



Frontal sinus cancer resection and reconstruction

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DECLARATIONS

Competing interests

None declared

Funding

None

Ethical approval

Written informed consent to publication has been obtained from the patient or next of kin

Guarantor

GSM

Contributorship

GSM compiled and wrote the case report; NGI assisted in the operation and wrote the operative notes; JS was the head and neck surgeon involved in the operation

Acknowledgements

None

Reviewer

Jaiganesh Manickavasagam

Frontal sinus cancer provides challenging management issues and reconstruction is equally as difficult as resection in these cancers.

Case report

This 36-year-old man presented with a three-month history of headaches which he attributed to sinusitis. He took several courses of antibiotics which did not relieve his symptoms. He began to gradually develop fullness and a lump in the midline of his forehead over the frontal sinus region. Sinus plain radiographs demonstrated ‘sinusitis’ for which he was referred to an otolaryngologist who arranged a paranasal sinus CT scan. This scan demonstrated a bone destructive lesion of the frontal sinus. A further MRI scan confirmed the presence of a frontal sinus tumour without intracranial extension or extension into the ethmoid bone. The tumour was limited to the lower two-thirds and anterior wall of the frontal sinus with obstructive changes in the superior part of the right frontal sinus. Fine needle aspiration biopsy of the lesion revealed a squamous cell carcinoma. He was otherwise fit and well barring mild hyperlipidemia. He has no family history of sinus cancer and did not take any medications. He did not smoke but drank alcohol two to three times a week.

On examination there was a poorly-defined smooth swelling approximately 4 cm in width on the forehead in the midline just about the eyebrows. There was normal skin sensation on the forehead bilaterally and no cranial nerve abnormalities. No other palpable masses were present in

the head and neck. Otolaryngological examination was normal. There were no other abnormalities detected on general examination. The diagnosis of primary squamous cell carcinoma of the frontal sinus was discussed with the patient along with the possible treatment options. It was agreed that the optimal treatment option would be surgical resection of the primary tumor followed by postoperative radiochemotherapy.

It was agreed with the patient that the optimal treatment option would be surgical resection of the primary tumour followed by postoperative radiochemotherapy. The procedure was done conjointly between the head and neck and neurosurgery teams. This case offered a surgically challenging frontal craniotomy with resection of the frontal sinus and reconstruction of the frontal bone.

The initial access and exposure was attained via a bicoronal incision was fashioned taking care to spare pericranium. Pericranium was dissected posteriorly and then retracted anteriorly with the flap. The tumour extended proximally 6 cm from nasion and the anterior scalp flaps were raised up to the level of the supraorbital ridge. The galeal pericranial were left on the tumour, which was dissected down just inferior to the nasion on the nasal bridge. The flap overlying the tumour was raised superficial to the galea whereas at all other points, the flaps were raised deep to the pericranium. Having opened this two fish hook retractors were laced and the resection stage of the operation could be begun.

The area to be excised was marked out using 1:1 scalp films that were previously obtained. The craniectomy was started using a Mida-Rex saw

around the frontal sinus where the resection was marked out. This began at the top of the frontal sinus overlying the frontal bone to ensure a wide margin around the tumour and was brought down until the supraorbital region. The tumour was circumferentially drilled in the frontal sinus taking care not to enter the tumour with the M8 bur on Midas-Rex drill. This was drilled into the frontal sinus bilaterally and the posterior wall frontal sinus was likewise taken with M8 bur on Midas-Rex drill.

Dura was identified and was dissected from superior to inferior down to the base of skull. A small dural tear was encountered, which was sewn with 4-U Surgilon stitched in a water-tight fashion. These bone cuts were then extended over the supraorbital region and the glabella and towards the nasal bone. This was done on both sides. On the left side, the bone cuts were made further inferiorly to include the supraorbital ridge and in the process, the Periorbital fat was exposed and the globe retracted downwards to prevent any injury. All this was done using a 2-mm burr. We then switched to a power saw to cut through the nasal bone in midline.

Once this was done, an osteotome was used to carefully chisel out the bone cuts and the entire specimen was removed en bloc and sent for routine histological examination. We then subsequently excised the frontal sinus mucosa on either side and sent that for routine histological examination as well as the mucosa of the nasofrontal ducts on either side. Once this was done, several small dural tears that were noted were repaired primarily using Nurolon, and the final reconstruction stage of the operation began.

A bone flap was subsequently harvested from the right parietal region and fashioned into shape to fit into the frontal sinus defect. A galeal pericranial flap was raised/harvested from the scalp flap and this was divided in midline to get two long strips, the left side was sutured down to the sinus mucosa to completely separate the nasal cavity from the bone flap itself. This was sutured all around the sinus mucosa circumferentially using 4-0 Surgilon stitches and at points required drill holes to be drilled into the frontal sinus bone and this was sutured in place.

The bone plate, a 6 × 5 cm graft, was taken from the right side calvarium taking care to stay off the midline and anterior to the motor strip. This was

taken using a craniotome followed by the B1 bit on Midas-Rex drill. This was contoured to fit the defect in the frontal sinus and was placed using the Neuroprobe miniplate system. The right leaf of the galeal and pericranial flap was then laid over the bone flap and sutured in place as well.

Porex graft was also cut 6 × 5 cm and contoured to fit the defect where the skull had been resected for donor graft harvest. The wound was copiously irrigated with saline and bacitracin. A Relia-Vac drain was laced in the epidural space and exited through separate stab wound. The wound was closed in layers and the galea was closed with inverted 2-0 Vicryl and staples were used for skin. Xeroform and clean dry dressing were applied. The patient tolerated the procedure well. In the post-anaesthetic care unit, the patient had no neurological deficit and was easily arousable.

Discussion

Squamous cell carcinoma of the frontal sinus was first published in 1907 by Prawssud¹ and is a very rare type of cancer. Nasal cavity and paranasal sinus cancer has an incidence of less than 1 per 100,000 persons per year,² the frontal sinus being involved in less than 0.3% of these cases.^{3,4} Histologically, squamous cell carcinoma is the most common cause of these tumours, making up more than 40% of cases with adenocarcinoma responsible for around 13–19% of cases.^{3,5,6} These cancers tend to present most commonly between 50–70 years of age.⁵ Men are affected significantly more than women.^{2,7} Since nasal obstruction, facial swelling and facial pain are the most common presenting symptoms in these patients, the initial diagnosis of sinusitis is often mistakenly made.⁵

Surgery alone is better than radiotherapy alone.⁵ However an association of surgery and radiation therapy remains the best treatment modality.⁸ There has been discussion regarding the benefits of exclusively endoscopic resection of sinonasal cancers without craniotomy. Early benefits on patient survival with exclusive endoscopic surgery⁹ have not been as convincingly emulated.¹⁰ No significant difference in disease recurrence and patient survival has been shown between these two approaches.¹⁰ The cancer in

this case was not susceptible for endoscopic approach due to sheer size and inability to endoscopically localize the skull base defect.¹¹

The rarity, late presentation and tendency for internal invasion in these tumours present unique difficulties for the surgeon and often demand radical and novel operative approaches as demonstrated in this case. By virtue of the rarity and varied presentation of this condition there is little literature or standard operative guidance in this field. This case report demonstrates one operative approach which can be adopted in light of future cases.

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