Our Experience in Encountering Intraoperative Hurdles in Otorhinolaryngology in a Tertiary Care Center: A Case Series

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Received Date: 03/02/2023 Revised Date: 16/03/2023 Acceptance Date: 19/05/2023

Abstract

Background: Every surgery has a distinct set of risks that change based on a variety of variables. Otorhinolaryngology procedures present special challenges. In this study, three of these circumstances will be covered. The study's primary focus will be on the particulars of the events and how they were handled. **Materials and Methods:** The study was carried out on patients who underwent surgery in the Department of Otorhinolaryngology at Chettinad Hospital and Research Institute after gaining approval from the Human Ethical Committee of Chettinad University. The first patient required functional endoscopic sinus surgery with septoplasty for recurrent sinonasal polyposis, however a cerebrospinal fluid leak developed during the procedure that needed to be fixed. In the second case, a modified radical mastoidectomy was planned for a cholesteatoma in the attic. The original procedure was changed to an atticotomy with tympanoplasty when the patient experienced an intraoperative haemorrhage. There was Grade 3 facial nerve paralysis following surgery. Patient was handled carefully. The third patient did not have FESS revision despite having bilateral recurrent sinonasal polyposis. After the polyps were removed and the HADAD flap was removed, Dura was found to be exposed on the left side. After surgery, the right pre-septal orbital emphysema was treated conservatively. **Conclusion:** It's critical to identify surgical issues and treat them gently at the operating table with the appropriate postoperative care.

Key words: CSF leak, facial nerve paralysis, modified radical mastoidectomy, and orbital emphysema

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Introduction

Every operation has unique complications. Depending on the patient's condition, the disease and surgery involved, the surgical techniques utilised, the location of the lesion on the body, the anaesthetic used, and many other considerations, otorhinolaryngology procedures might be challenging. It's critical to detect these problems when they occur and to deal with them.
to handle a variety of issues that arise during otology and rhinology operations

Purpose of the Study:

This investigation had two goals.
To evaluate the different intraoperative issues that arise during otology and rhinology procedures and the prompt handling of those issues.

Materials And Method

The study was carried out on three patients who underwent surgery in the Department of Otorhinolaryngology at Chettinad Hospital and Research Institute after receiving approval from the Human Ethical Committee of Chettinad University. We'll discuss the scenarios below.

Case -1

The right side was more affected than the left in a 65-year-old male patient's complaint of bilateral nasal obstruction during the preceding year, which got worse during URTI episodes. He was examined in the outpatient ENT section. The patient also had a history of anosmia, hyponasal voice, hearing loss in the left ear, and periodic tinnitus in the right ear. This patient was a known diabetic who had been receiving regular care for 33 years.

Clinical Examination

An anterior rhinoscopy revealed polyps in both nasal cavities, a left-deviated nasal septum, and a pale nasal mucosa.

Investigation

Blood tests were performed as usual. Several polyps and a left nasal septum deviation were found during a diagnostic nasal endoscopy.

Treatment

The patient underwent functional endoscopic sinus surgery, septoplasty, and removal of bilateral nasal polyps while under general anaesthesia. After experiencing CSF leaks in both nasal cavities, the patient underwent fascia lata graft repair intraoperatively (Figs. 1 and 2). Packs of soframycin and ivalan were not moved. The lumbar drain's output was maintained at 4-5 mL per hour. Following surgery, the patient was given IV antibiotics, antiepileptics, analgesics, and other supportive medications. The Soframycin and Ivalon packs were taken out of both nasal canals on POD-3. The Ivalon pack was placed back into the left nasal cavity to stop the minor CSF leak on the left side, and gel foam was used to cover the graft site. On the fourth postoperative day, the lumbar drain was halted for six hours before the Ivalon pack from the left nasal cavity was removed. After the lumbar drain was removed in an aseptic, sterile manner, no more CSF leaks were seen. Patient received continued follow-up after being discharged. The patient is in good health.

Case -2

A 72-year-old male patient presented to the ENT outpatient department with complaints of foul-smelling ear discharge dating back to infancy. The patient's left ear hearing loss had been present since childhood. Additionally, the patient reported a history of tinnitus in the left ear, giddiness, and headaches. For 12 years, the patient had been receiving regular treatment for diabetes.

Clinical Examination

The clinical examination revealed that the patient had a normal pinna, pre- and post-auricular region of the left ear, cholesteatoma debris in the pars flaccida, scutal erosion, and retracted pars tensa. Three-point pain and a negative fistula test result. The vestibular function tests were precise. Before surgery, a facial nerve evaluation was performed without issue. The right ear was examined and found to be in good condition.

Investigation

Routine blood testing revealed normal findings. Pure tone audiometry revealed a mild conductive hearing loss of 26 dBHL in the right ear and a moderately severe mixed hearing loss of 66 dBHL in the left ear. The left epitympanum of the middle ear cavity and the mastoid cavity both had soft tissue opacities on the HRCT of the temporal bone, along with ossicular erosion on the left side and hypopneumatized mastoid on both sides.

Treatment

The patient was diagnosed as Left Chronic Suppurative Otitis Media Atticoantral Type, which has no immediate consequences. After achieving anaesthesia fitness, the patient was initially scheduled for a Left Modified Radical Mastoidectomy under general anaesthesia. When the patient experienced sigmoid sinus bleeding after surgery, the Left Modified Radical Mastoidectomy procedure was postponed in favour of a Left Atticotomy with type IV Tympanoplasty. Intravenous steroids were given to the patient after the procedure because it was determined that they had facial nerve palsy. A doctor's opinion was sought in order to control excessive blood pressure and blood sugar levels. An ophthalmologist's opinion was sought for eye care, and physiotherapy exercises were used to correct face weakness. The patient received IV antibiotics, analgesics, and other supportive drugs. The patient underwent catheterization, a USG abdomen, and a serum PSA test, all of which were verified to be normal. As a result of the patient's increased urine output and dribbling pee, all of these procedures were done on the patient. After being discharged, the patient received outpatient follow-up. Foley's catheter was removed after a week, and over the next five months, the patient's facial nerve paralysis improved.

Case -3

At the ENT outpatient clinic, the patient reported having a headache, a six-month bilateral nasal block, hyposmia, and a hyponasal voice. The patient underwent functional endoscopic sinus surgery for sinonasal polyps four years ago.

Clinical examination

A grayish-white polypoidal tumour between the septum and the lateral nose wall was discovered in the patient's bilateral nasal cavities during the clinical examination.

Investigation

Blood tests were performed as usual. A diagnostic nasal endoscopy revealed many polyps, although the nasopharynx was unobstructed.

Treatment

The patient underwent revision functional endoscopic sinus surgery under general anaesthesia. After the polyps were removed, Dura was visible on the left side (Fig. 4). An infiltration and an incision were created on the left side of the septum's superior section, and a HADAD flap was elevated. It was covered with the defect-covering flap (Fig. 5) before being glued shut with fibrin. An Ivalon pack was put into each nasal cavity. The nose's front was dressed. Right periorbital edoema that extended to the right maxillary region plagued the patient after surgery. CT Brain with Orbit with PNS was used to detect right pre-septal orbital emphysema. The patient was treated conservatively with intravenous steroids and other supportive medications following consultations with an ophthalmologist and a neurosurgeon. The periorbital edoema completely disappeared, the patient's symptoms improved, and she was then discharged. Patient was followed up with frequently.

Discussion

The surgical therapy of cerebrospinal fluid (CSF) rhinorrhoea has undergone significant alterations since the advent of functional endoscopic sinus surgery. The clear anatomical exposure of the roof of the nasal and paranasal sinus cavities by the endoscope, which gives the surgeon a prime opportunity to pinpoint the area of CSF leak, has made it possible to use the fascia lata sandwich graft technique for endoscopic endonasal repair of CSF rhinorrhoea.[1-3]

Only when the intima's latent function is activated and a fibrin ferment is produced does a stage in one of the repair processes, the formation of a clot within a blood artery, occur. The stimulation could have been brought on by a toxic, bactericidal, inflammatory, or traumatic irritation. Accidental harm to the sigmoid sinus wall becomes highly critical when the infection breaks through the clot's barrier of protection. The sudden, powerful outrush of blood carries with it the pollution brought by the offending instrument and also tends to wash away septic material from the location of the injury, hence it is likely that most sinus wall injuries do not result in septic thrombosis. The clot itself then dissolves, releasing poisons and microorganisms into the bloodstream[4]. The sigmoid sinus, which is generally located more on the posterior side, can migrate anteriorly and protrude deeper into the mastoid cavity due to the condition known as procidentia [5]. Injury to the sigmoid sinuses, which might result in bleeding, may lead to facial nerve paralysis, one of the most feared side effects of middle ear surgery. A preoperative CT scan can be used to assess the complexity of a mastoidectomy. The distances between the temporal lobe and the top plane of the petrous bone (7 mm) and the anterior border of the sigmoid sinus to the posterior wall of the external auditory canal lower than (9 mm) indicate the surgical difficulties of completing a mastoidectomy.[6,7]

CSF Leak

Following endoscopic sinus surgery, there are normally 0.5% or fewer significant complications. CSF leaks discovered during or following surgery would fall under this category of critical problems. The occurrence of covert cerebrospinal fluid fistulae during sinus surgery was looked into in a study by Bachmann et al.[8]. The beta-trace protein assay revealed a 3% rate of hidden leaking. They had examined 69 patients who had undergone surgery in a hospital setting with the assistance of a skilled surgeon. Through the 6-month follow-up period, none of the patients with occult leaks had any symptoms or side effects. Despite clearly benefiting specific patients, image-guided surgery has not been shown to lower the risk of complications in large case series.

Another significant development in sinus surgical technology recently has been the use of powered equipment, which has modified the severity of issues and increased the possibility of brain parenchymal injury rather than the more manageable CSF leaks. It's crucial to rule out major intracranial vascular problems when there has been brain parenchymal damage. When

CSF leaks are discovered during sinus surgery and cause complications, they should frequently be fixed on the operating table.

The repair can be made using local intra-nasal tissue, usually with positive outcomes. The most likely anatomical locations for CSF leaks complicating sinus surgery are the very thin bone of the lateral lamella of the cribriform plate, the area of the anterior skull base where it is weakened by the anterior ethmoid neurovascular bundle, and posteriorly where there may be uncertainty as to the exact anatomical relationship between the last posterior ethmoidal cell and the sphenoid sinus.

In rare cases, it may be decided not to treat the CSF leak while the patient is under anaesthesia. There is a reason to refer patients to specialised facilities for closure when the degree of surgical disorientation is such that attempts at restoration could cause even more harm, such as an orbital or brain parenchymal injury. The incision can be thoroughly packed while taking extra precautions as the patient "wakes up" from the anaesthetic. After extubation, the patient cannot receive positive pressure breathing since doing so could cause serious pneumocephalus. During the healing process, CSF leaks that complicate sinus surgery may also be found. Following surgery, clear rhinorrhea is a major issue that requires in-depth research.

Repair Of Surgically Caused Skull Base Defects

Various clinical issues are being treated with endoscopic methods that target the anterior skull base, sellar, and parasellar regions. Minor mistakes can be fixed, much like defects with different root causes. Free-fat grafts can be utilised successfully for more severe defects. Vascularized tissue flaps have received a lot of interest lately. It is not a novel concept to use vascularized septal or turbinate flaps to stop CSF leaks. About 30 years ago, Yessenow and McCabe initially talked about the effective use of this tissue in transnasal, extracranial, non-endoscopic repair of CSF leaks [9]. The majority of studies have emphasised posterior septal flaps. The septal mucoperiosteum and mucoperichondrium based on the nasoseptal artery are used in the so-called "Hadad-Bassagasteguy" flap.

In 75 patients, Kassam et al.[10] documented the overall effectiveness of endonasal endoscopic cranial base surgery. During the course of a year, 30 patients from two skull-base centres were the subject of a study by Harvey et al. Numerous flaps, such as those on the inferior turbinate, nasal floor, posterior septum, and others, were used to join them. Some of the technical concerns relating the flap that were brought up included the significance of avoiding an unnecessary initial posterior septectomy, choosing between a contemporaneous hemi-transfixion and a Killian septal incision, and carefully conserving the flap during surgery. The utilisation of a multi-layer skull base restoration that is initially supported by an inflated Foley catheter balloon was also underlined.

Facial Nerve Paralysis

One of the most dreaded side effects of ear surgery, regardless of the technique used, is facial paralysis. It is best to first discuss how to avoid this specific injury before discussing what to do after the nerve has been hurt.

Understanding the facial nerve's anatomy in its entirety is the greatest strategy to prevent injury [11–13]. The facial nerve may run abnormally in a small number of patients or may be dehiscent within the horizontal or vertical segments, either spontaneously or as a result of disease-related erosion. This calls for a preoperative CT scan of the temporal bones.

A meticulous technique should always be used while performing a mastoidectomy. Recognisable landmarks should be located from the lateral to the medial sides. Even though it is unusual, finding the facial nerve while having surgery can be helpful. The facial nerve or the lateral/horizontal semicircular canal may be damaged if the surgeon performs a mastoidectomy on a mastoid that is chronically ill. The facial recess technique is the most straightforward

method for locating the facial nerve once the antrum, incus, and lateral semicircular canal have been located. After locating the facial nerve, it would be able to follow it to the stylomastoid foramen. During the vertical portion, the facial nerve shifts a little from medial to lateral. Following the digastric ridge to the stylomastoid foramen, which links to the facial nerve, is another technique to locate it. Although it is extremely rare (less than 1%), facial nerve damage during virgin ear surgery might rise to 4%–10% in cases of revision [14]. Even though it is not required for ear surgery and cannot replace anatomical competence, intraoperative monitoring of the facial nerve aids the surgeon in protecting the nerve [15,16]. The facial nerve monitor can assist the surgeon in differentiating between ill and healthy nerve when a serious ailment has worn away the bony covering of the face nerve.

Additionally, up to 50% of normal temporal bones have been documented to have a tiny dehiscence (less than 0.4 mm in diameter) in the tympanic section [17]. The geniculate ganglion, the facial recess, and the mastoid area are other natural sources of dehiscence [18]. This condition most usually occurs when the mucosa of an air cell covers the facial nerve. It is best to recognise the injury in the operating room rather than waiting until the patient awakens in the recovery area.

The surgeon must first assess the severity of the damage if it is discovered in the operating room. The facial nerve is actually very resilient and is only marginally affected by manipulation [19,20]. Decompressing 5 to 10 mm of bone on either side of the dehiscence is advised if the bruise or contusion seems severe [21]. The surgeon must decide whether to expose the nerve's sheath to facilitate extension and lessen any negative effects of edoema or bleeding after assessing the extent of the nerve damage [22,23].

According to popular wisdom, decompression on either side of the injury is advised when less than one-third of the nerve is injured [24]. A nerve transplant offers a better probability of maintaining facial nerve function at the level of grade 3 on the House-Brackman scale if more than one-third of the nerve is severed [25,26].

If the nerve can be repaired easily, preferably without strain, this approach is favoured because it just calls for one anastomosis and no graft. A graft is necessary if the two ends do not converge neatly. The stylomastoid foramen can be removed in order to extend the facial nerve by a mm. One anastomosis causes no less synkinesis or worse facial nerve function than two anastomoses, it has not been demonstrated [22,27]. However, this strategy could create some blood supply disruption and recovery issues. Use a 9-0 or 10-0 monofilament suture to join the nerve or the nerve graft and heal the transected nerve. The fallopian canal thankfully provides a perfect bed for putting the nerve transplant where it should not shift. The ends may need to be reaproximated and sealed with a sealant like Cargile, Gelfoam, or fibrin glue in this situation [22,23,28]. To enhance the surface area for axon regeneration, the nerve graft and facial nerve must be sliced obliquely before being implanted [25,29].

The great auricular nerve and the sural nerve were traditionally the two nerves used during face nerve transplantation. There is no need to do a sural nerve transplant because the required nerve length should unquestionably be less than 10 cm, which is roughly the length that can be obtained from the great auricular nerve [22]. The incision required for any form of ear surgery is frequently already constructed and in the field, and the great auricular nerve is easily accessible. The sternocleidomastoid muscle, which is generally situated about two thirds of the way from the mastoid tip to the angle of the jaw [25], is cut down in order to reach the great auricular nerve. A section of the nerve can be cut off and utilised as a graft after it has been mobilised. The ends are bevelled at an angle to promote healing and the area that can be used for reapproximation. Once more, the nerve graft is fixed in place using sutures or by being placed adjacent to the two ends of the facial nerve and being fastened there with fibrin glue or another similar substance. The best case scenario for grafting is around 75% of normal function [27]. Synkinesis must be explained because it could be problematic [30,31]. The use of high

dosages of steroids is categorically advised; the typical prednisone dosage is 60 to 80 mg per day for 7 to 10 days. Simple nerve injuries typically recover more quickly.

A decision needs to be made regarding the next step if the facial paralysis is found in the recovery area rather than the operating room. The nerve is almost certainly not completely transected and has a less significant lesion if the paralysis is not fully developed (the patient still has a good nasal sniff or a decent reflex with grimacing). In these cases, the patient is being monitored while high-dose steroids are given. Electrical testing is done and a decision must be made regarding the need for additional surgical therapy, such as facial nerve decompression, if the damage does result in complete facial paralysis. ENOG, or electroneurography, is the recommended method of evaluation. The likelihood of decompression can be taken into account when degeneration is less than 95%.

Re-exploration should be carried out, typically as soon as is practical (i.e., within 24-72 hours), if the surgeon is relatively confident that the nerve is in fact damaged and feels comfortable doing so [32,33]. On this exploration, the necessary repairs should be made as previously mentioned. Some advocate delaying any re-anastomosis for 3–4 weeks to allow for potential neurologic regrowth [22,34]. Waiting three to four weeks is not generally recommended by surgeons. The patient can benefit from electrical testing if the surgeon is confident that the nerve has not been damaged in any way and had discovered it during surgery.

Only if a patient with grade VI facial paralysis has more than 90% to 95% degeneration on ENOG scans should one consider re-exploration or decompression. The best way to cope with facial paralysis is to try to avoid it altogether; if it does occur, one must remain calm and treat the injury carefully to give the patient the best prognosis.

Orbital Emphysema

The development of orbital emphysema, a benign disorder, is caused by a forceful air injection into the soft tissue regions of the orbit. Typically, there has been a history of trauma, and an orbital bone fracture allows for ventilation. Orbital emphysema has been linked to infections, pulmonary barotrauma, injuries from compressed air hoses, surgical problems such FESS and dental procedures, sneezing, flying, and Boerhaave's syndrome (esophageal rupture) [35,36,37]. The medial or inferior orbital walls, which enable air to enter through the ethmoid and maxillary sinuses, respectively, are the weakest parts of the orbital wall and are where fractures most frequently occur. In spite of the fact that the medial wall (lamina papyracea), which is only about 0.5 mm thick, is thinner than the orbital floor, isolated medial wall fractures only happen in 10–30% of cases of orbital trauma, although orbital floor fractures are more frequent [38, 39, 40]. When the orbital soft tissue functions as a ball valve, forcing the fracture fragment back or herniating into the sinus cavity, air is trapped in the periorbital regions [38, 41]. The most significant effects of orbital emphysema, including orbital compartment syndrome, include proptosis, visual loss, increased intraocular pressure, and central retinal artery occlusion [38]. Periorbital emphysema is a rare clinical manifestation that frequently does not require surgical decompression and frequently does not cause major complications, but it may be an option in extremely rare circumstances due to the risk of elevated intraocular pressure and impaired ocular perfusion [42]. In order to avoid overusing antibiotics and antihistaminics, it is also essential to distinguish periorbital emphysema from illnesses like angioedema, anaphylactic response, and orbital cellulitis. The presence of crepitus caused by air bubbles in the subcutaneous tissue is an important distinguishing feature[43]. Due to the possibility that staphylococci, streptococci, and anaerobic bacteria could spread through a damaged bone wall and cause periorbital infection, systemic antibiotic prophylaxis is required in cases involving oral or nasal surgery [44]. For treatment, a symptomatic approach is preferred. Local or systemic antibiotic therapy might be used when there are infection symptoms. If there is discomfort, painkillers can be administered. After a week, the condition usually gets better, but depending on where and how much air is trapped in the deep fascial

plane, potentially fatal disorders such cardiopulmonary embolism, cardiac tamponade, and respiratory distress may develop[45].

Only 1% of FESS situations have serious problems. Direct injury to the optic nerve, CSF rhinorrhea, visual impairment brought on by orbital hematomas, injury to the orbital muscle, and other conditions are among them [46,47]. Minor problems happen more frequently, with rates as high as 5% [47]. After FESS, it is not uncommon for there to be a little amount of periorbital air; this condition is typically benign and brief. It results from a lack of lamina papyracea, which may be caused by iatrogenic factors or a typical anatomical variation. However, a rare adverse effect of FESS is clinically severe emphysema. It can lead to disastrous outcomes, like blindness for the rest of one's life, if it is not controlled. Increased intranasal pressure from coughing, sneezing, or blowing the nose can result in air being trapped in the orbit if the lamina papyracea is damaged. Air entrapment in the postseptal space can lead to a compartment syndrome and subsequent direct damage to the optic nerve. Air tracking anteriorly and an increase in lOP may cause ischemia of the retina and optic nerve [48,49]. The focus of the initial exam should be on the hardness, extraocular movement, and visual acuity of the enlargement (including checking for an afferent pupillary abnormalities). To measure lOP, a CT scan and an appointment with an ophthalmologist are advised. The extent and location of air entrapment can be determined with the aid of a CT scan.

After a period of observation to monitor any progression, patients can be discharged with instructions to refrain from nasal blowing and straining. You should consider receiving therapy if your vision is deteriorating, you're experiencing excruciating pain, or your emphysema is getting worse. Lateral canthotomy with cantholysis or needle decompression may be beneficial in urgent conditions [50,51,52].

Conclusion

Therefore, based on the findings of this study, we can infer that there is always a chance that anything could go wrong during surgery and that the difficulties associated with such procedures depend on a number of factors. It is essential to acknowledge these problems and resolve them quickly and courteously at the table. Asking for more help when necessary is typically a good idea. Priority should always be given to the patient's stabilisation as well as their post-operative recovery and rehabilitation. Since the issues in all three cases in our study were resolved swiftly and with sufficient post-operative care and frequent follow-up, we saw good recovery rates in all three cases.

Positives of The Study

This study is robust because we carefully considered three examples with their intraoperative issues and how they were handled. All three patients' symptoms have improved since routine follow-ups.

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Figure Captions

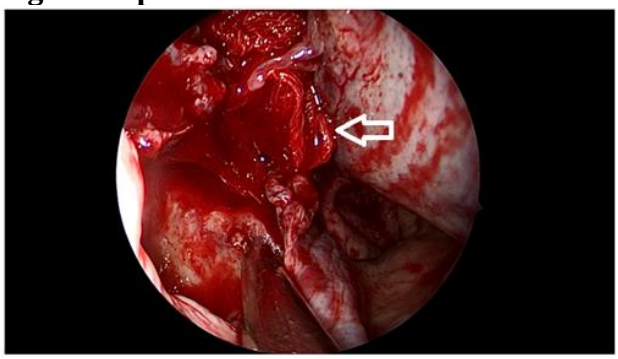

Figure 1: Intraoperative finding of CSF Leak in right nasal cavity

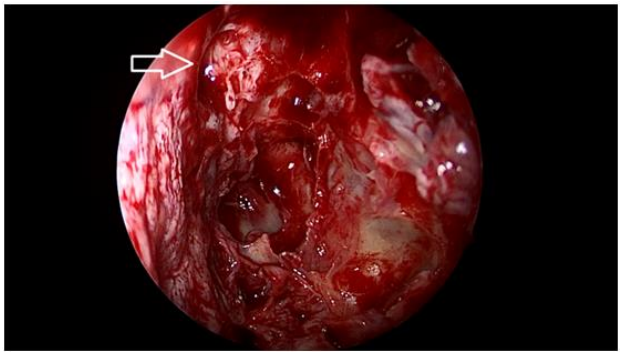

Figure 2: Intraoperative finding of CSF Leak in left nasal cavity

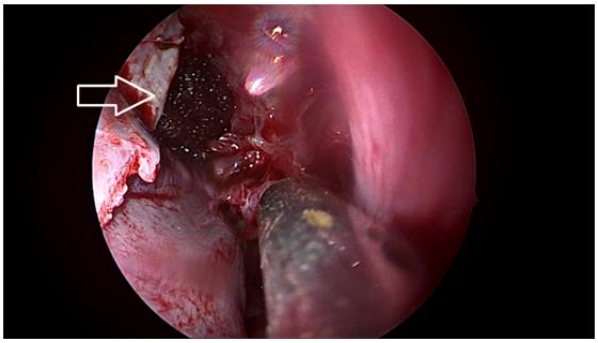

Figure 3: CSF Leak repair in right nasal cavity

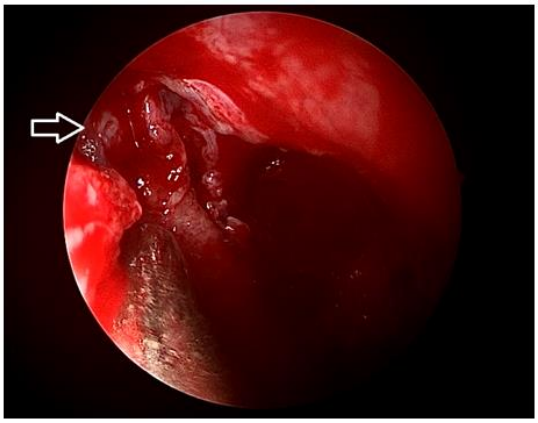

Figure 4: Exposed Dura on the left side

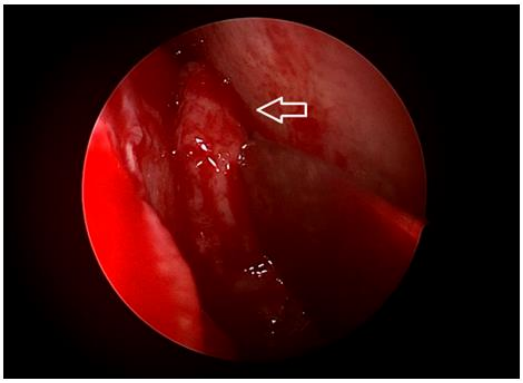

Figure 5: HADAD flap positioned over the area with defect