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RESEARCH ARTICLE
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ASSESSMENT OF FUNCTIONAL AND SURGICAL OUTCOMES IN COMBINED APPROACH MASTOIDECTOMY FOR CHRONIC OTITIS MEDIA SQUAMOSAL TYPE.

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ABSTRACT:
Patients who need ossicular chain reconstruction, have recurring infections, or have large or complex cholesteatomas benefit most from Combined Approach Mastoidectomy. More accurate removal of diseased tissue, better preservation of the ear's architecture, and better results in terms of hearing restoration and recurrence prevention are all made possible by the dual access. The process is customized to the patient's pathology, with technique modifications made in response to the severity of the illness and the ear's anatomical characteristics.
Compared to conventional methods, this strategy has shown a notable decrease in cholesteatoma recurrence rates and enhanced hearing results. To reduce problems like facial nerve damage or lingering disease, it necessitates meticulous patient selection, thorough preoperative imaging, and proficiency with both techniques.
The combination strategy continues to develop with advancements in surgical technology, such as the use of endoscopy and intraoperative imaging, and provides a promising remedy for difficult ear diseases.

INTRODUCTION: A surgical procedure called Combined Approach Mastoidectomy (CAM) combines internal (trans-canal or endoscopic) and exterior (postauricular) techniques to treat complex ear diseases, especially chronic otitis media with cholesteatoma. When the illness process affects large or challenging-to-reach regions of the middle ear, mastoid, and adjacent structures, this method is intended to provide a holistic remedy. The likelihood of both disease eradication and hearing restoration is increased by CAM's twofold access to the ear, which improves the surgeon's capacity to remove abnormal tissue efficiently

while maintaining essential anatomical structures thus improving the chances of both disease eradication and hearing restoration.

In order to reach the middle ear and mastoid air cells, mastoidectomy is typically done by a postauricular technique. However, a prolonged or combined approach is frequently needed when cholesteatomas are big or have progressed to challenging areas like the petrous apex. The CAM procedure employs the transcanal route for precision work on the middle ear cavity and the external approach for accessing the mastoid and retroauricular regions. In more complex cases, endoscopic help might be used to enhance visualization and make it easier to remove disease from hard-to-reach places.

Patients with complex cholesteatomas, recurrent infections, or those in need of ossicular chain restoration have found the combination therapy to be especially successful. CAM lowers the risk of residual disease and improves long-term results by providing more flexibility and enhancing the surgeon's vision and access to vital areas. Furthermore, in contrast to conventional single-access techniques, it might result in superior hearing preservation.

Notwithstanding its benefits, CAM can be technically difficult, thus cautious patient selection and thorough planning are necessary. Moreover, it necessitates a deep comprehension of both conventional and sophisticated ear surgery methods, especially with regard to the treatment of vestibular, cochlear, and facial nerve systems. With the use of endoscopes and intraoperative imaging, among other technological advancements, CAM procedures are developing and providing patients with complex ear problems with ever more accurate and efficient treatment options.

MATERIAL & METHODS

Surgical Instruments:

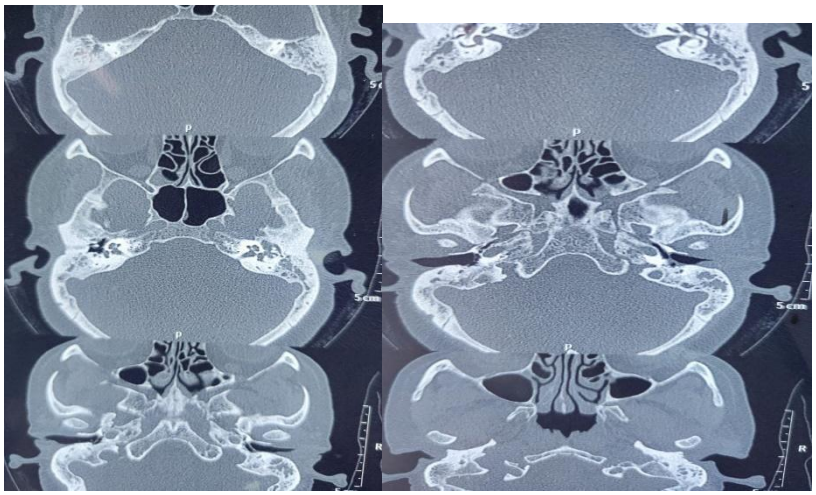
High definition Storz video camera system, Microscope Suction machine, unipolar cautery 3-4 mm endoscope with variable degrees as 0, 30,70, 2.7mm oto-endoscope 0 degree Sickle knife, circular knife, flag knife, elevator, Suction elevator, scalpel, artery forceps, allis forceps, mastoid retractors, scissors Bone curator, cup forceps, crocodile forceps, micro-scissors, ear picks Micromotor drill with burr of various sizes of both types diamond burr as well as cutting burr.

Surgical Equipment:

o Local anesthetics: Lidocaine, either with or without epinephrine, is commonly used for infiltration.
o General anesthesia: During a combined approach mastoidectomy, the patient is frequently sedated.
o Sutures: The retroauricular region is closed with absorbable sutures.
o Packing material: Post-operative packing to shield the surgical site or ear canal, such as cotton or gel foam.

Imaging (Preoperative):

o Temporal bone HRCT scan: Aids in illustrating the degree of illness in the middle ear, mastoid, and adjacent structures.
o MRI: To evaluate soft tissue involvement, an MRI may be utilized in specific circumstances.



HRCT temporal bone

Method (Step-by-Step Procedure):

1. Preoperative Preparation:

o Patient Positioning: To provide the best possible access to the ear, the patient is positioned supine with their head turned to the other side.

o Anaesthesia: The patient is put under general anesthesia.

o Sterilization: Antiseptic solutions such as iodine or chlorhexidine are used to clean and prepare the surgical site, which includes the ear and adjacent areas.

Pre op picture

2. Making the Incision:

To reach the mastoid, a postauricular incision is done. This incision is nicely hidden after surgery and offers a clear view of the mastoid cavity.

3. Mastoidectomy:

- The mastoid bone is gently drilled to reveal the antrum, mastoid air cells, and maybe the sigmoid sinus or facial nerve.
- Any cholesteatoma or contaminated tissue is removed by accessing the epitympanic space, which is located above the tympanic membrane.

4. Trans Canal Approach: (Using endoscope)

- The tympanic membrane, ossicles, middle ear space, and other deep structures can be accessed with the transmembrane method.

- To locate the important buildings and search for hidden places.

5. Excision of Disease:
- The middle ear and the mastoid cavity both remove the main pathology, such as a cholesteatoma, granulation tissue, or infection.
- To avoid recurrence, the sac is gently removed if a cholesteatoma is present. If necessary, this may entail removing certain ossicles in order to clear the illness.

6. Reconstruction (if applicable):
- To rebuild the ossicular chain and restore hearing, ossiculoplasty may be necessary.
- A myringoplasty may be used to restore the tympanic membrane if it has been perforated.

7. Closure:
- The mastoid cavity is filled with absorbable materials once the pathology has been completely removed.
- Sutures are used to close any ear canal incisions as well as the retroauricular incision.
- To support the surgical site, a mastoid dressing is put to the ear.

8. Postoperative Care:
- The patient is watched for indications of complications including infection or injury to the nerves in the face.
- Antibiotics are usually provided after surgery.
- To remove packing and track healing, including hearing status, follow-up appointments are planned.
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Intra op image **Post op image**

Aim and objective-

1. To assess the surgical results of a combined approach mastoidectomy with regard to the preservation of hearing and the removal of disease.
2. To evaluate the incidence of complications associated with CAM versus alternative mastoidectomy methods.

Study design: Case series

Sample size: 10

Inclusion

1. Patients diagnosed with squamosal COM.
2. Age: 18-65 years
3. Patient willing for surgery and follow-up

Exclusion

1. Active middle ear infections
2. Previous ear surgeries

Surgery performed: All patient underwent postauricular modified radical mastoidectomy using microscope to remove all the disease and then storz 0 degree endoscope was used through trans canal route to look for hidden areas, left over disease and look for vital structures. Also ossicular chain reconstruction, posterior wall , attic defect reconstruction and graft placement were done via transcanal route using endoscopic .
No post operative complication were noted.

OBSERVATION:

Age distribution:

AGE	NO. OF PATIENT	PERCENTAGE
10-20	0	0
21-30	2	20%
31-40	6	60%
41-50	2	20%
>50	0	0

Table 1: Out of 10 patients ,the most represented age group is 31-40, making up 60% of the sample. Both 21-30 and 41-50 age groups account for 20% each. There are no patients in the 10-20 or >50 age ranges.

Tympanic membrane status:

Tympanic membrane status	No. of patient
Attic retraction	5 (50%)
Posterosuperior retraction	3 (30%)
Attic perforation	1 (10%)
Atelectatic TM	1 (10%)

Table2: Amongst 10 patients, attic retraction was found in 5 patients contributing 50% of the sample. Postero-superior retraction was seen in 3 patients i.e 30%. Attic perforation was 10% and atelectatic TM was 10%.

Average hearing gain before and after:

Before surgery	After surgery
58.8db	42.1 db

Table3: Average hearing level was **58.8 dB**, indicating moderate to severe hearing loss pre-operatively. Post operatively hearing improved to **42.1 dB**, reflecting a gain of **16.7 dB** on average.

RESULT:

The range of age of 31-40 has the highest representation in the sample, accounting for 60% of the total. Each age group (21-30 and 41-50) contributes 20%. There are no patients aged 10 to 20 or above 50.
Attic retraction was seen in 5 out of 10 individuals, accounting for 50% of the sample. Three individuals had postero-superior retraction, accounting for 30%. Attic perforation and atelectatic TM were both 10%.

Attic Retraction Dominance (50%).
The most common result is attic retraction, which indicates substantial eustachian tube dysfunction and negative middle ear pressure. This syndrome is frequently a prelude to cholesteatoma development.

Posterosuperior Retraction (30%).
A significant majority of individuals exhibit posterosuperior retraction, which may indicate developing tympanic membrane disease or the danger of ossicular erosion due to localized middle ear alterations.

Attic perforation(10%) is typically caused by persistent infection or the establishment of a cholesteatoma. This low proportion indicates that there is minimal advanced or untreated illness in this group.

Atelectatic TM(10%) refers to significant thinning of the TM caused by continuous negative pressure and scarring. While uncommon, it suggests a possible development to adhesive otitis or ossicular fixation.

Hearing Gain Analysis in a sample of 10 individuals who underwent surgery:
Pre-operatively, the average hearing threshold was 58.8 decibels, suggesting moderate to severe hearing loss. Whereas, postoperatively , hearing improved by 28.4% (16.7 dB out of 58.8 dB) with an average gain of 16.7 dB with hearing threshold of 42.1 db
This gain shows a considerable improvement in auditory function, which is consistent with normal outcomes in tympanoplasty and mastoidectomy for comparable diseases.

DISCUSSION:
The age group of 31-40 is the most represented in the sample, accounting for 60% of the total. Each age group (21-30 and 41-50) accounts for 20%. There are no patients aged 10 to 20 or above 50.
The majority of patients (60%) are between the ages of 31 and 40, indicating that this age group is the most afflicted or likely to seek medical assistance for the illness being studied. Moderate representation is in the age groups 21-30 and 41-50. According to **Chrisanthus et[1]. al** in a study of patients undergoing MRM for cholesteatoma indicated that the median age of afflicted persons was about 39 years, with the majority of cases falling between the ages of 31 and 50. These results closely match the distribution of our sample.
Furthermore, results were found in a study done by **Chouhan et. al[2]**depicts that the frequency of severe illness in this age range may represent delayed detection or progression due to restricted early care. According to **Yusuf et al[3],** a total of 57 patients who underwent MRM included in this study consisted of 29 (50.9%) males and 28 (49%) females. The age of patients varied, ranging from 10 to 74 years, with a median age of 39 years.
Each age group in this study makes up 20% of the sample. This shows some frequency among younger and older persons in this range, albeit at a lesser level than in the 31-40 age group.
In this study, there is no representation in the extreme age groups (10-20 and above 50). According to a research done by **Mousumi Modhumita Agarwala et. al[4]**., the majority of patients receiving mastoidectomy were between the ages of 21 and 30 years old, accounting for 33.9% of cases, with a broader range of ages noted. This contrasts with our results, where the 31-40 age group was dominating at 60% which is in contrast to this study.
The lack of individuals in the 10-20 and >50 age categories in this study indicates either these populations may be less exposed to risk factors, or their health-seeking behavior changes. This study also emphasizes on the implications for healthcare focus because of their increased prevalence, the 31-40 age group may receive priority in healthcare resources and initiatives.
Harris et al[5] revealed in pooled review of mastoidectomy techniques for cholesteatoma that mean ages differed depending on surgical technique and site. For example, pediatric instances frequently bias towards smaller age ranges, but adults' distribution may peak in the 20s or

30s.n5 out of ten people, or 50% of the study, had attic retraction. 3 patients had postero-superior retraction, making up 30% of the total.Both attic perforation and atelectatic TM accounted for 10%. Studies with comparable findings in combined approach tympanoplasty demonstrate the variety of tympanic membrane diseases. For example, **Tshifularo et.al**[6] found that attic retraction and perforations were the most common concerns, with attic retraction frequently associated to chronic eustachian tube dysfunction. Similarly, posterosuperior retraction and atelectasis were seen but were less prevalent. The surgical approach and techniques, such as underlay or sandwich procedures, influenced results, with graft success rates ranging between 67-86%, depending on pathology and surgical management.

The pre-operative average hearing threshold was 58.8 dB, indicating moderate to severe hearing loss. Postoperatively, hearing improved by 28.4% (16.7 dB out of 58.8 dB) with an average gain of 16.7 dB and a hearing threshold of 42.1 dB.
Hearing gain averages of 16-20 dB have been observed following tympano-mastoidectomy, indicating successful closing of air-bone gaps post-surgery. This improvement is typically attributed to effective ossicular chain rebuilding and improved middle ear aeration.
Comparable studies like **Al Hamoud M et.al**[7] reveal preoperative hearing thresholds around 55-60 dB, increasing to 40-45 dB postoperatively, corresponding with our results of improvement from 58.8 dB to 42.1 dB.

Erkan Kaya et al[8]. discovered that utilizing an endoscope in conjunction with a microscope in congenital cholesteatoma cases reduced the risk of recurrence and residual disease by shielding the external auditory canal in patients with severe mastoid invasion.
The inside-out procedure allows for the safe evacuation of cholesteatoma from the epitympanum to the mastoid by a single-stage rebuilding of the ossicular chain. For this reason, we support our unique technique, which allows us to create the smallest cavity feasible for the size of the cholesteatoma. **Roth TN et.al**[9] findings show that the inside-out strategy is beneficial in the treatment of pediatric cholesteatoma.
BO Li et.al[10] concluded that EES reduced the residual lesion rate and postoperative recurrence risk in patients with middle ear cholesteatoma. However, there was insufficient evidence to prove that EES was advantageous in graft intake success rate auditory performance, and operation time. Combined approach mastoidectomy allows for more efficient disease removal while maintaining vital anatomical structures. In situations of ossicular chain reconstruction, recurring infections, and extensive cholesteatoma, this dual technique is especially helpful as it improves surgical results, lowers recurrence rates, and restores hearing.

Combined approach tympanoplasty has many benefits, but in order to reduce the risk of side effects such facial nerve damage or residual disease, it necessitates a high degree of surgical skill and cautious patient selection. CAM is anticipated to become a more useful instrument in otologic surgery as the technique develops further with technological breakthroughs like endoscopy and intraoperative imaging, boosting the accuracy and success of operations for intricate middle ear and mastoid disorders.
In a study by **Sajjadi H et.al**[11] Endoscopy performed during first procedures indicated a 22% incidence of concealed cholesteatoma "remnants" despite apparent 100% microscopic eradication in closed cavity cases and 10% in open cavity patients. Endoscopic removal of cholesteatoma remnants decreased long-term cholesteatoma "residual" to 9.7% in patients with closed cavities. Furthermore, endoscopic surgery greatly decreased the necessity to access the mastoids during second-look procedures.
Rong BG et.al[12] revealed , when performed with carefully selected patients, combined approach tympanoplasty was a practical surgical way to improve surgery results and patients' quality of life after the operation; nevertheless, modern equipment and excellent operation skill are required. With the potential to enhance long-term patient outcomes and quality of life, complementary and alternative medicine (CAM) presents a viable treatment option for challenging ear conditions when used properly.

Conclusion:

A major development in the surgical treatment of complicated ear disorders, especially chronic otitis media and cholesteatoma, is the Combined Approach Mastoidectomy (CAM). CAM offers improved access and imaging of difficult regions by combining conventional mastoidectomy with tran-scanal or endoscopic procedures. The joint strategy for the treatment of middle ear diseases, cholesteatoma, and chronic otitis media, mastoidectomy is a very successful surgical procedure. Combining endaural and transmastoid techniques allows surgeons to better expose difficult-to-reach ear regions, giving patients the best possible results. In order to avoid difficulties and guarantee long-term success, careful attention to surgical technique and postoperative management is crucial.

Conflict of interest: Dr. Vikas Patel (Author), Dr. Surendra Singh Moupachi (second author) ,Dr Pallavi Indurkar (third author) , Dr. Neeraj Dubey (Fourth author) Dr. Ankita Kujur (corresponding author*) declares that there is no conflict of interest.

REFERENCE:

1. Jaya Chrisanthus, Shibu George:Mastoidectomy: retrospective analysis of 137 cases in a tertiary care hospital International Journal of Otorhinolaryngology and Head and Neck Surgery Chrisanthus J et al. Int J Otorhinolaryngol Head Neck Surg. 2018 Jan;4(1):93-99
2. Anant chouhan et. al:Modified intact canal wall mastoidectomy technique in chronic suppurative otitis media: A prospective study of 50 cases. Indian Journal of Basic and Applied Medical Research; September 2014: Vol.-3, Issue- 4, P. 332-340
3. Yusof, A.N.M., Boon, W.J., Ali, A. *et al.* Outcomes of canal wall down mastoidectomy in cholesteatoma: a 5-year experience. *Egypt J Otolaryngol* **39**, 50 (2023).
4. Mousumi Modhumita Agarwala et al., Complications of Mastoid SurgeryJournal of Clinical and Diagnostic Research. 2024 Jun, Vol-18(6): MC01-MC04
5. Harris AT, Mettias B, Lesser THJ. Pooled analysis of the evidence for open cavity, combined approach and reconstruction of the mastoid cavity in primary cholesteatoma surgery. *The Journal of Laryngology & Otology*. 2016;130(3):235-241
6. Tshifularo, M. Tympanoplasty success based on surgeon and patient-reported outcomes perspectives: a 10-year review in a tertiary center. *Egypt J Otolaryngol* **38**, 15 (2022)
7. Al Hamoud M, Alzubaidi A, Al Shahrani K, et al. (February 28, 2024) Degree of Hearing Improvement and Reduction of Air-Bone Gap After Tympanoplasty in a Tertiary Hospital in Saudi Arabia. Cureus 16(2): e55159**.**
8. Kaya E, Kaya F, Kaya Mİ, Çaklı H, İncesulu ŞA. A study on the efficacy of combined surgery in advanced-stage congenital cholesteatoma with canal-wall-up surgery. Eur Arch Otorhinolaryngol. 2024 Nov;281(11):5747-5752.
9. Roth TN, Ziglinas P, Haeusler R, Caversaccio MD (2013) Cholesteatoma surgery in children: long-term results of the inside-out technique. Int J Pediatr Otorhinolaryngol 77(5):843–846.
10. Bo Li, Lingyun Zhou, Miaowei Wang, Yanwen Wang, Jian Zou, Endoscopic versus microscopic surgery for treatment of middle ear cholesteatoma: A systematic review and meta-analysis, American Journal of Otolaryngology, Volume 42, Issue 2, 2021, 102451, ISSN 0196-0709,
11. Sajjadi H. Endoscopic middle ear and mastoid surgery for cholesteatoma. Iran J Otorhinolaryngol. 2013 Spring;25(71):63-70. PMID: 24303422; PMCID: PMC3846264.
12. Rong BG, Chen WL, Ding YP, Ding SL, Xu AT, Chen Y, Wang TD. [Clinical study of combined approach of tympanoplasty and mastoidectomy with close technique]. Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi. 2005 Jun;40(6):449-51. Chinese. PMID: 16144344.