Autogenous bone blocks and dental implant placement to reconstruct a large volume hard tissue defect following a grinding disc injury: A case report

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Abstract

Injuries to the maxillofacial region resulting from the use of angle grinders have been reported previously. These injuries are often disfiguring and can negatively influence phonetics, masticatory function as well as self-esteem. The authors report a case wherein autogenous bone blocks followed by dental implant placement were used to reconstruct a large volume hard tissue defect caused by a grinding disc injury.

Introduction

Penetrating injuries are those that violate the soft and hard tissues by an object that forcefully enters the body. These injuries in the maxillofacial region may either be isolated or any combination of contusions, abrasions, lacerations, dento-alveolar fractures, luxations in their several forms, (lateral, intrusive, extrusive), subluxations, dental tissue lesions, and avulsions.[1, 2] Bastone et al (2000) in their study found that males experienced significantly more facial trauma than females with male:female ratios ranging from 1.3-2.3:1.[3] Most traumatic dental injuries are unintentional with the most dominating causes being falls, collisions and being struck by an object.[4] The authors present an unusual case of reconstruction of the dento-alveolar structures one year following an injury caused by a broken disc from an angle grinder.

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Case Report

A 35 year old male presented to the Department of Periodontics and Oral Medicine, University of Pretoria, with a request to replace his missing upper right canine and first premolar with a fixed restoration. He reported having an accident one year previously. An angle-grinder disc snapped and cut into his face. He sustained a full thickness laceration through the right upper and lower lips. He also sustained a dento-alveolar fracture, with traumatic luxation of the upper right canine and first premolar. The loss of teeth negatively influenced his phonetics, masticatory function, as well as his self-esteem.

Figure 1: Anterior facial view.

Figure 2a: Intra-oral right labial view.

Figure 2b: Occlusal view.

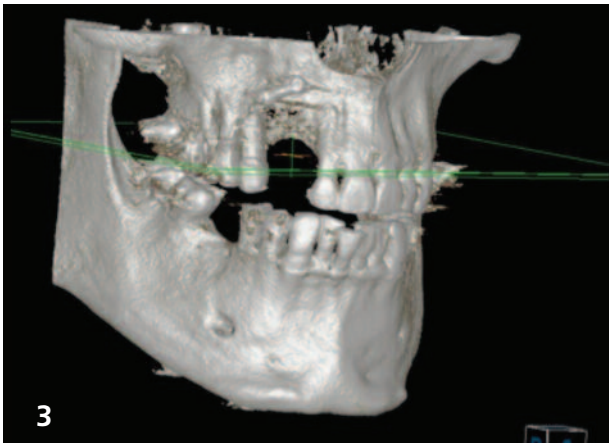

Figure 3: 3D reconstruction of CBCT.

A comprehensive medical and dental history was taken. This was followed by extra-oral and intra-oral examination. Extra-oral examination revealed a vertically orientated scar about 4cm in length extending across both the upper and lower lips from the inferior aspect of the right nasal ala (Figure 1). Intra-oral examination revealed a healthy periodontium and no dental disease. A large volume hard and soft tissue defect was noted in the first quadrant between teeth 15 and 12 (Figure 2a and b). A cone beam computed tomography (CBCT) scan was done as an adjunctive diagnostic aid. The scan revealed the presence of a mini-plate and screws in the region of the healed fracture and graphically demonstrated the hard tissue defect that existed in both the vertical and horizontal dimensions (Figure 3). Reduced bone height along the proximal surfaces of teeth 15 and 12 was noted.

Treatment planning

The patient was assessed by a periodontist and a prosthodontist. Teeth 15 and 12 were not considered suitable abutment teeth for a four-unit bridge. The hard tissue defect precluded the ideal three dimensional placement of dental implants to replace teeth 14 and 13. Augmentation of the site with autogenous bone blocks, followed by a healing period of 4-6 months and then placement of dental implants was considered to be the treatment of choice. Treatment protocol was based on a consensus statement of the Third ITI conference, which states that "Augmentation utilising autogenous blocks with or without membranes results in higher gains in ridge width and lower complication rates than use of particulate materials with or without membranes."[5]

The surgical SAC assessment was graded as complex and the restorative SAC assessment as advanced.[6]

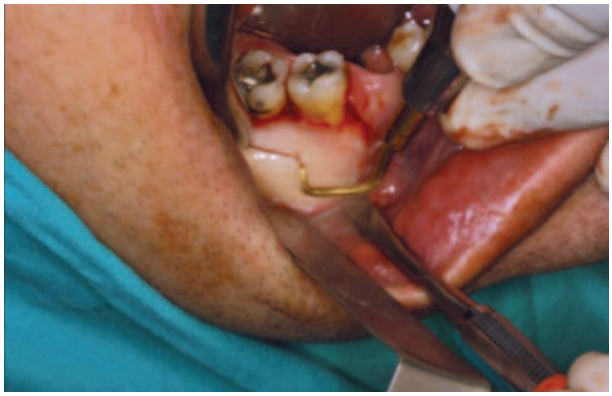

Figure 4: Use of the piezo-electric knife.

Figure 5: Placement of bone blocks horizontally and vertically.

Bone augmentation surgery

Under local anaesthesia and sedation, bone blocks were harvested from the right external oblique ridge and ascending ramus of the mandible. A piezoelectric knife was used to harvest the bone (Figure 4). One bone block was fixed to the lateral aspect and a second bone block to the superior aspect of the deficient residual ridge using bone screws (Figure 5). Guided bone regeneration was performed by covering the bone blocks with anorganic bovine bone mineral and a collagen membrane as described by von Arx and Buser.[7] Tension-free primary closure was obtained with 5-0 nylon sutures. Postoperative medication included a chlorhexidine mouthwash, antibiotics, anti-inflammatories and analgesics.

Dental implant surgery

Following a healing period of 4 months the bone screws were removed and Straumann bone level implants were inserted in tooth 14 and 13 positions. A pre-fabricated surgical stent (Figure 6) was used as a guide for the ideal three-dimensional placement of the implant fixtures (Figure 7). Closure screws were placed and primary closure obtained and a further two months of healing was allowed.

Dental implant exposure

The implants were exposed 2 months later utilising the roll-back technique (Figure 8). Osseointegration of the implants was verified with a RFA monitoring instrument, yielding an adequate Implant Stability Quotient (ISQ) at implant level and healing abutments placed.

Prosthodontic phase

Following a further healing period of 2 weeks, implant-level impressions were taken and temporary acrylic restorations manufactured. A period of two months was allowed for soft tissue training to optimise the emergence profiles of the crowns. Screw-retained porcelain fused to metal crowns were subsequently manufactured (Figure 9).

Figure 6: Use of a surgical stent.

Figure 7: Periapical radiograph showing implants in 14 and 13 positions.

Figure 8: Surgical exposure of implants.

Figure 9: Final restorations on day of placement.

Discussion

Traumatic injuries as a result of work-related injuries occur frequently with the most common sites injured by angle grinders being the head and face.[1, 8-11] Injury occurs when a disc shatters while rotating during use. Human error by unskilled or untrained workers and mechanical failure have been cited as being some of the most common causes.[1, 9] Dental trauma constitutes a significant health issue amongst adults with 15,5% reporting a history of injury to the mouth or teeth.[12]

Various treatment modalities have been used to replace lost anterior teeth, including removable partial dentures and bonded or cementable fixed bridges. With increasing patient demands, the use of removable partial dentures is rarely the option of choice as a definitive solution. Clinical follow-ups of teeth supplied with single crowns or included as abutments in bridge works have indeed demonstrated that pulp tissue necrosis is not a rare complication and may affect 10–20% of the observed teeth over a 10–15-year period.[13] Survival rate of implants placed in horizontally augmented bone is high.[5] Nevins, in a systematic review, found that implants placed in regenerated bone had similar survival rates to implants placed in native bone.[14]

In the repair of alveolar bone defects, intra-oral donor sites offer a number of advantages. The proximity of the recipient and donor sites makes it ideal for outpatient implant surgery because less operative and anaesthetic time is required. There is also no cutaneous scar and patients report reduced morbidity and discomfort compared with extra-oral locations.[15, 16]

Conclusion

The use of autogenous onlay block grafting from intra-oral sites is a predictable treatment modality for reconstruction of large volume alveolar bone defects. Aesthetics, function and phonetics can be restored following trauma to the anterior maxilla by guided bone regeneration and dental implant placement.

Acknowledgements

The authors would like to thank Dr Ashana Harrypersad, Department of Prosthodontics, University of Pretoria for the outstanding prosthodontic work.

Disclosure of conflict of interest

No conflict of interests have been reported.

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