convalescence following operation and was discharged on the sixteenth day.

Case 6.—Mrs. M. S., aged 31, was admitted to the Manchester Royal Infirmary on July 11th, 1934. The patient was very pale and collapsed—pulse 164, and very feeble. A diagnosis of ruptured tubal gestation was made. Two pints of gum saline were introduced into the saphenous vein at the ankle by the continuous drip method, followed by a pint of citrated blood. Operation was contemplated about two hours after admission, but her condition was still too poor to warrant it. At three and a half hours the condition was better, but not good. As it was feared that the haemorrhage might be continuing, operation was then performed, but with some anxiety. At operation, under ether anaesthesia, the haemorrhage appeared to have stopped completely. The affected portion of the tube was excised and the blood removed. The continuous saline infusion was maintained during the operation, at the end of which the general condition of the patient was much improved. This seemed to suggest that one might with advantage have withheld operation a little longer. She made a good convalescence, apart from a continued slight pyrexia, and was transferred to the Convalescent Hospital on the twenty-first day.

Commentary

As long ago as 1906 Crile² described a case of uncontrolled haemorrhage following nephrolithotomy, in which a direct transfusion from the radial artery of the donor to the basilic vein of the patient brought about great improvement in the general condition, so that a difficult nephrectomy was successfully undertaken.

Dretzka³ (1930), in discussing the treatment of rupture of the spleen, states: "The two factors to be placed in the balance when confronted with a case of intra-abdominal haemorrhage are the patient's resistance to additional operative trauma, and the knowledge that delay beyond a certain point is fatal. To operate on a patient suffering with systemic shock is unpardonable." He advocates warmth, intravenous injections of saline and glucose, and later direct transfusion of blood. There is therefore nothing original in the employment of massive intravenous injections as is advocated in this paper. But it has appeared worth while to record this series of cases, because of a somewhat prevalent reluctance to employ intravenous infusions while the haemorrhage is still uncontrolled. That recurrence of haemorrhage may not ensue from very massive infusions is seen in Case 6 above, in which no further haemorrhage had taken place after the administration of two pints of gum saline and a pint of blood. The employment of the continuous intravenous drip method has been largely a matter of convenience, and is not essential. It is a method which has been widely employed for other conditions, and about which there is accumulating an increasing literature. (Matas,⁹ Hendon,⁷ Gallie and Harris,⁴ Hyman and Hirshfeld,⁸ Bailey and Carnow,⁶ etc.) It may be argued that most cases of uncomplicated intra-abdominal haemorrhage, even though submitted to operation in a desperate condition, do recover. That is undoubtedly true, and it is certainly not essential to employ these measures in all cases. But occasional cases do not recover, and it is incredible that Cases 2, 5, and 6 of this series should all have undergone successful operation without the adequate pre-operative treatment described.

It is not possible to state the length of time which should be devoted to the pre-operative treatment. This will vary according to the needs of the case. In Case 2 an apparently moribund patient was brought to successful operation in splendid condition after treatment for four hours. In Case 6 the condition had improved after three and a half hours, but considering that the haemorrhage had not started up again and that the general condition was very much better at the end of the operation than

at the beginning it would appear that a longer period of pre-operative preparation could advantageously have been employed. It is a general impression that one tends to operate a little too early rather than too late.

Summary

The small series of cases recorded in this paper seems to demonstrate conclusively the value of massive intravenous infusions in the pre-operative preparation of grave intra-abdominal haemorrhages. It also shows that blood is not an absolute essential, but that gum saline is a satisfactory substitute, even though the haemorrhage is still uncontrolled. The cases are put on record as a plea for a much more vigorous pre-operative treatment of severe haemorrhages than is commonly employed in practice.

The author wishes to express his gratitude to the honorary surgeons of the Manchester Royal Infirmary, by whose kind permission this work is recorded.

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SARCOMA OF THE TONGUE

WITH REPORT OF A CASE

BY

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Sarcoma of the tongue appears to be almost as rare to-day as when Butlin said of the condition: "It would be quite useless to try to write an account of it which shall be useful." He was not only referring to the rarity of sarcoma of the tongue, but was emphasizing the fact that numerous cases have been included in this category in the past which cannot be considered sarcomatous after careful investigation. Thus Fripp and Jocelyn Swan¹ were forced to discard fifteen out of forty-four cases of so-called sarcomata collected from the literature in 1905. Coughlin² in 1915 recorded fifty-eight cases, and added two of his own, but Kudlich³ was only able to collect records of sixty cases in 1931, and added that many of these were insufficiently or inaccurately described. Goldstein,⁴ after a most intensive study of the literature from all sources, found records of sixty-five cases.

I do not propose to deal with lymphosarcoma of the base of the tongue or with the so-called lympho-epithelioma. As has been pointed out by New, Broders, and Childrey,⁵ these tumours generally arise in the tonsil or pharynx, and cannot be regarded as primary tumours of the tongue. Unusual forms of sarcoma of the tongue have been recorded by Menetrier and Surmont,⁶ Loubat and Petit,⁷ and Kudlich, who have described sarcomatous growths with an angiomatous element arising during early infancy. Heath⁸ reported an encapsulated round-celled sarcoma which recurred three weeks after removal. Professor Coenen⁹ recorded a case of hypernephroma of the base of the tongue without evidence of primary growth in either kidney. Thus it would appear that sufficient cases have now been reported and described to indicate the usual features of sarcoma linguae.

Aetiology

If the relatively small group of congenital neoplasms be excluded, sarcoma of the tongue may be regarded as a disease of adult life. Males are more commonly affected in the proportion of two to one. The question of trauma is as vexed in sarcoma of the tongue as in sarcoma elsewhere. Coughlin claims that 16 per cent. of cases reveal a definite history of trauma, and include those in which biting, scalding, and the irritation by a sharp tooth or by a scar have occurred a reasonable period before the onset of the growth.

Pathology

While there are several varieties of sarcoma of the tongue histologically, the macroscopic appearance in the main presents a surprising uniformity. The growth appears as a rounded intraglossal mass, fibrous, and white, or slightly tinged with pink. The tumour is firm and elastic in consistence, and is sometimes surrounded by a pseudocapsule. The tendency may be to push aside rather than to infiltrate the median raphe. The varieties seen microscopically are: (1) small round-celled sarcoma; (2) large round-celled sarcoma; (3) spindle-celled sarcoma; (4) mixed-celled sarcoma; and (5) lymphosarcoma. There does not, however, appear to be the same degree of difference of malignancy between the spindle-celled growth and the other varieties as in sarcoma elsewhere. Fripp and Swan commented on this fact, and Coughlin showed that metastases occurred in the lymph nodes in the following proportions: (1) round-celled, 35 per cent.; (2) spindle-celled, 25 per cent.; (3) mixed-celled, 33½ per cent.

It is suggested by some authorities—namely, Spencer and Cade¹⁰—that round-celled sarcoma of the tongue is probably a lymphosarcoma. This is an abstruse question with which I do not propose to deal in detail, but the following factors do not appear to support this view: (1) Round-celled sarcoma occurs sometimes in the anterior two-thirds of the tongue; this was so in the case reported below. If the round-celled sarcoma is in reality a lymphosarcoma, one would suppose that it would be almost invariably situated in the posterior third of the tongue, richly endowed as it is with lymphatic tissue. (2) It has been pointed out that lymphatic metastases occur in 25 per cent. of cases of spindle-celled sarcoma of the tongue. This fact disposes of the argument that round-celled sarcoma is of a lymphosarcomatous nature, since lymphatic metastases are reputed to be confined to the latter variety. Ewing,¹¹ who mentions round-celled sarcomata of the tongue, does not commit himself as to their exact nature. Kaufmann¹² differentiates between what he calls the interstitial and tuberous, sometimes pendulous, forms of the growth.

Clinical Classification

Sarcoma of the tongue falls into three main categories. Secondary growths occur fairly commonly at the base of the tongue. Several cases of so-called congenital sarcoma manifesting themselves during the first year of life and exhibiting an angiomatous element have been reported from time to time. It is, however, with the primary sarcoma arising during adult life that I propose to deal.

Symptoms

In a word these are the sensations produced by the actual presence of a swelling in the tongue. The onset is insidious and pain exceptional, the latter only occurring if secondarily produced ulceration is present. If the tumour is in the anterior two-thirds interference with speech will occur, if situated in the posterior third deglutition is deranged, in both instances the effect being mechanically produced by the presence of a mass in the substance of the tongue. Frequently the patient notices the lump himself. The later symptoms—ulceration, pain, both local and

referred, haemorrhage, and foetor oris—are similar to those experienced by patients with carcinoma of the mouth.

Physical Signs

Sarcoma is seen most frequently in the middle and posterior thirds of the tongue, the anterior third being a most unusual situation. A swelling is found arising in the substance of the tongue and bulging on the dorsum. Its consistence is almost invariably firm and elastic. The covering epithelium is stretched on the dorsal aspect of the tumour; it is sometimes blanched by the tension, or may exhibit dilated vessels. The epithelium on the dorsum is usually adherent to the tumour, while that of the ventral aspect appears normal and unattached.

Coughlin claims that ulceration frequently occurs, but this is contrary to the experience of most writers, who have found that ulceration only occurs where a large

tumour is in contact with irregular teeth. Fripp and Swan have pointed out that if the middle third is affected the lower part of the tumour may present as a rounded mass in the submaxillary triangle of the neck. Metastases in the cervical lymph nodes occur in a large proportion of cases; 40 per cent. is quoted by some authors. Secondaries are occasionally found in the brain, lungs, peritoneum, etc.

Diagnosis

Carcinoma of the tongue of the nodular variety is the most likely condition to be confused with sarcoma. Providing the possibility of sarcoma is considered, the following points are helpful in distinguishing these two conditions. (1) As in other parts of the body, sarcoma of the tongue occurs rather earlier in life than carcinoma; (2) pain is rarely experienced in sarcoma; (3) a sarcoma is non-tender, and firm and elastic in consistence, whereas carcinoma is hard, craggy, and friable; (4) even with the nodular variety of carcinoma there is usually a fissured ulcer to be seen just under the lateral border of the tongue. Ulceration in sarcoma only occurs opposite irregular or jagged teeth; (5) sarcoma arises in the substance of the tongue and forms an intraglossal mass.

While these points of distinction may be helpful, the diagnosis rests on microscopical evidence. In this connexion Giuseppe Cirillo¹³ has recorded a factor of interest. In his case of a small round-celled sarcoma the patient died suddenly a few days after the removal of a small piece

of the growth for microscopical section. He quotes Naegele as having a similar death two days following biopsy for sarcoma of the tongue. Cirillo states that he does not believe that the cause of death in either case was pneumonia, although in both there were some indications of lung involvement.

Prognosis

On this subject I shall confine myself to saying that from the published cases the prognosis is not so gloomy as might be expected, especially as the operative treatment of many of these has been restricted and inadequate. Of twenty-four cases quoted by Fripp and Swan, eleven patients were alive and well at periods varying from six months to thirteen years from the time of operation. The condition in the remaining thirteen recurred early, either locally or in the cervical nodes.

Treatment

I could find no record of any sarcoma of the anterior two-thirds being treated with radium. Numerous cases are recorded, as that of Simons,¹⁴ in which x-ray therapy and radium had been used in the treatment of lymphosarcoma of the base of the tongue. In the past a wide removal of either the whole or half the tongue was recommended, sometimes followed by a bloc dissection of the cervical glands. I followed the latter teaching in my own case. I did not use radium for the tongue, mainly because the cut surface of the tumour appeared firm, fibrous, and relatively avascular when a small wedge was removed for biopsy. The microscopical appearance confirmed this relative avascularity. With regard to the neck, I performed a bloc dissection of the cervical glands on the same side, since I cannot help feeling that this procedure is more efficacious than superficial or interstitial irradiation in cases of secondary malignant glands.

Case Report

A male, aged 44, healthy in other respects, attended the out-patient department complaining of the rapid onset of a swelling of the tongue. He had no pain of any description, and there was no history of injury. On examination there was a swelling one inch in diameter and firm in consistence situated near the tip of the tongue on the left side (see figure). The swelling was intraglossal, and there was no ulceration of the covering epithelium, which was a little stretched over the convexity of the tumour. Protrusion was full, and there was no fixation. The cervical nodes were not palpable.

A small wedge-shaped piece of the tumour was taken for microscopical examination, and was reported by the pathologist as a round-celled sarcoma. Clinical and x-ray examination of the chest revealed no secondaries. Whitehead's operation was undertaken, the left half of the tongue, including part of the right half in the vicinity of the tumour, being removed. Three weeks later I performed a bloc dissection of the glands on the left side of the neck, and this was followed up by a course of x-ray therapy. The glands removed at operation were not sarcomatous when sectioned.

The patient is well and free from local and glandular recurrences at the time of writing, which is a year and a half after the operation.

Conclusions

1. Sarcoma of the tongue is a rare disease.
2. There are, however, several characteristic symptoms and signs which help to distinguish sarcoma from the nodular type of carcinoma.
3. Attention is drawn to the fact that small round-celled sarcoma occurs sometimes in the anterior two-thirds, suggesting that this type of growth is not, as has been frequently stated, a lymphosarcoma.
5. The prognosis appears to be less gloomy than might be anticipated.

I am indebted to Dr. T. B. Davie and Dr. Hugh Smith for examining and reporting on the microscopical sections.

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TREATMENT OF CHOLERA WITH A NEW ANTI-CHOLERA SERUM

PRELIMINARY NOTE

BY

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Since the introduction of saline transfusion by Sir Leonard Rogers little progress has been made in the treatment of cholera. The mortality rate is still very high; in the recent epidemics in the Central Provinces and Ganjam Districts it was over 50 per cent. Saline transfusion is only a means mechanically to replace the loss of fluid, but up to this time nothing has been found to counteract the toxic condition or the fatal vasomotor paralysis. During the height of an epidemic of cholera, when the mortality is high, death has been due mostly to vasomotor paralysis. The saline transfusion has often only a transitory effect; the pulse gradually sinks, and no stimulant can improve it. Excess of saline produces oedema of the lungs. Unless the toxin which produces the fatal vasomotor paralysis can be neutralized, further advance is not likely to be made in treating successfully the more severe cases of cholera. I thought that a potent anti-cholera serum might achieve this, and I accordingly began, three years ago, to try to isolate the toxin which is responsible for the acute symptoms.

Isolation of a Toxin

For long the attempt to isolate the real toxin which produced the acute diarrhoea and vasomotor paralysis in cholera was unsuccessful. I was trying to isolate the toxin while in charge of the biological laboratory of the Bengal Chemical and Pharmaceutical Works. In December, 1932, I made a communication on the "Nature of Cholera Toxin and Symptoms of Cholera" to the Scientific Section of the All-India Medical Conference.¹ In this I showed that by anaerobic culture of the cholera vibrio in a special broth a toxin could be obtained which, when injected in small doses intravenously in rabbits, produced cholera-like diarrhoea. I obtained sufficient corroborative evidence of the presence of a toxin in this medium by experimentally producing cholera-like diarrhoea in laboratory animals. The result was published in the *Comptes Rendus des Séances de la Société de Biologie* of Paris,² in which the technique of preparation of the toxin and experimental pathogenic action were described.

Preparation of Serum and Trial

This toxin was prepared from only one strain of cholera vibrio, as it was found to produce uniform toxin provided the medium was prepared exactly according to our formula. Conservation of the virulence of the strain was found to be as difficult as that of *B. diphtheriae*, and the production of toxin depended upon conservation of