



Microsurgical Reconstruction Following Resection of Frontal Sinus Carcinoma: A Case Report

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Abstract

Primary carcinoma originating from the frontal sinus is exceptionally rare, in this anatomical region, the manifestation of mucoepidermoid carcinoma is infrequently, representing 0.1% of primary malignant neoplasms. The tumor and its association with the neighboring dura and periorbita are accurately depicted through a combination of CT and MR imaging. When surgical resection is the treatment of choice, it will leave a significant defect in the skull to be reconstructed. We report a case of a microsurgical reconstruction following resection of frontal sinus mucoepidermoid carcinoma using anterolateral thigh free flap.

Keywords: Frontal sinus; Microsurgical reconstruction; Mucoepidermoid carcinoma

Introduction

Malignancies affecting the nose and paranasal sinuses are infrequent, constituting around 3% of all head and neck cancers. The estimated annual incidence is less than 1 per 100,000. Primary carcinoma originating from the frontal sinus is exceptionally rare, representing about 0.3% of all paranasal sinus malignancies [1]. In particular, Mucoepidermoid Carcinoma (MEC) is believed to originate from the minor mucoserous glands located within the mucosa, beneath the respiratory-type epithelium of the nasal cavity and paranasal sinuses. In this anatomical region, the manifestation of MEC is infrequently, representing 0.1% of primary malignant neoplasms [2].

Patients frequently experience symptoms such as frontal headache and swelling, orbital disruptions, nosebleeds, and nasal discharge. The tumor and its association with the neighboring dura and periorbita are accurately depicted through a combination of CT and MR imaging [3].

When surgical resection is the treatment of choice, it will leave a significant defect in the skull to be reconstructed. The defects in the frontal sinus represent special challenges, particularly when complicated by cerebrospinal fluid leakage [4].

Large defects of the anterior wall of the frontal sinus require closure using either autologous or alloplastic material [5]. Many different techniques for closing such defects are available. Small to medium-sized defects are typically addressed with the rotation of local flaps, while larger defects need the use of free flaps. The options for bone reconstruction vary and may involve a split calvarial bone graft or the application of miniplates and wire mesh [3].

We report a case of a microsurgical reconstruction following resection of frontal sinus mucoepidermoid carcinoma.

Case Presentation

A 68-year-old man presented with a 3-month history of swelling of the forehead, and occasional frontal and orbital pain. He did not report diplopia, decreased vision or epistaxis. The patient underwent a previous endoscopic approach for the resection of the tumor including left turbinectomy. The histopathological diagnosis of MEC was established. Upon examination, a diffuse, ill-defined, firm, non-pulsatile swelling measuring 4 cm × 3 cm was observed in the forehead, more pronounced in the left side. The swelling encompassed the supraorbital margin and the region medial to the medial canthus. Computed Tomography (CT) imaging unveiled an irregular, contrast-enhancing soft tissue mass affecting the left frontal sinus. Noteworthy observations included erosion of both the anterior and posterior walls of the frontal sinus, extending to the subcutaneous tissues and extradural intracranial cavity, resulting in posterior displacement of the brain. Additionally, erosion

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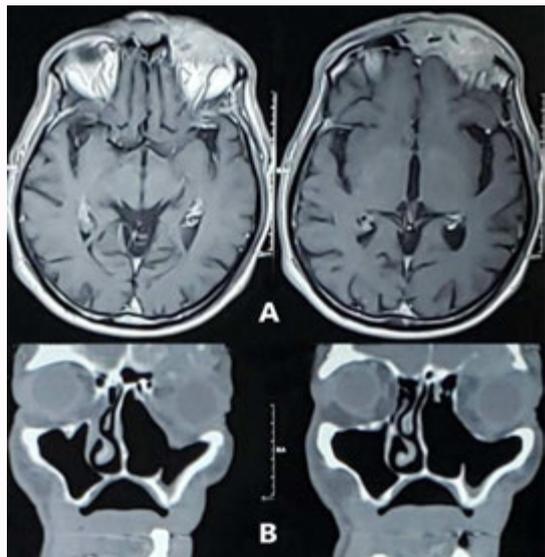


Figure 1: Computed tomography of the skull (A) and sinuses (B).



Figure 2: Frontal craniotomy.



Figure 3: The reconstruction of the dura mater using a dural regeneration matrix.



Figure 4: The reconstruction of the bone with a titanium mesh.



Figure 5: Microvascularized anterolateral thigh free flap.



Figure 6: Immediate post operative.

of the upper segment of the orbital wall was identified (Figure 1). A frontal craniotomy was performed with the objective of excising the tumor. An incision was made in the specified region, and the tumor

was extracted en bloc, along with the skin, anterior and posterior walls of the frontal sinus, dura mater, and the left eye, which had been affected by the tumor (Figure 2). Tumor tissue was sent for pathological analysis confirming MEC. The reconstruction of the dura mater was performed using a dural regeneration matrix (Duragen) (Figure 3) and reinforced with a fascia lata graft. A titanium mesh was employed for the reconstruction of the bone table (Figure 4), while a microvascularized anterolateral thigh free flap was employed for the reconstruction of soft tissue and facial volume (Figure 5). The lateral descending branch of the circumflex femoral artery and one of the accompanying veins were anastomosed to the superficial temporal artery and vein, respectively, using 8.0 nylon. The postoperative



Figure 7: The patient 60 days after surgery.

course was uneventful without leakage of cerebrospinal fluid (Figure 6). Minimal pain in the frontal area was treated with non-steroidal anti-inflammatory drugs. The patient was discharged after 10 days of prophylactic antibiotic treatment. He underwent radiotherapy (50 cGy). Figure 7 shows the patient 60 days after surgery. He died due to a massive brain invasion caused to tumor recurrence after one year.

Discussion

The prognosis of frontal sinus carcinoma is very poor. Six cases who underwent surgical intervention and adjuvant radiation therapy were reported. The recurrence was rapid, and the average survival period was 14 months [6]. The poor prognosis can be ascribed to the tumor's advanced stage upon presentation, the intricate anatomy of the region making radical resection technically challenging, and the hesitancy among surgeons and oncologists to pursue aggressive treatment, given the potential for significant cosmetic sequelae.

CT and MRI play a crucial role in assessing the extent of tumors and the involvement of orbital and intracranial structures. In this case, CT scan conclusively confirmed the extension into deep orbit and dura mater.

Limited information is available regarding the reconstruction of the frontal sinus. Existing literature primarily consists of case reports or small series that introduce novel materials and techniques in this particular domain.

Current techniques for skull reconstruction involve the utilization of alloplastic and autologous materials [7]. Some authors employ calvarial grafts in this process [8]. The utilization of a pericranial flap and titanium mesh to achieve both restoration of frontal contour and preservation of the frontal sinus following resection of the anterior table of the frontal sinus was outlined [9]. The use of bilateral temporal myofascial flaps for the reconstruction of frontal sinus defects was described [10]. Additionally, a customized titanium prosthesis was employed for the reconstruction of the anterior wall of the frontal sinus [11].

An intriguing algorithm for anterior skull base reconstruction was described following oncological resections. This encompassed various reconstruction techniques, such as temporalis fascia, double-

layer fascia lata graft, split calvarial bone graft, posterior frontal sinus wall, three-dimensional titanium mesh, temporalis muscle flap, and rectus abdominis free flap [12].

There is limited information in the current literature regarding the application of microvascularized flaps for the reconstruction of cranial components [13,14]. Furthermore, there is a scarcity of literature specifically addressing frontal sinus reconstruction [15].

Conclusion

The anterolateral thigh free flap should be considered an effective option for frontal sinus reconstruction, especially when skin resection is required along with tumor removal.

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