EXTENDED APPLICATION OF FUNCTIONAL ENDOSCOPIC SINUS SURGERY IN OPHTHALMOLOGY AND NEUROSURGERY

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ABSTRACT

Objective: To establish the importance of functional endoscopic sinus surgery (FESS) as extended application to avoidmore conventional and radical procedure for orbit and skull base.

Study Design: Retrospective study.

Place and Duration of Study: This study was carried out at Military Hospital and CMH Rawalpinidi, and CMH Quetta from Sep 2013 to Sep 2017.

Material and Methods: Fifty-six patients were included in this study with inflammatory disease, tumour of skull base and orbit. Patients were referred by Ophthalmologists, Neuro surgeons, pediatricianand few came directly to ENT department. Different endoscopic techniques, endoscopic orbital decompression, trans-sphenoidal endoscopic approach, endoscopic CSF repair were adopted to treat these cases. Angled endoscopes from 0,30,70 degrees were used along with microdebrider and drill (powered instruments)for extended application of FESS. Outcomewas successful disease removal with endoscopes. Data was analysed by data triangulation method, involving ophthalmologists and neuro surgeons.

Results: Results were achieved in the form of complete endoscopic removal of inflammatory pathology in 32 cases, fungal disease in 12 cases, tumour pathology in 2 cases and cyst removal in one case. Revision surgery was done in 5 cases. Success rate of endoscopic surgery was 91.7% as primary treatment and 100% with revision surgery.

Conclusion: Endoscopic sinus surgery (FESS) was found 91.7% successful as primary treatment and 100% with revision surgeryof orbit and skull base diseases.

Keywords: Endoscopic sinus surgery, Extended applications, Orbit, Powered instruments, Skull base.

INTRODUCTION

Functional endoscopic sinus surgery (FESS) was pioneered by Messenklinger, who discovered that the sinuses had a predetermined mucociliary clearance pattern towards the natural ostium, irrespective of additional openings into the sinuses. FESS is now accepted standard surgical management of choice for chronic Rhinosinusitis. Further-more, as knowledge about the anatomy of the sinuses has improved, other ancillary surgeries such as endoscopic lacrimal surgery, orbital decompression, optic nerve decompression, approaches for the sphenoid sinus for cysts or mass, and approaches for pituitary fossa for inflammatory pathologies or tumour, have become easier. Innovation in instrumentation has also led to the acceptance of endoscopic management of benign nasal, orbital or skull base tumours and more recently, on endoscopic management of malignant tumours of the nose and sinuses. FESS has become more interesting because of some recent developments, one is advent of compact multi-angled telescopes that allow excellent visualization of the nasal cavity for examination and of the sinuses during procedures. Second is the advent in radiological imaging. Endoscopic diagnostic examinations and CT scan have proven to be an ideal combination and have been accepted as the "standard of care' for sinus and skull base diseases. The rationale of this study was to identify these advancements to help improve the accurate diagnosis and treat

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refractory cases of sinusitis and ancillary diseases of skull base and orbit.

MATERIAL AND METHODS

This retrospective study was carried out at MH Rawalpindi, CMH Rawalpinidi and CMH Quetta, from Sep 2013 to Sep 2017. Total number of 56 patients of all ages and both genders with orbital and skull base pathologies were included in the study by cluster sampling. Forty-six patients were referred by ophthal-mologist, three by paediatric physician, three by Neuro surgeons and four patients came directly to ENT OPD. For environmental triangulation data was collected from patients of all three hospitals from different cities of Punjab and Baluchistan. Data triangulation was also done by photographs and, written record of patients for particular disease. All cases were thoroughly evaluated using endoscopic nasal examination by ENT surgeon. Examination of all preoperative CT scans was made by both radiologists and FESS surgeon, and close postoperative follow up done by ophthalmologists, neuro surgeons and ENT surgeon. Surgical procedures adopted were transsphenoidal approach for pituitary, endo-scopic DCR, endoscopic decompression of orbit, endoscopic decompression of optic nerve, and endoscopic repair of CSF. All patients were followed up through standard protocol involving office endoscopic examination at 2 to 4 days and weekly for 4 to 6 weeks post-operatively. Patients were then followed closely thereafter with monthly endoscopic examinations. Repeat CT scans of the patients having persistent pathology on endoscopic examination was done in two patients and revision surgery was done.

The majority of the surgical procedures were performed using the 4 mm, 0 and 30-degree endoscope, reserving 70-degree endoscope. Before the surgical procedure was started, the middle turbinate, uncinate, and anterior ethmoid bulla were injected with 1% lignocaine with adrenaline 1: 100,000 concentrations. The middle turbinate was moved medially, uncinate process resected. Then the straight biting Blakesly forceps was used to resect the anterior ethmoid bulla, continuing posteriorly through the ground lamella, posterior ethmoid cells opened. If the sphenoid sinus needed surgical treatment, its ostium was enlarged. After removing the disease either inflammatory, polyps or mass, middle turbinectomy was performed to create more space to deal with lamina papyraceaand gradually orbit was dropped in the nasal cavity. The nose was packed gently at the end of the procedure and these packs were removed the following day.

During surgical technique of DCR mucosal flap was elevated on lateral wall of the nose anterior to middle turbinate. Removal of the frontal process of the maxilla uncovered the antero-inferior portion of the lacrimal sac. At this juncture diamond burr was used to remove the rest of the bone up to the superior mucosal incision. Exposed sac was opened vertically, and marsupalized. Silicon lacrimal intubation tubes was placed through the upper and lower puncta and retrieved endo nasally. Silicon tubes were removed in the clinic after 4 weeks.

Table: Operative Procedure for Extended application of FESS.

S.No	Operation	Disease	No of cases (%)
1.	DCR	Decrocystitis	29 (51-8)
2.	Trans SphenoidalHypophysectomy	Pituitary Adenoma	02 (3.5)
3.	Endoscopic Advance Skull base Procedure	SphenoidalMucocele	01 (1.8)
4.	Endoscopic Orbital Decompression	Proptosis	21 (37.5)
5.	Endoscopic Orbital Nerve decompression	Visual Loss	01 (1.8)
6.	Endoscopic Repair of Dura	CSF leak	02 (3.5)
Total numbers of cases			56

For Endoscopic optic nerve decompression, standard technique of FESS was used, the natural ostium of the sphenoid sinus waswidely opened. Diamond burr was used to thin this bone down (optic tubercle) until it was almost transparent[1,2]. Orbital periosteum was kept intact, when all the bone was cleared off the optic canal and underlying optic nerve sheath was clearly visible, the sheath was incised. The incision was continued onto the orbital periosteum of the posterior orbital apex with resultant protrusion of orbital fat. No packs were placed on the nerve or in the sinuses.

maxillary antrostomy, anterior ethmoi-dectomy, and transnasal uncinectomy, while maxillary antrostomy and total ethmoi-dectomy was also done[6-10].

The trans-nasal endoscopic approach for pituitary tumours, was started by doing spheno-idotomy, on both the sides or the side where the sinus was larger. The sphenoidotomy was opened up to the level of the skull base using a sphenoid punch. Vomerine spur was removed. The lateral aspect of the anterior wall removed. A Kerrison antrum punch was used. The vomer where it joins the sphenoid, was drilled. Knife

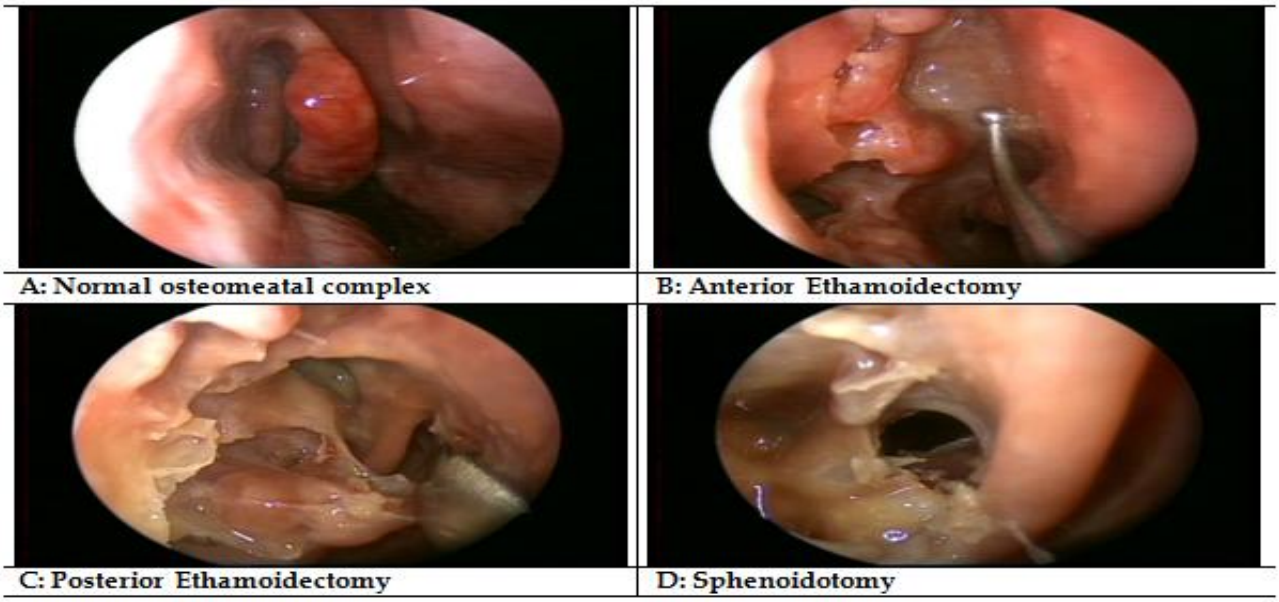


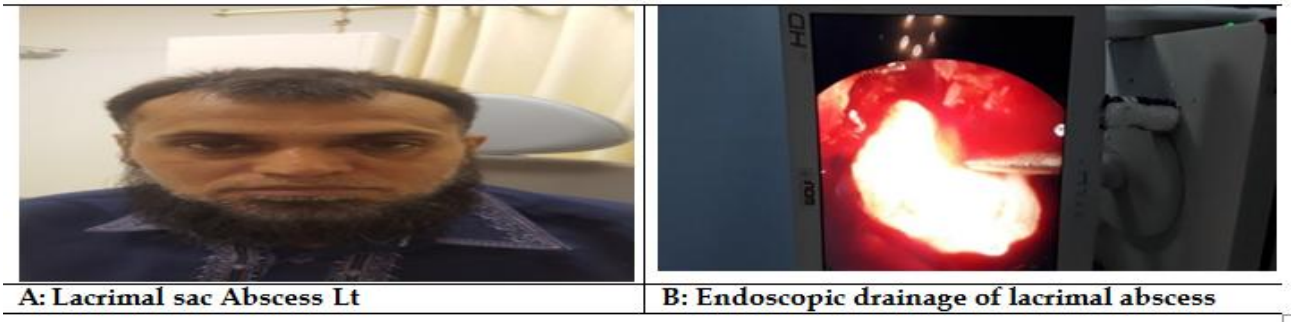
Figure-1: Endoscopic sinus surgery, Basic surgical steps.

For Orbital abscess and orbital decom-pression, An endoscopic spheno-ethmoidectomy was done as described by Stammberger (1991)[3] and Kennedy (1985)[4]. The middle turbinate was removed before opening the lamina papyracea. Bone of the lamina papyracea was removed in a superior direction. Incision of the periorbita was extended along the ethmoid roof and the orbital floor. A horizontal strip of periorbita overlying the medial rectus muscle was preserved. This fascial sling serves to decrease prolapsed of the muscle and is thought to reduce the incidence of postoperative diplopia[5]. Surgical techniques in all these patients involved

was used to open the dura by making a cross-shaped incision through it. Tumour removed with ring curette. The pituitary fossa closed at the end of the procedure with raised naso-septal flap or dermal graft placed onto the bony defect, human tissue glue and gel- foam placed over it. Similar technique was used for sphenoid almucocele.

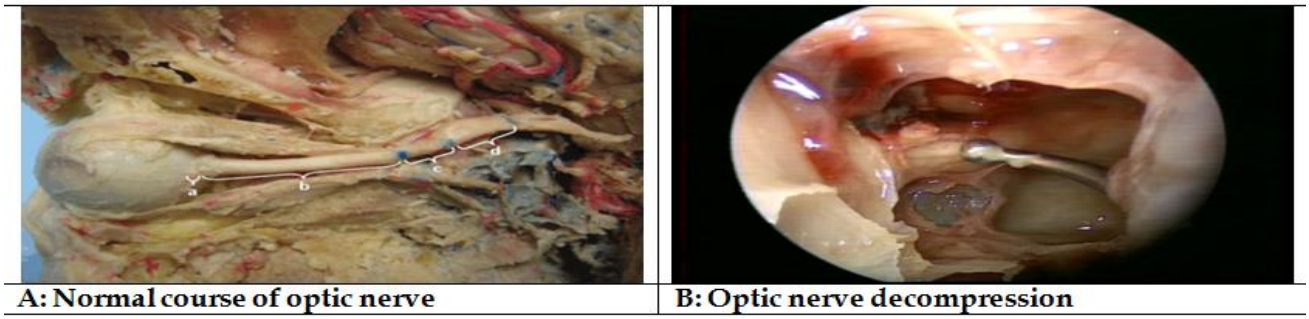
For CSF repair, first site of leak is identified endoscopically, surgical freshened the margins of fistula. The repair of CSF fistula involved the use of multi-layered barrier comprised of free tissue grafts harvested from the nasal perichondrium or temporalis fascia. On top of the on lay graft, an

abdominal fat graft was used as a bolster and a biological dressing. A fibrin sealant was applied to help fixate the fat graft. Merocel packing were placed intra-nasally to support the fat graft and provide some compression. A total of 56 patients were treated endoscopically for diseases of orbit and skull base, out of 29 cases of DCR 3 cases showed failure and revision surgery was done. Pituitary adenoma cases showed successful recovery of visual symptoms, both cases were followed up to 6 months. Spenoidalmucocele showed full recovery and no recurrence till one year. Out of 21 cases of orbital abscess with proptosis all showed complete resolution except two, in which CT scan was repeated and revision surgery was done. CSF cases showed successful healing. Data was analyzed in SPSS version 21. Frequency and percentage were calculated.



A: Lacrimal sac Abscess Lt | B: Endoscopic drainage of lacrimal abscess

Figure-2: Endoscopic DCR.



A: Normal course of optic nerve | B: Optic nerve decompression

Figure-3: Optic Nerve Decompression.

RESULTS

To minimize or avoid performance bias, cluster stratification of patients was considered, all patients having an operation by one surgeon were placed in one group, as opposed to placing individual patients into groups. All patients were examined by ENT surgeon endoscopically post operatively at interval of 2 weeks, 4 weeks, two months and six months for persistence of disease, recurrence of the disease and symptoms of the patients.Total of 56 cases for extended FESS surgery were included, all results were assessed for surgery by Endoscopic surgeon, Ophthal-mologist and neuro surgeons, table.

Out of 56 patients 44 (78.6%) were male and 12 (21.4%) patients were female. Nine (75% of female patients) females were operated for DCR and 3 (25% of female patients) for orbital decompression/ orbital abscess. Wide range of patients were included from 4 years to 56 years. In this study there were only 3 (5.3%) children, all were operated for orbital abscess. Three cases of DCR and two cases of proptosis resulted in persistence of symptoms and were subjected to revision surgery. Out of 56 cases, 51 cases (91.7%) were symptom free after primary surgery and all 56 (100%) after revision surgery (fig-1 to 5).

DISCUSSION

Advances in Endoscopic sinus surgery over the last two decades have only been possible with the collaboration of multiple surgical

specialities[11]. potential benefits of endoscopic surgery are improved cosmoses and decreased morbidity due to minimum tissue trauma and careful manipulation of tissues. The consequences of decreased morbidity are, a faster recovery, short hospital stay and less cost of medical care[12]. In our study all the cases of orbital abscess were treated with antibiotics for 48 to 72 hours, non responsive cases and increasing pain or proptosis was the criterion to operate early. Harris recommends emergency drainage for patients of any age, whose visual function is compromised[13]. Urgent drainage, usually within 24 hours, is indicated for the following: large orbital abscess causing discomfort, superior or inferior orbital abscess, evidence of intracranial extension. The advantage of FESS is the avoidance of external ethmoidectomy and associated external facial scar and an early drainage of the affected sinuses and subperiosteal abcess[14]. We have also achieved similar results in our study. Imaging studies are indicated when neurologic signs are present, to rule out associated epidural or subdural empyema, brain abscess, or cavernous sinus thrombosis[15-17], but we have subjected all our patients to CT scan for assessment, complications and surgery. We had two cases of CSF leak, both were traumatic. Kapitanov and associates[18], reported an equal number of traumatic and spontaneous CSF leaks, while Virk *et al*[19] reported on 2/3 of patients with spontaneous CSF leaks. Nyquist and associates[20] reported an overall endonasal closure rate of 93.8% (30 of 32 procedures). Lee and associates[21] reported a success rate of 86% at first-attempt, and 93% at second attempt. Virk *et al* had an overall success rate of 93%, and 100% after the second operation. Lee and associates[21] believe that the success of endoscopic endonasal repair primarily depends on direct visualization of the defect. Seth and associates[22] emphasize the use of fluorescein, localization of the leak site was greater when fluorescein-colored CSF was visualized, detecting 100% of defects, versus 81.3% without use of fluorescein. In our study endoscopic repair had 100% results and no fluorescein was used as leaks were well identified with scope and no lumber drain was used.some

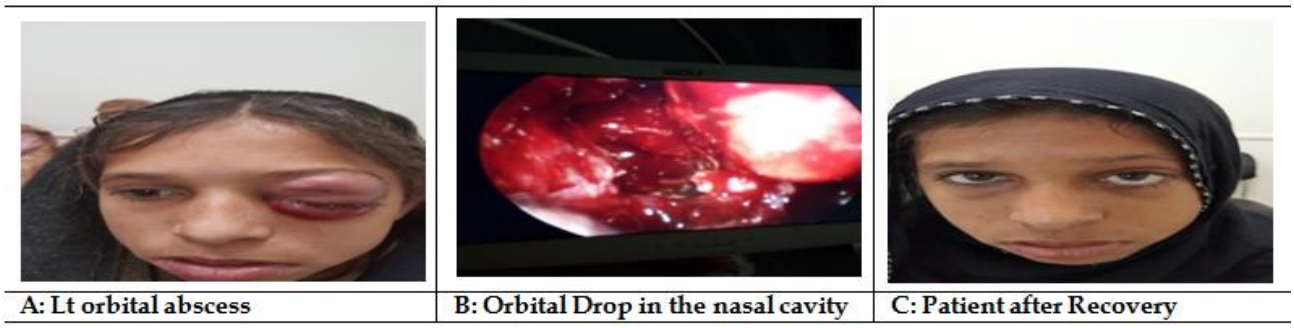


Figure-4: Orbital Decompression

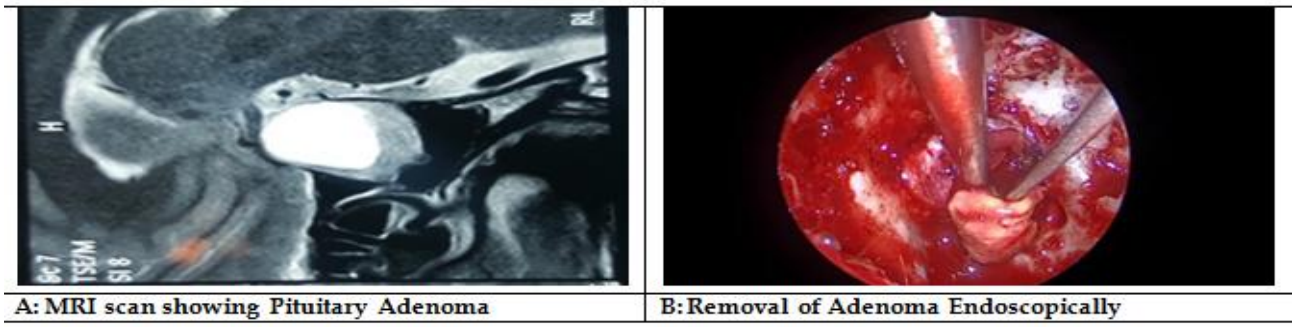


Figure-5: Pituitary Adenoma.

authors do not share this opinion and believe that lumbar drains are necessary only in patients with increased intracranial pressure.On the other hand, some authors do not use lumbar drains after CSF repair at all[23,24]. Oles[25] did not use lumbar in his study. Pituitary adenomas were successfully treated with complete resection in our study with no recurrence till 6 months follow up. Cappabianca *et al* estimated that surgical treatment of pituitary tumours had a 30% recurrence rate, while incomplete tumourresection was associated with recurrence rate as high as 75%[26]. According to recent literature, the endoscopic approach for pituitary adenomas can achieve a complete resection rate of 77%-96%[27]. Hide *et al* used endoscopic endonasal transsphenoidal surgery for the resection of pituitary adenoma,with increased safety and effectiveness of procedure[28]. Mucoceles of the sphenoid sinus are a very rare condition and represent only 1% of all paranasal sinus mucoceles[29]. Almost 200 cases of sphenoidal and or intrasellarmucoceles have been reported since 1872. Surgical treatment is absolutely indicated in mucoceles[30]. Currently, the endonasal endoscopic approach constitutes the modality of choice[31]. We also used endonasal approach to treat our case.

Intranasal marsupialization of mucocele was reported as early as 1921 by Horwath[32] and recently for other authors[33,34]. Moryiama *et al*[35] did not report recurrence during follow-up periods of 10 years. Other authors have similar results[36,37]. However, because the mucocele can develop 15-25 years after the initial surgery so a long-term postoperative follow-up is mandatory. With newer, more advanced instrumentation, endoscopic surgery has become more and more popular, and with increased experience, the success rates have begun to approach those of external DCR[38-40]. Endoscopic DCR, on the other hand, has the benefit of no external incision and scar, Disadvantage of endoscopic DCR include cost of instrumentation, steep learning curve of endonasal techniques, and difficulty of suturing the lacrimal sacnasal mucosal flaps. Despite these disadvantages, with improved instrumentation and technical advancements, success rates of up to 94% has been reported[41]. Post-operative endoscopic nasal debridement, is necessary for successful results[42,43]. Our study has shown 85% success for DCR with excellent advantage of no disruption of cosmoses. Disadvantages like DNS are better handled by ENT surgeon.

CONCLUSION

Endoscopic sinus surgery (FESS) was found 91.7% successful as primary treatment and 100% with revision surgery of orbit and skull base cases. Endoscopic sinus surgery, in recent years have proved to cause less complications and more safety. With more experience and expertise, better surgical results were achieved over last two decades. It is said that FESS is not a minimal invasive study rather it is maximal invasive surgery and future to come many skull base procedures will be taken over by endoscopic surgery.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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