SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF LARYNGOLOGY AND SECTION OF OTOLOGY

(COMBINED MEETING HELD IN LONDON, JUNE 4TH AND 5TH, 1936)

LARYNGOLOGICAL SESSION

Chairman—LIONEL COLLEDGE, F.R.C.S. (President of the Section of Laryngology)

Malignant Disease of the Upper Jaw

The opening paper read by Dr. G. ÖHNGREN is published in this issue of the *Journal of Laryngology and Otology*, Vol. LII, No. 1, pp. 18-27.

DISCUSSION

MUSGRAVE WOODMAN: In malignant disease of the upper jaw we have not only to consider growths which arise in the air cells, but also the large number which begin in the alveolus and extend secondarily into the antrum and the air cells. Thirdly, we have to consider the group from the nasopharynx, and lastly, we have a number of cases referred from the radiological department, which begin like rodent ulcer and become secondarily epitheliomatous, invading the bones of the nose and the air sinuses.

The classical incision has long ago been abandoned; an improvement has been effected by an incision through the mucosa of the lower eyelid to avoid a depression beneath the lower eyelid and any subsequent œdema, although it leaves a deformity in the angle of the eye. An incision, which Mr. Wilfred Trotter advocated, begins at the canaliculus in the lower lid, and goes through the lid. The incision which I introduced in my Hunterian Lecture in 1923 starts at any point from the top of the eyebrow, and goes down the side of the nose and through the lip.

If the growth is low in the alveolus it may be reached easily from the oral aspect by turning back the mask of the face. Or it may be treated by an incision along the side of the nose, carried beneath the nostril and vertically through the upper lip, thus turning aside the lower half of the face. If the growth extends up the lachrymal duct, or invades the orbito-ethmoidal cells or the orbit itself, the incision through the eyebrow, displacing the eye outwards, gives an adequate exposure and an excellent scar.

The post-nasal space is packed off. The operation is carried out with the patient sitting up, and without tying of the external

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carotid. The incision starts in the eyebrow, passes down the side of the nose and comes through the lip, and the eye is turned well out. Generally I use an ordinary scalpel for the incision down the side of the nose. The subsequent dissection is carried out with diathermy. After the flap has been turned aside, the growth is removed, and any further deep extensions are treated with the diathermy fork.

Certain areas give particular trouble in dealing with the depths of the growth. An obvious path of extension is up the lachrymal duct and lachrymal sac; occasionally the neoplasm goes through the tin wall of the roof of the antrum and the floor of the orbit. The malar bone has many tendinous muscular insertions, and if the growth runs through or round the malar bone, it is better to remove the bone entire, without even attempting diathermy coagulation of the surrounding tissues. Another important area of extension is the spheno-maxillary fossa, through the posterior wall of the antrum; another is the pterygoid area and the Eustachian tube. These do well with diathermy, but if the growth reaches the Eustachian tube the prognosis is more serious.

The only hopeless extension is that to the dura mater. One case of such an extension was treated with the diathermy button, and the patient lived for two years, dying eventually of increasing high tension in the meninges, possibly due to secondary growth in the brain.

I would like to give a word of warning about the use of radium in tumours of the upper jaw. Radium is an element which is dangerous to the patient, and, incidentally, to the surgeon too, and in these days it has become of medico-legal importance. We are fond of using it in the mouth, but I question whether it is of much value in the upper jaw.

In my practice I have had two cases of radium necrosis. In the first case the disease was in the upper jaw; the patient lived without recurrence, but he gradually died of radium necrosis, which eventually extended to the brain. In the second case the disease was in the lower jaw, and eventually there was complete loss of the mandible.

In many cases I have had X-rays applied three or four days before operation, so as to lower the vitality of the tumour cells, though I agree with Dr. Öhngren that this method reduces the healing power also. After healing has taken place, the value of X-ray treatment is very great, and I advise my patients to have it. Diathermy is, in my opinion, the most valuable method for dealing with these cases; any necrosis which follows is innocent, does not extend, and always clears up. I think healing takes place sooner if no radium is used after the operation.

As an example of prognosis I may mention a case of epithelioma

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of the eye, involving the skin of the side of the nose and the ethmoid region. The growth was excised and subsequently repaired by a tube graft. It is twelve years since the original operation, and the patient remains well to-day.

Finally I make a plea that these cases should not be regarded as inoperable. Provided the patient is willing to face the operation, I do not think any case which comes to us is really an inoperable one. Many cases may technically be regarded as such, because of involvement of the skin and the eye, but we must remember that these growths are not highly malignant, and if they recur we can deal with the recurrence either by diathermy or by radium. In the last resort we can feel that even if we do not entirely cure the condition, we shall have saved patients a great deal of suffering and preserved their lives for many years.

NORMAN PATTERSON: *Anatomical considerations.*—Tumours involving the upper jaw may be classified anatomically as follows. (1) Those originating in relation to the bony substance of the upper jaw. (2) Those arising in soft tissues in contact with the upper jaw. (3) Those having their origin in adjoining territory such as the ethmoidal cells, nasopharynx, inferior turbinate. When the tumour has reached considerable dimensions it may be impossible to determine its exact site of origin. The position of a tumour is of great importance in relation to treatment. Apart from any consideration of their type or degree of malignancy, tumours situated definitely below an imaginary horizontal plane, corresponding roughly to the level of the roof of the antrum, are in a comparatively favourable position; those which originate or extend above this plane are in an unfavourable position. A vertical plane may be imagined corresponding to the posterior wall of the antrum; tumours situated at some distance anterior to this plane may be said to be favourable for operative treatment; those lying or extending posterior to this plane with the exception of a growth which has spread to the soft palate, may be considered almost incurable, at any rate by surgical methods.

Before commencing treatment the relationship of tumours to these two planes should be studied. Although extension upwards into the anterior part of the orbit does not necessarily render the case inoperable, the surgeon must be prepared to sacrifice the eye. When the posterior region of the orbit becomes involved, causing proptosis, the condition may be classed as inoperable. Extension to the ethmoid is serious, but so long as the growth stops short of the floor of the anterior fossa, the case need not be considered hopeless. When the growth has invaded the frontal sinus—fortunately a late and rare occurrence—the outlook is extremely grave. Extension into the nasopharynx can always be recognized either by examination with the mirror or by palpation. When this

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region has become invaded radical removal is out of the question. The same remark applies when the tumour has invaded the pterygo-maxillary or spheno-maxillary fossae, regions rich in veins and lymphatics. In certain instances operative treatment may be ruled out on account of metastatic deposits. Before undertaking the treatment of any case a thorough radiographic study should be made. A portion of the tumour should also, when possible, be submitted to a pathologist, and in removing a piece of tissue ordinary cutting methods should be avoided. Diathermy excision is ideal.

There may be an entire absence of symptoms and signs. An inflammatory process may closely simulate malignant disease and *vice versa*. Unfortunately the two conditions may be present in the same patient. It must have been the experience of most rhinologists to discover accidentally a tumour of the antrum when it has been opened for the relief of suppuration. Pain may be very misleading and I recall a case of carcinoma which started in the alveolus where the only local sign present was spongy gums and the only symptom was pain in the frontal region. Every patient should be carefully examined for areas of anæsthesia affecting the skin or mucous membranes supplied by the second division of the trigeminal nerve. There may be complete anæsthesia over the cutaneous area supplied by the infra-orbital nerve, or only a small patch of anæsthesia or hyperæsthesia. The same remark applies to the mucous membrane lining the roof of the mouth. Recently I examined a man who complained of bleeding from the nose. The left side of the nose was filled with polypi. There was marked anæsthesia to pin-prick (not to cotton-wool) over the roof of the mouth on the left side. I have not completed the investigation of this case, but I feel certain that the mucous polypi conceal a malignant growth. If the disease extends high up in the nose the nasal branch of the ophthalmic nerve may become compressed. Other nerves may be involved as the result of extension to the nasopharynx or sphenomaxillary fossa. Not only may nasal polypi conceal a growth but rhinitis caseosa may be present along with malignant disease, and the tumour only comes into view when the putty-like material has been removed.

Retention of the function of smell on the affected side is a favourable sign.

Before the introduction of surgical diathermy I operated on a small number of tumours of the maxillary region by the classical method of excision. It was quite possible to carry out a complete resection without making an incision below the lower eyelid which, besides causing a noticeable scar, gives rise to troublesome œdema persisting for a considerable period. Although this incision can generally be dispensed with, it may form part of an encircling

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manœuvre in the removal of a growth which has spread to the soft tissues or skin of the cheek. Diathermy proved so well suited to the treatment of carcinoma of the mouth and pharynx that its adoption in the case of tumours in the region of the nose and upper jaw naturally followed. Results have shown that it is by far the most powerful weapon we possess. The methods of employing electro-coagulation vary with different operators. Personally, in the majority of cases, I prefer to combine ordinary surgery with diathermy. Approach by an external incision will obviously be adopted when the growth has invaded the skin of the cheek, a large area of which may have to be sacrificed.

Some surgeons hold that practically all tumours of the region under consideration should be attacked by the buccal route. A skin incision should, I think, be made in the following circumstances: (1) When the growth appears to involve the floor of the orbit. In a case of this nature it is easier to ascertain the relationship of the bony orbital wall, periosteum, and orbital contents to the tumour. (2) In cases in which the ethmoid is apparently involved. If necessary the frontal sinus can be explored or even the dura mater of the anterior fossa exposed. Diathermy must be employed with great caution in the upper regions of the nose and in the neighbourhood of the orbit. For this reason I consider that an open operation with removal of portions of the ascending process of the maxilla and possibly part of the nasal bone is safer than a procedure carried out entirely from below. (3) A skin incision seems advisable when there is a suspicion that the tumour has penetrated the bone and involved the deeper tissues of the cheek. Careful suturing at the end of the operation should lead to almost invisible scars. It may be objected that incisions, with reflection of perhaps the greater part of the cheek, increase the severity of the operation, but the immediate mortality from these operations on the upper jaw is very small. Only two post-operative deaths have occurred in my practice—one from a pulmonary embolus on the sixth day, the other from post-operative pneumonia. Both took place before the introduction of diathermy technique.

When the growth is confined to the roof of the mouth, or invades the lower part of the nose or antrum, there is no advantage in an external incision and the operation should be carried out entirely through the mouth. In nearly every case, whatever the precise technique adopted, I consider removal of the whole or a portion of the bony roof of the mouth on the diseased side an essential part of the operation; this allows of inspection and facilitates the subsequent application of radium. No attempt should be made to close, by plastic methods, the opening which results; a good obturator can always be fitted by a competent dental surgeon. The patient should present himself at frequent intervals for

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examination, which cannot be properly carried out through the nasal orifice.

I think it is most important that the surgeon should banish from his mind during the actual operation any benefits to be derived from treatment by radium or X-rays. He should aim at a knockout blow. I do not mean to suggest that post-operative radiation is to be neglected, or that preliminary radiation may not be advisable. Too much reliance on ray treatment will lead to an inadequate operation, followed perhaps by complications associated with the employment of an excessive dose.

I shall refer to two regions where the situation of the tumour calls for special operative procedures. In collaboration with Mr. Charles Goulden, I have operated on a number of cases in which a rodent ulcer or epithelioma, starting in the region of the eyelids, generally near the inner canthus, invades the underlying bone. In such a case my colleague begins by removing all suspicious skin and afterwards exenterates the orbit. The remainder of the operation, which is entrusted to me, consists in freely taking away all bone in the neighbourhood of the disease; the bone removed often includes portions of the maxilla. Finally the cavity is carefully treated with diathermy.

Another kind of case in which a special method of approach is advisable is that of cancer involving both the upper alveolus and cheek. During the last ten years I have employed what I term "the skin-flap method" in dealing with cases of carcinoma of the cheek, and I have found this operation most suitable when the alveolus as well as the cheek is invaded.

I employed preliminary ligature of the external carotid in my early cases only. Severe hæmorrhage is rare after these operations, and if it does occur, a week or more has generally elapsed since the operation took place, and by this time the collateral circulation is pretty well established. If ligature were thought necessary it could easily be performed as an emergency measure, but I have not met with any conditions in which it was required.

In cases of malignant disease invading the region of the maxilla, glandular metastases are uncommon. Treatment therefore is simplified and the prognosis after operation is comparatively favourable. In well-established tumours, however, invasion of the cervical lymphatics may occur. When certain structures in the neighbourhood become involved by extension of the growth, metastases may appear quickly. This may be the case when the tumour spreads to the soft palate, the tonsil, the nasopharynx, or the skin covering the maxilla. Metastases seem prone to occur in the cervical vertebrae.

I will now refer to some cases of my own in which metastases have occurred.

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I.—A woman, aged 58, showed five apparently discrete tumours on the right side of the roof of the mouth : these tumours were probably connected by subepithelial strands of malignant tissue. The growth was found, on operation, to have extended upwards into the maxilla and antrum. It was removed by a modified resection of the upper jaw followed by the application of diathermy. (In all the cases to which I shall refer diathermy was employed.) A year and nine months after the operation a recurrence appeared in the centre of the upper lip, where a scar resulting from the operation was present ; this might have been an implantation cancer. The tumour was removed and a plastic operation performed to fill the gap. Four years and three months after the original operation the patient presented herself with a large mass of secondary glands on the right side of the neck. I carried out a block dissection which included resection of the internal jugular vein. It occurred to me that the metastases might be secondary to the tumour in the upper lip, but as the patient died two years later—six years and three months after the original operation—from a local recurrence, the glandular involvement may have been secondary to the primary disease.

II.—A woman, aged 51, had noticed a small lump on the roof of the mouth for ten years, for six months two lumps had been present. Examination showed a pigmented mass occupying a large area on the roof of the mouth just extending on to the soft palate. One ulcerated nodule showed very little pigmentation, but there were two markedly pigmented nodules in front of the ulcer. The margin of the pigmented area was ill-defined. Palpable glands were present below the angle of the jaw on the left side. The tumour was freely removed. Two months later a block dissection was carried out on the left side of the neck ; many of the glands were sooty black. X-ray treatment was given. Nearly two years later a block dissection was performed on the right side, the glands having the same macroscopic appearances. The primary tumour and glands were reported on by the pathologist as melanotic carcinoma. The patient died three years and four months after the original operation, probably from metastases in the abdomen.

III.—A woman, aged 46, had three quite separate growths : (1) An elevated area about one inch in diameter at the junction of the alveolus and palate on the right side, (2) another area between the upper lip and alveolus, and (3) a nodular tumour on the mucous membrane just behind the angle of the mouth on the right side. There was slight chronic superficial glossitis. A portion of tissue was reported on as "squamous and prickle-celled horny carcinoma". The case was treated by combined diathermy and insertion of radium needles. Two years and four months later the patient died, and metastases were found as follows :—"Secondary polypoid, squamous and prickle-celled horny carcinoma of lymphatic glands in prevertebral tissue of the right side of the neck, in the third, fourth and fifth cervical vertebrae, in the lower lobe of the right lung, and on the anterior surface of the liver."

IV.—A man, aged 42, was referred to me by Dr. Norrie of Calcutta. When the patient arrived in England he was found to be suffering from

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Fig. 1.
Lateral view.

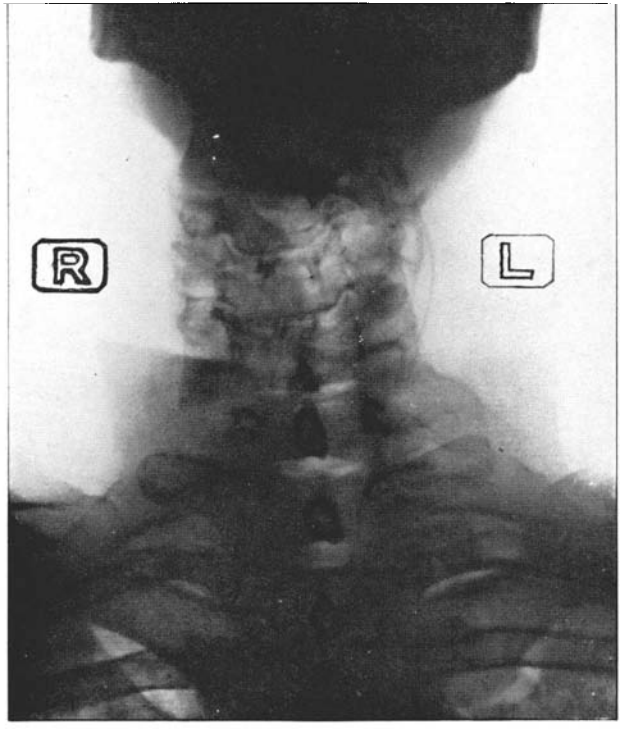


Fig. 2.
Antero-posterior view.

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a tumour involving the left superior maxilla. It had caused some swelling below the inner canthus and at the side of the nose. The pathological report was as follows: "Sections show connective tissue containing columns of cells of the basal-celled carcinomatous type. The suggestion of early bone formation is present in some areas, no cyst formation present. The condition is that of an atypical adamantinoma." Dr. Allchin carried out preliminary X-ray treatment after which I performed an operation which seemed to be radical. Subsequently the patient was treated by teleradium, radium and further radiation with X-rays. Later on a recurrence in the hard palate was dealt with by diathermy. The patient died nine months after the original operation with signs of malignant deposits in the cervical vertebrae.

V.—A man, aged 28. A pedunculated growth was seen springing from the right side of the septum. On three occasions specimens were removed for microscopic investigation; the reports were that the tumour was non-malignant, but as it continued to grow rapidly, it was removed, and was found to have invaded the outer wall of the nose and antrum. The entire tumour was sent for pathological examination and was reported on as a "squamous-celled carcinoma". A year and ten months later the patient died. When last examined a large hard swelling occupying the posterior wall of the bucco-pharynx had developed and there were signs of involvement of the left cervical sympathetic. In this case metastases had evidently occurred in the cervical vertebrae. There was no local recurrence.

VI.—A woman, aged 49, was sent to me by Dr. Fuller, suffering from a granulomatous condition affecting the right vestibule of the nose and spreading to the columella; the growth also involved the outer wall of the nasal cavity. Microscopic examination showed it to be a squamous-celled carcinoma. A somewhat extensive operation was carried out, including removal of a portion of the external nose and a part of the right maxilla. Three years afterwards Sir Harold Gillies performed a plastic operation. The patient remained well for nearly eight years from the time of the first operation; she then developed some induration on the left side of the nose; there was also a hard smooth swelling about $\frac{1}{2}$ in. in diameter in the region of the outer part of the left eyebrow, attached to the skin, but movable over the bone. Another nodule, much smaller, was present over the malar bone about $1\frac{1}{2}$ in. farther back. Examination of the interior of the nose showed a large area on the outer wall, on the left side of bare and apparently necrotic bone. I transferred the patient to Dr. Carter Braine for treatment. This he carried out successfully with X-rays and radium. Not only did the swellings disappear, but a large bony sequestrum came away from the left nasal cavity. The patient died, nearly ten years after the time she first saw me, apparently from some obscure chest condition, possibly malignant. The interesting feature of this case is the fact that there was never any recurrence at the site of the original growth; moreover, the secondary manifestations were on the other side and situated apparently in subcutaneous structures.

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F. M. ALLCHIN said that the case referred to by Mr. Patterson, which had been treated by irradiation, clearly showed the great difficulty associated with these cases. The patient was treated by X-rays in *March*, 1935, for six days, having a total of 1,260 " r " units. The voltage was 180, and was given through the 1½ mm. of copper. Three days after cessation of the X-rays he was operated upon, the whole maxilla and hard palate being removed with the ethmoid up to the floor of the orbit. Healing was good in spite of the previous irradiation, and a fortnight after the operation the patient was treated with the 2 gm. radium unit, twenty-three hours total treatment. In the following *August* he had 3,440 " r " units with X-rays, and in *September* and again in *December* he had further applications of the radium bomb. In *January*, 1936, he lost the sight of his right eye, and as his left eye was affected by radiation cataract, this loss meant total blindness. The oculist reported that there were no pathological changes in the right eye, and the lesion was therefore most likely a metastasis in the cortical visual area. Two months later he complained of great pain in the neck and X-ray examination showed the condition of the cervical spine seen in Figs. 1 and 2 (facing page 42). There was almost complete destruction of the fourth cervical vertebra and partial destruction of the fifth.

DR. CONSTANCE WOOD: Two one-gramme radium units are used in the treatment of this disease in the Radium Department of the Cancer Hospital. One of these units has been in use for the past seven years and the second one for four years. Both units are used together in the treatment of a case, one on each side, so that the patient is irradiated from both sides simultaneously. This has the advantage of reducing the total treatment time and adding to the intensity of radiation in the depth of the tissues.

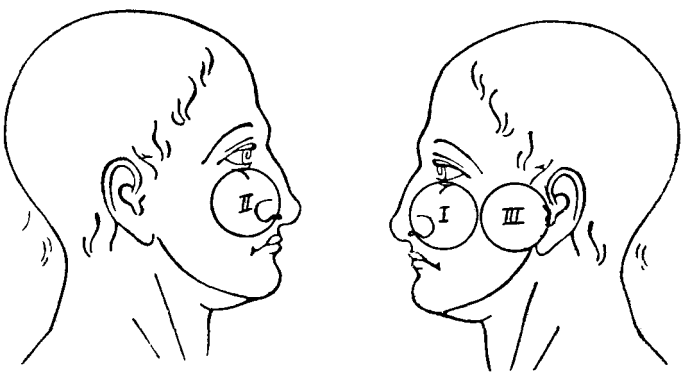
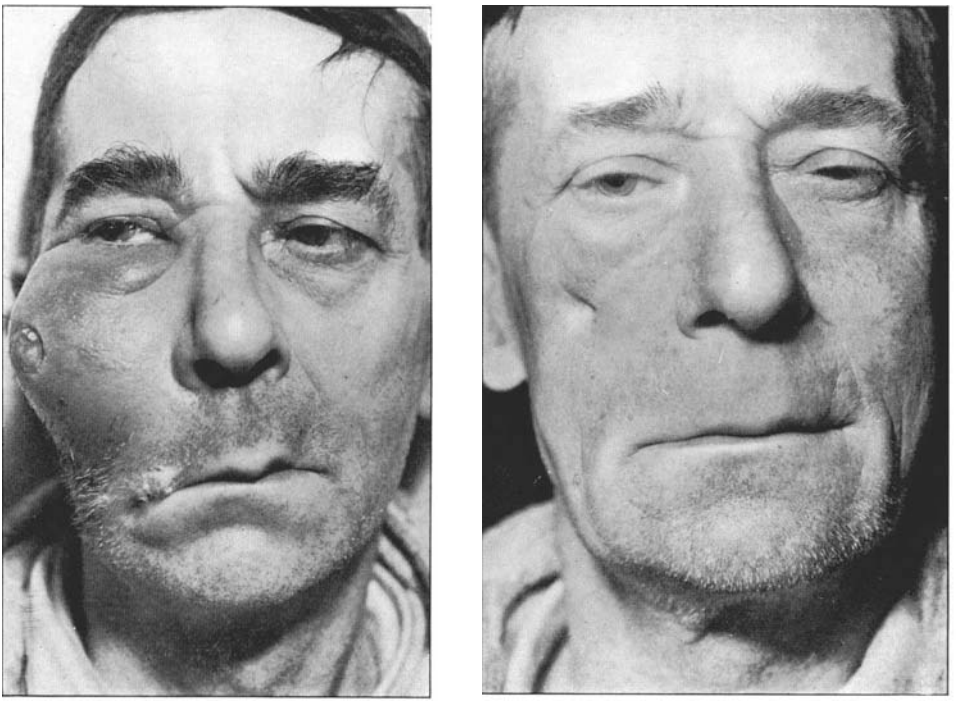


FIG. 1.

Fig. 1 shows the ports of entry through which the radiation is delivered. Port I delivers radiation to the anterior part of the

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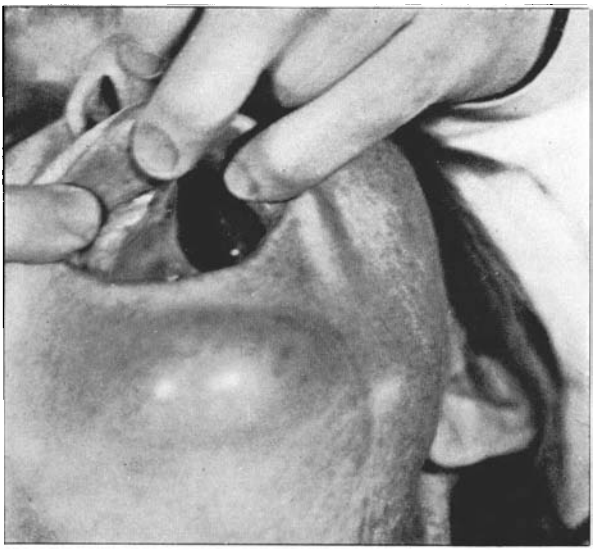


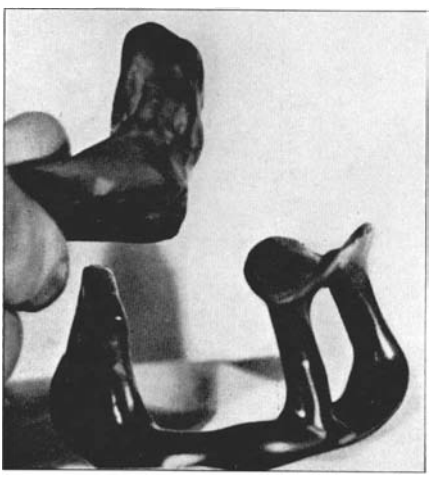
(*a*) FIG. 2. (*b*)

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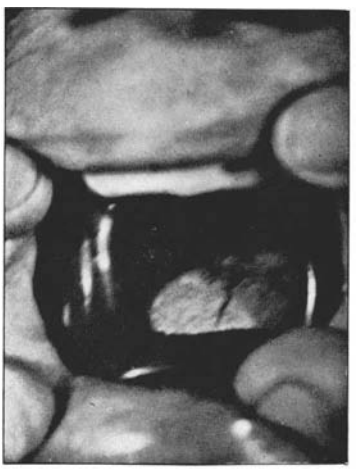


FIG. 3.

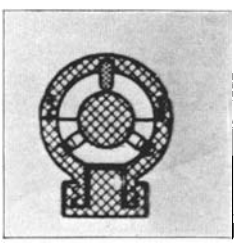




FIG. 4.

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antrum; Port II, on the opposite side to the lesion, delivers radiation to the medial wall of the antrum, and Port III radiates the posterior part of the antrum, spheno-maxillary fossa, and pterygoid region. In cases where there is any swelling above the zygoma a larger area is irradiated, to include the temporal region. This results in a complete irradiation of the maxillary antrum and also of the surrounding tissues. After teleradium treatment has been delivered through these areas it is usually sufficient to produce disappearance of all visible tumour even when the growth has ulcerated through the skin and through the mucosa of the hard palate.

Fig. 2 shows the regression produced in a case treated through the areas described above.

After the external radiation is completed, the hard palate on the side of the growth is removed and a local application of radium is given to the interior of the antrum. The applicator is mounted on an upper denture specially constructed so that it has a projection which fills the antrum. It is into this projection that the radium is placed. It is absolutely essential to have a well-made applicator if an equalized and adequate radiation is to be delivered. By careful distribution of the radium in the applicator a homogeneous dose can be delivered, and at the same time osteo-necrosis avoided. In order to get a good result it is quite unnecessary to risk osteo-necrosis. When such an applicator has been loaded with radium the radiation emitted from the surface of the applicator should be measured with great accuracy and the dosage determined in absolute " r " units. The method of wrapping radium in packets and placing these in the antrum is not scientific. The dosage in this method is very irregular, resulting in over-irradiation and osteo-necrosis in some parts and under irradiation—and so failure to cure—in other parts.

Fig. 3 shows the opening in the antrum and an applicator in position.

Fig. 4 illustrates the small Sievert condenser chamber used to measure the intensity of radiation in " r " units emitted by the type of applicator described above, and from this can be worked out the time that the applicator should be left in position. The principle of the Sievert's condenser chamber method is to measure the loss of electric charge from a small electric condenser. The small insulated metal ball inside the metal casing is charged to about 500 volts and in the absence of radiation holds its charge indefinitely. When exposed to radiation the air in the gap becomes ionized and the charge leaks away from the inner sphere. The amount of charge which leaks off in a known time is the measure of the radiation which is passing through the condenser. The charge left in the sphere after exposure is measured simply by

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placing it in contact with the electrode of a sensitive chamber such as a Wulf electrometer. The great advantage of the method is that very small isolated measuring instruments no bigger than a pea can be used, so that the dosage received by the walls of the antrum can be measured with accuracy. It is time that the old method of determining the dosage in mg. el. hrs., which served its purpose in the early days of radiation therapy, was abandoned. Such a unit does not indicate the true dose, because the distance of the radium from the walls of the antrum is not taken into account. The "r" unit, being an absolute unit, is quite independent of distance and quantity of radium.

An interesting type of growth from the point of view of the radiation therapist is adenocarcinoma of the upper jaw. It is important to recognize this type. The diagnosis should not be dependent on the histologist alone. There is a sufficiently clear history and clinical character of the growth to enable a diagnosis to be made. The natural duration of life of this tumour is up to seven years. The swelling on the hard palate may be oval or slightly lobulated, smooth, and adherent to the thickened intact mucosa. On palpation it may be firmly elastic or fluctuating and the surface is shiny and pale.

Figs. 5*a* and *b* illustrate a case of adenocarcinoma of the upper jaw. The response to radiation in this type of growth is much slower than in squamous carcinomata, and if there is no regression at first it does not mean that the dose has been inadequate. The regression after irradiation in this type of tumour is always delayed. The percentage of "curative" results for adenocarcinoma is approximately half that for squamous carcinoma on account of its relative radio-resistance and marked tendency to recur after surgical excision.

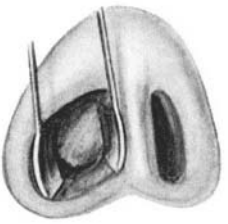
In conclusion I would like to emphasize the value of beginning treatment of tumours of the upper jaw by giving external irradiation first. By this means, in many cases, such regression of the growth is brought about that removal of the hard palate alone, followed by electrocoagulation of the walls of the antrum and a local application of radium, is sufficient to produce a successful result. An extensive operation is thereby avoided and no external incision is necessary.

STANFORD CADE said that his experience of disease originating in the antrum itself had led him to differentiate carcinoma from sarcoma; in each case it was essential for a histological diagnosis to be made.

For small-celled or large-celled sarcoma of the antrum the ideal treatment was neither surgical nor by radium, but by X-rays alone. Dr. Allchin had shown one case of five years' survival, and he himself had six others.

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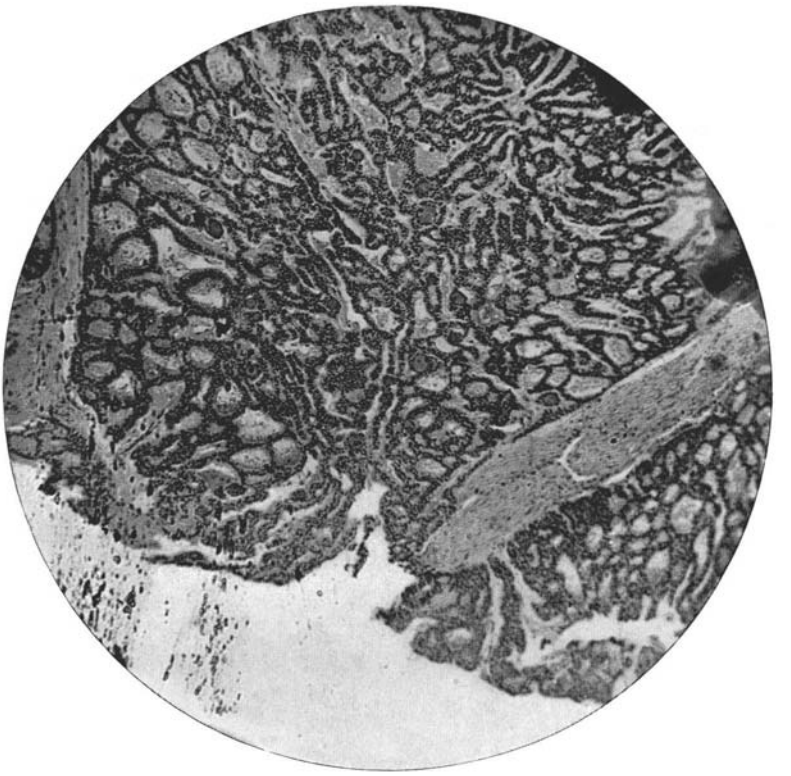


FIG. 5*b*.

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He thought that in cases of carcinoma the dangers of irradiation were increased by the presence of sepsis, by inadequate access, or insufficient drainage. The method which Mr. Douglas Harmer and himself had practised for ten years was fenestration through the mouth, removal of the hard palate, and the application of radium by means of dental appliances. In this way treatment could be controlled from all points, both as to time and dosage, and watch could be kept for recurrences. Provided there was adequate drainage, the results obtained by this method were as good as those from others. Ultimate failure must be looked for in 50 per cent. of cases, owing to metastases which were beyond the control of treatment; failures might also be due to a desire to get the patient out of hospital too quickly. Fenestration of the upper jaw and subsequent radiation required six weeks.

He had had 79 cases in 19 of which the patients were still alive. The fenestration method involved a small risk of radium necrosis.

The danger of the occurrence of radium necrosis referred to by Mr. Musgrave Woodman was not greater than that of diathermy, and it was scarcely conceivable that a patient would take legal proceedings against a surgeon because he found that he had diathermy necrosis or necrosis following surgery, and the same remark applied to irradiation, especially if screening was adequate, and the usual precautions taken.

If a patient had a malignant growth of the upper jaw, irradiation combined with surgery offered a little more benefit than did either irradiation alone or surgery alone.

Dr. Öhngren (in reply) said he agreed with what Mr. Musgrave Woodman said about scarring. The scar was an unimportant detail and the operator might use the skin incision that seems to him to be most convenient to effect the coagulation. He did not agree with Miss Wood as to the benefit of the pre-operative ray-treatment. The surgeon could not depend on there being no tumour left in the original site and he must proceed as if there had been no previous irradiation. He did not approve of the advice of Mr. Stanford Cade to restrict endothermy to carcinoma and to treat sarcoma by irradiation only, as the sarcomata treated at Sabbatsberg were almost exclusively of the relatively radio-resistant type. Some of the cases of sarcomata had relapsed after previous irradiation but remained free from recurrence with subsequent endothermy. There was a marked difference between the necrosis of the ethmoid after irradiation and that after endothermy. Irradiation considerably reduced the resistance to infection and the tendency to heal. Endothermy closed the lymphatics and blood-vessels and mobilized enormous masses of leucocytes, forming a dense wall between coagulated and healthy tissue and thus preventing infection from spreading into the cerebral cavity.

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