# Chronic Rhinosinusitis: Role of CT scans in the evaluation of paranasal sinuses

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## Abstract

Rhinosinusitis is a common condition seen in the United Kingdom and many other countries. Presenting symptoms can be varied and often vague. This review article aims to discuss the use of CT scanning in the investigation and assessment of patients presenting with these features.

# INTRODUCTION

Chronic rhinosinusitis is a commonly seen condition in the United Kingdom. A classification of rhinosinusitis symptoms has been described by The Task Force on Rhinosinusitis of the American Academy of Otolaryngology- Head and Neck Surgery. The major symptoms included facial pain or pressure, nasal obstruction, congestion, purulent rhinorrhoea and post nasal catarrh. The minor symptoms were headache, halitosis, fatigue, dental pain, cough and ear pain ( $_1$ ,  $_2$ ).

Although rhinosinusitis is frequently encountered, its diagnosis relies on clinical judgment based on a number of often vague physical complaints and symptoms such as facial pain, headache, postnasal catarrh and fatigue. Because of the inherent uncertainty associated with its diagnosis, more objective tools have been sought. Since the introduction of the rigid endoscope and computed tomography (CT) scan, a more objective data is obtained regarding the condition of the nasal mucosa and the presence of fluid or polyps.

The Royal College of Radiologist Working Party (<sub>3</sub>) said that plain radiographs have no place in the routine management of rhinosinusitis due to the low specificity and sensitivity compared to clinical and surgical findings. When comparing the forms of imaging, CT scan is the investigation of choice as it provides detailed information about the ostial anatomy. It is indicated when maximal medical treatment has failed, complications of rhinosinusitis or if malignancy was suspected.

Currently, CT scanning is the standard imaging in the

evaluation of the paranasal sinuses. It is also used as a tool to establish the severity of disease and response to treatment and surgery. Furthermore CT findings are an integral part of several severity staging systems mat are used for chronic rhinosinusitis ( $_4$ ). Despite the widespread use of CT scans, their true accuracy in the diagnosing of chronic rhinosinusitis is less clear. We would like to discuss some of the controversies on its role in diagnosing rhinosinusitis.

# DISCUSSION

Stammberger ( $_{s}$ ) and Kopp ( $_{6}$ ) postulated that variations in the anatomy of the nasal cavity result in obstruction and mucous stasis that can lead to infection. Other authors have also proposed these concepts to explain how anatomical variants such as concha bullosa ( $_{7}$ ) and pneumatized superior turbinate ( $_{s}$ ) might produce similar symptoms.

Therefore, are these anatomical variations found on CT scans significant?

Many surgeons would recognize that sinus disease is often associated with an anatomical variation such as a concha bullosa or a large agger nasi cell but these are also seen in healthy individuals .Numerous comparative studies have been done over the last few years. For example one study ( $_9$ ) reports a higher prevalence of concha bullosa in the symptomatic group compared to the asymptomatic group. However other studies ( $_{10,11,12}$ ) have found the prevalence of concha bullosa to be the same in both the diseased and control groups. Another study ( $_{13}$ ) also assessed the anatomical parameters of women's sinuses, airways and ostia and found that despite been smaller than those of men, there is no difference in the prevalence of rhinosinusitis in both sexes. Overall, with the current findings, anatomical variations have shown no consistent, correlation with the pathogenesis of rhinosinusitis.

Because of the importance of symptoms in the evaluation of chronic rhinosinusitis, a quantification of these symptoms would be useful in its diagnosis and management. Currently several scoring systems have been clinically validated ( $_{14}$ ) and other systems have quantified the disease seen on CT scans findings ( $_4$ ). Because these two sets of information are the primary modes of rhinosinusitis evaluation, it is important to define the relationship between the two. Unfortunately due to the lack of uniformity between the scoring systems, this has made it difficult to compare the results of different surgical techniques.

Hence which scoring systems should be used?

The classification and scoring system proposed by Lund and MacKay ( $_{15}$ ) is the most widely used because it is the most straightforward and can be done more easily compared to the others. This scoring system also includes symptoms, endoscopic appearance, anatomical variations and a surgical score.

Studies analyzing CT scans of asymptomatic patients have shown rates of incidental opacification as high as 40%. This has also been noted in studies performed in the paediatric population ( $_{16+17+18+19}$ ). The worry is that if this specialist investigation is over prescribed, the diagnosis of rhinosinusitis will be inappropriately made to many patients with incidental changes.

However, even when a patient has symptoms and CT scans shows signs of disease, the extent of the mucosal changes did not correlate with the extent of their symptoms. This was described by Bhattacharyya el al ( $_{20}$ ). CT has also not been shown to correlate to surgical findings ( $_{21}$ ).

Another cohort study looked at 973 consecutive patients of whom 101 patients had symptoms of facial pain but no endoscopic or CT evidence of disease. The 101 patients were followed up for a mean period of 2 years and 2 months. At the end of that period, after various treatment strategies, none of these patients were found to have pain attributable to sinus disease ( $_{22}$ ), Shields et al ( $_{23}$ ) also did not find any correlation between facial pain and sinus disease severity by CT scans

It is also worthwhile mentioning that patients with facial

pain are commonly diagnosed to have "sinusitis". This belief can be very misleading for the patients as there are non sinogenic causes for facial pain. In the same study ( $_{22}$ ), the author highlights the need for the surgeon to consider the neurological causes of facial pain especially if there is lack of evidence of sinus disease.

Apart from the controversies mentioned, CT scans of the paranasal sinuses do have an important role in the management of chronic rhinosinusitis. It is extremely useful in providing the "road map" prior to endoscopic sinus surgery ( $_{24}$ ). It also helps to diagnose atypical infections and malignancy ( $_{25}$ ). It also assists in managing complications of sinusitis with regards to whether there is intracranial or orbital involvement ( $_{26}$ ).

# CONCLUSION

The diagnosis and management of chronic rhinosinusitis continue to pose a great challenge to clinicians even though it is a relative common disease. The problem lies in the fact that we have to frequently rely on the patient's subjective symptoms, which can often be very vague, and only a few objective criteria. The effective management of rhinosinusitis is based on a thorough history, examination including a nasal endoscopy and aggressive medical treatment. Despite the evidence, CT scans of the paranasal sinuses will continue to be use as an adjunct in the diagnosis and management of this disease and its complications.

## References

1. Lanza DC, Kennedy DW. Adult rhinosinusitis defined. Otolaryngol Head and Neck Surg 1997,117(part2):S1-S7 2. Hadley JA, Schaefer SD. Clinical evaluation of rhinosinusitis: history and physical evaluation. Otolaryngol Head and Neck Surg 1997,1179(part2):S8-S11 3. The Royal College of Radiologist Working Party (1995). Making the best use of a Department of Clinical Radiology: Guidelines for doctors, 3rd Edn,pp.1-96. The Royal College of Radiologist, London. ISBN: 1 872599044 4. Lund VJ, Kennedy DW. Staging for rhinosinusitis. Otolaryngol head and Neck Surg 1997;117(part2):S35-S40 5. Stammberger H. (1991) Secretions transport. Functional Endoscopic Šinus Surgery pp. 17-46. 6. Kopp W, Stammberger H, Fotter R (1998). Special radiologic image of the paranasal sinuses. Eur. J. Radiol., 8.152-156 7. Blaugrund SM. Nasal septum and concha bullosa. Otolaryngol Clin North Am (1989); 22:291-306. 8. Clerico DM. Pneumatized superior turbinate as a cause of referred migraine headache. Laryngoscope (1996);106:874-879 9. Calhoun KII, Waggenspack GA, Simpson CB (1991). CT evaluation of the paranasal sinuses in symptomatic and asymptomatic populations. Otolaryngol Head and Neck Surgery. 104,480-483. 10. Bolger WE, Butzin CA, Parsons DS. (1991). Paranasal sinus bony variations and mucosal abnormalities: CT

analysis for endoscopic sinus surgery. Laryngoscope 101,56-64

11. Jones NS, Sirobi A, Holland I (1997). CT findings in 100 patients with rhinosinusitis and 100 controls. Clin. Otolaryngol, 22, 47-51.

12. Kayalioglu G, Oyar O, Govsa F (2000). Nasal cavity and paranasal sinus bone variation: a computed tomography study. Rhinol. 13,23-26

13. Lang J. (1989) Clinical anatomy of the nose, nasal cavity and paranasal sinuses, pp.1-144

14. Leopold D, Ferguson BF, Piccirillo JF. Outcomes

assessment. Otolaryngol Head and Neck Surg (1997);1179(part2):S58-S68 15. Lund V & MacKay V.(1993) Staging in rhinosinusitis. Rhinology 107,183-184.

16. Glasier CM, Ascher DP, Williams KD. Incidental paranasal sinus abnormalities on CT of children: clinical correlation. AJNR Am J Neuroradiol (1986); 7:861-864. 17. Diament MJ, Senac MO, Gilsanz V. Prevalence of incidental paranasal sinuses opacification in pediatric patients: A CT study. J Comput Assist Tomogr (1987).;3:426-431.

18. Havas TE, Motbey JA, Gullane PJ. Prevalence of incidental abnormalities on computed tomography scans of the paranasal sinuses. Arch Otolaryngol Head and Neck Surg. (1998);114:856-859.

19. Flinn J, Chapman NE, Wightman AJ. A Prospective analyses of incidental paranasal sinus abnormalities on CT head scan. Clin. Otolaryngol 1994;19:287-289.

20. Bhattachryya T, Piccirillo J, Whippold FJ. (1997). Relationship between patient-based descriptions of sinusitis and paranasal sinus CT findings. Arch. Otolaryngol Head and Neck Surg 123;1189-1192. 21. Jianetto DF, Pratt M F. (1995) Correlation between

preoperative computed tomography scans and operative findings in functional endoscopic sinus surgery. Laryngoscope 105:924-927.

22. West B, Jones NS.(2001). Endoscope negative, CT negative facial pain in a nasal clinic. Laryngoscope 111:581-586.

23. Shields G, Seikaly H, Le Bouef M, Guinto F, Pincus T, Calhoun K. (2003) Correlation between facial pain or headache and CT in rhinosinusitis in Canadian and US subjects. Laryngoscope 113, 943-945

24. Mason JDT, Jones NS, Hughes RJ (1998). A systematic approach to interpretation of CT scans prior to endoscopic surgery. J Laryngol Oto. 112,986-990.

25. Lloyd GAS (1998) Diagnostic Imaging of the Nose and Paranasal Sinuses.

26. Uzcategui N, Wraman R, Punt J. (1998) Clinical practice guidelines for the management of orbital cellulitis, J Pediatr Opthalmol Strabismus 35, 73-79.

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