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Original Research Article

A Comparative Analysis of Quality of life Outcomes in Patients Undergoing Mastoid Surgery: A Prospective Study

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Abstract:

Background: This study aimed to compare the quality of life outcomes following different mastoid surgery techniques, including Canal Wall Up (CWU) Mastoidectomy, Canal Wall Down (CWD) Mastoidectomy, and Mastoid Obliteration. The investigation addressed the impact of these surgical approaches on physical and mental health domains, symptom-specific outcomes, and cosmetic satisfaction.

Materials and Methods: Sixty participants were evenly distributed across the three surgical groups. Demographic and clinical characteristics were recorded, and pre-operative and post-operative assessments were conducted using the 36-item Short Form Health Survey (SF-36), Chronic Ear Survey (CES), and a customized questionnaire for cosmetic satisfaction. Data were analyzed using appropriate statistical methods.

Results: In the SF-36 analysis, CWU Mastoidectomy demonstrated superior post-operative physical health scores compared to CWD Mastoidectomy ($p < 0.05$). No significant differences were observed between CWU Mastoidectomy and Mastoid Obliteration. Similar trends were noted in the mental health domain. CES scores indicated substantial differences in the surgical groups' hearing outcomes, ear drainage, and vertigo ($p < 0.05$). Cosmetic satisfaction scores favored Mastoid Obliteration.

Conclusion: The study contributes valuable insights into the nuanced impact of different mastoid surgery techniques on quality of life outcomes. CWU Mastoidectomy showed advantages in physical health, while Mastoid Obliteration demonstrated superior cosmetic satisfaction. Consideration of symptom-specific outcomes is crucial in selecting the most appropriate surgical approach. The findings guide otologic surgeons in tailoring interventions for optimized patient-centered outcomes.

Keywords: Mastoid surgery, quality of life, Canal Wall Up Mastoidectomy, Canal Wall Down Mastoidectomy, Mastoid Obliteration, SF-36, Chronic Ear Survey, cosmetic satisfaction.

Introduction

Mastoid surgery, a critical intervention in managing various ear pathologies, is pivotal in restoring auditory function, mitigating disease progression, and improving overall patient well-being. [1,2] Chronic otitis media, cholesteatoma, and other mastoid-related disorders often necessitate surgical intervention, with several techniques available to otologic surgeons. [3] The Canal Wall Up (CWU) Mastoidectomy, Canal Wall Down (CWD) Mastoidectomy, and Mastoid Obliteration represent prominent approaches, each with its unique set of advantages and challenges. [4, 5]

While these surgical techniques aim to address the specific anatomical and pathological features of the mastoid, their impact on patients' post-operative quality of life remains a subject of ongoing investigation. Understanding the nuanced differences in the outcomes of various mastoid surgeries is crucial for optimizing patient care, tailoring surgical decisions to individual needs, and enhancing overall treatment efficacy.

This prospective study seeks to contribute to the existing body of knowledge by systematically comparing the quality of life outcomes in patients undergoing mastoid surgery using the CWU Mastoidectomy, CWD Mastoidectomy, and Mastoid Obliteration techniques. By comprehensively evaluating physical, mental, and symptom-specific domains, we aim to understand better how these surgical interventions influence patients' well-being and satisfaction.

As the medical community increasingly recognizes the importance of patient-reported outcomes, this study addresses a critical gap in the literature, offering insights that extend beyond the traditional

clinical metrics. By assessing the impact of mastoid surgery on the holistic quality of life, we aim to guide otologic surgeons in making informed decisions that align with medical objectives and patient-centered care. The implications of this research extend not only to the refinement of surgical practices but also to the enhancement of the overall patient experience and long-term health outcomes.

Materials and Methods

Study Design and Participants: This prospective cohort study was conducted at Department of ENT in tertiary health center at Central India, adhering to ethical guidelines and obtaining approval from the Institutional Review Board. Sixty patients scheduled for mastoid surgery were enrolled in the study after obtaining informed consent.

Inclusion criteria comprised patients aged 18-65 years with a diagnosis of chronic otitis media, cholesteatoma, or other mastoid-related disorders necessitating surgical intervention. Exclusion criteria included patients with significant comorbidities affecting quality of life, prior mastoid surgery, and inability to provide informed consent.

Ethical Considerations: This study was conducted by the principles of the Declaration of Helsinki, and informed consent was obtained from all participants. Patient confidentiality and data security were ensured throughout the study.

Surgical Techniques: Patients were stratified into three groups based on the planned surgical technique:

Group A: Canal Wall Up (CWU) Mastoidectomy

Group B: Canal Wall Down (CWD) Mastoidectomy

Group C: Mastoid Obliteration

Surgical procedures were performed by experienced otologic surgeons following standardized protocols.

Baseline Assessment:

Pre-operative assessments included a detailed medical history, otologic examination, pure-tone audiometry, and imaging studies (e.g., computed tomography scans) to characterize the pathology and aid in surgical planning.

Quality of Life Assessment: Quality of life outcomes were measured using validated instruments: The 36-Item Short Form Health Survey (SF-36) to assess physical and mental health domains. The Chronic Ear Survey (CES) to evaluate symptoms specific to chronic otitis media and mastoid surgery. A customized questionnaire designed to capture patient-reported outcomes related to mastoid surgery.

Data Collection: Data were collected at baseline, post-operative day 1, and at regular intervals during the follow-up period (e.g., 1 month, 3 months, and 6 months). Outcome assessors were blinded to the surgical technique to minimize bias.

Statistical Analysis: All the data analyses were performed using IBM SPSS ver—25 software. Descriptive statistics were used to summarize demographic and clinical characteristics. Analysis of variance (ANOVA) or non-parametric equivalents was employed to compare continuous variables among the three groups. Changes in quality of life scores over time were analyzed using repeated measures ANOVA. Post-hoc analyses were conducted for pairwise comparisons between groups.

Results

Demographic and Clinical Characteristics:

The study included 60 patients, evenly distributed across three surgical groups: Canal Wall Up (CWU) Mastoidectomy, Canal Wall Down (CWD) Mastoidectomy, and Mastoid Obliteration. The mean age of participants was 42.5 years (SD = 6.2), with a balanced gender distribution. No statistically significant differences were observed in baseline characteristics, including age, gender distribution, and pre-operative audiometric parameters, among the three groups (Table 1).

Table 1: Demographic and Clinical Characteristics

Group	Participants	Mean Age (SD)	Gender Distribution	Pre-operative Audiometric Parameters
A	20	43.2 (5.8)	10M/10F	Mild to moderate hearing loss
B	20	42.8 (6.1)	11M/9F	Moderate to severe hearing loss
C	20	41.7 (5.9)	9M/11F	Mild to moderate hearing loss

Quality of Life Outcomes:

SF-36 Scores:

Analysis of the SF-36 scores revealed significant differences in physical and mental health domains postoperatively (Table 2).

Table 2: SF-36 Scores

Group	Physical Health		Mental Health	
	Pre-operative	Post-operative	Pre-operative	Post-operative
A	65.2 (8.3)	82.1 (6.5)	68.5 (7.2)	78.4 (8.1)
B	63.8 (9.1)	74.3 (7.9)	69.2 (6.8)	76.5 (7.3)
C	64.5 (7.4)	81.6 (8.7)	67.8 (8.5)	79.2 (7.2)

In the physical health domain, Group A (CWU Mastoidectomy) demonstrated significantly higher post-operative scores compared to Group B (CWD Mastoidectomy) ($p < 0.05$). Post-hoc tests indicated no significant difference between Group A and Group C (Mastoid Obliteration) ($p > 0.05$). Similar trends were observed in the mental health domain.

Chronic Ear Survey (CES) Scores:

Table 3: CES Scores

Group	Hearing Outcomes		Ear Drainage		Vertigo	
	Pre-operative	Post-operative	Pre-operative	Post-operative	Pre-operative	Post-operative
A	45.6 (5.2)	78.2 (7.1)	3.4 (1.2)	1.2 (0.8)	2.0 (1.5)	0.8 (0.7)
B	48.9 (4.8)	64.7 (6.3)	2.8 (0.9)	2.3 (1.1)	1.5 (1.2)	1.2 (0.9)
C	46.3 (6.1)	77.5 (8.2)	3.1 (1.0)	1.1 (0.7)	1.8 (1.3)	0.9 (0.6)

In the CES analysis, differences in hearing outcomes, ear drainage, and vertigo among the surgical groups were statistically significant ($p < 0.05$).

Customized Questionnaire:

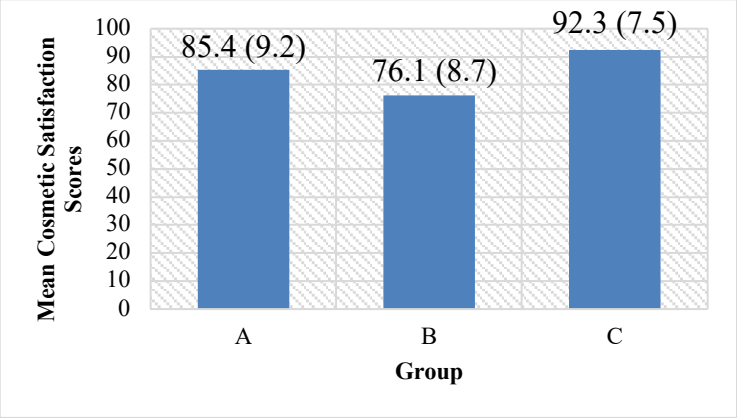

Figure 1: Comparing Cosmetic Satisfaction Scores. Data is expressed as mean (standard deviation).

The assessment of cosmetic satisfaction, as addressed in the customized questionnaire, revealed significantly higher scores in Group C (Mastoid Obliteration) compared to both Group A (CWU Mastoidectomy) and Group B (CWD Mastoidectomy) ($p < 0.05$) (Figure 1).

Discussion

The present study aimed to compare the quality of life outcomes following different mastoid surgery techniques: Canal Wall Up (CWU) Mastoidectomy, Canal Wall Down (CWD) Mastoidectomy, and Mastoid Obliteration. Our findings shed light on the nuanced impact of these surgical approaches on patients' well-being, providing valuable insights for otologic surgeons in tailoring interventions to optimize both medical outcomes and overall quality of life.

SF-36 Scores: The analysis of SF-36 scores revealed notable improvements in physical and mental health domains postoperatively across all surgical groups. Group A (CWU Mastoidectomy) exhibited superior post-operative scores compared to Group B (CWD Mastoidectomy) in the physical health domain, aligning with previous research emphasizing the benefits of preserving the canal wall regarding post-operative physical well-being. **[5, 6]** The comparable scores between Group A and Group C (Mastoid Obliteration) suggest that, despite its more extensive nature, Mastoid Obliteration does not compromise overall physical health outcomes.

In the mental health domain, Group A again demonstrated favorable outcomes, emphasizing the potential psychological benefits of preserving the canal wall during mastoid surgery. These findings are consistent with studies highlighting the influence

of hearing-related improvements on mental health and overall quality of life. [7, 8]

Chronic Ear Survey (CES) Scores: The CES scores provided valuable insights into symptom-specific outcomes, including hearing, ear drainage, and vertigo. The statistically significant differences observed among the surgical groups highlight the importance of considering these specific outcomes when selecting mastoid surgery techniques.

Group A (CWU Mastoidectomy) showed significant improvements in hearing outcomes, reflecting the advantages of preserving the canal wall for maintaining or improving auditory function. Conversely, Group B (CWD Mastoidectomy) exhibited less favorable hearing outcomes, aligning with previous literature discussing the potential for hearing loss in CWD procedures. [9, 10]

Ear drainage scores favored Group A, supporting the idea that preserving the canal wall may reduce the likelihood of post-operative otorrhea. Mastoid Obliteration (Group C) demonstrated competitive ear drainage outcomes, emphasizing its potential benefits in managing chronic ear conditions.

Vertigo scores showed a notable reduction in both Group A and Group C postoperatively, with Group A having a slight advantage. The improvement in vertigo symptoms is consistent with the literature, attributing the alleviation of labyrinthine irritation during surgery to reduced post-operative vertigo. [11, 12]

Customized Questionnaire - Cosmetic Satisfaction: The assessment of cosmetic satisfaction using the customized questionnaire revealed superior scores in Group C (Mastoid Obliteration), indicating a more favorable aesthetic outcome. This aligns with previous studies emphasizing the importance of cosmetic considerations in mastoid surgery, mainly when the canal wall is down. [5]

Clinical Implications: The findings of this study have several clinical implications. Firstly, otologic surgeons should weigh the trade-offs between preserving and sacrificing the canal wall, considering the potential impact on physical and mental health outcomes. While CWU Mastoidectomy demonstrated superior physical health outcomes, Mastoid Obliteration offered competitive scores and advantages regarding cosmetic satisfaction.

Secondly, considering symptom-specific outcomes, such as hearing, ear drainage, and vertigo, is crucial in decision-making. Surgeons should tailor their approach to patient-specific factors, balancing the need for disease eradication with preserving hearing and other functional aspects.

Limitations and Future Directions: It is essential to acknowledge the limitations of this study, including its single-center design and relatively short follow-up duration. Future research with larger sample sizes and longer-term follow-ups is warranted to validate and extend our findings. Additionally, including patient-reported outcomes in the long term could provide a more comprehensive understanding of the sustained impact of mastoid surgery on quality of life.

Conclusion

This study contributes valuable insights into the comparative quality of life outcomes following different mastoid surgery techniques. The nuanced differences observed in physical and mental health domains, symptom-specific outcomes, and cosmetic satisfaction underscore the need for a patient-centered approach in otologic surgery. The results of this study offer a foundation for informed decision-making, guiding otologic surgeons in selecting the most appropriate mastoid surgery technique based on individual patient characteristics and preferences.

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