

RADIOLOGICAL DIAGNOSIS OF EXTERNAL AND MIDDLE EAR DISEASES BASED ON CLINICAL SIGNS AND SYMPTOMS WITH SPECIAL REFERENCE TO SOUTH INDIA

Radiodiagnosis

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ABSTRACT

To study radiological diagnosis of external and middle ear based on clinical signs and symptoms for the population of South India, descriptive research was conducted using more qualitative and some bit of quantitative study. The data sample of 250 patients who visit different health centers within the community was used for the study. The findings showed that middle ear infections are more prevalent than the external infections for the CSOM and EAC atresia respectively. The most complication of middle ear infection associated with CSOM was found to be scutum bony erosion with the frequency of 112 outcomes. The least complication of the middle ear infection is the bony erosion of superior plus posterior meatal wall with a frequency of 25. The imaging method mostly used in both cases of external and middle ear infection is the High-Resolution Computed Tomography (HRCT) whereas Computed Tomography (CT) scans are mostly used for diagnosis of external ear infections like EAC atresia.

KEYWORDS

CSOM, HRCT, CT, CSOM, EAC atresia

Introduction

Radiological diagnosis of external and middle ear diseases is very important in helping to find the critical and precise categorization of the disease severity and the choice of treatment method to use. The diagnosis is mainly made based on clinical signs and symptoms. Some radiological methods of disease diagnosis are available which can be used to choose the best treatment method based on the findings of diagnosis. Examples of radiological diagnosis available for use include CT scanning, Magnetic Resonance Imaging (MRI), and High Resolution Computed Tomography scan abbreviated as HRCT among others (Trojanowska et al., 2012). The following sections show the result of South Indian research study about some external and middle ear infections and the corresponding radiological diagnosis.

Methodology

This research study uses more of qualitative descriptive method and a little quantitative method to study the prevalence of middle and external ear diseases and their radiological diagnosis for the populations of South India. The study was restricted to data gathered from online sources with a sample size of 250 patients that visited different health centers with cases ear infections. Frequencies were used to describe the erosion of middle ear bony wall on HCRT imaging for patients affected by different type of bony wall erosion or complication. The cases of external ear infections are also described qualitatively using data collected via online sources.

Results

Infections of the external ear

Atresia in the external auditory canal

Atresia is the most widespread congenital lesion that affects external auditory canal. Osteomyelitis and malignant otitis are the inflammatory lesions that characterize the infection (Chatra, P. S. (2011). The lack of external ear canal is the defect in birth that is also featured by auricle deformity. The results of research carried out in South India showed that atresia in the EAC was the external infection of the ear that could at least be reported but in rare circumstances (Trojanowska et al., 2012).

Symptoms: The symptoms of EAC atresia include loss of hearing. The clinical assessment can also show narrowed or patent external auditory canal and malformed auricle. The sound also fails to reach the tympanic membrane thus explaining the reason for the loss of hearing (Trojanowska et al., 2012). Most of these symptoms were also were

also noted for most patients.

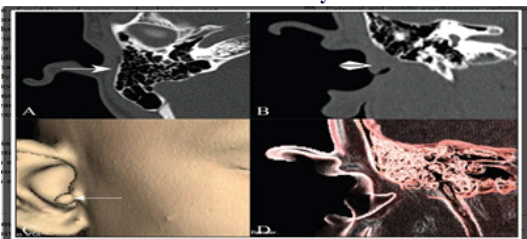
Suitable imaging method: The High-Resolution Computed Tomography (HRCT) is the method of choice for temporal bone (Jyothi & Shrikrishna, 2016). The study of imaging becomes a must because atretic EAC cannot permit visualization of tympanic membrane plus the structures of the middle ear. Therefore, HRCT becomes very useful in the evaluation of ear infections that involves EAC (Chintale et al., 2017, Bagul, 2016). The method is prominently used in South India for radiological diagnosis of patients who are victims of EAC atresia

Relevant clinical results: The results from radiological diagnosis are very important for precise categorization of disease severity and the plan for surgery. This involves selection of best patients that meets the condition of surgery through evaluation. The evaluation can be done by following a system of grading such that that consists of critical areas of anatomy for the temporal bone with every area having a rating point of 1 excluding the presence of straps which has two points. In this case, any patient with less than or equal to 5 points becomes non-surgical candidates. The rating of 8 points, on the other hand, implies the probability of resorting to normal hearing or levels that are near to normal (Trojanowska et al., 2012). The table below shows preoperative assessment of congenital aural atresia depending on high CT resolution results.

Structure Rating points	
Stapes present	2
Oval window open	1
Facial nerve	1
Middle ear space	1
Mastoid pneumatized	1
Incus complex	1
incus-stapes connection	1
External ear appearance	1
Round window	1

Table 1: Preoperative assessment of congenital aural atresia depending on high CT resolution results

Figure 1 below shows the atresia of EAC consisting of two parts A and B; Part A shows the atretic plate in the arrow direction that is well pneumatized through axial HRCT imaging. Part B shows bony atresia in the arrow direction (Chatra, 2011).

Figure 1: Atresia of the external auditory canal

Treatment options: Unilateral atresia is normally not treated in the case where one ear is functioning well. The surgical treatment is used for victims who are at the age of 5 to 6 years for the case of bilateral atresia. The reconstruction of the auricle is followed by the surgery of the middle ear.

Infections of the middle ear

The external ear can be infected by some diseases which manifests through signs and symptoms. Although it can be accessed through direct assessment, the imaging indications appear to be limited (Trojanowska et al., 2012).

Chronic Suppurative otitis media (CSOM)

CSOM is an infection of the middle ear that leads to loss of hearing and inflammation that is clinically featured by discharge from the ear, fever plus otalgia. The infection has remained a considerable problem for the population of South India regarding sequelae economic and its occurrence. Early recognition of the infection can help in its proper treatment and avoid its devastating long and even short-term sequelae (Bhalla, Singh & Jana, 2017, Uju, & Nosa, 2013, Chandrasekharayya et al., 2012).

Symptoms: CSOM symptoms include hearing loss with otorrhea being the most common symptom. Others include Scutum erosion, mastoiditis and mastoid, erosion of sinus plate, Cochlea and mastoid cortex, lateral semicircular erosion, observation of Cholesteatomas among others (Vallabhaneni, R., & Srinivasa Babu, C. R. (2016).

Suitable imaging method: HRCT of temporal bone and MIR can be used to recognize several results associated with the location and disease extent which are very significant in providing guidelines on the best treatment approach to take such as the surgical method of treatment. The method is majorly useful in the diagnosis and preoperative assessment of the location, type and the scope of the infection process to help in management planning (Anbarasu, Chandrasekaran & Balakrishnan, 2012).

HRCT is important in evaluating chronically discharging ear, particularly in looking for bone erosion plus ossicle integrity. It also has excellent spatial resolution hence better for complications which are intra-temporal. MIR, on the other hand, has been found to be useful in the evaluation of intracranial extension. MIR also has high resolution for a soft tissue when it comes to recognition of labyrinthitis. MIR also helps in the differentiation of granulation tissue, cholesteatoma, and effusion (Bhalla, Singh & Jana, 2017, Vallabhaneni, & Srinivasa Babu, 2016). The use of HRCT is also better than other conventional approaches of radiology such as X-ray which is characterized with the restricted capability of delineating the details of complicated temporal bone plus the anatomy of cochlea vestibular and pathology of the disease (Handi, Patil & Nisha, 2017).



Thinning of tegmen, left cavity of automastoidectomy with soft tissue density post auricular fistula.
Treatment option: The CSOM infection can be treated through surgical approach.

Findings And Conclusion

Findings

The atresia in the external auditory canal was found to be very rare among the population of South India. As such, the associated radiological diagnosis of HRCT imaging based on clinical signs and symptoms are rarely conducted. This means that patient population with infections of the external ear is rare to find. However, the following shows the description of research results depicting how the majority of victims in South India are affected by scutum erosion, followed by thinning of tegmen in consideration of middle ear infections (Chatterjee, Khanna & Talukdar, 2015). Out of the sample size of 250, it is evident that scutum erosion for bony wall has the highest frequency of occurrence for the middle ear infection at 112, followed by thinning of the tegmen for the bony wall at 47. The erosion of superior plus posterior meatal wall has the least number of occurrences.

Table 2

Erosion of middle ear bony wall on HCRT	
Erosion of bony wall	Victim frequencies
Scutum erosion	112
Tegmen erosion	34
Thinning of tegmen	47
Erosion of sigmoid sinus plate	32
Erosion of superior plus posterior meatal wall	25
Total	

Other external ear disease infection that affects people in South India were found to be external auditory osteoma. However, the disease is very rare as compared with external auditory atresia. Computed Tomography (CT) scan is used in this case to reveal the associated pathogens (Carbone & Nelson, 2012). Cholesteatoma is also part of middle ear infections that affects a good number of populations in South India apart from the above-mentioned infections. It is diagnosed through otoscopic examination and with surgery treatment. HRCT is used as an imaging method to show the status of the structure for the middle ear during diagnosis of Cholesteatoma (Rogha et al., 2014, Eshetu & Aygun, 2013). Another infection is the traumatic opacified middle ear which affects temporal bone due to the injury to the blunt head. HRCT is also used as a radiological diagnosis method for this infection (Lemmerling et al., 2008).

Conclusion

The diseases of the middle ear appear to more widespread for the South Indian population. In specific, CSOM is the most common infection that affects most patients in this community, resulting in hearing loss together with inflammation of ear discharge, otalgia, and fever. The most widespread type of complication associated with CSOM is the scutum erosion of bony wall. The external ear infections like EAC atresia is rarely reported among the population. High-Resolution Computed Tomography (HRCT) is mostly used as the imaging method for the diagnosis of CSOM while CT scan is used in to reveal pathogens associated with external ear infections like EAC atresia.

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