in 1902—eight years after the second operation—very well, but very feeble from old age.

The second of these patients was a woman from whom one side of the tongue was removed in October, 1894. In December of the same year two or three enlarged glands were removed, and in the following February (1895) some more glands. She remains quite well up to the present time—a period of more than thirteen years.

The results of operations for the removal of recurrent disease, whether of the tongue or glands, have been so bad that operators are counselled to make the first operation as complete as possible, in the belief that the only hope of the patient lies in the thorough manner in which this operation is performed.

THE OPERATIVE TREATMENT OF INTRAORAL CANCER:

WITH SPECIAL REFERENCE TO THE CHOICE OF OPERATION, ORDER OF OPERATION, AND LIGATURE OF THE LINGUAL AND FACIAL ARTERIES.

FROM AN EXPERIENCE OF THIRTY-NINE CASES.

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FEW surgical diseases offer a wider choice of operative procedure for their cure or relief than carcinoma within the oral cavity. There are those surgeons, for instance, who strongly advocate a preliminary laryngotomy or even tracheotomy, others who have never found any necessity for their performance; those who favour preliminary ligature of the linguals, others who never practise it and speak disparagingly of it; those who recommend the operation on the tongue and neck at one sitting, others who usually do it in two; those who remove first the tongue and later the glands, others who remove first the glands and later the tongue; those who perform Kocher's operation, which entails a communication between a septic wound in the mouth and an extensive recent wound in the neck, others who see grave objections to it on these grounds; those who frequently divide the lower jaw, others who consider it seldom necessary; and so on. The purport of the present communication is to consider the modern surgical treatment of intraoral cancer, in conjunction and in comparison with my own experience in dealing with it, with the view, if possible, of indicating what appear to me to be the most rational and practical methods to adopt. I assume that the following general statements and principles will be subscribed to by all modern surgeons.

1. *The Necessity of a Wide Local Removal.*—This will usually mean the sacrifice of not less than half the tongue, frequently of the whole tongue, sometimes of a considerable portion of the floor of the mouth, part of the lower jaw, even exceptionally of the upper jaw, side wall of the pharynx, etc., according to the position and extent of the growth. Wherever the disease is situated, to be considered at all hopelessly operable, it must be capable of a wide local removal, and I mean by this an excision which ensures a wide margin of apparently healthy tissue attached all round the growth. This is an important point, because cancer, distressing enough in any situation, is so peculiarly distressing in the mouth that, even as a palliative measure, to secure a non-recurrence *in situ* must be a particular aim of the surgeon. In carrying out this principle we are hampered considerably by the limitation of the cavity of the mouth; there is not the same scope for cutting wide of the tumour as in the breast for instance. If the disease, therefore, is so advanced, or so situated, or so fixed as to be incapable of a wide local removal, then in my opinion it is inoperable, because though a patient, after the dangers have been explained to him, is quite justified in risking his life in an attempt to be rid of such a terrible disease as cancer in the mouth; and though the surgeon, who knows the full extent of the misery which is in store for him is quite justified in urging him to undergo this

risk, yet if the disease is to return *in situ* within a few weeks or months and his misery is to begin all over again, it is better to let him die once than twice, and not subject him to the trial of a serious operation into the bargain. Of course, the surgeon cannot guarantee against local recurrence, for apparently healthy tissue may contain cancer cells, but he should have this prospect particularly in view in recommending or discountenancing operation, and in whatever operative procedures he adopts. If, on the other hand, recurrence takes place in the neck, even within a short time, the case is different. The disease here, distressing enough, is so much less so than in the mouth that the intraoral operation will have been worth the doing, though if it has taken place in an early stage the patient, who will be ignorant of the misery he has escaped, will not fully appreciate the surgeon's effort.

2. *The necessity of a wide glandular dissection in all cases in accordance with the modern principle of treating cancer surgically.* This entails the removal of the fascia, fat and lymphatics from the submaxillary triangle (including in all cases the submaxillary salivary gland), and from the anterior triangle, down to the sheath of the great vessels, as well as the deep chain of lymphatic glands beneath the sterno-mastoid, from the clavicle to the atlas. The necessity of performing this extensive operation on both sides in all cases has not been finally determined. If the disease crosses or even approaches the mid-line in the tongue or floor of the mouth it is demanded; it is also demanded if the disease, though unilateral, is situated towards the base of the tongue, because there is a free communication across the mid-line between the lymphatics of that part. If the disease is situated anteriorly and is strictly unilateral the general opinion is that a dissection of one side is enough. Sufficient evidence to settle this question is not at present forthcoming, and surgeons and pathologists should direct their attention to it. Da Costa has recently recorded a case in which, the primary disease being strictly unilateral, the glands on both sides of the neck were secondarily affected. The matter is an important one for decision, because a bilateral neck dissection adds considerably to the severity of the operation.

3. Consequent on (1) and (2), the operation is very severe and serious. But there are other well-recognized circumstances which make it especially dangerous. Patients with cancer in the mouth are usually getting on in life; they are frequently quite old; they are often the subjects of past syphilis, over-indulgence in tobacco and alcohol, as well as of the bronchial troubles that attend advancing years. They are not, therefore, the best subjects for major operation. In addition, there are special dangers attending the operative procedure itself. There is during the operation the danger of haemorrhage and of asphyxia owing to the entry of blood into the air passages. Subsequently, there is the danger of shock, of inhalation pneumonia, and of septic cellulitis owing to communication in some of the operations—Kocher's, for instance—of a septic wound in the mouth with a large recent wound in the neck. Lastly, excision of the tongue is an operation in which the psychic element is an unfavourable factor. The idea of losing his tongue, even in a successful operation, is depressing to the patient, and probably influences the result in some cases. The causes of a high primary mortality, therefore, are not far to seek, and the importance of avoiding those that are avoidable must be kept in view in determining the choice and scope of operation.

4. *The desirability of performing this operation as of all operations at one sitting if possible.* A patient will sometimes be able to screw his courage up to face a single operation who cannot be brought to face a second. This object nevertheless, however desirable, is frequently unattainable in cases of mouth cancer.

5. *The desirability of avoiding a communication between a wound in the mouth which is necessarily septic and a large wound in the neck which otherwise there is no difficulty in keeping aseptic.*

6. *The desirability of not introducing any unnecessary procedures into an operation which of itself is quite complicated enough.* Assuming that these statements and principles are correct, the practical question is how best to conform to them in the operative treatment of intraoral cancer.

LIGATURE OF ARTERIES.

I shall first state my proposition, and subsequently give the reasons for its advocacy. The proposition is:

That in every case of intraoral cancer the neck should be attacked first, one or both linguals and facials tied, and the primary growth in the mouth should be removed subsequently, either at the same or a future sitting.

As one of the chief objects of this paper is to advocate ligature of the lingual and facial arteries, which, in my opinion, is the key to the operation for intraoral cancer, I shall consider this question first. It is strange that with such powerful supporters behind it as the late Professor Billroth and Sir Frederick Treves ligature of the lingual artery should have found so little favour generally among surgeons. I think the reason is that it was advocated under quite different circumstances from those existing at the present day. Extensive gland dissections were not then in vogue. Either gland dissections were not done at all or were limited to the perfunctory removal of an enlarged gland or two beneath the jaw or in the anterior triangle. Hence ligature of the lingual introduced an additional preliminary operation; it involved a complication, was not necessary in the hands of a surgeon of skill and experience who felt confident he could deal with the haemorrhage without it, and perhaps was not always easy. But other surgical procedures may come up again for consideration under altered circumstances, and this question of ligature of the lingual artery is, I think, one. In the procedure advocated here—namely, attacking the neck in all cases first, ligature of the lingual assumes a different aspect. It is done as part of the dissection of the neck. Sometimes in dissecting the anterior triangle the lingual comes into view at its origin and may be ligated there. I have on a few occasions so performed it. The ligature is, however, almost always placed upon it immediately after the dissection of the neck, beneath the hyoglossus muscle. The submaxillary triangle has been dissected, the bellies of the digastrics are in full view, and the hyoglossus with the hypoglossal nerve and usually the ranine vein lying upon it. Ligature of the lingual becomes the simplest of proceedings; the anterior belly of the digastric is hooked downwards and forwards, the posterior downwards and backwards. The great cornu of the hyoid bone is felt, and just above it the fibres of the hyoglossus are divided by a few light touches of the scalpel. No director is used. With the aid of a pair of dissecting forceps and a blunt dissector or blunt end of the ligature forceps the lingual artery is invariably picked up just beneath the hyoglossus. I have never failed to find it with the greatest ease, and the operation for its ligature occupies less than two minutes. The only precaution necessary is to work gently and avoid wounding the ranine or any other veins in the neighbourhood. The ranine vein is usually seen running with the hypoglossal nerve upon the hyoglossus muscle, and is kept out of the way together with the nerve with a squint hook. The facial artery is always ligated and divided during the dissection of the neck when the submaxillary gland is lifted from its bed. It comes into view during this proceeding, and requires no looking for.

In April, 1904, almost a year before the publication of Mr. Butlin's paper, I commenced extensive glandular dissections of the neck in malignant disease within the mouth. On April 4th, 1904, I performed the following operation at the Royal Portsmouth Hospital:

The patient had an epithelioma involving the whole of the right side of the tongue and dorsum to opposite the faucial pillar, and extending into the substance of the tongue on the left side. Enlarged glands were felt in the right submaxillary and anterior triangles—none in the left. The following account of the operation is taken from my notes: The left submaxillary region was dissected out, including the submaxillary salivary gland, and the left lingual and facial arteries were tied. An incision was then carried from the mastoid process on the right side along the sterno-mastoid muscle to 2 in. above the clavicle, and one to join it was carried up to the symphysis menti opposite the hyoid bone. Skin flaps, including platysma, were reflected. The glands, fascia, and fat were cleared out of the anterior and submaxillary triangles (including the submaxillary salivary gland), as well as the deep chain beneath the sterno-mastoid muscle. The right lingual and facial were tied. The tongue was then split and the right half was brought out through an incision in the mucous membrane of the mouth beneath the jaw and removed (Kocher's method). The left half was excised intraorally, as an attempt to pull it out through the wound stopped breathing. The operation was performed at one sitting,

and the patient made an excellent recovery. He subsequently died of recurrence in the neck.

At the operation the glands were found infiltrating and breaking down, and the prognosis was consequently very unfavourable. When I began these extensive glandular dissections of the neck for intraoral cancer, I began to practise at the same time ligature of the lingual and facial arteries in all cases, and I shall state now the advantages that have appeared to me to attend this practice. My experience extends to ligature of these arteries on 39 occasions.

1. *It reduces the excision of the tongue to a practically bloodless operation.* Mr. Jacobson, in his remarks on ligature of the lingual artery in excision of the tongue, makes the following criticisms:

(a) "In 3 cases in which I know of this precaution having been taken, the haemorrhage was as free as in the usual operation with scissors, performed without any such preliminary," and in a footnote he gives as the reason that the lingual was probably tied in front of a large dorsalis linguae.

The only answer one can give to this is that Mr. Jacobson's experience must have been singularly unlucky, and likely enough to prejudice him against the procedure. In the 39 cases of ligature of the lingual in my own experience, this has never occurred. I always pull the lingual well up and place the proximal ligature as far back as possible to avoid this contingency, though I have never seen the dorsalis linguae, and I always divide the artery between two ligatures to make quite certain that I have ligated it. In all of my cases it has reduced the excision of the primary growth to a bloodless operation, very much as it would be in the deadhouse. With few exceptions, these patients have been operated upon at the Portsmouth Hospital, where I have over and over again demonstrated to those who have done me the honour of being present the simplicity to which it reduces the subsequent excision of the growth in the mouth. Hardly ever any artery spurts at all. The facial has already been tied in removing the submaxillary gland. By these manœuvres not only has the blood supply of the tongue but of the gums and floor of the mouth been cut off, this being furnished almost entirely by the sublingual branch of the lingual and the submental branch of the facial. With regard to venous bleeding, this, as a rule, is quite trivial, as might be expected. The tongue and floor of the mouth are terminal circulatory organs. No large venous trunks are present in them, and the venous bleeding is consequently slight. The only cases in which I have found it at all troublesome are when the disease is in the tonsil and its neighbourhood, from the pharyngeal plexus and inferior palatine veins. Mr. Jacobson's second objection to ligature of the linguals is:

(b) "I think that an experience derived from operations in over 50 cases justifies me in saying that if the operation with scissors be performed with attention to the details given above, the haemorrhage is not so difficult to deal with as to require this precaution." And in a footnote he adds: "In writing this I am taking it for granted that the surgeon will be aided by helpers as apt and ready as I have been fortunate enough to find."

This in some cases may be taking a good deal for granted, but with this "if" the statement is no doubt correct. It is admitted that to those experienced in excision of the tongue, and who have skilled assistance at their disposal, the control of haemorrhage is not a very difficult matter. But I think it will be equally admitted that the less blood these patients, often old and broken down with suffering, lose the better. In the hands of surgeons even of experience I have more than once seen a patient lose a considerable quantity, and even a large quantity, of blood before the completion of the operation, and I have been told by ex-house-surgeons of other hospitals that in the usual operation, without ligature of the linguals, post-operative haemorrhage is not a very uncommon event for them to have to deal with. Mr. Jacobson says: "That the haemorrhage is free with the scissors alone, none will deny." Why have haemorrhage at all? For the safe, easy, and rapid removal of the uterus we tie, as a preliminary measure, the ovarian and uterine arteries; for the safe, easy, and rapid removal of the thyroid we tie the thyroid arteries; for the safe, easy, and rapid removal of the tongue we should tie the lingual. Whether the patient lose a large or small quantity of blood; whether haemorrhage be difficult or easy to control, ligation of the lingual

and facial eliminates it, and must surely, therefore, be an advantage. As stated above, I have ligatured the lingual and facial arteries on thirty-nine occasions, on one or both sides, previous to excision of cancer in the tongue or floor of the mouth, in all possible situations, at one sitting or more. In almost every case in the latter operation no vessel whatever has required a ligature; in the remaining bleeding has been of the most trivial character. In not a single instance has there been any post-operative haemorrhage, either reactionary or secondary. Mr. Jacobson's third line of criticism against ligature of the lingual is (c) that it is not an easy operation, and cannot always be done quickly. I do not think the difficulty of an operation alone should deter a surgeon, though the time occupied in performing it, perhaps a natural sequence of the difficulty, would undoubtedly in these cases be an argument against it. But this criticism applies to ligature of the lingual artery independently of the dissection in the neck, and therefore is not relevant to the operation I am discussing here. As I have stated above, ligature of the lingual after dissection of the neck is a simple and easy procedure, and adds practically nothing to the duration of the operation.

2. Owing to the elimination of the one and only troublesome complication of the operation within the mouth—namely, haemorrhage—it greatly enhances its rapidity and simplicity. It reduces the actual excision of the tongue to a minor operation, which it never is without it. It consequently frequently enables the surgeon to perform an operation at one sitting which he would otherwise consider it prudent to divide into two. If, for instance, the disease is confined to the tongue and at the termination of the gland dissection the patient is in good condition, and the surgeon's judgement prompts him to remove the tongue or half the tongue at the same sitting, he knows that he has quite a trivial and bloodless operation in front of him; whereas if the tongue is excised first, and the operation has been troublesome and the patient has lost a good deal of blood, the surgeon will hesitate to submit him to a long dissection of the neck immediately afterwards. After ligature of the feeding arteries the mouth operation (unless the jaw has to be divided) becomes quite insignificant; the gland dissection is the only major operation.

3. Owing to the elimination of haemorrhage, it enables the surgeon to excise the growth in the mouth with greater precision and deliberation. This is, perhaps, its greatest advantage. The surgeon can see exactly what he is doing and where he is cutting—a matter of great importance in dealing with this disease in a confined, and not always easily accessible, cavity.

4. If, as in many cases of extensive disease, it is considered prudent to divide the operation into more than one sitting, it cuts off the blood supply to the growth meanwhile. As Sir Walter Cheyne has pointed out, the growth in the glands is frequently more rapid than in the mouth. On this ground alone it would in many cases be wise to remove the glands first. If we can put a brake on the blood supply to the primary growth at the same time it is an additional reason for attacking the glands first, for if the tongue operation is performed first we cannot in the interval cut off the blood supply to the glands.

5. Ligature of the lingual and facial arteries may starve any cancer cells in the neighbourhood which have been left behind after the completion of the operation, and in this way possibly prevent or retard recurrence. It is impossible to prove this, but it is not an unreasonable supposition, or one unsupported by experience. The ideal modern operation for cancer is to remove the entire disease—and I mean by this the primary growth and every cancer cell which has sprung from it—in one piece. This is best exemplified in the case of the breast. The ideal is to remove the breast, a wide margin round it, the lymphatics running to the axillary glands and the axillary glands themselves, all in one piece inclusive, with the object of having in the removed portion every cancer cell. That is the objective, possibly seldom attained. In the tongue this is impossible. It is impossible to remove the tongue and glands of the neck in one piece. Tissues remain between the primary focus in the mouth and the removed portions in the neck, which may and probably do contain cancer cells. Also, notwithstanding the most careful dissection, cancer cells may be left—indeed, certainly often are left—in the neck. By cutting off the blood supply to

these as far as possible, we may succeed in retarding their growth or even in starving them out altogether. This is further aided by the cicatricial contraction of the large wound in the neck and in the mouth. Mott was the first to suggest ligature of the feeding arteries to inoperable malignant tumours. The same principle may be extended, as an additional aid to those that are operable. We have a hint in this direction from the natural history of such tumours. The rapid and luxuriant growth of malignant tumours containing little formed fibrous tissue, and in a soil composed of young and vascular elements, the comparatively slow growth of tumours containing abundance of well-formed fibrous tissue, and in a soil composed of less vascular and atrophied elements, would suggest that cutting off the blood supply and producing abundance of cicatricial tissue in the neighbourhood of cancer cells is likely to destroy them or retard their growth. In the mouth and neck by the cicatrization of the large wounds there, after the extensive modern operation for cancer, and by greatly diminishing the blood supply to these parts by ligature of the lingual and facial arteries, especially if it be done on both sides, we are in a position to produce conditions which we know to be unfavourable to the growth of cancer naturally.

6. It does away with any necessity for preliminary laryngotomy or tracheotomy. Now opening the air passages and plugging the fauces, however simple a proceeding, introduces an additional complication, makes a wound which, owing to its communication with the air passages, is necessarily a septic wound, and should be avoided if possible. In fact its advocacy is an admission of the anxieties of haemorrhage and its consequences in excision of the tongue. After ligature of the lingual and facial arteries it has in my experience never been necessary. In no single instance has the entry of blood into the air passages been a source of anxiety. It is admitted that with a skilled operator, skilled assistants, and a skilled anaesthetist, this operation may not be required, even if the lingual and facial arteries are not tied, but the latter operation greatly reduces the anxiety of blood entering the air passages, and renders preliminary laryngotomy or tracheotomy quite unnecessary.

I have stated the advantages that have appeared to me to follow an attack upon the neck first, with ligature of the lingual and facial arteries, from the experience of a considerable number of cases. Another argument for attacking the neck first is this—it is a contingency that may not often occur, but it is not without the bounds of possibility: If the tongue is removed first the patient may subsequently decline the operation upon the neck. All that is troubling him at this time is the disease in his mouth. Although he may have had it clearly explained to him that a second operation will be necessary, and although he may have made up his mind to submit to this, after he has gone through the experience of the first, and has got rid of all appreciable evidence of his disease, he may be unreasonable or his courage may forsake him, and he may refuse the second; whereas if the glands are removed first he is not likely to refuse the subsequent removal of the disease in his mouth. Patients, especially hospital patients, are occasionally very unreasonable, and no amount of argument will persuade them to follow the surgeon's advice.

The last point which I wish to emphasize, in the choice and scope of operation for intraoral cancer, is the advisability of avoiding a communication between the wound in the mouth, which is necessarily septic, and the large recent wound in the neck left after a glandular dissection. This can always be done, except, I believe, the growth be in the tonsil and its neighbourhood, and requires excision from without. Provided the disease be confined to the tongue, this can always be excised intraorally; and if the disease is in the floor of the mouth, any communication with a large recent wound in the neck can always be avoided by dividing up the operation into two stages.

Typical positions of intraoral cancer may be conveniently taken, with the view of indicating the *modus operandi* in carrying out the principles advocated in this article.

1. *The growth is confined to one side of the tongue, in a median or anterior position (with or without a slight adjacent involvement of the floor of the mouth).* This is the simplest case. The surgeon proposes to clear the anterior and submaxillary triangles on one side, tie the

facial and lingual arteries, and then remove half the tongue. Butlin's skin incision is made. There is no necessity to describe minutely the dissection. Commencing from below, and carrying the dissection upwards as far as the parotid gland, and forward to beyond the mid-line, the whole contents of the triangles down to the great vessels (including the submaxillary salivary gland) are removed in one piece. When the submaxillary gland is lifted from its bed the facial artery comes into view, is ligated and divided. The internal jugular vein may require removal. The carotid vessels are next pulled forward, the sterno-mastoid muscle backward, and the deep chain of glands posterior to the vessels are next dissected out in one piece from the clavicle to the transverse process of the atlas. As the final step in the operation on the neck the hyoglossus is divided and the lingual artery tied and cut between the ligatures.

The wound is now closed, a rubber tube being brought out at the lower end, and no gauze packing being used. Gauze packing, which I used in my earlier cases, frequently sticks to the edges of the skin and acts as a retainer of discharges instead of a drain. The best plan, in my opinion, is to insert one rubber tube at the lower end of the incision and place a sponge or two in the dressing to ensure elastic compression of the large wound and thus prevent oozing. The wound in the neck, having been closed, is covered temporarily with a towel soaked in 1 in 40 carbolic acid to protect it from contamination during the excision of the tongue. This can now be usually performed straight away, being quite a minor and bloodless operation, and occupying only a very few minutes. After the excision of the tongue the gloves are changed, and the dressing is applied to the wound in the neck. If for any reason it be considered prudent to defer the excision of the tongue—though if the operation is performed in this order and in this way it will not often be necessary—it can be done in a fortnight, the blood supply to the primary growth having been cut off in the interval. At this second operation there will likewise be no bleeding, notwithstanding any theoretical considerations about the establishment of collateral circulation.

2. *The growth is confined to the tongue, but crosses or approaches the mid-line (with or without a slight adjacent involvement of the floor of the mouth).* Both anterior and submaxillary triangles will require dissection, and the whole tongue must be excised intraorally. This is a very severe operation, and the surgeon can proceed in two, or exceptionally even three, stages, according to the circumstances and condition of the patient. I have more than once successfully dissected out both anterior and submaxillary triangles, tied both linguals and facials, and subsequently excised the whole tongue intraorally at one sitting. Still, further experience convinces me that the operation is too severe, and as a rule two sittings will be required. I think they are best arranged as follows: At the first operation the triangles upon one side are dissected with ligature of the lingual and facial. A fortnight later a similar operation is performed on the other side and the tongue then excised. Alternatively the neck dissection might be done on both sides at the first sitting, with ligature of both linguals and facials. In one case, however, in which this operation was performed, sloughing of the anterior portion of the tongue followed, though this *contretemps* did not interfere with the patient's recovery. This is the only single accident that has happened in my series of cases of ligature of the lingual. The first plan, therefore, seems the best. If the patient's age or condition involves great anxiety as to how much he will be able to stand, the operation can even be performed in three sittings, a neck dissection on each side separately and a subsequent excision of the tongue.

3. *The floor of the mouth is extensively involved either laterally or in front.* The operation here, I think, requires a median division of the jaw, and should always be done in two stages, exceptionally in three. The first operation, as a rule, will consist in a dissection of both anterior and submaxillary triangles, with ligature of both lingual and facial arteries. In a fortnight, when the wound in the neck is healed (the blood supply to the growth having been cut off in the interval), the lower jaw is divided in the mid-line, and the disease, wherever situated, is widely and bloodlessly excised. The jaw should always be wired, because, though it frequently does not unite by bone, yet

the wiring ensures a good position for it subsequently, and in my experience its non-union causes very little inconvenience. A portion of the lower jaw may require removal. Finally a drain tube is carried from the mouth to the lower angle of the wound in the neck and kept in position for about a week. The large wound in the neck caused by the dissection of the triangles a fortnight earlier having healed, there is now no danger of cellulitis in the neck. Three sittings may occasionally be required for excision of the disease in this situation, as exemplified in my last case at the Portsmouth Hospital.

The patient was a feeble old man, said to be 65—he looked 75. The disease occupied the left side of the floor of the mouth and both halves of the tongue. On June 22nd, 1908, the left neck dissection was performed with ligature of the lingual and facial on that side. The patient's condition did not allow of more; the wound healed by first intention. On July 6th the right side was similarly treated, and with the same result. The blood supply to the growth had been cut off. He was not fit for the final operation till July 31st. The lower jaw was divided and the whole tongue and floor of the mouth were excised. No vessel required a ligature. One or two small vessels alone spurted in reflecting the lower lip (inferior dental). He made an uninterrupted recovery.

I am confident the operation could only have been safely done in this piecemeal and bloodless manner.

4. *The disease occupies the tonsil and its neighbourhood—for example, fauces, palate, pharynx, etc.* The consideration of these cases will be very brief, as the present article is not intended to cover them. They will usually have to be dealt with by one or other of the operations of pharyngotomy, and the operation will, I think, have to be performed in one stage, for if the neck dissection is done first anatomical landmarks will be obliterated during the cicatrization of the neck wound, which will make the excision of the primary tumour from without exceedingly difficult and dangerous. I have operated upon three such cases during the past two or three years.

In two of them, in which the disease involved the tonsil and its immediate neighbourhood, the glands of the neck were dissected out and the lingual and facial arteries were ligated close to their origins from the carotid. An incision was then carried up to the angle of the mouth, and the lower jaw was divided opposite the masseter. This gave very good access to the disease, and there was during its removal practically no arterial bleeding and no necessity for laryngotomy or tracheotomy.

In the third case the disease involved the tonsil, soft palate, and the alveolus of both upper and lower jaws, being very extensive within the mouth. As is not very infrequently seen in cases of extensive primary growth, the disease seemed to be expending itself locally, and there was very little glandular enlargement. An attempt was therefore made, at the patient's earnest insistence, to eradicate it. The neck dissection was first performed and the external carotid tied. To lessen the danger of secondary hæmorrhage the lingual, facial, and superior thyroid were next ligatured. The growth was exposed in the same way as in the two preceding cases. After median division, the lower jaw on the side of the growth, being involved, was disarticulated, and a large section was also removed of the neighbouring alveolus of the upper jaw, to which the disease had extended. There was no arterial hæmorrhage, though the bleeding from the inferior palatine and pharyngeal veins caused a little trouble. This patient made an excellent recovery, and followed his employment as a cabdriver for a year, when he had recurrence *in situ*. There was never any sign of disease in the neck.

In all these cases the disease was removed with scissors, and in all of them the advantage of preliminary ligature of the feeding arteries was manifest. In none of them was laryngotomy or tracheotomy required. In none of them was it possible to close the wound in the pharynx. The same principles as advocated in this article for dealing with cancer of the tongue and floor of the mouth were extended to these cases, except that the operation was in each instance performed at one sitting, involving a communication between the mouth and the large wound in the neck, and thereby greatly increasing its risks. But if a clean dissection of the contents of the triangles is carried out I do not see how this is to be avoided.

CONCLUSIONS.

To sum up, the following are the two main principles advocated in the present communication in the operative treatment of cancer of the tongue and floor of the mouth:

The neck should always be attacked first, with ligature of the lingual and facial arteries on one or both sides. This manœuvre reduces the excision of the primary growth, provided that it can be extirpated without division

of the jaw, to an insignificant and bloodless operation, which can consequently be frequently performed without danger immediately after the neck operation. It enables the primary growth to be removed with greater precision. It does away with all necessity for preliminary laryngotomy or tracheotomy. It cuts off the blood supply to the tumour in the interval, if the operation has to be divided into two stages. It will possibly starve cancer cells which may be left behind after attempted extirpation of the disease. In my experience it is the key to the operation.

The second principle is that a communication between the mouth and a large wound in the neck should always be avoided where possible. Unless the disease be situated in the tonsil or its neighbourhood, and except the patient insist on a single operation, this can always be accomplished by dividing the operation into two stages in those cases in which for the satisfactory removal of the disease the lower jaw requires division. The neck, as before, is attacked first, and the lingual and facial arteries are tied. When, in a fortnight, the large wound in the neck is healed, the jaw is divided and the primary growth is excised, as before, bloodlessly. In conclusion, as regards final results, early diagnosis is the only hope. With this view, the therapeutic test of cancer, iodide of potassium, should be relegated to the limbo of dangerous playthings. Immediate microscopic examination of a piece of the growth should be the only test, and the therapeutic test should never be employed unless the microscopic report is doubtful. It should then be pushed rapidly, and its effects not watched too long.

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THE SURGERY OF COLITIS.

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BEFORE discussing the present position of the surgery of colitis, it is necessary to have a clear idea as to what the word "colitis" is meant to convey. For the purposes of these remarks, it is intended to include acute and chronic affections of the colon, sigmoid, and rectum produced by catarrh, inflammation, infection, or intestinal irritation.

It is not too much to say that now practically every morbid condition of the large bowel and rectum has been relieved by surgery at one time or another, and although there is not yet, and cannot well be, any decided line drawn as to which cases should receive one or the other treatment, it becomes a daily increasing necessity for the surgeon to be familiar with the causation and pathology of these conditions as well as to have an intimate knowledge of their treatment.

Colitis must be divided first into two large groups, Acute and Chronic, the subacute being merged into the chronic, far the larger group of the two.

ACUTE COLITIS.

For practical purposes it may be said that all cases of acute colitis are infective in origin, which does not mean that all infective cases of colitis are acute.

Mention must be made of those cases which are brought about by exposure to cold, etc. Such hardly come within the scope of this paper, as when uncomplicated they usually get well with ordinary medical measures. But when there is in addition a well-marked condition of oral sepsis which has probably been present for years, a very different state of affairs may supervene.

The large bowel swarms with micro-organisms which in the ordinary way do no harm, but when the membrane is inflamed the resisting power is much diminished, and the streptococci make active use of it, with the result that serious and wholesale destruction of the mucous membrane occurs, and at the same time considerable toxic absorption takes place, producing grave constitutional disturbances.

Symptoms.

These are acute abdominal pain associated with tympanites, diarrhoea, haemorrhage, and the passage of much blood-stained mucus and foul discharge, and in advanced cases sloughs may come away. A marked condition of toxæmia is always present in acute cases.

Treatment.

The surgical treatment in these acute cases does not differ from that which is done in the subacute cases, and the details will be given with the description of the subacute cases. The only point to emphasize here is that the condition is one of great emergency, and as such must be considered in undertaking any operation for its relief.

CHRONIC COLITIS.

The far larger group of chronic cases may be classified as follows:

1. Mucous colitis.
2. Membranous colitis.
3. Ulcerative colitis.
4. Haemorrhagic colitis.

Mucous and membranous colitis are practically the same, as both are due to excessive secretion of mucus.

The excessive secretion is caused by inflammatory irritation of the secreting glands, and when the inflammation is recent and subacute the discharge is entirely mucous, but in the acute cases the mucus is bloodstained.

When the inflammatory area is situated in the rectum or sigmoid the discharge consists of mucus only, but if the affected area is higher up in the colon it will be mixed with the intestinal contents. When the inflammation is of a chronic character, the mucus is secreted more slowly and becomes laminated, forming in some cases a complete cast of the bowel. This is the condition which is known as membranous colitis.

Ulcerative Colitis.

Ulcerative colitis (chronic) is a further stage of the inflammatory process, in which a destruction of tissue has taken place. Four varieties may be considered here, namely:

1. Follicular ulceration.
2. Ulceration due to sepsis.
3. Ulceration due to traumatism.
4. Dysenteric.

Follicular ulceration occurs mainly in the sigmoid and upper part of the rectum, as it is in this part of the intestinal canal that the majority of the solitary follicles exist. They are situated in the mucous membrane itself and the base of the follicle extends to the submucous tissue. The sigmoidoscopic examination shows a number of sharply-cut-out ulcers extending down to the submucous coat, and the mucous membrane around the ulcer is inflamed.

The symptoms mainly consist of a discharge of blood or blood-stained mucus; there is little or no pain associated with it, and the patients are otherwise quite healthy.

This form of ulcerative colitis is not of any serious importance as to the suffering it entails, but it is probably quite as difficult to cure as any of the different forms of colitis.

Ulceration due to sepsis when originally in the colon is due to a microbic infection of an already inflamed mucous membrane, and in ulcerative colitis associated with haemorrhage the organism present is usually a streptococcus. The contents of the large bowel, as has already been said, swarm with micro-organisms which in the ordinary way do not affect the mucous membrane; but when this is inflamed the micro-organisms not only have a destructive action on the inflamed membrane, but, in addition, the absorption of toxins causes constitutional symptoms of more or less gravity.

Traumatic ulcerations apart from ulceration due to post-operative sepsis are almost restricted to women in whom the pressure of the fetal head in a protracted labour has caused absolute destruction of a part of the mucous membrane, which sloughs away, leaving an ulcerated area behind it.

Dysenteric ulceration, as far as symptoms and surgical treatment go, does not differ from the other forms mentioned, except for the fact that the patients have usually resided in tropical countries where dysentery is endemic, and that whilst in these parts they have suffered from symptoms associated with dysentery.

It is rather necessary to put it in this way, because it is only too commonly the custom in tropical countries to class all forms of subacute and chronic diarrhoea as dysenteric, and in military hospitals when the ulceration is discovered as well, it is nearly always diagnosed and treated as syphilitic. With regard to this latter form of ulceration as a cause of colitis, I purposely have not