

Original Research Article

Clinical study of active squamosal chronic otitis media

Rashmi P. Rajashkhar, Rohit Anand*, Gundappa D. Mahajan, K. Gowtham, Parul Rathi

Department of Otorhinolaryngology, Dr. D. Y. Patil Medical College and Hospital, Pune, Maharashtra, India

Received: 05 March 2021

Revised: 28 April 2021

Accepted: 29 April 2021

***Correspondence:**

Dr. Rohit Anand,

E-mail: rohit.dr.infi@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Cholesteatoma term was coined by Johannes Muller in 1838. Cholesteatomas are the last stage of squamous epithelial retraction comprising either the pars tensa or flaccida that are not self-cleansing, which retain epithelial debris and elicit a secondary, inflammatory reaction. Active squamosal epithelial disease is a retraction pocket which is filled with keratinous debris.

Methods: 50 patients were selected presenting with active squamosal chronic otitis media (COM). For all cases a detailed history was taken, otoscopic and otomicroscopic examination along with tuning fork test were performed to know the status of tympanic membrane and status of air and bone conduction of sound waves. Audiological assessment was done by pure tone audiometry. X-ray mastoid and high-resolution computed tomography (HRCT) temporal bone was done for analysis. Pre anaesthetic fitness was taken and patients were posted for tympanomastoid exploration.

Results: Most common presentation was of foul smelling otorrhoea in 40 patients, reduced hearing in 40 patients. 8 patients presented with vertigo and 2 presented with facial nerve paresis. Most common otoscopic finding was pf postero-superior retraction pocket in 26 patients. After clinical and radiological assessment 30 patients were posted for canal wall down mastoidectomy.

Conclusions: Primary acquired cholesteatoma can affect all age group with significant effect on hearing and quality of life.

Keywords: Cholesteatoma, Active squamosal disease, Tympanomastoid exploration, Retraction pocket

INTRODUCTION

Cholesteatoma term was coined by Johannes Muller in 1838. Cholesteatomas are the last stage of squamous epithelial retraction comprising either the pars tensa or flaccida that are not self-cleansing, which retain epithelial debris and elicit a secondary, inflammatory reaction.¹

Active squamosal epithelial disease is a retraction pocket which is filled with keratinous debris. Annual incidence of cholesteatoma is 3 per 100000 in children and 9.2 per 100000 in an adult.²

Cholesteatoma is formed by a combination of tympanic membrane retraction and basal cell proliferation. There is

increased expression of MIB1 in the basement membrane of cholesteatoma.³ There is proliferating keratinocytes which is localized into small epithelial cones. Epithelial migration pattern is maintained until the retraction pocket deepens and drainage pathway becomes small leading to accumulation of keratin debris. This debris is infected leading to influx of inflammatory cells and production of cytokines.

Increased p53 gene proteins prevents cellular proliferation and promote apoptosis. There is an increase in inflammatory markers like Ki67, TNF, caspase 8 leading to increase cell death and accumulation of keratin. Once inflammation is initiated, there is an accumulation of fluid and inflammatory cells in the middle ear cavity, causing

conductive deafness and rarely secondary cochlear dysfunction through diffusion of cytokines through the round window.⁴ Cytokines, such as Tumor necrosis factor (TNF) alpha and interleukin-8 (IL-8), induce up regulation of mucin genes within the middle ear and the altered viscosity impairs mucociliary clearance.^{5,6}

Expansion of cholesteatoma is by increased expression of cytokeratin 13/16. Further invasion of the surrounding bone and tissues are promoted by the expression of cathepsin C, D and H and matrix metalloproteinases 9 enzyme.¹ Cholesteatoma can also be classified according to its topology - attic cholesteatoma: mixture of retraction and papillary proliferation; sinus cholesteatoma: involves postero-superior retraction or perforation of the pars tensa which extend into the tympanic sinus, and beyond; and tensa cholesteatoma: involves the retraction and adhesion of pars tensa and may also go on to involve the tympanic orifice of the eustachian tube.⁷

Aural complications of active squamous otitis media - subperiosteal abscess: mastoid cortex can be breached, most commonly at Macewens's triangle and pus accumulates under the periosteum, resulting in pain and post auricular swelling and tenderness; labyrinthine fistula: cholesteatoma, particularly of the postero-superior pars tensa variety, is the most frequent cause of lateral canal fistula; labyrinthitis: inflammatory process reaches the vestibule of cochlea via a fistula; and facial paralysis: presenting with an infranuclear facial paralysis.

Intracranial complication of active squamous COM - thrombophlebitis infection passes from the lining mucosa of the middle ear and mastoid thought intact bone by means of a progressive thrombophlebitis of small venules; meningitis was the most frequent intracranial complication in the pre antibiotic era, may result from infection spreading via retrograde thrombophlebitis, bone erosion, and pre formed pathways or via the labyrinth through the round and oval window; and brain abscess result of venous thrombophlebitis. Osteitis of granulation tissue causes retrograde thrombophlebitis of dural vessels that terminate in the white matter of brain producing encephalitis.

Treatment

The priorities are: complete eradication of disease, preventing recurrence of disease, and either preserve or restore hearing of the affected ear.

Surgeries

Canal wall up and canal wall down mastoidectomy.

METHODS

All patients fitting into the definition of active squamous COM and fulfilling the inclusion criteria were taken into study.

This prospective study was conducted with 50 patients between age group 10 to 50 years with active squamous type of chronic suppurative otitis media who were selected from outpatient department in otorhinolaryngology department of Dr. D. Y. Patil Medical College and Research Centre Pimpri, Pune; from September 2018 - August 2020.

All patients fitting into the definition of active squamous COM and fulfilling the inclusion criteria were taken into the study. Clinical diagnosis was established using detailed ENT examination. Otomicroscopic examination of the ear was done to improve upon our clinical findings. Audiological assessment was done by pure tone audiometry to know the type and degree of hearing loss. Routine blood test and urine tests was done.

X-ray mastoid (B/L Schuller's view) was taken for all the cases and HRCT temporal bone was done for all patients. Based on all this the patient was planned either for canal wall up mastoidectomy or canal wall down mastoidectomy after pre-anaesthetic fitness under general anaesthesia.

Inclusion criteria

Cases presenting with retraction pocket in attic and postero-superior quadrant of pars tensa with active squamous disease and patients ranged from 10 to 50 years presenting with active squamous COM were included in the study.

Exclusion criteria

Patients with age less than 10 years and more than 50 years, patients with congenital cholesteatoma, past history of ear surgery, and mucosal COM and adhesive otitis media.

Ethical approval

DY Patil, Pune, Institute Ethics Committee approval was obtained before the start of study.

Data analysis

No statistical tool (software) was used for the analysis of data.

RESULTS

The proportion of patients in the age group of 30-40 years was significantly higher than other age group.

Most common presentation was of foul smelling otorrhea in 40 patients, reduced hearing in 40 patients. 8 patients presented with vertigo and 2 presented with facial nerve paresis. Most common otoscopic finding was of postero-superior retraction pocket in 26 patients. The most common ossicle found eroded on HRCT temporal bone was that of incus only (56%) followed by erosion of incus

and malleus (36%). After clinical and radiological assessment 30 patients were posted for canal wall down mastoidectomy. Most of the patients presented with cholesteatoma in epitympanum (52%).

Most common ossicle found eroded intraoperatively was incus (64%). There were near equal presentation of patients with mild, moderate and moderately severe conductive hearing loss.

Table 1: Age of presentation.

Age (years)	Number	Percentage
15 -25	11	22
25-40	28	56
40-50	11	22

Table 2: Presenting symptoms of patients.

Symptoms	Total number
Foul smelling otorrhoea	40
Reduced hearing	40
Earache	8
Tinnitus	26
Vertigo	8
Facial weakness	2

Table 3: Presenting signs of patients.

Signs	Total number	Percentage
Attic retraction	22	44
Postero superior retraction	26	52
Aural polyps	2	4
Postero-superior retraction with facial palsy	2	4
Attic retraction with nystagmus	4	8

Table 4: HRCT temporal bone findings.

Erosion of ossicles	Number
Incus only	26
Incus+malleus	18
Incus+stapes	6
Erosion of tegmen plate	4
Dehiscence of fallopian canal	2
Erosion of Sinus plate	4
Erosion of lateral semi-circular canal	2

Table 5: Type of surgery undertaken.

Type of mastoidectomy	Number
Canal wall down mastoidectomy	20
Canal wall up mastoidectomy	30

Table 6: Extent of cholesteatoma.

Extent of cholestatoma	Number
Antrum	12
Epitympanum	26
Antrum with epitympanum	12

Table 7: Status of ossicles.

Status of ossicles	Intact	Eroded
Malleus	24	26
Incus	18	32
Stapes	40	10

Table 8: Degree of hearing loss.

Degree of hearing loss	Number
Mild hearing loss	14
Moderate hearing loss	16
Moderately severe hearing loss	18

Table 9: Type of hearing loss.

Type	Number
Conductive	28
Mixed	22

DISCUSSION

This study was conducted with the aim of clinical assessment of cholesteatoma in active squamosal COM. The population under study was scrutinized by following protocol of inclusion and exclusion criteria, with the result obtained in the study elaborated in the text. The maximum number of patients in our study was in the age group of 25 to 40 years with the youngest being 15 years and the eldest being 48 years, mostly belonging to low socioeconomic status. When we compare this to a study done by Khan et al, the average age in their study was between 11-20 years, slightly lower than average age in my study. This difference was probably due to the fact that our study did not include patients presenting with congenital cholesteatoma. The total number of ear in the study was 50 out of which 30 were male and 20 were female. Male to female ratio was 3:2. In a similar study done by Khan the male to female ratio was 2.33:1.⁸ The ratio from the said study roughly corresponds to my study. Thus we can safely conclude that there is no gender preponderance in patients presenting with cholesteatoma.

In our study, incidents of cholesteatoma was same for both right and left ears. the chief presenting complaint of patients presenting with cholesteatoma in squamosal COM includes foul smelling otorrhea in 40 patients, reduced hearing in 40 patients, otalgia in eight patients, tinnitus in 26 patients, vertigo in eight patients, an facial weakness in two patients. The quality of life was impaired due to the symptoms. On otoscopy 48 patients presented with retraction pockets out of which 26 had retraction of

posterior superior aspect of pars tensa and 22 presented with attic retraction. Two patients presented with aural polyp. In a similar study conducted by Shwetha et al, pars flaccida cholesteatoma was found in 45.5% of the patients whereas 33.3% patients had pars tensa cholesteatoma.

On clinical examination two patients presented with facial nerve paresis and four patients presented with nystagmus. Thus In total six patients presented with complication of cholesteatoma in our study. When we compare this do a similar study done by Shwetha et al, 21% patients were diagnosed with complication of cholesteatoma.⁹

Cholesteatoma in squamosal COM is diagnosed clinically with an otoscopic Examination of the ear followed by an otomicroscopic examination to improve upon the findings for the selection of correct treatment modality. Tympanic membrane retraction, whether in pars tensa or pars flaccida, presence of cholesteatoma flakes, status of this scutum may be seen through the oto microscope. Pure tone audiometry what's conducted in all patients who participated in the study, since PTA being an important indicator evaluating the hearing at initial presentation and hearing outcome after treatment. PTA was conducted pre operatively and six weeks after surgery. It must be noted that all patients had some amount of reduced hearing as was evident on PTA, however only 40 patients had reduced hearing as a chief complaint, that being 80% of all the patients. Out of total of 50 patients 28 patients had conductive type of hearing loss while 22 presented with mixed hearing loss. In patients presenting with conductive hearing loss, 14 presented with mild hearing loss, 16 presented with moderate hearing loss while 18 presented with moderately severe hearing loss. In comparing this to a similar study conducted by Khan et al, 19.9% patients had mild conductive deafness, 74.47% had moderate conductive deafness and 6.38% had severe conductive deafness.⁹

All the patients were investigated with high resolution computed tomography off temporal bone two understand the extent of disease, status of the ossicles, status of the fallopian canal, status of the tegmen tympani and the presence of any fistula. Out of 50 patients, 26 patients presented with erosion of long process of incus. 18 patients presented with erosion of long process of incus and handle of malleus while six patients presented with erosion of incus and stapes superstructure.

Erosion of tegmen was found in four patients where is erosion of fallopian canal was found in two patients. Sinus plate erosion was seen in four patients whereas erosion of lateral semicircular canal was seen in two patients in HRCT temporal bone. In a similar study conducted by Gaurano et al 92% patients had erosion of the ossicles with erosion of long process of incus seen in 48% patients, erosion of facial canal seen in 86%, and 75% presented with erosion of tegmen wall.¹⁰ In a study conducted by Shah et al in Surat, on 30 patients for role of HRCT temporal bone in pre-operative evaluation of

cholesteatoma, erosion of long process/body of incus was seen in 85.7% of cases whereas that of malleus was found to be in 45.7% of the cases. Stapes suprastructure was found to be eroded in 31.4% of the cases.¹¹ Thus we can safely conclude that long process of incus was the most common ossicle found eroded on HRCT temporal bone and it forms an important modality in management of active squamosal COM.

Considering the above symptoms and clinical findings patients were diagnosed to have actives, squamosal COM. They were planned for mastoid surgery under general anesthesia after getting preanesthetic evaluation done. Out of the total 50 patient 20 underwent canal wall down mastoidectomy while 30 patients underwent intact canal wall mastoidectomy.

Intra operatively, the extent of cholesteatoma, status of ossicles and status of fallopian canal was assessed. Careful exploration was done to look for any fistula in the lateral semicircular canal. Cholesteatoma was found extending into the epitympanum only in 26 patients while in 12 patients cholesteatoma wall extending into the antrum. 12 patients presented with cholesteatoma extending into the epitympanum and the antrum.

Intra operatively, the most common ossicle found eroded was incus with long process of incus being the most common part. It was found to be eroded in 32 patients. Malleus was eroded in 26 patients while stapes superstructure was found to be eroded in 10 patients. Fallopian canal dehiscence leading to exposure of the facial nerve was found in 16 patients. In a study conducted by Chan et al to assess facial nerve dehiscence at mastoidectomy in cholesteatoma, it was found out that 28.7% of the patients presented with facial nerve dehiscence and tympanic segment being the most common involved segment in 81.8% patients.¹²

In case of two patients presenting with facial nerve paresis, canal wall down mastoidectomy was performed and facial nerve decompression was done from the geniculate ganglion up to the stylomastoid foramen. Facial nerve was found intact throughout the course.

In two patients who presented with lateral semicircular canal fistula, intraoperatively it was found that they had type 1 lateral semicircular canal fistula i.e. with an intact endosteum. LSCC fistula closure was done using surdille flap.

Patients were discharged on postoperative day 7 after suture removal and with appropriate antibiotic cover and ask to follow up after six weeks at which time the year was examined for uptake of graft and status of the cavity. PT was also conducted for these patients at six weeks postoperatively.

Five patients who underwent canal wall down mastoidectomy presented with a discharging mastoid

cavity. They were subsequently asked to follow up every two weeks during which thorough cleaning of the mastoid cavity along with its inspection carried out. In long term follow-up of these patients the mastoid cavity was adequately healed and thus became dry.

Postoperative hearing of patients conducted at six weeks showed significant reduction in airborne gap in patients presented with conductive hearing loss. In 14 patients who had presented with mild hearing loss, there was significant reduction in the airborne gap up to 10 decibels. Those patients presenting with moderate hearing loss that is 16 patients the reduction in airborne gap what's found to be around 20 to 25 decibels while those presenting with moderately severe hearing loss that is 18 patients the reduction in airborne gap was found to be around 30 to 40 decibels. In patients presenting with mixed hearing loss there were significant reductions seen in the conductive component.

In long term follow up of patients presenting with facial nerve paresis, significant improvement was found in their muscular function and tone.

CONCLUSION

Primary acquired cholestatoma is the disease which can present in any age group with no gender preponderance with predilection for presentation in low socio-economic status. The presenting complaints of squamosal COM includes foul smelling otorrhoea, reduced hearing, otalgia, and complicated cases may present with vertigo and facial weakness.

The most common otoscopic finding is presence of retraction pocket in postero-superior portion of pars tensa and attic retraction.

The common audiometric finding is of a conductive hearing loss which gradually improved post operatively, following up at 6 weeks subsequently.

Tympanomastoid exploration is the ideal treatment in management of cholestatoma and depending on the extent of disease can either be canal wall up mastoidectomy or canal wall down mastoidectomy, which may be undertaken with ossiculoplasty to improve post-operative hearing outcome ultimately leading to a better quality of life.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Brown S. Chronic otitis media. Scott Brown's otorhinolaryngology head & neck surgery Vol-2. Pediatrics the ear skull base, 8th edition. CRC press, Taylor & Francis group, Boca Raton, London, New York. 2018;993.
2. Brown S. Chronic otitis media. Scott Brown's otorhinolaryngology head & neck surgery vol-2. Pediatrics the ear skull base; 8th edition. John C Watkinson, Raymond Clark; CRC press, Taylor & Francis group, Boca Raton, London, New York. 2018;981.
3. Semaan MT, Megerian CA. The pathophysiology of cholesteatoma; Otolaryngology Clinics of North America. 36th edition. Elsevier Saunders. 2006;1150.
4. Juhn S, Hamaguchi Y, Goycoolea M. Review of round window membrane permeability. Acta Otolaryngol. 2009;105(457):43-8.
5. Juhn S, Jung M, Hoffman M. The role of inflammatory mediators in the pathogenesis of otitis media and sequelae. Clin Exp Otorhinolaryngol. 2008;1:117-38.
6. Kerschner J, Meyer T, Burrows A. Chinchilla middle ear epithelial mucin gene expression in response to inflammatory cytokines. Arch Otolaryngol Head Neck Surg. 2004;130:1163-7.
7. Sudhoff H, Tos M. Pathogenesis of attic cholesteatoma: clinical and immunohistochemical support for combination of retraction theory and proliferation theory. Am J Otol. 2000;21:786-92.
8. Khan MA, Asaduzzaman A, Islam MT, Ahmed B, Hossain MK, Sumon MM, Rabbani S. Clinical Presentation of Cholesteatoma- A Study of 50 Cases. J Armed Forces Med Coll. 2017;13(1):66-70.
9. Shwetha. Surgical outcome in chronic otitis media with cholesteatoma. Int J Otorhinolaryngol Head Neck Surg. 2018;4:1376-82.
10. Gaurana JL, Joharjy IA. Middle ear cholesteatoma: characteristic CT findings in 64 patients. Ann Saudi Med. 2004;24(6):442-7.
11. Shah C, Shah S. Role of HRCT temporal bone in pre-operative evaluation of choesteatoma. Int J Med Sci Public Health. 2014;3:69.
12. Chan KC, Wang PC, Chen YA, Wu CM. Facial nerve dehiscence in cholesteatoma. Int Adv Otol. 2011;3:311-6.

Cite this article as: Rajashekhar RP, Anand R, Mahajan GD, Gowtham K, Rathi P. Clinical study of active squamosal chronic otitis media. Int J Otorhinolaryngol Head Neck Surg 2021;7:933-7.