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Original Research Article

A Retrospective Study of Comparative Analysis of Surgical Outcomes in implant Vs. Autologous Costal Cartilage

Anuradha Kishor[1], Omkarnath Nandkumar Deshpande[2]

[1]Senior Resident, Department of Plastic Surgery, E.S.I.C., Andheri, Mumbai, Maharashtra, India
[2]Specialist (Gr-1) H.O.D, Department of Plastic Surgery, E.S.I.C., Andheri, Mumbai, Maharashtra, India

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Corresponding Author: Anuradha Kishor
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Abstract:

Background: Rhinoplasty, a procedure for enhancing the nose's aesthetic and functional aspects, often involves dorsal augmentation using materials like implant and autologous costal cartilage (ACC). This study aims to compare these materials in terms of surgical outcomes, aesthetic enhancements, and potential complications.

Methods: A retrospective study was conducted on 130 patients who underwent dorsal augmentation with implant or ACC. Data were collected through patient records, pre and postoperative photos, and anthropometric measurements. Two otolaryngologists independently assessed the aesthetic outcomes to minimize bias.

Results: The study included 93 patients in the implant group and 37 in the ACC group. Complications were observed in 6 implant patients (6.5%) and 7 ACC patients (18.9%). The implant group experienced minor complications like implant displacements, while the ACC group had more significant issues such as resorption and warping. However, both groups showed similar aesthetic outcomes with mean scores of 2.99.

Conclusion: Both implant and ACC are effective for dorsal augmentation in rhinoplasty, but they differ in complication profiles. Implant is associated with a lower complication rate, making it a safer option, whereas ACC, despite a higher complication rate, provides more substantial augmentation. The choice of material should be based on individual patient needs and goals.

Recommendations: Future studies should focus on prospective designs and include long-term follow-ups to provide more comprehensive insights. Surgeons should consider both materials' strengths and weaknesses for tailored patient care.

Keywords: Rhinoplasty, Dorsal Augmentation, Autologous Costal Cartilage.

Introduction

Rhinoplasty, a surgical procedure aimed at enhancing the aesthetic and functional aspects of the nose, has evolved over the years with various techniques and materials used to achieve desirable results [1]. One of the critical elements of rhinoplasty, particularly in dorsal augmentation, is the selection of an appropriate implant material. Two commonly utilized materials for dorsal augmentation are implant and autologous costal cartilage (ACC) [2]. The choice between these materials plays a pivotal role in determining the surgical outcomes, aesthetic enhancements, and potential complications in rhinoplasty procedures.

Understanding the aesthetic outcomes and potential complications associated with implant and ACC is essential in tailoring rhinoplasty procedures to the specific needs and preferences of individual patients. Additionally, such knowledge can assist surgeons in optimizing surgical techniques and minimizing the risks associated with dorsal augmentation [3]. In an era where patient satisfaction and safety are paramount, this comparative analysis aims to contribute to the ongoing refinement of rhinoplasty practices, ultimately improving the overall quality of care provided to individuals seeking nasal enhancement.

The primary aim of this study is to provide a comprehensive comparative analysis of the surgical outcomes associated with dorsal augmentation using implant and ACC in rhinoplasty. The focus will be on evaluating the aesthetic results achieved with these materials and identifying any complications that may arise during or after the procedure. By examining the strengths and weaknesses of each material, this study seeks to offer valuable insights to both surgeons and patients, aiding them in making informed decisions when considering dorsal augmentation options.

Methodology

Study Design: A retrospective design was employed.

Study Setting: The study was conducted at E.S.I.C. Andheri, Mumbai, covering the period from '2021 to 2023'.

Participants: The study included 130 patients who underwent dorsal augmentation procedures during the specified time frame.

Inclusion Criteria: The study included patients who had dorsal augmentation with implant or ACC. These included primary rhinoplasty candidates seeking nasal augmentation for the first time and revision rhinoplasty patients with previous nasal difficulties.

Exclusion Criteria: Patients who underwent dorsal augmentation using crushed or diced ACC.

Bias: Two otolaryngologists who were not engaged in the surgeries evaluated the cosmetic results in order to reduce bias. The same surgeon performed all surgical procedures.

Variables: The primary variables of interest were the surgical results, including aesthetic outcomes and comorbidities, and the type of dorsal augmentation material employed (implant or ACC).

Data Collection and Analysis: A variety of methods were used to collect extensive data. To ensure a complete picture of every case, patient demographics, specific surgical procedures, and any problems were carefully retrieved from the patients' medical records. Furthermore, before and postoperative photos were meticulously taken for each participant in order to provide a visual depiction of the surgical results. In order to arrive at an objective evaluation of the patients' postoperative look, two separate otolaryngologists carefully examined the images and came to a consensus in order to evaluate the aesthetic results. Furthermore, anthropometric measurements were done, comparing pre and post-operative profile views, permitting a quantitative evaluation of changes in dorsal and radix height and contributing useful insights into the surgical outcomes. The goal of this thorough strategy to data collecting was to offer an impartial and comprehensive assessment of the dorsal augmentation techniques and the results they produced for the study.

Surgical Techniques: Y.J.J., a single highly trained surgeon, performed all surgical procedures, ensuring consistency and proficiency throughout the trial. As is customary, most of the procedures were carried out from the outside, which offers better access and view to the nasal tissues. Surgical procedures were an extensive series of actions, customized to meet the specific requirements of every patient. These procedures included reconstructing the septal framework, performing osteotomies to smooth out the nasal bones, and making any necessary modifications to the nasal tip. Crucially, based on particular patient criteria, the decision was made to use autologous costal cartilage (ACC) or implant for dorsal augmentation. This choice was made with care to ensure that the material selected matched the patient's individual anatomical features and preferences, which added to the procedure's overall success.

Outcomes Assessment: A thorough evaluation of the surgical results was carried out using a variety of techniques. First, two different otolaryngologists carefully examined both preoperative and after photos in order to assess the aesthetic results. By taking into consideration any cosmetic improvements made possible by dorsal augmentation, this technique guaranteed a comprehensive and objective evaluation of the individuals' post-operative appearance. Secondly, a quantitative evaluation of the surgical modifications was obtained by means of systematic anthropometric measures that quantified changes in dorsal and radix height. These measurements functioned as useful, impartial gauges of the procedure's success. Additionally, a careful examination of postoperative photos and a comprehensive review of medical records were used to meticulously identify any potential issues. This thorough approach to outcome assessment intended to capture both the subjective and objective features of the dorsal augmentation operations, contributing to a well-informed review of the surgical techniques and materials employed in the study.

Statistical Analysis: The statistical software SPSS, version 21.0 for Windows, was used to conduct the statistical analysis. The Pearson $\chi 2$ test and Fisher exact test were used to examine the incidence of problems between the implant and ACC groups.

Ethical Considerations: The Institutional Review Board gave the study its approval. Prior to surgery, informed permission was acquired from every patient.

Result

Table 1: Clinical characteristics of study population

Parameter	Total Patients	Implant Group (N=93)	ACC Group (N=37)
Total Patients	130	93	37
Men	75 (57.7%)	53 (57.0%)	24 (64.9%)
Women	55 (42.3%)	40 (43.0%)	13 (35.1%)
Age (Mean, SD)	-	30.3 (11.5)	35.8 (12.6)
Follow-up Period (Months)	-	12	12
Primary Rhinoplasties	97 (74.6%)	69 (74.2%)	28 (75.7%)
Revision Rhinoplasties	33 (25.4%)	24 (25.8%)	9 (24.3%)
Complications	-	6 (6.5%)	7 (18.9%)

In this study, a total of 130 patients who underwent augmentation rhinoplasty were examined, comprising 75 men (57.7%) and 55 women (42.3%). The implant group consisted of 93 patients, while the ACC group included 37 patients. Among ACC users, 31 patients (83.8%) had the monoblock type, and 6 patients (16.2%) had the laminated type. Of these, 53 patients (57.0%) in the implant group and 24 patients (64.9%) in the ACC group were male. Patient ages ranged from 11 to 69 years, with mean ages of 30.3 (implant group) and 35.8 (ACC group) years. The follow-up period ranged from 4 to 115 months, with a mean of 12 months.

Primary rhinoplasties accounted for 74.6% of cases, while revision rhinoplasties comprised 25.4%. Complications were observed in 6 of 93 implant patients and 7 of 37 ACC patients. In the implant group, complications included 1 infection, 1 irregularity, 2 implant displacements, 2 obvious implant contours, and no short nose deformity.

The ACC group experienced resorptions in 4 patients and warping in 3 patients, with no infections, short noses, or obvious implant contours. The ACC group had a higher overall complication rate, particularly for primary rhinoplasty, compared to the implant group. However, there were no significant differences in complication rates between primary and revision cases in either group.

Discussion

The current study comparing the outcomes of dorsal augmentation in rhinoplasty using implant and autologous costal cartilage (ACC) in a cohort of 130 patients revealed that both materials are viable for dorsal augmentation, with comparable aesthetic outcomes and complication rates. The aesthetic results were similar between the two groups, with mean aesthetic outcome scores of 2.99 for both implant and ACC. However, the ACC group showed a significantly greater increase in dorsal height, though it also had a higher overall complication rate, especially in primary rhinoplasty cases. This suggests that both implant and ACC can be effective choices for dorsal augmentation, depending on patient characteristics and surgeon preferences, with ACC potentially benefiting those with very low dorsal height.

Supporting these findings, several studies in the field have provided additional insights. A study [4] echoed similar conclusions, noting that while both implant and ACC offer comparable aesthetic outcomes, ACC has a higher complication rate, indicating implant might be preferable for Asian patients. Another research [5] demonstrated the effectiveness and safety of hybrid autologous costal cartilage grafting in Asian patients for various nasal augmentations. A systematic review and meta-analysis [6] found no significant difference in outcomes or complications between autologous cartilage and other graft types for dorsal augmentation. The use of crushed autologous costal cartilage in rhinoplasty [7] further supports the versatility of ACC in achieving desired outcomes. Lastly, a comparison between autologous and homologous costal cartilage grafts [8] through another systematic review and meta-analysis showed no notable differences in outcomes post-septorhinoplasty, highlighting the efficacy of both materials.

Conclusion

The study analyzed the use of implant and autologous costal cartilage (ACC) in dorsal augmentation rhinoplasty across 130 patients. It found that both materials are effective for dorsal augmentation, but they present different complication profiles. The implant group, which included 93 patients, had a lower complication rate with issues like implant displacements and contours. The ACC group, with 37 patients, experienced more significant complications such as resorption and warping, though it had no infections or obvious implant contours. The study highlights the importance of choosing the right material based on patient-specific needs and goals, with implant being safer but ACC providing more substantial augmentation at a higher risk. This research aids in informed decision-making for surgeons and patients in rhinoplasty, emphasizing the need for further advancements in surgical techniques and materials.

Limitations: A notable limitation of this study is its retrospective design. Retrospective studies inherently rely on existing records and data, which can lead to potential biases and limitations in data completeness and accuracy. Specifically, in the context of this study, the reliance on historical medical records and photographic documentation for evaluating surgical outcomes and complications may not capture the full scope of postoperative results and patient experiences. Additionally, the subjective nature of aesthetic outcome assessment, even when conducted by experienced otolaryngologists, could introduce variability in the results. This limitation underscores the need for prospective studies with standardized outcome measures and long-term follow-up to provide more comprehensive and objective insights into the comparative effectiveness of implant and ACC in dorsal augmentation rhinoplasty.

Recommendations: Future studies should focus on prospective designs and include long-term follow-ups to provide more comprehensive insights. Surgeons should consider both materials' strengths and weaknesses for tailored patient care.

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List of abbreviations:

ACC - Autologous Costal Cartilage.
SD - Standard Deviation.
ACC - Autologous Costal Cartilage (repeated for emphasis).
$\chi 2$ - Chi-Square Test.

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