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Case Report

Face of Courage: Maxillofacial Prosthetic Rehabilitation of Facial Defect Due To Bear Maul Injury" – A Case Report

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ABSTRACT

Introduction: Human–wildlife conflict is an important cause of traumatic injury in populations residing near forested and mountainous regions. Although bear attacks constitute a relatively uncommon form of animal-related trauma, the injuries produced by bear mauling are often devastating because of the considerable force exerted by the animal's claws, paws, and jaws. The craniofacial region is particularly vulnerable during such encounters, and injuries may range from deep lacerations and puncture wounds to extensive soft-tissue avulsion, fractures, ocular injuries, and loss of facial structures.

Patient Details and Treatment Plan: A 70-year-old male patient reported to the Department of Prosthodontics, Crown and Bridge, Government Dental College and Hospital, Srinagar, with the chief complaint of a facial defect involving the nose and left eye. The patient had a history of a bear maul injury sustained 8 years ago, which resulted in the loss of the nasal and left orbital structures. Reconstructive plastic surgery was performed 7 years ago; however, a residual facial defect persisted.

Conclusion: Bear-maul injuries involving the maxillofacial region can result in extensive soft and hard tissue destruction, with permanent facial disfigurement and substantial functional, esthetic, and psychosocial consequences. [1–3] Although surgical reconstruction remains an essential component of initial and definitive management, complete restoration of complex facial structures may not always be achievable, particularly in patients presenting with extensive or long-standing defects.

Keywords*: Bear Maul Injury, Maxillofacial Trauma, Facial Defect, Orbital Rehabilitation, Facial Prosthesis.*

Introduction:

Human–wildlife conflict is an important cause of traumatic injury in populations residing near forested and mountainous regions. Although bear attacks constitute a relatively uncommon form of animal-related trauma, the injuries produced by bear mauling are often devastating because of the considerable force exerted by the animal's claws, paws, and jaws. The craniofacial region is particularly vulnerable during such encounters, and injuries may range from deep lacerations and puncture wounds to extensive soft-tissue avulsion, fractures, ocular injuries, and loss of facial structures. [1–3]

Bear-maul injuries are of particular relevance in the Kashmir region, where proximity of human settlements and agricultural areas to forest habitats increases the possibility of human–bear encounters. Shah et al.[1], in a study of 200 patients with bear-maul injuries treated at Government Dental College and Hospital, Srinagar, observed that all patients sustained soft-tissue injuries, with frequent involvement of facial viscera, eyes, salivary glands, and the facial nerve. Similarly, Tak et al.[2] reported that head-and-neck lacerations and fractures involving the facial and skull bones were prominent findings among bear-attack victims in Kashmir. Such injuries may result in permanent facial disfigurement, loss of vision, functional impairment, and considerable long-term psychosocial morbidity.

Management of severe bear-maul injuries requires a multidisciplinary approach. Initial treatment is directed toward preservation of life, wound debridement, prevention of infection, repair of associated fractures, and reconstruction of damaged tissues. [1–3] However, extensive tissue loss may make complete surgical reconstruction difficult, and residual defects can persist despite multiple reconstructive procedures. Defects involving aesthetically important structures such as the nose and orbit are especially challenging because successful reconstruction requires restoration of complex three-dimensional anatomy, symmetry, color, texture, and facial contours.

Maxillofacial prosthetic rehabilitation provides an important alternative or adjunct to surgical reconstruction when complete surgical correction is not feasible, is contraindicated, or does not provide an acceptable esthetic outcome. Extraoral facial prostheses can restore missing facial structures, camouflage disfigurement, and facilitate the patient's social and psychological rehabilitation. Medical-grade silicone is widely used for facial prostheses because of its flexibility, biocompatibility, ability to reproduce fine surface details, and potential for intrinsic and extrinsic color characterization to simulate surrounding facial tissues. [4,5]

The present case report describes the prosthetic rehabilitation of a 70-year-old male patient with a long-standing combined Naso-orbital defect resulting from a bear-maul injury. Despite previous reconstructive plastic surgery, a substantial residual defect involving the nose and left orbital region persisted. A custom-made medical-grade silicone maxillofacial prosthesis was therefore fabricated with the aim of restoring facial form, improving esthetics, and facilitating the patient's psychosocial reintegration.

Patient Details and Treatment Plan:
A 70-year-old male patient reported to the Department of Prosthodontics, Crown and Bridge with the chief complaint of a facial defect involving the nose and left eye. The patient had a history of a bear maul injury sustained 8 years ago, which resulted in the loss of the nasal and left orbital structures. Reconstructive plastic surgery was performed 7 years ago; however, a residual facial defect persisted.

On clinical examination, a combined Naso-orbital defect involving the nose and left orbital region was observed. Following comprehensive clinical and dental evaluation, the treatment plan included rehabilitation of the facial defect with a custom-made maxillofacial prosthesis fabricated using medical-grade silicone to restore facial esthetics and improve the patient's quality of life.

Clinical Procedure
Following acquisition of written consent, a comprehensive medical assessment was undertaken and appropriate medical clearance was obtained prior to the commencement of prosthetic rehabilitation.

Facial Impression Procedure:
The facial skin was lightly coated with petroleum jelly to facilitate atraumatic removal of the impression material. A facial impression framework was fabricated using impression compound (DPI, dental products of India, Mumbai, India) reinforced with modeling wax (DPI, dental products of India, Mumbai, India) and adapted over the facial contours. This framework served as a supporting matrix for the impression material and prevented excessive material flow during the impression procedure.

To ensure maintenance of a patent airway throughout impression making, a modified 3-mL disposable syringe was employed as a mouth-breathing aid. The patient was instructed and trained to breathe through the mouth before the procedure. The defect site was gently packed with petroleum jelly–impregnated gauze to prevent ingress of impression material into the defect, while the contralateral eye was protected using adhesive tape (Fig 1).

A thin mix of irreversible hydrocolloid impression material (tropicalgin, zhermack, badia polesine, Italy) was applied over the defect area. Gauze strips were incorporated within the alginate to reinforce the impression, followed by application of impression plaster (Kalabhai Karson pvt. Ltd., Mumbai, India) as a backing material. Additional gauze reinforcement was incorporated to improve strength and dimensional stability. Following complete setting, the impression was carefully retrieved and poured in Type IV dental stone (Kalrock, Kalabhai Karson pvt. ltd., Mumbai, India) to obtain the primary facial cast (Fig 2).

Definitive Functional Impression:
A custom impression tray was fabricated on the primary cast using auto polymerizing acrylic resin (DPI RR cold cure, dental products of India, Mumbai, India). A definitive functional impression was subsequently made using addition silicone elastomeric impression material (aquasil, denstsply sirona, charlotte, NC, USA) in putty and light-body consistencies. During impression making, the patient was instructed to perform a series of functional facial movements, including wide smiling and other dynamic expressions, to accurately record the functional contours of the surrounding tissues. This approach facilitated the fabrication of a prosthesis capable of maintaining adaptation and stability during facial movements.

The definitive impression was poured in Type IV dental stone (Kalrock, Kalabhai Karson pvt. Ltd., Mumbai, India) to obtain the master cast (Fig 2).

Donor Facial Moulage and Wax Pattern Fabrication:
To reproduce a natural nasal contour, a facial moulage was obtained from the patient's elder son, who served as the donor. The donor impression was made using the same impression protocol described previously. Molten modeling wax was poured into the donor impression to obtain a wax replica of the nasal component. The resulting wax form was subsequently modified and sculpted to harmonize with the patient's facial proportions and contours. Pre-defect facial photographs were used as references during wax pattern refinement to achieve optimal esthetic integration.

Fabrication of the Orbital Component
The orbital component was fabricated by first constructing an ocular prosthesis incorporating a three-dimensional (3D)-printed iris shell. The ocular prosthesis was accurately positioned on the master cast according to established anatomical landmarks. Subsequently, a wax pattern for the orbital prosthesis was sculpted around the ocular component to restore the lost periorbital tissues (Fig 3).

At the wax try-in appointment, the prosthesis was evaluated for adaptation, retention, marginal continuity, facial symmetry, and overall esthetic appearance (Fig 4). Functional nasal patency was established by creating patent nostrils within the wax pattern. Adequacy of airflow through the nasal openings was verified using the mouth mirror test. Necessary modifications were performed until satisfactory esthetic and functional outcomes were achieved.

Processing of the Silicone Prosthesis:
The finalized wax pattern was invested using plastic utility containers as the flasking assembly. The wax pattern was sealed to the master cast, and the first pour was completed using Type III dental stone. To preserve the morphology of the nostrils during processing, they were blocked with putty-consistency addition silicone. Conical orientation indices were incorporated into the first stone pour to facilitate precise reorientation of the mold components during packing. Following application of a separating medium, the second pour of the investment was completed.

After complete setting of the investment material, dewaxing was carried out for approximately 15 minutes (Fig 4). Particular care was taken to ensure complete removal of residual wax from the mold cavity. The prosthesis was fabricated using medical-grade room-temperature vulcanizing (RTV) silicone elastomer (Technovent Ltd., United Kingdom). The silicone base and catalyst were mixed in a ratio of 10:1 in accordance with the manufacturer's recommendations.

Intrinsic coloration was performed under natural daylight conditions. The lightest skin tone identified on the patient's face was selected as the base shade, and intrinsic pigments were incrementally incorporated until an acceptable color match was achieved. An anti-slump agent was subsequently added and thoroughly blended to improve the handling properties of the material.

The intrinsically characterized silicone was packed into the mold, and the flask was closed under uniform pressure to allow extrusion of excess material. Polymerization was permitted to proceed at room temperature for 24 hours. Following complete vulcanization, the prosthesis was carefully retrieved from the mold and excess flash was trimmed using surgical scissors. The processed prosthesis was examined for defects such as voids, tears, and surface irregularities prior to final characterization and delivery (Fig 5).

Prosthesis Delivery and Follow-up:
The completed silicone Naso-orbital prosthesis was evaluated for fit, adaptation, marginal integrity, esthetics, function and patient comfort. The prosthesis demonstrated satisfactory retention and harmonious integration with the surrounding facial tissues. Prosthesis was retained using water soluble adhesive (Technovent, UK). Additional retention was provided using spectacles (Fig 6). Detailed instructions regarding placement, removal, cleaning, storage, and maintenance of the prosthesis were provided to the patient. Regular follow-up visits were scheduled to assess prosthesis performance, tissue health, and patient satisfaction.

Conclusion:
Bear-maul injuries involving the maxillofacial region can result in extensive soft- and hard-tissue destruction, with permanent facial disfigurement and substantial functional, esthetic, and psychosocial consequences. [1–3] Although surgical reconstruction remains an essential component of initial and definitive management, complete restoration of complex facial structures may not always be achievable, particularly in patients presenting with extensive or long-standing defects.

In the present case, a residual combined Naso-orbital defect persisted despite previous reconstructive surgery. Prosthetic rehabilitation using a custom-made medical-grade silicone facial prosthesis provided a conservative and effective means of restoring the missing facial structures. Careful reproduction of facial contours, appropriate colour matching, and blending of the prosthetic margins with the surrounding tissues contributed to an acceptable esthetic outcome.

This case highlights the important role of the maxillofacial prosthodontist in the multidisciplinary rehabilitation of patients with severe post-traumatic facial defects. Medical-grade silicone prostheses can provide a practical alternative or adjunct to further surgical reconstruction and can contribute significantly to the restoration of facial appearance, patient confidence, social acceptance, and overall quality of life. [4,5]

Images:

Fig 1: Pre operative image, Frame for impression made using impression compound and modelling wax, Modified syringe for ventilation, Preparation for impression making.

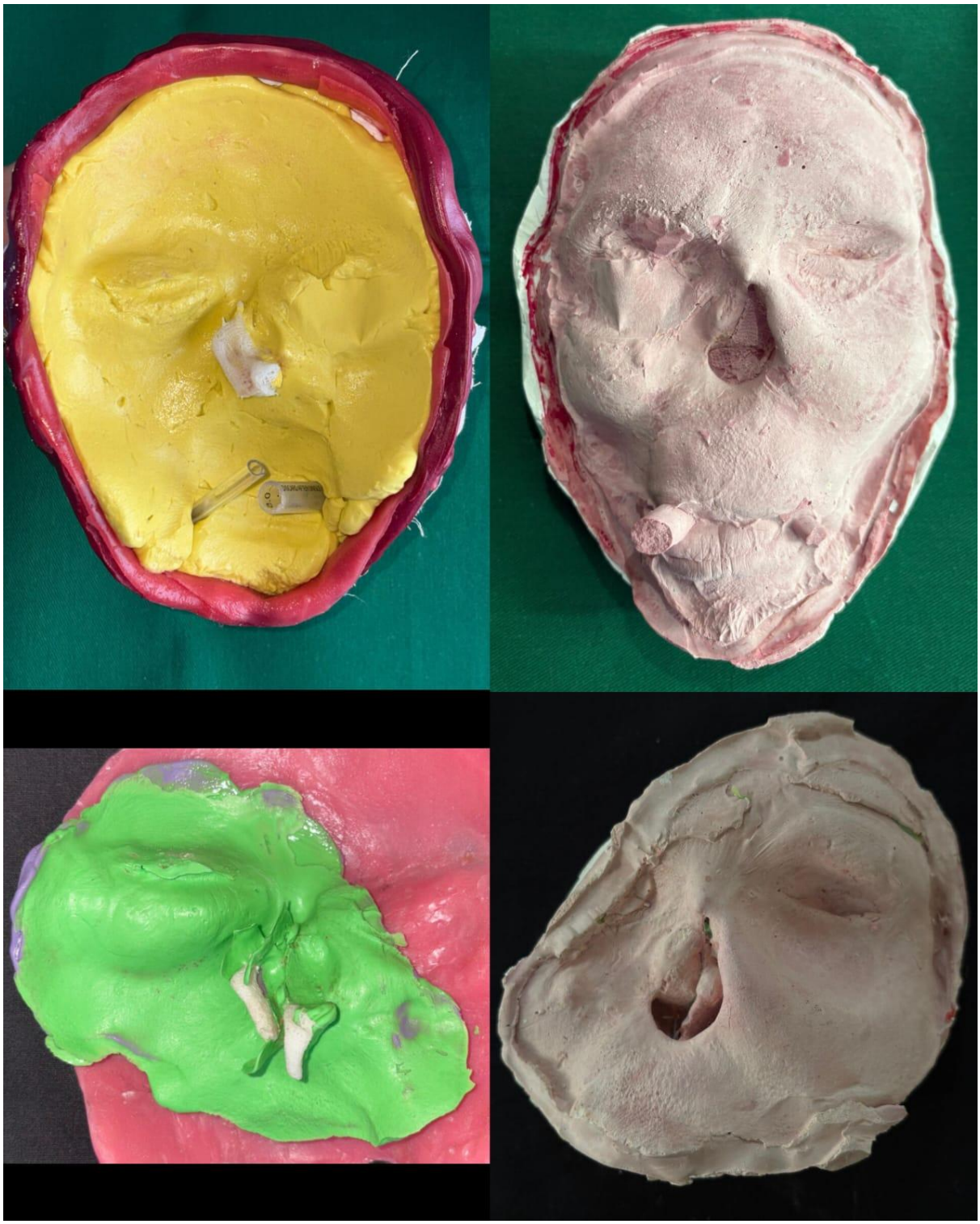

Fig 2: Primary impression, Primary cast, Functional impression, Master cast.

Fig 3: 3-dimensional printed iris shell, Processing of ocular prosthesis, Wax pattern of ocular prosthesis, Wax pattern of nasal and orbital prosthesis.

Fig 4: Wax trial, Wax trial with additional retention using spectacles, Flasking of wax pattern, Mould after elimination of wax.

Fig 5: Shade matching, Selected shades for various spots of facial defects, Characterization using extrinsic staining, Final Naso-orbital prosthesis.

Fig 6: Prosthesis retained with water soluble adhesive with additional retention.

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