

Role of High Resolution Computed Tomography Scan of the Temporal Bone in the Assessment of Ossicular Chain Status in Chronic Suppurative Otitis Media.

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Abstract

Introduction : Chronic Suppurative Otitis Media is defined as a chronic inflammation of the middle ear and mastoid cavity. It is classified into 1) inactive mucosal disease, 2) active mucosal disease, 3) inactive squamosal disease, 4) active squamosal disease, 5) healed chronic otitis media. Chronic otitis media with cholesteatoma is a locally invasive disease that requires surgical intervention for definitive eradication of the disease. High resolution CT Scans are widely used to 1) understand the anatomic information, 2) know the extent of disease, 3) relationship of destruction to the anatomical structures.

Aims and Objectives: To identify high resolution computed tomography (HRCT) scan findings of temporal bone in chronic inflammatory diseases of the middle ear ,to identify preoperative findings and to evaluate any correlation between scan findings and surgical and functional outcome of the surgery.

Materials and methods: This study was conducted on a group of 50 patients with Chronic Otitis Media. A thorough ENT clinical and otoscopic examination was done on all patients. HRCT scan was ordered and interpreted for all the patients. Surgical intervention was done. Post – operatively all the patients were subjected to pure tone audiometry and Health related Quality of Life Questionnaire in the pre and post operative period after 3 months to evaluate functional outcome.

Results: It was observed that 32% of the patients were aged between 11 – 20 years, male to female ratio was 2.1 : 1, erosion of the head and the handle of malleus were found in 34% and 10% on HRCT scan respectively. Incus body and the long process were found to be eroded in 26% and 62% of cases on HRCT scan and stapes suprastructure was found eroded in 36% of cases on HRCT scan.

Conclusion: This study supports the role of HRCT scan in all cases of chronic suppurative otitis media to know the status of ossicular chain for the best treatment strategy.

Keywords: Chronic Suppurative Otitis Media, ossicular chain status, High Resolution Computed Tomography scan and surgical technique.

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I. Introduction

Inflammatory diseases of the middle ear remain a significant global health problem in terms of prevalence, economics and sequelae. Chronic Otitis Media is very common in developing countries where poverty, ignorance , dearth of specialists and limited access to medical care increases its prevalence. Chronic suppurative otitis media is defined as a chronic inflammation of the mucosa, the middle ear and the mastoid cavity. Otorrhea through a perforation in the tympanic membrane is the most common presentation. This disease is usually classified into 1) Inactive mucosal disease, 2) Active mucosal disease, 3) Inactive squamosal disease, 4) Active squamosal disease (cholesteatoma) and 5) Healed chronic otitis media.

Chronic otitis media is a locally destructive disease that requires surgical intervention to achieve its eradication. Cholestatoma definitely needs to be addressed by surgery of different variations depending on the extent and type of the disease. Investigations to evaluate the disease include X-ray, polytomography, three dimensional computed tomography and magnetic resonance imaging, but the advent of High Resolution CT scans brought an emphatic enhancement in the pre – operative assessment of the pathology of temporal bone. HRCT is extensively used because it provides information on 1)the anatomy and its variations, 2) the extent of the disease in the middle ear cleft and pre – op localization of disease in hidden areas according to which surgery is planned and 3)the relationship between the severity of disease and amount of destruction.

The use of HRCT in the pre – operative evaluation of the patient with chronic otitis media is still controversial. While some otologists use it regularly others restrict its use only for cases in which there is a suspicion of complication, recurrence or doubt in diagnosis. This study aims to evaluate the role of HRCT in

planning for surgery, assessing the correlation between surgical and radiological findings of ossicular chain status and to assess the outcome of surgery in Indian scenario.

II. Aims And Objectives

To study the status of ossicular chain in the chronic inflammatory middle ear disease on a HRCT scan, confirm and correlate preoperatively and plan for surgery accordingly..

III. Materials And Methods

This study is a prospective study conducted on 50 patients who presented with clinical features of chronic otitis media and belonged to the age group between 5 and 70 years to evaluate the ossicular chain status both on HRCT scan and preoperatively. All the patients were subject to surgical procedures depending on the pathology and Pure Tone Audiometry after a minimum period of 3 months to evaluate the functional outcome.

IV. Observations and Results

In this study, erosion of the head and the handle of malleus were seen in 34% and 10% of cases on HRCT and 32% and 10% of cases intraoperatively respectively. The sensitivity of HRCT in detecting erosion of the head was 93.7% and 80% for the handle of malleus. While specificity for the head of malleus was 94.1% and for the handle of malleus was 97% with a high negative predictive value of around 97% for both. Incus body and long process erosion were studied which were detected in 26% and 62% cases on HRCT while it was found in 30% and 66% of cases intraoperatively respectively. HRCT was found to be having around 86% sensitivity for incus body and long process, while for incus body it was 100% sensitive and 80% specific for long process.

Stapes suprastructure erosion was found in 36% of cases in HRCT while during surgery actually was found only in 22%. False positive cases were 12 and false negative cases were 5 with the HRCT scan giving 54% sensitivity and 69.2% specificity in detecting stapes suprastructure erosion.

Out of all the ossicles, incus long process was the most common ossicle to get eroded and malleus was the ossicle whose integrity was predicted with greatest accuracy.

V. Discussion

Chronic suppurative otitis media has been an important cause of middle ear disease since prehistoric times. Radiological evaluation of the temporal bone was difficult owing to its complicated anatomic structure of the middle and inner ears. A major advance in the imaging of the ear structures has occurred with the development of High Resolution Computed Tomography (HRCT) scan.

In this study the head and the malleus were found to be eroded in 34% and 10% cases respectively with a total of 36% of patients having malleus erosion. This was similar to the study by T.Rai¹¹, where malleus was found eroded in 30% cases and higher when compared to a study done by Varshney S et al.¹², which showed a malleus erosion of 19.33%. This study quoted that HRCT was 80% sensitive and 97% specific in detecting the erosion of handle of malleus and 97% sensitive and 80% specific in detecting handle of malleus erosion.

The body of the incus was found eroded in 30% and long process in 66% of cases intraoperatively which is higher than the values in the study by T.Rai¹¹ but lower than in the study by Gaurano JL et al¹³. HRCT was 100% specific and 86.6% sensitive for body but 80% specific and 85.7% sensitive for the long process of incus which was similar to the values in the study by Garg Payal et al¹⁴, and also higher than the values reported by O' Donoghue et al¹⁵, but lesser when compared to values obtained in a study by Abdel Karim et al¹⁶, where sensitivity of 96% was reported.

This study demonstrated that HRCT was not accurate in demonstrating the integrity of stapes suprastructure with only 69.2% specificity and 54.5% sensitivity and with 12 false positive and 5 false negative cases. These values were higher than values when compared to those of the study done by Garg Payal et al¹⁴, where specificity was 26.67% and sensitivity was 40%.

VI. Conclusion

HRCT with a specificity of 95 – 100% and sensitivity between 85 – 95% well depicted the integrity of malleus and body of incus. Thereby from the results, this study supports the role of HRCT in all cases of chronic suppurative otitis media to know the status of the ossicular chain, which could alert the clinician and guide in the surgical approach and the treatment plan.

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