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Case Report

# Trauma to an osseointegrated anterior dental implant: a case report

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Abstract – Single tooth implant systems have been shown to offer a safe and highly predictable option for the replacement of anterior teeth. There is however, a paucity of evidence on the result of trauma to single tooth implant systems, particularly in the vulnerable anterior maxillary area. This article presents a report on the outcome of a traumatic incident to an osseointegrated single tooth implant.

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Single tooth implant systems have been shown to offer a safe and highly predictable option for the replacement of anterior teeth, studies indicating a success rate of up to 97.6% (1). The incidence of early and late complications associated with implant failure, which can include failure of osseointegration, the failure of maintenance of osseointegration associated with the development of peri-implantitis or functional over-loading and implant fracture, are lowest in single tooth implant systems (2).

Retrospective studies have confirmed the success of single tooth implants in the replacement of anterior teeth avulsed because of trauma. Central maxillary incisors are the teeth most frequently lost because of trauma and replaced with single-tooth implants. The traumatic loss of two or more teeth is usually accompanied by alveolar fracture secondary to the avulsion injury resulting in a reduction of bone volume available for implant placement. A decrease in bone volume is also associated with an increase in equivalent stress/strain on bone (3). The single tooth implant-replacement of two or more teeth lost because of trauma usually requires bone augmentation (4).

The biological and mechanical complications associated with implant loss are well documented as are the causes and outcomes of traumatic injuries to natural teeth (5), but there is a deficiency in the literature on the consequences of trauma to single unit implant retained crowns. Two case reports of trauma to anterior dental implants have been published, in which the outcome of trauma included distortion of the implant fixation screw (6) and loosening of the abutment screw together with fracture of the porcelain on the abutment crown (7).

The following case report gives details of a further outcome of a traumatic event to a single-tooth implant, which was one of two implants placed to replace maxillary incisors lost because of previous trauma.

## Case report

A 25-year-old male presented at the emergency clinic of University Dental School and Hospital, Cork, Ireland, casualty service. He complained of trauma to his upper anterior dentition following an alleged assault, a 'blow to the face' 2 days previously. Specifically, he complained of a 'chipped crown' on the maxillary left central incisor, which had moved, resulting in difficulty closing his teeth, plus tenderness in another anterior tooth. He reported no other symptoms or injuries arising as a result of the assault.

### Past dental history

The patient reported that he had recently (within the last few months) had implants to replace his central incisors which had been previously lost in another trauma incident. Further questioning revealed that surgical placement of two implants had been undertaken approximately 4 months previously in the UK. The full veneer crown restorations had been placed 1 month prior to the trauma. The patient noted that the treating clinician 'had great difficulty getting the implants in' and he had been advised that these difficulties had been caused by a lack of bone.

### Intra-oral examination

Intra-oral examination revealed intact dental arches with all teeth present save for the maxillary central incisors. No soft tissue lacerations were noted. Intra-oral examination confirmed the presence of two implant-retained porcelain fused to metal crowns replacing the central incisors. The crowns had been cemented to the abutments.

The porcelain on the left central incisor porcelain fused to metal (PFM) crown was fractured. It was quite firm and did not display mobility but was seen to be displaced in a disto-palatal direction (Fig. 1). Further examination revealed that this displacement was causing a premature, occlusal contact on the tooth, which was preventing full closure of the posterior dentition (Fig. 2). It was considered that displacement of the tooth was the result of alveolar fracture secondary to blunt trauma, or distortion and 'bending' of the abutment screw again secondary to blunt trauma. The left lateral incisor was tender to percussion and exhibited grade 1 mobility. It recorded a negative response with ethyl chloride and electronic pulp testing.

Radiographic examination was performed using an upper, anterior occlusal view supplemented with intra-oral, peri-apical radiographs (Fig. 3). Radiographic examination of the left incisor was inconclusive, neither alveolar fracture nor screw distortion being confirmed by radiograph. The decision was made to remove the crown on the implant and to investigate further. No evidence of root-fracture on the left lateral incisor was found but widening of the periodontal ligament was noted around it.

Immediate treatment for symptomatic relief was provided. Selective grinding on the labio-incisal aspect of the left central incisor relieved the premature occlusal contact, which allowed normal closure into occlusal contact of the posterior teeth. The patient was given an appointment to return for further investigation.

*Fig. 1.* Clinical appearance of UL1 on presentation.

*Fig. 2.* Clinical appearance of UL1 on presentation.

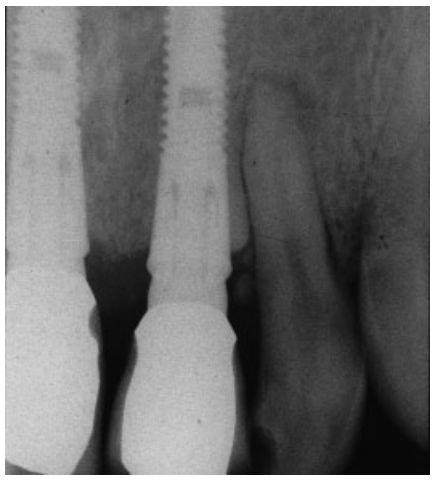

*Fig. 3.* Intra-oral radiograph of 21 and 22. Note widening of the apical periodontal ligament on 22 and fractured bone fragments evident between 21 and 22.

## Clinical procedures

On the return visit, the PFM crown on the left central incisor was removed with ease. Examination revealed that the abutment fixation screw (AstraTech™, Stonehouse, UK) had not loosened or distorted and that complete osseointegration of the implant was maintained. There was no pain or evidence of loosening of the implant. The position of the left central incisor implant within the bone was seen to be at a different orientation and plane to that of the right central incisor (Fig. 4).

It appeared that blunt trauma to the implant abutment had resulted in bodily movement of the implant within the cancellous bone, possibly in combination with fracture of the labial cortical plate. The implant had maintained its osseointegration indicating that the implant–bone interface had maintained its integrity, with bony healing occurring around this interface in the new position adopted by the implant post-trauma.

*Fig. 4.* Position of implants 11 and 21 within the alveolus.

*Fig. 5.* Clinical appearance of replacement implant-retained PFM crown on 21.

A 'pick-up' impression was made using an AstraTech impression coping. An impression of the lower dentition, together with an occlusal registration, details of shade and characterizations, were sent to the laboratory with instructions to make a new PFM crown on the implant abutment of the left central incisor.

On delivery of the PFM crown, the fit, appearance and occlusion was checked. When this was deemed to be satisfactory and the patient was happy, the crown was cemented in with zinc-phosphate cement (Fig. 5).

Further review appointment confirmed the continued stability of the implant and a lack of any radiographic evidence of adverse events such as peri-fixtural radiolucency or marginal bone loss. The left lateral incisor displayed continued negative responses to vitality tests and was successfully root canal treated.

## Discussion

This report adds somewhat to our limited knowledge of the outcome to implants following a traumatic incident. Previous cases have reported loosening or distortion of the fixture screws following trauma. This outcome is of minor consequence and can be effectively managed by reattachment of the abutment or replacement of the distorted screw.

In this case-report, the impact of the force applied to the implant most probably resulted in fracture of the bone surrounding the recently inserted implants. This is potentially a more serious outcome following trauma to an implant. If the labial plate had been fenestrated or a bony dehiscence created, failure of the implant would have been almost inevitable.

The outcome of trauma displayed in this case may have resulted because the healing bone was still relatively immature and poorly organized offering little resistance to force. It may also have been the consequence of low residual bone volume in the anterior alveolar region of this patient following his traumatic tooth avulsion This may have led to increased stress on the bone following implant insertion and a lowered threshold for fracture. The patient gave no history of having had bone augmentation prior to implant placement and reported that the clinician had difficulty placing the implants which offers some support to this hypothesis. A minimal volume of bone may be required to offer more resistance to bony fracture in the event of trauma to dental implants, especially in the susceptible anterior maxillary segments.

This case does however demonstrate the power of osseointegration and the strength of the bond at the implant-bone interface which is able to withstand a trauma without loss of osseointegration.

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