Introduction

Chronic sinusitis produces long-term inflammation of the mucous lining of the paranasal sinuses (***Ramdan, 1999***).

Chronic rhinosinusitis (CRS) is a heterogeneous disorder with multiple phenotypic presentations. Broadly, the disease is often subcategorized as either CRS with nasal polyps (CRSwNP) or CRS without nasal polyps (CRSsNP). CRSwNP, is characterized by a skewed T-helper 2 (Th2) responses and tissue eosinophilia; CRSsNP is more likely to exhibit T-helper 1 (Th1) responses and a predominantly neutrophilic inflammation (**Van zele T et al, 2010**) .

Although the medical management of patients with CRS has not been universally established, prolonged therapy with culture-directed antibiotics, topical and systemic corticosteroids, saline irrigation, and adjunctive measures (topical or system decongestants, mucolytics, allergy diagnosis and treatment) has been frequently shown to improve symptoms, endoscopic resolution of disease, and radiographic findings. When the underlying inflammatory disorder cannot be adequately controlled, and the patient continues to be symptomatic, surgery is indicated (**Hessler et al, 2007**).

Over the past 25 years, there has been a rapid evolution of techniques and technologies deployed in the surgical treatment of CRS that, together with an understanding of our complications and failures, has resulted in improved surgical management of CRS. Meticulous surgical dissection using mucosa-sparing techniques and technologies has allowed surgeons to surgically treat problem areas within the paranasal sinuses and preserve the natural function of the sinus mucosa. This has been the primary surgical philosophy that began with the work of Messerklinger. Despite our increased appreciation of CRS, we remain without a consensus on how to surgically treat this disease (**Kevin et al ,2009**).

Currently, endoscopic sinus surgery is seen as the standard treatment in clinically challenging chronic rhinosinusitis (CRS) and in sinonasal polyposis. The endoscopic procedure is based on the principles introduced by Messerklinger in 1978, which prioritize both the function and the ventilation of the paranasal sinuses, in a precise and guided intervention on the lateral wall of the nose. In 1985, Kennedy described this technique and popularized the term “Functional Endoscopic Sinus Surgery - FESS” **(Bunzen et al, 2006).**

The theory behind functional endoscopic sinus surgery (FESS) is to re-establish drainage from the maxillary, ethmoid, sphenoid, and frontal sinuses. In addition, allowing the ostiomeatal complex to stay patent is an important factor in re-establishing mucociliary clearance from the dependant sinuses. By achieving adequate drainage from the natural ostium, the mucosal disease and subsequent symptoms could become reversible in many cases. Many children who are considered for FESS have comorbidities that include allergies, immune deficiency, ciliary disorders or cystic fibrosis. Medical management should be maximized before FESS (**Bublik M et al ,2009**).

The modern optical systems and transmission of light by fiberglass have made it possible to have access to unexplored areas of the nasal cavity and paranasal sinuses. So fiber optic endoscopes of various degrees and diameters, plastic suction cannulas and requisite instruments (Blakesley forceps, Trucuts, Backbiting, Sickle knife) and spinal needle for infiltration into nasal mucosa were used in endoscopic sinus surgery **(Bharangar and Sharma, 2001).**

Nowadays in FESS, after mucosal infiltration of 2% carbocaine with epinephrine, uncinectomy and middle antrostomy were performed without partial resection of middle turbinate when possible. Standard endoscopic anterior ethmoidectomy was made, opening the agger nasi and the ethmoidal bulla. When the posterior ethmoid was not involved by disease, surgical procedure is ended at this point. In case of CT opacifcation of the posterior ethmoid and/or sphenoid sinus, a posterior ethmoidectomy and/or sphenoidotomy was performed. Moreover, an enlargement of frontal recess was performed when the disease was also located in the frontal sinus. At the end of surgery, after irrigation with saline of the surgical site, nasal cavities allocated to the MeroGel® group were packed with MeroGel®, which was cut according to the size of the middle meatus and placed between the middle turbinate and medial wall of the maxillary sinus (**Berlucchi et al, 2009**).

Although FESS can be a safe procedure that can provide substantial relief for symptomatic patients, there are multiple risks that accompany the procedure. Given the proximity of the operative field to the skull base, eye, and major blood vessels, the risk of injury is always present. Minor complications of surgery include crusting, adhesions, septal perforation, mild bleeding, anosmia, nasal obstruction, and orbital penetration. More severe complications include orbital hematoma, injury to extraocular muscles, skull base penetration with resultant cerebrospinal fluid leak, carotid artery penetration, and death (**Bublik M et al ,2009**).

One problem the surgeon often encounters is that of post-operative adhesion occurring between the middle turbinate and the lateral nasal wall in the region of the ethmoid sinuses ***(Ramdan, 1999).***

If severe adhesions occur, the recurrence of symptoms is often due to these synechiae, and further surgery may be required to restore normal function.

Various surgical approaches, as well as the use of systemic drugs and site-specific barriers have been used to minimize inflammation and injury during surgery so as to reduce the risk of adhesion formation ***(Gupta and Motwani, 2006).***

Prevention of scar band formation begins at the outset of surgery with the use of meticulous atraumatic technique from the moment the intranasal injection is given to the end of the operation.

Any bony spicules without mucosal covering should be removed completely, and surgery should be limited to those structures involved with disease. (***zara and satish ,2010)***

Although some authors have considered a middle turbinectomy to alleviate scar formation, others have found this technique to either worsen the condition by having the middle turbinate remnant scar over the frontal recess, or they have found that removing this structure can lead to further nasal complaints. (***zara and satish ,2010)***

Many surgeons now opt to leave the middle turbinate intact and place a small stent within the middle meatus to prevent lateralization. Some use a technique known as Bolgerization, which is to cauterize a point on the medial aspect of the middle turbinate and then a correlating point on the septum to facilitate scarring of the middle turbinate to the septum.

Others will suture both middle turbinates through and through to fix them medially to the septum bilaterally. Whichever method is used, the goal is the same: to prevent lateralization of the middle turbinate and scarring of the ostiomeatal complex.

Meticulous debridement in the postoperative period will have the greatest impact on prevention of synechiae formation, but if they are noted postoperatively, good topical anesthesia will allow for removal of these bands of scar tissue in the office (***zara and satish ,2010)***.

Mitomycin C (MMC) is a topical agent that has demonstrated clinical efficacy in the reduction of clinical scar formation ***(Kao et al., 1996).***

Initially isolated from the *Streptomyces caespitosus* strain of actinomyces for its antibacterial properties, MMC was used as a chemotherapeutic agent because of its ability to cross-link DNA and inhibit cellular mitosis.

Studies of MMC on cultured fibroblasts have demonstrated an antiproliferative effect at concentrations of 0.04 mg/mL and cytocidal effects at higher concentrations ***(Hu et al., 2000).***

A single 5-minute topical application has a measurable effect on cell proliferation and cellular morphology for up to 36 hours ***(Khaw et al., 1993).***

The success of MMC at reducing scar formation has been attributed to its ability to suppress fibrosis and vascular ingrowth ***(Kao et al., 1996).***

MMC has been used extensively to reduce scar formation associated with ophthalmologic surgery ***(Singh, 1988).***

Studies have also examined the efficacy of topical MMC for otolaryngologic procedures. Topical application of MMC inhibited laryngotracheal stenosis ***(Gupta and Motwani, 2006).***

Hu et al. (2000) examined the effect of MMC on cultured human nasal mucosa and found that brief exposure to MMC inhibits fibroblast proliferation and increases fibroblast apoptosis.

Studies showed that topical Mitomycin C applied to the middle meatus for 4 minutes at a concentration of 0.4 mg/ml results in fewer adhesions than the control side and causes no adverse effects **(Chan et al, 2006).**