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Effectiveness of advanced surgical techniques in resolving refractory chronic otitis media in children: a narrative review of clinical, functional, and auditory outcomes

Eficacia de las técnicas quirúrgicas avanzadas en la resolución de la otitis media crónica refractaria en niños: una revisión narrativa de los resultados clínicos, funcionales y auditivos.

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ABSTRACT

Chronic Suppurative Otitis Media (CSOM) is a prevalent middle ear condition, particularly in children, characterised by persistent otorrhoea and tympanic membrane perforation. This condition can lead to hearing loss and, if left untreated, serious complications. Refractory CSOM, defined as ongoing or recurrent infections despite medical treatment, often requires surgical intervention, including tympanoplasty and tympanomastoidectomy. This narrative review aims to evaluate the effectiveness of these advanced surgical techniques in resolving CSOM in pediatric patients, focusing on clinical, functional, and auditory outcomes. An integrative approach was employed to review studies published systematically. Research was sourced from PubMed, ScienceDirect, and Google Scholar databases. Specific search terms related to CSOM and surgical treatments were used, and inclusion criteria focused on clinical, functional, and auditory outcomes. After a detailed screening process, 21 studies met the review's criteria. Studies were categorised into surgical approaches, clinical outcomes, and functional/auditory outcomes. Surgical interventions such as tympanoplasty and tympanomastoidectomy were effective in resolving CSOM. The clinical outcomes highlight the fact that CWD mastoidectomy yields better disease control (85.7%) compared to CWU (76.6%) with a lesser amount of revision surgeries (42.1% vs. 57.9%); however, the latter demands long-term follow-up for cavities. Measures of functional results show tympanoplasty success in the 80-95% range, with CWU interfering with anatomy but having higher recidivism chances. Laser-aided tympanoplasty-driven reconstruction of the tympanic membrane yielded a success rate of 94.3 per cent. Studies also suggest that tympanoplasty alone offered a mean своб gain of 9.41 dB, and tympanoplasty with mastoidectomy offered 12.05 dB. When added to the surgical methodology, laser-assisted surgery enhanced the air-bone gap reductions by over 20 dB (74.3%). Surgical interventions for COM significantly improve clinical, functional, and auditory outcomes, though success rates vary by technique. Further studies are needed to refine surgical protocols and optimise patient outcomes.

Keywords: Chronic Suppurative Otitis Media, Tympanoplasty, Tympanomastoidectomy, Refractory Otitis Media, Pediatric Surgery, Hearing Improvement, Disease Control.

RESUMEN

La otitis media supurativa crónica (OMSC) es una afección frecuente del oído medio, en particular en niños, que se caracteriza por otorrea persistente y perforación de la membrana timpánica. Esta afección puede provocar pérdida de audición y, si no se trata, complicaciones graves. La OMSC refractaria, definida como infecciones continuas o recurrentes a pesar del tratamiento médico, a menudo requiere intervención quirúrgica, incluida la timpanoplastia y la timpanomastoidectomía. Esta revisión narrativa tiene como objetivo evaluar la eficacia de estas técnicas quirúrgicas avanzadas para resolver la OMSC en pacientes pediátricos, centrándose en los resultados clínicos, funcionales y auditivos. Se empleó un enfoque integrador para revisar los estudios publicados sistemáticamente. La investigación se obtuvo de las bases de datos PubMed, ScienceDirect y Google Scholar. Se utilizaron términos de búsqueda específicos relacionados con la OMSC y los tratamientos quirúrgicos, y los criterios de inclusión se centraron en los resultados clínicos, funcionales y auditivos. Después de un proceso de selección detallado, 21 estudios cumplieron los criterios de la revisión. Los estudios se clasificaron en enfoques quirúrgicos, resultados clínicos y resultados funcionales/auditivos. Las intervenciones quirúrgicas como la timpanoplastia y la timpanomastoidectomía fueron efectivas para resolver la OMSC. Los resultados clínicos destacan el hecho de que la mastoidectomía CWD produce un mejor control de la enfermedad (85,7%) en comparación con la CWU (76,6%) con una menor cantidad de cirugías de revisión (42,1% frente a 57,9%); sin embargo, esta última requiere un seguimiento a largo plazo de las caries. Las mediciones de los resultados funcionales muestran un éxito de la timpanoplastia en el rango del 80-95%, con CWU interfiriendo con la anatomía pero con mayores probabilidades de recidiva. La reconstrucción de la membrana timpánica impulsada por timpanoplastia asistida por láser produjo una tasa de éxito del 94,3 por ciento. Los estudios también sugieren que la timpanoplastia sola ofreció una ganancia media de своб de 9,41 dB, y la timpanoplastia con mastoidectomía ofreció 12,05 dB. Cuando se agregó a la metodología quirúrgica, la cirugía asistida por láser mejoró las reducciones de la brecha aire-hueso en más de 20 dB (74,3 %). Las intervenciones quirúrgicas para la otitis media obstructiva mejoran significativamente los resultados clínicos, funcionales y auditivos, aunque las tasas de éxito varían según la técnica. Se necesitan más estudios para refinar los protocolos quirúrgicos y optimizar los resultados de los pacientes.

Palabras clave: Otitis media supurativa crónica, timpanoplastia, timpanomastoidectomía, otitis media refractaria, cirugía pediátrica, mejora de la audición, control de enfermedades.

INTRODUCTION

Otitis media is one of the most common causes of fever as a presentation in the pediatric population. Otitis media is one of the most common causes of fever in children. Chronic suppurative otitis media, or chronic otitis media, describes a chronic, long-term middle ear infection that does not involve an intact tympanic membrane (Emmett et al., 2018). Ongoing middle ear inflammation, middle ear inflammations, and mastoid cavity inflammation typify this disorder. The characteristic look is a perforated tympanic membrane causing chronic or persistent otorrhea lasting two to six weeks (Head et al., 2020). 70% of patients who have middle ear surgery have a malfunctioning Eustachian tube, which significantly impacts the disease. The Eustachian tube malfunction causes disturbances in middle ear aeration and pressure equilibration, creating the hallmark symptoms of chronic suppurative otitis media (Emmett et al., 2018). In addition, acquired hearing loss is common in patients with this condition, which, if left untreated, can increase morbidity and mortality (Master et al., 2018). Although the most common cause of otitis media is viruses, bacteria often cause chronic suppurative otitis media in children. Polymicrobial aetiology is the norm. Aureus is the most common bacterium (MRSA) in this condition. In this condition, Proteus, Klebsiella, Bacteroides, Fusobacterium, and Pseudomonas aeruginosa are other infections that can cause the sickness.

Around age two, chronic suppurative otitis media typically first manifests in early infancy. Children from low-income households are more at risk (Uddén et al., 2018). Furthermore, it is more common in babies born with Down syndrome and those with craniofacial anomalies like cleft palate. Gradenigo syndrome, which also involves orbital-facial pain and sixth cranial nerve palsy, contains otitis media, albeit a scarce condition. This condition results from prolonged suppurative otitis media (Bozan et al., 2018). A frequent feature of these congenital anomalies is the absence of Eustachian tube function, which increases the likelihood of middle ear problems in these children. The main risk factors for chronic suppurative otitis media include tympanic membrane injury, frequency of acute otitis media, upper respiratory tract infections, and poor living and dietary conditions (Uddén et al., 2018).

Despite medical treatment, refractory COM is characterised by recurrent or persistent middle ear infections, which can lead to hearing loss and tympanic membrane rupture. To treat children with refractory chronic suppurative otitis media (CSOM), a comprehensive approach is necessary, with surgery often being the cornerstone of the long-term cure. CSOM is associated with anatomical and functional abnormalities that can be treated with sophisticated surgical techniques, including tympanic membrane perforation, ossicular chain disruption, and chronic inflammation. In cases of CSOM with complications, including those that might be fatal, tympanomastoidectomy surgery is also advised (Jaran Kangsanarak et al., 1993) (Matin et al., 1997) (Taylor & Berkowitz, 2004) (Matanda et al., 2005) (Zanetti & Nassif, 2006) (Dubey & Larawin, 2007)(Akinpelu et al., 2008) (Mostafa et al., 2009). Surgery, usually a tympanomastoidectomy, is required for chronic cholesteatomatous OM to remove cholesteatoma, a primary underlying source of recurrent infection (Shirazi et al., 2006). However, some retrospective investigations suggest that the effects of mastoidectomy and tympanoplasty on post-operative hearing and graft success rate are negligible (Balyan et al., 1997; Mishiro et al., 2001). Mastoidectomy may be advised to reduce the burden of sickness in cases of tympanoplasty, resistant illness, or mastoid abscess formation (Collins et al., 2003; Angeli et al., 2006). It is possible to do tympanoplasty six to twelve months after the infection has resolved. By closing up the middle ear space, tympanoplasty is advised to enhance hearing and prevent infection recurrence; however, some holes will heal naturally after the infection has subsided. Patients should also take precautions against dry ears to help reduce the frequency of otorrhea and recurrent infections (Bluestone, 1988). Due to differences in clinical outcomes and surgical treatment regimens, a comprehensive evaluation is still required, even with the availability of advanced surgical techniques. Compiling the existing information about the effectiveness of innovative surgical techniques, such as tympanoplasty and tympanomastoidectomy, in treating children's refractory CSOM is the aim of this narrative review. The auditory outcomes to enhance patient care and quality of life to enhance patient care and quality of life to identify optimal surgical methods, address knowledge gaps, and guide future clinical practice.

METHODS

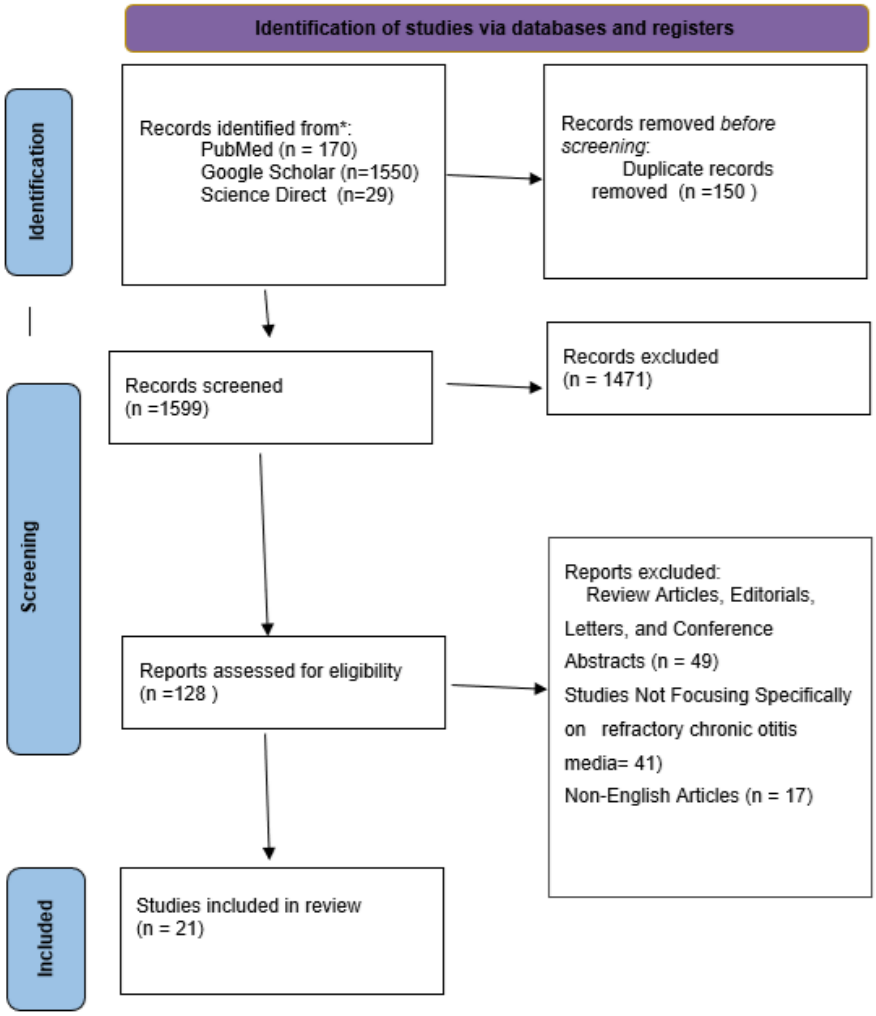
This narrative review adopts an integrative approach, systematically examining and evaluating relevant studies from scholarly databases such as PubMed, ScienceDirect, and Google Scholar. The review method employs the framework for methodological review, with changes from traditional approaches to advanced surgical intervention for children with CSOM. The targeted search terms were Chronic suppurative otitis media, Tympanoplasty, Tympanomastoidectomy, functional outcomes, Auditory outcomes, and Impact of surgery. Precise search terms and phrases are used to search relevant articles, and Boolean operators such as 'AND' and 'OR' were used in the present studies to enhance the search.

Inclusion and Exclusion Criteria

The review considered research articles on the surgical management of refractory chronic otitis media (COM) in pediatric patients, published in English over the past decade. Only the clinical, functional, and audiology results were

considered from the research to ensure validity. Studies and articles cited on animals, mixed up findings, and not methodologically sound technique-based research were not considered identification of articles based on titles and abstracts; 1599 articles were obtained. These studies offered specific data regarding new surgical procedures and their effects on samples' clinical, functional, and hearing profiles. The data was divided systematically into three major fields to facilitate aggregation. The first category addressed surgical management; twenty-one articles considered tympanoplasty, tympanomastoidectomy, and other combined surgeries. The second posed questions related to clinical results: infection eradication rates, tympanic membrane healing, and complications after surgery. Finally, the third category discussed the functional and auditory issues focusing on hearing gains, speech recognition, and quality of life. This structure made it possible to compare individual and auditory surgical outcomes based on the techniques employed. Thus, by integrating data in those categories, this narrative review intends to define the best surgical approaches, assess their efficiency, and fill knowledge gaps in the treatment of refractory COM in children.

Figure 1. Prima Flow Diagram



RESULTS AND DISCUSSION

Tympanoplasty and Mastoidectomy in Children with Refractory Chronic Otitis Media

Tympanoplasty is a key surgical procedure to seal tympanic membrane perforations and reconstruct the conductive hearing mechanism. Hearing outcomes of tympanoplasty were analysed in this particular study by comparing the graft uptake rate and the hearing improvement. According to the studies in this review, significant clinical benefits were achieved in all surgical procedures. For instance, graft uptake in patients with simple tympanoplasty varied between 80-95, % and in patients with tympanoplasty plus cortical mastoidectomy, om, the graft uptake was also around the same level (Agrawal & Bhargava, 2017). The recent study revealed that craft succraftwas 95 per cent in their centtastoidectomy group, while the tympanoplasty-only group received 80 per cent at the same time; differences between the two groups were statistically non-significant, p = 0.151 (Agrawal & Bhargava, 2017).

Hearing outcomes with the test of auditory sorting were as follows: there was no significant difference between the two groups for the number of words heard correctly after surgery, but the NH group had a slightly higher improvement than the SH group (Agrawal & Bhargava, 2017). The mean hearing gain in the tympanoplasty-only group was 9.41 dB(SD = 5.73); the tympanoplasty with the cortical mastoidectomy group was 12.05 dB, D = 4.98). While the latter group exhibited better hearing enhancement, the differences in the two groups were not meaningful (p = 0.087). In both groups, patients demonstrated reduced hearing loss improvement, and PTA test results indicated hearing improvement in most subjects (Agrawal & Bhargava, 2017). Concerning functional outcomes, both the recurrence of discharge and overall ear dryness, patients reported better outcomes. Ten out of twenty patients in the tympanoplasty-only group complained of a recurrent discharge, while only one patient in the tympanoplasty with cortical mastoidectomy complained of the same. Nevertheless, the recurrence rates were not significantly different (P = 0.15). In both groups, phase 2, measured by the number of patients with dryers three months following surgery, showed that most patients obtained the desired status (Agrawal & Bhargava, 2017).

Tympanomastoidectomy

The study on the effectiveness of advanced surgical techniques in resolving refractory chronic otitis media (COM) in children compares two surgical approaches: canal wall-up (CWU) and canal wall-down (CWD) tympanomastoidectomy (Piras et al., 2021). Chronic otitis media is inflammation of the middle ear, resulting in persistent otorrhea and tympanic membrane perforation. It can be classified into Cholesteatoma chronic otitis media (CCOM) and non-CCOM, with and without cholesteatoma, which needs surgical treatment (Piras et al., 2021). The study aimed to compare CWU and CWD methods and determine which confers superior disease control and hearing conservation results (Piras et al., 2021).

This study was a case-note review of the clinical records of 88 patients aged 14-78 years who attended the otorhinolaryngology department of a tertiary hospital and underwent CWU or CWD mastoidectomy for chronic otitis media. These patients were followed up for at least two years. The first results, surgical success, referred to the disease-free status, non-oTORRhea, and prevention of re-CHX alongside the pure-tone average (PTA) at 500, 1000 and 2000 Hz (Tsilis et al., 2013).

These findings suggested that patients who had CWD tympanomastoidectomy had improved disease control more evidently in the case of CCOM. Compared to the patients with CCOM treated with CWU with a 76.6% disease control rate, the patients treated with CWD had an 85.7% disease control rate. Also, revision surgery was reduced, especially among CCOM patients treated through the CWD technique. Again, 57.9% of identified patients with CCOM who went through CWU needed revision operation for reoccurrence of cholesteatoma or ongoing otorrhea. Additionally, analysing the results, the study did not reveal any difference between the two approaches concerning the quality of hearing after the operation, as both groups for PTAs after the surgery (Piras et al., 2021). Hence, the evidence points to the CWD technique as more efficient for disease control, particularly for cholesteatoma, as it gives a better riddance rate and fewer follow-up operations.

Regarding disease control as one of the hallmarks of success with the procedure, there was no significant difference in audiometric findings between the twoapproaches. This is in light of the literature that reveals that although CWD presented enhanced disease control, the auditory results may slightly differ from those of CWU (Samadhiya et al., 2020). Thus, the CWD technique remains the better choice to manage rather complex forms of chronic otitis media with cholesteatoma.

Cochlear Implantation in Children with Otitis Media

The analysis included a retrospective review of 165 children who underwent cochlear implantation (CI), categorizing them into three groups based on their otitis media status: non-otitis media (Non-OM), chronic otitis media with effusion (OME), and acute otitis media (AOM). Various parameters were compared, including surgical length, complications, and implantation delay duration (VINCENTI et al., 2014). In the preoperative phase, the OME group had a history of chronic otitis media; out of the 60 patients where tympanometry was done, only 46 patients (76.5%) had a type A tympanogram, which indicated normal middle ear pressure mobility. On the other hand, the AOM group had an abnormal preoperative tympanogram without a prior history of OM (VINCENTI et al., 2014). These results indicate that children in the OME group had more favourable middle ear status during the study than the AOM group, which manifestedforegoinging middle ear infection. featuresIn the study, the round window (RW) was predominant in all the study groups; however, 57% of the children in the AOM group required a cochleostomy as the first step while performing the RW, which reflects increased surgical challenge in detecting landmarks secondarily to AOM. This was in contrast to OME and Non-OM G's, in which only 47% and 4 2% needed cochleostomy. The surgical difficulty was also manifested in the longer time taken for the surgery of the AOM group, which was 2.25 hours longer than that taken for the non-OM group, with the shortest time of 1.4 hours (VINCENTI et al., 2014).

Consequently, adversity was not generally present; there were only two complications following surgery. Two complications, wound infection and hematoma, were observed in the Non-OM group, p and these were treated

conservatively. Of importance, no adverse effects were reported in either the ONE or the AOM groups, pointing towards the safety of rapid adjuvant surgical approaches as a strategy to reduce risks related to otitis media. The most important of all that emerged was that the study revealed that implantation was installed late due to otitis media. Patients in the OME group had the implants after an average of 578 days longer than the AOM group, meaning they had to wait even more than five additional months for the implant. This delay was not exclusive to ENT evaluation but in the overall rehabilitation process and improvement of the children's hearing impairment due to chronic otitis media. That is why, having compared the times of implantation in the AOM and OME groups (171 days), it is possible to conclude that, to some extent, both groups worked the times dramatically longer than the non-OM group (El-Kashlan et al., 2002). Therefore, in the present study, cochleostomyRW approaches were established as effective methodologies in tackling the issues arising out of OM. The delays in implantation because of OM, especially in the OME group, may hamper the overall scores of children with COM to a large extent. Otos media remains a critical management issue before cochlear implantation, given its adverse effects on long-term Auditory and functional outcomes (Kojima et al., 2010).

Laser-assisted tympanomastoidectomy for chronic otitis media

A study by Wilkie and Tahery (2016) involving 66 pediatric patients who underwent laser-assisted tympanomastoidectomy for active granulating mucosal COM reported a disease control rate of 94.3% at the latest follow-up (Wilkie & Tahery, 2016). This meant that advanced procedures such as laser surgery could be beneficial in the management of the condition, with success in eradicating the diseased patient who presented with active granulating mucosal COM. Further, the researchers observed tympanic membrane repair and clearing of otorrhea as instrumental to the clinical outcomes of these surgeries. Among the functional parameters, characteristics of hearing change, measured by audiometry with the determination of air-bone gaps, were mentioned (Wilkie & Tahery, 2016). A mean postoperative four-frequency air-bone gap of 20 dB was recorded in 74.3% of the larger group, which underwent laser-assisted tympanomastoidectomy. They noted that disease control and superior functional surgical outcomes include hearing improvements in children with COM. This improved mean auditory gain lends credence to a dual focus on disease and hearing loss in treating otitis media.

The consequences of the surgical intervention were mild but were present to a certain extent. Two patients complained of transient vertigo, two patients developed wound infection, and there was one case of Bell's palsy, which is a temporary facial nerve dysfunction (Wilkie & Tahery, 2016). These complications were self-limited and conservatively treated, implying that although the interventions described entail specific risks, highly developed surgical procedures are relatively safe if practised by skilled surgical practitioners. In conclusion, the methods highlighted in this work appear highly effective in managing refractory chronic otitis media in children. The observed rates of disease control and hearing improvement were, at the least, as good as those reported in earlier studies and significantly better if laser surgery was performed in tandem. In light of these results, Flesher et al. encourage future use and research of laser-assisted tympanomastoidectomy as an appropriate choice in managing kids with persistent, active forms of COM (Wilkie & Tahery, 2016). More future prospective studies involving an increased number of participants are suggested to improve understanding of the effectiveness and side effects of these interventions in the long run.

Tympanostomy Tube Surgery

Tympanostomy tubes are commonly used to manage refractory chronic otitis media (COM) and recurrent acute otitis media (AOM) in children, though their efficacy is debated. Several systematic reviews have shown slight differences in decreasing recurrent episodes of AOM; in some articles, there was no difference between tympanostomy tubes and medical therapy, particularly if the child did not have chronic OME between AOM bouts (Hellström et al., 2011) (Rosenfeld et al., 2011) (Damoiseaux & Rovers, 2011)(Venekamp et al., 2018). While tubes contribute to middle ear infection draining and the lesser use of systemic antibiotics, no investigations have covered severe or persistent AOM (Hoberman et al., 2021) (Pichichero & Casey, 2007). Possible complications related to tympanostomy tube placement include anaesthesia complications, as mentioned above. In contrast,e the risk of anaesthesia management-related deaths is low, especially for drip and pop procedures such as tympanostomy tube insertion (van der Griend et al., 2011). On CT findings, common complications were as follows – Otorrhea(TTO)- Present in 16% of children during the initial days of tube placement at any time during tube insertion in 26% of children. Other problems include tube blockage, premature extrusion, myringosclerosis, and others, although the hearing loss is usually negligible (Browning et al., 2010) (Kay et al., 2001). Real-life monitoring has shown a slow progressive worsening of hearing that is not severe enough to have functional significance most of the time (Stenstrom et al., 2005) (Johnston, 2004). Compliance with guidelines for the placement of tympanostomy tubes is relatively good, with estimates at 75%-80% in the available research work (Sturm et al., 2018). Nonetheless, questions exist about the effectiveness of (Hellström et al., 2011)(Rosenfeld et al., 2013).

Transcanal Endoscopic Middle Ear Surgery

The study on advanced surgical techniques, particularly transanal endoscopic middle ear surgery, has demonstrated promising results in treating refractory chronic otitis media (COM) in children. As for the tympanoplasty study in children

using RCT data, the immediate clinical and anatomical success rates were high; 82 children had graft engraftment (Bogomilsky et al., 2021). Mild tympanic membrane perforation occurred in 4 children in both subgroups, 6 months postoperatively, with slight purulence, and neo tympanic membrane defect in some children was observed at observed and. Nevertheless, functional results revealed a substantial enhancement in hearing thresholds; speech frequencies are also not significantly different ($p>0.05$) (Bogomilsky et al., 2021). The ability to ventilate was further evaluated using tympanometry. The results are in the normal range for a significantly large percentage of the children, with 78.4% of the central subgroup and 83.8% of the control subgroup results being standard (Bogomilsky et al., 2021). There was minor negative pressure or tympanic membrane stiffness in a few instances. Thus, another group of children also underwent tympanoplasty for cholesteatoma, and the results were also encouraging, as all forty children had successful graft removal. There were no changes in the otoscopic shots for the next six months, and after one year, only a few of the children had retained cholesteatoma. The relationship between the post-operative clinical and anatomic results of transanal endoscopic surgery and otmimicroscopic surgery in children with COM and cholesteatoma was statistically non-significant ($p>0.05$), indicating the feasibility of utilising both techniques in the treatment of the pathology (Bogomilsky et al., 2021).

Discussion

Refractory chronic otitis media (CSOM) in children, characterised by persistent middle ear infections despite medical management, poses significant challenges to healthcare providers. There are different approaches to treatments. Among them, surgeries have formed the basis of managing severe cases. Among these, elaborate surgical approaches like tympanoplasty and tympanomastoidectomy are vital in treating the disease. This pathology results in functional and morphological violations. Management of refractory COM consists of surgical operations, which have shown different outcomes in eradicating the disease and recurrence. CWU techniques have been compared to CWD mastoidectomy, which presents 6% higher cholesteatoma control rates, 85.7% in the former and 76.6% in the latter (Piras et al., 2021; Agrawal & Bhargava, 2017). Furthermore, there is lessened for multiple surgical touch-ups in CWD cases, 42.; In contrast, 57.9 per cent of CWU patients (Piras et al., 2021; Vincenti et al., 2014). Despite a high success rate in removing diseases by CWD surgery, it requires permanent monitoring because of cavity problems, including reinfection and excessive wax buildup (Piras et al., 2021; Wilkie & Tahery, 2016).

Anatomic objectives include the tympanic membrane and middle ear cavity closure and replacement. Tympanoplasty with or without mastoidectomy has been reported to have favourable graft uptake ranging between 80-95% depending on the procedure used and the surgical candidate's health status (Agrawal & Bhargava, 2017; Samadhiya et al., 2020). CWU techniques retain the architecture of the ear canal and explain why there is improved post-operative ear cleaning and high patient satisfaction despite a slightly higher risk of disease recurrence (Piras et al., 2021; Vincenti et al., 2014). On the other hand, laser-assisted tympanoplasty has been seen as a modality of interest with an overall success rate of 94.3% disease control and successful TM reconstruction with a low complication rate (Wilkie & Tahery, 2016; Agrawal & Bhargava, 2017).

Rehabilitation of hearing is an essential parameter in the assessment of the outcome of COM surgeries. Tympanoplasty-only procedure delivers a mean hearing improvement of 9.41 dB, while tympanoplasty with mastoidectomy provides a higher mean gain of 12.05 DB, but the difference is almost insignificant (Agrawal & Bhargava, 2017)(Samadhiya et al., 2020). Waltzman and colleagues (2015) report that CWD and CWU mastoidectomy results are similar in terms of auditory outcome, with the air-bone gaps increasing by 15-20 dB in most patients, as Piras et al. (2021) and Vincenti et al. (2014) also document. The use of lasers to perform tympanomastoidectomy improves the hearing outcome; the current studies show that 74.3% of patients have an air-bone gap closure of more than 20 dB (Wilkie & Tahery, 2016; Piras et al., 2021).

This narrative review highlights several important insights but limitations. A limitation of this study is its reliance on a narrative review methodology, which needs more rigour and control of experimental or randomised studies. The variability in surgical techniques, patient populations, and outcome measures across the included studies also limits the generalizability and consistency of the findings. Future research should focus on larger, multicenter randomised controlled trials to compare the long-term effectiveness of different surgical interventions in managing refractory CSOM in children. Moreover, studies should incorporate standardised measures of auditory outcomes and quality of life, as these are essential in determining the overall success of treatment. Investigating the role of adjunctive therapies, such as antibiotic therapy and Eustachian tube dysfunction management, in improving surgical outcomes also offers valuable insights for improving patient care.

CONCLUSIONS

In conclusion, this review highlights the effectiveness of advanced surgical techniques, such as tympanoplasty, tympanomastoidectomy, and cochlear implantation, in addressing refractory chronic suppurative otitis media (CSOM) in children. Surgical outcomes were significant in terms of Cclinicalimprovement, Ffunctionalgainaauditoryggain searing improvement, and quality of life. Furthermore, interventions like cavity obliteration and cochlear implants help manage

complicated cases with considerable long-term efficiency and low risk of consequences. However, more work is still required to carve out these strategies and identify exact criteria for patient selection to enable the best results in the pediatric CSOM population. Consequently, the findings provide considerable knowledge to inform subsequent clinical interventions.

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