

Use of osseointegrated dental implants to treat partial edentulism resulting from trauma: A case presentation

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Facial trauma often results in partial tooth and alveolar bone loss as a result of subapical fractures. Such traumatic alveolar bone loss is usually of a greater extent than that which results after the extraction of teeth because of dental disease. This reduction in the denture-supporting area and the number of teeth has inevitably led practitioners to resort to a removable partial denture as the treatment of choice.

The introduction of osseointegration has created new opportunities for more convenient and esthetically approved prosthodontic designs, which offer the clinician a greater variety of treatment options in the restoration of facial injuries.^{1,2} As it has been stressed in the past, proper diagnosis, treatment planning, surgical placement of the fixtures, and prosthodontic management are demanding procedures requiring productive communication and team work among the oral surgeon, prosthodontist, and dental laboratory technician.³

This article presents some of the clinical and laboratory procedures for the fabrication of a tissue integrated prosthesis (using the Bråne-mark implant system) in a patient who suf-

fered from upper segmental alveolar bone and tooth loss due to a motor vehicle accident.

Clinical and Laboratory Procedures

Orofacial trauma from a motor vehicle accident resulted in alveolar bone fracture and loss of teeth 22, 23, 24, 25, 26, and 27 in a young patient. Except for a slight, probably preexisting, midline deviation in maximum intercuspation, no other remarkable restriction in mandibular functional movements was recorded. All remaining teeth were in good condition with satisfactory occlusion. Anterior guidance was present in straight protrusion and right lateral eccentric movement (Fig 1).

After the articulation of diagnostic casts, an initial full contour diagnostic waxup was created on a removable acrylic resin record base (Fig 2). An assessment of the remaining bone quality and quantity was used to ascertain the number and position of implants that needed to be placed in the maxilla. The diagnostic waxup was tried in the mouth so that the prosthodontist, dental technician, and patient could visualize and assess the functional and esthetic result. It is a good idea to use ivory rather than green or blue inlay wax, for it gives to all observers a more precise idea of the future final restoration (Fig 3).

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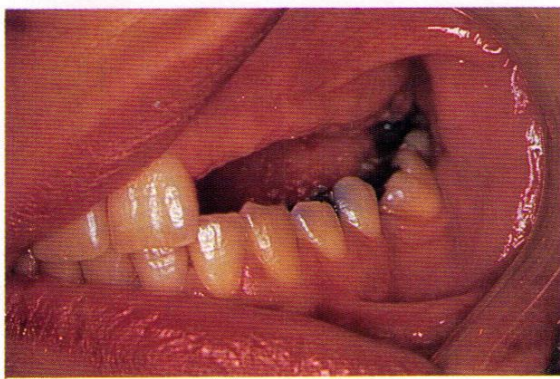


Fig 1 Left lateral view showing loss of the natural teeth and alveolar bone. Observe the mandibular plane of occlusion.

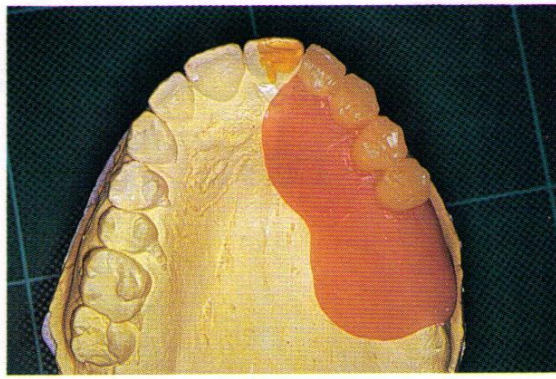


Fig 2 Occlusal view of diagnostic waxup replacing teeth 22, 23, 24, and 25. Note the extent of the acrylic resin record base.

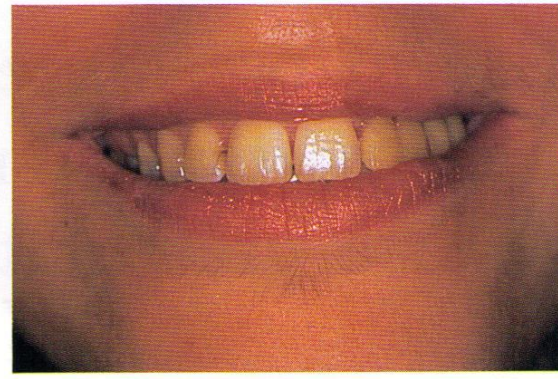


Fig 3 Anterior view of clinical try-in of the diagnostic waxup using ivory wax to simulate tooth shape.

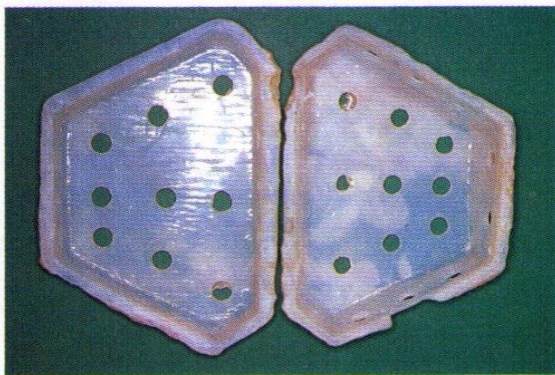


Fig 4 Upper and lower halves of denture duplicator. Observe the holes utilized to retain alginate used for denture duplication.

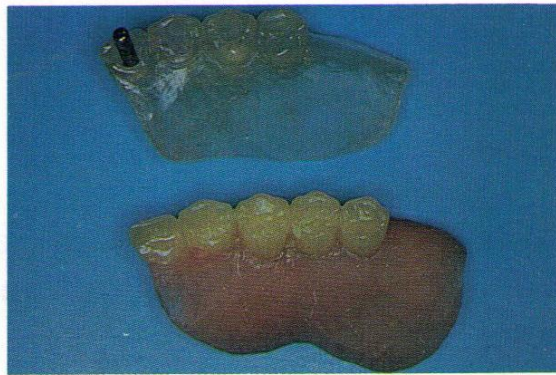


Fig 5 Clear acrylic resin diagnostic and surgical guide with occlusally located access holes (*top*); diagnostic waxup on the acrylic resin denture base (*bottom*).

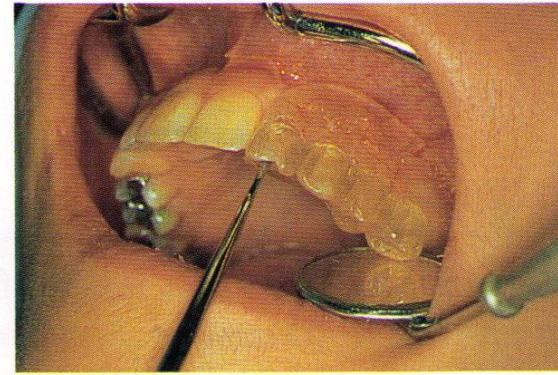


Fig 6 Left lateral view of surgical guide in situ with the location of fixture site in area 22 being identified.

The acrylic resin denture base with its diagnostic waxup is duplicated in clear acrylic resin using alginate and a plastic denture duplicator (Fig 4). The resulting template serves as both a diagnostic and surgical guide. Holes are placed into the occlusal aspects of the teeth, which serve for the accommodation of radiographic markers and to aid in determining the location of the fixture sites during stage-one surgery (Fig 5).

The surgical guide is placed in the patient's mouth, and the future fixture sites are marked through the occlusally emerging access holes. In this patient, due to anatomic restrictions, only three self-tapping fixtures were installed at the prior locations of teeth 22, 23, and 24 (Fig 6). After placement of the fixtures, in this instance with significant labial inclinations due to the bony morphology of the maxillary residual ridge, they are allowed to osseointegrate for a period of 6 to 8 months. The abut-

ment fixtures are uncovered in a second-stage surgical procedure, and the esthetic cones, guide pins, and impression copings are tried in the abutments (Fig 7). It was noted that there was a severe labial inclination to these abutments, which was corrected by replacing the esthetic cones with angulated abutments. This procedure facilitates the restorative phase and redirects the access to the screws from the labial surface to the occlusal aspect of the restoration (Fig 8).

An impression is made with the transfer copings in place and poured in dental stone to create a master cast, which replicates the implants, natural teeth, and soft tissues. In this procedure the gingival aspect around each abutment and pontic area is created using a resilient soft lining material. This will allow the dental laboratory technician to have a clear understanding of the anatomy of this region and allow for the proper build-up of



Fig 7 Anterior view of guide pins and square impression copings placed in the implants. Observe the severe labial angulation, which compromises the esthetic and functional result of the final restoration.

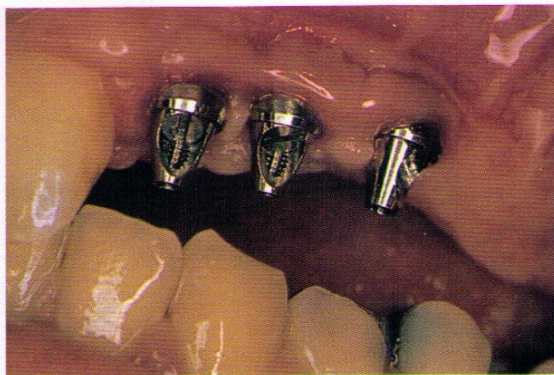


Fig 8 Left lateral view of angulated abutments inserted into the implants, which more favorably direct the abutments along the correct arch form and allow for the access screws to be orientated occlusally.

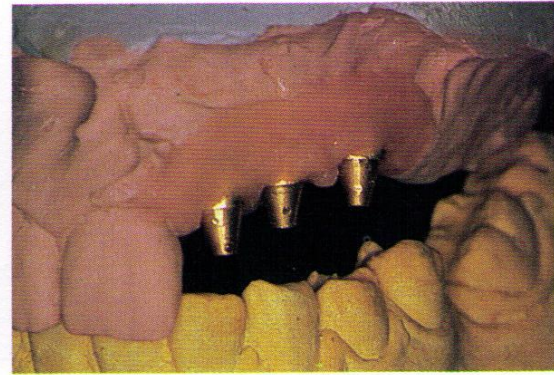


Fig 9 Left lateral view of articulated master cast with brass abutment replicas surrounded by resilient soft re-line material.



Fig 10 Lingual view of full-contoured waxup of the four-unit fixed partial denture supported by three implants. Observe the gold cylinders and access holes in the occlusal aspect of the bridge.



Fig 11 Left lateral view of the try-in of the full contour waxup. Any esthetic and functional corrections can be made at this stage, prior to completion of the fixed partial denture.

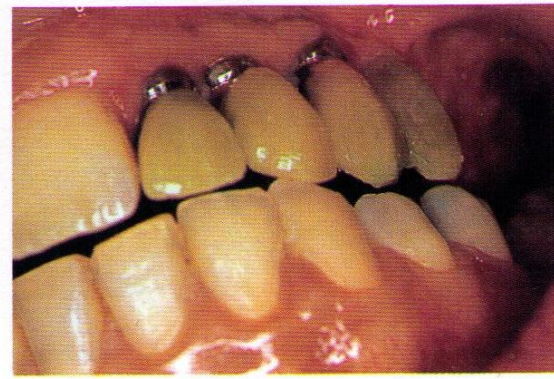


Fig 12 Anterior view of teeth brought into left lateral eccentric position, used to check the anterior guidance.

dental porcelain (Fig 9). The resultant cast is articulated by means of a facebow transfer procedure and intermaxillary records in centric occlusion.

Individual conical gold cylinders are secured with gold screws to each of the brass replicas to create the metal framework for the fixed partial denture that is to be supported by the three implants. These cylinders are joined together with a fine-grained acrylic resin (Dura Lay, Reliance Dental, Worth, IL). The acrylic resin substructure is extended distally to cantilever one premolar from the fixed partial denture. A full contour waxup is then completed over the acrylic resin pattern, using a combination of green and ivory inlay wax (Fig 10). This full contour waxup is tried in the patient's mouth to verify anatomic position, function, and esthetics. In addition, the pas-

sivity of fit of the gold cylinders against the abutments is verified. If the fit is not accurate, a new transfer impression must be made (Fig 11). Various excursive mandibular movements are checked as part of the verification of function of the implant-supported prosthesis. A careful examination of the fixed partial denture is made, with special attention paid to anterior guidance during left lateral eccentric movement (Fig 12).

After clinical verification and adjustment of the waxup intraorally, it is duplicated in dental stone. A silicone impression is made of the labial and occlusal surfaces of the cast to guide the dental laboratory technician in cutting back the correct amount of the waxup for proper metal strength and porcelain application. After cut-back and checking with the silicone guide, the wax pattern is sprued, in-

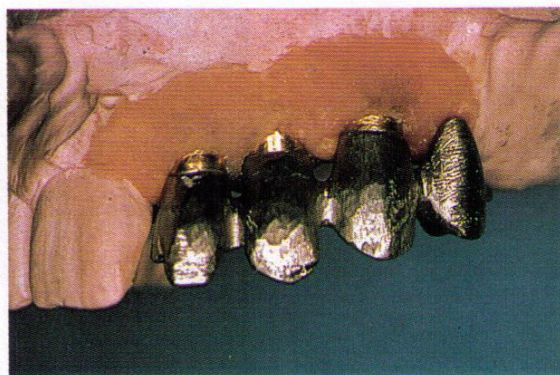


Fig 13 Left lateral view of finished casting placed on the gold cylinders of the master cast. Observe the amount of cut-back and gingival embrasure form and pontic area.



Fig 14 Left lateral view of try-in of cast fixed partial denture on three titanium osseointegrated abutments.



Fig 15 Labial view of completed four-unit implant-supported fixed partial denture in situ. As a result the exposure of the metal collar of the angulated implant abutment, dental porcelain was carried slightly more gingivally in the cervical regions of 22, 23, and 24 to improve the esthetics of this critical gingival region.



Fig 16 Palato-occlusal view of completed four-unit implant-supported fixed partial denture in situ. Proper use of angulated abutments allows the employment of occlusal access holes to retain the restoration. These holes do not interfere with the esthetics of the final restoration. Access holes in areas 22 and 23 will be left open after final tightening because of their close proximity to the occlusal surface, while the access hole around 24 can be filled in with composite resin.

vested, cast, and finished using standard fixed partial denture techniques (Fig 13). The casting is returned to the dentist for intraoral verification of fit after finishing (Fig 14). The casting must be checked again circumferentially for passivity of fit against the titanium abutment collar. In case of inadequate fit at this stage, the casting can be sectioned, the parts fit individually, and a new index made intraorally with Dura Lay acrylic resin. In addition, the embrasure areas should be checked for adequate room to allow access for proper plaque control. Any restricted areas should be modified to facilitate adequate oral hygiene.

After this clinical verification, the fixed partial denture casting can be returned to the dental laboratory for the application of dental porcelain (Fig 15). This can again be tried in the patient's mouth for verification of shade, contour, and embrasure form (Figs 15 and 16). In addition, as part of the try-in procedures, the occlusion of the fixed partial denture must be checked and adjusted in centric occlusion as well as eccentric movements. The occlusion is removed in all centric and eccentric contacts to minimize unfavorable loading of the cantilevered premolar pontic (Figs 17 and 18).

The completed restoration can be inserted

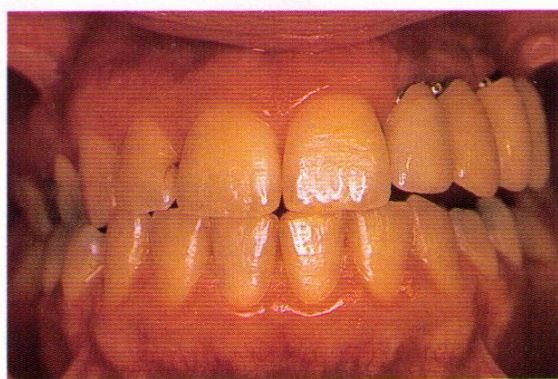


Fig 17 Anterior view of teeth and implant in a straight protrusive position. Observe the contact of the implant-supported prosthesis in this mandibular position.



Fig 18 Left lateral view of teeth and implant in left lateral eccentric position. Observe the contact of the implant-supported prosthesis in this mandibular position.



Fig 19 Anterior view of the completed restoration as part of the patient's overall smile. Observe the esthetic effects of this implant supported prosthesis. In spite of the elongated appearance of the replacement teeth, the smile line is not compromised because it does not expose the cervical region of the restoration, thus offering the patient optimum dental and facial esthetics.

and screwed to place over the titanium abutments. Home care instruction and intraoral hygiene aids are given, and the patient is placed on a frequent recall schedule for observation and adjustment. This type of prosthesis provides an excellent functional and esthetic result when all aspects of its diagnosis, surgery, dental laboratory, and restorative procedures are carried out with care using a "teamwork" approach (Fig 19). Implant-supported prostheses provide an additional valuable adjunct to the armamentarium of the dentist.

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