Frontal sinus osteomyelitis with midline fistula

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Abstract

Chronic osteomyelitis of frontal sinus is a rare complication of recurrent sinusitis. The pent-up secretions in the sinus may result in pressure necrosis of the containing wall of frontal sinus resulting in persistently discharging fistula. Here we present a case of chronic osteomyelitis of frontal sinus with persistent midline fistula over forehead in a 30 year old male managed surgically by osteoplastic flap procedure and frontal sinus obliteration with abdominal fat.

Keywords Osteomyelitis · Frontal sinus · Osteoplastic flap procedure · Frontal sinus obliteration

Introduction

Developing secondary to recurrent frontal sinusitis, frontal sinus osteomyelitis is a rare entity, with very few cases reported in post antibiotic era [1]. It can occur as a result of spread of sinusitis of frontal bone. The pent up secretion can erode the containing walls of the sinus resulting in persistently draining fistula. It can also result from the trauma to the pre frontal region of the skull and surrounding soft tissue [1,2]. Here we present a case of chronic osteomyelitis of frontal sinus with a persistent midline fistula over the forehead in a 30 year old male managed surgically by osteoplastic flap procedure and frontal sinus obliteration with abdominal fat.

Case report

The male 30-year-old presented to the Otolaryngology outdoor with a history of chronic headache for the last 5 years and recurrent foul smelling discharge from a fistula over the

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Fig. 1 Clinical photograph of the patient showing mucopurulent discharge coming out from the sinus.

Fig. 2 X-ray PNS OM view showing grossly enlarged left frontal sinus with radiodense shadow in cavity.

Fig. 3 CT scan nose and PNS coronal section showing grossly enlarged left frontal sinus with haziness of the cavity and erosion of inner table. Right frontal sinus is normal.

Fig. 4 CT scan of nose and PNS coronal section showing grossly enlarged hazy left frontal sinus with dehiscence of inner table. Right frontal sinus is normal.

Fig. 5 Peroperative photograph showing sequestrum in the left frontal sinus.

forehead for the last 1 year which exaggerated by stooping forward especially towards evening. He also complained of intermittent mucoid discharge with nasal obstruction more on left nostril. There was history of 3–4 episodes of pain, redness and swelling in the region of frontal sinus before the appearance of fistula. There was no history of trauma or any operative intervention to the forehead.

On examination, a sinus was seen present in the midline over the forehead. On asking the patient to stoop forward, active purulent discharge was seen coming out of the sinus (Fig. 1). On palpation, the skin around the sinus was indurated, non-tender and adherent to the underlying tissue. On anterior rhinoscopy, no significant finding was present except mildly deviated septum. Nasal endoscope could not be negotiated into the region of frontal recess due to deviation of septum.

The patient was admitted and subjected to routine investigations along with X-ray PNS OM view, A Caldwell view from 6 feet distance and CT scan of nose and paranasal sinuses. The goal of the Caldwell view was to obtain an x-ray image that depicts the frontal sinuses in exact dimensions to the patient. This film was sterilized and used as a template to mark the exact location of the frontal sinuses intraoperatively when the frontal bone was exposed. The film assists in designing a precise osteoplastic flap. X-ray PNS OM view showed grossly enlarged left frontal sinus with a radiodense shadow in the cavity, right frontal sinus was found to be normal (Fig. 2). CT scan of nose and paranasal sinuses revealed a grossly enlarged left frontal sinus with evidence of erosion of inner table and normal right frontal sinus (Fig. 3,4).

A provisional diagnosis of chronic frontal sinus osteomyelitis with midline draining fistula was made. A decision

to undertake osteoplastic flap procedure and frontal sinus obliteration with abdominal fat was taken. The patient was treated with para-antibiotics for 2 weeks to control the active disease.

Operative procedure

The head of the patient was completely shaved on the day of the operation. The operation was carried out under general anesthesia with orotracheal intubation. The patient was kept in a reverse trendelenberg position with 15° head elevation. A bicoronal incision was given above the hairline. The skin was elevated upto the supraorbital rim, in the midline and laterally upto the root of the helix, leaving periosteum on the bone. The sterilized template of frontal sinus was placed and the margin of the frontal sinus was outlined using supraorbital rim as the landmark. The periosteum is divided 1 cm outside the area of the template and reflected towards the osteoplastic flap for eventual use when the flap was returned to its anatomical position. A fissure burr was used to make a beveled cut on the frontal bone from lateral to medial as the outer table of frontal sinus is lifted, taking care that the frontal sinus is entered. The intrasinus septum was fractured using a gouge after the bone flap is separated from the orbital rim on either side. The bone is pried away from the skull fracturing the base at the level of supraorbital rim, creating a hinge like viable bone flap attached to the skull by the periosteum. The frontal sinus was seen filled with purulent discharge, which on removal revealed a sequestrum (Fig. 5). The sequestrum was taken out. The inner table of frontal sinus was eroded in the upper part with extensive granulation tissue over the dural surface. The lining mucosa of the sinus was thoroughly curetted and

the granulation tissue over the dura along with the sinus tract was meticulously removed by drilling with a diamond bur. The dura was found to be intact with no obvious CSF leak. An abdominal incision analogous to McBurney's incision was made in the left pelvic region. Fat was harvested from the area and was used for complete obliteration of frontal sinus. The area of opening of fronto-nasal duct was obliterated by stripping the lining mucosa and fat. The abdominal incision was closed with interrupted mattress sutures after placing a drain. The osteoplastic flap was reposed back in position. The wound was closed in layers, no drain was given. The skin incision was closed with interrupted mattress sutures and a pressure bandage was applied and the patient was kept in semi-fowler position post-operatively. The post-operative recovery was uneventful.

Discussion

Commonly seen as a complication of recurrent frontal sinusitis, frontal sinus osteomyelitis is a rare entity, with very few cases reported in post antibiotic era [1] It can occur as a result of spread of sinusitis of frontal bone. The pent up secretion can erode the containing walls of the sinus resulting in persistently draining fistula. There was positive history suggesting development of acute sinusitis of fronto-ethmoidal region and probably pott's puffy tumor, preceding the development of fistula in our case. Although the condition can also result from the trauma to the prefrontal region of the skull and surrounding soft tissue, no such history was elucidated.

The frontal sinus drains into the nose via the fronto-nasal duct, which runs a tortuous course along the ethmoid labyrinth. This duct is susceptible to blockage by various anatomical and pathological variations which give rise to various complications secondary to recurrent sinusitis [2].

The clinical presentation of a patient with frontal sinus osteomyelitis varies from recurrent headache, nasal obstruction to severe illness including alteration of consciousness and severe neurological deficit [2]. The patient in our case presented with usual symptoms of chronic headache, rhinorrhea and nasal obstruction with a very unusual and rare complication of chronically discharging fistula over the forehead. The usual sites of fistula reported till date is limited to the floor and posterior wall of frontal sinus. But the presence of fistula over the exceptionally thick anterior wall is indeed a rare occurrence [1].

As the mucosal venous drainage of the frontal sinus is through the Diploic vein of Breschet's, which communicates with the dural venous plexus, septic thrombi can potentially evolve from the foci within the frontal sinus and propagate through this venous system leading to intracranial involvement with or without direct erosion of frontal sinus which explains the presentations where frontal sinus osteomyelitis is associated with intracranial complications [2].

The features of intracranial involvement was conspicuously absent in our case in spite of presence of gross granulation over the exposed dura under the posterior table of sinus.

Radiological evaluation include conventional radiography and CT scan. The sensitivity of conventional plain films was not considered very high. The views commonly employed are Occipito-mental view and Caldwell view from 6 feet distance. The goal of Caldwell view is to obtain an X-ray image that depicts the frontal sinuses in exact dimensions to the patient. The advent of CT scan has improved the diagnosis tremendously. The use of high-resolution, 1.5-mm thin-cut CT scanning provides improved diagnostic power for assessing the extent of pathology in the frontal sinus and intracranial sequel of the disease [1, 3].

Treatment of the condition commences with the control of acute infection if any with 6-8 week course of appropriate antibiotics, surgical intervention remains the cornerstone of the management [1, 2].

The surgical techniques for dealing with frontal sinus pathology dates back to 1898 when Reidel first undertook the first ablative frontal sinus surgery. He described total exenteration of the sinus by removing the anterior table and floor of the sinus, allowing the skin to overlay the posterior table. This technique created an obvious marked cosmetic defect. In 1951, Bergara and Itoiz devised the osteoplastic flap procedure. They described exposure of the sinus by removing the anterior table, but unlike Reidel, it was left hinged to an inferiorly based pedicle of pericranium. The flap was replaced at the end of the procedure. This technique resulted in a marked improvement in the overall aesthetic result [3, 4].

In the late 1950s and 1960s, Goodale and Montgomery first described the ablative frontal sinus procedures that are the basis for current surgical oblitative management of frontal sinus fractures. They took the osteoplastic flap procedure step further, describing methods of ablating the frontal sinus by grossly removing all sinus mucosa and packing it with autogenous fat, essentially eliminating the sinus as a functional unit [3, 4, 5].

The technique commonly employed these days is based upon the method described by Bergara and Itoiz osteoplastic flap procedure and Goodale and Montgomery ablative frontal sinus technique [4, 5, 6].

The frontal sinus may be approached in a multitude of ways. The anterior frontal bone can be exposed through either a brow (gull-wing) incision or with a bicoronal incision placed above the hairline. The principal disadvantage of gull-wing incision is the need to divide the supraorbital nerve, which result in troublesome paresthesia and numbness of the forehead postoperatively. The bicoronal incision offers better exposure of the frontal sinus and more easily permits the use of osteoplastic flaps and grafting materials for sinus obliteration with the benefit of completely hidden scar except in cases with male pattern baldness [4, 5].

Multiple materials, both autogenous and alloplastic, have been described for frontal sinus obliteration.

Autogenous materials that have been used include fat, bone, muscle, and fascia. Alloplastic materials include Proplast, acrylic resin, Gelfoam, and methyl methacrylate. Overall, autogenous materials appear to be more successful than alloplastic materials in achieving obliteration and preventing long-term complications [4, 5, 6].

Certain technical principles must be followed to ensure appropriate obliteration of the sinus and prevention of long-term sequel. First, completely removal all sinus mucosa. To this end, the use of surgical loupes and microscopes has been recommended. Second, removal of all inner cortex bone from the sinus. Mucosa in the human frontal sinus is able to invaginate into pits of inner cortex bone. Failure to remove mucosa from these pits can possibly lead to entrapment and late formation of mucocoeles. Third, occlusion of the nasofrontal duct except in cases with suspected CSF leak. Fourth, selection of appropriate ablative material [4, 5, 6].

Conclusion

Frontal sinus osteomyelitis is a very rare entity in the post antibiotic era. Presence of a discharging fistula is a very

uncommon association. The osteoplastic flap procedure with frontal sinus obliteration although a primitive technique, it still remains the cornerstone for surgical management of frontal sinus osteomyelitis with excellent cosmetic results.

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