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SPECTACLE FRAME–SUPPORTED ACRYLIC SPLINT FOR MAINTENANCE OF EAR PROJECTION FOLLOWING MICROTIA RECONSTRUCTION: A CLINICAL REPORT

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Abstract

An 11-year-old female with Grade II right-sided microtia underwent stage II ear reconstruction and required postoperative support to prevent retro auricular sulcus obliteration and loss of auricular projection. Two weeks after surgery, considering the risk of early graft contracture, a temporary splint fabricated from impression compound was delivered as an interim measure to maintain ear elevation during the fabrication of a definitive appliance. After one week, a passive heat-cured polymethyl methacrylate (PMMA) acrylic splint was provided and secured to a spectacle frame tray using self-cure acrylic resin to achieve stable retention and improved camouflage. The stepwise approach ensured continuous support of the elevated auricular framework while maintaining comfort and aesthetics. The patient was instructed to wear the splint daily. At 2-month follow-up, auricular projection was clinically maintained with no evidence of sulcus obliteration, skin irritation, pain, or appliance fracture. Patient compliance was excellent, and the spectacle-supported design enhanced social acceptability. This sequential splinting protocol represents a simple, cost-effective, and practical method for postoperative maintenance of ear projection in paediatric microtia reconstruction.

Keywords: microtia, ear reconstruction, acrylic splint, spectacle-supported splint, auricular projection, postoperative management

Introduction:

Microtia is a congenital malformation of the external ear characterized by partial or complete absence of normal auricular structures. Epidemiological studies report a prevalence ranging between 0.8 and 4 per 10,000 live births, with a higher incidence in males and a predominance of unilateral involvement.[1]

Autologous auricular reconstruction has evolved significantly over decades, and multiple classification systems—including those of Marx and other surgical frameworks—aid in clinical assessment and treatment planning.[1,2]

Autologous costal cartilage reconstruction remains the gold standard for definitive auricular rehabilitation.[2,3] The Brent technique and its subsequent refinement through the Nagata method have established structured, multi-stage protocols to achieve aesthetic and structural restoration.[3,4] Stage II reconstruction involves elevation of the reconstructed auricle and formation of a retroauricular sulcus to create an appropriate cephaloauricular angle.[5,6] Despite meticulous surgical execution, graft contracture and scar maturation may compromise projection, potentially leading to partial sulcus obliteration or need for revision procedures.[6,7]

To counteract these contractile forces, postoperative splinting has been widely advocated. Various techniques have been described, including thermoplastic appliances, customized splints, Foley catheter–based devices, impression compound appliances, and acrylic resin splints.[8,9,10,11] While these modalities aim to preserve projection, concerns remain regarding retention, structural rigidity, hygiene maintenance, and long-term compliance, particularly in paediatric populations.[8,9] Therefore, development of a practical, stable, and aesthetically acceptable splinting strategy is clinically relevant.

This report presents a stepwise postoperative splinting protocol employing an interim impression compound splint followed by a spectacle frame–supported heat-cured polymethyl methacrylate splint for maintenance of auricular projection following stage II microtia reconstruction.

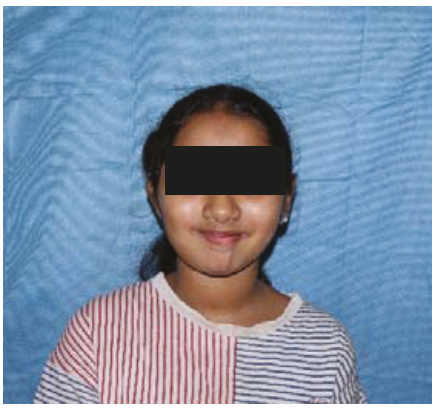
Case Report

An 11-year-old female patient reported to the Department of Prosthodontics for fabrication of a postoperative splint following stage II reconstruction of right-sided Grade II microtia. The patient had undergone auricular elevation with retroauricular sulcus formation two weeks prior. There was no relevant medical history, no syndromic association, and no history of hearing aid use.

Clinical Findings

At presentation, the skin graft over the postauricular region appeared healthy with satisfactory healing (Figure 1). Auricular

A- surgical site



B- Frontal extraoral view

C- Lateral surgical site view

Figure 1:

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projection was clinically adequate; however, slight tenderness was present on palpation. Considering the risk of postoperative graft contracture and potential sulcus obliteration during scar maturation, preventive splint therapy was planned.

Interim Splinting Phase

A temporary splint was fabricated using regular impression compound softened in a water bath at 55–60°C. The softened material was directly adapted over the retroauricular sulcus region and contoured to engage the newly created sulcus (Figure 2). The maximum thickness was approximately 1.5 mm at its thickest portion. Retention was achieved through mechanical engagement of the sulcus and contour locking without auxiliary support or adhesive. The splint was worn throughout the day for one week, serving as an interim measure while the definitive splint was being fabricated. No adjustments were required during this period.

Definitive Spectacle-Supported Acrylic Splint

Impression and Cast Fabrication

At the first appointment for definitive splint fabrication, an addition silicone putty impression was made. The material was first adapted into the sulcus region and subsequently extended externally to cover the entire surgical site (Figure 3).

The impression was poured using Type III dental stone to obtain a working cast (Figure 4).

Figure 2 Impression compound adapted over retroauricular sulcus

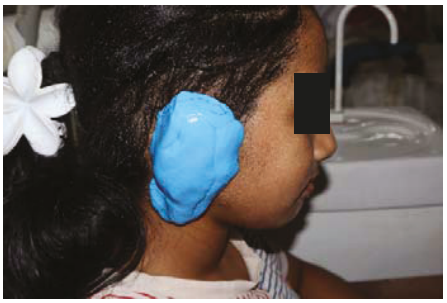
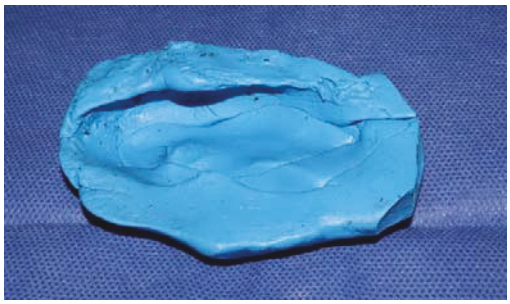


Figure 3: A – Adapted addition silicone impression on the pedicle graft



B – Impression of the defect

Figure 4: Working cast

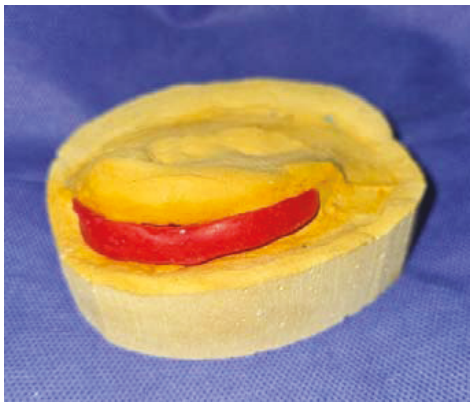
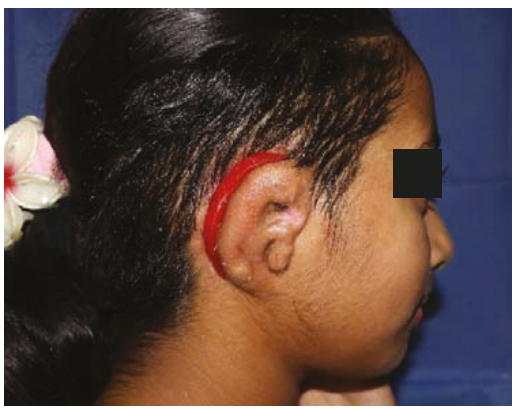


Figure 5: A – Fabrication of wax pattern



B – Try-in of wax pattern

Fabrication of Wax Pattern and Try-In

Modelling wax was adapted over the defect area on the cast to fabricate a wax pattern. During the second appointment, the wax pattern was tried (Figure 5). The following parameters were evaluated:

- Accurate engagement of the retroauricular sulcus
- Adequate maintenance of projection
- Absence of undue pressure on grafted tissues
- Patient comfort during mandibular and head movements
- Aesthetic contour and symmetry with the contralateral ear

After confirmation of satisfactory fit and projection, the wax pattern was processed.

Laboratory Processing

The wax pattern was flasked using Type 3 dental stoneand Type IV die stone, dewaxed, and packed with heat-activated clear polymethyl methacrylate (PMMA). Characterization was achieved using intrinsic skin-tone pigments blended with the acrylic resin. A commonly used heat-cure acrylic resin (DPI Heat Cure) was utilized. The polymer-to-monomer ratio was maintained at the manufacturer-recommended 3:1 ratio by volume. The material was processed using a conventional compression moulding technique and cured in a water bath at 74°C for 8 hours following standard long curing cycle protocols. After bench cooling to room temperature, the prosthesis was deflasked, trimmed, and polished (Figure 6). The final thickness was approximately 1.5 mm, and the splint weighed approximately 25 grams.

Attachment of Spectacle Frame

During the third appointment, the processed splint was evaluated for passive fit and projection (Figure 7). The appliance was purely passive and designed to engage the sulcus without exerting active pressure. No relief was provided over the grafted region to ensure adequate support and maintenance of projection.

The patient's own spectacle frame was used for retention. The optimal attachment site was identified and marked while the spectacles were worn without the splint. The corresponding areas on both the splint and spectacle frame were roughened mechanically. Self-cure clear PMMA resin was then applied to bond the splint to the

Figure 6: A – Flasking and Dewaxing of the Wax Pattern B – Packing of the heat - activated PMMA resin

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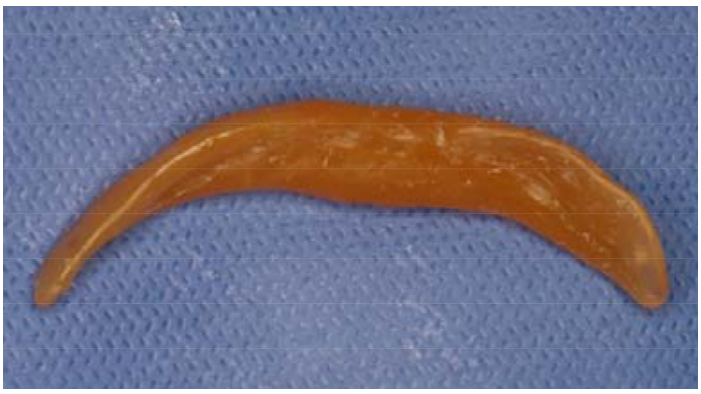
spectacle tray while the patient maintained proper positioning to ensure accurate alignment (Figure 8). After polymerization, the attachment site was trimmed and polished, and the appliance was delivered.

Retention was achieved through sulcus engagement and spectacle support. Stability was ensured by maintaining proper positioning during auto polymerizing resin setting.



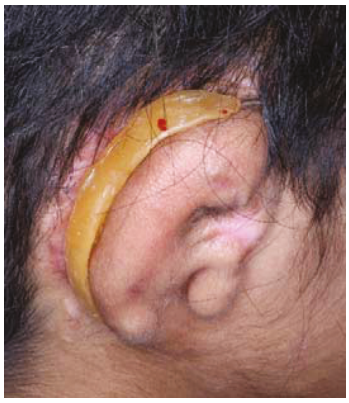


Figure 7: A – Processed ear splint

B – Evaluation of the fit of the Ear Splint

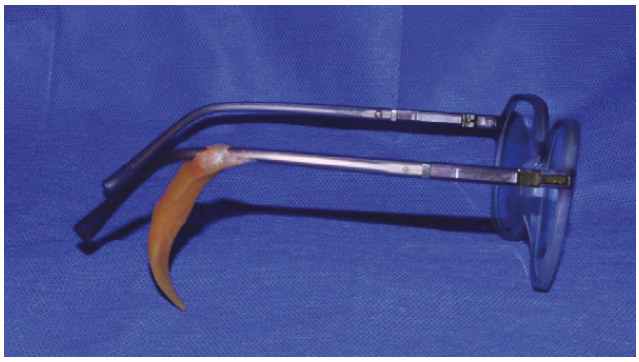


Figure 8: A – Definitive Spectacle Frame attached Ear Splint,

B – Lateral view of the Ear Splint,

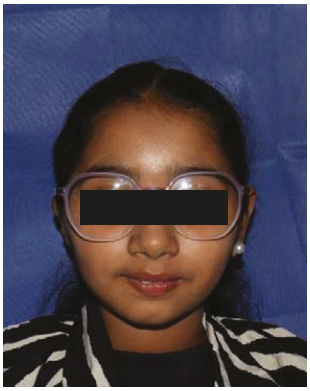


Figure 8: C – Frontal view of the Ear Splint,

D – Frontal view of the Ear Splint on the Patient

Post-Delivery Instructions and Follow-Up

The patient was instructed to wear the appliance during daytime hours for approximately 15 hours daily and remove it at night. The planned duration of wear was four months until the third-stage surgical procedure.

At 2-month follow-up, the patient continued to wear the splint regularly (Figure 9). Auricular projection was clinically maintained with no evidence of sulcus obliteration. No erythema, ulceration, fracture, loosening, or need for relining was observed. Both patient and parent reported satisfactory comfort and aesthetic acceptance.

Comprehensive clinical and laboratory documentation, including pre-splint, interim splint, definitive splint, and follow-up images, were recorded.

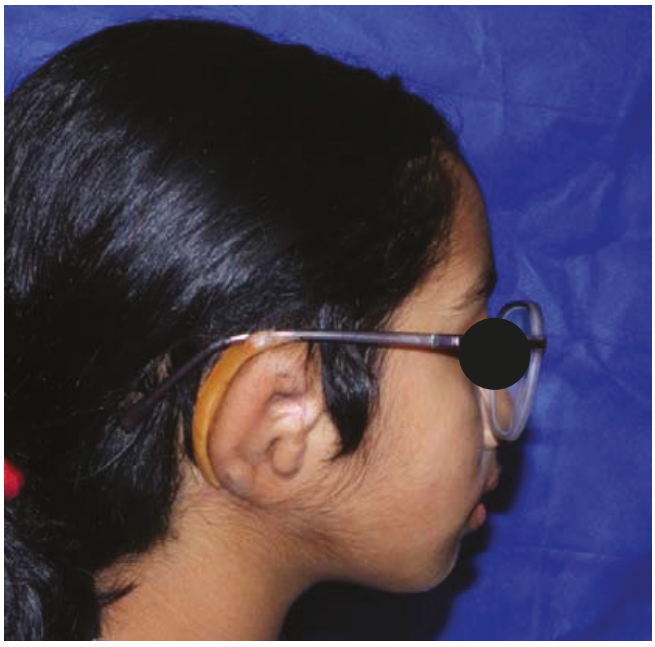


Figure 9: 2 month follow up of Spectacle supported Ear Splint

Discussion

Maintenance of auricular projection following stage II microtia reconstruction remains a critical determinant of long-term aesthetic success. Although cartilage framework support and fascial coverage enhance stability, biological remodelling processes such as scar contraction remain unpredictable.[5,6] Even well-executed reconstructions may demonstrate gradual reduction in projection during maturation.[7] Consequently, splint therapy functions as a biomechanical continuation of the surgical objective rather than merely an auxiliary measure.

Multiple splinting modalities have been described to maintain sulcus depth. Overview literature emphasizes thermoplastic and customized splints as commonly employed approaches.[8,13] These devices are adaptable but may lack sufficient rigidity for prolonged structural support. Foley catheter–based splints provide a cost-effective and relatively simple method for maintaining sulcus patency.[11] However, their circular configuration primarily offers tension-based support and may not provide precise three-dimensional stabilization.

Impression compound has been reported as an effective material for maintaining ear elevation during early postoperative healing.[10] Its thermoplastic adaptability allows intimate sulcus engagement with minimal fabrication complexity. However, its durability is limited when prolonged support is required. In contrast, acrylic resin splints offer superior dimensional stability and resistance to deformation.[9,14] Processed heat-cured PMMA allows controlled rigidity, enabling sustained maintenance of sulcus depth without repeated reshaping. Nevertheless, careful adaptation is essential to avoid excessive pressure over grafted tissues.

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Recent advances include digitally fabricated and three-dimensional printed splints.[12] Randomized clinical evidence suggests improved maintenance of cranioauricular distance compared with conventional thermoplastic appliances.[12] Stepwise workflow protocols further emphasize reproducibility and cost-effectiveness.[14] However, specialized equipment requirements and increased costs may limit universal adoption.

Microtia reconstruction using autologous cartilage frameworks remains technically demanding and outcome-sensitive.[2,3,4] Systematic reviews have reported measurable complication rates, reinforcing the importance of adjunctive postoperative support strategies.[15] Integration of splint therapy into the reconstructive algorithm may therefore enhance stability and minimize projection relapse.

In the present case, a staged prosthodontic approach combined early adaptable support using impression compound with long-term rigid stabilization through a heat-cured PMMA splint. Spectacle-frame retention provided discreet and socially acceptable stabilization, improving compliance in a paediatric patient. At two months, projection was maintained without tissue irritation or mechanical complications, supporting the clinical feasibility of this sequential protocol.

Limitations

The present report represents a single clinical case with a relatively short follow-up duration of two months. Objective measurements such as cephaloauricular angle quantification or standardized scar assessment scores were not recorded, limiting quantitative comparison with previously published data. Furthermore, the absence of a control group precludes direct evaluation of superiority over other splinting modalities. Long-term follow-up and prospective comparative studies are necessary to validate the durability and reproducibility of this sequential splinting protocol.

Conclusion

Sequential postoperative splinting using interim impression compound followed by a spectacle-supported heat-cure PMMA splint effectively maintained auricular projection after stage II microtia reconstruction. This cost-effective, patient-friendly approach provided stable sulcus engagement, satisfactory aesthetics, and good compliance, highlighting the value of prosthodontic collaboration in interdisciplinary microtia rehabilitation.

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