EuropeanJournalofMolecular &ClinicalMedicine

ISSN2515-8260 Volume 09,Issue 06,2022

Original Research Article

Pediatric RhinosinusitisDiagnosis and Management

[1]Dr.MMeena Kumari,[2]Dr.Sowjanya Kumari

[1]Senior Resident,Govt ENT Hospital,Osmania Medical College,Hyderabad,Telangana, India
[2]Assistant Professor, Govt ENT Hospital,Osmania Medical College,Hyderabad,Telangana, India

Corresponding Author:
Dr. M Meena Kumari

Abstract:

Background: In children, an inflammatory illness known as paediatric chronic rhinosinusitis (CRS) can affect both the nose and the paranasal sinuses. The presence of two or more of the following symptoms, nasal blockage, face pain, purulent rhinorrhea or cough for at least 12 weeks is required in order to make a diagnosis of paediatric CRS.
Methodology: A prospective study was conducted in paediatric patients who presented with rhinosinusitis to a tertiary care centre in Telangana. There were a total of 30 cases with a study span of one year, from August 2019 to July 2020.
Results: In this study, a total of 30 children who were diagnosed with paediatric rhinosinusitiswere treated at our hospital were examined, 18 of these patients were male, which represents 60% of the total population and 12 of these patients were female, which represents 40% of the total population.In thisstudy,2 patients had preseptal cellulitis,3 patients had orbital abscess,1 patient had intracranial complicationand 1 patient had frontal osteomyelitis. Majority of patients were managed with medical management with intravenous antibiotics for 10 days.In the case of orbital abscess,drainage followed by orbital decompression done,neurosurgical intervention taken in intracranial complication case.
Conclusion: In uncomplicated paediatric CRS, medical therapy is still considered to be the first line of treatment, with surgical management being reserved for cases that are not adequately managed by medical management.

Keywords: Pediatric chronic rhinosinusitis,endoscopic sinus surgery,adenoidectomy,ABRS acute bacterial rhinosinusitis

Introduction

Pediatric chronic rhinosinusitis (CRS) is an inflammatory disease involving the nose and paranasal sinuses. The diagnosis of pediatric CRS is made by the presence of two or more of the following symptoms nasal obstruction, facial pain, purulent rhinorrhea, or cough for at least 12 weeks [1]. It should be noted that the addition of cough as a diagnostic criteria in pediatric CRS differs from that of adult CRS. Additionally, one objective clinical sign such asmucosal edema, purulent drainage or nasal polyps must be observed endoscopically and computedtomographic (CT) evidence of sinus mucosal thickening or osteomeatal complex opacification must be present.

Pathophysiology of paediatric rhinosinusitis

Understanding the embryologic development of the paranasal sinuses is crucial for the diagnosis and treatment of pediatric rhinosinusitis. For example, treatment of CRS in children below twelve years is different than children between 13 and 18 years due to differences in sinus growth. The ethmoid and maxillary sinuses develop in the 3rd month of gestation and are usually present at birth and display early growth, and reach adult size by the age of ten. The sphenoid sinuses are generally appreciable on imaging before 3 years of age, become aerated at age 5 years, and expand in size into the second or third decade of life, typically becoming fully developed by age 12-14.The frontal sinuses develop from an anterior ethmoidal air cell and are pneumatized by age 5 or 6 years. The majority of all sinuses will reach adult size by the age of 15 years with the frontal sinus, the last to develop, reaching adult size by19 years[7].The outflow tract of the maxillary sinus is situated at the most superior portion of the medial wall which makes gravitational drainage difficult.There are six anatomic drainage pathways from the sinuses-three for each side.The frontal sinus drains via the nasofrontal duct into the anterior superior nasal cavity.The maxillary and anterior ethmoid sinuses drain via a common area, the osteomeatal unit.The sphenoid and the posterior ethmoid sinuses drain via the sphenoethmoidal recess.Obstruction of any one pathway leads to sinusitis in the respective sinus areas.

Predisposing factors for rhinosinusitis

Local predisposing factors	Systemic predisposing factors
• Allergic rhinitis	• Immune deficiency
• URI	– IgA deficiency
• Anatomic abnormality:	– Panhypogammaglobulinemia
– Deviated septum	– IgG subclass deficiency
– Concha bullosa	– HIV
– Enlarged adenoids	• Cystic fibrosis
• Nasal polyps	• Ciliary disorder
• Tumor	• Wegener's granulomatosis
• Foreign body	
• Trauma	
• Barotrauma	
• Diving, swimming	
• Smoke	
• Topical decongestant abuse	
• Nasal intubation, Nasogastric tube(4,7)	

Aims and Objectives

1. To describe the etiology and clinical presentation.
2. To evaluate complications in pediatric chronic rhinosinusitis.
3. To evaluate management options for rhinosinusitis in children.

Materials and Methods

Prospective study conducted in paediatric patients presenting with rhinosinusitis.
No of cases 30.
Study period includes1yr i.e. august 2019 to July 2020.
Tertiary care centre in Telangana.

ISSN2515-8260 Volume 09,Issue 06,2022

Inclusion criteria

1. Patients with age group 5 to 14 yrs.
2. Patients who required both medical and surgical management.
3. Patients willing for surgery.

Exclusion criteria

1. Patients age >14yrs.
2. Patients who are not willing for surgical management.
3. Patients (attenders) who didnot give informed consent.

Results

All patients were subjected to detailed history, clinical examination,endoscopic and radiological investigations after taking consent.
In this study, 30 patients who presented to our hospital with paediatric rhinosinusitis were studied,among them 18 were male(60%) and 12 were female (40%).

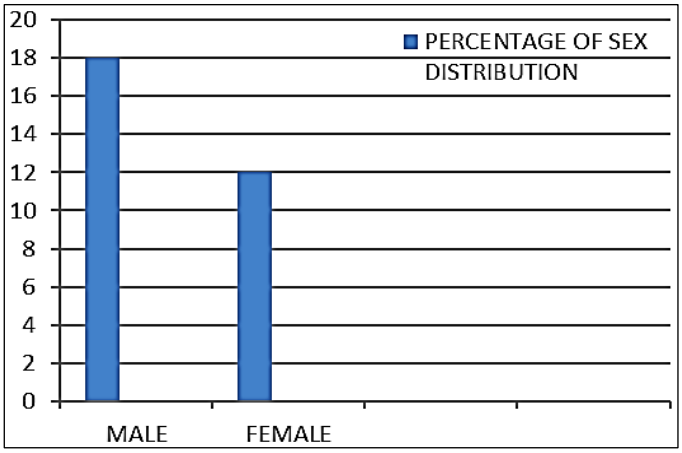

Fig 1: Sex Distribution

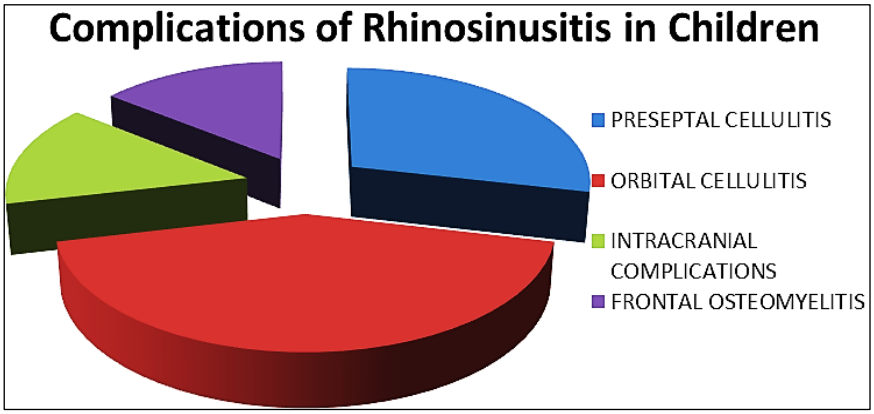

Fig 2: Percentage of Distribution of Complications of Rhinosinusitis in Children

In thisStudy,2 Patients had Preseptal Cellulitis,3 Patients Had Orbital Abscess,1 Patient Had Intracranial Complicationand 1 Patient Had Frontal Osteomyelitis.
Majority of Patients Were Managed with Medical Management with Intravenous Antibiotics for 10 Days.

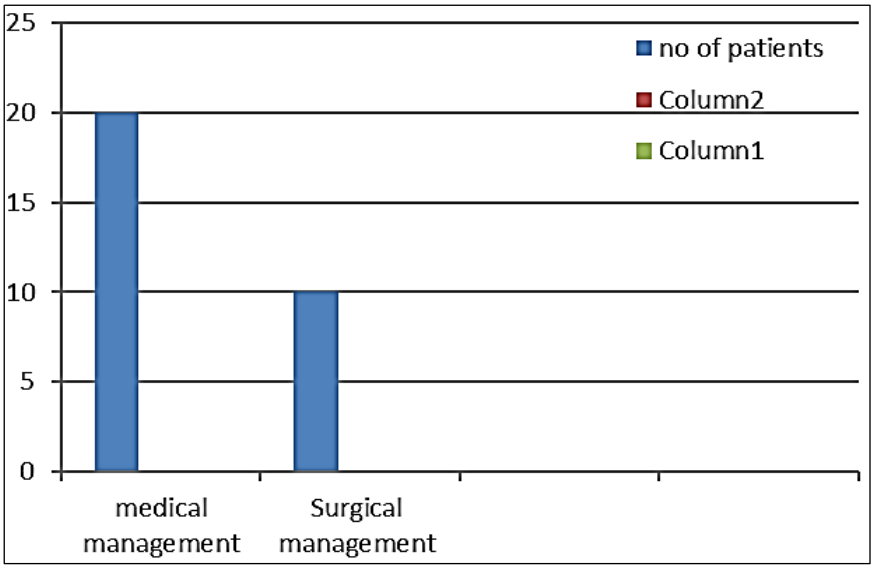

Fig 3: Percentage of Patients Who Required Medical and Surgical Management

In this study 20 patients (66%) patients required medical management,10 (34%) patients required surgical management.

Diagnosis

Pediatric rhinosinusitis is classified according to the duration of signs:acute (up to one month), subacute(one to three months) or chronic (more than three months).Acute bacterial rhinosinusitis is diagnosed in a child based on several criteria (persistent upper respiratory tract symptoms more than 10 days,cough or nasal discharge or both) or recurrence of symptoms after initial improvement: fever, worsening cough,or new purulent rhinorrheaor severe onset of symptoms like fever or purulent nasal discharge lasting more than three consecutive days associated with facial tenderness or headache[3]. Common pathogens involved in ABRS are *Streptococcus pneumonia*, *Haemophilus influenza*and *Moraxella catarrhalis*.Up to 5-10% of viral upper respiratory tract infections in children progress to ABRS[2,3], with a number of them developing into chronic rhinosinusitis. The presentation of viral rhinosinusitis is similar to ABRS and it is difficult to differentiate between them since they both have the same clinical and radiological findings.

Image 1: Endoscopic picture showing purulent discharge being drained during surgery

Nasal endoscopy

An examination of the nasal cavity can be performed by anterior rhinoscopy or endoscopy to assess the quality of nasal mucosa and the presence of purulent drainage. Although generally well-tolerated, anterior rhinoscopy often provides a limited view of the middle meatus and inferior turbinate. A nasal endoscopy should be performed in all children able to tolerate it for improved visualization of the middle meatus, sphenoethmoid recessand adenoids oronasopharynx[1,2]. Nasal polyps are uncommon in children and should prompt suspicions of cystic fibrosis (CF) or allergic fungal rhinosinusitis. Antrochoanal polyps are more commonly seen in pediatrics but are typically unilateral and isolated.

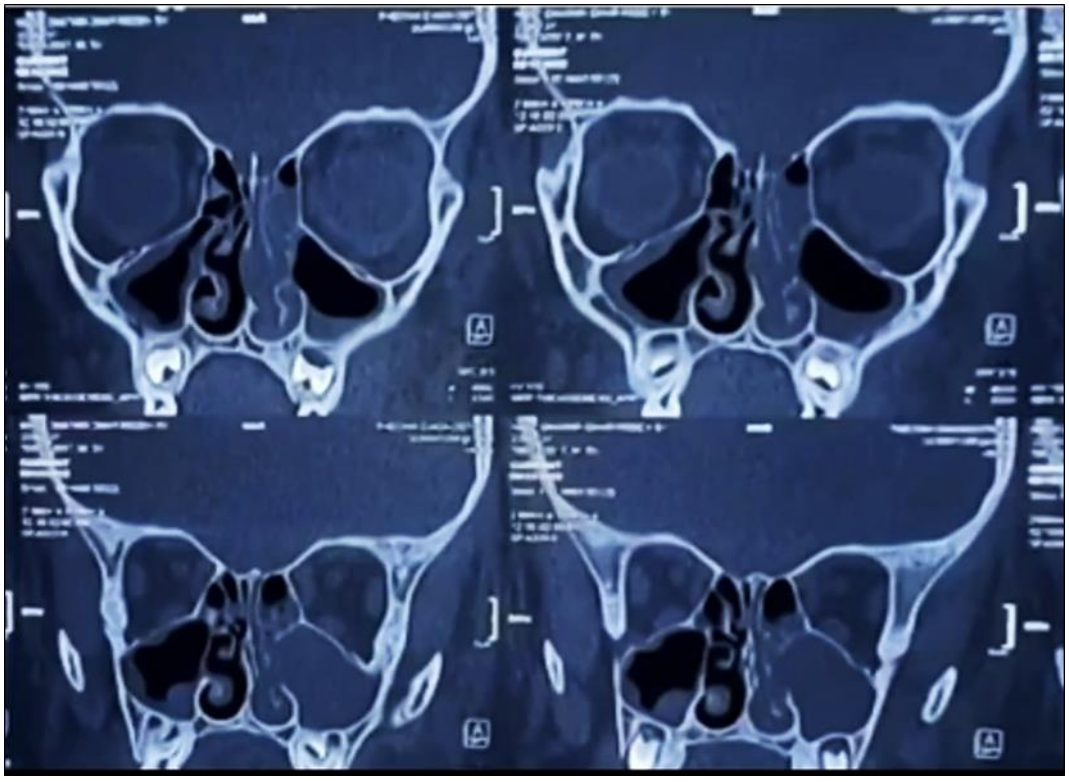

Image 2: CT Scan Showing Soft Tissue Density in the Ethmoid AMD Maxillary Sinus

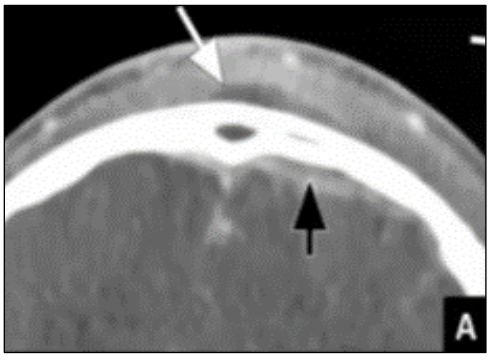

Image 3:CT Scan Showing Subperiosteal Abscess in Frontal Area

Imaging

Computerized tomography (CT) is the imaging of choice and both coronal and axial images are obtained. The limited coronal sinus CT scan allows assessment of osteomeatal unit patency and the anatomy of the sinuses.Use of contrast with the CT scan is usually reserved

for cases where abscess formation is suspected in either the orbit or the brain. Rim enhancement allows the improved detection of possible abscesses and facilitates the decision for surgical intervention if necessary. Three radiographic findings indicate sinusitis:air-fluid level, opacification (partial or complete)and 4-6 mm thickening of the mucus membrane.

Complications

The frontal and ethmoid sinuses are the mostcommon sinuses from which complications arise. Thedelicate and thin walls of the ethmoid sinuses, can allow for spread of infection into the orbit.Orbital complications are the most common. Signs of orbital infection include eyelid swelling, proptosis, and impairment of extraocular muscle movement. This complication may result from spread of infection through the natural dehiscences of the lamina papyracea,the bone that comprises the medial wall of the orbit or from transmission by venous thrombophlebitis across the same route. This leads to the development of a subperiosteal abscess of the orbit. The prevalence of orbital complications of ARS in children is higher in children than adults and has a more favorable prognosis [10]. Orbital complications are classified according to Chandler's Classification.

Classification

i) Preseptal cellulitis.
ii) Orbital cellulitis.
iii) Subperiosteal abscess.
iv) Orbital abscess.
v) Cavernous sinus thrombosis[11].

Image 4: Picture Showing Left Orbital Cellulitis-Most Common Complication

The mainstay of treatment starts with broad spectrum intravenous antibiotics. If the infection is not controlled, or there are any signs of decreased vision or compromise of the orbit, surgical drainage is recommended. The bony complication of acute frontal sinusitis is Pott puffy tumor, which is a subperiosteal abscess of the frontal bone[12].

Management

An acute attack of rhinosinusitis is usually self-limiting and recovers with symptomatic treatment and with minimal intervention. The nasal decongestants decrease mucus production and can be safely used for 5-7 days. Extended use beyond this period may lead to rebound vasodilatation and worsening of nasal stuffiness [16].Nasal saline irrigations, nasal steroids,

and topical cromolyn have been found to be useful. The saline irrigations assist to mechanically clear secretions, minimize bacterial and allergen burdenand improve mucociliary function [17]. Nasal steroidal or cromolyn drops or sprays improve symptoms in children with concurrent nasal allergy. Short burst of systemic steroids is employed preoperatively to minimize intraoperative blood loss in children with nasal polyp [18]. Antihistamines are beneficial in those with associated nasal allergy.

High-dose amoxicillin (90 mg per kg per day) should be considered as a first-line agent for the treatment of sinusitis because of its activity against sinus pathogens. Because the proportion of cases caused by Haemophilus influenza is likely increasing and the rate of B-lactamase production by this organism is also increasing,the addition of clavulanic acid to amoxicillin provides an advantage over amoxicillin alone. Using (90mg/kg/day) of the amoxicillin component provides better coverage for penicillin non-susceptible S.pneumoniae[3]. Cephalosporins, such as cefpodoxime, cefdinir, or cefuroxime, are alternative antibiotics,although they are less active against S pneumonia than amoxicillin-clavulanate. For those children in whom amoxicillin-clavulanate or second or third generation cephalosporins fail, a combination of cefixime (or cefdinir) and linezolid may be used as an alternative to the use of parenteral antimicrobial agents. For patients in whom beta-lactam antibiotics are contraindicated, respiratory fluoroquinolones (levofloxacin or moxifloxacin) or doxycycline may be used. Referenceto local antibiotic susceptibility patterns may aid in choosing appropriate therapy. Nasal saline irrigation should be considered as a primary treatment in pediatric CRS[13]. Moreover, culture-directed antibiotic therapy improves outcomes for pediatric CRS patients who have not responded to empiric antibiotic therapy [4].

Surgical intervention is not the mainstay of treatment of CRS and is only used in the presence of complications, in failure of medical treatment and in patients with suspected anatomic abnormalities[14, 5].

Adenoidal tissue acts as a bacterial reservoir in children with CRS regardless of their size and removing them improves outcomes[15, 9]. Adenoidectomy is highly effective as an initial surgical therapy in children aged up to 6 years, it has been found that the efficiency of this treatment decreases between the age of 6 and 12. However for older pediatric patients the panel could not reach an agreement[4].Tonsillectomy (without adenoidectomy) is ineffective treatment for PCRS [4].

Endoscopic sinus surgery in PCRS is performed in case of failure of medical management and/or adenoidectomy in controlling the symptoms of PCRS. CT scan of the sinuses is indicated before endoscopic sinus surgery in order to assess the anatomy of the sinuses and the severity of sinus disease [4].

Absolute indication of fess in children with rhinosinusitis

1. ABRS with complications.
2. Fungal rhinosinusitis.
3. Antrochoanal polyp.
4. Mucoceles,mucopyoceles.

Conclusion

The development of CRS in children is multifactorial with the adenoids comprising a larger role compared to adult CRS. Most common etiology being upper respiratory tract infections and adenoiditis.Most common complication being orbital cellulitis. Despite the risk of radiation,CT Scan is the imaging modality of choice for evaluation of PNS diseases becoz it is very sensitive at detecting mucosal inflammation and sinus x rays are not recommended.Medical therapy remains first line in the treatment of uncomplicated pediatric

ISSN2515-8260 Volume 09,Issue 06,2022

CRS with

surgical intervention reserved for cases not well controlled by medical management.

Acknowledgement

The author is thankful to the department of ENT for providing all facilities to carry out this work.

References

1. Brietzke S, Shin JJ, Choi S. Clinical consensus statement: pediatric chronic rhinosinusitis. Otolaryngol Head Neck Surg. 2014;151:542-553.
2. Fokkens W, Lund V, Mullol J, *et al*. EPOS 202: European position paper onrhinosinusitis and nasal polyps. Rhinology. 2012;50:1-12.
3. Chow AW, Benninger MS, Brook I, Brozek JL, Goldstein EJ, Hicks LA, *et al*. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. Clinical infectious diseases:an official publication of the Infectious Diseases Society of America.2012;54(8):e72-e112.Doi:10.1093/cid/cir1043.Large evidence-based guidelines and recommendations for acute bacterial rhinosinusitis.
4. Brietzke SE, Shin JJ, Choi S, Lee JT, Parikh SR, Pena M, *et al*. Clinical consensus statement: pediatric chronic rhinosinusitis. Otolaryngology-head and neck surgery:official journal of American Academy of Otolaryngology-Head and Neck Surgery.2014;151(4):542-53. Doi:10.1177/0194599814549302.This consensus report presents the recent updates concerning the diagnosis and management of CRS.
5. Wald ER, Applegate KE, Bordley C, Darrow DH, Glode MP, Marcy SM, *et al*. Clinical practice guideline for the diagnosis and management of acute bacterial sinusitis in children aged 1 to 18 years. Pediatrics. 2013;132(1):e262-80. Doi:10.1542/peds.2013-1071.
6. DeMuri G, Wald ER. Acute bacterial sinusitis in children. Pediatrics in review/American Academy of Pediatrics.2013;34(10):429-37.quiz 37. Doi:10.1542/pir.34-10-429. [Excellent review of the diagnosis and management ofacute bacterial rhinosinusitis].
7. Moore BM, Blumberg K, Laguna TA, Liu M, Zielinski EE, Kurachek SC. Incidental sinusitis in a pediatric intensive care unit. Pediatric critical care medicine: A journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies.2012;13(2):e64-8.Doi:10.1097/PCC.0b013e31820ac3f5. [This is the first study demonstrating the association between nasal instrumentation and sinusitis].
8. Abou-Hamad W, Matar N, Elias M, Nasr M, Sarkis-Karam D, Hokayem N, *et al*. Bacterial flora in normal adult maxillary sinuses. American journal of rhinology & allergy.2009;23(3):261-3. Doi:10.2500/ajra.2009.23.3317.
9. Anfuso A, Ramadan H, Terrell A, Demirdag Y, Walton C, Skoner DP, *et al*. Sinus and adenoid inflammation in children with chronic rhinosinusitis and asthma. Annals of allergy, asthma & immunology:official publication of the American College of Allergy, Asthma, & Immunology.2015;114(2):103-10. Doi:10.1016/j.anai.2014.10.024. [This is the first study demonstrating the inflammatory patterns both in adenoid and sinus tissues in children with CRS.] [PMC free article].
10. Al-Madani MV, Khatatbeh AE, Rawashdeh RZ, Al-Khtoum NF, Shawagfeh NR. The prevalence of orbital complications among children and adults with acute rhinosinusitis.Brazilian journal of otorhinolaryngology.2013;79(6):716-9.Doi:10.5935/1808-8694.20130131.
11. HealyGB, Chandler, *et al*.The pathogenesis of orbital complications in acute sinusitis.Laryngoscope. The Laryngoscope.1970;80:1414-1428; 1997;107(4):441-6.

12. Deutschmann MW, Livingstone D, Cho JJ, Vanderkooi OG, Brookes JT. The significance of Streptococcus anginosus group in intracranial complications of pediatric rhinosinusitis.JAMA otolaryngology-head & neck surgery.2013;139(2):157-60.Doi:10.1001/jamaoto.2013.1369.
13. Hong SD, Kim JH, Kim HY, Jang MS, Dhong HJ, Chung SK. Compliance and efficacy of saline irrigation in pediatric chronic rhinosinusitis.Auris, nasus, larynx.2014;41(1):46-9.Doi:10.1016/j.anl.2013.07.008.
14. Patel RG, Daramola OO, Linn D, Flanary VA, Chun RH. Do you need to operate following recovery from complications of pediatric acute sinusitis? International journal of pediatric otorhinolaryngology.2014;78(6):923-5.Doi:10.1016/j.ijporl.2014.03.008.
15. Neff L, Adil EA. What is the role of the adenoid in pediatric chronic rhinosinusitis? The Laryngoscope. 2015;125(6):1282-3. Doi:10.1002/lary.25090.
16. Lin CY, Cheng PH, Fang SY. Mucosal changes in rhinitis medicamentosa. Annals of Otology, Rhinology and Laryngology. 2004;113(2):147-151.
17. Georgitis JW. Nasal hyperthermia and simple irrigation for perennial rhinitis: changes in inflammatory mediators. Chest. 1994;106(5):1487-1492.
18. Marple BF. Allergic fungal rhinosinusitis: current theories and management strategies.Laryngoscope.2001;111(6):1006-1019.