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Laboratory Diagnosis of Cancer*

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WHEN I was asked to participate in to-day's proceedings, I had hoped that we might be meeting in the original Greek sense of the word "SYMPOSION" and exchanging our ideas and experiences on cancer. However, I was allotted the task of speaking to you on "Pathological aspect of Malignancy." This was evidently too big an undertaking for one person and certainly impossible of realisation in the available time. I have therefore decided to deal with a very restricted aspect of the subject, so far as it pertains to the laboratory diagnosis of cancer, with particular reference to the newer improvements in our techniques.

The most useful advances during the last twenty years have been in the nature of improved diagnostic methods—clinical, radiological and pathological—so that a greater number of malignant lesions are detected at a stage when they are still amenable to control or eradication with the known methods of treatment. I do not share the view of those who believe that malignant disease still remains an incurable problem. The American College of Surgeons have on their records 36,000 cases of cured cancer and our hope lies in an early and correct diagnosis of disease, until the discovery of some new and revolutionary therapeutic procedure. "Cures of malignant disease have doubled during the past two decades, thanks to the co-ordination and dissemination of information about the behaviour of tumours and to the development of new techniques in surgery and radiotherapy. These

* Based on an introductory paper in the symposium on "Malignancy" at the Second Indian Congress of Radiology, Bombay, December 1947.

advances have been the direct result of correlations of histologica studies on the structure of tumours and of their clinical course under varying conditions."[7]

The laboratory diagnosis of cancer is attempted along three lines of approach. A microscopic examination of tumour material, a biochemical investigation of body fluids and a biological study of tissues and their products. The oldest method and the sheet anchor of the treatment of cancer is still the histological diagnosis and classification of tumours. The removal of a piece of tumour tissue from a suspected and accessible lesion is the most important single procedure available for diagnosing malignant disease and affords one of the reliable bases for planning out its treatment. The tissue is removed with a knife, an electric cautery at white heat, a sharp punch or a biting instrument. The size, location and character of the biopsy material are matters of some consequence towards a proper diagnosis. It is evidently futile to submit necrotic tissue, or one markedly altered by radiation to histological examination. The surgeon has therefore to exercise skill and judgment in the selection of material, if he wishes to obtain useful information from his colleagues in the laboratory. The pathologist studies the microscopic structure of the excised tissue and a satisfactory evaluation is only possible if distortion of delicate cells by pinching with dissecting forceps, coagulating with red hot cautery, by desiccation on a piece of gauze, or autolysis in water during transportation to the laboratory is avoided. The information which accompanies the biopsy specimen is of considerable importance to the pathologist. It should include the duration, evolution, the physical characteristics and size of the tumour along with information regarding previous therapy and the reaction of the tumour to it. In expert hands the removal of such tissue is unattended with any risk to the patient and recent experimental studies in animals by MAUN and DUNNING[13] have confirmed this opinion.

There are no contra-indications to a properly performed biopsy, though it is advisable to excise widely certain tumours such as pigmented moles and neurofibromas.

There are some tumours which are inaccessible to the knife or punch biopsy owing to their deep location[18]. There are others which it is preferable not to cut into. The material obtained by aspiration from such tumours has been of great benefit in ascertaining their nature.[5] It is a method of choice for determining the presence of metastases in enlarged lymph nodes[11] drain ing a carcinoma which is to be or has been

treated with radiation or removed at operation. Recently Nerurkar and I[12] have elaborated a technique for examination of material aspirated from bone tumours which has yielded encouraging results. The skilled collaboration of our colleagues in obtaining the material has been of invaluable assistance in these investigations.

The latest development in histological diagnosis is a study of detached cancer cells in secretions or excretions of the body. The pathologists did not take kindly to this techniques at first, as they were not convinced of the characters of an "unmistakable cancer cell." The persistent efforts of Papanicolau during the last twenty years[15] has however taught pathologists "to scrutinise more fully and evaluate the details of cell structure in smears. It has established diagnosis of isolated cells as a reliable rather than haphazard procedure," and has shown the way to screening of persons reaching the cancer age. A study of exfoliated cells or clumps of crowded and overlapping cells in uninary,[16] bronchial[8] and gastric[1] secretions has opened up possibilities "of observing the first stages of cancer and possibly also of transitions between benign and malignant lesions."[7]

There are several biochemical procedures which are now employed as routine methods in the investigation of cancer cases. A chemical examination of body fluids or tissues for a diagnosis of cancer is based on the belief that cancerous cells have an abnormal metabolism which is reflected in the presence of abnormal substances or abnormal quantities of normally occurring substances in them. The chemical changes in most cases are non-specific, as several unrelated diseases are capable of producing the same abnormality. Nor does the absence of a particular abnormality preclude the existence of a tumour, as it is well known that tumour cells loose their particular functional characteristics during the phase of rapid proliferation. If, however, the mechanism of a particular chemical change is clearly understood and correlated with the clinical evolution of the tumour, the laboratory data become highly useful in establishing a correct diagnosis. I might illustrate this point by presenting two examples from groups of tumours in which we have been interested for some time.

Under normal conditions the amount of calcium in the serum of most healthy adults is between 10 and 11 mgms. per 100 cc. In children and infants it is about a mgm. higher than in adults. The amount of inorganic phosphorus in the serum of fasting adults is from 2.5—4.5 mgms. per 100 cc. In children the range is between 4.0 and 6.0 mgms. The

amount of inorganic phosphorus in the serum is lowered after carbohydrate ingestion. The major portion of the calcium in the body is in the bones, whereas phosphorus is present in considerable amounts in all tissues. The mineral constituent of bone is principally a tertiary calcium phosphate $Ca_3(PO_4)_2$, with varying and small amounts of dibasic phosphate $CaHPO_4$, a carbonate $CaCO_3$ and a hydroxide $Ca(OH)_2$ of calcium. These mineral salts are deposited in the organic matrix of the bone and are ultimately derived from food. Continued inadequacy of these minerals in the diet leads to deficiency diseases of bone, such as rickets or osteomalacia. The same conditions supervene if the intestinal absorption is impaired as in sprue or chronic diarrhoea, in spite of a sufficient supply of these minerals in the diet. A similar effect may also be produced by a deficiency of vitamin D. The absorbed calcium and phosphorus are transported to the tissues by the blood. The serum calcium is made up of several fractions, of which the most important are the ionised fraction and the fraction bound to serum albumin and globulin. The ionised calcium fraction in the blood has an important effect on the irritability of muscles. The level of this fraction in the blood is controlled by the parathyroids. Calcium and phosphorus whether absorbed from the food or derived from the tissues are transported to the kidneys and excreted there. The normal kidney excretes calcium slowly when the blood level is between 7·5–9 mgms. per 100 cc. When the level rises above 11·5 mgms. the excretion rises rapidly. The renal threshold for inorganic phosphate appears to be lowered by vitamin D, dehydrotachysterol and parathyroid hormone in decreasing order of importance.

Calcium and phosphorus when they are available in adequate amounts either in an inorganic or an organic form are deposited as complex calcium phosphate. The bone elaborates an enzyme —a phosphatase —which splits organic phosphorus compounds to supply a local excess of inorganic phosphorus. Bone phosphatase is known as alkaline phosphatase, because its maximum activity is noticed at an alkaline pH 9. Almost all the alkaline phosphatase in the blood is derived from bones, although its presence has been demonstrated in many non-osseous tissues. It enters the circulation easily from the bones and is excreted in the bile. Its level in blood rises in hepatic disorders and this fact has always to be borne in mind when interpreting the blood serum values. The serum alkaline phosphatase cannot be used as an index of bone activity in patients with advanced liver disease. The normal serum values for alkaline phosphatase in adults are 1·5–5·0 Bodansky units, with

sodium beta-glycerophosphate as a substrate; and 5·0–17·0 King Armstrong units with phenyl-phosphate as substrate. Alkaline phosphatase is increased when new bone is formed in repair of fractures or when abnormal new bone is being formed as in osteitis deformans, osteogenic sarcoma or osteoplastic bone deposits. The level of alkaline serum phosphatase however does not necessarily correspond to the amount of new bone which is formed. When metastases of cancer from non-osseous tissues are deposited in bones, there may or may not be an increased production of alkaline phosphatase in the bone. When there is an increase in alkaline phosphatase the lesions are usually osteoplastic, although sometimes the metastatic tumour destroys the bone more rapidly than new bone can be laid down and osteolytic areas appear even when the phosphatase is high. When the alkaline phosphatase production is not increased the lesions are usually osteolytic.

A problem which often presents itself in our work is to decide whether a tumour in the bone is benign or malignant, whether it is primary or metastatic. A determination of blood calcium, phosphorus and phosphatase very often affords valuable indications regarding these questions[19], if the course of their appearance in blood which I have attempted to explain, is borne in mind. The numerous benign tumours of the bone produce no changes in the calcium, phosphorus, phosphatase values in serum. An elevation of the phosphatase values on the other hand raises a suspicion of malignant transformation. In benign giant cell tumours which have shown phosphatase values above 7 Bodansky units such tranformation has often been demonstrated. The contrary is not true. In an osteogenic sarcoma moderate elevation of phosphatase value is often encountered. The sclerosing type of these sarcomata on the other hand may cause hardly any elevation of serum phosphatase values, although the tumour may contain abundant phosphatase. A definite rise in the serum phosphatase indicates an active growth of the tumour. The osteolytic metastases in bones from breast, thyroid and kidney cancers show usually moderately elevated phosphatase values (6–7 Bodansky units) with calcium and phosphorus values near the upper normal limits(12·5 and 4·5). The osteoplastic metastatic deposits from prostatic cancer however show a marked increase in alkaline phosphatase (20–30 Bodansky units) without any significant rise in calcium and phosphorus values. There is an elevation of acid phosphatase which is peculiar to this tumour. The acid phosphatase has a maximum activity between a pH of 4·2 and 5·0. The activity of normal serum for this

type of phosphatase does not exceed 1 unit per 100 cc. of serum, whereas with metastasing carcinoma of the prostate the value may rise to as high as 250 units. In metastatic areas in bone the acid phosphatase is produced by the tumour in the bone, the alkaline phosphatase whose values may also be high ranging from 20-150 units is produced by the bone around the tumour.

The next example relates to some endocrine gland tumours which produce masculinising symptoms in girls. Cushing in 1932 [4] separated a group "characterised by rapid, plethoric, painful obesity of the trunk and head, acrocyanosis with purplish striae atrophicae, hypertrichosis, osteoporosis, polycythemia hypertension, insulin-resistant diabetes, and muscular weakness." In these persons a basophil adenoma of the anterior pituitary gland was demonstrated. There is another group of masculinising tumours without the "metabolic changes" noticed in Cushing's Syndrome. These patients show "hypertrophy of the clitoris, hirsutism increase in musculature, deepening of voice and irregularity or cessation of menses" (Adreno-genital Syndrome). A quantitative determination of 17-ketosteroid excretion is of great assistance in differentiating these neoplasms. Hyperplasia or neoplasia of adrenal cortex, as well as tumours of the interstitial tissue of the testis are usually attended with excessive excretion of 17-ketosteroids in the urine. The normal twenty-four hours urinary excretion of these substances is about 1·3 mgms. between the ages of 4-7 years; 4·0 mgms. between 7-12 years; and 8·2 mgms. between 12-15 years. In adult women the excretion is between 2·7—8·1 mgms. In children with Cushing Syndrome or Adreno-genital Syndrome the twenty-four hour excretion of total 17-ketosteroids may be from 25-800 mgms. A separation of the ketosteroid fraction into *alpha* and *beta* fractions shows, that whereas, normally only 5-15 % of the total ketosteroids consist of the *beta* fraction, in the adrenal cortical carcinoma the *beta* fraction becomes markedly elevated [9]. Values of nearly 50 mgms. of this fraction are encountered in the 24 hour urine samples of these patients.

There are several general tests for cancer which are reported to be as indicative of the disease, as for instance, the Wassermann reaction or Kahn test for syphilis. It is alas, a common failing of the human mind to trail the unapproachable, and to yearn after the inaccessible. How many philosophers have tried to discover a touchstone to separate the dross from gold? How many alchemists have tried to transmute base into nobler metals? How many people have proclaimed panaceas for this, that or other disease? Every

few months a cure for cancer is discovered, which soon joins its predecessors in the vaults of oblivion. The laboratory workers are not exempt from such longings. They have striven to evolve a test for all cancer and very often have come to grief with their discoveries [14]. None of these tests appear to have a specificity which could commend their general use. However three of them are striking enough to encourage extended work on the biochemical alterations which mark their appearance. Fuchs [6] has observed that the serum from cancer patients hydrolyses fibrin from normal blood but not from cancer blood. Robertson [17] has observed a peculiar behaviour of blood when it is dropped in the urine of cancer patients. Recently Beard [2] has demonstrated the excretion of certain sterols in the urine of persons suffering from cancer.

An interlocking of the disciplines of chemistry and pathology has yielded valuable results in an understanding of intermediary metabolism. This has been especially made possible through the use of radioactive tracer elements [10]. I shall mention only one such element in this connection—the use of radioactive iodine in an investigation of thyroid cancer. With the artificial production of more and more of these tracer elements new techniques are being added for an exploration of pathological states of the cellular system.

The biological study of tumour tissue for diagnostic purposes is a very recent development and may still be considered beyond the reach of most laboratories. According to the method developed by Greene at the Yale University, small particles of tumour tissue are transplanted in the anterior chamber of the eye of rabbits or guinea pigs. The evolution and differentiation of the growing tissue under an almost constant environment have yielded interesting information about several tumours. Another method elaborated by Murray and Stout during the last few years depends on a cultivation of minute fragments of tumour tissue in vitro and studying their growth peculiarities and morphological differences. The method has now passed beyond the experimental stage but demands some skill in cultivation and much experience in interpretation of different types of tumours.

An assay of hormones for diagnostic purposes was first suggested some twenty years ago when Aschheim and Zondek [20] demonstrated the presence of gonadotropic hormones in the urine of some patients with testicular tumours. The reactions elicited in immature female mice by injection of urine, from some patients with testicular tumours are of two distinct types; and depend on the presence of two gonadotropic hormones. One of the hormones is the

"castrate type" which is elaborated by the hypophysis cerebri. It produces follicle growth in the ovaries in the test animals without luteinisation. The hormone is present in the urine of castrated persons of either sex, in elderly men and in women after menopause. The other hormone is the "placental gonadotropin" which produces luteinisation in the ovaries of the animals and is identical with the hormone excreted in the urine by pregnant women. Its detection in the urine of patients with testicular neoplasms indicates the presence of a biologically active chorionic tissue [3] which may or may not be evident in the routine microscopic preparations of the tumour. The failure to demonstrate such tissue histologically may be due to the fact that it may be very small and may not have been represented in the piece selected for microscopic examination. The increased excretion of 17-ketosteroids in some adrenal and ovarian tumours, of estrogens in granulosa cell tumours, and of gonadotropins in testicular tumours had raised the usual hope of employing this technique for diagnostic purposes. We know to-day that increased excretion of these substances is indicative of certain types of new growths, but normal excretion does not imply their absence.

I have given you a rapid sketch of the complexity of the laboratory procedures we employ. I am sure you have realised that their intelligent use does not lie in a routine carrying out of certain tests, but in a patient and careful study of the conditions prevailing in each particular case. Such work is toilsome and time-consuming; and there is no glamour attached to it. It has however its rewards.

I might be permitted to close with a statement which may appear facetious. It is, that the diagnosis of a tumour is not writ large on a microscopic slide or in a test tube, so that he who runs may read. A correct evaluation of a microscopic preparation or a biochemical test is often an easy matter, but it could also be the most difficult, needing long experience, repeated study and much reflection. The clinician should therefore bear lightly with the laboratory worker and his difficulties. Our work at the Tata Memorial Hospital during the last seven years has shown us that the largest measure of success has fallen to our lot, when the surgeon, the radiologist and the pathologist have worked as a unit and have striven to study each case as a problem with all the available information culled from the three disciplines. The present position regarding the laboratory detection of cancer can best be summed up as, "although there is as yet no laboratory test or series of tests that will surely and in every case give the answer to this problem, there are tests that when wisely interpreted are very helpful" (W. C. Alvarez).

References:

1. Barnet, M. K.—Avenues of Approach to the Gastric Cancer Problem, Jour. Nat. Cancer Inst., 7:127, 1946.
2. Beard, H. H., Halperin, B., and Libert, S. A.—Effect of Intraperitoneal Injection of Malignant Urine Extracts in Normal and Hypophysectomised Rats, Science, 105: 475–476, 1947.
3. Brewer, J. I.—Chorionic Gonadotropin in the Diagnosis of Testicular Tumours, Arch. Path., 41: 580–591, 1946.
4. Cushing, H.—Papers Relating to the Pituitary Body, Hypothalamus and Parasympathetic Nervous System, Springfield, Illinois, 1932.
5. Ellis, F.—Needle Biopsy in the Clinical Diagnosis of Tumours, Brit. Jour. Surg., 34: 240–261, 1946–47.
6. Fuchs, H. J.—Uber Proteolytische Fermente in Serum II. Biochem. Ztschr, 175: 185–201, 1926. (Quoted from 14 below).
7. Gates, O., and Warren, S.—A Handbook for the Diagnosis of Cancer of the Uterus by the use of Vaginal Smears. Harvard University Press, Cambridge, Mass., 1947.
8. Hurley, G. A. P.—The importance of Bronchoscopy in Planning the Treatment of Pulmonary Lesions, Surg. Clin. North America, 26: 292–297, 1946.
9. Johnson, H. T., and Nesbit, R. M.—17-Ketosteroids in the Diagnosis of Adrenal Tumours, Surgery, 21: 184–193, 1947.
10. Kamen, M. D.—Radio-active Tracers in Biology, Academic Press, New York, 1947.
11. Khanolkar, V. R., and Gharpure, V. V.—Aspiration Biopsy in the Diagnosis of Malignant Tumours, Indian Physician, 3: 193–206, 1944.
12. Khanolkar, V. R., and Nerurkar, R. V.—Diagnosis of Bone Tumours by Aspiration, Indian Physician, 5: 125–135, 1946.
13. Maun, M. E., and Dunning, W. F.—Is the Biopsy of Neoplasms Dangerous? Surg. Gynec. and Obstr., 82: 567–572, 1946.
14. Maver, M. E.—Review of Serodiagnostic Tests for Cancer. Jour. Nat. Cancer Inst., 4: 571–578, 1943–44.
15. Papanicolaou, G. N.—New Cancer Diagnosis. Proc. Third Race Betterment Conference, 1928. Quoted from Papanicolaou G. N., and Traut, H. F.: Diagnosis of Uterine Cancer by the Vaginal Smear. The Commonwealth Fund, New York, 1943.
16. Papanicolaou, G. N., and Marshall, V. F.—Urine Sediment Smears as Diagnostic Procedure in Cancers of Urinary Tract, Science, 101: 519–520, 1945.
17. Robertson, F. N.—Clinical and Laboratory Notes, a Test for Carcinoma, Canad, M.A.J., 51: 54–59, 1944.
18. Volwiler, W., and Jones, C. M.—The Diagnostic and Therapeutic Value of Liver Biopsies, New Eng. Jour. Med. 237: 651–656, 1947.
19. Woodard, H. Q.—Role of Chemical Labaratory in Diagnosis of Bone, Arch. Surg. 47: 368–383, 1943.
20. Zondek, B.—Ueber die Hormone des Hypophysenvorderlappens. III. Follikelreifungshormon (Prolan A) und Tumoren, Klin. Wchnschr, 9: 679–682, 1930.

Some Aspects of Surgery in Cancer*

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IN the treatment of malignant disease Surgery, Radiotherapy and Chemotherapy all play a part. Each has its appointed place in a well ordered scheme of treatment, and the best results are obtained if these methods are not considered in any competitive sense, but are resorted to judiciously with an eye to serving the best interests of the patient.

In the short time at my disposal it is not possible to cover the whole field of cancer surgery, and so I shall only dwell upon some aspects of the problem that are controversial or that seem to me to require special attention.

From our point of view one may classify malignant diseases in 5 groups:

Group I. Those that are only amenable to surgical excision.

II. Those that are best treated by radiotherapy.

III. Those that are best managed by a combination of methods.

IV. Those that may be treated by either method successfully.

V. Malignant diseases whose treatment is controversial.

Malignant diseases that are amenable only to surgical excision.—Pre-eminent in this group is malignant disease of the gastro-intestinal tract. Adenocarcinoma and sarcoma of this region are not amenable to cure by radiation. To stress this is necessary as it has been our distressing experience at the Tata Memorial Hospital to have patients refuse an operation for an early cancer of the stomach or rectum because they were referred to us by their family physicians for *radium treatment*. Very early squamous cancer of the anus may very occasionally be cured by radiotherapy but apart from this radiation occupies a very insignificant place in the treatment of cancer of the gastro-intestinal tract.

Now, surgical operations for the eradication of malignant disease of the stomach, colon or rectum are major surgical procedures, and there is still an impression persisting in this country that the Indian subject cannot stand these operations and that these operations carry too high a mortality. This notion is entirely

* Paper read as part of a Symposium on Cancer at the Second Indian Congress of Radiology, December 1947, Bombay.

false. Where modern principles of pre-operative and post-operative treatment are observed and surgical technique and team-work are perfected these operations carry no greater risk and mortality than anywhere else in the world. To illustrate this it may be permissible to quote our figures for mortality and cure. For cancer of the rectum there have been in the last 6 years 35 radical resections with only 3 post operative deaths, a mortality of 8·5%. Of these 35 cases 15 had abdomino-perineal resections done in one-stage with only one post-operative death from uraemia (6·6%). Comparing these figures with those of other clinics abroad we find that the mortality for abdomino-perineal resections as reported abroad ranges from 6% to 12%. Our mortality figures are therefore well within this range.

The results of treatment of cancer of the rectum are the best in the range of cancer. In the early cases when the disease is limited to the rectal wall alone cures as high as 90% have been reported by some clinics[2]. Taking all the cases together both early and late of the 35 cases done we have 21 patients alive and well, one for 6 years, one for 5 years, 2 for 4 years and 12 for over one year and the rest under one year.

As regards cancer of the stomach, the end results are not so satisfactory. The statistics of the Mayo Clinic in America (1943)[6] where they get a large proportion of early cases show that of 100 cases seen by them only 26 came to gastric resection and after allowing for a 9% mortality and recurrences only about 6 patients of the original hundred lived for more than 5 years. Pack and Livingstone[5] after a study of statistics from all American hospitals came to the same conclusion, but took the rather optimistic view that of the resected cases 30% can be expected to live for more than 5 years. Thus it is obvious that this number could only be increased if earlier diagnosis is made.

Our figures at the Tata Memorial Hospital repeat the same story. Of over 150 cases of cancer of the stomach 32 only were resectable. There were 7 post-operative deaths. The results are one patient alive and well for 3 years. Two patients alive and well for over 1 year. The others died from metastasis to the liver or in the abdomen after intervals varying from 2 months to 2 years after the operation.

Next in this group of diseases that can only be cured by surgical operation may be placed certain sarcomas. Osteogenic sarcoma, fibro-sarcomas, neurogenic sarcomas, chondrosarcomas, etc. We shall not tarry with these, but pass on to consider certain oral cancers which in our experience we find can only be adequately

treated by surgical excision. I refer to cancer of the buccal mucosa involving the mandible in particular and oral cancer involving bone in general. At the Association of Surgeons Conference held in Lucknow last year the principal speaker on cancer of the buccal mucosa stated that once the cancer involved the mandible the case was incurable and could only be treated palliatively with radiation. It is apparently not generally known that cancer of the buccal mucosa is a very slowly growing and disseminating tumour and that even when the mandible is involved cures can still be obtained with a radical excision of the growth and the affected portion of the mandible. In fact experience teaches that any attempt to cure buccal cancer that has invaded bone with Radium or X-rays is doomed to failure. Cancer appears to gather resistance to radiation when ensconced in bone. It is not enough to chisel off the affected portion of the mandible with a generous margin of apparently healthy bone around. Whenever we have been tempted to adopt this conservative procedure we have regretted it later. Once the mandible is invaded it is impossible to determine with the naked eye how far the infiltration has proceeded in the bone marrow and we believe that the only safe attitude is to carry out a hemimandibulectomy, resecting the bone from the condyle behind to almost the middle line in front. To preserve the contour of the chin it is better to preserve the symphisis menti when possible. Only thus can one avoid recurrences that are fatal. Our practice is to start the operation with an upper neck block dissection removing the submaxillary salivary gland and all the lymph nodes of the submental, submaxillary and upper deep cervical group. The operation then proceeds to removal of the affected mandible together with the buccal growth. All these tissues—growth, glands and bone—are removed in one mass. We do not think it necessary to combine the mandible resection with a complete block dissection of the neck in buccal cancer because, as pointed out before, buccal cancer is essentially a slowly disseminating disease, and metastases to the nodes in the lower neck even in advanced cases are comparatively rare.

To illustrate the fact that advanced buccal cancers involving the mandible can be cured let me mention the figures of the Tata Memorial Hospital. There were 39 cases in which resection of the mandible was done 34 of which were fairly advanced cases. The mortality was 3 (7.7%). Of the 36 that survived 3 are well for over 5 years. 4 for over 4 years, 3 for over 2 years, and 2 for over a year, *i.e.*, 12 patients of the 39 may be said to have done well. Therefore involvement of the mandible does not necessarily indicate a hopeless prognosis.

What has been said about buccal cancers involving the mandible is also true of cancers of the hard palate *involving bone*. It is futile to attempt to cure these by radiation. Surgical excision is the only way to cure them.

Here I would also like to draw the attention of the radiotherapist to another feature in buccal cancer that in our opinion calls for surgical treatment. When the cancer has infiltrated through the whole substance of the cheek and come through the skin on the outside we do not advise radiation, except as palliation for any advanced cases, for two reasons. First, the chances of a cure with radiation in these extensive cases are not very bright. Second, because even if one succeeds in completely destroying the cancer one is left with a hole in the cheek with badly irradiated scarred edges that are poor material for plastic repair. A surgical excision removes the disease at one sitting and leaves behind healthy tissue for successful repair.

And last in this group of cancers that can only be cured by surgery I should like to include the malignant melanoma. You will probably think this a very surprising claim to make when I am sure many of you can recall having cured or having read about the cure of malignant melanoma with Radium or X-rays. Nevertheless we maintain that the *malignant melanoma is a most* radioresistant tumour and the so-called melanomas that are alleged to have been cured with radiation were really pigmented basal or squamous cell carcinomas. We believe that a pigmented tumour of the skin should not be treated by radiation. If it is a malignant melanoma it is not likely to be cured by radiation, and if it is a pigmented basal cell cancer there is no certain way of knowing this except by biopsy, and if there is one thing that should never be done, it is to biopsy a malignant melanoma. There is the gravest danger of disseminating the growth widely. We have seen the most disastrous consequences from even a careless excision of the growth. The only treatment of a malignant melanoma is excision of the lesion with a wide margin of healthy tissue and a radical lymphatic dissection at the same time or sometime later.

Malignant diseases best treated by radiation.—About the cases that are best treated by radiation I shall not say anything leaving it to Dr. Mody to do full justice to them. I shall only indicate that in this group fall the malignant lymphomas, like Hodgkin's disease, lymphosarcoma etc., and all cancers of the pharynx and larynx and tongue that are situated behind the level of the anterior

pillar of the fances with the solitary exception of cancer of the intrinsic larynx.

Malignant diseases best treated by a combination of methods :—The third group comprises of cancers that are best treated by a combination of surgery and radiotherapy. In this group may be mentioned carcinoma of the breast, thyroid, corpus uteri and anterior two-thirds of the tongue.

Although there are some individuals who advocate radiation as a primary treatment in cancer of the breast, the consensus of opinion, even among radiologists is that radical surgery followed in certain cases by post-operative radiation gives by far the best results. Here I would like to say a few words about a new school that has arisen in Edinburgh that advocates simple mastectomy followed by post-operative roentgen therapy, as opposed to a radical operation that includes extirpation of the pectoral muscles and axillary lymphatics. With this plan of procedure these workers claim results which are equal to those of the radical school. Does this mean that a radical operation is unnecessary? I do not think that it is wise to discard conceptions based on experience and a sound knowledge of pathology just because of a set of good results published by a new school. There are so many factors involved in the final production of results that unless each of these is given due consideration a proper evaluation of the treatment cannot be arrived at. It is only when other workers confirm these results of simple mastectomy that one may consider revising our present day notions. It is difficult to believe that when the axillary lymphatics are infiltrated with cancer it makes no difference to the ultimate result if these are extirpated or not. For one thing I am sure the radiologist does not claim to be able to sterilise the axilla as completely when there are a large number of fairly enlarged and infiltrated lymph nodes present as when all those have been removed and only stray microscopic deposits are left over. And if it be argued that in cases where the disease has already reached the axilla the cancer has also passed beyond the limits of a surgical extirpation one can point out that 30% of cases where the axilla is involved are cured by the methods of treatment in vogue to-day.

I will not say anything about cancer of the thyroid which is best treated by surgical excision followed by deep X-radiation in certain histological types. Nor will I discuss cancer of the corpus uteri which yields the best results where intrauterine radium is combined with a total hysterectomy a few weeks later. Of this group I will only select cancer of the maxillary antrum as deserving of special mention. It is not

generally realised that opening of the antrum by making an opening in the hard palate is in most cases an essential preliminary to radiation. Not only does it allow for dependant drainage for what is often an infected cavity but it permits of careful inspection during treatment and in the follow-up examinations for detection of early recurrence.

Malignant diseases that respond to either surgery or radiation:—Now we come to a group of cancers that can quite adequately be dealt with by either surgery or radiation. We may include here basal cell and squamous cell cancers of the skin, early carcinoma of the anterior two-thirds of the tongue and early cancer of the lip and cheek. I do not think there is much to choose between the two methods in the case of skin cancer, though being a surgeon I could make a very strong case for keeping the radiologist away from these lesions. However, discretion is the better part of valour, and feeling rather in a minority in this assembly I shall restrain myself.

Malignant diseases whose treatment is controversial:—And finally we come to a group of cancers whose treatment has given rise to much controversy. From this group I would like to select just three for special consideration the Giant Cell Tumour of Bone, Esophageal Cancer, and finally that eternal bone of contention: Cancer of the Cervix.

The first thing to realise about the giant cell tumour of bone is that there is a benign and a malignant variety and that the latter accounts for about 20% of these tumours. The malignant type may often be suspected by its radiographic features but can only be diagnosed definitely by aspiration or formal biopsy. Therefore we consider that an aspiration biopsy is essential before treatment. The malignant giant cell tumour can only be rationally treated by amputation of the limb proximal to the lesion, as these tumours behave like bone sarcomas and usually metastesise to the lungs. The benign giant cell tumour may be adequately treated either by surgery or radiation. Having seen good results with radiation I would not hesitate to recommend it in preference to surgical methods.

As regards cancer of the esophagus I must say that the results with radiotherapy have been most disappointing. Of our 500 cases seen at the Tata Memorial Hospital in the last 6 years there are only 4 cases we can reasonably claim to have cured. 98% of the patients have died within a year of the diagnosis. This distressing state of affairs has led to the surgeon's intrusion into this field and when early operable lesions have been encountered the surgeon has

been able to achieve an operative mortality of 25% and a cure rate of 20%. The surgeon has certainly not offered a solution of this problem of esophageal cancer but in the present state of our knowledge surgery can salvage more patients than radiotherapy. We have recently reported 3 consecutive successful resections of the esophagus[1] of which one died from bone metastases, one died a year later from general debility and cardiac failure probably the result of undetected metastases, and one is alive and well for the last 11 months.

And now let us take up the problem of cancer of the cervix which has been the subject of much acrimonious debate between surgeons and radiotherapists. About the advanced cases, classified according to the classification of the League of Nations III and IV, everyone is agreed that radiotherapy is the only treatment. But in the earlier cases, L.O.N. I and II there are surgeons who claim that the radical operation produces results that are equal or better than those of radiation, and they would advocate radical surgery for all these cases. The radiotherapist, however, retorts that his own excellent results are obtained without the 10% mortality associated with the best radical surgery for this disease and maintains that radiotherapy is *the* treatment for early cervical cancer. If one examines the rival claims dispassionatey one finds that the truth lies in between these two extreme views. There are certain cases that are best treated surgically and others that are best handled by the radiotherapist, and I shall endeavour to indicate on what basis the selection of the best treatment for the particular case should be done.

1. Radical surgery is justified only if the cancer is limited to the cervix and the cervix alone. If the disease has invaded the parametrium it is impossible to carry out a radical extirpation of the disease *en masse* because the ureter passes through the parametrium and it is impossible to remove every bit of the parametrium without severe damage to the ureter. If involved parametrial tissue is left around the ureter the operation is an incomplete one and bound to fail. We believe that even if clinically only the cervix and vaginal vault are invaded, the mere fact of the vaginal vault being invaded makes it very probable that microscopical infiltration has already taken place into the parametrium. This infiltration can be dealt with without damage to the ureter by radiation but not by surgery. Therefore surgery is only justified when only the cervix alone is diseased.

2. Radical surgery is only possible in those patients that are fit for major surgery. The operation is usually associated with much blood loss and considerable shock. Surgery is not advisable in the large fat and flabby woman · the lean and wiry type stands the operation best.

3. The histological type of the cancer also has some bearing on the ultimate result. We classify our cervical cancers according to Martzloff[4] into the most differentiated spinous cell type, the intermediate transitional cell type, and less differentiated spindle cell type, and the adenocarcinoma.

It is readily understood that the high grade anaplastic type that disseminates early and widely is best suited to radiotherapy.

But contrary to what has usually been taught it has been our experience, and that of many other workers in the same field, that the adenocarcinoma of the cervix, and the more differentiated spinal cell tumours show a fairly high degree of radio sensitivity.

Here I may mention that Martzloff[4] has reported a series of 349 cases of cancer of the cervix treated by Wertheim hysterectomy. He finds that the results were poorest in the spindle cell and transitional type of cancer and best in the spinal cell type and adenocarcinoma.

While, Jones *et al*[3] reported 87 cases treated with radiotherapy and the results were poorest in the spinous cell type and adenocarcinoma and best in the other two types.

Therefore if one were surgically inclined and wished to select cases for surgery on a histological basis one would pick upon the spinal cell type and the adenocarcinoma as being the most differentiated and therefore the least likely to show the best response to radiation. The problem is however confused by the fact that biopsy specimens may not represent the predominant histological type of the tumours.

In our series, only 11% of cases are limited only to the cervix and of these only 30% are of the spinal cell type and 4% are adenocarcinoma. This means that if we follow the criteria discussed above we find in practice that out of a 100 cases of cancer of the cervix, we select eleven as being only limited to the cervix and as amenable to cure by surgery. The spinal cell and adenocarcinoma account for 34% of these 11 *i.e.* 4 cases. From these 4 cases one must eliminate the fat and the flabby and the poor risk patients which leaves us only about 2 cases that can justifiably be subjected to a radical hysterectomy. When only 2 cases out of a hundred are suitable for surgery the radiotherapist can well afford to be magnanimous and offer these to the surgeon as the price for peace.

References:

1. Borges, E. J.—Surgical Resection for Cancer of the Esophagus, Ind. Jour. Med. Scs. 1:1-8, July 1947.
2. Gabriel, W. B.—The Principles and Practice of Rectal Surgery. H. K. Lewis & Co., London, 1945.
3. Jones, H. W. and Jones, S.—J.A.M.A , 122: 931, 1943 (Quoted from Proceedings of Tata Memorial Hospital, Bombay, Ind. Physician, 3:182-187, 1944.)
4. Martzloff, K. H.—Bull. John's Hopkins Hospital, 34:141-184, 1923 (Quoted from Proceedings of Tata Memorial Hospital. Bombay. Ind. Physician, 3:182-187, 1944.)
5. Pack, G. T., and Livingstone, E. M.—Treatment of Cancer and Allied Diseases, Paul B. Hoeber, Inc., New York, 1940.
6. Walters, W., Gray, H. K., and Priestley, J. T —Prognosis and End Results in the Treatment of Cancer of the Stomach, Arch, Surg., 46:939-943, 1943.

Scope of Radiation Therapy in Malignant Diseases

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EVER since radiation came to be used in the treatment of malignant diseases, and that was from the very beginning of the discovery of X-rays and Radium, one was apt to relegate surgery to a subsidiary status. This is a serious misconception and we are all grateful to Dr. Borges for having put forward so clearly the important role of surgery in the treatment of malignant neoplasms. We must not forget that 50 years back there was no radiation and our entire reliance was on surgery. Brilliant operations were undertaken, and many of these are still being practised with conspicuous success. Total laryngectomy, radical mastectomy, Wertheim for the cervix, excision of the stomach and intestines are all examples of the older surgery still being practised with some of the best results even now.

In the treatment of malignant diseases our ideal is to eradicate the primary growth together with the regional lymphatics. From this point of view surgery has great advantages as it can do so at one stroke. Unfortunately there are serious limitations, as it can only be used for early cases, once that stage is passed only palliative procedures can be undertaken. Such early cases are very few, particularly in this country, as you must know from your own experience. Take cancer of the stomach as a typical example. The large majority are inoperable from the start, out of those that are opened up a good proportion are found to be so advanced that nothing very much can be done. When you have weeded these out and discounted the primary mortality of the operation, there remains a very small percentage of 3

and 5 year survivals, probably 5 to 7%. But we must remember that with radiation there would have been no survivals.

A question of fundamental importance is to decide whether the treatment in a particular case is to be radiation or surgery. In order to do so we must have a clear understanding of the action of radiation on tissues in general. It acts on individual cells, if the dose is adequate, cells are destroyed beyond recovery, if inadequate cellular activity is merely retarded and the cell recovers. Different tissues and different neoplasms react in different ways to the action of radiation. According to their response they can be classified into three main groups:—

(1) *The radio-sensitive group* in which there is clinical regression after a comparatively small dose, say 2,500r. These are the lymphomas and lympho-sarcomas, the seminomas, the lympho-epitheliomas and the highly anaplastic types of squamous carcinomas. Response is rapid and immediate, but unfortunately such high sensitivity connotes high malignancy, in fact it is because of the highly malignant nature of these tumours that the sensitivity is so great. Metastasis takes place to which the patient ultimately succumbs.

(2) *The radio-responsive group*:—These comprise the usual squamous carcinoma of the skin, the oro-pharynx, the extrinsic larynx and the cervix uteri. They require about 5000r—tumour dose—for regression, but once controlled the end results are satisfactory.

(3) *The radio-resistant group*:—Usually an adenocarcinoma of the breast, the gastro-intestinal tract and the lungs. There is so little difference in the response of the tumour and of the surrounding healthy structures that in trying to destroy the malignant process, normal tissues are subjected to irreparable damage. This group is particularly suitable for surgery. It is thus evident that our main reliance as regards the selection of cases rests on the histological texture of the neoplasm. Other factors have also to be taken into account in arriving at a decision, though they play a minor part. Mutilation, loss of function and the risks to life inherent in surgical procedures have all to be considered, so that if there is an alternative method of treatment, such as we have in radiation, that should enter into our calculations. A patient for instance may rightly refuse to have a total laryngectomy, in which case one would be justified in resorting to radiation. If after about 10 days of treatment the lesion shows no signs of regression, operation can always be undertaken afterwards. Broder's classification is of very great help in the selection

of cases, in the response that we can expect and in gauging the prognosis.

Once a case is accepted for radiation several important points have to be considered. Are we going to cure the case or just palliate, all depending on the stage of the disease? This has a great bearing on the dosage that we have to plan. In early cases of carcinoma of the oro-pharynx, the larynx, the cervix and skin, we expect and plan for complete eradication of the disease. Unfortunately the majority of our cases are advanced problems with extensive primary lesion and glandular enlargement often bilateral. It is common experience that even in the worst cases regression takes place, primary is often controlled and the glands sometimes disappear. Large foul fungating ulcers of advanced breast cancer often heal, bleeding and discharge from an advanced cancer of the cervix are controlled and there is an all round improvement though temporary with considerable raising of morale and a radical change in mental outlook.

Pre-operative X-ray treatment used to be a routine procedure some years back. We now reserve it for the highly anaplastic tumours found in pregnant and lactating women, fortunately not common. Unfortunately whatever we do for these cases end results are disappointing. Malignant bone tumours, particularly the sensitive type such as Ewing's are heavily radiated prior to operation the idea being to sterilise the sensitive cells, so that they may not be disseminated in the blood stream during surgical manipulations.

Post-operative treatment is routinely given in breast carcinoma after radical mastectomy if the axillary glands show metastatic deposits. It improves the 5 year results. The indications for radiation treatment in malignant diseases are almost universal, particularly in this country where there is a large preponderance of oro-pharyngeal lesions. Even those cases which ordinarily are surgical problems have to come to the Radiologist as they are often too far advanced. This is in sharp in the contrast with the large preponderance of gastro-intestinal cases in the U.S.A., which are entirely surgical problems.

The deleterious action of radiation on cells is due to the impact of the quantum of rays on the individual cells. Unfortunately the law of chance applies to this and one finds that however big the dose may be certain cells are bound to escape the impact. Fractionation of dosage attempts, amongst other things, to take care of this unfortunate occurrence. An important point to decide is the total dosage, the time interval and rate of fractionation. It is now well recognised that a tumour dose

of 5,500*r* is essential for satisfactory sterilisation of squamous and epidermoid carcinoma. The time interval and the daily dose can only be determined empirically, and here we have to rely on our own experience as well as on the accumulated evidence from different clinics. What is the idea behind fractionation? On a particular day and hour certain number of cells are sensitive, others are resistant. The daily dose should be just enough to destroy all the sensitive cells, if the dose given is less some cells will escape. If on the other hand the dose is more, we are unnecessarily damaging the tissues. An attempt is being made to put this on a scientific basis. Serial biopsies are taken from day to day and the effects of particular doses are studied with a view to arrive at the optimum figure.

Correct technical factors are necessary for ensuring success, such as selection of adequate k.v., accurate centering, assessment of the extent of the tumour, distance, filter, number of fields and above all the correct direction of the beam. We should not be content with a bare statement of the k.v. we must think in terms of absorption. After all it is the quantum which is absorbed is of importance. We must so select the k.v. that the maximum absorption takes place at the level and depth which we must reach. A very useful criterion is D [illegible] the depth in the tissues at which the absorption is 50% of the surface dose. For instance in Contact therapy the half value is at ·5 to 1 cms. at 85 k.v. it is 1 to 2 cms., at 140 k.v. it is 3 to 4 cms., depending on distance and filter.

The best results are obtained in accessible cancers. Upto a few years back, these comprised only the Skin group. but now with modern apparatus which permit us to use intra-oral treatment at higher voltages the majority of oro-pharyngeal tumours can be called accessible. We use these largely at a k.v. ranging from 140 upwards. Many of these intra-oral cancers are deeply infiltrating, though clinically they may appear to be quite superficial, particularly so in cancer of the tongue. One great advantage of intra-oral therapy is that it obviates the necessity for using radium needles, which used to be the method of choice. The advantages of substituting X-rays for Radium are obvious, no pain, no hospitalisation, better dose distribution and above all avoidance of trauma. In connection with tongue lesions, we do not give so-called prophylactic radiation to the neck as a routine. We keep the case under observation and at the first signs of glandular metastasis neck dissection is undertaken.

Regarding the important question of dosage, two extremes have to be avoided, underdosage and overdosage. In sensitive lesions, clinical

regression is almost complete after a comparatively small dose, and one is apt to stop treatment prematurely, with almost a certainty of recurrence. On the other hand in those cases which are radio-resistant, the temptation is to push on treatment owing to poor clinical regression without bearing in mind the deleterious effects of overdosage. Radio-necrosis and late changes are real dangers, giving rise to distressing complications associated with severe pain, marked fibrosis and intractable ulceration. Moreover when radiation has been given once in adequate doses further radiation should be undertaken with extreme care or not at all.

I have tried to cover the ground as much as I could in this short space of time, and I hope it will help to crystallise our ideas on this important subject. Carefully planned radiation has cured thousands of cases of malignant neoplasms, on the other hand haphazard methods have resulted in immense harm.

Supervoltage Rœntgen Therapy and Recent Developments

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X-RAYS were being used for treatment almost from the very beginning of their discovery. Results were satisfactory in skin and superficial conditions, but when an attempt was made to treat deep seated lesions, particularly malignant group of diseases, the response was practically negligible. The action of radiation on tissues and the physics of radiation therapy were just beginning to be understood and it was clearly evident that such failures were due to inadequate penetration of the rays owing to inadequate machinery for their production. Physicists and instrument makers concentrated their energies on the manufacture of machine with greater penetrating power. It was well recognised that penetration into the depths was governed by the voltage at which machines were operating. The 200 k.v. was the first to be introduced and was the only one available for a number of years. Soon after 400, 600 900 k.v. and ultimately a 1,000 k.v. were manufactured. In the beginning these units were cumbersome, unreliable and difficult of operation. All these difficulties were overcome and in the last 12 years a million, million and a half, 2 million and 3 million units are obtainable and are now being used in routine treatment.

In treating deep seated malignant tumours the main problem for the therapeutist is to deliver a cancericidal dose to the tumour with minimum damage to the surrounding normal tissues and skin. X-rays by their ionising action destroy certain cancer cells and render others vulnerable to the resolving influence of the tissue fluids and cells. Irreparable damage to the normal tissues surrounding the growth render them incapable of influencing the damaged cells. This compels us to keep the dose at the tolerance level of the surrounding normal tissues It is difficult but not impossible to achieve success with the conventional 200 k.v., the introduction of supervoltage units is an attempt to solve these problems.

What are the advantages of the supervoltage group? Such evaluation can be done from different angles. We can study this problem from the physical characteristics, the biological effects on tissues and more important than all such theoretical considerations are the statistical data available.

The physical characteristics suggest a great many advantages. Owing to the preponderance of shorter wave lengths a much more penetrating

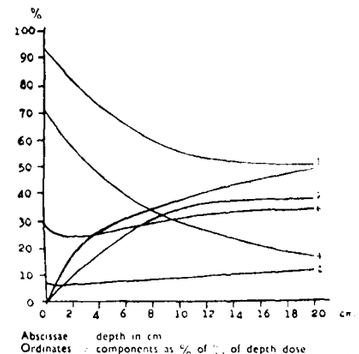

FIG. 1.

beam is produced. The depth dose at 10 cms is 35% for 200 k.v., 48%

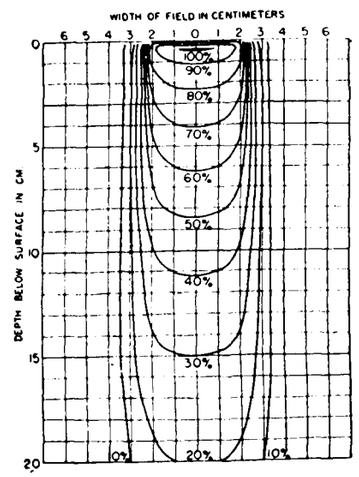

FIG. 2.

for 1,000 k.v., 52% for 2,000 k.v. and 57% for 3,000 k.v. What is more

important, in supervoltage therapy the effects are chiefly produced by

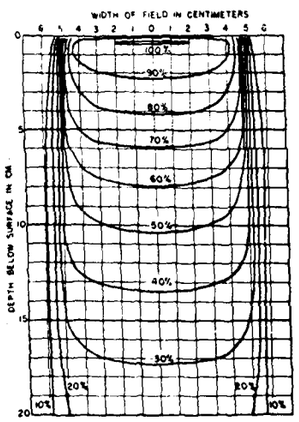

Fig. 3.

the primary beam and not by scattered radiation as in the 200 k.v. To quote figures, in 200 k.v. there is 9% primary and 26% scattered, whereas in the 1,000 k.v. the ratio is half

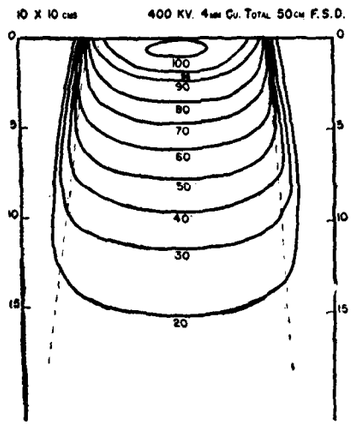

Fig. 4.

and half, 24% primary and 24% scattered. Lateral and back scatter are also heavy with the 200 k.v. nearly 30 to 36% as against only 9% with the 1,000 k.v. Such scattering unnecessarily and indiscriminately damages the skin and normal tissues without taking any part in the destruction of the neoplasm. In order to increase the depth dose large fields have to be used with 200 k.v. whereas with a million volts small fields are as effective as large ones, thus saving damage to the normal tissues. Radiation sickness is ascribed to the absorption in the body of broken down products of tissues and hence it is much more marked with the 200 k.v. because of the necessity of having to employ large fields to secure an adequate depth dose. Whereas with supervolatage therapy

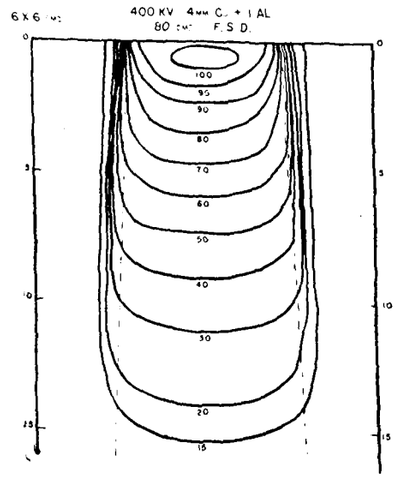

Fig. 5.

adequate depth doses can be secured with small fields, minimising this

serious complication. The maximum effects are not on the skin as with the 200 k.v. but just below it so that the intense skin reactions seen with conventional therapy are absent with the higher k.vs Even with a heavy dose such as 5000r the skin presents only a mild erythema. A single port would often suffice instead of the usual cross firing. Such cross firing

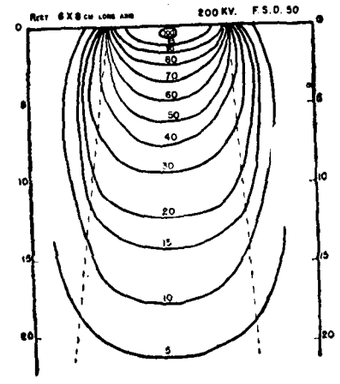

Fig. 6.

has to be resorted to in deep seated conditions and here one has to bear in mind the largeness of the exit dose, being 22% as against 11% at 20 cms. distance. One further characteristic of the supervoltage group is that the depth dose is effective in the entire extent of the beam, there is no falling off as in the 200. The sum total of all these physical characteristics is that we are able to increase the effectiveness with which deep seated tumours can be treated without undue damage to the skin and

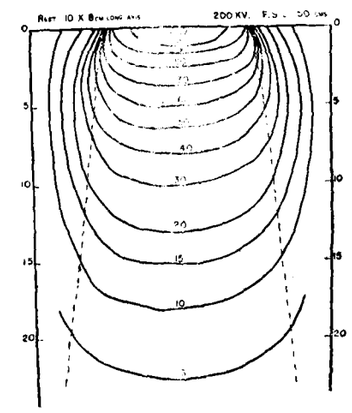

Fig. 7.

with minimum discomfort to the patient. We can use single fields for tonsil, tongue or naso-pharynx. We can use 2 opposing fields for oesophagus instead of the complicated set up of 6 fields and more. We can use small fields accurately centred as for the rectum and get a high degree of regression. The skin is saved, radiation sickness is less, unnecessary damage to normal tissues is minimal. Treatment is simpler without sacrificing efficiency. When we come to consider the biological effects produced by such short wave lengths, one is apt to run away with the idea that shorter the wave length the greater must be the effects. Experiments on animals even with the 20 million volt Betatron, and the very successful use of Contact Therapy with it's long wave lengths prove conclusively that there is no inherent difference in the biological action

whether the wave lengths are short or long.

It is now over 12 years since the routine use of supervoltage therapy, a large mass of clinical material is available for statistical evaluation. After all everything is judged by the results, "the proof of the pudding is in the eating" as they say. Here is a report on 1,800 cases treated at the Massachusettes General Hospital from 1937 to 1944. Only such cases have been included that have been followed up for 5 years.

76 cases oral cavity—7% 5 year cure—no difference as compared to treatment with 200 k.v.

60 cases tongue cancer—9% 5 year cure—treatment by one field, 6000*r*, reaction not severe.

60 cases carcinoma naso-pharynx—6% 5 year cure.

58 cases of carcinoma tonsils—17% 5 year cure—treatment by single field 6000*r*.

50 cases of larynx—2% 5 year cure—very poor result.

152 cases of carcinoma lung—none lived for more than 3 years, but good palliative results were obtained.

98 cases of carcinoma oesophagus—no patient lived more than 2 years. This is an ideal location for supervoltage treatment as 2 opposing fields can effectively deliver an adequate depth dose.

25 cases of carcinoma rectum—none lived more than 2 years.

40 cases of testicular tumours—11% 5 year cure—no better than with 200 k.v.

196 cases of carcinoma bladder—15% 5 year cure no better results than with 200 k.v.

89 cases of ovarian malignancies—12% 5 year cure—no better results than with routine treatment.

424 cases of carcinoma cervix—24% 5-year cure. No better results than with 200 k.v. but better palliation was obtained. Supervoltage therapy is worthwhile in this group because of absence of skin reactions and less radiation sickness.

145 metastatic deposits—no better results.

14 bone tumours—out of these 3 were Ewing's Tumour, and 2 of the 3 survived 5 years rather a remarkable achievement.

Deep seated localised lesions have done better with supervoltage treatment in that life is prolonged and made more comfortable. There is very little evidence to show, however, that a greater number of tumours can be destroyed by treatment with the supervoltage units than with routine treatment with the 200 k.v's. The results are disappointing and the reason for such poor salvage is obvious. Deep seated lesions are surrounded by important organs

such as the bladder, the rectum, the ureters, the small bowel. Although skin damage is minimal, damage to these important organs is as great as to the disease. It would be very easy to deliver as high a dose as 6,000*r* to the cervix without affecting the skin, but the damage to these organs that are so intimately bound up with the cervix would be profound and fatal. In other words the dose that can be safely delivered is not guided by the skin tolerance but by the tolerance to the normal organs. Intensive research is leading us to higher and higher k.v. units. We already have the Betatron, working at 20 million volts. There are cyclotrons which produce high energy beta, alpha, proton, and deutron particles. Accelerated protons of the 100 million volt magnitude are being tried out in tissue radiation. The dosage at the depth is expected to be 100 times the dose on the surface. What a fascinating prospect, that 50*r* on the skin developes into 5000*r* at the depths. There are developments in other directions, notably in radio-active isotopes. These have proved invaluable as tracers in the study and better understanding of physiological and biological problems in the human system. For a long time attempts have been made to utilise them for the treatment of malignant diseases. The substances used have been radio-active Ph., Iodine, Carbon, Chromium, the Halogens and Calcium. Such substances when injected are taken up electively by certain tissues, such as Iodine by the Thyroid, where they lodge and release their radio-active energy. Chamberlain quotes the case of a lawyer who suddenly developed a rapidly growing carcinoma with large tumour masses in various parts of the body. Radio-active Ph. was given and by the end of the 2nd week he was back at work A month later they recurred. He was again given radio-active Ph. this time in large doses. The masses regressed and he kept well for a month when he started bleeding and died from shock. Post-mortem was done, no tumour masses could be found in any part of the body, every tumour cell had been destroyed. He died from a dose that was adequate to cure the tumour, but which produced profound and fatal changes in the blood forming organs.

Certain chemical compounds also offer hopes of destroying malignant cells in situ, wherever they are. A great deal of work is being done on Nucleic Acid metabolism, which is the chief product of cellular activity. Radiation causes a decrease in the formation of this substance, it is likely that as a result of such treatment certain chemical substances are produced which inhibit Nucleic Acid metabolism. It should be possible to isolate such substances and use them for injections in malignant disease.

An interesting point of research in this direction is being attempted at the Tata Memorial Hospital. A young girl with a huge lymphosarcoma of the breast is given radiation treatment on one part only, the other part being heavily shielded so that no radiation can reach it. Our work with this case confirms in part the Hevsy phenomenon observed with the sarcoma of rats. While a diminution in the Nucleic Acid charge is manifest in the irradiated area, other interesting features have been noticed in the shielded part. These are under investigation in the Cytology Department of the Tata Memorial Hospital.

The object of this paper is to sound a note of warning against over-optimism. Chamberlain rightly points out "that in the past we have been told too many times that this or that new and different source of radiation would revolutionise cancer therapy. There is no reason to believe or hope that newer methods will provide a final answer to the cancer problem. Cancer has been cured by irradiations in thousands of cases and results are showing steady improvement. This has been due in small part to improvements in equipment, in large part to increased knowledge and skill of the radiologist. We must not jump to the conclusion that a revolutionary method has suddenly come to hand, one that will solve or greatly modify the problem of cancer.

References:

1. Hardin B. Jones.—Recent Developments in Medical Physics having application to Radiation Therapy. American Journal of Rœntgenology and Radium Therapy, July 1947.
2. John G. Trump, Clarence R. Moster and Robert W. Cloud.—Efficient Deep Tumour Irradiation with Rœntgen Rays of Several Million Volts. The American Journal of Rœntgenology and Radium Therapy, June 1947.
3. George W. Holmes and Milford D. Schulz.—A Review of the Cases Treated during an 8 year period (19 7-1944 inclusive) Supervoltage Radiation. From the Department of Radiology, Massachusetts General Hospital, Boston. The American Journal of Rœntgenology and Radium Therapy, May 1946.
4. Innes G. S.—Million Volt Therapy. British Medical Bulletin No. 1, 1946. Radiobiology, Experimental and Applied.
5. Chamberlain W. E.—Future of Atomic Energy: Biological Phase. Chemical and Engineering News. Vol. 24 No. 10 (May 25, 1946).

INTERESTING CASE REPORTS

Double Renal Pelvis with Bifurcation of the Ureter—A Case of Congenital Anomaly

MAJOR R. BHATTACHARYA, B.SC., M.B., & AMALANANDA DAS, M.R.C.P. (Lond.),
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H. L., Female, age 25 years.

This lady has been suffering from pain in the right side of her abdomen since March 1947. The pain is more or less constant with occasional exacerbations during which it becomes more marked in the lower right quadrant and in the small of the back. The later exacerbations are characterised by frequency in micturition, rise in temperature and burning sensation in passing urine. In one of these recent attacks with fever, examination of the urine revealed a large number of pus cells and calcium oxalate crystals and the blood count showed a leucocytosis of 13,800 with 83% of Polymorphs.

Past History:—She is subject to attacks of dysentery. Entamoeba Histolytica and Giardia Cysts were found once in the stools. She had pain and tenderness in the liver region one year ago. A few months before she was seen by us she had her appendix removed.

Present State:—In addition to the constant pain in the right side of her abdomen with the occasional exacerbations, she often passes mucus in her stools though the abdominal pains do not conform to the characteristics of bowel colic. There had been no symptoms suggestive of Dietl's crisis.

Physical Examination:—A thinly built woman, "Spare, long-waisted, with narrow loins." Scar of Macburney's incision. The only abnormal physical finding is the enlarged and tender right kidney, the whole of which could be palpated in the upright position.

Radiological examination.—The radiological examination, which was done in a quiescent period, brought out the unusual features in the case. It consisted of a series of skiagrams taken after an intravenous injection of 20 cc of Pyelectan and the findings are as follows:—

1. Film taken 10 minutes after the injection with the patient just holding her breath at the middle of her respiratory movements (*Fig. 1*).

FIG. 1. Intravenous Pyelogram, taken 10 minutes after the injection. Middle of inspiration and expiration.

Left side : —There is nothing abnormal found. The excretory function is normal and the renal pelvis with the ureter have filled well with the dye.

Right side: The right ureter is bifurcated at the level of the transverse process of the 4th lumbar vertebra. The two limbs ascend to different heights, terminating in two independent renal pelves, the upper one being small and the lower, bigger and more fully formed. Both pelves are in the more or less antero posterior plane, so that the normal curve at the uretero-pelvic junction with its medial convexity is not present. Though the calyces of the lower and bigger portion project outwards as in a normal kidney, the renal pelvis in relation to it remains situated on its anterior aspect. This can only be due to a partial renal torsion on account of failure of rotation during development.

The outline of the kidney as a whole on this side is bigger than that of the left but no definite line of cleavage can be distinguished between the upper and the lower portions. It is therefore a fused kidney with two independent pelves and two ureters, the latter joining with each other at a lower level.

Skiagrams taken at the end of inspiration and expiration (*Figs. 2 & 3)* show the extent of movement in a vertical plane with respiratory excursions. The inspiratory descent on the right side causes a distinct

FIG. 2. Intravenous Pyelogram, taken 30 minutes after the injection. End of inspiration.

ureteral kinking on the abnormal side at a level below the transverse process of the 4th lumbar vertebra *(Fig. 2)* which practically disappears with the expiratory ascent *(Fig. 3)*.

FIG. 3. Intravenous Pyelogram, taken 35 minutes after the injection. End of expiration.

Comment.—1. This is a typical case of unilateral double renal pelvis and morphologically a fusion of two independent kidneys with separate excretory system. The ureters do not however follow independent courses right down to the bladder but unite to form a single tube after a little while.

2. The characteristic features of pelvic duplication presented by such cases with congenital anomalies are well shown in this particular instance also. These are :—

(*a*) The lower element of a fused kidney is genenerally bigger and more fully formed. This feature is well shown in this case by the skiagrams.

(*b*) The upper element, as is usual, is rudimentary containing a single or perhaps two calyces. Looking thus like a hammer with a handle it presents the typical picture of a "Hammer-head" type of pelvis.

(*c*) The ureters may unite at varying levels below the uretero-pelvic junction or pursue independant courses right down to bladder. In this case they have united at the level mentioned above.

3. The unusual feature present in this case is the failure of rotation of the lower and bigger element though the usual ascent from the pelvic position has not failed. Failure in rotation is usually associated with failure in ascent also.

4. The downward respiratory excursion of the right kidney as a whole during inspiration produces a distinct kink in the ureter which may be accepted as an evidence of a mild degree of ptosis with some urinary stasis, but the latter does not amount to an actual obstruction with production of hydronephrosis. This ptosis may be accounted for by the poor nutritional condition of the patient with loss of perinephric fat.

5. The case also illustrates the truth of the statement enunciated by Wesson—"It is a general law of medicine that an abnormal organ is more susceptible to pathological conditions than a normal one, and this is particularly true in the case of the kidney, for here malformations routinely predispose to disease." The abnormal right kidney of this patient, according to the above "Law" is liable to repeated infections and this is well corroborated by the history of periodical exacerbations with other evidences of such events. The colitis added to the stagnation of urinary flow are likely to lead to pyelitis, which apart from the exacerbations, is probably continuing as a subacute infection causing the vague abdominal pains and "Kidney consciousness." Periods of blockage of the urinary flow may occasionally occur at the site of the ureteral kink with sharp attacks of pain of a renal character, but this may only happen when the infective factor is preponderating. During quiescent stages, as has been demonstrated by our radiograms, the kink practically disappears and there cannot be any obstruction during these periods.

Summary.—A case of double renal pelvis with a right sided fused kidney and bifurcated ureter is presented with complete radiological investigation and the liability of such abnormal organs to infection has been proved by the frequently repeated symptoms of Pyelitis present in the case. The radiological demonstration of the kinking of the ureter produced by the descent of the kidney by the movements of inspiration has also been clearly brought out in the skiagrams reproduced.

Bibliography:

Wesson, M. B. and Ruggles, E. H.—Urological Roentgenology. Henry Kimpton, 1937.

Treatment of Osseous Metastasis from Carcinoma of the Female Breast by Testosterone Propionate with one Case Report*

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Herrman, Adair and Woodard reporting a total of 14 cases (between the age of 32 and 69) of osseous metastasis from breast cancer treated by androgen[1] summarise and conclude as follows:

With the exception of three cases previously treated with irradiation but without benefit, all received only Testosterone propionate intramuscularly. As those three patients improved with the subsequent androgen therapy, it would seem that repeated irradiation of bones does not destroy their power to react to the androgen. Eight patients showed symptomatic improvement within two weeks of the institution of the therapy. Six patients revealed X-ray evidence of calcification of metastatic areas.

In some instances as bone density increased, there was a drop in the serum calcium indicating either a deposition of this element or a decrease in osteolysis. In eight patients a rise in serum alkaline phosphatase was noted, which in the absence of liver disease indicates bone growth or an attempt at bone regeneration. It is likely that some mechanism involving the pituitary or the suprarenal stimulates the osteoblastic activity and the alkaline phosphatase production.

The bone lesions appeared to remain quiescent for a varying length of time after the termination of the therapy. If pain recurs additional androgen gives relief. In many cases this status may be maintained till pulmonary or liver metastasis appears, when the patient rapidly retrogresses in spite of the continued administration of the androgen. The dosages used in this series were 100 mg. and 200 bi-weekly and 100 mg. tri-weekly. The treatment was continued till the patient became asymptomatic. A maintenance dose of 25 to 50 mg. bi-weekly was given in some of the cases. The androgen induced amenorrhoea, but the menses returned when this was withdrawn. One patient developed pain in the metastatic area when the androgen was withdrawn. Some showed facial hirsuitism and deepening of the voice and some developed acne in the

*Presented at the Second Indian Congress of Radiology at Bombay in December 1947 after the "Symposium on Malignancy."

neck, shoulders and chest. A transient oedema of the face and legs was noticed in some. An increase in the libido was noticed in many patients. At the beginning of the treatment all patients gained in weight, but after the termination of the treatment much of this weight was lost. This increase in weight was probably due to protein nitrogen retention by the tissues rather than to fluid retention. Majority of the cases showed no significant alteration in the blood, serum protein, chlorides or urine.

The Therapeutic Trials Committee of the Council on Pharmacy and Chemistry of the American Medical Association made a report on the status of Androgen and Estrogen therapy in Mammary Cancer[2] based on the investigations of Adair of Memorial Hospital, New York, of Nathanson of the Massachusetts General Hospital and of certain English investigators.

They find no indication that this form of Steroid Hormone therapy affords a cure, it is palliative only. In some carefully selected cases this type of therapy gives symptomatic relief and may prolong the life expectancy. Radical surgery with pre- or post-operative roentgen radiation is the only procedure recommended for curable lesions. Only cases that are definitely inoperable should be given this treatment.

Androgen therapy:—It is for patients who have metastases in bones that androgen affords some relief. Relief from pain, increased appetite, gain in weight, ability to sleep without narcotics is obtained within 2–3 weeks. An increased density of bone with deposition of new bone is noticed in X-rays. "Sometimes, however, there is evidence of increase in osseous metastases, even though the patient shows symptomatic improvement."

As an evidence of regeneration of bone the alkaline phosphatase rises from 3 to 5 units per 100 c.c. to as high as 15 to 17 units. An alkaline phosphatase level of 25 to 50 units suggests damage to liver or hepatic metastases.

In younger patients with large doses of Testosterone definite masculinising effects are noted. The serum calcium level may rise at first but comes down with clinical improvement. The duration of relief obtained by this treatment is variated and in recurrences further treatment may be given. As regards the maintenance dose further investigations are suggested.

Estrogen therapy:—Older women with soft tissue manifestations of carcinoma breast, respond favourably. Definite regressions following this therapy have been noted in the primary tumour, soft tissue recurrences, lymph and pulmonary metastases. Haemopoiesis appeared more active, appetite increases, and a gain in weight is noticed. No influence is seen in skeletal metastases and pain is relieved only sometimes. The drug extensively used is Diethyl Stilboestrol orally in doses of 5-20 mg. a day. Undesirable side effects are loss of appetite, nausea, vomiting cutaneous eruptions, diarrhoea and oedema. General criteria are different from those for androgen therapy, and the favourable reactions appear transitory.

Contra-indications:—Androgen therapy is contra-indicated in patients with high blood calcium levels 14 mg. per 100 c.c. or above. If during treatment, the level rises high the treatment should be discontinued.

Estrogen is contra-indicated in the patients who still menstruate or had menstruated within a five year period, as it accelerates the rate of growth of the carcinoma. Most suitable patients are women above 60 years and it should be used with care, as cardiac decompensation may be precipitated due to retention of fluid.

Since 1937, I have, in my private clinic, as a routine, adopted X-ray castration for the ovaries[3] in all cases that had not reached menopause (in addition to the usual pre- or post-operative irradiation to breast and glands). In localised metastasis deep X-ray therapy has been beneficial, but I always refrained from such therapy in cases with generalised metastasis. British therapists had reported on beneficial effects of Stilboestrol in advanced breast malignancies advocating it in small doses. My personal experience with Stilboestrol in three such cases, has not been favourable. With the adoption of X-ray castration for younger patients, I was inclined to try in a few advanced growths androgens, but the dose I gave was small 10 to 25 mgms. daily, and even this could be continued only for a short period as the patients did not survive long enough to draw conclusions. The one case under report was a medical colleague's wife and the improvement she made was remarkable. She died of coronary thrombosis 18 months after osseous metastasis was discovered.

Short notes regarding case.–Early in 1944, at the age of 38 a lump was noticed in the left breast, movable over deeper tissues with skin dimpling at one spot—glands not palpable—radical amputation done in February 1944 by Surgeon N. M. Rao. Pathological report—"Carcinoma, simplex, glands not affected." Post-operative deep X-rays were given at the Barnard Institute of Radiology, Government General Hospital, Madras. No castration dose to ovaries was given at the time. She returned practically to normal, except for the psychological aspect; periodical X-rays showed freedom from secondaries.

Two years four months later, a lump in the right breast was noticed by the patient. Immediately radical amputation was decided upon and done early in June 1946 by Surgeon C. P. V. Menon. Radiographs of skeletal system at the time showed no evidence of secondaries (*Fig. 1*).

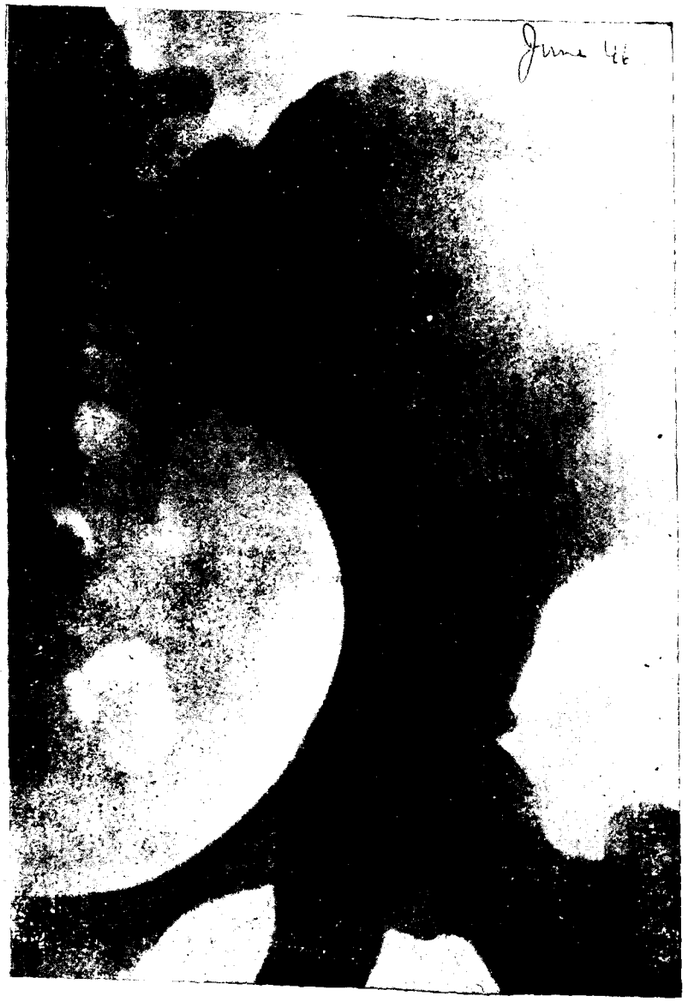

FIG. 1.

Pathological report: "Spheroidal cell carcinoma—two glands showed

FIG. 2.

secondary involvement." Following the mastectomy, irradiation of operative field and axilla, as also of the pelvis (castration dose) was given by me in my clinic. During this treatment and after, she had the usual

Replied to Tantia Tope's question that the causes for this country-wide uprising were varied viz., conversion of people to Christianity, the British rulers keeping aloof from the mainstream of life of Indians and showering of abuses on the subjects eg., native, nigger, black, idiot, pig, bloody, bastard, fool, dog bitch, etc., and using the expression 'native' prince for rulers like the Gaikwar of Baroda and the Nizam of Hyderbad ; for them, Raja Rajendralal Mittra and Pt. Satyavrata Samashrami were 'native' pandits, Dr. Mahendralal Sarkar and Gangadhar Kaviraj were 'native' physicians, Raja Ram Mohan Roy and Ishwar Chandra Vidyasagar were 'native' reformers everything 'indian' was thus an object of disgust; the main cause being the forcible annexation of various princely states by hook or crook, such as the Punjab, Pegu (Burma), Sikkim, Satara, Sambalpur, Jhansi, Bhagalpur, Udaipur, Nagpur, Jaitpur, Karouli, etc: transfer of country's wealth to England, resulting in poverty, famines and deaths due to starvation ; imposition of various taxes such as education tax, road tax, water tax, income tax, land tax, etc, scarsity of cloth and food grains made people semi-naked and half-dead ; recruitment of soldiers from illiterate and foolish populace who were deprived of education for the rest of their lives; great discrimination and partiality towards European soldiers with respect to treatment and salaries ; merciless suppression of country's soldiers who dared to register their protests against maltreatment ; thus, the treatment of soldiers by the British Officers being worse than that of animals, mutiny appeared to be imminent. Replied to Kunwar Singh's question that a war for independence would never go unrewarded ; India had become dependent gradually in a hundred years against foreign aggression and so, another hundred years might be required to gain independence. My chief aim of coming to Kumbha Mela at Haridwar was two-fold : one to search out adept yogis and the other, to organize the *sadhus* who numbered in lakhs ; had I not this latter aim in my mind, I would have joined you immediately.

The five leaders asked me to continue the task of organising the sadhus as hundreds and thousands of people were already engaged in rousing the public from Peshawar to Calcutta and from Meerut to Karnatak. "I advised them to adopt the method of circulation of lotus flowers and of *chapatis* as per the ancient traditional practice to spread the secret message of rising among warriors and civilians respectively. The leaders then took leave of me."

"In the course of my efforts to organise *sadhus*. I put forth my request before the four Heads of Mutts of Adwaitins (followers of Adi Shankaracharya). They replied that for them, only Brahma was real and all else-nation, society. family, life, world, independence, slavery *varna*, *ashrma*, mine-thine, etc , were false and unreal; as such it would be futile to do anything with respect to things which they considered unreal. The Dwaita Vaishnavite *sadhus* replied in a different manner, but carrying the same purport that their bodies were reserved only for the devotion and *bhajan* of Shri Rama or Shri Krishna and for no other purpose at all; it would be a great sin to use that body for other purposes such as service to the country, society or nation; the human body was not meant for such useless errands; salvation was certain if the rituals of service to God and his *bhajan* were adopted; it was not wise to use the human body for such purposes which came in the way Bhagavadbhajan."

"While returning with disappointement, I remarked that in a country where such devotees were in the largest numbers its doom was quite certain. I then, approached leaders of various sects and subsects of Vaishnavism; they failed to understand even the importance of an organisation. Observed various processions of sadhus making deafening noise in the Kumbha Mela and felt very bad that in a dependent country like India under foreign aggression, the *sadhus* were so overwhelmed with joy, forgetting everything."

supportive treatment with daily injections (I.M.) of Liver Extract with vitamin B.

Patient's general health returned to normal. Two months later, patient had attacks of lymphangitis in the right arm (side operated last). Co-incident with these attacks was the return of a low back pain, which the patient has had for over four years even before the left breast condition was noted. This pain has always been coming on with exertion, and completely subsiding with rest and fomentations (Infra-red light). In the month of September when further muscular and referred pains were complained of radiographs taken showed evidences of extensive secondaries all over the pelvic bones, lumbar and dorsal vertebrae and the ribs. There was no local recurrence in the scar, chest wall or axilla. One characteristic of these deposits was that there were islands of condensation of bone within larger areas of rarefaction *(Fig. 2 vide page 97)*. There being cases reported of osteoblastic metastasis from breast cancer, some of my colleagues opined that the condensed areas were the secondaries while I felt that the osteolytic (rarefied areas) where the metastatic deposits and that the condensed areas were islands of normal bone with (naturally) reaction around due to the osteolytic processes. In this case, as subsequent radiographs taken, show a degree of retrabeculation of rarefied areas consequent on androgen therapy, I feel I was justified in surmising that condensed islands of bone were not the secondaries *(Fig. 3 and 4 vide pages 99 & 100)*.

Blood chemistry showed increase of serum phosphatase; serum calcium normal. The patient's general condition was fairly good—weight 100 lbs. against 98 lbs. previously. Blood picture normal; no tenderness over the bones showing these secondaries. I did not consider irradiation desirable with such extensive metastasis and so advised hormone therapy. Testosterone propionate 35 mgms. daily to a total of 2000 mgms. were given intramuscularly. General health considerably improved with relief from muscular pain and discomfort; slight signs of masculanisation, facial hirsuitism and deepening of voice developed, when daily injections were stopped. After an interval of a few weeks, she was given a maintenance dose of 25 mgms. weekly, and later 50 mgms. weekly, after perusal of published reports of larger maintenance doses. General health was quite satisfactory all the time, excepting for the low back-ache occasionally complained of. Weight 112 lbs. Radiographs of pelvis and vertebrae were taken at intervals and showed increased consolidation and retrabeculation; general health and active habits were

maintained until death on 15-3-'48 by an acute attack of typical coronary occlusion—18 months after secondaries were discovered. At no time was she bedridden with the secondaries.

Fig. 3.

Discussion and conclusion:—Androgens have a definite place in the

treatment of secondaries in bone from breast cancer. In advanced cancer of the breast the results are not conclusive. The mechanism is apparently

Fig. 4.

the influence on the pituitary or the suprarenal which increases osteoblastic activity. Androgen therapy demands greater consideration, since some therapists (myself since 1937) have adopted routine X-ray castration of ovaries, thereby diminishing estrone in the circulation. Artificial menopause is thus brought about (as when androgen is administered) in younger patients with breast cancer. With androgen therapy it is reported that "sometimes there is evidence of increase in osseous metastases, even though the patient shows symptomatic improvement." It is not clear from reports whether this statement is based on finding increased osteolytic metastasis or osteoblastic metastasis following androgen therapy. If it is that the osteolytic lesions showed an increase in extent early during androgen therapy, the finding will be significant that there may be a stimulative effect in the beginning, caution about which has to be taken. If it is the increased calcification in the (?) osteoblastic processes that is interpreted as "increase in osseous metastasis", I feel further investigation and follow up of cases treated with androgens when recalcification takes place in areas of rarefaction (as in the one case under report) is necessary before we accept that osteoblastic metastasis do occur in cancer of the breast. I personally agree with older writers who say breast cancer always produces osteolytic metastasis, while prostatic cancer produces osteoblastic metastasis and the opposite hormones androgen and estrogen respectively can be given with benefit in such cases.

The position with regard to adoption of estrogens in breast cancer should be gone into more thoroughly in view of the fact "that estrone accelerates growth of carcinoma" and that "most suitable cases will be those over 60 years of age or 5 years after reaching menopause" when naturally estrone in circulation is minimal.

Androgen and estrogen should never take the place of radical surgery in operable breast cancer. Estrone is of no therapeutic value in bone metastasis.

References:

1. The Use of Testosterone Propionate in the Treatment of Advanced Carcinoma of the Breast. Treatment of Osseous Metastasis by Hermann, Adair and Woodard. Surgery, St. Louis, Vol 22, No. 1, July 1947, P. 119.
2. Journal of the American Medical Association, Vol. 135, No. 15, 13th December 1947, Pp. 987-8.
3. Carcinoma of Breast [illegible] P. Rama Rau, Indian Journal of Surgery, Vol. [illegible], No. 2, June 1943, P. [illegible].

in several instalments in the "Sarvadeshik", a Hindi weekly journal of The Sarvadeshik Arya Pratinidhi Sabha, Asaf ali Road, New Delhi during 1969-70 (5th Jan. '69 to Nov. '70). This was a Hindi translation (of the Bengali version) by Shri Dinabandhu Vedashastry, Secretary, Bihar-Bengal Arya Pratinidhi Sabha, Calcutta.

It was claimed that during his 4 months' stay (between 16th Dec. 1872 & 16th Apr. 1873) at Bengal, Swami Dayananda Saraswati dictated his detailed autobiography in Sanskrit to Bengalee pandits as per the requests of Brahma Samaj leaders viz., Maharshi Devendranath Thakur, Pt. Iswarachandra Vidyasagar and Keshavachandra Sen, etc. It was also stated that Swamiji directed the Brahmo leaders not to publish his autobiography during his life time (as otherwise, serious complications might arise).

A Bengali translation of this autobiography was later on made by Bengalee Pandits, but no attempts to publish this seemed to have been taken after the death of Swami Dayananda as the relations between Brahmo Samaj and Arya Samaj were strained at that time.

Shri Nagendranath Chatterjea, a Brahmo leader published a short biography of Swami Dayananda entitled "Mahatma Dayanander Sankshipta Jivani" in Bengali in the year 1886[5]. It seems that he was not aware of this autobiography in Bengali lying in dust in the bookshelves of Brahmo leaders.

After publication of this autobiography in Hindi in the "Sarvadeshik" weekly journal, Swami Satchidanandh Yogi of Sri Narayana Swami Ashram, Nainital carried out investigations and got published this autobiography in a book form (containing about 250 pages) entitled "Yogi ka Atmacharitra" by Yogeswar Maharshi Dayananda Saraswati in the year 1972 along with the

results of his investigations, several appendices giving supporting proofs, additional informations and photostat copies of several pages of manuscripts in Bengali. The publishers were Patanjala Yoga Sadhna Sangha, Rohtak.

Acharya Dinabandhu Sastry, in his preface to the Hindi translation, states that his efforts to collect the various manuscripts in Bengali[6] from the houses of several Bengalee pandits and Brahmo leaders covered nearly 45 years (1923-68). He gives out names of several Bengalee pandits, viz.,

1. Pt. Satyavrat Samashrami
2. Historian Ramesh Chandra Dutta, I.C S.,
3. Pt. Satyacharan Sastry of Rishida (Hooghly)
4. Acharya Anantha Krishna Sheel of Sadharan Brahmo Samaj
5. Shri Kshemendranath Thakur, great grandson of Maharshi Devendranath Thakur
6. Sri Balai Chand Mullick
7. Acharya Hrudaya Krishna De of Ulta, Banga Sa. Br. Samaj
8. Shri Hemendranath Chatterjea of Behala
9. Sri Devavrat Chakravarty of Varahanagar
10. Acharya Sureshchandra, Sankhya-Vedanta Thirtha of Adi Brahmo Samaj
11. Shri Kshitindranath Thakur of Adi Br. Samaj
12. Pt. Sitanath Tattwa Bhushan of Sa. Br. Samaj

The Indian Journal of Radiology

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Editorial

THE successful treatment of malignant tumours very largely depends upon 3 main factors *viz.* a sound knowledge of the disease, wise selection of the method of treatment and lastly accurate and skilful technique. This knowledge can only be obtained by a combination of clinical and pathological study with a disinterested and critical survey of the results of the treatment. "To choose the best method of treatment requires complete freedom from bias for any particular form of treatment and the ideal choice can only be made if all forms of treatment are available and this choice is made independent of any vested interest in an X-ray machine or a quantity of radium or the possession of the required skill and courage to undertake major surgical operations.' This choice of the method of treatment should be conducted solely in the interests of the patient and no form of treatment should be denied to him or her because it is outside one's scope. Skilful technique in radiation therapy depends upon the close co-operation between the physicist and the radiotherapist and a sound conception of biological effects of radiation. The most essential thing is the spirit of team work in the association of a group of workers *viz.* the surgeon, pathologist and the radio-therapist each an expert in his own branch.

From this point of view the symposium on malignant diseases by Drs. Khanolkar, Borges and Mody read during the last session of the Indian Congress of Radiology which met at Bombay recently has certainly done an invaluable service in bringing home to all those who are interested in the early diagnosis and treatment of malignant diseases, the necessity for team work in tackling this great problem. Dr. Khanolkar very rightly assessed the value of the various laboratory methods that are available to us in the early diagnosis of malignant diseases and what guidance they could give us in the selection of the correct line of treatment. The intelligent use of the various methods described will certainly go a long way to help us in

our fight against cancer and improving our results.

Dr. Borges in his paper on some aspects of surgery in cancer detailed the indications for surgical treatment of certain types of malignant diseases. Although the indications for the choice of the method of treatment in various malignant tumours according to their histological differentiations and anatomical situations are fairly well defined and accepted, unfortunately they are not usually adhered to in actual practice. Unless there are very strong reasons against performing a major operation for eradicating the disease Radiotherapy, should not be offered as an alternative. When the best is available, the second best should never be offered as equally good. Dr. Borges therefore has done real service in once again focussing our attention on this question. The right method of treatment given at the right time and in the right way will certainly go a great deal towards improving the results of our treatment in malignant diseases.

In his paper Dr. Mody discussed briefly the role of radiation therapy in the treatment of malignant diseases. Although it is comparatively a young science, the contribution made by Radio-therapy in the treatment of malignant as well as certain benign conditions during the past quarter of a century is practically unparallelled in the history of medical science. It has been proved beyond any doubt that in competent hands we have in Radio-therapy a very powerful weapon both in the field of curative and palliative therapy. The indications and also the limitations of radiation therapy are now well understood and as such there should be no difficulty in making wise selection of cases for this line of treatment. Dr. Mody's paper has again certainly focussed our attention on this important aspect of Radiotherapy.

It may be pointed out that Radiotherapy in this country at any rate has not progressed in the way it should have done. It is time that this branch of medical science is recognised by all that it is a highly technical and specialised one and as such it could be practised successfully only by medical men possessing the necessary experience and qualifications. Further to gather together a team of specialists that are required to tackle the problem of treating malignant diseases in a scientific manner, these institution would have to be centralised. These centres should wherever possible be attached to the large University Centres so that the ancillary departments may be available for the necessary team work without very great cost to the tax- payer.

K. MANJUNATH RAI.

GENERAL-SECRETARY'S ANNOUNCEMENTS

The following intimation from Dr. Ralston Paterson has been received by me and I request members planning to attend the Congress to kindly intimate to me as soon as possible.

P. RAMA RAU,
General Secretary.

6th International Congress of Radiology, 1950

PRELIMINARY NOTICE

Approval has been given by the Executive Committee for the next International Congress of Radiology to be held in London in the summer of 1950, under the Presidency of DR RALSTON PATERSON of Manchester. The Officers for the Congress are :—

President:	— DR. RALSTON PATERSON
President Emeritus:	— DR. A. E. BARCLAY
Vice Presidents:	— DR. S. COCHRANE SHANKS
	PROF. B. W. WINDEYER
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All recognised radiological societies are being asked to supply a list of their members, and full details will be sent to each radiologist and published as soon as possible. An office for the Congress has been established at 45, Lincoln's Inn Fields, London, W C. 2.

J. W. McLAREN,
Secretary-General.

The Radiological Society of North America

The Thirty-fourth Annual Meeting of The Radiological Society of North America, Inc., will be held in San Francisco, California, December 5—10, 1948.

Headquarters: Hotels Fairmont and Mark Hopkins.

Refresher Courses will be given Sunday afternoon and evening, December 5th and each morning, Monday through Friday, from 8-30 to 10-00 o'clock. Scientific Sessions will begin Monday morning, December 6th and continue through December 10th.

For complete details write D. S. Childs, M.D., 607, Medical Arts Building Syracuse 2, New York.

List of Publications Received

"Annals of the Rheumatic Diseases," Dec., 1947.

"British Journal of Radiology," Feb. and Mar., 1948.

"Indian Journal of Medical Sciences," Feb. and Mar., 1948.

"Indian Journal of Venereal Diseases and Dermatology," Jan. and Mar., 1948.

"International Medical Abstracts and Reviews," Jan., Feb. and Mar., 1948.

"The Indian Physician," May, and Apr., 1948.

"Journal of the Indian Medical Association," Feb. and Mar., 1948.

"La Radiologia Medica," Feb. and Mar., 1948.

"Medical Digest," Jan., Feb. and Mar., 1948.

NOTICE TO CONTRIBUTORS

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

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

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

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