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Review Article

Evaluation, complications and treatment of chronic rhinosinusitis

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ABSTRACT

Chronic rhinosinusitis (CRS) is a disease which commonly affects people of all ages and significantly impacts the quality of life. The clinical symptoms of CRS, which is defined by a chronic inflammation of the sinonasal mucosa, include persistent rhinorrhoea, nasal congestion, sinus pressure, and a diminished sense of smell that lasts longer than 12 weeks. CRS can be categorized into two groups: CRS with nasal polyps and CRS without nasal polyps. Inflammatory, environmental, and host factors are responsible for causing CRS although the mechanism is debatable. Diagnostic examination including anterior rhinoscopy, endoscopy or radiography, ideally from sinus computed tomography, can aid in confirmational diagnosis of CRS. The objective of the treatment is to improve mucociliary clearance, nasal drainage and outflow, reduce local infection and inflammation, and facilitate topical medicament access. Nasal saline irrigation and intranasal corticosteroid sprays are the first-line treatments. Antibiotics may be helpful for patients who have symptoms of a superimposed, acute active sinus infection. Endoscopic sinus surgery may be useful if medical therapy is ineffective. Referrals to otolaryngologists should be made for patients who are not responding to first-line medical therapy. CRS if not treated timely can further lead to complications including development of various diseases such as asthma breathing issues, smell disorders and certain bacterial and fungal infections. Effective treatment of the CRS is hence needed. The purpose of this research is to review the available information about evaluation, complications and treatment of CRS.

Keywords: Chronic, Rhinosinusitis, Nasal, Treatment

INTRODUCTION

Allergic rhinitis is an immunoglobulin E-mediated inflammation of the nasal mucosa in response to allergen exposure, clinical manifestations include rhinorrhea, itching, post-nasal drip, nasal congestion, and sneezing. Numerous illnesses, such as asthma, acute and CRS, and atopic dermatitis, are linked to allergic rhinitis. The prevalence varies among various geographical locations and approximate prevalence among adults varies from 7%

to 28%. The risk factors for allergic rhinitis include male gender, family history of allergy and atopy, maternal smoking in the first year of life, pet adoption and dust mite exposure, high socioeconomic classes, firstborn children, positive allergen-specific skin prick tests, high serum immunoglobulin E levels, and early antibiotic use.[1] Inflammation of the mucosa in the nasal cavities and paranasal sinuses that persists over time duration of three months is marked as CRS, a clinical illness with an estimated frequency of 10% in the Western world. Nasal blockage, nasal discharge, facial pain, or olfactory dysfunction are the symptoms that must be present subjectively for at least two weeks in order to be considered part of the syndrome. Objective verification of sinonasal mucosal inflammation via nasal endoscopy or diagnostic imaging is necessary because symptoms coincide with those of other frequent diseases.[2] All age groups are affected by CRS making it one of the most prevalent chronic medical disorders globally. As per incidence estimates 12.3% people in United States, 10.9% in Europe and 13% in China suffer from CRS.[3]

CRS is an extremely diverse illness that places remarkable cost burden on the healthcare system. It is caused by a confluence of inflammatory, environmental, and host variables, however the specific method by which each one contributes to CRS remains debatable. It has been proposed that allergies and abnormalities in the sinonasal anatomy raise the risk of CRS by causing persistent inflammation and blocking the sinus ostia.[4] CRS refers to a broad category of incapacitating chronic inflammatory sinonasal disorders. The expanding knowledge of the pathophysiology of the various phenotypes and endotypes is reflected by the shift in therapeutic recommendations over time. The cause of CRS is still not fully known, despite the fact that it has been the focus of extensive research. Microbes, abnormal inflammatory patterns, anatomical variations, the genetics underlying the innate immune system and epithelial barrier integrity and mucociliary clearance, hypersensitivity associated with asthma, hormonal imbalance, autoimmune disorders, and immunodeficiency are just a few of the many potential causative agents that have been researched.[5]

Initial assessment includes evaluation of the patient's symptoms and their influence on quality of life, as well as diagnostic imaging. Apart from the conventional classification of CRS which is CRS with nasal polyps and CRS without nasal polyps, more subtypes of disease are also researched. A more specialized and individualized therapeutic approach for the disease subtypes is being developed as a result of the greater understanding of the disease endotypes, which are identified by their inflammatory pathways and mediators.[6] Both preoperatively and postoperatively, topical corticosteroid therapy is a staple of the recommended treatment for CRS. First-line therapy also include standard intranasal corticosteroid sprays.[7] The purpose of this research is to review the available information about evaluation, complications and treatment of CRS.

LITERATURE SEARCH

This study is based on a comprehensive literature search conducted on October 26, 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about evaluation, complications and treatment of CRS. There were no restrictions on date, language, participant age, or type of publication.

DISCUSSION

For CRS, a dynamic model of chronic episodic disease has been developed. Particularly early in the disease course, chronic episodic diseases have periods of remission and relapse with longer symptom-free intervals; however, as structural changes take place such as inflammation in the sinuses or airways, symptoms may become less likely to remit and more likely to get worse over time. As per various studies, postoperative respiratory problems, steroid and antibiotic use, and CRS-related complications are worse the longer it takes from CRS diagnosis to sinus surgery. The severity of symptoms and radiographic findings are likewise linked to longer disease duration.[8] There are, however, few clinical therapy options available for patients with chronic sinonasal inflammation, in part due to the varied and poorly understood underlying pathogenic pathways. The chronic inflammatory and tissue-deforming processes that characterize CRS are thought to be influenced by changes in mucociliary clearance, anomalies in the sinonasal epithelial cell barrier, and tissue remodelling. The host's innate and adaptive immune systems are also highly active and may contribute to disease.[9]

Assessment and evaluation

The nasal cavity and paranasal sinuses are both affected by mucosal inflammation in CRS, which can have a wide range of different, sometimes overlapping, causes. Nasal polyps, anatomical mechanical blockage including septum/turbinate difficulties, and chronic allergic and nonallergic rhinitis are the most prevalent disorders that are linked to CRS. Inflammation, fungal or bacterial sinusitis with or without associated biofilm formation, gastroesophageal reflux, exposure to smoke and other environmental toxins, immune system deficiencies, genetics, and aspirin-exacerbated respiratory disease are some other less common etiologies. A history of symptoms such as congestion and/or fullness; nasal obstruction, blockage, discharge, and/or purulence; discolored postnasal discharge; hyposmia/anosmia; facial pain and/or pressure lasting for more than three months is very suggestive of CRS. If inflammation does not affect the middle meatus or ethmoid bulla, physical evidence of

mucosal edema or discharge observed during physical examination along with computed tomography imaging is required for a conclusive diagnosis. The diagnosis of CRS and the choice of treatment are complicated by multivariant causes. A structured approach to CRS diagnosis and management can assist to standardize and streamline care.[10]

Bhattacharya stated in his study that with a greater than 97% specificity and positive predictive value for CRS, the presence or absence of polyps was the most effective predictor of real CRS. Patients without considerable dental discomfort or those with significant dental pain and congestion but no obstruction were more likely to exhibit real CRS in the absence of polyps. Additionally, prior therapy with prolonged antibiotic courses indicated the existence of CRS even in the absence of polyps. Surprisingly, symptoms such as facial pressure, headache, nasal steroid use, antihistamine use, and other symptoms did not appear to have an impact on or contribute to the classification of patients as being in healthy or ill states.[11] Jian, Kern and Altman concluded in their study that based on histological results, CRS is a diverse disease. Light microscopy data that can be obtained but is often not reported can be useful prognostic indicators. Routine histological staining, however, performs poorly in identifying the various CRS subtypes. Although, analysing certain inflammatory mediators in sinus mucosa samples may assist predict outcomes and direct more individualized care for the patient.[12]

Treatment

Treatment for CRS with nasal polyps, the most severe type of CRS, can be difficult. Physicians all across the world use a wide range of clinical procedures, frequently with scant evidence to back up the use of current treatments. Oral steroids and topical nasal steroid sprays are the treatments for CRS with nasal polyps with the best evidence and recommendations. There is also solid evidence in favour of surgery, as well as pre- and postoperative oral steroids and antibiotics for at least two weeks. Other treatments, such as widely used methods like oral antibiotics, antihistamines, and immunotherapy, are not well supported by the available research. There are currently very few medications for this heterogeneous disorder that have evidence-based supporting data. It is likely that in the near future, clinicians will be able to design and develop medications using high-level data with better results owing to more in-depth understanding of CRS.[13] CRS in children is challenging to treat, leading to recurrent failures and recurrences. Similar to the disagreement over the precise origin of this condition, there are disagreements regarding the treatment. Antibiotics, topical nasal corticosteroids, and nasal lavage with saline solutions are the medical options; however, there is disagreement over the effectiveness of the last one. The majority of children who have been treated successfully with the novel balloon sinuplasty procedure, which restores sinus airflow with little tissue damage and danger. Adenoidectomy is one of the most common surgical operations performed on children when it comes to the surgical approach, but its therapeutic benefit is debatable because randomized studies have been unable to establish that adenoidectomy alone is adequate to treat CRS. Functional endoscopic sinus surgery, a less intrusive procedure, restores the patency of the sinus ostia and allows for the restoration of natural ventilation and drainage channels.[14]

The most effective medications for treating airway inflammatory illnesses like asthma, allergic rhinitis, and CRS are corticosteroids, which are the cornerstone of therapy. Endoscopic sinus surgery is only advised when all other options have failed. Medical care following surgery, including nasal and oral corticosteroids, is however, advised.[15] Although there is little evidence to support their effectiveness, oral corticosteroids are frequently recommended to treat CRS. Multiple studies have shown that oral corticosteroids are effective in improving CRS-related quality of life scores over short term, making its usage in patients with polyps more well-established. Because treatment regimens are brief as a typical one would be 30 mg of prednisolone per day for 2-3 weeks risk of side effects including adrenal suppression and bone mass loss is modest. Even with these brief courses, there is still a chance of experiencing adverse effects like insomnia and gastrointestinal problems. Patients should also be informed of the risk of osteonecrosis, which can develop at steroid dosages that were previously believed to be safe. For individuals who have not improved after trying saline irrigation and topical corticosteroids as a 1st line of treatment, oral corticosteroids are a feasible alternative because their benefits often last 3-6 months. Use of oral corticosteroids is limited to brief, infrequent courses, with full patient disclosure of any potentially dangerous adverse effects.[16]

Common pharmacological treatment includes reducing bacterial or pathogen load, reduce inflammation, and make it easier for mucus or purulent material to exit the sinonasal cavity. Biologic therapies that target particular inflammatory pathways linked to CRS subtypes have recently been discovered and tested. These biologic therapies may be used to treat a portion of CRS with refractory, poorly managed disease, as per preliminary findings. Additional research is required to determine which patients might benefit from biologic therapy the most and to evaluate the cost-benefit ratio of these medications.[17] Schawartz et al also concluded in their study that although immunomodulatory medicines have been developed for the treatment of CRS, they have not yet been widely used because further studies are required to clarify its function.[18]

Intranasal corticosteroids, antihistamines, and allergen immunotherapy continue to be the most effective therapies according to a review of pertinent clinical research in medicine and surgery. The first biologic to be licensed for CRS with polyps is dupilumab. In the future,

omalizumab, mepolizumab, and benralizumab may be used to treat CRS. Novel corticosteroid delivery systems, like a fluticasone exhalation delivery system and bioabsorbable sinus implants, offer improved and localized corticosteroid distribution. Clinical results in CRS with or without nasal polyposis are improved by surgical therapy that is targeted to the underlying disease process. More precise treatments have been developed as knowledge of the varied nature of rhinitis and rhinosinusitis has increased. Enhancing knowledge of various endotypes should make it easier to choose the best existing and novel treatments for these disorders.[19]

Complications

Comorbid disorders are frequently made worse by CRS, which affects the quality of life. Asthma, breathing problems while asleep, and smell disorders can all be caused by CRS. Deformities in the surrounding bone structures or the onset of allergic fungal rhinosinusitis might worsen CRS. Both morbidity and mortality are impacted by fungal complications. Coordination of multidisciplinary care is frequently needed for the treatment of these complication.[20] Findings from a longitudinal study revealed that adjusted hazards ratio=2.43, 95% confidence interval=2.10-2.80 for haemorrhagic stroke and adjusted hazards ratio=1.76, 95% confidence interval=1.61-1.92 for ischemic stroke; values were considerably higher in the CRS patients compared to the controls. Regardless of age or gender in the subgroup analysis, the CRS group's hazards ratio of haemorrhagic stroke was considerably higher. All CRS group subgroups experienced a significant increase in the hazards ratio of ischemic stroke. Regardless of age or gender, CRS consistently elevated the risk of both ischemic and haemorrhagic stroke.[21] Results of a retrospective cohort study showed that the overall incidence of depression throughout the 11-year follow-up was 1.51 times greater in the CRS group than in the non-CRS group among the 48 672 participants in the study population. Additionally, the CRS group had a higher incidence of anxiety than the comparison group did. An increased prevalence of anxiety and depression is linked to CRS.[22]

There are many comorbidities associated with CRS. It is unknown if these comorbidities cause CRS, are encouraged by CRS, or share a systemic disease process with CRS due to a paucity of long-term research studies. The likelihood of developing additional illnesses increases the burden of a condition that is already extremely difficult and may indicate that CRS either stimulates the development of additional illnesses or is a sign of systemic disease processes. Different patterns of association with diseases per CRS phenotype may be caused by restrictions on the size of the CRS with nasal polyps sample or represent various patterns of disease onset. The screening recommendations and treatment of CRS patients may be affected by these findings. For the incidence of upper airway diseases, such as adenotonsillitis, lower aerodigestive tract diseases, such as asthma, epithelial conditions, such as atopic dermatitis, and hypertension, CRS without nasal polyps cases were at higher risk than controls. The likelihood of obesity was higher in CRS with nasal polyp cases compared to controls, but they were not linked to other disorders.[23] Further research studies are however needed to determine efficacy of the treatments available also to develop new effective treatment modalities to improve the management of CRS.

CONCLUSION

CRS is prevalent disease significantly affecting quality of life. Though eliminating the underlying cause of CRS is still difficult, a multi-drug regimen and endoscopic sinus surgery after complete medical treatment can assist to lessen the disease's burden and enhance the quality of life among CRS patients also newer therapeutic strategies need to be validated with further research and clinical trials.

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