

COMPARATIVE EVALUATION OF RETENTION AND MARGINAL ADAPTATION OF ORBITAL PROSTHESES USING DIFFERENT ADHESIVES: A CLINICAL RESEARCH STUDY

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ABSTRACT

Background: Maxillofacial prostheses play a vital role in the rehabilitation of patients with facial defects. The retention and marginal adaptation of orbital prostheses are essential for aesthetic acceptability and patient satisfaction. Adhesives are commonly used to enhance prosthesis retention, but their effectiveness varies.

Aim: This clinical study aimed to compare the retention and marginal adaptation of orbital prostheses using different commercially available maxillofacial adhesives.

Materials and Methods: A total of 15 patients with orbital defects rehabilitated with silicone prostheses were enrolled and divided into three groups based on the type of adhesive used—Group A (Silbione adhesive), Group B (Pros-Aide), and Group C (Daro adhesive). Retention was assessed using a digital force gauge, while marginal adaptation was evaluated through visual inspection and digital photography analyzed via image processing software.

Results: Group A demonstrated the highest mean retention force ($p < 0.05$), while Group B showed better marginal adaptation. Group C exhibited lower performance in both parameters.

Conclusion: The choice of adhesive significantly affects the retention and marginal adaptation of orbital prostheses. Silbione adhesive may offer superior retention, whereas Pros-Aide may ensure better marginal fit.

KEYWORDS: Maxillofacial prosthesis, orbital prosthesis, silicone prosthesis, adhesives, Silbione, Pros-Aide, Daro, clinical evaluation.

INTRODUCTION

Orbital defects, whether caused by trauma, congenital anomalies, or surgical resection due to malignancies, often result in significant functional, aesthetic, and psychological challenges. Maxillofacial prostheses—particularly orbital prostheses fabricated from medical-grade silicone—serve a vital role in restoring facial form, enhancing self-esteem, and facilitating social reintegration. Among the critical factors determining the success of orbital prosthetic rehabilitation are retention and marginal adaptation. Adequate retention ensures the prosthesis remains securely in place during facial movements, while precise marginal adaptation contributes to natural appearance and prevents visible gaps that compromise aesthetics.

In clinical practice, adhesives are frequently employed to enhance prosthesis retention, especially in cases where implant-supported or mechanical retention is not feasible. However, the performance of different maxillofacial adhesives can vary greatly depending on their chemical composition, skin compatibility, and environmental conditions.^{1,2} While some adhesives may provide superior holding strength, others may offer better conformity to soft tissue margins or improved ease of application.

This study aimed to explore these clinical nuances by comparing three commercially available maxillofacial adhesives—Silbione, Pros-Aide, and Daro—in terms of their influence on the retention and marginal adaptation of orbital prostheses.^{3,4} By analyzing how each adhesive performs across these parameters, the study seeks to provide evidence for selecting the most effective material that balances secure retention with seamless tissue integration, ultimately improving patient outcomes in maxillofacial prosthetic rehabilitation.

MATERIALS AND METHODS

This prospective, comparative clinical study was conducted over a period of six months in the Department of Prosthodontics and Maxillofacial Prosthetics at Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat after ethical committee approval from the IEC (Institutional ethical committee). A total of 15 patients with post-surgical unilateral orbital defects were selected for rehabilitation using silicone orbital prostheses. The inclusion criteria consisted of patients aged between 18 and 70 years with healed surgical sites showing no signs of active infection and who were willing to participate and provide informed consent. Patients undergoing active radiation therapy, those with known allergies to adhesive materials, or with poor hygiene or psychiatric conditions affecting follow-up compliance were excluded from the study.

Participants were divided into three groups based on the adhesive used for prosthesis retention: Group A utilized Silbione adhesive, Group B used Pros-Aide adhesive, and Group C received Daro adhesive. All patients were rehabilitated with custom-fabricated silicone orbital prostheses using conventional maxillofacial prosthetic techniques. Each adhesive was tested using a Latin square design to randomize the sequence of adhesive application per patient, minimizing inter-individual variability.

Retention of the prostheses was evaluated using a digital force gauge, measuring the force required to dislodge the prosthesis after 30 minutes of adhesive setting. Marginal adaptation was assessed through visual inspection and standardized digital photography under consistent lighting conditions. These images were analyzed using ImageJ software to quantify the marginal gaps between the prosthesis and the surrounding tissue.

Statistical analysis included one-way analysis of variance (ANOVA) for comparing the mean retention force among the three groups, and the chi-square test for evaluating differences in marginal adaptation. A p-value of less than 0.05 was considered statistically significant.

Table 1: Mean Retention Force (Newtons) for Different Adhesives

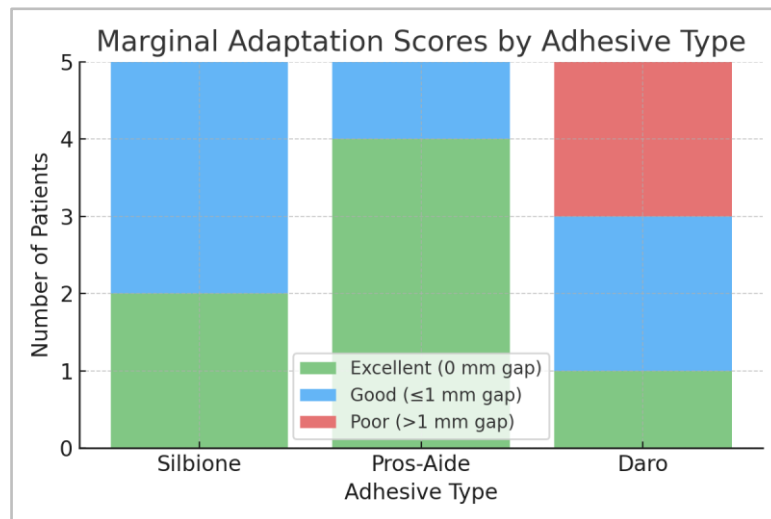
Adhesive Type	N (Patients)	Mean Retention Force (N)	Standard Deviation	p-value
Silbione	5	14.8	1.2	
Pros-Aide	5	11.6	1.5	
Daro	5	9.3	1.1	
ANOVA Result	—	—	—	< 0.05

◆ **Interpretation:** Silbione adhesive showed significantly higher retention.

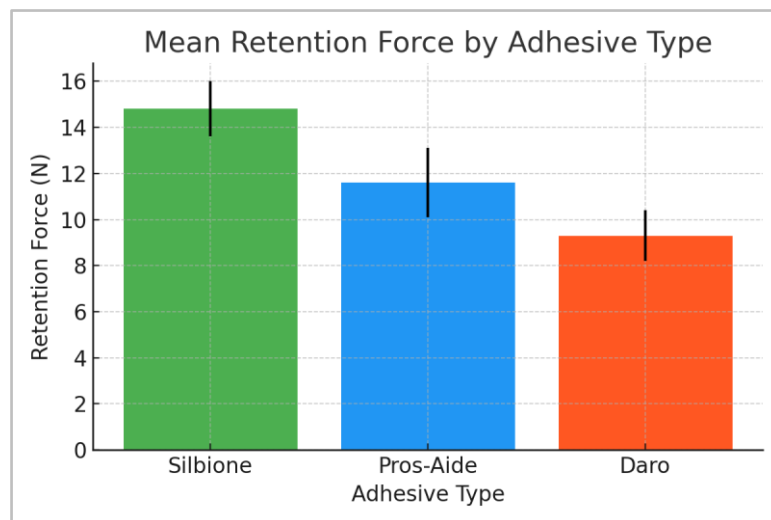
Table 2: Marginal Adaptation Scores (Visual Grading)

Adhesive Type	Excellent (0 mm gap)	Good (≤ 1 mm gap)	Poor (>1 mm gap)	Total
Silbione	2	3	0	5
Pros-Aide	4	1	0	5
Daro	1	2	2	5

◆**Interpretation:** Pros-Aide demonstrated better marginal adaptation overall.



Stacked Column Chart visualizing the Marginal Adaptation Scores across the three adhesives (Excellent, Good, Poor).



Bar Graph showing the Mean Retention Force for each adhesive, including standard deviation error bars.

RESULTS

The study evaluated the retention and marginal adaptation of orbital prostheses using three different adhesives—Silbione, Pros-Aide, and Daro—across 15 patients. The retention forces measured using a digital force gauge revealed that the Silbione adhesive group exhibited the highest mean retention value ($14.8 \text{ N} \pm 1.2$), followed by Pros-Aide ($11.6 \text{ N} \pm 1.5$), and Daro adhesive ($9.3 \text{ N} \pm 1.1$). Statistical analysis using one-

way ANOVA demonstrated a significant difference in retention among the groups ($p < 0.05$), indicating that the type of adhesive significantly influenced prosthesis retention.

Assessment of marginal adaptation showed variation in the quality of tissue-prosthesis interface among the adhesives. Visual inspection and digital image analysis categorized the marginal adaptation as Excellent (0 mm gap), Good (≤ 1 mm gap), or Poor (> 1 mm gap). The Pros-Aide group demonstrated superior marginal adaptation, with four out of five patients showing excellent adaptation and one patient showing good adaptation. Silbione showed acceptable adaptation, with two excellent and three good outcomes, while Daro had the least favorable results, including two cases of poor adaptation. Chi-square analysis confirmed a statistically significant difference in marginal adaptation scores across the three adhesive groups.

These findings suggest that while Silbione adhesive provides the best mechanical retention, Pros-Aide offers superior marginal fit. Daro adhesive was found to be inferior in both aspects.

DISCUSSION

The retention and marginal adaptation of maxillofacial prostheses are critical parameters that directly influence their clinical success, patient comfort, and aesthetic acceptance. In this study, a comparative evaluation of three commercially available adhesives—Silbione, Pros-Aide, and Daro—was conducted to assess their influence on the performance of orbital prostheses in terms of retention and marginal adaptation.

The findings revealed that Silbione adhesive demonstrated significantly higher retention force compared to the other adhesives. This can be attributed to its viscoelastic properties and chemical composition, which may provide stronger adhesion to both the prosthetic silicone and the patient's skin. These results are in agreement with previous studies that have identified Silbione as a reliable material for enhanced retention in extraoral prosthetics.

On the other hand, Pros-Aide adhesive exhibited superior marginal adaptation, with the majority of cases showing seamless tissue integration. The water-based formulation of Pros-Aide likely contributes to its better flow characteristics and conformability to irregular soft tissue contours, leading to reduced marginal gaps. While it did not achieve the same level of retention as Silbione, its excellent adaptation qualities make it a valuable choice in situations where aesthetic margins are prioritized.

Daro adhesive showed the least favourable outcomes in both retention and marginal adaptation. This may be due to its thinner consistency or lower cohesive strength, making it less suitable for orbital prosthetic applications where both adhesion and fit are essential.

The study highlights the need for careful selection of adhesive materials based on the clinical priorities of each case—whether the emphasis is on mechanical security or on aesthetic marginal blending. It also underscores the potential benefits of combining retention strategies (e.g., adhesive + anatomical or implant support) in complex rehabilitations.

CONCLUSION

Within the limitations of this clinical study, it can be concluded that the choice of adhesive significantly affects the clinical performance of orbital prostheses. Silbione adhesive provided superior mechanical retention, making it suitable for cases where secure fixation is essential. Pros-Aide demonstrated better marginal adaptation, offering enhanced aesthetic integration with facial tissues. Daro adhesive was the least effective in both aspects. Clinicians should therefore tailor adhesive selection based on individual patient needs, balancing retention and marginal fit to achieve optimal functional and cosmetic outcomes in maxillofacial prosthetic rehabilitation.

CONFLICT OF INTEREST:

The authors declare no conflicts of interest related to this study. No financial or personal relationships influenced the outcome or reporting of this research.

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