subsequent thrombosis. The pulse may disappear after a few hours, or it may remain full until shortly before the onset of gangrene, as shown in three published cases, where gangrene ensued after disappearance of the pulse on the eighth, tenth, and sixteenth days, respectively. In these circumstances the only answer to this condition, once it has occurred, is intensive treatment, the necessity for which remains undiminished by the presence of palpable pulses in the affected limb.

The appearance of discoloured skin patches in the affected limb has been described in several of the previously reported cases. They have also been reported as a complication of arteriography and ascribed by Wagner (1944) to secondary spread of thrombosis from the main vessel to distal cutaneous branches. In the present case, however, with no brachial artery thrombosis, the patch would seem to have been due to a direct local effect of the thiopentone shunted into the skin vessels.

The treatment of this condition is directed towards ensuring full vasodilatation of the limb with obliteration of all arterial spasm, the prevention of thrombosis, and satisfactory venous drainage. There is no place for complacency: once the mistake has been recognized, treatment must be started immediately and followed through intensively. The experience gained from the present case emphasizes the fact that, if at all possible, the operation should not be allowed to continue, as was permitted in this instance and subsequently regretted when oozing from the penis became an additional source of worry on the second and third days.

As the patient is unconscious when the first brachial plexus block is performed immediately after the accident, and consequently paraesthesiae or other corroboration of the success of the block cannot be obtained, it is advised that Patrick's method be employed, using at least 20 ml. of solution, preferably with hyalase. The repetition of the block in the present case, several hours later after heparinization had begun, together with the intra-arterial injection of tolazoline and heparin, was recognized as a hazardous procedure, but it was felt that the vascular supply to the limb at this stage was jeopardized to a precarious extent by the arterial spasm.

Tolazoline has been the subject of a report on peripheral vascular disease by Edwards *et al.* (1952). These workers found it to be one of the best vasodilators available, and recommended a dosage of 50–100 mg. at weekly intervals. In addition, they state that "Swan's plethysmographic studies (quoted by Lynn, 1950) demonstrated an increased blood flow in an already sympathectomized limb following the intra-arterial injection of 50 mg. of tolazoline." This drug would thus appear to have properties of much value in the treatment of cases of intra-arterial thiopentone, not least of which is its prolonged action after intra-arterial injection. It is of interest to note that the same workers showed that intra-arterial procaine had little or no value in producing an increase in peripheral limb blood flow. It is suggested, therefore, that immediate treatment for cases of accidental intra-arterial thiopentone should include intra-arterial tolazoline, in addition to the brachial plexus block, a procedure easily accomplished, as Dundee (1953) states, by puncturing the subclavian artery on completion of the block. In the case under review tolazoline was not immediately available, but when it was injected into the subclavian artery the vasodilator response was both dramatic and prolonged.

Other methods of assisting vasodilatation and forcing the collateral circulation should be employed, especially warmth and sedation. The use of morphine has been shown by Learmonth (1946) to relax vessel spasm, although in the present case vomiting became a troublesome complication, which ceased on the substitution of pethidine.

In view of reports of delayed onset of gangrene in several cases, it is difficult to say for how long these measures should be maintained. In the present case the strict regime was not relaxed until the sixth day, and the patient remained under observation until the thirteenth day. By this time

the danger from arterial spasm is well past, and, in the absence of any significant sign of impaired limb blood flow, it is difficult to conceive the danger of delayed thrombosis being anything but remote.

Summary

A case of accidental intra-arterial injection of thiopentone is reported with a description of the treatment employed.

A test injection of 2 ml. with a safety pause is advocated as a preventive measure.

The operation should be abandoned, if at all possible, once the mishap has occurred.

The necessity for immediate and intensive treatment is stressed.

The use of intra-arterial tolazoline is recommended.

I wish to thank Dr. A. C. Forrester for permission to publish this case, and to express my appreciation to Professor W. A. Mackey for his advice.

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TOTAL PAROTIDECTOMY WITH PRESERVATION OF FACIAL NERVE A REVIEW OF 47 CASES

BY

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The operation of total parotidectomy with preservation of the facial nerve for non-malignant conditions as advocated by Hamilton Bailey (1941) is slowly gaining adherents in this country, and 47 patients who have had this operation have now been followed up to try to ascertain the answers to three questions: (1) Does total removal of the parotid gland reduce the number of recurrences which follow local removal of mixed parotid tumours? (2) Can total removal of the parotid gland be performed and full function of the facial nerve be preserved in every case? (3) What is the cause of the Frey syndrome and how may it be prevented?

The technique of the operation used in these cases has been described elsewhere (Kidd, 1950, 1953), and the value of starting the dissection by locating the branch of the cervico-facial nerve going to the lower lip is confirmed. Increased familiarity with the operation favours the preservation of the branch of the great auricular nerve going to the lobe of the ear and, in many cases, deliberate resection of the auriculo-temporal nerve.

Diagnosis

It is not perhaps generally recognized how many different primarily non-malignant conditions arise in the parotid gland, nor how difficult it can be to be sure that a tumour in the parotid area is actually in the gland. Many true parotid tumours feel very superficial and mobile, and deep-seated tumours may be found to arise from deep lymphatic glands. The history and careful palpation are the best guides; good sialograms are also of value, but in some cases only exploration will clinch the diagnosis. As the danger of cutting into a mixed parotid tumour is very real, it is wise to plan the incision and approach, in a difficult

case, so that total parotidectomy can be proceeded with should the tumour be found to arise from the parotid gland. Lipomas may be superficial and arise in the fat between the parotid gland and the skin, but can also lie deep in the substance of the parotid gland. Sebaceous cysts may be mistakenly diagnosed when a cystic tumour of the parotid gland is present. Pre-auricular adenitis can cause difficulty, but the length of history is usually much less than in true parotid tumours.

The 47 cases (18 male and 29 female) were made up as follows: 3 chronic infection, 2 calculus, 1 tuberculosis, 1 oncocytoma, 2 adenolymphoma, 1 lipofibromatosis, 1 lipoma, 29 mixed parotid tumour, 3 carcinoma, 2 recurrent tumour, 1 congenital fistula, and 1 cyst, of branchial origin.

The carcinoma cases included here were those found to be so on pathological examination, but, except under unusual circumstances, preserving the facial nerve is not advised when the clinical appearance indicates malignancy.

The recurrent tumours occurred in cases in which a local removal of a mixed parotid tumour had been done elsewhere, and in both the recurrence showed microscopical evidence of malignancy.

Two other cases that were obviously malignant, and were not included in this series, gave a history of a local removal of a mixed parotid tumour many years previously. The recurrence rate after local excision or simple enucleation of mixed tumours has been variously stated by different authors to vary between 10 and 30%. Irradiation has no place in the treatment of these tumours, as it never causes the disappearance of the tumour, only a reduction in size. While the natural history of mixed tumours shows that they grow slowly over many years, they are liable to sudden increases in size and malignant change. In one case, not included in this series, a girl of 16 had a mixed parotid tumour treated by local excision, and when it recurred shortly afterwards radiotherapy was given. Within a few months it had ulcerated through the skin, and in spite of wide excision, including a block dissection of the neck, death occurred nine months later. Apart from the danger of recurrence, local excision is too often followed by partial or complete facial palsy.

Recurrence

The first case in this series was done in 1943 and the last in February, 1955, and there has been no recurrence in any of the primary cases, although two of the patients have since died of other diseases. The two recurrent cases previously mentioned, both adenocarcinoma after local excision of a mixed tumour, were treated by total excision of the gland, and the facial nerve was preserved. Two small tumours 4 mm. in diameter have been removed from one of these cases since, but there has been no further trouble during the last fourteen months. There have been no cases of permanent facial paralysis. Lower-lip palsy is present in a few cases, but was due to deliberate division of the lower branch of the cervico-facial nerve. This small series thus agrees with those of Redon (1953), of Paris, who, using a similar technique, reported 165 cases of mixed parotid tumour with no recurrence and no facial paralysis, and Patey (1954), in a recent review, also concurs.

Frei Syndrome

The scar—if made below the jaw, in the skin crease, and curved round the lobe of the ear to split the tragus—is unobtrusive. There is, however, one sequela which may come on from one month to two years after the operation, and that is the Frei syndrome. This consists of flushing and sometimes sweating on the same side of the face as the operation, and occurs during or after a meal. It occurred in 11 out of 45 patients followed up in this series, and varied in intensity from a minor degree of flushing and dampness to a considerable discharge of sweat. About the same incidence of this syndrome is given in other reports of this operation, and no really satisfactory explanation of its cause has been given. It does not disappear spontaneously and is not easily treated. It occurs chiefly in the malar area, which

is supplied by the sensory branch of the auriculo-temporal nerve. The auriculo-temporal nerve is also the motor nerve to the parotid gland, and it is thought that when the tongue is stimulated by hot or strongly flavoured substances the impulses pass via the glossopharyngeal nerve to the otic ganglion and thence to the auriculo-temporal nerve. The divided motor branches of this nerve then anastomose with the distal branches of the sympathetic system which supply the skin and which were severed when the skin flap was raised. Redon always ligates the external carotid artery, but has a 25% incidence of Frei syndrome. Although in this series it has rarely been necessary to tie this artery the incidence of Frei syndrome is about the same.

In one case in 1951 the nerve was identified and carefully preserved; this patient developed a Frei syndrome. Since 1951 an attempt has been made to identify the auriculo-temporal nerve, and in 10 cases in which it was thought to have been clearly identified and sectioned, as far proximally as possible, only one has developed a complete Frei syndrome and one has a flush only.

Conclusion

The results of this review allow the questions posed at the beginning of this paper to be answered as follows:

1. The recurrence rate for mixed parotid tumours can be reduced to nil by total parotidectomy, with preservation of the facial nerve.
2. The facial nerve can be preserved and will recover its functions in every case.
3. The cause of the Frei syndrome is not known, but deliberate identification and resection of the auriculo-temporal nerve may materially reduce the 25% incidence of this complication.

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Medical Memoranda

Perforation of Intestine by Unsuspectedly Swallowed Foreign Body

It must be quite unusual to find, during laparotomy, intestinal perforation caused by a foreign body the patient did not know had been swallowed. The following three cases occurred in the Royal Alexandra Infirmary, Paisley, during 1954.

CASE REPORTS

Case 1.—A woman aged 43 had rheumatoid arthritis, and was in the orthopaedic ward just recovering from an osteotomy of the neck of the femur, when she developed severe pain in the left side of the abdomen with nausea and slight pyrexia. On examination she had marked tenderness and rigidity in the left iliac fossa, suggesting local peritonism or peritonitis. Without rectal and vaginal examination, which could not be made owing to the orthopaedic condition, a twisted ovarian cyst seemed a possible diagnosis, and laparotomy was indicated. At operation there was a mild peritonitis with slight turbid exudate, and a splinter of wood 1½ in. (3.8 cm.) long was found perforating the middle of the small intestine. It was removed and the puncture holes—then almost invisible—were closed. Convalescence was uneventful. The patient did not remember swallowing the splinter.

Case 2.—A woman aged 47 complained of having had pain in the right iliac fossa for 24 hours, with nausea. Her temperature was 99.2° F. (37.3° C.). There was moderate tenderness and slight rigidity in the right iliac fossa, and the condition appeared to be acute appendicitis, but at operation the appendix was normal, and a splinter of wood 1½ in. (3.8 cm.) long was found perforating the bowel at