CASE REPORT

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Challenging Craniotomy of Large Frontal Sinus Mucocele With Intracranial Extension

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ABSTRACT

A 45-year-old man presented with a swollen left eye for two years, and it has been worsening in the last few months. A gradual decrease in vision in the right eye accompanies this complaint. The head CT scan examination showed a hyperdense mass (51 HU), extra-axial, thick-walled, well-defined, regular edges, and non-calcified, which increased particularly on the left frontal and pressing on the left lateral ventricle. A craniotomy was performed for mucocele evacuation. This case highlights the urgency of early detection before the erosion of the surrounding bone and intracranial invasion. Early craniotomy surgery is advantageous and is still challenging for this case.

Keywords: Case report; frontal sinus mucocele; surgery

Introduction

Langenback first introduced paranasal sinus mucocele in 1820 under the name hydatids. Then in 1090, Rollet replaced the name with mucocele. Paranasal sinus mucocele is an accumulation of mucoid secretions and desquamation of the epithelium in the sinuses with distension of their walls.(1) A mucocele is a cyst that expands the surrounding wall. However, a mucocele is more characterized as a space-occupying lesion which causes bone erosion and displacement of the surrounding structures. The location of the mucocele adjacent to the brain causes morbidity and risk of death if left untreated. The frontal sinuses are more frequently affected, whereas the sphenoid, ethmoid, and maxillary mucocele are rarely found. The aetiology of a mucocele is multifactorial and can be caused by inflammation, allergies, trauma, anatomic abnormalities, previous surgical history, fibrous dysplasia, osteoma and ossifying fibroma. Obstruction of the ostium preventing sinus drainage is a common finding. The paranasal sinuses are closely related to the orbital area and the brain. This nature location 2 of the paranasal sinus mucocele can rapidly spread intraorbital and intracranially.(1-6) The diagnosis of a mucocele is based on clinical investigations supported by Computed Tomography (CT) Scan and Magnetic resonance (MR) imaging. CT is often used to determine the location of the mucocele anatomically and investigate the extent of the lesion in the surrounding area, particularly in the intracranial and the cranium. The primary treatment for mucoceles is surgery, which can be used endoscopically, craniotomy to craniofacial. Because surgical tools have developed and the pathophysiology of mucoceles is increasingly understood, the management of mucocele surgery is minimally invasive. (2-5,7)

Case Report

A man aged 45 years was presented to the neurosurgery outpatient clinic with the chief complaint of a swollen left eye. Complaints have been felt since 2017 but the complaints have become increasingly burdensome in the last six months. Complaints are also accompanied by visual function in the left eye, which is felt to decrease gradually. There were no complaints of fever, nausea, vomiting, seizures or loss of consciousness. There was no history of the same illness in the family. The patient had no history of

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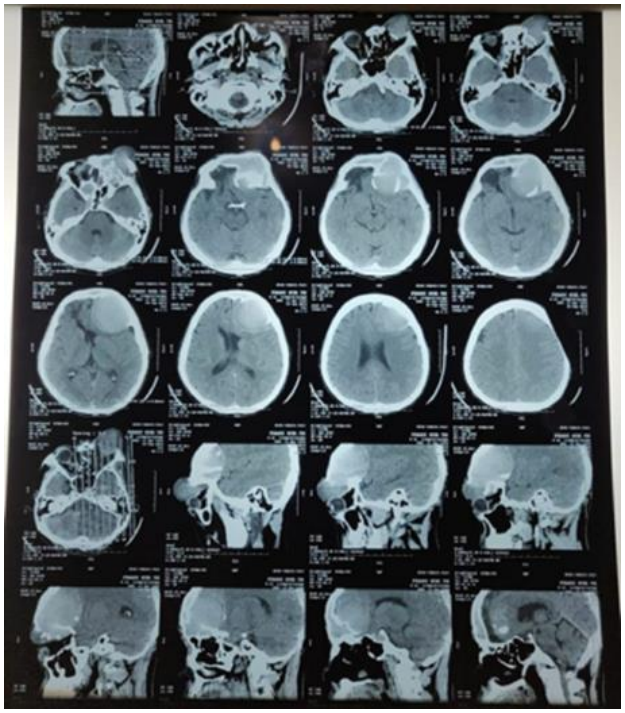

Fig. 1. The results of a head CT scan with contrast in the patient showed a left frontal sinus mucocele

diabetes mellitus, hypertension, or previous history of trauma. A general physical examination of the patient found that the general condition was good, conscious, and with normal vital signs. On neurological examination, there was decreased vision in the left eye (visual acuity 1/300). There were no other neurological deficits. Laboratory tests showed that the results of a complete blood count, random blood glucose, kidney function, liver function, and serum electrolytes were within normal limits. The results of a CT scan of the head with contrast (Figure 1) showed a hyperdense mass (51 HU), extra-axial, thick-walled, well-defined, regular edges, non-calcified, particularly on the left frontal with a size of +/- 5.0 x 5.5 cm x 9.0 cm. This lesion is accompanied by a 3 characteristic buckling grey matter in the left frontotemporal region which erodes the left frontal bone, pressing the left lateral ventricle and causing a midline shift to the right as far as +/- 0.9 cm. A mass was also seen pushing the ocular anteriorly, although both the ocular bulb and the scanned retrobulbar structure were within normal limits. In addition, the gyrus sulcus also experienced obliteration. The patient was finally diagnosed with a left frontal sinus mucocele and planned an elective craniotomy to evacuate the mucocele.

The initial clinical conditions and the stage of the operation performed can be seen in Figure 2. At first, the patient lay supine under the influence of

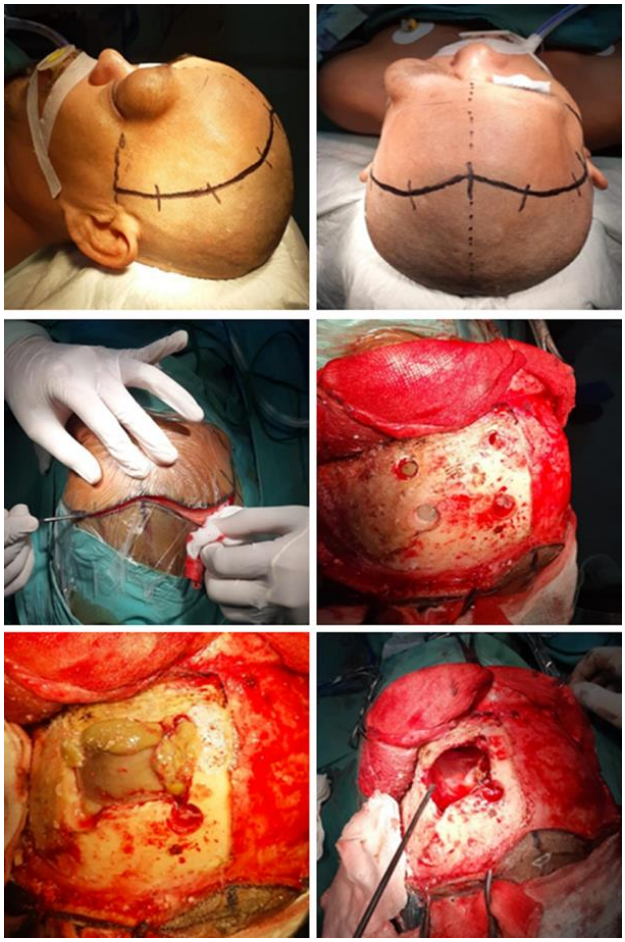

Fig. 2. The initial clinical photograph of the patient and the stages of the mucocele evacuation craniotomy surgery

general anaesthesia. Disinfection and draping procedures were then performed in the frontal region bilaterally. 4 Then a bicoronal incision is made and deepened to the pericranium and the flap anteriorly. Four boreholes were performed and followed by a craniectomy procedure using a craniotomy. The cranium bone was then removed until a yellowish-green mucocele appeared with a soft, supple consistency. The mucocele was then excised, and the sample was sent to the laboratory for histopathological and microbial culture examination. The cranialization and obliteration were then performed to close the defect in the frontal sinus using the temporalis muscle. After the surgical wound is cleaned, the wound is closed, leaving one drain. The histopathological examination showed necrotic tissue accompanied by calcification and lamellar keratin masses, which support the diagnosis of mucocele.

Discussion

A mucocele is an accumulation of mucus in an epithelial sac on the sinus wall. This condition

leads to sinus obstruction, which may injure the surrounding bone walls. Mucocele is a slow-growing benign tumour that is often frontal and ethmoidal and rarely found intranasally.(1-4) The sac may be filled with a mixture of pus from chronic infection and is known as chronic pyococele. Mucocele originates from obstruction of the sinus ostium caused by infection, fibrosis, inflammation, trauma, surgery, or obstruction due to a tumour such as an osteoma.(1-5) The histological image reveals infection of the frontal sinus cavity and blockage of the frontal recess, which results in lymphocyte and monocyte stimulation that causes cytokine and fibroblast reactions. These cytokines promote destruction of bone by increasing reabsorption and remodeling due to expansion of the mucocele. Examination of fibroblasts in the frontoethmoidal mucocele showed a significant increase in prostaglandin E2 and collagenase compared to fibroblasts in the frontal sinus. Increased prostaglandin E2 was discovered to have a significant role in the osteolytic process in the mucocele and to explain the aggressiveness of the mucocele's expansion in the study. (1, 2, 4, 8) The frontal sinus accounts for 60-89% of cases, the ethmoidal sinus for 8-30%, and the maxillary sinus for less than 5%. In the sphenoid sinus is very rare. Mucoceles can occur at any age, but are usually found at the age of 40-60 years. In terms of gender, the frequency between men and women is the same. On examination of the culture of the mucocele sometimes found an infection, in one study the most bacteria found were Staphylococcus aureus, alpha-hemolytic Streptococci, Haemophilus species, and gram-negative bacilli. In anaerobic bacteria, the most common are Propionibacterium acnes, Peptostreptococcus, Prevotella, and Fusobacterium species.(1-3) 6 The clinical presentation of mucoceles varies greatly depending on the anatomic location of the mucocele. Symptoms that appear are usually sudden. Frontal headaches, facial asymmetry, edema, and ophthalmological symptoms like vision abnormalities, decreased ocular movement, and even proptosis are common complaints among patients with frontoethmoidal mucocele. A mucocele might appear clinically without any symptoms or with severe headache and vision problems. The most often reported symptoms are proptosis (83%), followed by diplopia (45%).(2, 5, 8-10) In patients, the symptoms that appear are proptosis in the left eye, which is slowly getting bigger, accompanied by a gradual decrease in vision. On physical examination, there was periorbital tenderness, oedema, ecchymosis, decreased vision, and limited ocular movement. Meningitis and CSF fistulas may result from an intracranial invasion of the posterior region of the frontal sinus. In the presence of an infection, the posterior sinus will erode and worsen. The presence of the direction of proptosis can determine the lesion. Masses at the orbital apex cause anterior proptosis, and frontoethmoidal lesions cause proptosis.(2, 5, 6, 8-10) On physical examination, there was proptosis in the left eye, which was felt slowly, and tenderness in the left frontal, especially the supraorbital. The history, physical examination, and radiological findings were used to make the diagnosis of a mucocele. A CT scan must meet three requirements to identify a mucocele: characteristic features include a homogeneous isodenum mass with well defined borders, osteolysis surrounding the mass, and erosion of the sinus wall with sclerotic signs.(2-5, 7) In the patient, CT scan results showed a hyperdense mass (51 HU), extra-axial, thick-walled, well-defined, regular edges, non-calcified, especially on the left frontal with a size of +/- 5.0 x 5.5 cm x 9.0 cm with a buckling grey matter appears in the left frontotemporal region which erodes the left frontal bone, pressing on the left lateral ventricle causing a midline shift to the right as far as +/- 0.9 cm. There is also a mass pressing the bulbus oculi anteriorly, which is 7 consistent with the mucocele description. The differential diagnosis may include dermoid cysts, histiocytosis, fungi, TB, fronto-orbital cholesterol granulomas, and uncommon neoplasms.(2-4, 9) The standard treatment for mucoceles is surgery. The goal is to drain the mucocele, restore sinus ventilation, and eradicate the mucocele while preventing morbidity. Surgery depends on the size, location and extent of the mucocele. Surgery should not be performed in cases of infection in mucoceles that infiltrate intracranial and intraorbital. In fronto-ethmoidal mucocele, surgery can be through (Lynch-Howarth frontoethoethmoidectomy) or osteoplastic flaps on the frontal mucocele by maintaining the frontal recess and giving good outcomes. (6,9,10) With the development of endoscopic surgery, this technique is more often used to maintain the function and shape of the sinus anatomy and not leave scars.(4, 6, 8) In cases where the intranasal endoscopic approach is difficult, external drainage can be considered, or a combination of external and endoscopic approaches. A combination of external and endoscopy is usually used in difficult cases such as difficult anatomic locations of mucoceles, expansion of mucoceles, and cases of fistulas in the sinuses.(3, 4, 9) Management of complicated

cases with intracranial extension can be done in various ways. Some neurosurgeons are inclined to open (craniotomy) and eradicate all cyst walls.(6) In a mucocele with intracranial expansion, action can be carried out through craniofacial and endoscopy. Mucocele tends to recur if eradication is not adequate. The current treatment standard is endoscopy, although in some cases of large mucoceles, an external approach (craniotomy) is necessary to enable a wide field of vision and drainage to prevent recurrence.(2, 3, 8,10) Conflict of interest: Nothing to declare 8 Ackowledgement: The authors would like to thank Farhamna Academic for assisting in the preparation of this manuscript. Thanks to neurosurgery department staff of the Hasanuddin University Medical Faculty who have assisted in providing treatment in this case report. Research Funding: This manuscript preparation received no specific grant from any funding agency in the public, commercial, or not for profit sectors.

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