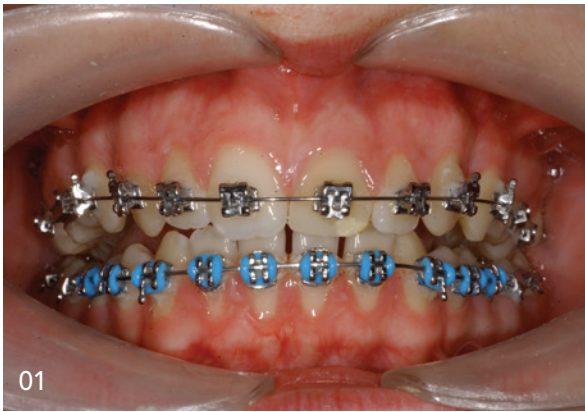


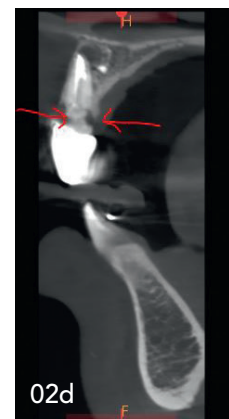
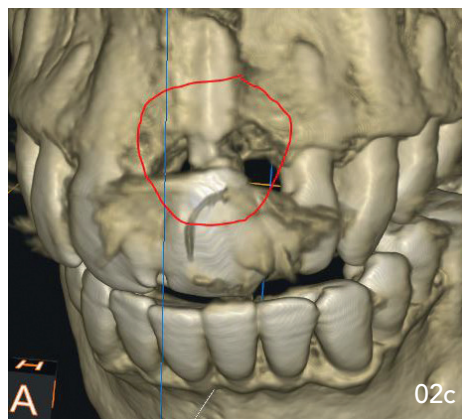
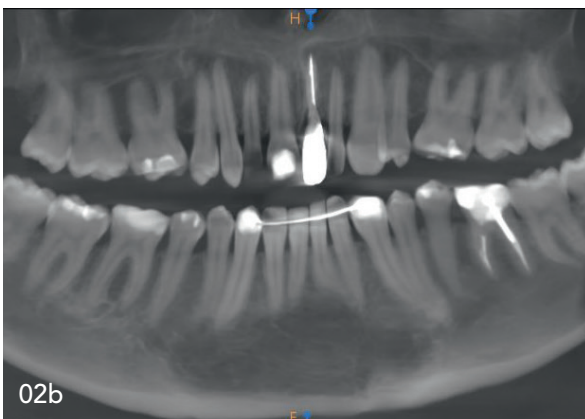
# Single-tooth restoration in the anterior maxilla

Dr João Pedro Almeida & António Korrodi Ritto, Portugal



**01**  
Clinical situation at the start of orthodontic treatment in 2011.

**02a-d**  
CBCT images showing marginal bone loss around tooth #21.



## Introduction

Replacing an unsalvageable tooth in the anterior maxilla with a dental implant poses certain challenges clinicians must navigate. Due to the high visibility of this area, using an implant system that can facilitate optimum aesthetics by predictably preserving the hard and soft tissue is crucial. In the clinical case described below, an implant system was used to restore a central incisor that has been proven in independent long-term studies to precisely achieve that.<sup>1,2</sup>

This two-piece tissue-level implant has a parallel-walled design with a shallow thread and is inserted using moderate torques not exceeding 30 Ncm to avoid compression of the surrounding tissue and thus to allow fast and predictable healing, which is a prerequisite for long-term stability and vitality of bone levels and overall tissue health.

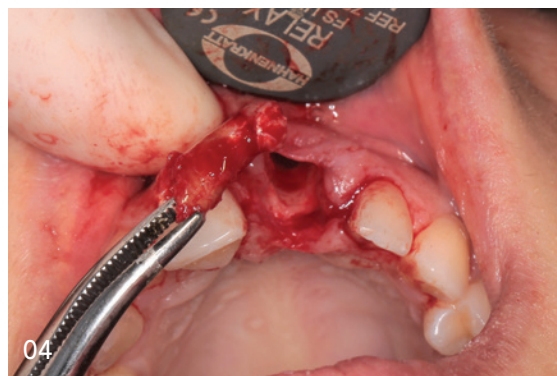
The implant treatment described in this case required a multidisciplinary approach and coordination with the orthodontist, as orthodontic treatment had not been completed at the time of implant placement, as the patient was still wearing retainers.

## Initial situation

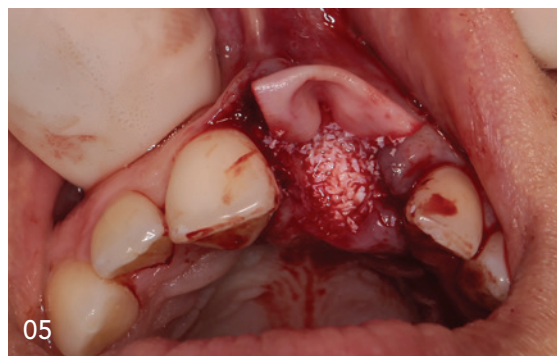
The female patient, aged 30, was referred by her orthodontist owing to the fractured root of tooth #21. She had started orthodontic treatment in 2011 (Fig. 1). After discoloration of the tooth developed, a CBCT scan was taken (in 2021), and it showed marginal bone resorption and bone loss around the root of the endodontically treated tooth #21 (Figs. 2a-d).



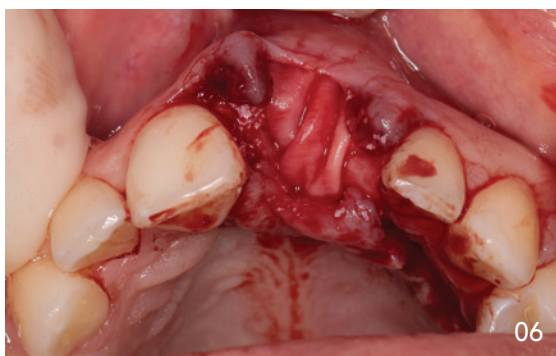
**03**  
Removal of the crown and failing post-and-core restoration.



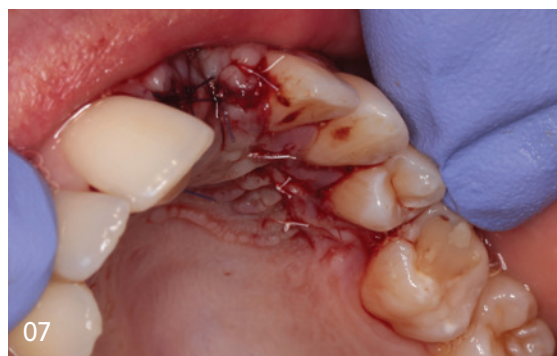
**04**  
Extraction of the remaining root.



**05**  
Extraction socket filled with particulate xenograft material.



**06**  
Grafted site covered with the collagen membrane.

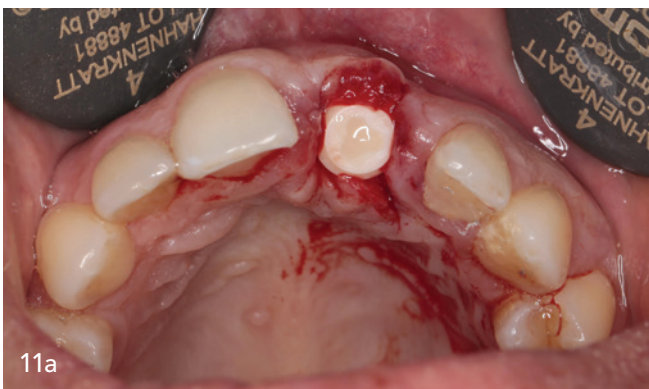
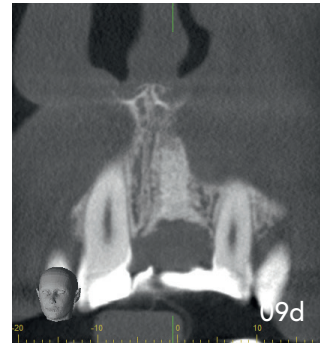
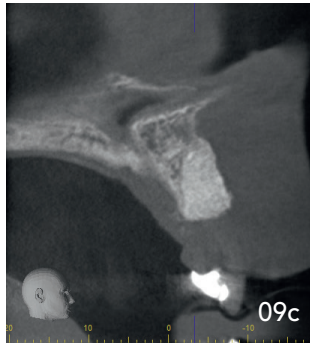
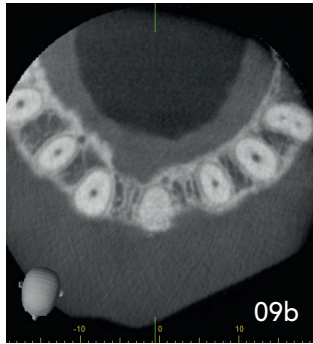
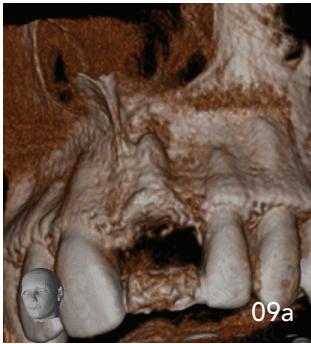


**07**  
Sutured site.



**08**  
Clinical situation after placement of the provisional restoration.

**“A minimally invasive implant placement with a moderate insertion torque of a maximum of 30 Ncm is imperative to ensure minimal bone compression to retain the vitality of the bone after implant insertion, allowing healing to progress undisturbed.”**



## Treatment planning

The treatment would involve extraction of the failing tooth and augmentation of the surrounding hard and soft tissue. This would be followed by placement of a two-piece dental implant in this position after healing.

## Surgical procedure

The crown and failing post-and-core restoration were removed (Fig. 3), and the remaining root was extracted (Fig. 4). The extraction socket was then carefully curetted to remove any fibrous tissue and filled with particulate xenograft material (Bio-Oss, Geistlich; Fig. 5). The site was covered with a collagen membrane (Bio-Gide, Geistlich; Fig. 6), and a full-thickness palatal pedicle graft was rotated and positioned to assure closure and augmented soft-tissue volume. The site was then sutured (Fig. 7), and a provisional restoration (Maryland bridge) was bonded to the adjacent teeth (Fig. 8).

After a healing period of 6.5 months (Fig. 9), the provisional restoration was removed (Fig. 10). The osteotomy was prepared according to the surgical protocol of the implant manufacturer and a two-piece dental implant (Patent™ Dental Implant System, Zircon Medical Management; 4.5 mm in diameter and 11.0 mm in length) was placed equigingival to an insertion torque of 30 Ncm. The soft tissue was adapted around the implant on the labial aspect as part of a minimally invasive grafting procedure to increase the gingival volume (Figs. 11a & b). The connection of the implant was sealed with a PTFE strip and flowable composite, and a new provisional restoration (Maryland bridge) was bonded to the adjacent teeth, covering but not touching the implant (Fig. 12).

**09a-d**  
CBCT images  
after 6.5 months  
of healing.

**11a + b**  
Clinical situation  
after implant  
placement and  
minimally invasive  
grafting to  
increase the  
gingival volume.

**10**  
Clinical situation  
after removal of  
the provisional  
restoration.

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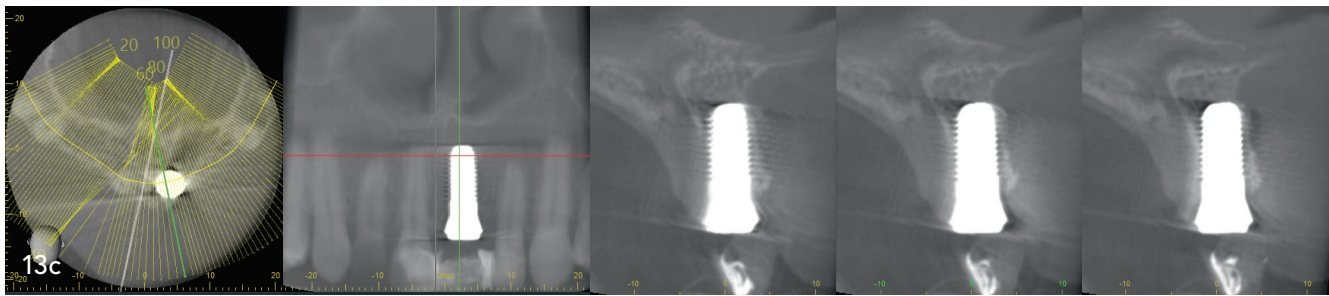
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**12**  
Clinical situation after placement of the new provisional restoration.

**13a-c**  
Clinical situation and CBCT images after a further healing period of four months.



**14**  
Removal of excess gingiva.



**15**  
Cementation of the glass fiber post.

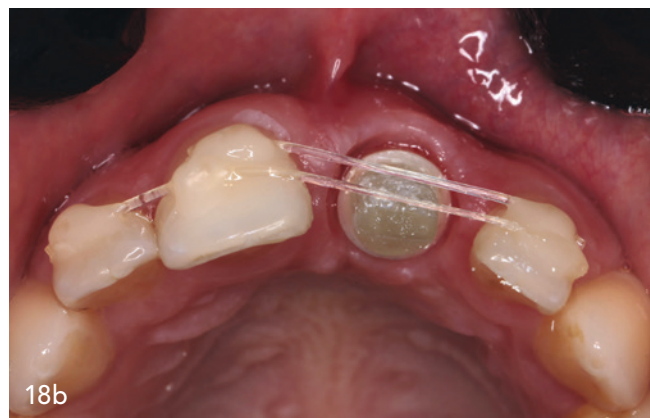


**16**  
Clinical situation after intra-oral preparation of the glass fiber post.

**17**  
Clinical situation  
after placement  
of another  
provisional  
restoration.



**18a + b**  
Clinical situation  
one month later,  
after orthodontic  
space closure.



**19**  
Fabrication of the  
final crown.



### Prosthetic restoration

After a further healing period of four months, the patient returned for prosthetic restoration, showing a successfully osseointegrated implant with healthy soft tissue and a stable marginal bone level (Figs. 13a–c). Excess gingiva was removed with an electrosurgical device to expose the margin of the implant (Fig. 14). The glass fibre post of the two-piece implant system used was then cemented into the implant’s prosthetic connection using a dual-polymerising dental cement (ACTIVA BioACTIVE-CEMENT, Pulpdent; Fig. 15) and prepared using a diamond bur at high speed under water irrigation (Fig. 16). The prepared post received a provisional crown (Fig. 17), and the patient was sent to the referring orthodontist for space closure before the placement of the final crown.

One month later, the spaces on either side of tooth #21 had been closed (Figs. 18a & b), and a final digital impression was taken. The Matisse-protocol was used to match the shade and achieve the proper colour. The scan files were transferred to the dental laboratory (Dentalook), where the final crown was fabricated (Fig. 19). The patient then received a second provisional crown (Fig. 20). Three months later, the patient received the final crown. The result, two weeks after placement of the final restoration, was deemed highly satisfactory (Fig. 21). At a follow-up eight months later, the soft tissue had matured and was deemed healthy and stable (Figs. 22a & b).

### Discussion

The challenges of this clinical case included the lack of marginal bone crest because of external root resorption and the absence of an alveolar buccal wall, necessitating augmentation. Also, since the procedure involved restoring the aesthetic zone, a highly visible area, a dental implant was needed capable of maintaining vital and stable hard and soft tissue. The Patent™ system has been demonstrated to have this capability in long-term studies.<sup>1,2</sup> These studies have reported healthy soft tissue, an aesthetic increase in keratinised gingiva as well as minimal marginal bone losses after nine years of function, and no peri-implantitis even up to 12 years of function. These results reflect the treatment outcome of the case discussed here, where the



20



21

**20**  
Clinical situation after placement of another provisional restoration.

**21**  
Satisfactory result two weeks after placement of the final crown.

**22a + b**  
Healthy and stable soft tissue eight months later.



22a



22b

patient presented with stable bone levels around her new implant at the follow-up over 17 months after implant placement, as well as healthy soft tissue (Figs. 22a & b).

A minimally invasive implant placement with a moderate insertion torque of a maximum of 30 Ncm is imperative to ensure minimal bone compression to retain the vitality of the bone after implant insertion, allowing healing to progress undisturbed. This is crucial to maintaining long-term stability of the surrounding tissue. We have found adopting such a low torque strategy together with an atraumatic insertion protocol with this implant system to minimise marginal bone loss and to maintain overall tissue stability in daily practice.

## Conclusion

The implant system used in this clinical case represents a viable option for replacing teeth in the aesthetic zone. Owing to the implant's ability to maintain vital and stable hard and soft tissue and to foster strong soft-tissue adhesion, highly satisfactory aesthetic results are to be expected over the long term, and the risk of bacteria-induced chronic tissue inflammation like peri-implantitis is minimised.<sup>1,2</sup> The healing of the soft tissue in this case progressed rapidly with almost no inflammation.

### Literature:

- <sup>1</sup> Brunello G, Rauch N, Becker K, Hakimi AR, Schwarz F, Becker J. Two-piece zirconia implants in the posterior mandible and maxilla: a cohort study with a follow-up period of 9 years. *Clin Oral Implants Res.* 2022. december;33(12):1233-44. doi: 10.1111/clr.14005. PMID: 36184914.
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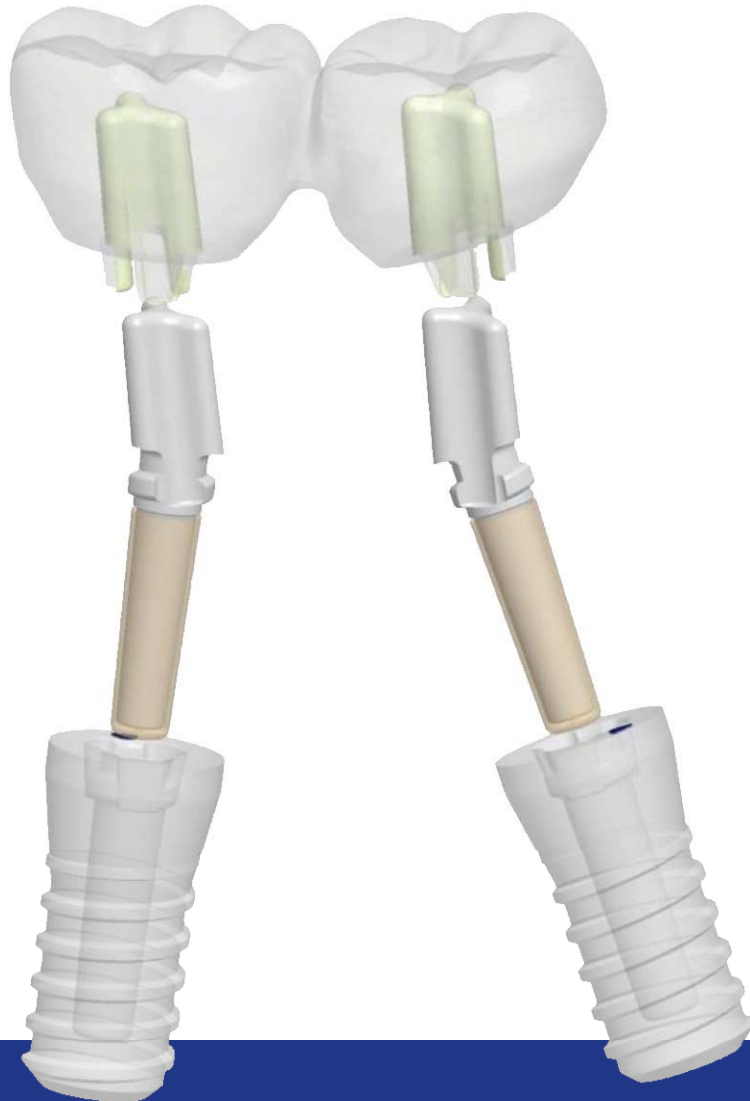
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