

Exploring the Clinical Relevance of Mastoid Surgery in Safe Chronic Suppurative Otitis Media Management: A Comprehensive Evaluation

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Conflict of interest: Nil

Abstract

Introduction: The clinical relevance of mastoid surgery in the context of safe CSOM management is multifaceted. Firstly, it directly targets the underlying disease process by removing infected tissue, thereby reducing the bacterial load and promoting a healthier environment for the middle ear. Secondly, surgical intervention can significantly improve auditory function, which is a critical consideration given that hearing impairment can adversely affect communication and quality of life.

Materials & Methods: A cross-sectional study was conducted in which a total of 50 study subjects were selected based on purposive sampling. Based on the clinical diagnosis of dry and tubotympanic disease (Quiescent/Inactive) and the mastoid pneumatization status, patients were divided into two groups, all of whom exhibited normal Eustachian tube function. 25 patients underwent tympanoplasty categorized as Group A while the remaining 25 patients underwent tympano-mastoidectomy categorized as Group B.

Results: The study showed preoperative mean A-B gap in Groups A and B was (29.45 ±11.56dB) and (33.61±8.89dB) respectively. Postoperatively mean AB gap was (14.33±9.31dB) in Group A and (9.78±6.64dB) in Group B. Overall AB gap gain was (15.89±10.22dB) for Group A and (23.83±7.68db) for Group B. There was a significant improvement seen in the ABG in our study in patients who underwent tympano-mastoidectomy.

Conclusion: By addressing the underlying pathology and facilitating improved auditory function, mastoid surgery significantly enhances patient outcomes and reduces the risk of recurrent infections. While surgical intervention is not without risks, careful patient selection and individualized treatment plans can optimize benefits and minimize complications.

Keywords: Clinical Relevance Mastoid surgery, Chronic Suppurative Otitis Media.

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Introduction

Chronic Suppurative Otitis Media (CSOM) is a persistent inflammatory condition of the middle ear characterized by recurrent ear discharge and potential complications if left untreated. It remains a significant public health concern, particularly in developing countries, where it is associated with high rates of morbidity and can lead to severe complications such as hearing loss, cholesteatoma formation, and even intracranial infections. [1] The World Health Organization (WHO) estimates that over 330 million individuals globally suffer from CSOM, emphasizing the need for effective management strategies. [2]

Traditionally, the management of CSOM has included medical therapy, such as antibiotics and topical antiseptics, aimed at controlling infection and promoting healing. However, medical treatment alone is often insufficient for chronic cases, where surgical intervention becomes essential. Mastoid surgery, particularly tympano-

mastoid surgery, is a common surgical approach employed to manage CSOM effectively. [3] This surgical technique not only addresses the pathological changes in the middle ear and mastoid but also facilitates the restoration of hearing and minimizes the risk of recurrent infections.

The clinical relevance of mastoid surgery in the context of safe CSOM management is multifaceted. Firstly, it directly targets the underlying disease process by removing infected tissue, thereby reducing the bacterial load and promoting a healthier environment for the middle ear. [4] Secondly, surgical intervention can significantly improve auditory function, which is a critical consideration given that hearing impairment can adversely affect communication and quality of life, particularly in children.[5] Moreover, mastoid surgery is associated with lower rates of recurrence compared to conservative management alone, thus

emphasizing its importance in achieving long-term disease control. [6]

Despite the acknowledged benefits of mastoid surgery, its role in the management of safe CSOM remains contentious among clinicians. Factors such as patient age, the presence of cholesteatoma, and previous treatment history often dictate surgical candidacy. [7] Additionally, there are inherent risks associated with any surgical procedure, including anesthesia complications, postoperative infections, and hearing deterioration, which necessitates careful patient selection and informed consent. [8]

This comprehensive evaluation aims to explore the clinical relevance of mastoid surgery in managing safe chronic suppurative otitis media. By assessing current literature and clinical outcomes, this study seeks to delineate the indications, benefits, and potential complications of mastoid surgery, providing a clearer understanding of its role in enhancing patient care. As CSOM continues to present challenges in clinical practice, optimizing management strategies through evidence-based surgical interventions is paramount.

Materials and Methods

A cross-sectional study was conducted over the period of 6 months from March to August 2024 in the Department of Otorhinolaryngology in which a total of 50 study subjects were selected based on purposive sampling. All the patients presented with dry tubo-tympanic CSOM in OPD and willing to participate in the study were included after taking written informed consent from each patient.

However patients with previous history of ear surgery or patients with sensorineural hearing loss or mixed hearing loss or Patients presenting with cholesteatoma were excluded from the study. Patients with known case of chronic illness like diabetes etc., patients on immunotherapy were also excluded from the study.

All patients underwent a thorough assessment, starting with a detailed medical history followed by a comprehensive physical and ENT examination. A clinical diagnosis was then established. Subsequently, patients were subjected to routine investigations, including a Complete Blood Count (CBC) and urine analysis, along with specific diagnostic tests.

1. Audiological Tests: Pure Tone Audiometry (PTA) was performed using the ALPS Advanced Digital Audiometer AD2100 in a soundproof room.

2. Eustachian Tube Function: Tympanometry was conducted to evaluate Eustachian tube functionality.

3. Otomicroscopy: Patients underwent microscopic examination to verify otoscopic

findings, assess the middle ear mucosal status, evaluate middle ear epithelialization, and examine the attic region.

4. Radiological Assessments: All patients had X-ray imaging (Mastoid Schuller's view) to assess the pneumatization of the mastoid process. Findings were categorized as follows:

- Well Pneumatized (large mastoids)
- Diploic (small mastoids)
- Sclerotic (small mastoids)

Based on the clinical diagnosis of dry and tubotympanic disease (Quiescent/Inactive) and the mastoid pneumatization status, patients were divided into two groups, all of whom exhibited normal Eustachian tube function. 25 patients underwent tympanoplasty categorized as Group A while the remaining 25 patients underwent tympano-mastoidectomy categorized as Group B

Management

Patients presenting with minimal ear discharge were managed conservatively. This involved administering oral antibiotics along with a combination of antihistamines and decongestants. Surgery was scheduled only after the ear remained dry for a minimum of four weeks.

Tympanoplasty Procedure: A routine postaural incision was made to access the surgical site. The following steps were performed:

- **Graft Harvesting:** A graft was harvested from the temporalis fascia.
- **Meatal Incision:** A meatal incision was created from the 12 to 4 o'clock position.
- **Perforation Preparation:** The margins of the perforation were freshened to promote graft adhesion.
- **Flap Elevation:** The tympanomeatal flap was elevated circumferentially. The superior and anterior aspects were elevated from medial to lateral using a circular knife.
- **Middle Ear Inspection:** The middle ear was inspected for any pathological conditions, including fibrous bands, granulations, and ossicular erosion. The continuity of the ossicular chain was carefully assessed.
- **Bony Overhang Removal:** If the posterior superior aspect was not adequately visualized, any obstructing bony overhang was removed using a curette or burr.
- **Graft Placement:** The harvested graft was laid using the underlay technique to ensure proper positioning.
- **Packing:** The external auditory canal (EAC) was packed with gel foam impregnated with ciprofloxacin drop to aid in healing and prevent infection.

- **Closure:** After achieving adequate hemostasis, the wound was closed in layers.
- **Postoperative Dressing:** A mastoid bandage was applied to support the surgical site.

Tympanomastoideotomy Procedure: The tympanomastoideotomy procedure closely followed the tympanoplasty steps, with the additional step of performing a cortical mastoideotomy to ensure comprehensive treatment of any underlying mastoid pathology.

Postoperative Care: Postoperative monitoring included vigilance for any signs of dressing soakage, vertigo, facial paralysis, fever, otalgia, headache and tinnitus. Patients were typically discharged after seven days, following the removal of stitches. A follow-up appointment was scheduled for the 21st postoperative day to remove the gel foam and inspect the graft for proper healing and integration.

Follow-Up:

1. First Visit (21 Days Post-Op):

Purpose: Removal of the gel foam.

Assessment:

- Status of the postaural wound (noting if it was healthy, gaping, or had a stitch abscess).
- Subjective evaluation of hearing, tinnitus, and any other complaints.
- Assessment of graft uptake through otoscopy.

Instructions: Patients were advised using topical antibiotic ear drops (Ciprofloxacin).

2. Second Visit (1.5 Months Post-Op):

Purpose: Further subjective evaluation.

Assessment:

- Review of hearing, tinnitus, and any other complaints.
- Examination of the postaural wound and graft status through otoscopy or otomicroscopy.

3. Third Visit (3 Months Post-Op):

Purpose: Final evaluation.

Assessment:

- Subjective evaluation of hearing and any ongoing complaints.
- Pure Tone Audiometry (PTA) was repeated.

All findings from these follow-up visits were compared to preoperative assessments to evaluate the effectiveness of the procedure and the overall improvement in patient outcomes.

Statistical Method:

The data of the present study has been recorded and after its proper validation, checked for error; coding & data compilation, and segregation were done in MS Excel. Statistical Package for the Social Sciences (SPSS) software version 23.0 was used for statistical analysis. Categorical variables have presented in number and percentage (%) and continuous variables presented as mean ± SD and median. The quantitative data were expressed as Mean ± SD. P value < 0.05 was considered statistically significant

Results

In this study, majority of the study subjects were in the age group of 30-39 years (30%) followed by 40-49 years (24%).

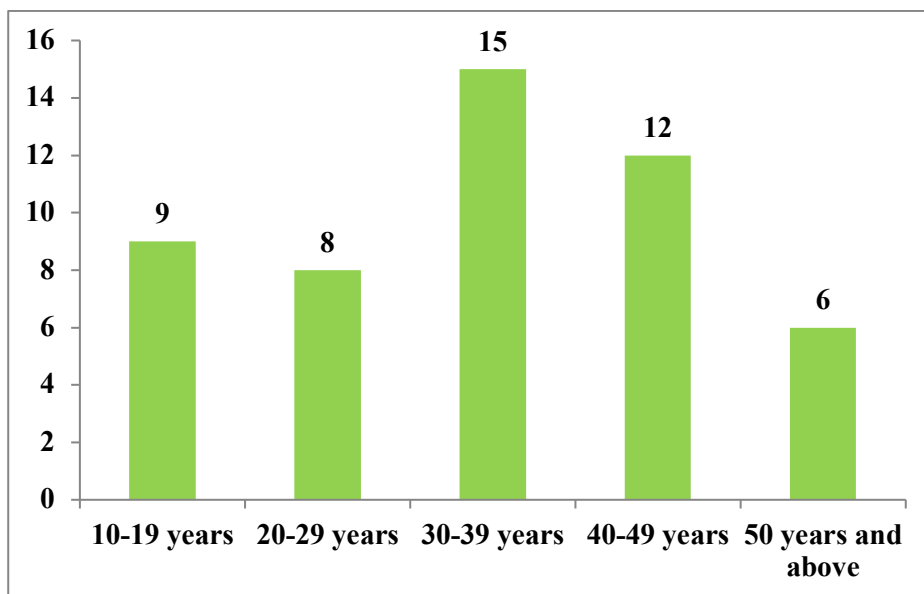


Figure 1: Distribution of study subjects according to age

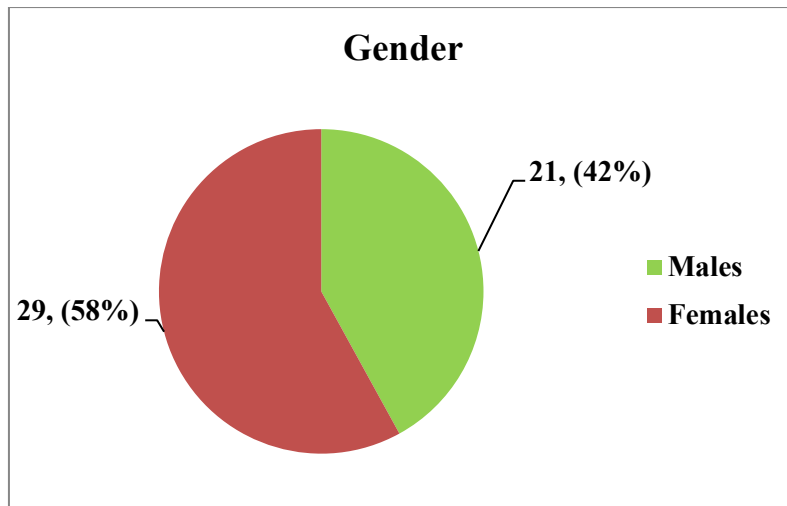


Figure 2: Distribution of study subjects according to gender

Majority of the study subjects (58%) were females while rest were males. Right ear involvement was seen in 29 cases while rest of the patients had left ear involved. The disease was unilateral in majority 44 (88%) study subjects and bilateral only in 6 (12 %) patients.

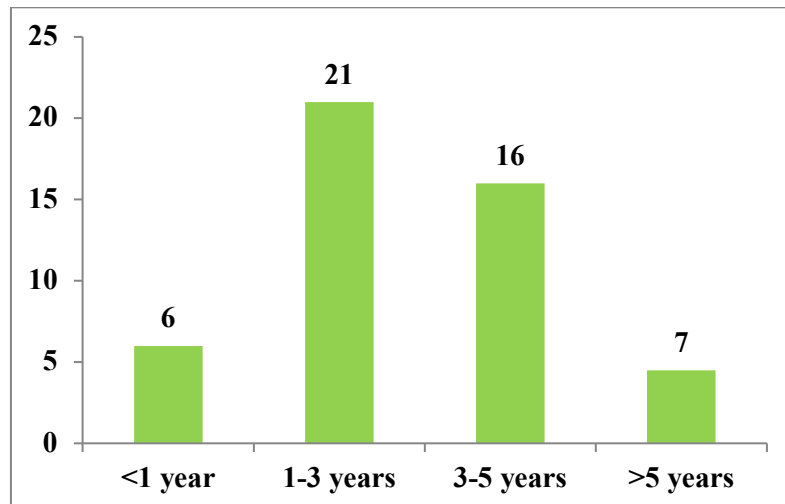


Figure 3: Distribution of study subjects based on duration of Ear discharge

Majority of the study patients had history of ear discharge of 1-3 years (42%) followed by 3-5 years (32%).

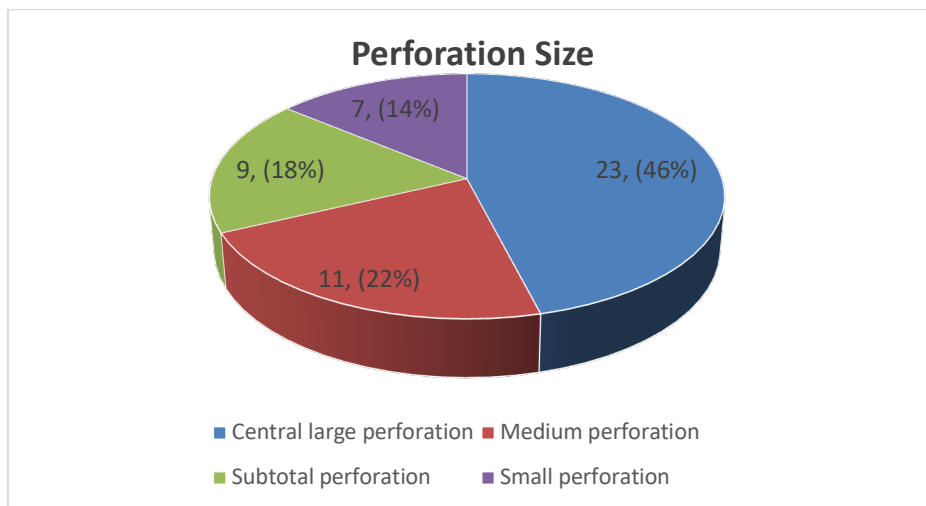


Figure 4: Distribution of study subjects based on perforation size

Central large perforation was the most common type of perforation seen in (46%), followed by medium perforation seen in (22%) of study subjects.

Table 1: Pre-OP Audiological assessment

	Group A	Group B
Pre-OP AB GAP (mean \pm SD)	29.45 \pm 11.56	33.61 \pm 8.89
Pre-OP AC TH (mean \pm SD)	39.23 \pm 13.47	42.04 \pm 12.33

The study showed that the preoperative mean A–B gap in Groups A and B was (29.45 \pm 11.56dB) and (33.61 \pm 8.89dB) respectively. The preoperative AC threshold was (39.23 \pm 13.47) and (42.04 \pm 12.33) for Group A (patients undergoing tympanoplasty) and Group B (patients undergoing tympano-mastoidectomy) respectively.

Table 2: Post-OP Audiological assessment (AC)

	Group A	Group B	p value
Pre OP ACTH (mean \pm SD)	39.23 \pm 13.47	42.04 \pm 12.33	0.435
Post OP ACTH (mean \pm SD)	21.56 \pm 11.24	20.89 \pm 6.79	0.799
ACTH gain (mean \pm SD)	17.89 \pm 9.90	21.15 \pm 8.12	0.246

The average gain seen in air conduction threshold was 17.89 \pm 9.90 in patients who had undergone tympanoplasty while the gain seen in patients who had undergone tympanomastoidectomy was 21.15 \pm 8.12. However this was not statistically significant.

Table 3: Post-OP Audiological assessment (A–B gap)

	Group A	Group B	p value
Pre OP A-B gap (mean \pm SD)	29.45 \pm 11.56	33.61 \pm 8.89	0.324
Post OP A-B gap (mean \pm SD)	14.33 \pm 9.31	9.78 \pm 6.64	0.791
A-B gap gain (mean \pm SD)	15.89 \pm 10.22	23.83 \pm 7.68	0.012*

* Statistically Significant

The study showed preoperative mean A–B gap in Groups A and B was (29.45 \pm 11.56dB) and (33.61 \pm 8.89dB) respectively. Postoperatively mean AB gap was (14.33 \pm 9.31dB) in Group A and (9.78 \pm 6.64dB) in Group B. Overall AB gap gain was (15.89 \pm 10.22dB) for Group A and (23.83 \pm 7.68db) for Group B. There was a significant improvement seen in the ABG in our study in patients who underwent tympanomastoidectomy.

Discussion

Chronic Suppurative Otitis Media (CSOM) remains a significant global health concern, impacting millions and often leading to severe complications if inadequately managed. This evaluation highlights the critical role of mastoid surgery in the treatment of CSOM, emphasizing its clinical relevance in improving patient outcomes. A comparison of the results from various studies underscores the effectiveness of surgical intervention over conservative management, particularly in reducing recurrence rates and enhancing hearing function. The primary objective of mastoid surgery, particularly tympano-mastoid procedures, is to eliminate infected tissue and restore middle ear anatomy. Multiple studies report a substantial reduction in recurrence rates of CSOM following surgical intervention. For instance, a meta-analysis conducted by Al-Mandil et al. [9] demonstrated

that surgical management significantly decreased the recurrence of discharge compared to medical management alone, with a reported reduction of up to 50% in recurrent cases similar to our study results. These findings also aligns with Janssen et al. [10] who noted that patients undergoing mastoid surgery exhibited significantly lower rates of persistent infection compared to those managed conservatively. These results highlight the necessity of surgical intervention in patients with chronic or complicated CSOM. Hearing impairment is a common consequence of CSOM, affecting quality of life and communication, especially in children. Studies have consistently shown that patients who undergo tympano-mastoid surgery experience significant improvements in hearing thresholds. For example, Cohen et al. [11] found that 75% of patients reported improved hearing post-surgery, with many achieving normal hearing levels. This finding is corroborated by Mowry and Baker [12] who reported similar auditory improvements in their cohort. In contrast, patients receiving only medical treatment often experience limited or no improvement in hearing, underscoring the importance of surgical intervention in restoring auditory function in line with our study results. The decision to proceed with mastoid surgery must be individualized, considering various factors such as age, disease severity, and previous treatment outcomes. In

systematic review, Tona et al. [13] highlighted the importance of a multidisciplinary approach in selecting suitable candidates for surgery. Patients with cholesteatoma, for instance, often require surgical intervention due to the aggressive nature of the disease and its potential to cause significant complications. The literature suggests that early surgical intervention can prevent such complications, as delayed treatment often leads to more severe disease and poorer outcomes similar to study done by Feldman & Kirtman. [14] While the benefits of mastoid surgery are clear, the evaluation also points to the risks and complications associated with the procedure. Complications can include postoperative infections, dizziness, and even hearing deterioration in some cases.

A study by Chole and Harker [15] reported that complication rates vary widely, ranging from 2% to 15%, depending on the surgical technique and surgeon experience in line with current study results. These findings emphasize the need for careful patient selection and informed consent, ensuring that patients are aware of potential risks. The variability in surgical outcomes is also influenced by the differences in surgical techniques employed by practitioners. A standardized approach to mastoid surgery could help mitigate some of the risks and improve overall outcomes. As noted by Janssen et al. [10] ongoing training and skill development for surgeons are essential for optimizing surgical techniques and minimizing complications. The study showed preoperative mean A-B gap in Groups A and B was (29.45 ±11.56dB) and (33.61±8.89dB) respectively. Postoperatively mean AB gap was (14.33±9.31dB) in Group A and (9.78±6.64dB) in Group B. Overall AB gap gain was (15.89±10.22dB) for Group A and (23.83±7.68db) for Group B. There was a significant improvement seen in the ABG in our study in patients who underwent tympanomastoidectomy. Similar results were seen in study conducted by Kabdwal et al. [16] the average hearing gain in patients who underwent tympanoplasty alone was 7.8 dB and the gain in patients who underwent tympanomastoidectomy was 3.5 dB.

The findings from this evaluation reinforce the significant role of mastoid surgery in managing Safe type of Chronic Suppurative Otitis Media. Surgical intervention not only reduces recurrence rates but also restores hearing function, greatly enhancing the quality of life for affected patients. Future research should focus on multicenter, prospective studies to further validate these findings and explore the long-term effects of surgical management. By adopting a comprehensive and evidence-based approach, healthcare providers can improve the management

of CSOM, ensuring better health outcomes for affected individuals.

Recommendations

1. **Standardized Guidelines for Surgical Indications:** Develop clear, evidence-based guidelines to help clinicians identify candidates for mastoid surgery in the management of Safe Chronic Suppurative Otitis Media (CSOM). These guidelines should consider factors such as disease severity, patient age, and prior treatment history.
2. **Multidisciplinary Care Approach:** Encourage collaboration between otolaryngologists, audiologists, and primary care providers to ensure comprehensive management of CSOM. This approach can enhance patient education, optimize treatment plans, and improve overall outcomes.
3. **Patient Education and Informed Consent:** Prioritize thorough patient education regarding the benefits and risks of mastoid surgery. Informed consent processes should include discussions about potential complications and expected recovery outcomes to facilitate shared decision-making.
4. **Long-term Follow-up Studies:** Conduct longitudinal studies to assess the long-term outcomes of patients undergoing mastoid surgery for CSOM. This research should focus on hearing restoration, recurrence rates, and overall quality of life.
5. **Training and Skill Development:** Invest in training programs for surgeons to refine their skills in advanced tympanomastoid techniques. Continuous professional development can enhance surgical safety and efficacy.
6. **Research on Minimally Invasive Techniques:** Encourage exploration of minimally invasive surgical options for CSOM, which may reduce recovery times and complications while achieving similar efficacy to traditional approaches.

Limitations

1. **Sample Size and Diversity:** Owing to the limited sample size and lack in diversity of patient populations, potentially affecting the applicability of the results to broader demographics.
2. **Variability in Surgical Techniques:** Differences in surgical approaches and techniques among various practitioners can impact outcomes. This variability may make it challenging to draw definitive conclusions about the effectiveness of mastoid surgery.
3. **Confounding Variables:** The presence of confounding factors such as previous treatments, comorbidities, and variations in

postoperative care can complicate the interpretation of results and outcomes.

4. **Subjective Outcome Measures:** Reliance on subjective measures for assessing improvements in quality of life and hearing may introduce bias and variability in reported outcomes.
5. **Short Follow-Up Duration:** The study may not provide long-term follow-up data, limiting the ability to assess the durability of surgical outcomes and the recurrence of CSOM.

Conclusion

In conclusion, this study underscores the essential role of mastoid surgery in the effective management of Safe Chronic Suppurative Otitis Media. By addressing the underlying pathology and facilitating improved auditory function, mastoid surgery significantly enhances patient outcomes and reduces the risk of recurrent infections. While surgical intervention is not without risks, careful patient selection and individualized treatment plans can optimize benefits and minimize complications. As the prevalence of CSOM continues to pose a public health challenge, integrating surgical options into comprehensive management strategies will be crucial for improving the quality of life and health status of affected individuals. Future research should focus on refining surgical techniques and exploring long-term outcomes to further validate the clinical relevance of mastoid surgery in this context.

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