with multiple stage operations. First direct successful primary anastomosis through the extra-pleural approach was reported by Haight and Townsley in U.S.A. in 1943, and by Franklin in 1947 in England. Later Gross in 1946, Sweet in 1950 from U.S.A., and Belsey 1950 from U.K. reported

successful direct anastomosis through transepleural approach. The highest survival rate is 67% by Gross. He operated upon all the 21 cases admitted in his hospital in 1952, and one third of these cases admitted in his hospital in 1952, and one third of these cases had extra oesophageal abnormalities.

First successfully treated case in India was reported by Udani and Billimoria in 1953. Except for a few isolated case reports, there is not much literature on this subject in India. A comprehensive analysis of 8 cases was reported in 1955 by Billimoria. Seven of which were operated upon with 43% success. In the same year Fletcher and Tackaro reported a case of this anomaly with unsuccessful surgery. Betts operated upon 3 cases of this anomaly admitted in his hospital but without success. All these cases were diagnosed late. This condition has rarely been thought over in this country due to the general unawareness of this anomaly, which makes the diagnosis possible, if at all, in the late stages. As this condition is supposed to be rare, therefore its possibility is often overlooked.

Purpose

The purpose of this paper, is to make the profession aware of the incidence of this condition, which is not so rare as is commonly thought. Awareness of the incidence of this condition, by the doctors, nurses and

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midwives, will make an early diagnosis possible, thereby, ensuring one of the conditions for successful surgical attempt, and also to review the published literature in India, and previously described roentgenological findings in this anomaly in the foreign literature and to present some observations made in our series of cases in this hospital.

Material for Study

Five cases of oesophageal atresia were admitted in the pediatric section of the M. Y. Hospital, Indore, in the past years, out of which 4 cases were in 1955, which were available for detailed roentgenological study. These cases were diagnosed fairly early, and only two showed aspiration pneumonia. Except for one infant which was premature and showed imperforate anus, no other extra oesophageal anomaly could be found. Unfortunately none could be operated upon.

Incidence

The literature offers conflicting statements as to the incidence. This condition is probably rare but more often present, than diagnosed. Shakowsky and Baron observed 1 in 50,000 births. Franklin in 1947, Turner in 1949 stated the incidence to be in the order of 1 in 2500 births but Belsey and Donnison in 1950 considered the incidence to be greater than 1 in 800. Billimoria states that the incidence in Bombay is about the same as estimated by Franklin and Turner. Four cases were diagnosed out of 10996, live births in this city, thus the incidence here roughly corresponds with that of Franklin and Turner. This is but definite, that many cases have gone undetected. If in 20% of the newly born, who die undiagnosed, or diagnosed as pneumonia or atelectasis, proper diagnosis were made and autopsies could have been possible in all

infant deaths, the incidence would definitely be much higher, and would correspond, probably with that of Belsey and Donnison.

Development of the Oesophagus and Embryogenesis

In order to obtain accurate concept of this anomaly and its various types, a brief resume of the embryology of the oesophagus would not be out of place. (Fig. I) illustrates the normal and abnormal development of the oesophagus. Most of the relevant embryological events take place between 5th and 10th week of foetal life. Until the 3rd week of embryonic life the oesophagus and trachea appear as a single structure (1). The upper half of the oesophagus and the trachea are derived from the pharyngeal segment and the lower half from the pregastric segment of the fore-gut. After the appearance of the tracheo-bronchial groove, in the 5th week, the separation of trachea and oesophagus is effected by the two lateral ridges, from the ingrowth of mesoderm which ultimately fuse in the Mid-line (2). After this separation, the Oesophagus rudiment and trachea undergo a rapid elongation (3). In the 6th week lumen of the Oesophagus becomes obliterated by rapid proliferation of its epithelial lining (4). Thus formerly patent tube passes through a solid stage for a short period, which again reverts back to its tube like status by a process of vacuolisation (5 & 6).

Gruenwald pointed out that this anomaly results from the failure of the coordination of two phases of development.

(1) Rapid elongation of trachea takes place before its complete separation from the Oesophagus. (3 a).

(2) The Oesophagus, which probably is solid at this stage (4 a) is drawn out along with the posterior wall of the trachea as a

thin cord or fragmented chain (6 a). The site of fistula in these cases depends upon the degree of separation at the time that caudal elongation of the trachea takes place. If this rapid growth takes place early, then the fistula will be near the carina, but if separation is almost complete, then the fistula will be high in trachea.

The embryogenesis of the Oesophageal atresia with or without tracheo-oesophageal fistula is still a very controversial subject. Various hypotheses have been brought forward to explain this anomaly. The most widely accepted theories with regard to the causes of this condition may be divided into 3 groups.

(i) Those dealing with retardation of oesophageal development before recanalisation of its lumen, as propounded by Keibel, Mall and Keith.

(ii) Those concerning deviation of tracheo-oesophageal septum as suggested by Shattock, Forsener and Huntington.

(iii) Those concerning change of tension as causative factor of deviation of the septum. The cause may be an abnormally large heart anlage, or an aberrant artery as postulated by Keith, Spicer, Krauses, Zdenic Fluss and Poppen. Presence of the aberrant artery has been well demonstrated roentgenologically by Neauhasur.

■ There is insufficient factual evidence to confirm mechanical theories and the cause is probably Gebetic *e.g.*, altered or deficient cell growth as suggested by Rosenthal. This view is further supported by Mac Kenzie series of this anomaly in 3 children of the same father but from 3 different mothers.

The following types of this congenital anomaly have been recognised (Fig. II).

Type I.—Complete agenesis of the oesophagus (a a).

Type II.—Oesophageal atresia with both ends blind without a fistula (b b).

Type III.—Oesophageal atresia with tracheo oesophageal fistula.

(a) Oesophageal atresia with upper segment communicating with the back of the trachea.

(b) Oesophageal atresia with lower segment communicating with the trachea.

(c) Oesophageal atresia with both segments communicating with the trachea.

Type IV.—Continuous normal oesophagus with tracheo-oesophageal fistula.

Type V.—Oesophageal stricture without any fistula.

Clinical Features

There is no doubt that early recognition of the Oesophageal atresia is of great importance, with regard to ultimate prognosis. It gives the Surgeon a better chance for successful surgery. The clinical findings in these patients are classical. This condition may be suspected, in the first instance when the infant brings up froth comprised of rather small bubbles which continues or increases. The total amount of oral secretions are not increased, but since the swallowing mechanism is blocked, the saliva and mucous drools out of the mouth, even during sleep. Any infant which brings up excessive salivation of frothy mucous, 24 hours after birth, should make one suspect oesophageal atresia. Regurgitation, attacks of temporary cyanosis and choking, on attempting to feed, are late symptoms. Abdomen also soon becomes distended and tympanitic and tends to increase whenever infant cries or strains due to the air being forced through the

fistula into the stomach, as a result of increased intra-thoracic pressure. Sometimes the clinical picture may be confusing in the presence of pulmonary complications and hence this anomaly may be overlooked. Confirmatory evidence is obtained from inability to pass an oesophageal catheter.

The value of the catheter, in diagnosis of this anomaly, is too much stressed. The catheter may coil up in the blind oesophageal pouch and so may be misleading for determining the patency of the oesophagus. Unless the aspiration of gastric contents is possible through the catheter, it is not to be relied upon. The catheter does not exclude the possibility of oesophageal stricture or patent normal oesophagus with tracheo-oesophageal fistula. Moreover, it fails to disclose whether there is any fistulous tract between oesophagus and trachea. Disclosure of this fistula is very important for surgical correction in addition to establishment of patency between the two oesophageal ends. Tucker and Pendergrass have mentioned a most elaborate catheter technique of visualising fistulous tract through a bronchoscope. I feel this is not advisable, as other signs are quite conclusive of its presence. In one of our cases, the clinical picture was diagnostic, however, the catheter was completely misleading, and clinical diagnosis was confirmed later on by radiological examination.

Roentgenological Features

In the literature various roentgenological features have been described, by which diagnosis of this anomaly is possible from the plain skiagram alone.

Plain Skiagrams and Fluoroscopy

The examination may be started with skiagrams in P.A. and Lateral projections if possible in the upright position.

In the lateral film a "Pencil like" air way leading from the bifurcation of the trachea to the stomach is seen (Fig. III & IV). This sign is due to the presence of air-filled lower oesophageal segment. The air cannot be demonstrated in the upper blind pouch of the oesophagus which is filled with retained secretions. This sign was first described by Solis Cohen and Levine. Three of our cases where lateral plain films were taken, showed this pencil like air way with no air in the proximal oesophageal end. Furhman believes this sign to be very unreliable pointing out that normal intra-pulmonary markings may simulate the pencil like air way. The lower end of the oesophagus, may be clearly seen in infants from the regurgitation of gas from the stomach and the gas may not be seen in the proximal end of the oesophagus in normal infants. No importance can be placed in the presence or absence of air in the proximal end of the oesophagus unless a dilated oesophageal pouch is outlined by swallowed or injected gas. A possibility of demonstrating a fluid level at the base of the pouch is quite conceivable in the upright lateral film. All my attempts have been quite unsuccessful to demonstrate fluid and gas.

Another characteristic sign in the plain lateral film is narrowing and anterior displacement of the trachea as a result of dilated and hypertrophied blind oesophageal pouch (Figs. III & V). This sign is very helpful in diagnosis of this anomaly and was first described by Selander. This sign was well demonstrated in our three cases where lateral skiagrams were taken.

Gas in the stomach and bowel

The presence of the gas in the stomach and bowel in the infants with oesophageal atresia, clearly indicates the presence of fistulous tract between the trachea or

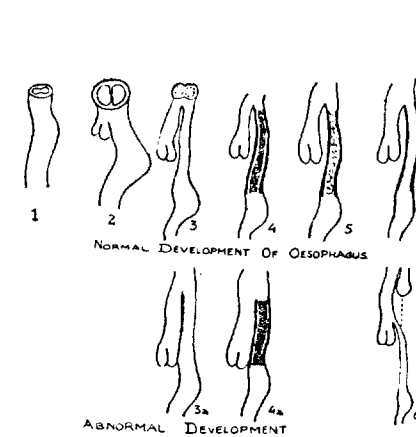


Fig. I

Normal and Abnormal development of the Oesophagus.

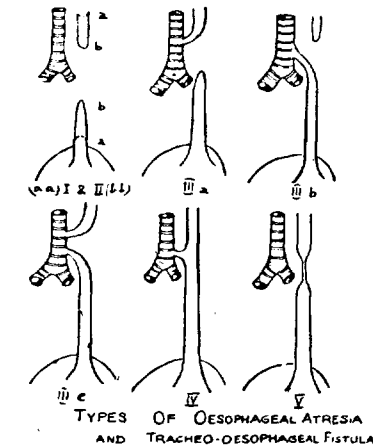


Fig. II

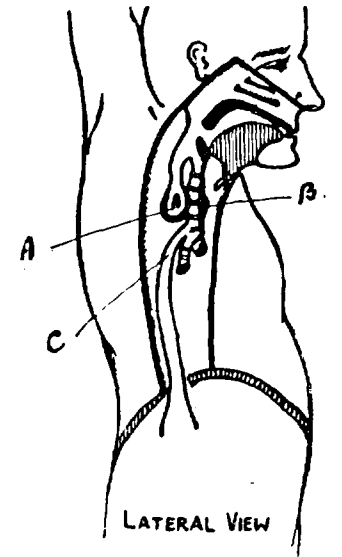


Fig. III

Diagrammatic sketch of the commonest type III-b of this anomaly showing distal oesophagus communicating with Trachea (a) and anterior displacement of the trachea as a result of dilated and hypertrophied blind oesophageal pouch (b).



Fig. IV

Lower Oesophageal end communicating with Trachea shows, "Pencil-like" Airways.



Fig. V

Trachea shows anterior displacement, as a result of dilated and hypertrophied blind oesophageal pouch.

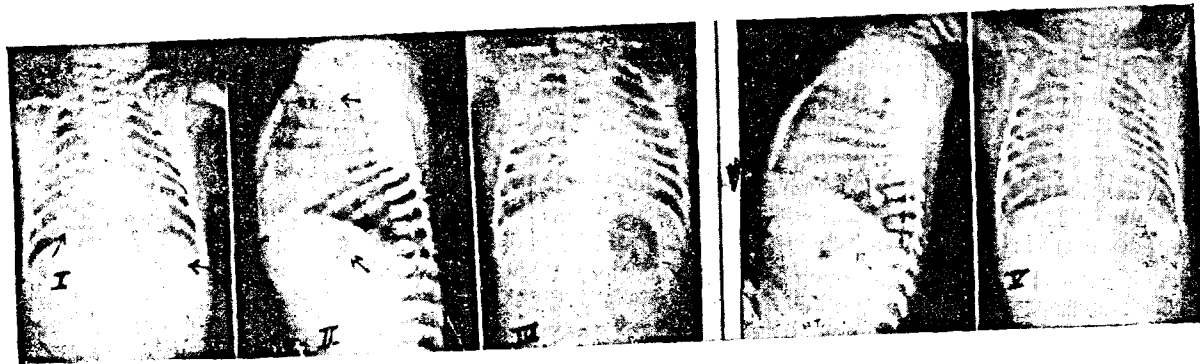


Fig. VI (a & b)

Increase of gas, in the stomach through the tracheo-oesophageal fistula, as a result of multiple inspirations.



Fig. VII

Aspiration Atelectasis of the left lung.

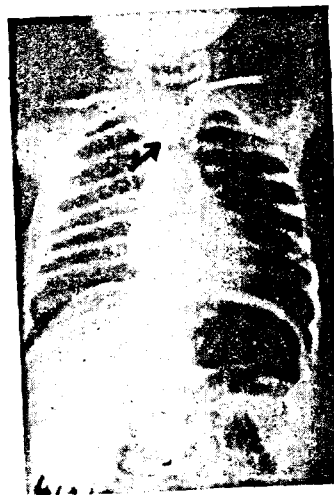


Fig. VIII

A. P. Erect film.

Shows blind oesophageal pouch filled with lipiodol and gas in the stomach and bowel as a result of tracheo-oesophageal fistula.



Fig. IX

Lateral film.

bronchus and the lower end of the oesophagus (Figs. VIII & IX). The gas in the stomach and bowel was seen in our all the four cases. Pronounced gaseous dilatation of the stomach mentioned as common clinical sign in these cases is physiological in the new born infants, and so is not of any importance.

Hall also mentioned the possibility of observing the distension of stomach with gas during inspirations under the fluoroscope, in these infants with oesophageal atresia and tracheo-oesophageal fistula. I have very eagerly looked for this sign and was able to observe it in our last case during the fluoroscopic examination. It has been clearly demonstrated in the series of these skiagrams taken one after another, after intervals. (Fig. VI).

Failure to visualise air in the stomach and bowel most of the time, for practical purposes, indicate absence of fistula. This may not be true always, as Holt and Haight series of 45 cases, 5 had no roentgenological evidence of gas in the stomach or bowel, which were diagnosed to have no fistulous communication between oesophagus and trachea, 2 out of these 5 cases showed a narrow fistulous tract during operation.

Recognition of complications

Plain skiagrams of the chest, without a contrast media, are very essential for final evaluation of the state of lungs more accurately. The presence of the opaque material in the oesophagus or overflowed opaque material into the lungs will obliterate the details. The importance of this careful analysis of the lungs preoperatively lies in the fact that some degree of pneumonic consolidation and atelectasis frequently occurs as a result of aspirations of attempted feedings or secretions within the pharynx and up per

oesophagus, which collect in the blind oesophageal pouch and tend to overflow into the lungs. In cases of fistulous tract from the lower end of the oesophagus with trachea, the regurgitation of stomach contents in the lying down position results into pneumonitis and absorption of the lung tissue as a result of chemical reaction. These complications are the most important immediate cause of death in infants with this anomaly. Sometimes the atelectasis as a result of obstruction from the aspirated secretions or attempted feedings is very difficult to differentiate from foetal atelectasis due to incomplete expansion of a part of the lung after birth. Both of these are commonly seen in the right upper lung fields. Fluoroscopic examination is very helpful in denoting the indirect signs of pulmonary volumes and mediastinal shift during respiration which cannot be encountered by the radiograms. Skiagrams, after postural treatment in cases of obstructive atelectasis would show a remarkable improvement within a short time. Frequently, it is not possible to differentiate atelectasis from pneumonia and one has to satisfy himself with mere presence of increase area of density.

In our series of 4 cases, two cases revealed aspirated pneumonia—one pneumonic consolidation in the right upper lung field and the other one aspiration pneumonia with atelectasis in the whole left lung. (Fig. VII).

Preliminary skiagrams of the chest and abdomen may also show occasionally associated developmental defect *e.g.*, Congenital heart disease, duodenal and small bowel atresia. In none of our cases these anomalies could be detected. One of our cases, which was premature, showed imperforate anus. Imperforate anus has been described to occur in about one fourth of the cases which have oesophageal atresia.

Contrast media

Use of barium sulphate is to be discarded in demonstrating any form of oesophageal atresia. It is non-absorbable and irritant material, which create a foreign body reaction, if it gains access to the lungs.

Two contrast media Air and Iodised Oil in the form of lipoidol or Dionosil oily or aqueous, can be used to demonstrate finally the presence of oesophageal atresia.

Fuhrman's technique of inserting a soft rubber catheter into the oesophagus under the fluoroscope and at the point of atresia injecting few c.c. of air, visualises the dilated blind oesophageal pouch, which subsequently can be demonstrated in the skiagrams. This contrast media is of great advantage as it is harmless but difficult to demonstrate.

The injection of Lipoidol under fluoroscopy through the catheter passed into the oesophagus, is the most accurate and reliable method and produce a satisfactory graphic roentgenologic proof of this anomaly. However, its use also is not devoid of danger, especially when used in unduly large quantity, because of likelihood of its aspiration into the lungs. Though non-irritant but it is known to produce irritant changes in abnormal lungs and can produce lipoid pneumonia and obstructive atelectasis which may prove fatal. 1 c.c. of lipoidol is very safe and sufficient for diagnostic purposes. Following lipoidol instillation into the blind oesophageal pouch and skiagrams in the upright position, the infant is always to be kept in the prone position with head raised in order to minimise any chance of aspiration of the opaque material and regurgitation of the stomach contents into the lungs through the fistula. Lipoidol should always be sucked out and infant be checked up by fluoroscopic examination to

insure complete removal of lipoidol. In our all the cases, blind oesophageal pouch was demonstrated by the lipoidol in the skiagrams in the upright position, thus establishing the final proof of diagnosis. Narrowing and anterior displacement of the trachea by the blind lipoidol filled oesophageal pouch could also be seen. Air as contrast media was not tried.

In addition to the establishment of diagnosis of this anomaly, the position and length of the proximal oesophageal segment should be routinely recorded. Fluoroscopy and films in full inspiration and expiration, in the lateral position offers an accurate means of determining the length of proximal segment. To determine the operability solely from the position of the upper oesophageal segment on a single film is fallacious. The proximal segment instead of being a fixed structure, is freely mobile with respiration. It moves up and down with respiration. Feasibility of surgical anastomosis can be based on the amplitude of this rhythmic excursion which seldom exceeds the length of two dorsal vertebral bodies.

Purposeful instillation of the opaque media *via* an intra-tracheal catheter between trachea and oesophagus is to be condemned.

Summary

The history of early surgical attacks to correct oesophageal atresia with tracheo-oesophageal fistula, abroad and in India, and the meagre literature so far published in India are briefly reviewed.

Present concepts of development of oesophagus and various theories regarding embryogenesis of this anomaly leading to its different types are discussed.

A crude analysis of the incidence of this condition in Indore and elsewhere indicates that the anomaly is commoner than is generally realised. 5 cases admitted to the M. Y. Hospital, Indore, are presented. Stress is laid on the characteristic clinical diagnostic features which, if kept in mind, should lead to early diagnosis which is necessary for successful surgical correction.

Various roentgenological features in the confirmation of a clinically suspected diagnosis and the recognition of its complications, are reviewed. Results of comprehensive study of these roentgenological

features carried out in this series of cases are also presented.

Acknowledgment

I am grateful to Dr. R. R. Rishi, Chief Radiologist, and Superintendent, M. Y. Hospital, Indore, for his guidance and kind permission for publication of this Paper. My thanks are due to Dr. I. Bhargava, for the drawings and his helpful suggestions in embryology, Dr. Pohowalla and Dr. Chamanlal Nagrath, without whose help these studies would not have been possible at all.

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Hony. General Secretary's Office,
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October 14, 1958.

(Phone No. 47000)

**All the Members of the Indian
Radiological Association**

Re:—Sarat Kumari Memorial Medal for the year 1958.

Dear Sir,

The Sarat Kumari Memorial Medal for the current year will be awarded to a member of the Indian Radiological Association, who fulfils the conditions as under:—

RULES GOVERNING THE AWARD OF SARAT KUMARI MEMORIAL MEDAL

1. The medal will be known as "Sarat Kumari Memorial Medal".
 2. It will be awarded to the author of the best paper in Diagnostic Radiology submitted to the Central Council of All India Radiological Association.
 3. The paper shall introduce newer methods, techniques and works (so far not done in India) and not a "paper full of academic thoughts". The 'paper' of the competitor has to contain proofs and details of technique of his actual work done in India.
 4. The competition is open to the members of Indian Radiological Association of at least three years standing at the time of submitting their work or the competitor/s should pay in advance three years subscription before submitting the paper. It will also be open to an individual or to a team of workers—private or belonging to an institution, but he/the leader of the team must be a member of the Indian Radiological Association as defined above.
 5. The President will appoint a committee of three members to judge the paper/s. One of them will be the Editor-in-Chief of the Indian Journal of Radiology. No competitor shall be a member of the Committee of judges, nor any of the members shall be interested, directly or indirectly in the work of any of the competitors. The decision of judges shall be final. Contravention of the conditions laid down, will disqualify a competitor.
 6. The last day for submission of papers will be 1st day of December every year.
 7. The judges will submit their report to the President by 31st December. He will inform Dr. S. Lahiri the name of the recipient of the Award who will make arrangements to send the medal.
 8. If in any year no competitor, in the opinion of the judges, come up to the standard, the medal may not be awarded. Such unawarded medal may be carried forward to the next congress in addition to the one due for that year.
 9. All the competitors for this Award are expected to read their papers at the Annual Congress and then submit those for publication in the Indian Journal of Radiology.
- In view of the fact that this notice has been delayed for various reasons, the last day for submission of the paper shall be *January 1st 1959*, instead of December 1, as mentioned in clause 6 above. Any paper received after January 1st 1959 shall not be considered. A consequential change shall also be made in regard to clause 7 above.

(VED PRAKASH)

Hony. General Secretary.

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DR. L. H. ATHLE,
M.B., B.S., D.M.R., (ENG.)
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COLLEGE OF RADIOLOGY

KRISHNA NIVAS,
1ST FLOOR,
JN. OF CHARNI ROAD,
& QUEEN'S ROAD,
BOMBAY 4.

30th Sep. 1958.

The Editor
Indian Journal of Radiology
Madras.

Sir,

The letter of Dr. R. F. Sethna published in the last issue of the Indian Journal of Radiology, does not state the whole truth. The objection to his criticism of Bombay Congress was solely on account of improper language used by him while criticising one of the honoured guests of the Reception Committee who happens to be an eminent person of international repute. The objection raised by responsible members from various parts of India was not without a proper basis.

We wish he had not referred to the affair in the correspondence columns.

Yours faithfully,

L. H. ATHLE,
S. S. KATDARE,
A. R. DESHPANDE.

Editor:—*Further correspondence regarding this will not be published.*

Abstracts of Radiological Literature

P. Jacobs, Intra-thoracic tumours of the sympathetic nervous system with a report of 2 cases. Jour. Fac. Radiologists. April 1955. 6: 275-280.

The tumours are rare, and though they may produce a variety of appearances, it is felt that the radiological picture, as in the 2 cases presented may be pathognomonic.

For the most part, they arise from the thoracic sympathetic chain situated in the paravertebral gutter on either side, and soon enlarge to occupy the posterior mediastinum, pushing the mediastinal pleura forwards. About 25 percent of the tumours consist of neuroblastoma and 75 per cent consist of ganglioneuromata. Although the ganglioneuroma are regarded generally as benign tumours, metastases have been reported. Both benign and malignant neurofibroma may assume a dumbbell form, occurring both in the spinal canal and in the thorax. Ganglioneuroma are more common, and upto 1950, 90 cases have been reported.

The majority of patients are infants and children. The symptoms are intrathoracic from pressure on the bronchial tree, recurrent laryngeal nerve or superior vena cava, and Horner's syndrome, spinal symptoms from pressure by dumbbell tumours, and symptoms due to metastases, in the orbits causing exophthalmos.

The tumours appear posteriorly in the upper part of the hemithorax, more left sided. Bony erosion of the ribs or of the vertebral column and enlargement of the intervertebral foramina may be found. An important feature is the presence of calcification. Metastases to the lungs may occur

from neuroblastoma elsewhere, and are very radiosensitive. Metastatic mediastinal tumours and pleural deposits and effusions may also be found.

In such cases it is important that radiography of all bones should be made in a search for metastatic deposits in the presence of a chest lesion. Tomography may be helpful. Diagnostic pneumothorax will help in determining whether an opacity is intrapulmonary or mediastinal.

2 cases are reported in detail. In conclusion, the author feels that when there is a round tumour situated posteriorly in the upper hemithorax of a child, showing calcification, the diagnosis of a sympathetic nerve tumour may confidently be made.

4 radiographs.

S. N. Deboo, Bombay.

Professor A. S. Johnstone. Oesophagitis and peptic ulcer of the oesophagus. The Mackenzie Davidson Memorial Lecture. Br. Jour. Radiol. May 1955. 28: 229-240.

Oesophagitis and peptic ulcer of the oesophagus are two separate entities with different morbid anatomy, clinical features and radiology. They are however firmly united with a common cause namely the reflux of acid pepsin from the stomach into the oesophagus.

A study of morbid anatomy shows that there are 2 types of ulcers, the first is oesophagitis, where the acid gastric juice produces erosions in the oesophageal epithelium, forming ulcers, which are shallow and do not penetrate the muscularis. Ultimately

there is fibrosis and stenosis. The 2nd type of ulcer is Barrett's "gastric ulcer" developing in the gastric mucosa which had extended into the lower oesophagus, is usually single; penetrating and tends to spread longitudinally. Obstruction was not a frequent complication, but death usually occurred from perforation into a vessel or into lung, pleura or mediastinum. Allison has added a third in which there is a combination of peptic erosion with stenosis of squamous epithelium, a gastric ulcer and even gastritis in the columnar epithelium of the lower segment.

In oesophagitis, there is a slight narrowing of the oesophagus just above the hiatus, then there is leukoplakia of the mucosa, leading to cicatrization and stenosis. The tapering is uniform. In Barret's "gastric ulcer", the stenosis is not usually so severe, and there is a short segment of oesophagus between the ulcer and the herniated stomach. The triad of a stenosis, followed by a segment wider than the oesophagus, and then a pouch of stomach, is pathognomonic of a gastric lined lower oesophagus, with oesophagitis at the mucosal junction. The vital observation rests upon the presence or absence of a constant reflux, not once seen, but present on several occasions. If the reflux is present, even though there is no convincing demonstration of a hernia, then there exists a 75 percent chance of oesophagitis. If in the absence of a reflux, one finds a pouch immediately above the hiatus, with mucosal folds thicker than the normal oesophageal rugae, then there is justification for considering it a cardiac antrum and a potential hernia. Finally the author impresses the importance of complete study of the stomach and duodenum, after finding a hernia.

29 radiographs.

S. N. Deboo, Bombay.

The pyloric antrum of the stomach. Caldwell Lecture 1954. Edward L. Jenkinson. Am. Jour. Roentgenol. June 1955. 73: 905-935.

Most investigators believe that the pyloric antrum is the most common location for functional and organic lesions in the stomach. Peristaltic waves are normally quite active in the pyloric antrum. Absence of peristalsis is an important finding in the diagnosis of organic lesions.

Hypertrophy of the pylorus

In a 4 year survey of congenital defects in the newborn, 275 cases were studied. Of these 35 had gastrointestinal tract deformities, of whom 20 had pyloric stenosis. The normal infant pylorus varies in length from 1.0 to 1.5 cms., whereas in congenital hypertrophy of the pylorus it varies from 1.5 to 3.0 cms. Many authors believe that the adult type of hypertrophy of the pylorus represented a carry-over from the infantile form. The cause is still not known. A number of authors believe that the destruction of the ganglion cells are cause. Raja reported a case in an infant, where in the specimen he found destruction of the ganglion cells. He also reported that infants in Brazil suffering from pyloric stenosis are particularly likely to suffer from either cardiospasm or megacolon, which facts lend support to neurogenic theory.

Antral gastritis

The symptomatology is variable, and may simulate gastric ulcer, even to the point of haemorrhages. The process frequently is deceiving and is similar roentgenologically to a malignancy in the same region. Hyperacidity is a frequent finding in the majority of patients, and may be of value in differential diagnosis from carcinoma. The x-ray shows rugosity, stiffening and

widening of the folds with the gastric pattern preserved. Wart like elevations may be widespread and often arise from an atrophic mucosa. The x-rays may show a cobblestone pattern with streaks of barium between and around the elevations. In the presence of a deformed pattern and early opening of the pylorus, carcinoma should be the first consideration. Radiology and gastroscopy should be used as complimentary methods rather than competitive methods.

Prolapse of the gastric mucosa

Symptoms consist of nausea, vomiting, and occasionally haemorrhages. The gastric mucosa prolapses through the pylorus into the duodenal cap without any other coexisting pathology. The x-ray shows usually a cauliflower-like defect often described as an umbrella shaped mushroom, and the folds of gastric mucosa are visualised in the duodenal bulb. About 50 per cent of the patients are relieved on ulcer management. Surgery is seldom indicated. Only in the presence of complications or other accompanying pathology such as gastric ulcer or very severe symptoms that surgery is indicated. If surgery is indicated it is probable that gastric resection is the method of choice.

Carcinoma of the pyloric antrum

In a report of 205 cases by Golden, 75 percent of the lesions were located in pyloric antrum, 20 percent media and 5 percent in the fundus. Most organic lesions of the stomach are due to carcinoma. Holmes and Hampton reported an incidence of 12 carcinomas to 1 ulcer in the prepyloric region. Prepyloric ulcers are more prone to become malignant than ulcers elsewhere in the stomach. In the light of our present knowledge it appears that the incidence of a degeneration of a simple ulcer into carcinoma is not frequent. Carcinoma of the

pyloric antrum may simulate benign lesions clinically and may show improvement following ulcer management, with the relief continuing for some time, but during this time the malignant process usually continues to progress. Even after all methods, radiology, gastroscopy etc. are used, it may be necessary to resort to an abdominal section before the diagnosis can be made. Roentgenologically carcinoma of the stomach is either a scirrhus, a medullary type or a malignant ulcer. Scirrhus type usually shows a napkin ring type of deformity, and a lack of peristaltic waves over the constriction, with an absent or a lessened flexibility. Medullary carcinoma produces a large fungating filling defect, with an irregular large tumour mass extending into the gastric lumen. The filling defect is not unlike finger prints. The disease may spread to the drainage glands of the stomach, direct to the liver or pancreas, and the peritoneum by seeding or by the blood stream to the liver, lungs, bones and brain.

11 radiographs.

S. N. Deboo, Bombay.

Frederick. N. Silverman. Gastroesophageal incompetence, partial intrathoracic stomach, and vomiting in infancy. Radiology. May 1955 64: 664-674.

Identification of the cardioesophageal junction radiographically has been regarded as highly reliable, but Johnstone by attaching clips to the junction of the mucosa of oesophagus and stomach as determined on oesophagoscopy was able to show that subsequent barium oesophagograms could be misleading in demonstrating the point where oesophageal and gastric mucosa were in continuity, so that radiographic identification of the cardioesophageal junction is of doubtful value. The position of

the cardiooesophageal junction is subject to considerable variation in different individuals and in the same individual at different times.

Competence of gastrooesophageal junction is due to the following factors (i) intrinsic sphincteric action (ii) pinchcock action of the diaphragm (iii) obliquity of insertion of oesophagus into the stomach (iv) a twist of the terminal oesophagus (v) a relative indifference of intrathoracic and intra-abdominal pressures. Lawler and McCreath observed 1000 consecutive patients under the Fluoroscope as they bent forward from the erect position. Out of 56 patients with dyspeptic symptoms, 53 showed regurgitation on forward bending, 34 of the 56 patients had radiographically demonstrable oesophageal hiatus hernia.

In the roentgen evaluation of vomiting in infancy, the question as to the frequency of gastrooesophageal reflux arises. The author examined 100 infants and children, 27 children showed gastrooesophageal reflux into the oesophagus, of these 15 had clinical conditions associated with vomiting, and 12 had not been vomiting. Of the 73 children in whom reflux was not shown, 18 had clinical disease associated with vomiting.

The observations indicate that gastrooesophageal reflux is not uncommon in infants and children, and that the clinical condition of vomiting may make it more easily demonstrable when sought for by technics involving position and pressure.

Clear differentiation between chaliasia and partial thoracic stomach is not always possible. The similarity in manifestations, complications, and response to therapy is such as to suggest that the 2 conditions may be identical, if not different stages of the same condition.

Congenital oesophagus probably does not exist as an entity, but is caused by the regurgitation of acid gastric contents into the oesophagus, causing oesophagitis and cicatricial retraction of the mucosa. The treatment for recurrent vomiting in association with chaliasia was to maintain the child in an erect position by means of props for a period of 3 to 4 weeks. The results of a left phrenic crush initially and if that is ineffective, herniotomy are far from satisfactory.

8 radiographs. 2 tables.

S. N. Deboo, Bombay.

Sigurd Eek. Congenital duodenal obstruction. *Am. Jour. Roentgenol.* May 1955. 73: 713-734.

The author presents material consisting of 29 patients suffering from congenital, organic duodenal obstruction, which was due to intrinsic stenosis in 5 and extrinsic stenosis in 24. Intrinsic duodenal obstruction occurs when there is diaphragmatic obstruction, or stenosis of the canal, or atresia, the atresia being rare and usually found in the terminal ileum. The obstruction is usually caudal to the papilla of Vater. Extrinsic duodenal obstruction occurs as a result of malrotation, with fibrous bands passing from the coecum to the duodenum, a rare case of extrinsic obstruction is the annular pancreas.

Vomiting of bile-stained material and dehydration with its usual sequelae dominate the clinical picture in every case.

A detailed account is given of the X-ray examination, in which right and left lateral decubitus films are taken with the head up and head down. When clinically recurrent volvulus is suspected, a barium enema

examination of the colon is carried out, and only when this is done, the stomach and duodenum are examined by passing catheter through into the duodenum and barium is introduced directly there, and when the examination is completed, most of the barium is aspirated.

In duodenal obstruction, there is enormous dilatation of the stomach and duodenum proximal to the obstruction, and the pyloric opening is rather wide. In cases of complete congenital stenosis from birth, no intestinal gas is seen caudal to the obstruction. If passage through the stenosis is difficult, only few small bubbles will be seen, and perhaps small patches of barium caudal to the obstruction. Directly after volvulus has occurred, the intestine caudal to the site of the volvulus in the duodenum will contain little gas and will have collapsed. If the passage is free from the stomach downwards, and there is caudal stenosis, usually situated in the middle of the transverse colon, a considerable and growing dilatation of the twisted section of the intestine will be found after the volvulus has lasted for some days. When the volvulus is corrected, the stomach and duodenum quickly regain their normal size and shape, but dilatation will set in quickly after development of the volvulus.

18 radiographs, II tables, 17 figures.

S. N. Deboo, Bombay.

Barton R. Young. Roentgen examination of the acute abdomen. The *Carmen Lecture. Radiology.* April 1955. 64: 483-497.

The author discusses the roentgen findings in many acute abdominal conditions. Ileus is either paralytic, segmental or mechanical.

In paralytic ileus, excess gas and fluids are widely and uniformly distributed in the small and large bowels without definite evidence of a block. Regional ileus is seen in the presence of acute inflammatory disease as for example in cholecystitis, appendicitis etc. The site of the ileus suggests the area of primary disease, for example distension of the loop of small bowel in the right upper quadrant suggests cholecystitis, and in the right lower quadrant is in favour of appendicitis. In mechanical ileus, the step like configuration resulting in distended loops of bowel by gas and fluid is seen. Mechanical ileus is frequently caused by adhesions and less frequently by abscesses in the peritoneal cavity. Strangulation of a loop of intestines occurs in incarceration, when the plain film reveals disproportionate distension of the involved loops by either gas or fluid. Intestinal obstruction in new born and early infancy is nearly always due to congenital anomalies, particularly atresias and stenosis. In intussusception, preliminary films may reveal exclusion of gas from the right side of the colon and excess gas in the small bowel proximal to the portion that is intussuscepted.

Paraduodenal or retroperitoneal hernia is an uncommon cause of intestinal obstruction in childhood. Volvulus of the colon should be suspected when plain film show tremendous distension to the point of effacement of the haustral markings of the involved bowel.

Free air in the acute abdomen is often due to ruptured peptic ulcer. Either lateral decubitus or erect film studies are necessary to show extraluminal gas beneath the highest portion of the peritoneal cavity. The lateral decubitus films are preferred because it requires less manipulation of the patient. Retroperitoneal free gas is more

to visualize the gallbladder, and a persistent pyelogram was obtained in all jaundiced cases.

11 radiographs. 2 tables, one chart.

S. N. Deboo, Bombay.

John A. Evans; James C. Monteith; and William Dubilier. Nephrotomography. Radiology. May 1955. 64: 655-663.

Nephrotomography is a combination of rapid intravenous nephrography with urokon and body section radiography, for differentiating renal cysts from neoplasm. Ninety seven cases of suspected renal disease and 3 normal controls have been examined, of these 32 were normal 42 renal cysts, and 11 renal neoplasms, 23 cysts were proved, and 10 neoplasms were proved. Of the cysts 10 showed bilateral cysts.

Cysts appeared as circumscribed areas of radiolucency surrounded by opaque renal parenchyma. Solid tumours of the kidney present an opaque appearance of equal or greater density than the adjacent normal parenchyma. In the arterial phase of the examination, an abnormal vascular bed may be identified, if present it indicates a solid mass rather than an avascular cyst.

Nephrotomography has proved valuable in demonstrating extrarenal masses not involving the kidneys. On routine pyelograms these masses appeared to be of renal origin, but they were either benign or malignant lesions in the abdominal or retroperitoneal spaces.

31 radiographs.

S. N. Deboo, Bombay.

Paul E. Anderson. Pneumoretroperitoneum in suprarenal disease. Acta Radiologica. April 1955. 43: 289-297.

The present method of pneumoretroperitoneum was introduced by Ruiz Riva, in which oxygen was injected by using the presacral and precoccygeal route for establishing a diffuse and extensive emphysema around the posterior abdominal viscera. The examination is carried out either in the knee elbow or the left lateral decubitus, and the oxygen is injected at the rate of 200 ml. per minute varying with the size of the patient, the amount of fatty tissue and the patient's reaction to discomfort in the flanks and abdomen. A total of 1500 ml. is generally employed. The patient is placed first in erect position, then in the right lateral decubitus position and finally in the left lateral decubitus. Four standard x-rays are taken, with the patient in prone, supine, right oblique and left oblique positions. Then frontal tomograms are taken. No fatal accidents or serious complications occurred with this method.

Mediastinal emphysema at the conclusion of the examination has been a very common finding; seen in well over 50 percent of cases. The p.r.p was carried out in 48 patients with manifest or suspected suprarenal disease, exploratory or radical operations being carried out in 12 cases.

The normal appearances of suprarenal glands are:

(i) triangular shadows, right often smaller than the left, which may be comma shaped.

(ii) vaguely demarcated homogenous shadows, triangular; the medial and superolateral borders are well defined, but the inferior border is confluent with the renal shadow.

(iii) vaguely demarcated; non homogenous shadows, on the medial surface of the kidneys, sometimes vertically streaked or granular, called lipo-parenchymatous type.

The results of the p.r.p was in conformity with the findings at operation in 9 out of 12 cases. The remaining 36 cases in which no surgical exploration was undertaken, are of less value, as no objective control of the radiological findings was possible. The dissociation between biological and radiological findings in cortical hyperfunction is stressed, but some relationship between the size of the suprarenal glands and the clinical condition exists as the severity of the clinical increases. Finally the authors stress the importance of tomography in the so called lipo-parenchymatous suprarenals.

2 radiographs.

S. N. Deboo, Bombay.

Eugene J. Macdonald. Evaluation of placentography in late bleeding of pregnancy. Radiology. June 1955. 64: 826-830.

Placenta previa is present when it is implanted in the zone of the internal Os, causing painless bleeding in the last trimester of pregnancy. The cause of low implantation is not known, but it is definitely associated with multiparity and probably with endometrial disease.

Early diagnosis is important and frequently can be made by films alone and without hospitalization. In the film the placental site appears as a crescentic zone of thickened uterine wall measuring about 7 cms. at its widest part.

The technic consists of a lateral recumbent roentgenogram, and when necessary an erect

antero-posterior and lateral view. Localisation is done first on a lateral recumbent roentgenogram by drawing an imaginary line across the shadow of the pregnant uterus, transversely. If the centre of the placenta lies above this line, then placenta previa can be excluded. Calcification when present aids greatly but is seldom seen before the fortieth week. A distended bladder or rectum must be excluded.

In the erect position, the presenting head lies equidistant from the promontory and the anterior brim of the pelvis. A head pubis distance of 3.0 cms. or a head promontory displacement of 1.5 cms. or more is consistent with placenta previa, esp. if there is also displacement on the antero-posterior film.

It is felt that a filter for screening out overpenetration of the anterior abdomen is unnecessary although theoretically sound. It is extremely unusual to see a breech presentation at term associated with a placenta previa, and transverse positions at term are frequently associated with placenta previa.

Poorest results can be expected in low implantation or marginal cases, a correct diagnosis is possible in about 75 percent of cases.

6 radiographs.

S. N. Deboo, Bombay.

Julius Wolkin; Maurice D. Sachs; and George H. Hoke. Comparative studies of discography and Myelography Radiology. May 1955. 64: 704-713.

The authors follow the technic of discography as described by Lindblom, injecting 35 percent Diodrast into the nucleus pulposus in the 4th and 5th lumbar interspace. If a disc is normal, only 0.5 to 1.0 c.c.

can be injected, the annulus fibrosus portion of the disc is torn or abnormal, 2.0 c.c of Diodrast is easily injected. After injection, the conventional anteroposterior and lateral films of L. 4 and L. 5 are taken.

3 types of abnormalities of disc occur clinically.

(i) The classical or frank rupture, in which there is a rent in the annulus fibrosus accompanied by a protrusion of the disc substance with free extrusion of the material injected into the spinal canal.

(ii) The bulging disc in which the annulus is weakened and thinned but is without a break in continuity, the nuclear material bulges into the spinal canal, without actually being loose in the canal.

(iii) The degenerated disc, in which there is narrowing of the intervertebral space with little or no bulging, and occasionally is associated with calcific deposits about the annulus.

It is almost impossible to inject into the normal annulus fibrosus, and in every instance the contrast medium outlining a normal disc is seen in the posterocentral part of the intervertebral space, and almost equidistant from the sides. The abnormal disc appears as an a typical structure with projections. In the presence of a tear in the annulus fibrosus, the medium extends posteriorly through the rent and escapes into the epidural space.

In a small comparative series, the accuracy of discography was found to be better than that of myelography, unsuspected multiple herniations are seen more often during discography.

Radicular pain occurring simultaneously with injection of herniated disc has been reported by some investigators. Of the

17 patients who were observed for pain, 13 showed duplication of the radicular pain at the time of injection, pain being considered as significant only if it is radicular in type and identical in location with that previously described by the patient.

The authors describe their technic, the advantages, the disadvantages of the method and the limitations.

15 radiographs. 1 photograph.

S. N. Deboo, Bombay.

Robert S. Sherman; and Myron Melamed.
Roentgen characteristics of osteogenic sarcoma of the jaw. *Radiology*. April 1955. 64: 519-527.

25 sarcomas with one benign tumour originally diagnosed as chondrosarcoma have been studied radiologically in an attempt to establish criteria for recognition of osteogenic sarcoma of the jaw bones. Nineteen of the sarcomas were considered as typical in that their clinical, roentgen and pathological features seemed to justify a diagnosis of osteogenic sarcoma.

At Memorial Hospital, New York, the osteogenic sarcomas were classified according to Ewing's classification, into medullary, telangiectatic, sclerosing, medullary fibrosarcoma, and periosteal fibrosarcoma, and chondrosarcomas. However they have evolved a broad grouping into 3 principal types, sclerotic the lytic, and the mixed. The sclerosing osteogenic sarcoma shows a predominance of dense structureless eburnated bone. In the lytic type, destruction predominates over production of bone, and usually no density may be expected. The mixed type presents approximately equal amounts of destruction and production. Added to these features, there is a medullary origin, an

assymetrical position in the bone, medullary and cortical bone destruction, periosteal reaction of various types, ill defined borders and a soft tissue mass, and a disorganised pattern of internal structure.

The typical group included 3 sclerosing osteogenic sarcomas, measuring about 5 cms, were oval in shape, with some marginal lobulation in one. All showed a perpendicular type of periosteal reaction, and were accompanied by a soft tissue mass. In 2 cases, teeth were present, but loss of the lamina dura was the only evidence of a neoplasm. In the lytic group there were 6 tumours, all in the mandible. Only 1 showed a definite periosteal reaction, they showed no fractures. Each of them was associated with a soft tissue mass. All seemed to arise from the medullary portion of the jaw, and all were assymetrically positioned. 10 osteogenic sarcomas were in the mixed category.

The differential diagnosis of osteogenic sarcomas of the jaw has been discussed and the reliability of the x-ray interpretation has been considered. Case reports of 7 tumours have been given to illustrate the specific points and indicate the difficulty sometimes encountered in establishing a final diagnosis.

10 radiographs, 1 microphotograph.

S. N. Deboo, Bombay.

M. Lederman. Epioesophageal cancer with special reference to tumours of the post-cricoid region. *Br. Jour. Radiol.* April 1955. 28: 173-183.

The author suggests that the term "post-cricoid cancer" be abandoned and replaced by the term "epioesophageal cancer" which is subdivided into (1) cricopharyngeal cancer, including cancers of the mouth of

oesophagus and lower pharynx (2) pharyngo-oesophageal cancer, when the tumour involves the upper oesophagus and lower pharynx equally, (3) cancer of the cervical oesophagus.

Clinically the dominant symptom is dysphagia in the epioesophageal group, and there is a higher proportion of sore throats as the first symptom in the cricopharyngeal group. Fixation of the larynx occurs more frequently in the cricopharyngeal group. Epioesophageal tumours are less frequently accompanied by lymph node metastasis, whereas tumours of the pharyngo-oesophageal subgroup appear to present lymph node metastasis more frequently.

All patients require at least 3 investigations.

(i) lateral soft tissue radiographs of the neck, are extremely valuable.

(ii) Tomography is of value only when you wish to assess invasion of the air passages, and helps in estimating the extent of tumour, but does not determine its point of origin.

(iii) Barium swallow and barium mucosal pattern as described by Welin, will help in determining both the extent of the tumour and the probable region of its origin. In advanced cases however it gives very little information.

Lateral soft tissue radiographs of the neck may show the following important changes.

(i) Broadening of the prevertebral shadow. The laryngo-pharyngeal shadow is pathologically enlarged if it measures more than 15 mms. in depth, or if it is greater than the antero-posterior measurement of the subjacent vertebral body.

(ii) Displacement of larynx and trachea:

(a) Cricopharyngeal group tumours produce a forward displacement of the cricoid cartilage, producing a notch where the cricoid shadow joins the tracheal shadow.

(b) Pharyngoesophageal group tumours produce marked displacement of the cricoid and the trachea.

Response to radiotherapy: is often of value in helping to identify the advanced cases. Thus disappearance of a lesion from the range of the laryngeal mirror during treatment is usually pathognomonic of an origin below the cricopharyngeal sphincter. Tumours of the cricopharyngeal and of the cervical oesophagus are radiosensitive. The response to radiation as reflected by the results of treatment for the whole group is very poor. The 5 years results show 9 per cent cure in the cricopharyngeal, 3 per cent cure in the pharyngoesophageal groups, and 30 per cent cure in the cervical oesophagus tumours. The occasional success in the cervicoesophageal group is encouraging in view of its bad surgical reputation.

14 radiographs, figures. 2 tables.

S. N. Deboo, Bombay.

Florence C. H. Chu,; Ralph Philips; James J. Nickson,; and J. G. Mc Phee. Pneumonitis following radiation therapy of cancer of the breast by tangential technic. *Radiology*. May 1955. 64: 642-654.

The x-ray diagnosis of radiation pneumonitis depends on the clinical history, the previous negative appearance of the lungs, and the development of an area of increased density on the irradiated side. The increased density is sometimes homogenous, but is usually irregular, patchy and linear. It

tends to start in the hilar area and then spread peripherally. In mild cases it may resolve completely within a few weeks, but in severe cases, the density becomes more irregular and extensive and may involve the entire lung; there may also be displacement of the mediastinum to the affected side and elevation of the diaphragm. The process may regress in a period of months or 1 to 2 years and may return to normal. In other cases, residual fibrosis persists appearing as linear areas of density with retraction and compensatory emphysema of the surrounding tissues. Radiation pneumonitis can not be divided into acute and chronic stages, as the one may merge into the other and complete or partial resolution may occur.

The roentgen ray therapy by direct portals produces radiation pneumonitis in 22 per cent of cases going up to about 60 per cent where as the tangential technic produce radiation pneumonitis with 250 kV in only 7 per cent of cases. With direct portal technic extensive pulmonary fibrosis occurs in approximately 20 per cent, only in 1 per cent, minimal pulmonary fibrosis occurs following tangential technics.

A 3 field tangential technic using medial, lateral and supraclavicular fields, 12 × 26 cms. in the first two, and 14 × 17 cm. in the supraclavicular is described by which a fairly homogenous tumour dose of 3500 to 4000r are delivered in 3½ to 4 weeks to the breast, chest wall and axillary, supraclavicular and internal mammary areas. The tumour dose of 4000r is obtained by delivering a skin dose of 2500 to the supraclavicular field, and 4000 to 5000r each to the medial and lateral tangential fields with 250 kV, 1.5 mm. Cu. filtration. With the same tangential technic using supervoltage (1000 kV) 6000r tumour dose have been possible in 5 to 6 weeks, but

incidence of radiation pneumonitis is increased to 25 per cent, the radiation fibrosis that resulted was minimal in the majority of cases.

II radiographs. 8 figures.

S. N. Deboo, Bombay.

H. G. Frank. Hodgkin's disease, clinical aspects, treatment and prognosis. *Jour. Fac. Radiol.* April 1955. 6: 254-266.

The paper surveys the findings in 157 cases of Hodgkin's disease, which accounts for 1 per cent of all malignant disease and for 30 per cent of malignant disease of the reticuloendothelial system.

Clinically, the most common symptom is a painless enlargement of a group of glands. Next are those symptoms associated with intrathoracic disease, such as enlarged mediastinal glands. In 135 cases the disease appeared to be unifocal in origin. Intrathoracic involvement was found in 101 patients, abdominal involvement with wide spread glandular enlargement and enlargement of the liver and spleen occurred in 99 patients. Skin involvement occurred in 20 patients. Bones involved showed osteolytic deposits, and if occurring in a vertebra, may be associated with collapse. Occasionally the deposits may be osteoblastic or mixed, the latter type being seen following x-ray therapy. The most common neurological lesion is a transverse myelitis due to pressure on the spinal cord by the collapse of a vertebra. 3 patients showed signs of pharyngeal involvement. There is no truly characteristic change in the blood.

Of the 110 deaths in the series examined. 61 patients died from toxæmia and cachexia associated with glandular enlargement, and in 33 patients, death was due to intrathoracic spread of the disease. 10 patients died

from profound anemia indicating aplasia of bone marrow.

The treatment methods are surgery, radiotherapy and chemotherapy. Some consider a surgical excision is of no value, as it produces occasionally dissemination of disease, and that apart from biopsy, the method of choice is radiotherapy. In adequate dosage radiotherapy can cause a local cure of the disease, and relief obtained by smaller doses. Certain contraindications are (i) active tuberculosis in the areas to be treated (ii) renal insufficiency (iii) Acute or rapidly advancing disease (iv) depression of the bone marrow caused by the toxicity. Chemotherapy is useful in the form of Nitrogen Mustard, unfortunately these tumours become eventually resistant. It is solely a palliative, and no long term survivals have yet been reported following its use. In large gland masses, osseous metastasis, or involvement of the lung parenchyma, it is advisable to combine the general effect of Nitrogen mustard with the local application of x-ray therapy.

Prognosis is good in the paragranulomatous form, 55 per cent of the patients survived (Jackson and Parker), where as the granulomatous form showed deaths between 1 and 3 years and that the prognosis in the sarcomatous form is very poor.

12 tables.

S. N. Deboo, Bombay.

Differential diagnose retroperitoneal Tumoren. (Differential diagnosis of retroperitoneal tumours). By A. Gebauer and J. Lissner. *Fortschr. Geb. Röntgenstr.*, 88,2, P. 200-210, Feb. 58).

The authors review the literature of differential diagnosis of retroperitoneal tumours

and discuss 7 of their own cases, including one hypernephroma, one adrenal adenoma, 5 retroperitoneal tumours not connected with urinary tract or supra-renal glands, amongst them a lipoma, a retroperitoneal cyst, a fibrosarcoma, a reticulum cell sarcoma and a lymphadenomatosis.

As methods of examination they use plain radiographs of the abdomen, study of the alimentary tract and retro-pneumoperitoneum in combination with pyelography and transverse tomography. For the pneumoperitoneum they prefer the older method of peri-renal insufflation to the pre-sacral approach as only 600 cc. of oxygen were needed instead of 1000 cc. They encountered no accident and no discomfort to the patient in about 400 examinations.

They arrive at the following conclusions:

Renal tumours can be practically always differentiated on account of the alterations of pelvis or calyces. Adrenal tumours may be diagnosed by their typical localisation above and medial to the kidneys and absence of deformity of the renal sinuses. In the various retroperitoneal tumours unconnected to kidneys or suprarenal glands, some kind of displacement of renal or ureteric shadows can usually be noted in conformity with their localisation. This symptom is, however, not necessarily diagnostic for retro-peritoneal neoplasm as the displacement also occurred in one of their patients with a splenic cyst. The reviewer had also recently opportunity to observe a similar displacement of the left ureter in a case of a large pancreatic cyst.

Valuable information as regards the position and extent of retroperitoneal tumours is also supplied by the investigation of stomach and intestines and by the retroperitoneum combined with tomography. Of particular interest is the fibrosarcoma which they could

demonstrate between the shadows of pancreas and left kidney by means of transverse tomography.

Retroperitoneal lipomas may be sometimes detected by their greater translucency in comparison with the surrounding tissues.

(14 Illustrations).

Die Nukleographie bei Schmorl'schen Knotchen. (Nucleography in Schmorl's nodes). By A. Grassberger and R. Seyss. (Fortschr. Geb. Röntgenstr., 88, 2, P. 183-187, Feb. 1958).

The authors consider discography a safe procedure of examination as they observed no damage in 300 patients. With this method they detected in 25% of their patients Schmorl's nodes many of which were not visible in the plain films. As regards the aetiology they distinguish 3 groups:

1. In young persons without history of accident the normally-shaped nucleus pulposus may enter the spongiosa of the vertebral bodies under normal conditions and cause no symptoms.

2. In older patients or also younger persons with a history of Scheuermann's disease, degenerative changes may lead to deformity of the nucleus pulposus and very irregular deposits of the contrast medium within or in front of the vertebral bodies. These abnormalities are often associated with signs of spondylosis and with dorsal or ventral displacement of the discs.

3. In patients of all ages trauma or destructive inflammatory lesions may either widen the pre-existent normal gaps or create new openings through which the nucleus pulposus herniates. In these cases follow-up

examinations after several months occasionally showed a regression of the penetration.

The authors feel that discography is a safe and reliable method to assess the occurrence and the clinical significance of Schmorl's nodes in individual cases.

(8 Illustrations).

Die Bronchostereographic. (Bronchostereography). By W. E. J. Schneiderzik and A. Kallenberg. (Fortschr. Geb. Roentgenstr., 88, 2, P. 156-171, Feb. 1958).

The technique of bronchostereography described by the authors can be employed with any X-ray plant without additional equipment.

They inject 20-30 cc. of Propylidone (Cilag) through the crico-thyroid membrane by means of a special cannula devised by them.

The patient lies for one minute in oblique supine position, at first on the side to be examined, then on the opposite side and

finally in lateral decubitus; The bronchostereograms are exposed in Trendelenburg's position at angles of 30°. During the manual change of the cassettes and shift of the tube, the patient has to hold the breath. This is facilitated by preceding hyperventilation through an oxygen mask.

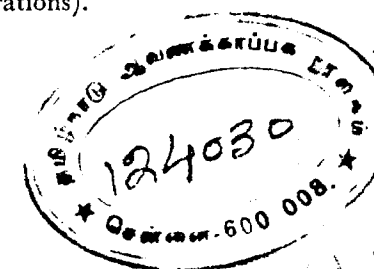
Data of technique: film-focus distance 120 cm, exposure time 0.3 sec., 200 mA, 55-65 KV for a.p. 70-90 KV for lateral bronchograms.

In their opinion bronchostereograms permit an accurate assessment of position, shape and extension of pulmonary lesions and an exact localisation of foreign bodies.

They present a.p. and lateral bronchostereograms of normal lungs, of a tumour in the apical segment of the right lower lobe and of bronchiectasis of the right upper lobe.

The rather short bibliography includes publications by Kohnle, Schneiderzik and Teschendorf, but not the investigations by Luppacciolo who has reported about successful bronchostereograms as early as 1952.

(5 Illustrations).



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