THE OSTEOPLASTIC FLAP APPROACH TO THE FRONTAL SINUSES

By THOMAS GIBSON,* (Glasgow) and FORBES M. WALKER,† (Ayr)

In 1951 we described in detail an approach to the frontal sinuses using a large osteoplastic flap which, while affording complete access to all extensions of the sinuses, produces no visible post-operative bony deformity and a minimum of scarring. Although it was evolved primarily for the removal of a large frontal osteoma, the success of the method suggested that it might be equally useful in other lesions of the sinuses. However, until the passage of time showed that the procedure was free from late complications, it was decided to limit its use to those cases in which other available methods were inadequate because of the limited access provided, or unsatisfactory because of the post-operative scarring and deformity involved. We have now used the approach in three further cases of widely differing pathology; in each the results have been completely satisfactory and short summaries of these cases are given below. They illustrate the versatility of the approach and may be of interest to others faced with similar problems.

For full technical details the reader is referred to the original paper (Gibson and Walker, 1951). Briefly, the operation is carried out as follows: a coronal incision is made about 1 cm. behind the frontal hair line, extending downwards on both temples to just above the level of the supra-orbital ridges. The skin flap thus outlined is dissected downwards superficial to the pericranium, laterally as far as the supra-orbital ridges but centrally only to the upper and lateral boundaries of the frontal sinuses which can be assessed fairly accurately from the radiographs. A small osteotome is driven through the upper border of the anterior plate into the sinus and thereafter used to cut completely around the upper and lateral borders down to the supra-orbital ridge of each side. A flat bladed instrument inserted deep to the plate enables it to be fractured through the base so that it can be turned downwards still attached to the scalp flap and with its blood supply intact. At the completion of the operation it is replaced with the flap.

Case I. *Unusual osteoma of the frontal sinus.* The patient, a farm-worker, aged 17, was first seen by us in August, 1951, complaining of

* From the Department of Plastic Surgery, Ballochmyle Hospital.
† From the Ear Nose and Throat Service, Ayrshire.

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deformity of the right upper eyelid and pain in the right eye. Some drooping of the lid was first noticed in 1948 and had very gradually increased (Fig. 1). Occasionally he had felt a dull pain in the eye and had several attacks of double vision. "Eye drops" had been prescribed two months previously and had given some relief. The signs and symptoms were obviously related not to the eye but to an expansile lesion of the right frontal sinus and X-ray revealed a large osteoma filling the right sinus and encroaching on the left (Fig. 3). The tumour differed from the

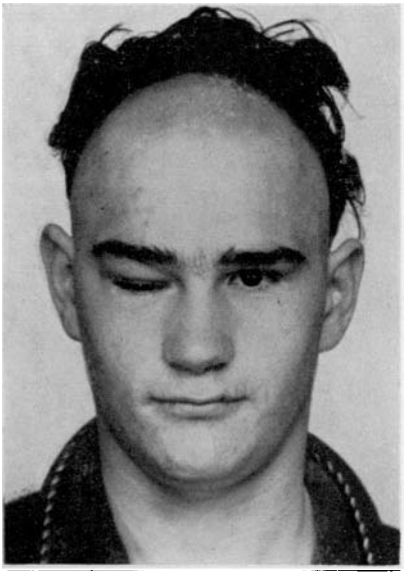


FIG. 1.

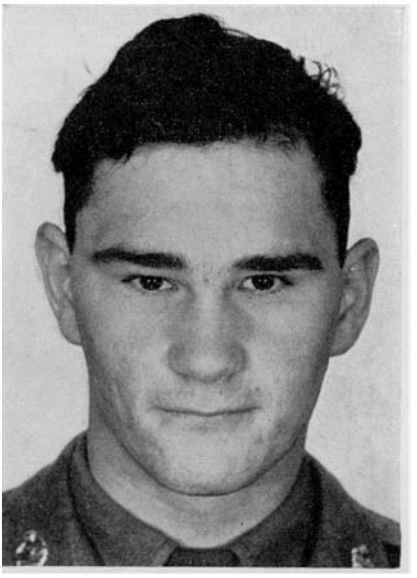


FIG. 2.

FIG. 1.

CASE I. Pre-operative photograph showing the swelling of the right upper eyelid and the degree of ptosis.

FIG. 2.

CASE I. Photo taken two years after operation. There is no bony deformity and the scar is hidden by the hair line.

usual in so far as it was much less dense and showed several areas of rarefaction which raised the question of malignant change. This, although excessively rare, has been reported (Hallberg and Begley, 1950). It was not possible to demonstrate the site of origin of the tumour by X-ray.

Operation was performed on August 28th, 1951. When the osteoplastic flap was turned down, the osteoma proved to be extremely friable and vascular and had to be removed piecemeal. It arose from a broad attachment on the posterior wall through which coursed several large blood vessels. This attachment was ablated as far as possible without entering the cranium and bleeding was controlled with Horsley's wax.

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Small mucoceles were present in two extensions of the sinuses and were removed along with all the mucosal lining except that immediately surrounding the fronto-nasal ducts. The wound was then closed with the provision of drains on each side at the lower limits of the incision. Histologically the tumour showed simple fibrous dysplasia of bone with no evidence of malignancy.

Healing was uneventful and the patient was last seen on September 28th, 1953 (Fig. 2), when he was symptom free and X-ray showed no recurrence of the tumour.

Comment. The advantages of having the greatest possible exposure in dealing with a vascular tumour of this kind arising from the posterior



FIG. 3.

CASE I. X-ray of the frontal sinuses. The outline of the œstoma which shows areas of osteoporosis has been emphasized.

sinus wall are obvious. Bleeding became more and more profuse as the base of the tumour was approached and great care had to be exercised to ensure complete removal without at the same time penetrating the skull.

CASE II. *Suppurative sinusitis with sequestrum formation.* The patient, an engineer, aged 34, was first seen in February, 1953, with severe pain over the left eye and swelling of the left side of the face. He had had two previous attacks of acute frontal sinusitis in 1949 and 1950. X-rays showed opacity of both sinuses and a possible sequestrum on the left side. He was treated at first conservatively with chloromycetin and aureomycin and with Proetz displacement therapy, but although the acute symptoms were relieved, pain and swelling over the left eye persisted (Fig. 4) and pus continued to discharge intranasally in varying amounts on both sides. Further X-rays (March 21st, 1953) showed a

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definite sequestrum of the anterior plate of the left sinus (Fig. 6) and it was decided to explore both sinuses using the osteoplastic flap approach.

Operation was performed on March 31st, 1953. As the scalp flap was being turned down and the upper limit of the sinuses approached, pus welled into the wound through the upper deficiency of the anterior plate on the left side, and there was no difficulty in cutting around the margins of the plate with an osteotome. When the plate was fractured downwards, the break on the left side occurred as usual just above the ridge; on the

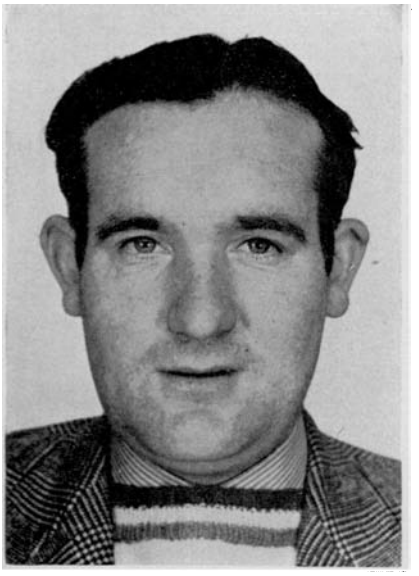


FIG. 4.

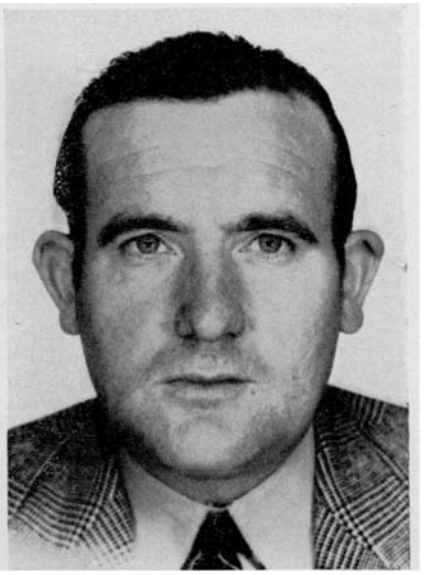


FIG. 5.

FIG. 4.
CASE II. Pre-operative photograph. The swelling over the medial half of the left supra-orbital ridge can be seen.

FIG. 5.
CASE II. The appearance five months after operation. Note the absence of bony deformity.

right side, however, it occurred *through* the ridge, the supra-orbital plate being deficient and the ridge correspondingly weak. The extensions of the sinuses on both sides were found to contain pus and on the left side a roughly spheroidal sequestrum about 1·5 cm. in diameter was lying free and was removed. This was obviously a detached piece of the anterior plate encrusted with new bone. The defect in the anterior plate was also about 1·5 cm. in diameter and the scalp tissue in the base was infected and covered with granulations. The mucosal lining was removed completely from all extensions of the sinuses leaving only a small margin around each fronto-nasal duct; the granulations on the scalp flap were

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shaved off, the flap replaced and the wound closed with bilateral drainage. Penicillin was administered in large doses of 1,000,000 units soluble every four hours for the first 48 hours. This was reduced to 1,000,000 units daily for a further five days. The drains were removed three days after operation. Healing occurred by first intention and there was no discharge from the drainage openings. The patient was discharged nine days after operation. Some altered blood continued to drain into the pharynx and was coughed up for a week or more after discharge. About five weeks after operation he complained of an aching pain over the right supra-orbital ridge. Such pains are not uncommon in healing fractures of the facial



FIG. 6.

CASE II. Pre-operative X-ray of the frontal sinuses. There is marked opacity on the left side and a sequestrum of the anterior plate of the left sinus.

bones in this region and were considered due to the fracture of the supra-orbital ridge which had occurred at operation. They cleared up rapidly and have not recurred. He was last seen five months after operation (Fig. 5) when his only complaint was a "funny feeling" in his head when lying flat on his back under a lorry for any length of time!

Comment. Other routes of approach commonly employed in such cases entail not only a bilateral operation but the removal piecemeal of much of the anterior plate of the sinuses in order to obtain full access; the bony deformities resulting are well known. The osteoplastic flap, while affording perfect access on both sides, retains the viable part of the anterior plate and prevents such deformity, the bony defect in this instance being limited to the area which had sequestrated before operation and being practically unnoticeable.

CASE III. *Bony expansion of the frontal sinus due to a mucocele of unknown ætiology.* The patient, a girl of 18, had had a swelling of her

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forehead just to the left of the midline and extending down to the left side of the nose since she was 6 years of age (Fig. 7). There was a vague



FIG. 7.

CASE III. Pre-operative photograph of the bony expansion involving the frontal sinuses and the root of the nose.

history of a fall and bruising over this area when she was 18 months old. The swelling had not visibly increased in size in the past few years and had never caused pain or headache, her only complaint being of the



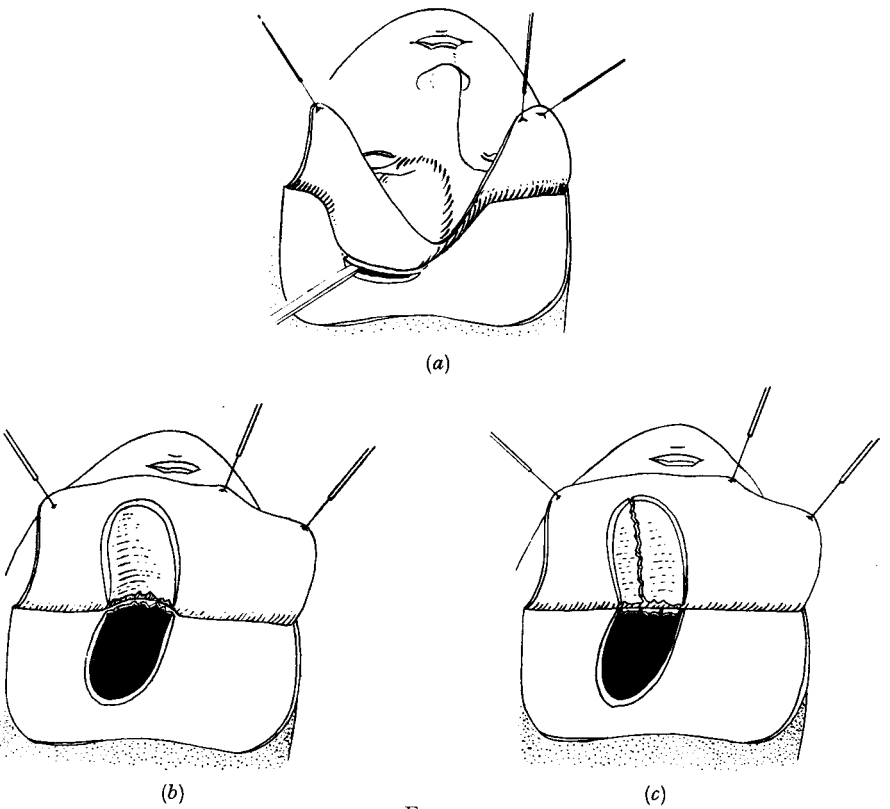
FIG. 8.

CASE III. The appearance two months after operation. There is still a slight residual bony swelling on the left side of the bridge of the nose which could not be reached from above. The main deformity is fully corrected.

deformity. X-ray revealed that the frontal sinus was expanded outwards and downwards, but there was no opacity and a provisional diagnosis of mucocele was made.

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Operation was performed on September 8th, 1953. On opening the sinus some clear glairy fluid escaped confirming the diagnosis of mucocele. Only the protruding part of the anterior plate was included in the osteoplastic flap and this fractured cleanly just above the supra-orbital ridge. A very large cavity was revealed which appeared to include the frontal sinus on each side and the ethmoidal sinuses on the left. A direct opening



(*a*) (*b*) (*c*)

FIG. 9.

Schematic drawings of the operative stages in Case III. (*a*) The scalp flap has been dissected downwards and the protuberant part of the anterior plate is being cut around with an osteotome. (*b*) The osteoplastic flap has been fully turned down. (*c*) The anterior plate has been cracked along the zone of maximum curvature and the supra-orbital ridge divided and in-fractured.

into the nose was located in a position well posterior to the normal site of the left fronto-nasal duct. The mucosa was carefully removed leaving as usual a cuff around the nasal opening.

In order to correct the bony deformity, the reflected part of the anterior plate was cracked vertically along the zone of maximum curvature. This was accomplished with the aid of two sequestrum forceps.

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The excess bone around the margin was then nibbled off and the edge bevelled so that it lay snugly in place. Four vertical cuts with a small osteotome were made through the expanded orbital ridge, one on each side where the protuberance began and two more centrally. Each cut passed downwards to the tip of the swelling on the left side of the nose. This had the effect of converting the protuberant area into three triangular bony plates each still attached to the overlying skin and subcutaneous tissue. These were then pushed inwards and after removing some excess of bone at the margins with nibbling forceps, they were moulded into position (Fig. 9). The osteoplastic flap was finally replaced.

When the wound had been closed and drainage provided a P.O.P. slab was carefully moulded over the forehead and nose and was retained in position for two weeks. A small hæmatoma was evacuated from the left side of the flap one week after operation. The blood had collected between the area covered by the plaster slab and the lateral incision. Otherwise healing was uneventful. Fig. 8 shows the appearance two months after operation. The pathological report on the excised mucosa was "œdematous chronically inflamed mucosa consistent with frontal mucocele" (Dr. J. Cooper).

Comment. The operation was undertaken in this case partly to explore the sinus but mainly in order to correct the deformity. The only other possible procedure would have been complete removal of the protuberant bone and a bone graft or inert plate as replacement. The comparative simplicity of the operation described is obvious.

Discussion

The three cases illustrate some of the possibilities of the approach and we feel that it is indicated whenever wide exposure of one or both sinuses is required. It is an extensive procedure only in so far as the scalp incision is long, the initial bleeding profuse and the final stitching laborious. At the same time the scar is hidden by the hair and both sensory and motor nerve supply to the forehead is preserved. Our main concern was that some infection and sequestration might develop in the traumatized anterior plate as a late complication, but this has not occurred (Case I and the first published case have now been observed for over two years). Indeed, we have been impressed on each occasion by the vascularity of this plate, capillary oozing from the mucous surface continuing throughout the operation.

In the first case reported (Gibson and Walker, 1951), it was found on replacing the plate that it tended to prolapse into the cavity of the sinus and a few catgut sutures through the pericranium were used to retain it in position. This tendency has been avoided in subsequent cases by cutting the margins of the plate in a bevelled fashion so that the edges overlap when the flap is replaced.

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In view of the development of a hæmatoma in Case III in the area between the margin of the P.O.P. slab and the incision, we would recommend that the slab should be so cut that it will cover the whole flap as exactly as possible.

Summary

1. A brief description of the osteoplastic flap approach to the frontal sinus is given.

2. Three further cases on whom the approach has been used are reported.

3. The wide exposure gained, and the absence of post-operative scarring and deformity which result are shown.

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