NEW SMILES EVERY DAY

with Neodent® immediate treatment protocols

Clinical Case Book

NEODENT®

A STRAUMANN GROUP BRAND

NEW SMILES EVERY DAY

with Neodent® immediate treatment protocols

Clinical Case Book

Narrative Review on Clinical Advantages of the Neodent® Morse Taper Connection

Narrative Review on Clinical Advantages of the Neodent® Morse Taper Connection

Arantza Rodriguez, DDS, MS, MSc; Mark W. Adams, DDS, MS

Introduction

When considering dental implants, there are many factors the clinician must consider, including the implant material, surface properties, size and shape. In recent years, however, one of the most important factors is the strength of the implant-abutment connection, and how the type of connection affects the surrounding hard and soft tissues following placement of the implant. Due to the bone remodelling and resorption that occurs after an implant is placed, this, together with considerations such as the distance between implants and the depth of placement, the connection type has become a crucial feature for clinicians, to minimise as much as possible the amount of bone resorption. The quality of the physical seal between the implant and abutment is also important, as any space (or 'microgap') between abutment and implant can increase the risk of bacterial accumulation, and hence the risk of peri-implant inflammation or peri-implantitis.

Certain problems with some external implant-abutment connections (e.g. external hex connection, where the implant has a hexagonal 'key' at the top, onto which the abutment fits), such as fracture or movement of the abutment or screw loosening, as well as microgaps, led to the development of internal connections. The most prevalent of these is the internal hex, where the abutment is fitted into a hexagonal opening within the implant, i.e. the hexagonal 'key' shape is on the end of the abutment and fits into the implant. Although this proved to give greater stability and a more precise interface between abutment and implant than the external hex type, screw loosening can still occur[1], which may be a result of microleakage[2]. From a mechanical point of view, the risk of loosening can be reduced by a connection that introduces a high degree of friction between abutment and implant, such as that produced by a Morse taper connection. This type of connection was

invented by Stephen A. Morse in 1864 as a way to join two machine components by the principle of a 'cone within a cone', where both the male and the female connections are tapered to the same degree[3]. Stephen Morse's original Morse taper was a small angle of 2°. The concept has been widely used in engineering, but was adapted for orthopaedic use in the 1970s, most commonly with taper angles between 5 and 18°. It has subsequently been successfully employed in dental implants, many with either an 8° or a 16° angle, due to its numerous advantages in this situation. For example, it offers high stability due to the friction between the abutment and implant surfaces, minimising the level of micromovement and microgap between abutment and implant, creating an effective seal between the two structures[4].

Importantly, because of the stable internal connection, it allows the possibility of 'platform switching', i.e. where the abutment has a narrower diameter than the implant. The concept has been shown to result in significantly lower peri-implant bone loss[5–10]. In particular, the platform switching concept with implants with a Morse taper connection has shown a trend towards less inflammation in the surrounding soft tissues, therefore reducing the possibility of inflammation-associated bone loss[10]. Although the concept was initially discovered by accident, it has since been incorporated into the implant systems design of numerous companies.

The Morse taper connection developed by Neodent®, the Cone Morse (CM) system, has been incorporated in several implant lines, including the Alvim CM, Drive CM and Titamax CM. It has been demonstrated to have an extremely good bacterial seal, high mechanical strength, and excellent crestal bone preservation properties. The long connection also helps with optimal load distribution. Placement of the implant below the level of the marginal bone (subcrestal placement) in combination with the Cone Morse connection transfers the loading forces deeper into the bone, effectively dissipating the forces exerted on the prosthesis and the supporting bone[11]. This serves to reduce the peak stress forces and, by shifting the loading forces away from the bone crest, minimises bone resorption and preserves the marginal bone. The intention of this review is therefore to demonstrate the scientific evidence behind the Cone Morse system, and to show how this translates into clinical advantages for the patient and clinician.

Effective bacterial seal

The presence of any microgap between the implant and abutment when the abutment is placed and tightened may allow the leakage of bacteria. This can result in leakage of bacterial endotoxins through the gap, and/or a peri-implant biofilm that can compromise the health of the surrounding bone and soft tissue and lead to inflammation. An implant-abutment connection that provides an effective seal is therefore necessary to minimise this risk. The Morse taper connection has been shown to provide such a seal, showing lower bacterial counts in microbiological investigations than other types of connection[12, 13] as a result of the frictional locking produced between the tapered abutment and internal implant surfaces[10]. It has also proven to exhibit a lower incidence of bacterial leakage than an external hex system[14] and under dynamic loading conditions[15], and other studies show that pure conical implant-abutment systems show significantly less bacterial leakage than other types of connection[4].

The conical seal of the Neodent® Cone Morse connection is designed to prevent bacterial migration into the implant, and this has been effectively demonstrated in vitro in other studies. For example, dos Anjos and colleagues investigated the ability of a specific bacterial strain to infiltrate Morse taper connections of two different implant systems[16]. They used 30 implants in three groups: 10 Ankylos implants with Ankylos abutment, 10 Neodent® implants with Neodent® abutment, and 10 Ankylos implants with Neodent® abutments. A 0.1 µL suspension of Escherichia coli (E. coli) was placed in the central chamber of each implant, and abutments were placed and tightened according to the manufacturer's recommendations. The implants were subsequently placed in a culture medium (MacConkey broth) in sterile test tubes and analysed for turbidity (indicating bacterial infiltration) after 1, 2, 5, 7, and 14 days. Although the bacteria were still shown to be viable after 14 days, no turbidity was found in any of the samples at any of the time points. The Morse taper connection therefore effectively prevented bacterial infiltration.

It could be argued, however, that a volume of 0.1 µL is inadequate to show any evidence of bacterial leakage. This was addressed by Silva-Neto and colleagues, who evaluated bacterial leakage of E. coli from Neodent® Morse taper implants[17]. The implant chambers were loaded with 0.1, 0.3, 0.5 or

0.7 µL volumes before being fitted with either passing screw abutments or solid abutments. The implants were then immersed in a brain-heart infusion broth for up to 7 days. Implants alone (without abutments) were used as negative controls, while implants (without abutments) with the same volumes of bacterial suspension were used as positive controls. The bacteria were shown to be viable after 7 days, and no evidence of bacterial leakage was indicated with the 0.1, 0.3 and 0.5 µL volumes for up to 7 days. The implants with 0.7 µL all showed evidence of leakage; however, the authors indicated that this volume was greater than the internal capacity of the implants upon placement of the abutments. Again, the Neodent® Morse taper connection proved to be effective at preventing bacterial leakage.

In addition, a later study by Resende and colleagues investigate the possible influence of the prosthetic index on bacterial microleakage [18]. This internal index is sometimes added to Mores taper implants to aid implant installation; however, abutments without an index could be placed on implants with an index, which may increase the space between implant and abutment, allowing bacterial leakage. The authors of this study used a universal post connection with or without prosthetic implant index, and abutment and implant (Neodent® Alvim CM) with index. A Streptococcus sanguinis solution was used to evaluate microleakage from the implant interior, and immersion in a solution of Fusobacterium nucleatum was used to evaluate leakage into the inner implant chamber. For leakage from the implant interior, 90% of the implants in all groups showed no leakage, and none of the implants showed leakage into the inner chamber. The Neodent® Morse taper connection therefore provides an effective bacterial seal, regardless of the presence of the prosthetic index.

Good biomechanical strength

The excellent biomechanical properties of Morse taper implant-abutment connections have been demonstrated in a number of studies. This type of connection provides [4]:

- High resistance to fatigue loads
- Lower stresses on the abutment screw, compensating for high stress and providing protection from overloading
- Resistance to abutment movement under loading
- Greater resistance to torque loss

The Neodent® Cone Morse connection is no exception to this. For example,

Coppedê and colleagues evaluated the fracture resistance of the implant-abutment connection of the Neodent® Alvim CM implant system versus the internal hex, parallel wall connection of the Alvim II Plus system[19], and showed the Cone Morse system to be more resistant to deformation and fracture under loading. Ten implant-abutment systems of each type were embedded in a stainless steel cylinder to a depth of 10 mm (to simulate 3 mm of bone resorption) and subjected to oblique compressive loading at a 45° angle to assess the fracture force and the maximum deformation force for each. The maximum deformation force was significantly higher for the Cone Morse system (mean 90.58 ± 6.72 kgf versus 83.73 ± 4.94 kgf; p = 0.0182; Figure 1), indicating much higher resistance to bending forces. Crucially, none of the Cone Morse assemblies fractured, while the mean fracture force for the internal hex assembly was 79.86 ± 4.77 kgf. Pessoa and colleagues, using a three-dimensional finite element analysis model of the Neodent® system, also showed that abutment stability is superior with a Morse taper connection compared to implants with an internal or external hex connection[20]. In addition, the von Mises stresses in the abutment screw are lowest with the Morse taper connection compared to internal or external hex, with a notable lack or abutment gap from loading compared to the other connection types.

Figure 1: Maximum deformation force values for the internal hex and internal conical systems

The amount of deformation caused by overloading compressive conditions on different diameters of Neodent® Morse taper implants and abutment systems was evaluated by Castro and colleagues [21]. They used implants 3.5 mm, 4.0 mm and 5.0 mm in diameter, each with two-piece abutments, to which strain gauges were attached. The implant-abutment assemblies underwent axial compressive loading (speed 0.5 mm/min) until a force of 1500 N was reached. The load force was chosen based on previous investigations that defined the force necessary to cause deformation in a 5.0 mm Morse taper implant. Under these conditions, 5.0 mm diameter implants showed significantly lower strain than the 4.0 and 3.5 mm implants (650.5 μS ± 170.0 versus 1170.2 μS ± 374.7 and 1388.1 μS ± 326.6, respectively; $p < 0.001$). Strain was therefore reduced by approximately 12.5% between the 4.0 and 3.5 mm implants, and by around 20% between the 5.0 and 4.0 mm implants. The 5.0 mm implants also showed significantly lower strain at the implant-abutment interface than the 4.0 and 3.5 mm implants (943.4 μS ± 504.5 versus 1057.4 μS ± 681.3 and 1159.6 μS ± 425.9, respectively; $p < 0.001$). The authors also noted that strain values reduced by approximately half upon removal of the load for all implant diameters. Based on the results, the authors suggested that 5.0 mm diameter implants would be clinically preferable in situations of high residual strain, such as in male patients with long-term bruxism. However, the authors also noted that all of the implants, regardless of diameter, exhibited clinically acceptable strain values.

Sotto-Maior and colleagues performed a study to assess how apical bone anchorage can affect bone stress and micromovement for subcrestal implants, using the Neodent® Cone Morse Titamax EX system [22]. Three-dimensional modelling was used to simulate 4.0 mm diameter implants placed at bone level, with or without the apex engaged in cortical bone, or 2 mm subcrestally, with or without the apex engaged in cortical bone. Models of abutments (heights of 1.5 mm for the bone level implants and 3.5 mm for the subcrestal implants) and premolar crowns were subsequently aligned to the implants. A loading force of 200 N was used to simulate centric occlusion and lateral excursion, and the principal stresses at the crestal cortical, trabecular and apical cortical bone were evaluated using finite element analysis. The authors found that, with centric loading, peak compressive stress was reduced at the crestal cortical bone

with subcrestal placement, and that the forces were transferred to the trabecular bone, though peak tensile stress and strain were higher for the subcrestal implants with apical engagement in cortical bone. The authors concluded that stress in the cortical bone is reduced with subcrestal placement, but that displacement of the implants can be effectively limited by apical engagement of the implant in cortical bone. Compressive stress was more efficiently transferred towards the trabecular bone on eccentric loading, but for implants with the apex engaged in cortical bone, the peak compressive stress at the cortical bone was much higher than for the equivalent bone level implants. Subcrestal placement with apical engagement also showed less horizontal and vertical micromovement compared to either the subcrestal or bone level implants without apical engagement, effectively limiting implant displacement. Subcrestal placement of Neodent® Cone Morse implants therefore effectively reduced stress in the crestal cortical bone, efficiently transferring the forces to the trabecular bone.

Favourable peri-implant bone response

A number of studies have indicated that Morse taper implants have a lower risk of microgap and hence reduced biofilm accumulation, as well as a lower incidence of peri-implantitis[10], which may contribute to the consistently lower peri-implant marginal bone loss[4, 10]. For the Neodent® Cone Morse system specifically, the evidence also clearly indicates predictable crestal bone preservation with subcrestal implant placement.

Peri-implant bone resorption around Neodent® Cone Morse implants or implants with an external hex connection was investigated by de Castro and colleagues in dogs[23]. Nine implants of each type were placed in dogs; the Cone Morse implants were placed 2 mm below the crestal bone level, while the external hex implants were placed at the level of the crestal bone. The implants were retrieved after 8 weeks and evaluated; the mean distance from the top of the implant to the first bone-to-implant contact was measured, as well as the mean distance from the top of the implant to the original crestal bone level. Histological examination showed bone at the implant shoulder of the Cone Morse implants, with close connection to the abutment in some cases. Conversely, significant bone resorption was seen at the external hex implants (Figure 2).

The distance from the top of the implant to the original crestal bone level was not significantly different between the implant types, but significantly less bone remodelling was observed for the Cone Morse implants on both the buccal and lingual sides (mean 0.03 ± 0.08 mm buccal and 0 ± 0 mm lingual for the Cone Morse implants versus 1.69 ± 0.44 mm and 1.40 ± 0.63 mm, respectively, for the external hex implants). Crestal bone remodelling was therefore positively influenced by subcrestal placement of Cone Morse implants.

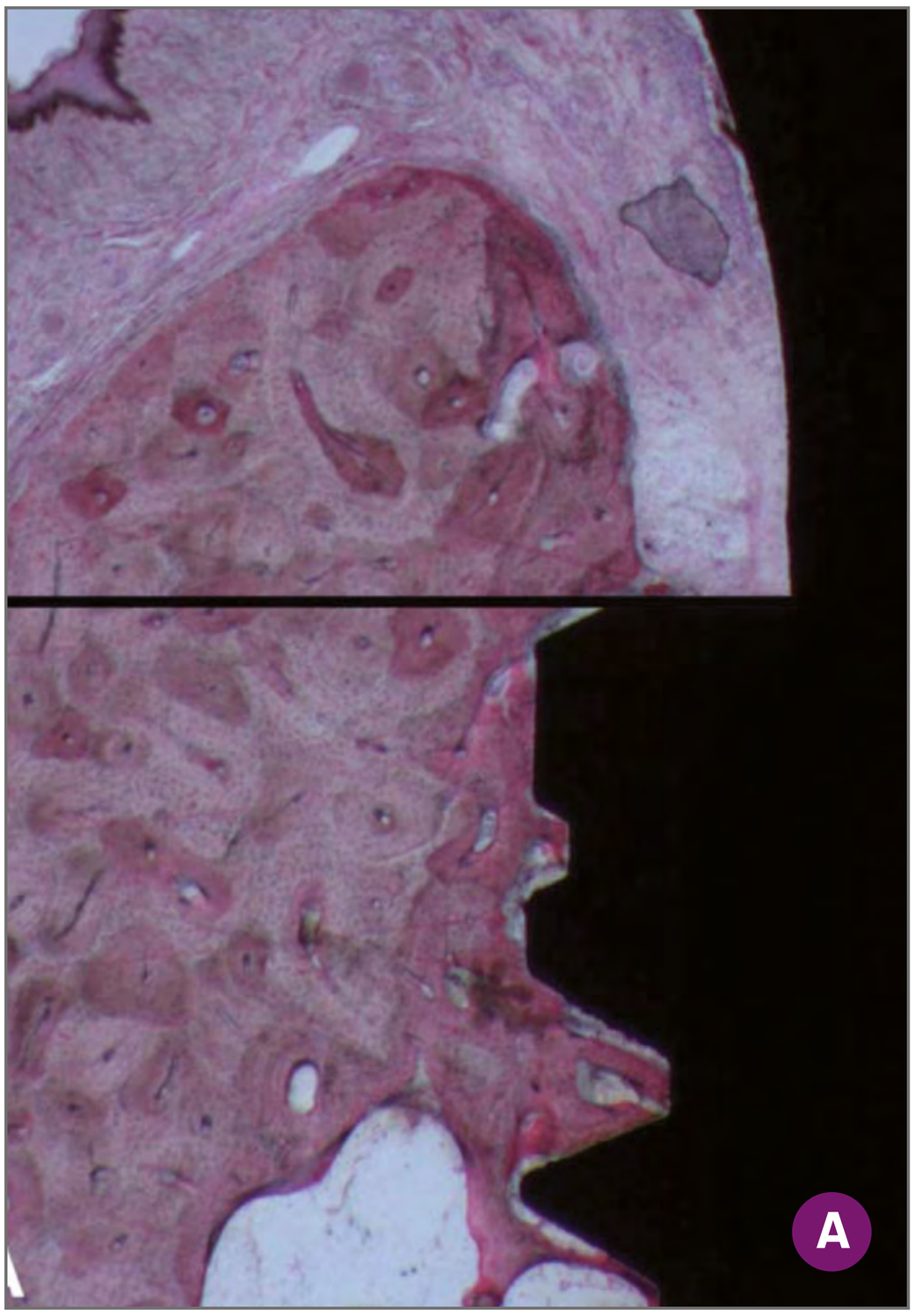


Figure 2: A, a small amount of bone loss or remodelling in the Cone Morse implant group. B, a severe remodelling and bone loss for the external hexagon implant group (Toluidine blue and acid fuchsin x40)

Several authors have indicated that, in patients requiring several implants, the distance between implants may have an influence on the extent of peri-implant bone loss, i.e. there is significantly greater bone loss when the implants are placed close together, around 2 – 3 mm apart or less[24–26]. However, evidence has indicated that platform switched

implants with a Morse taper connection may mean that implants can be placed closer together with no significant loss of bone[27]. A study by Barros and colleagues showed that this was indeed the case with Neodent® Cone Morse implants placed subcrestally [28]. The authors placed eight implants in each of six dogs; the implants were placed either at the bone crest level of 1.5 mm below, with either 2 or 3 mm between the implants. Metallic crowns were immediately placed. The amount of bone resorption at the implants and in the inter-implant area was measured after 8 weeks. Subcrestal placement resulted in significantly less bone resorption than placement at the bone crest level for inter-implant distances of both 2 and 3 mm, and some of the subcrestal implants showed no resorption at all. Vertical bone resorption at the inter-implant area was also lower for the subcrestal implants. Good bone density and bone-to-implant contact was observed in all groups. Subcrestal placement therefore showed predictable bone preservation, even with implants only 2 mm apart, and the lower vertical resorption may have a positive influence for areas of aesthetic concern.

The effect on papilla formation as well as bone resorption was evaluated by Novaes and colleagues[29]. Again, eight implants were placed in each of six dogs, this time either 2 or 3 mm subcrestally or at the bone crest level, with inter-implant distances of 2 or 3 mm and immediate placement of metallic crowns. After 8 weeks, the distance from then implant shoulder to the first bone-to-implant contact, and the distance from the contact point of the crowns to the top of the bone crest and to the tip of the inter-implant papilla was measured. Both crestal bone preservation and papilla formation were superior in the subcrestal implants, with significant differences from the bone level group for bone preservation at both inter-implant distances, and for papilla formation at the 3 mm inter-implant distance. As with the study by Barros and colleagues, the authors suggested that the results may have particular benefit in aesthetic regions.

To answer the question of this suggested benefit in aesthetic areas, Martin and colleagues evaluated Neodent® Cone Morse implants in the aesthetic region of nine patients[30]. The patients received a total of twelve implants to replace teeth in the anterior maxilla; the implants were placed immediately after tooth extraction. Peri-implant bone mesial and distal to the implants

was measured, as well as the height and width of the buccal wall. A slight gain at the distal aspect of the marginal bone crest (mean 0.07 ± 1.58 mm) and a slight loss at the mesial aspect (mean -0.14 ± 0.41 mm) was observed (Figure 3). However, there was significant increase in bone where the bone meets the implant surface at the mesial aspect (mean 0.92 ± 1.29 mm), while there was a smaller increase at the corresponding point on the distal aspect (mean 0.43 ± 1.63 mm) (Figure 3). There was a small, non-significant loss of buccal wall height (mean -0.20 ± 0.51 mm), much smaller than that observed in similar studies[31, 32]. The loss of buccal bone width from placement to 8 months was significant at the implant-abutment level and at 3 and 6 mm apical to the junction (mean values of -0.77 ± 0.75 mm, -0.59 ± 0.76 mm and -0.46 ± 0.81 mm, respectively), but again these values were lower than those observed in a similar study[32]. In addition, the authors did not see any signs of gingival recession during the study. The extremely favourable results were suggested to be a result of the implant geometry and type, as well as their position below the bone level and the surgical and prosthetic procedures used.

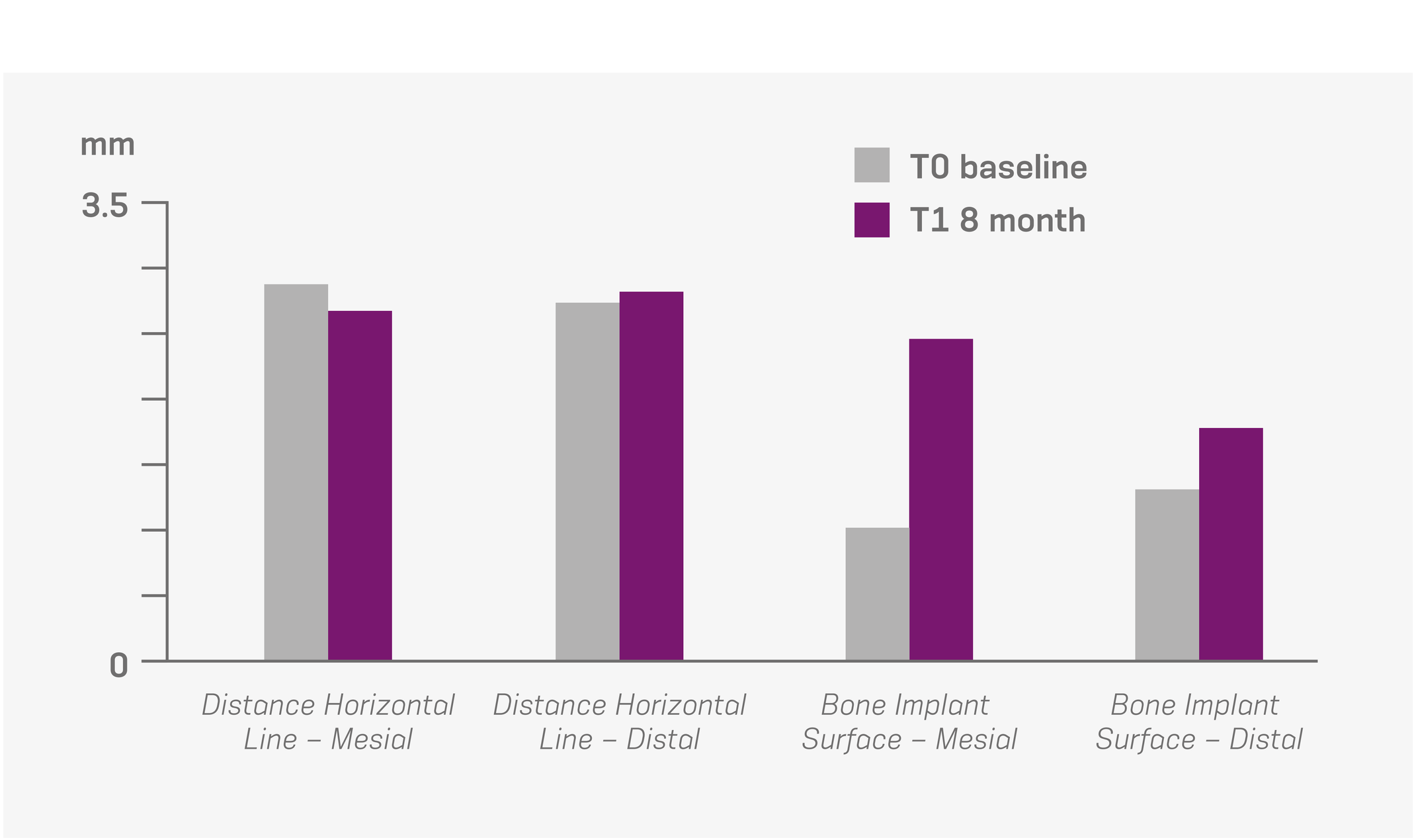


Figure 3: Column graph showing proximal level data at baseline and 8 months

Conclusion

The available evidence from studies with Neodent® Cone Morse implants shows that the connection has several advantages for both clinicians and patients. It is extremely effective in preventing bacterial migration either into or out of the central chamber of the implant, greatly reducing the risk of peri-implant biofilm build-up that can lead to inflammation and compromised tissue. The connection shows excellent biomechanical strength and mechanical resistance. For example, it results in very low stress forces on the abutment screw and in the crestal cortical bone, is highly resistant to bending forces, and shows good strain values under compressive loading, especially for the 5.0 mm diameter implant. The implants have also demonstrated superior crestal bone preservation, low vertical bone resorption with the implant-abutment junction situated below the crestal bone level. The system also shows good soft tissue stability and a natural, aesthetic emergence profile, indicated by papilla formation, supported by the lack of peri-implant bone resorption; this may be particularly useful in aesthetic areas. The system can therefore be used in a variety of clinical situations, especially where predictable peri-implant bone and soft tissue maintenance is crucial.

References

All references are published in peer-reviewed dental and biomechanical journals and were found via PubMed and/or Google Scholar.

1. Piermatti J, Yousef H, Luke A, Mahevich R, Weiner S. An in vitro analysis of implant screw torque loss with external hex and internal connection implant systems. Implant Dent 2006;15(4):427–35.
2. Sahin C, Ayyildiz S. Correlation between microleakage and screw loosening at implant-abutment connection. J Adv Prosthodont 2014;6(1):35–8.
3. Hernigou P, Queinnec S, Flouzat Lachaniette CH. One hundred and fifty years of history of the Morse taper: from Stephen A. Morse in 1864 to complications related to modularity in hip arthroplasty. Int Orthop 2013;37(10):2081–8.
4. Schmitt CM, Nogueira-Filho G, Tenenbaum HC, Lai JY, Brito C, Döring H, et al. Performance of conical abutment (Morse Taper) connection implants: A systematic review. J Biomed Mater Res Part A 2014;102(2):552–74.
5. Atieh MA, Ibrahim HM, Atieh AH. Platform switching for marginal bone preservation around dental implants: A systematic review and meta-analysis. J Periodontol 2010;81(10):1350–66.
6. Al-Nsour mm, Chan H-L, Wang H-L. Effect of the platform-switching technique on preservation of peri-implant marginal bone: a systematic review. Int J Oral Maxillofac Implants 2012;27(1):138–45.
7. Annibali S, Bignozzi I, Cristalli MP, Graziani F, La Monaca G, Polimeni A. Peri-implant marginal bone level: a systematic review and meta-analysis of studies comparing platform switching versus conventionally restored implants. J Clin Periodontol 2012;39(11):1097–113.
8. Strietzel FP, Neumann K, Hertel M. Impact of platform switching on marginal peri-implant bone-level changes. A systematic review and meta-analysis. Clin Oral Implants Res 2015;26(3):342–58.
9. Herekar M, Sethi M, Mulani S, Fernandes A, Kulkarni H. Influence of platform switching on periimplant bone loss: A systematic review and meta-analysis. Implant Dent 2014;23(4):439–50.
10. Macedo J, Pereira J, Vahey B, Henriques B, Benfatti C, Magini R, et al. Morse taper dental implants and platform switching: the new paradigm in oral implantology. Eur J Dent 2016;10(1):148–54.
11. Merz, BR; Hunenbart, S;Belser U. Mechanics of the implant-abutment connection: an 8-degree taper compared to a butt joint connection. Int J Oral Maxillofac Implants 2000;15(4):519–26.
12. Pautke C, Kolk A, Brokate M, Wehrstedt JC, Kneissl F, Miethke T, et al. Development of novel implant abutments using the shape memory alloy nitinol: preliminary results. Int J Oral Maxillofac Implants 2009;24(3):477–83.

13. Aloise JP, Curcio R, Laporta MZ, Rossi L, da Silva AMÁ, Rapoport A. Microbial leakage through the implant-abutment interface of Morse taper implants in vitro. Clin Oral Implants Res 2010;21(3):328–35.

14. Jaworski ME, Melo ACM, Picheth CMT, Sartori IA de M. Analysis of the bacterial seal at the implant-abutment interface in external-hexagon and Morse taper – connection implants : An in vitro study using a new methodology. Int J Oral Maxillofac Implants 2012;27(5):1091–5.

15. Mishra SK, Chowdhary R, Kumari S. Microleakage at the different implant abutment interface: A systematic review. J Clin Diagn Res 2017;11(6):ZE10-ZE15.

16. dos Anjos CM, Harari ND, de Aguiar Reis RS, Macial Vidigal Jr G. [In vitro analysis of bacterial leakage at the interface between Morse taper implant platform and prosthetic abutments.] ImplantNewsPerio. 2011;8(1):239–43. [Article in Portuguese]

17. da Silva-Neto JP, Majadas M de FF, Prudente MS, Carneiro T de APN, Penatti MPA, das Neves FD. Bacterial microleakage at the implant-abutment interface in Morse taper implants. Brazilian J Oral Sci 2014;13(2):89–92.

18. Resende CCD, Castro CG, Pereira LM, Prudente MS, Zancopé K, Davi LR, et al. Influence of the prosthetic index into Morse taper implants on bacterial microleakage. Implant Dent 2015;24(5):547–51.

19. Coppedê AR, Bersani E, de Mattos M da GC, Rodrigues RCS, Sartori IA de M, Ribeiro RF. Fracture resistance of the implant-abutment connection in implants with internal hex and internal conical connections under oblique compressive loading: an in vitro study. Int J Prosthodont 2009;22(3):283–6.

20. Pessoa RS, Muraru L, Júnior EM, Vaz LG, Sloten J Vander, Duyck J, et al. Influence of implant connection type on the biomechanical environment of immediately placed implants - CT-based nonlinear, three-dimensional finite element analysis. Clin Implant Dent Relat Res 2009;12(3):219–34.

21. Castro CG, Zancopé K, Veríssimo C, Soares CJ, Das Neves FD. Strain analysis of different diameter Morse taper implants under overloading compressive conditions. Braz Oral Res 2015;29(1):1–6.

22. Sotto-Maior BS, Lima CDA, Senna PM, Camargos GDV, Del Bel Cury AA. Biomechanical evaluation of subcrestal dental implants with different bone anchorages. Braz Oral Res 2014;28(1):1–7.

23. de Castro DS, de Araujo MA, Benfatti CA, de Araujo C dos RP, Piattelli A, Perrotti V, et al. Comparative histological and histomorphometrical evaluation of marginal bone resorption around external hexagon and Morse cone implants: An experimental study in dogs. Implant Dent 2014;23(3):270–6.

24. Tarnow DP, Cho SC, Wallace SS. The effect of inter-implant distance on the height of inter-implant bone crest. J Periodontol 2000;71(4):546–9.

25. Degidi M, Novaes AB, Nardi D, Piattelli A. Outcome analysis of immediately placed, immediately restored implants in the esthetic area: The clinical relevance of different interimplant distances. J Periodontol 2008;79(6):1056–61.

26. Al Amri MD. Influence of interimplant distance on the crestal bone height around dental implants: A systematic review and meta-analysis. J Prosthet Dent 2016;115(3):278–282.e1.

27. Novaes AB, de Oliveira RR, Muglia VA, Papalexiou V, Taba M. The effects of interimplant distances on papilla formation and crestal resorption in implants with a Morse cone connection and a platform switch: A histomorphometric study in dogs. J Periodontol 2006;77(11):1839–49.

28. Barros RR, Novaes AB, Muglia VA, Iezzi G, Piattelli A. Influence of interimplant distances and placement depth on peri-implant bone remodeling of adjacent and immediately loaded Morse cone connection implants: a histomorphometric study in dogs. Clin Oral Implants Res 2010;21(4):371–8.

29. Novaes AB, Barros RRM, Muglia VA, Borges GJ. Influence of interimplant distances and placement depth on papilla formation and crestal resorption: A clinical and radiographic study in dogs. J Oral Implantol 2009;35(1):18–27.

30. Martin C, Thomé G, Melo ACM, Fontão FNGK. Peri-implant bone response following immediate implants placed in the esthetic zone and with immediate provisionalization---a case series study. Oral Maxillofac Surg 2015;19(2):157–63.

31. Botticelli D, Berglundh T, Lindhe J. Hard-tissue alterations following immediate implant placement in extraction sites. J Clin Periodontol 2004;31(10):820–8.

32. Sanz M, Cecchinato D, Ferrus J, Pjetursson EB, Lang NP, Lindhe J. A prospective, randomized-controlled clinical trial to evaluate bone preservation using implants with different geometry placed into extraction sockets in the maxilla. Clin Oral Implants Res 2010;21(1):13–21.

B

Step-by-step
clinical case

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Posterior
	1 Implant	Non guided surgery
Restorative Solution	CAD/CAM	PMMA

CM Alvim NeoPoros

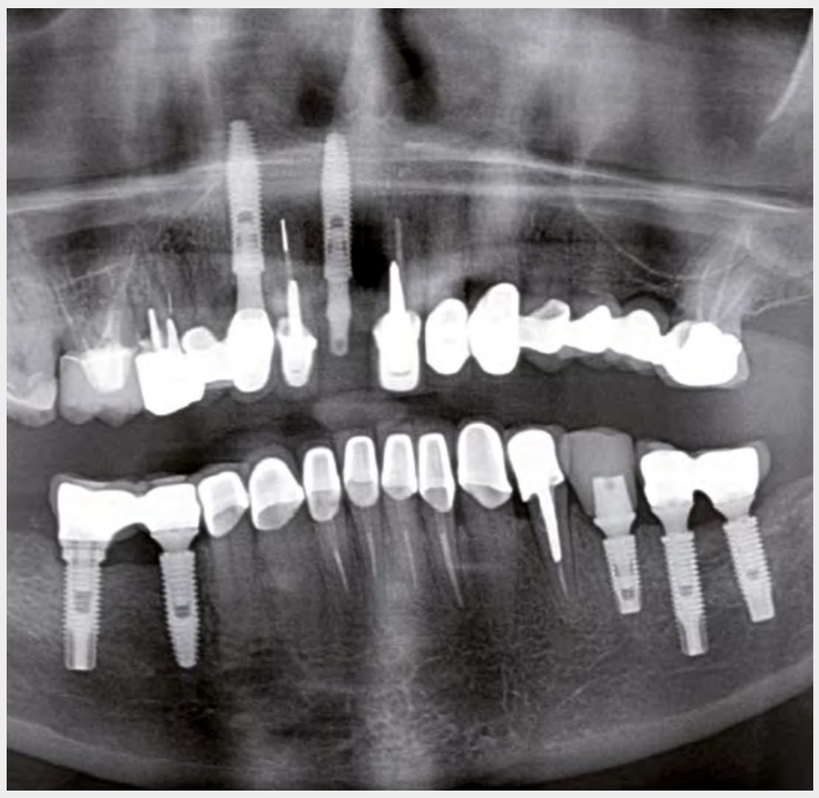
Profile
H.C., Female, 71 years old, Vilamoura, Portugal

Clinical Situation
Tooth 15 presenting extensive root decay without peri-apical infection

Restorative Solution
Extraction, followed by immediate implant placement, bone grafting and immediate loading with provisional crown on a universal abutment. Plan to adapt "one-abutment-one-time" concept, and finalize with a ceramic crown.

Surgical products
CM Alvim (3.5 × 13 mm)

Prosthetic products
CM Universal Abutment (3.3 × 4 × 3.5 mm)



Initial situation

10/2017 **Tooth Extraction**

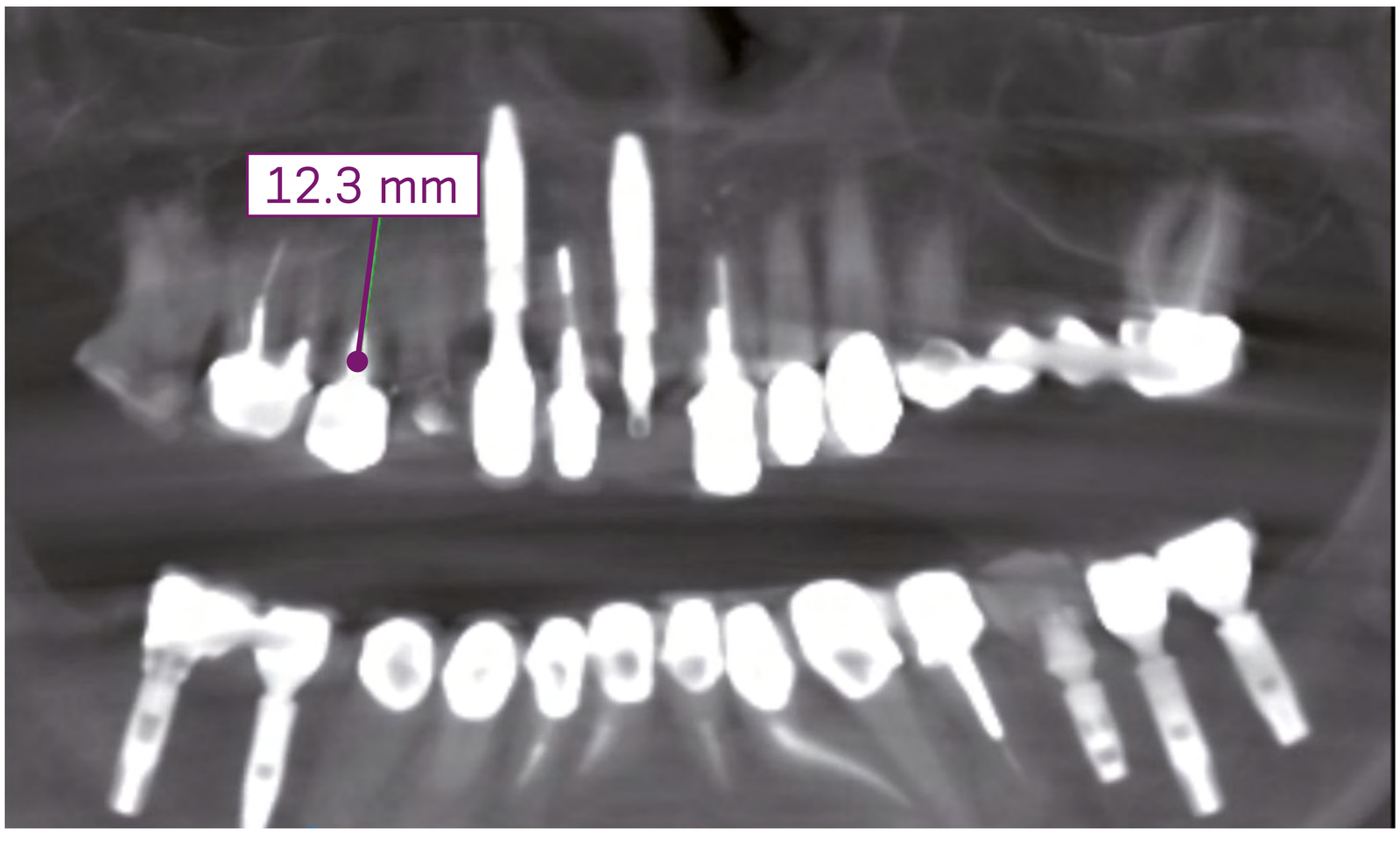
10/2017 **Implant Placement**

10/2017 **Provisional Restoration**

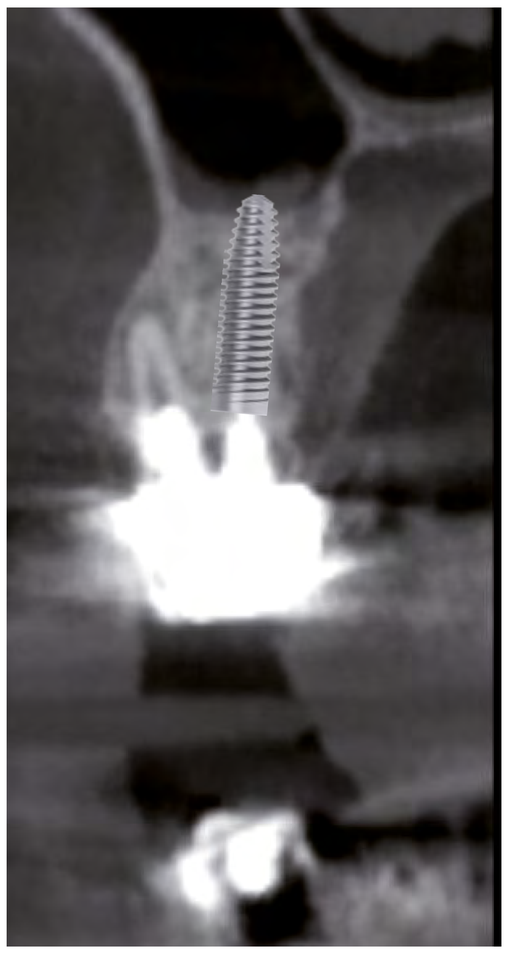
XX/2017 **Final Restoration**

Dr. Sérgio Pereira Albufeira, Portugal
Oral Surgeon of Previdente Team
Aesthetics & Prosthodontics

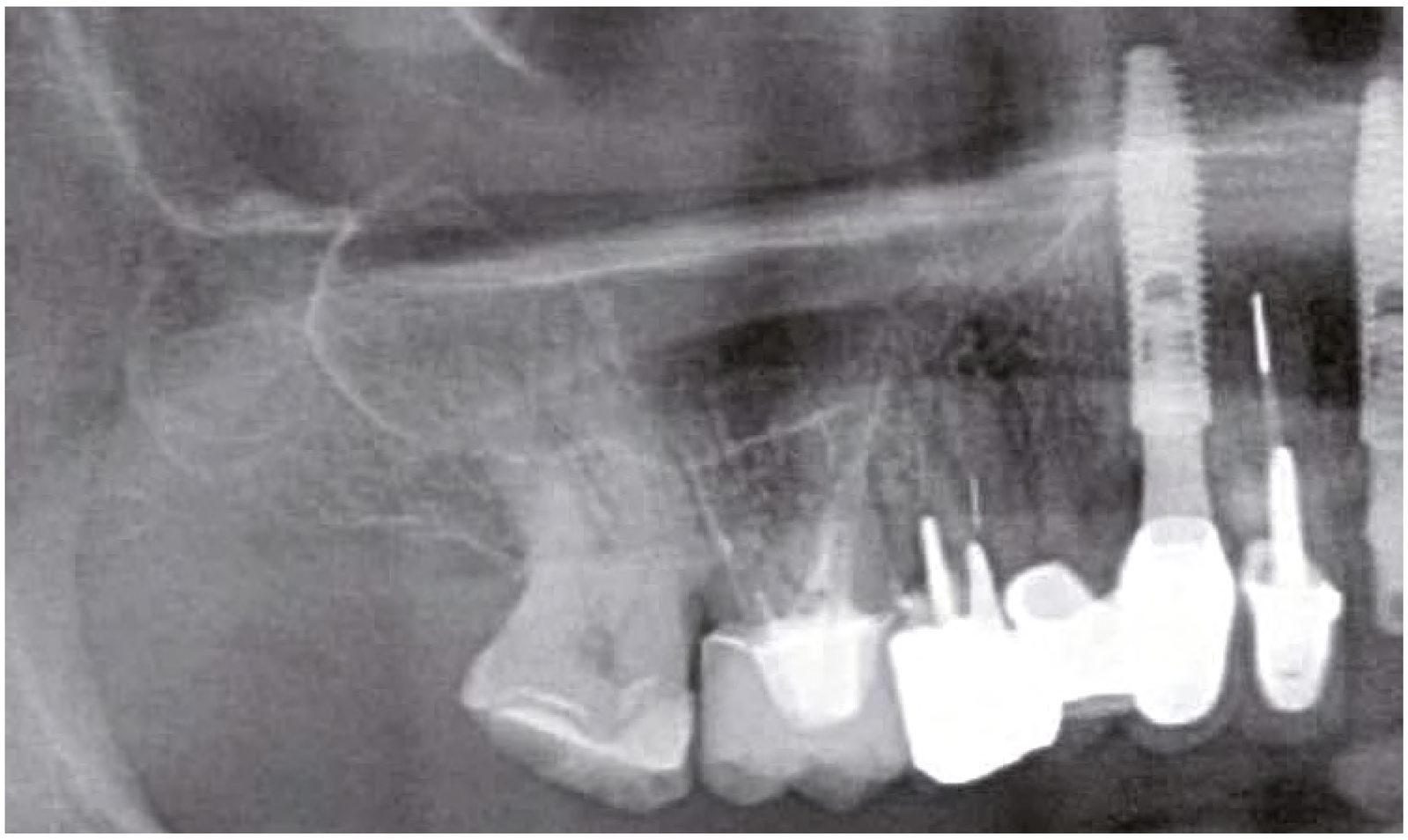
Initial situation and implant planning



0.1 Pre-op CBCT



0.2 Pre-op CBCT



0.3 Pre-op X-ray OPG

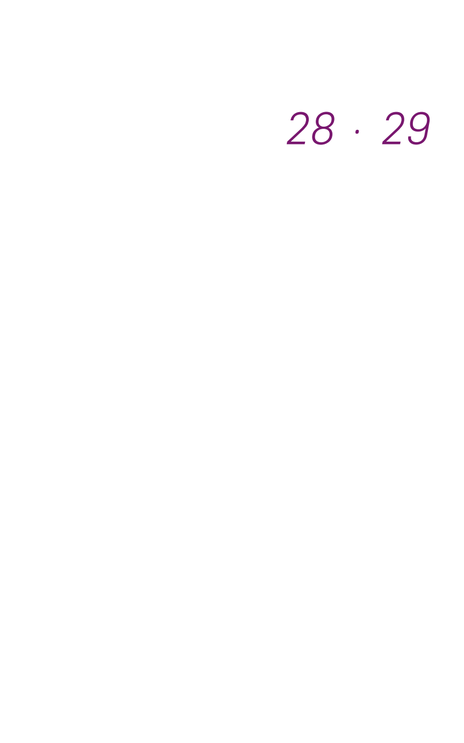
Operative set up
Armamentarium and Material

1. **Anesthesia**
2. **Flap elevation**
3. **Tooth Extraction**
4. **Extraction Socket Cleaning**
5. **Implant Bed Preparation, Implant and Abutment Placement**
6. **Bone Grafting**
7. **Suturing**

1

7

6

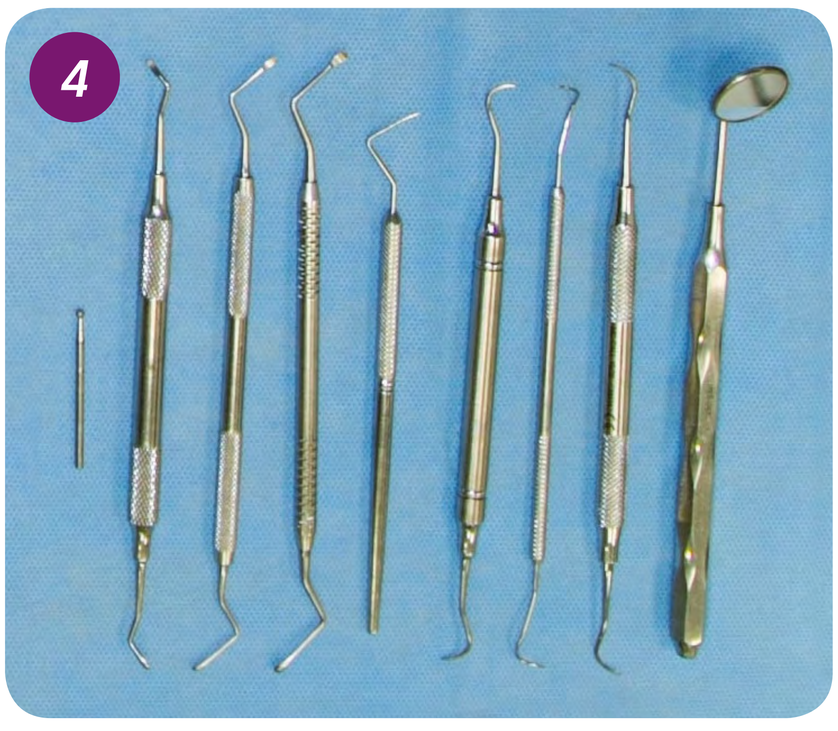


5

2

3

4

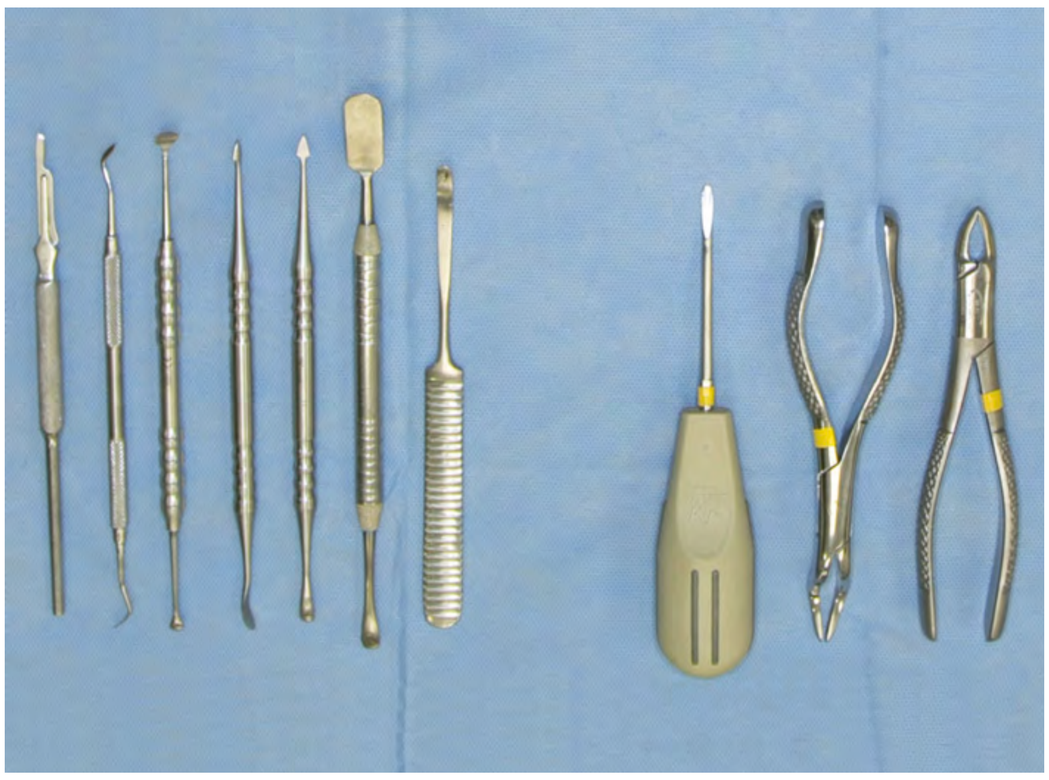


1. Anesthesia

1.1 Anesthesia setup

1.2 Anesthesia injection

2. Flap Elevation and **3.** Tooth Extraction



2.1 Extraction setup

2.2 Syndesmotomy

2.3 Tooth extraction with forceps

4. Extraction Socket Cleaning

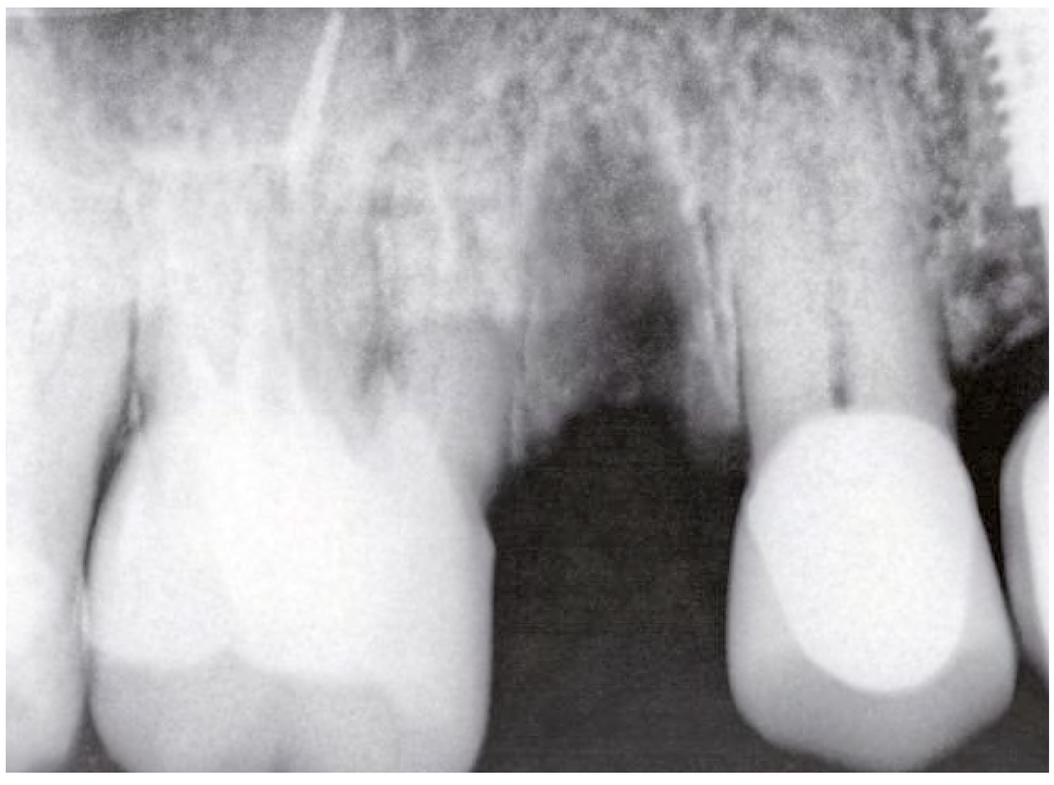
3.1 Alveolar socket cleaning setup

3.2 Alveolar socket

3.3 Cleaning surgical curettes

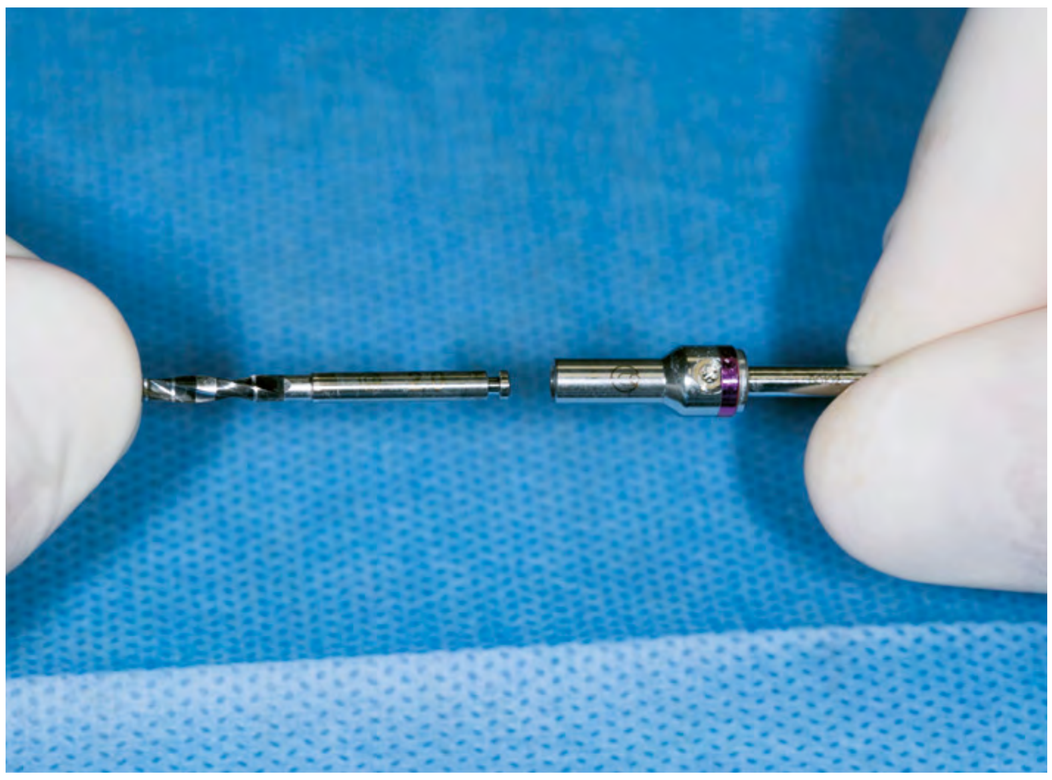
3.4 Cleaning with round bur

3.5 Cooling and rinsing with saline solution

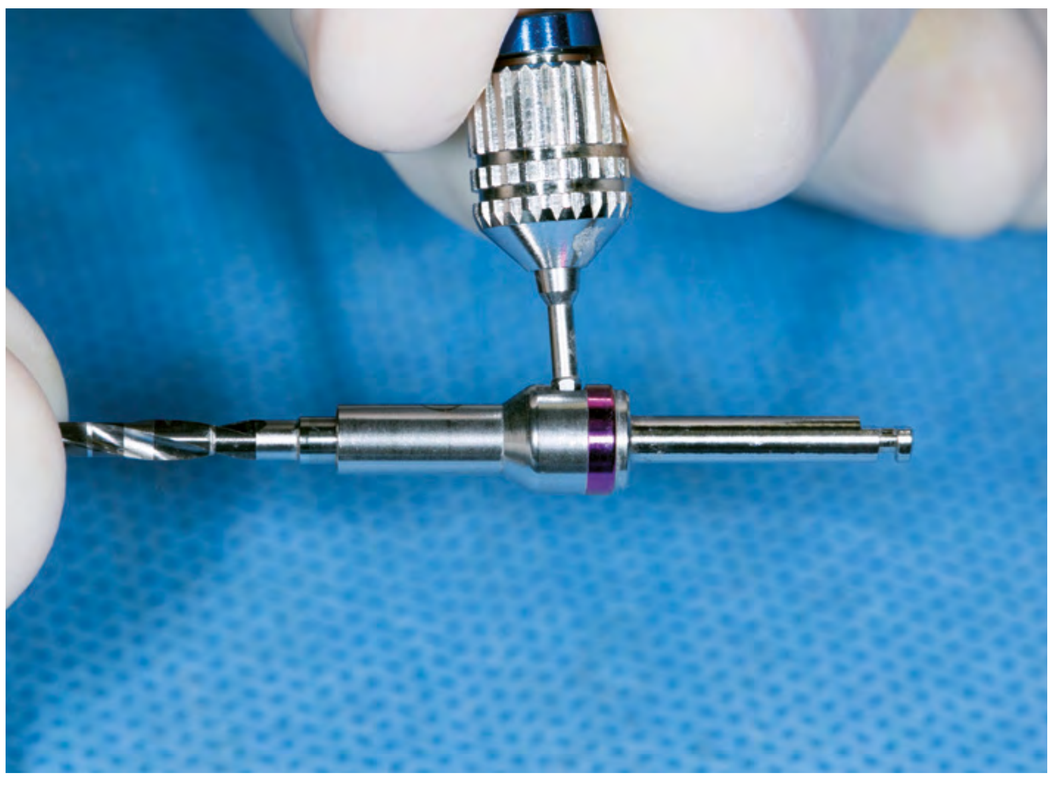


3.6 Post-extraction peri-apical X-ray

5.a Implant Bed Preparation



5.a.1 Drill extension connection



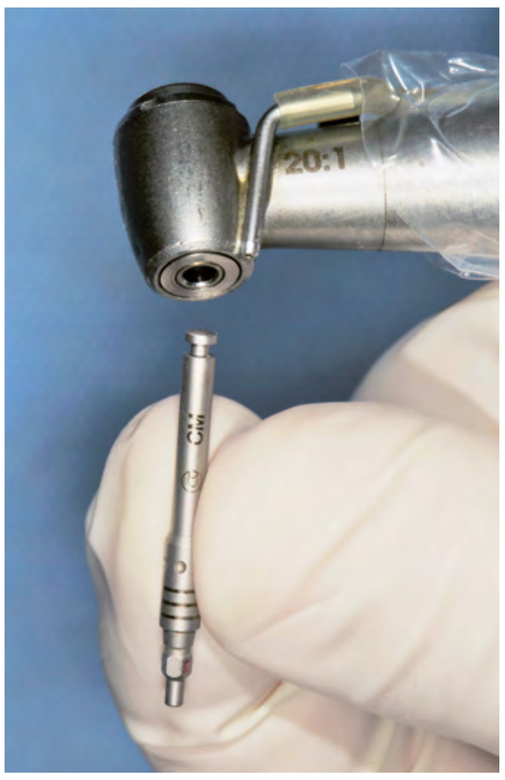
5.a.2 Drill tightened

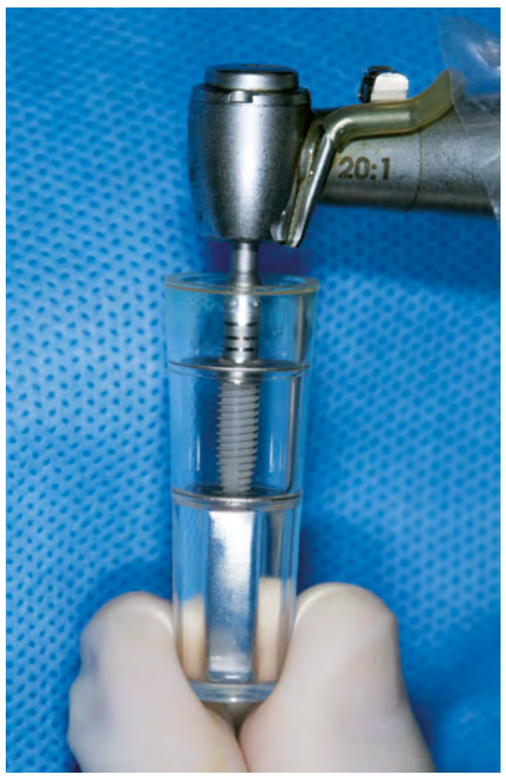
5.a.3 Implant bed preperation

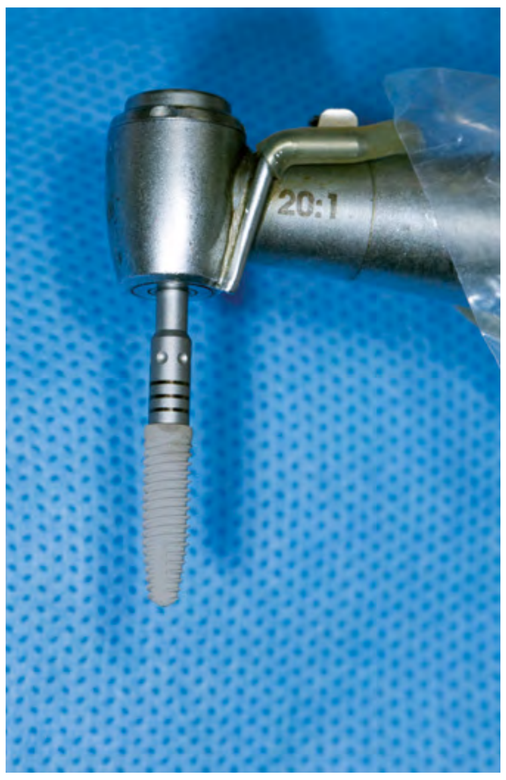
5.a.4 Implant bed enlargement

5.a.5 Direction Indicator

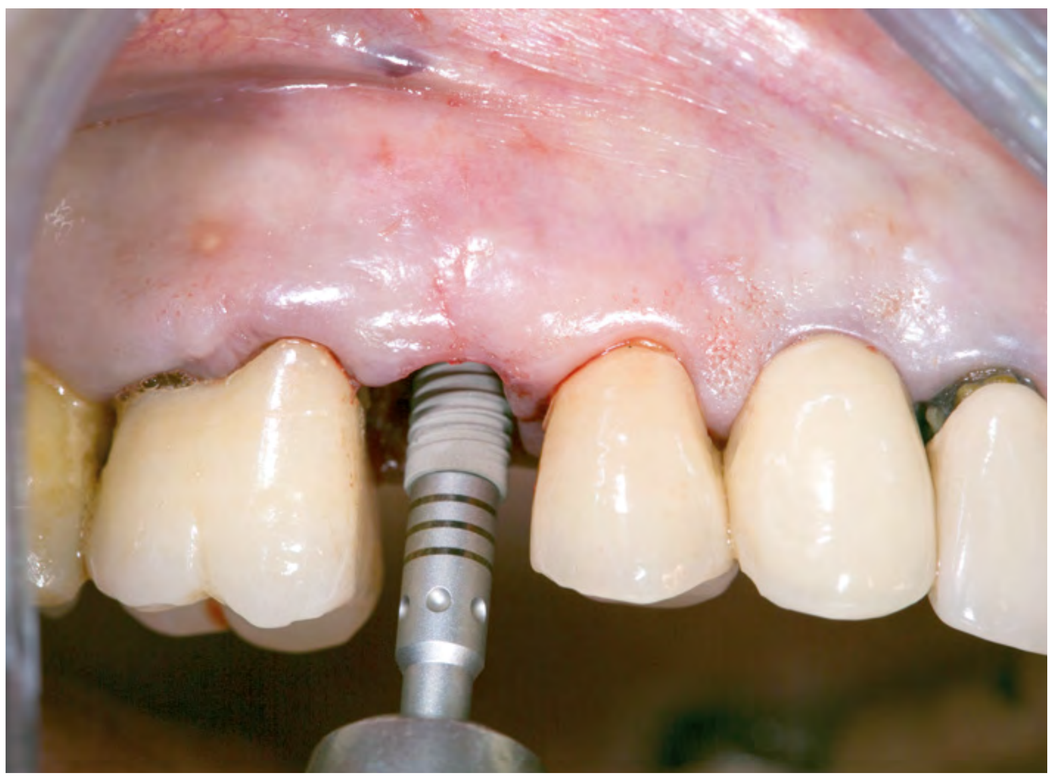
5.b Implant Placement



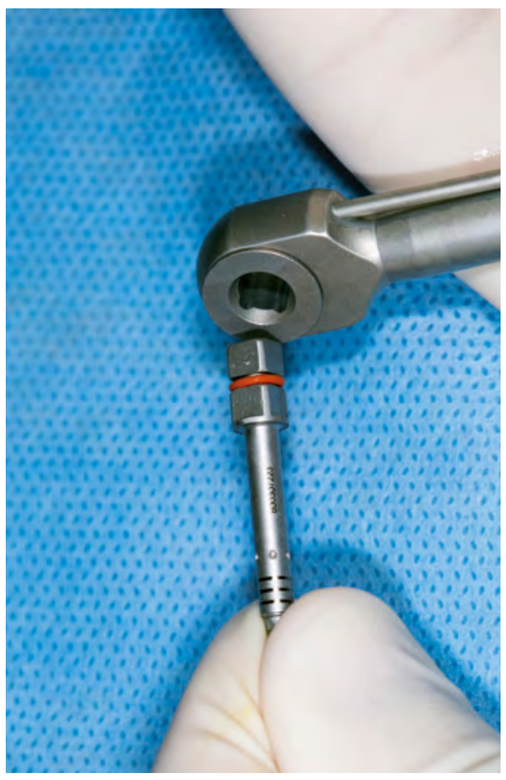




5.b.1 Implant mounting with implant driver to hand piece

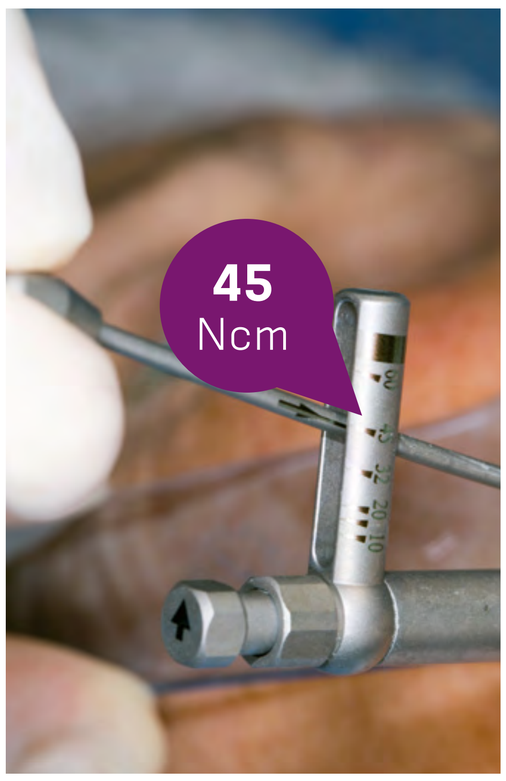


5.b.2 Implant insertion

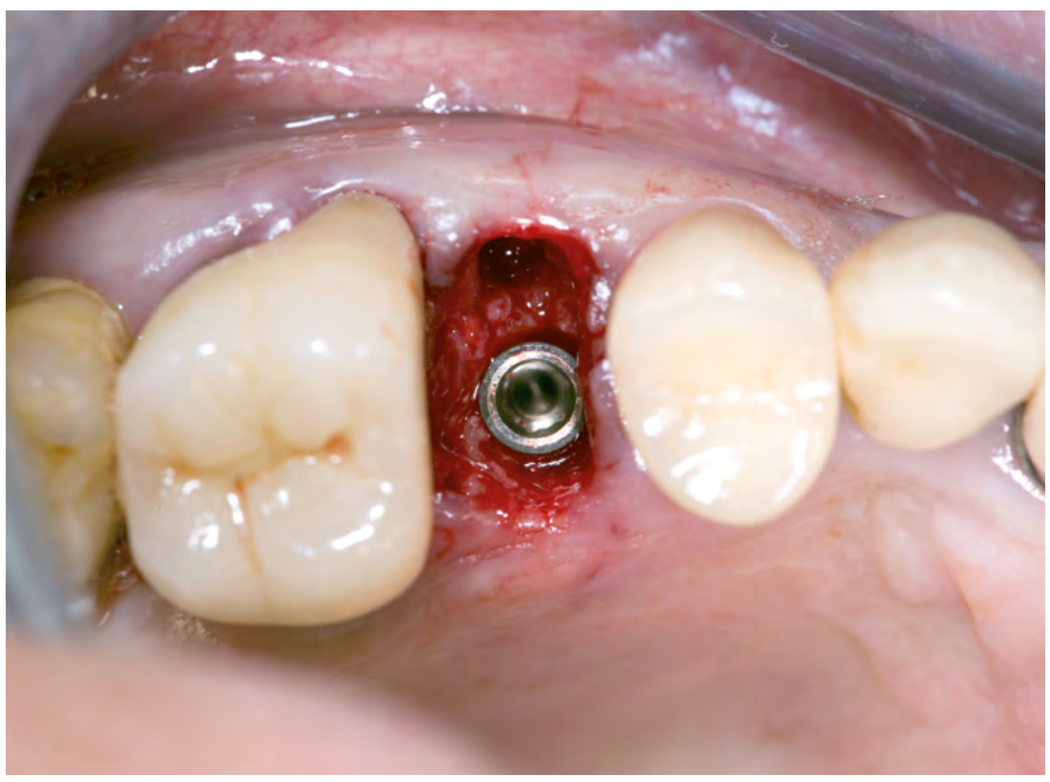


5.b.3 Implant driver mounting to ratchet

5.b.4 Implant insertion

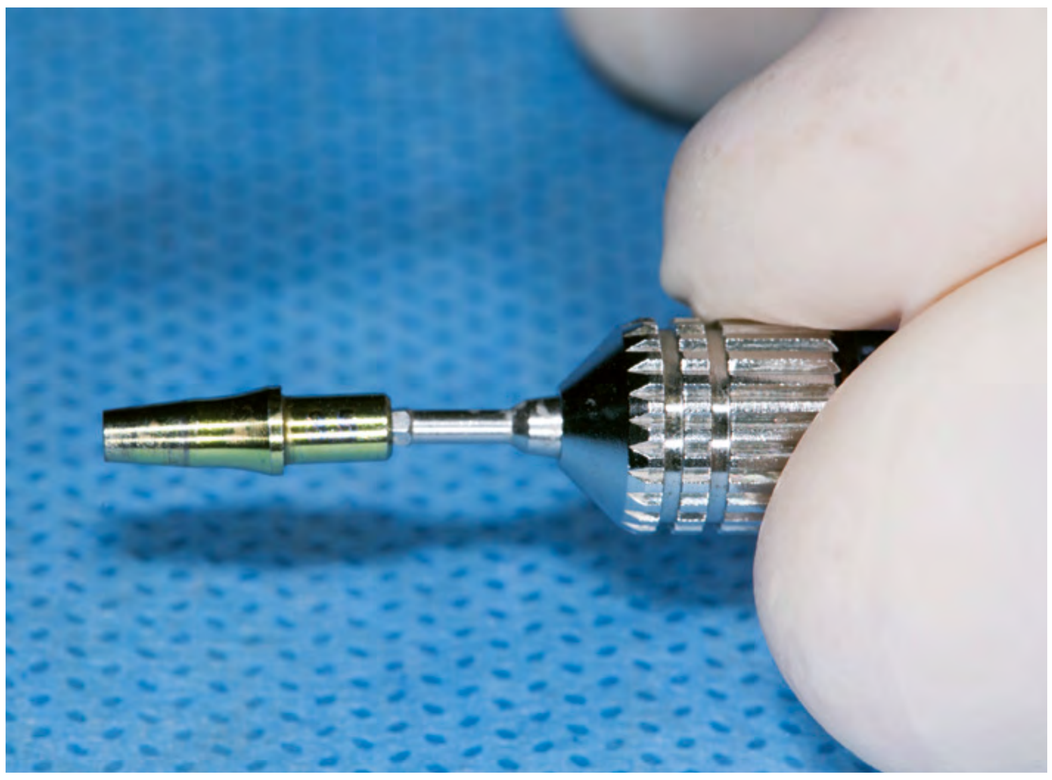


5.b.5 Stability assessment through insertion torque



5.b.6 Implant in place

5.c Abutment Placement



5.c.1 CM Abutment try-in

5.c.2 Final abutment

5.c.3 Final abutment insertion

5.c.4 Hex screwdriver torque connection 1.2 mounting to ratchet

5.c.5 Abutment insertion

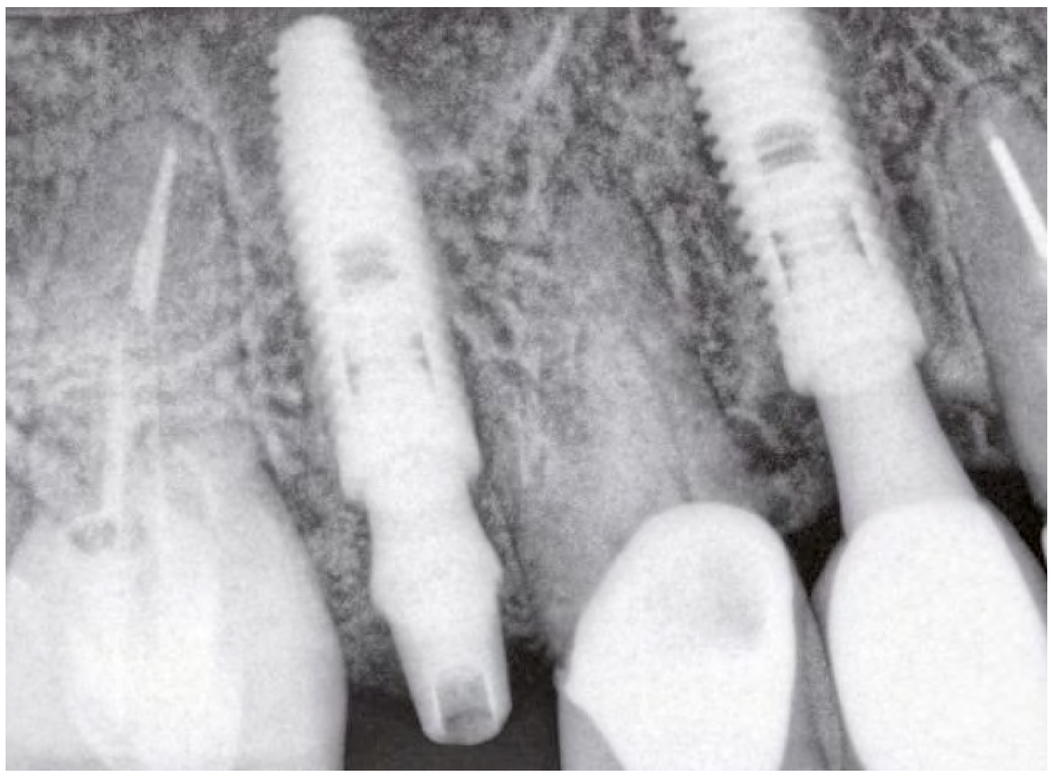
5.c.6 Stability assessment through insertion torque

5.c.7 Final abutment in place

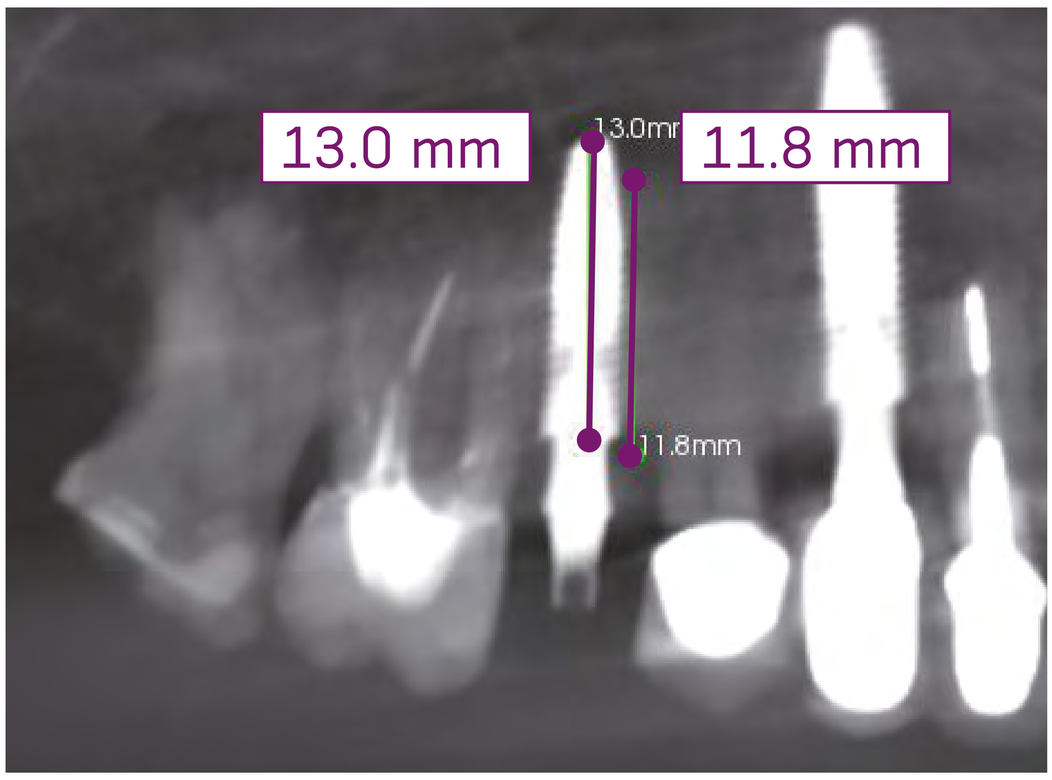
6. Bone Grafting

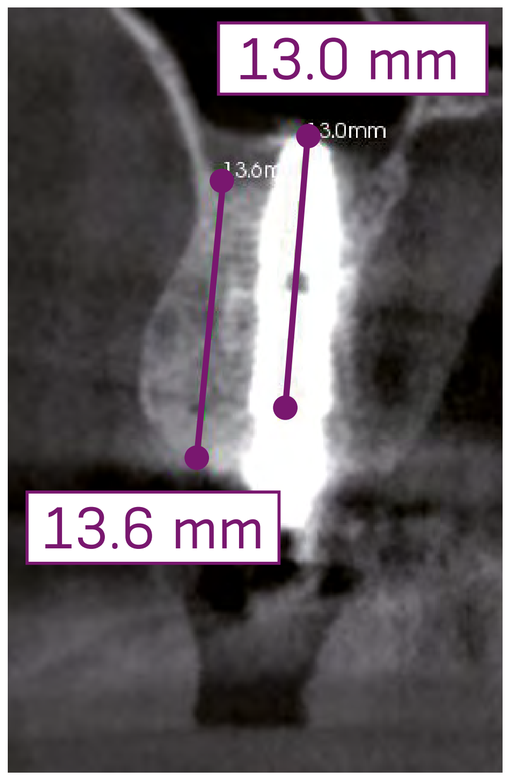
6.1 Bone graft material preparation

6.2 Bone graft application and bone contouring



6.3 Post-op peri-apical X-ray

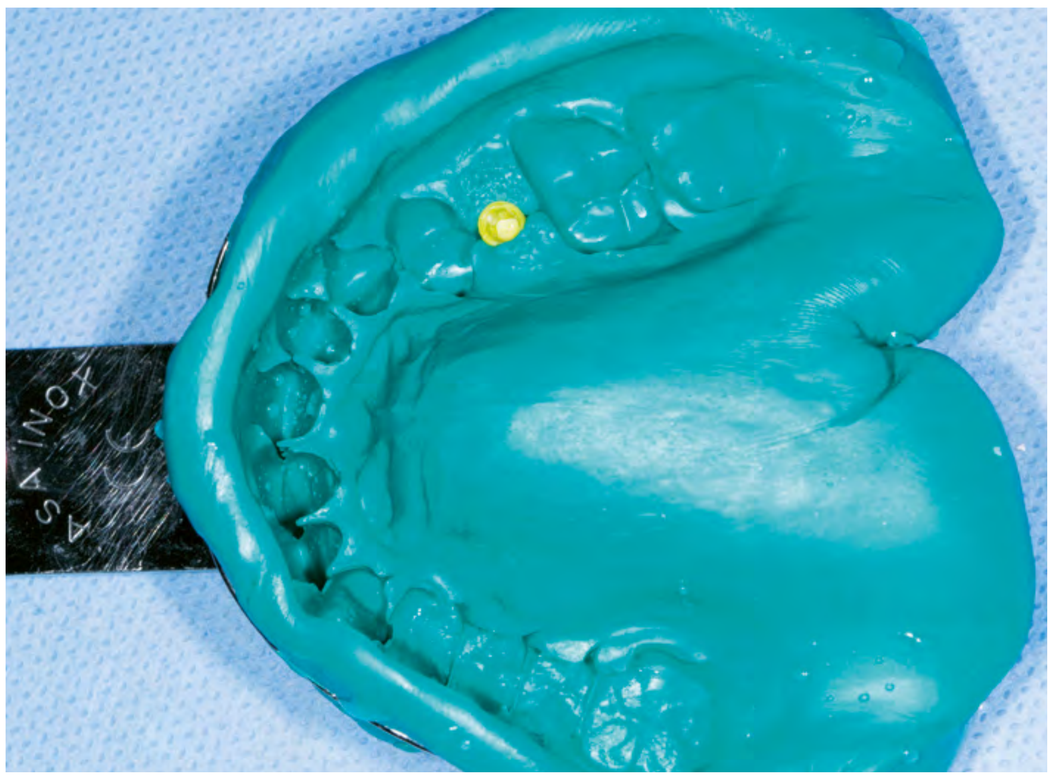


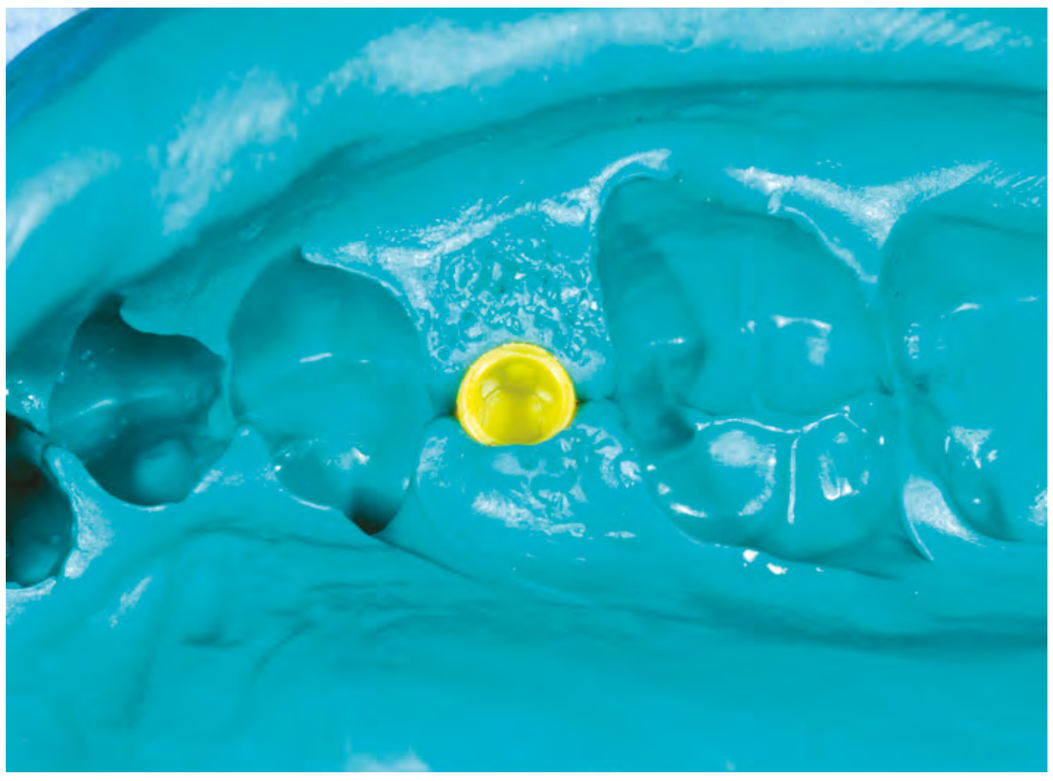


6.4 Post-op CBCT

Impression Taking

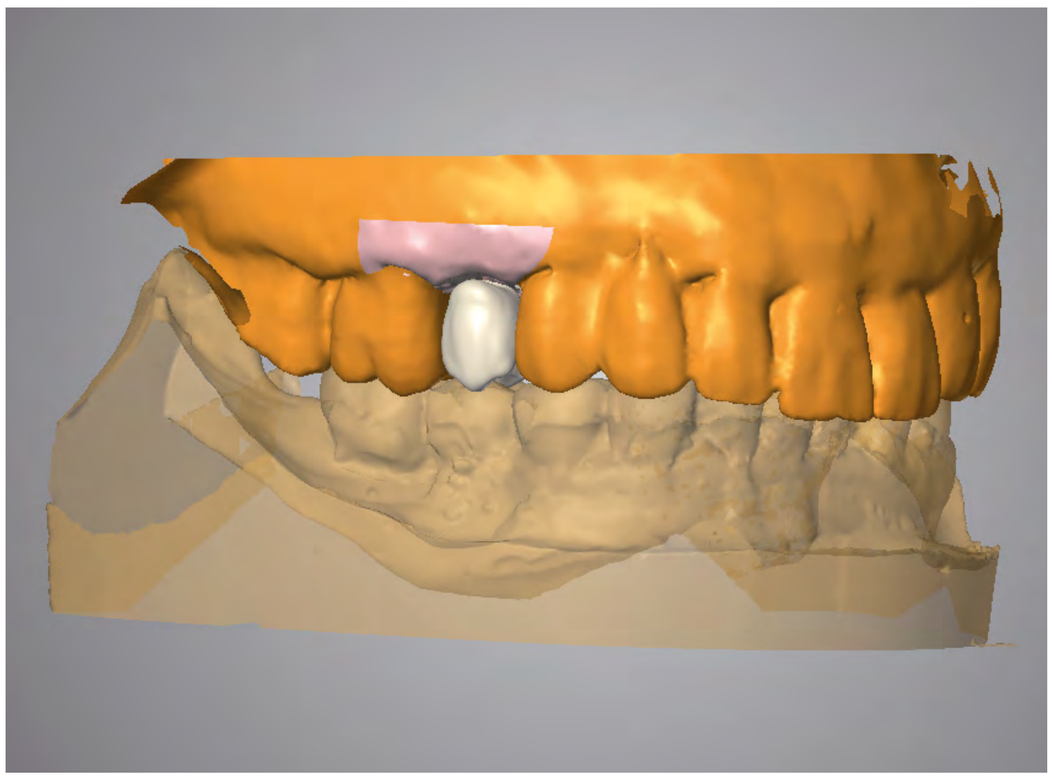
1. Impression analog insertion





2. Closed-tray impression taking

Temporary Restoration



1. Temporary crown digital planning

2. Temporary crown in place

C

Clinical Cases
of immediate treatment protocol

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	1 Implant	Non guided surgery
Restorative Solution	Conventional	PFM

CM Drive NeoPoros

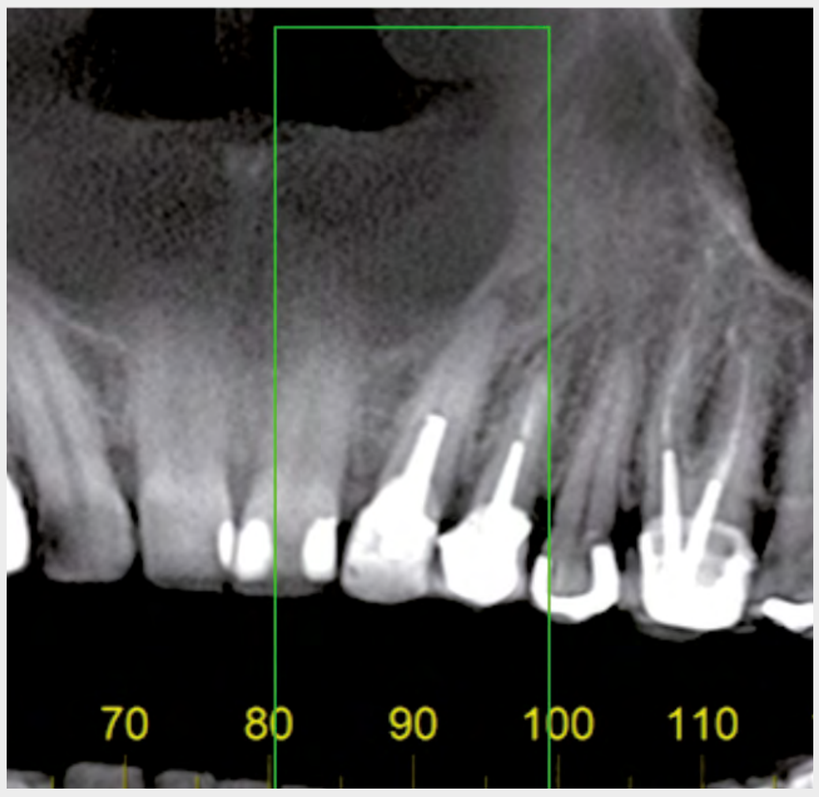
Profile
V.B., Male, 37 years old, Brasília, Brazil

Clinical Situation
Tooth 23 at the position of #22 presenting peri-apical infection and root fracture.

Restorative Solution
Extraction followed by immediate implant placement and immediate loading, provisional crown on universal abutment with “one-abutment-one-time” concept, finalized with a Porcelain-fused-to-metal crown (PFM) crown.

Surgical products
CM Drive NeoPoros (4.3 × 13 mm)

Prosthetic products
CM Universal Abutment Non-Exact (3.3 × 6 × 2.5 mm)



Initial situation

06 / 2015 **Tooth Extraction**

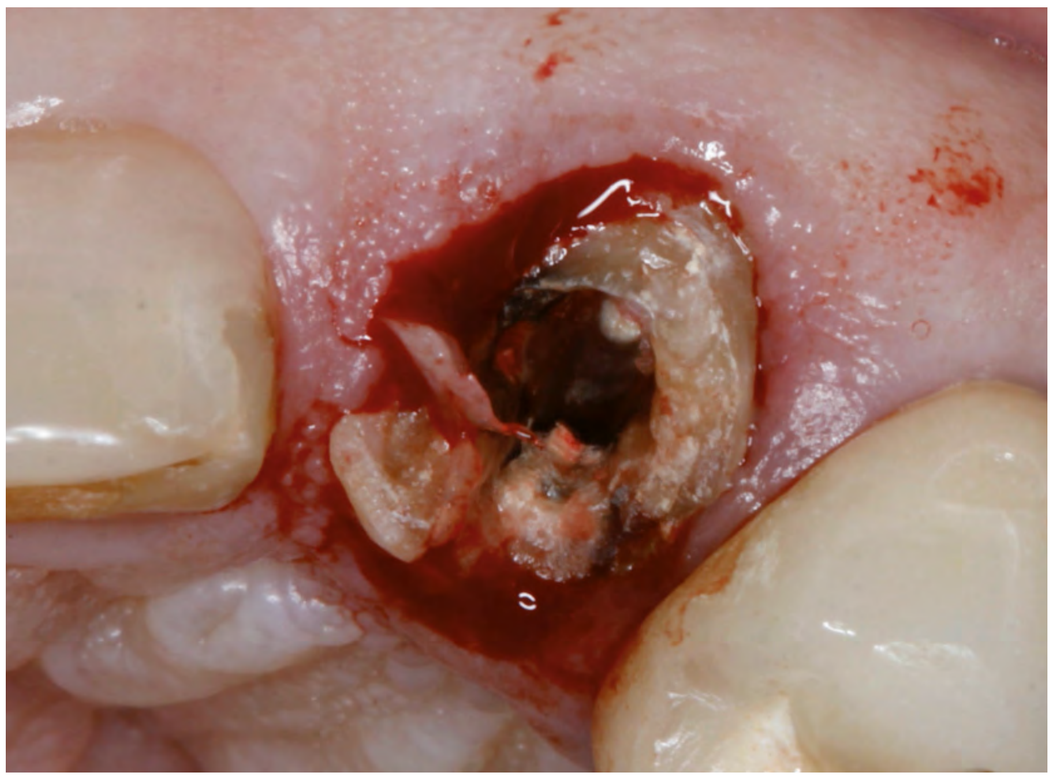
06 / 2015 **Implant Placement**

06 / 2015 **Provisional Restoration**

09 / 2015 **Final Restoration**

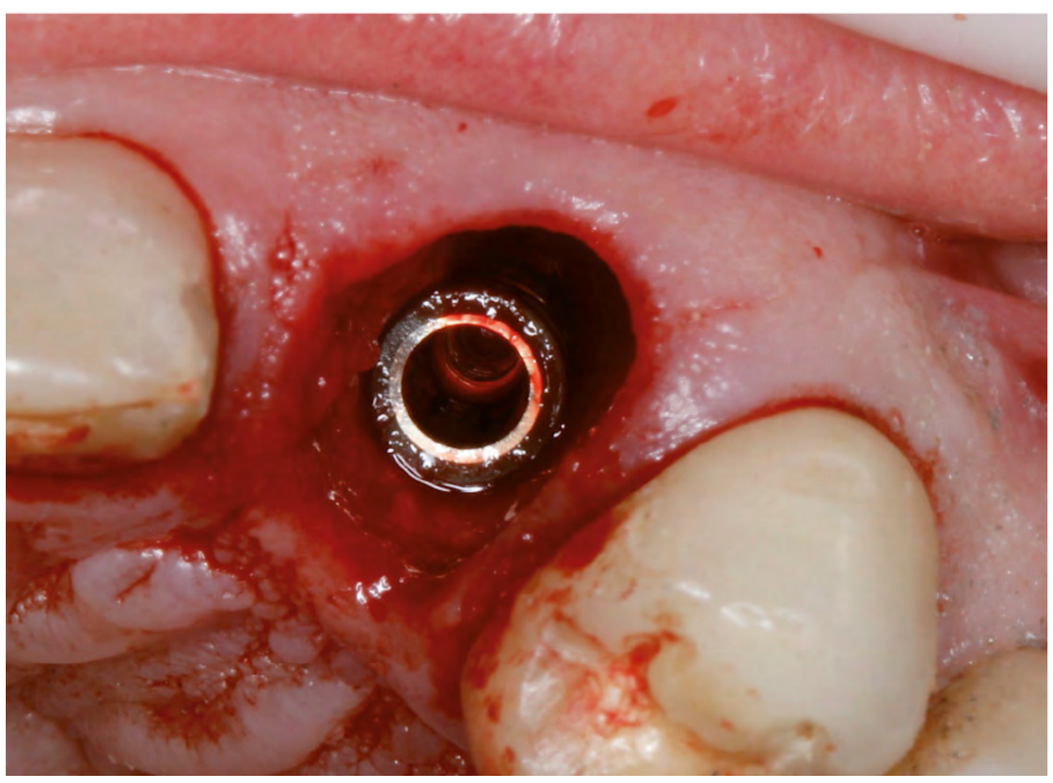
Dr. Christian Jarry Brasília, Brazil
Oral Surgeon, Periodontist – D.D.S., M.Sc., Ph.D

1. Pre-operative occlusal view

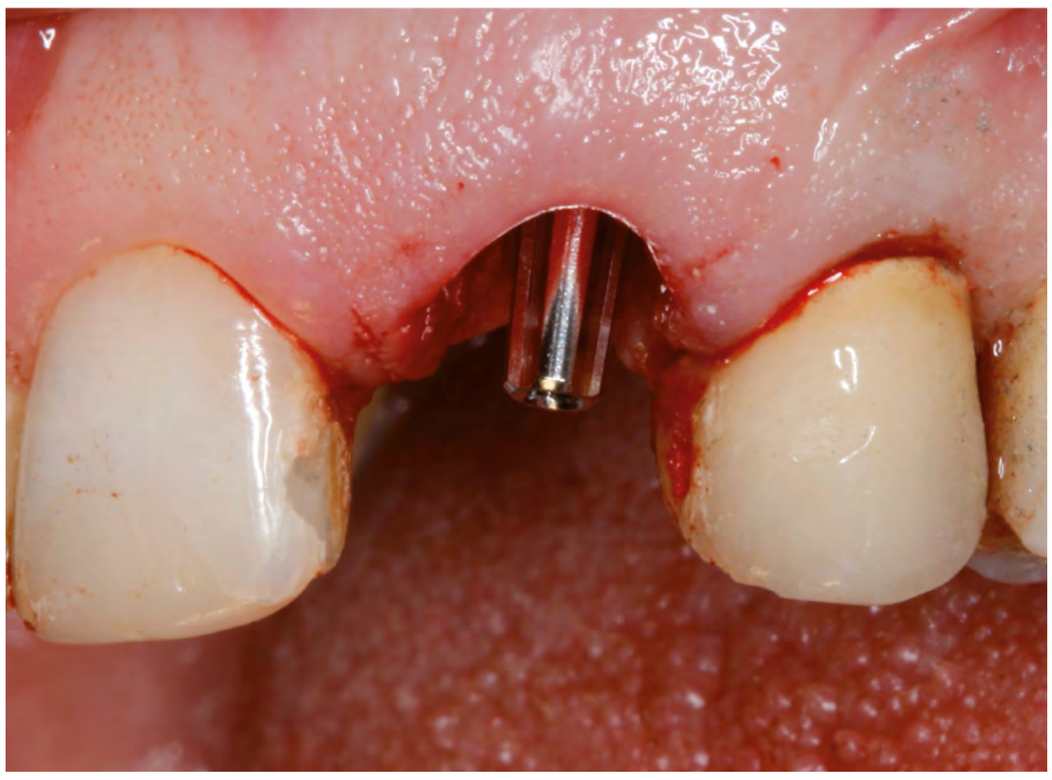


2. Crown removal –visible fracture

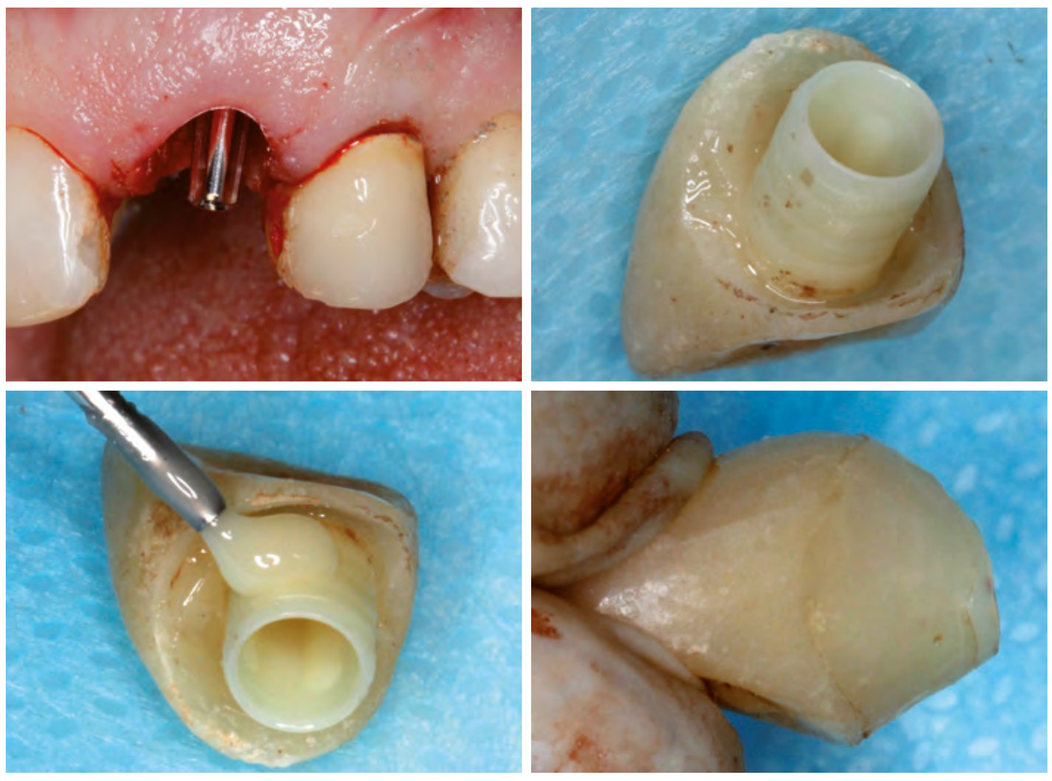
3. Implant bed preparation



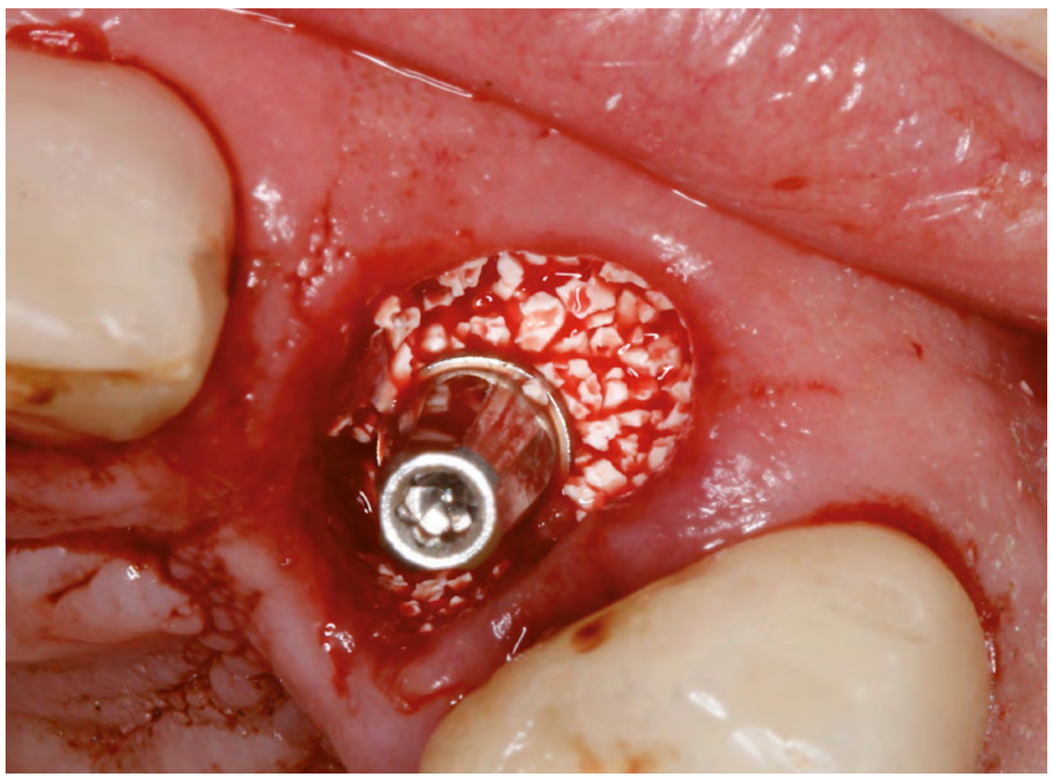
4. Implant in place allowing adequate gap management



5. Abutment in place

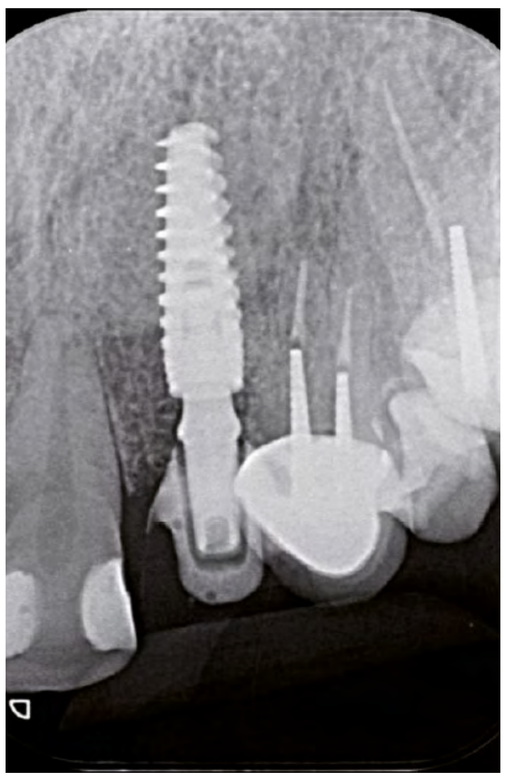


6. Provisional universal abutment coping captured into prefabricated crown shell



7. Gap management with synthetic bone substitute

8. Provisional crown in place together with splinting to adjacent teeth



9. Immediate post-operative X-ray

10. Stable soft tissue contour 40 days after surgery

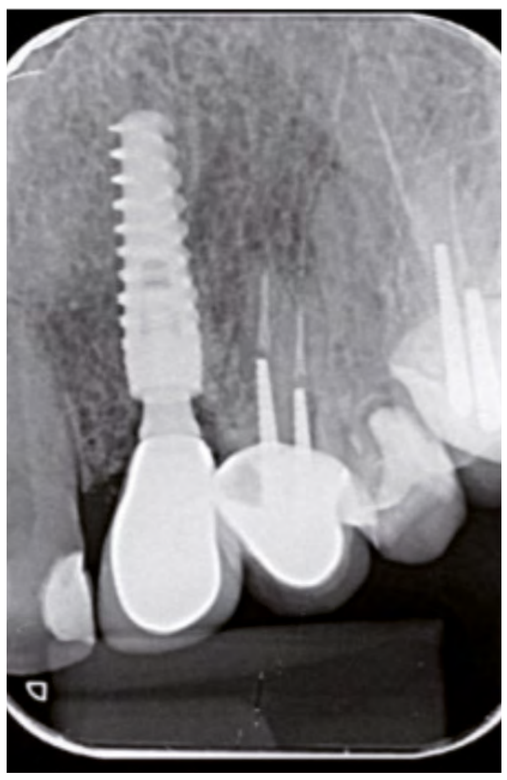
11. Great emergence profile 3 months after surgery

12. Universal abutment impression coping in place

13. Alloy coping try in

14. Final restoration in place – Close-up

15. Final restoration intraoral frontal view



16. 2-year follow-up X-ray

Clinical case

CM Drive Acqua

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	1 Implant	Non guided surgery
Restorative Solution	Conventional + Digital	Porcelain applied to Zirconia coping

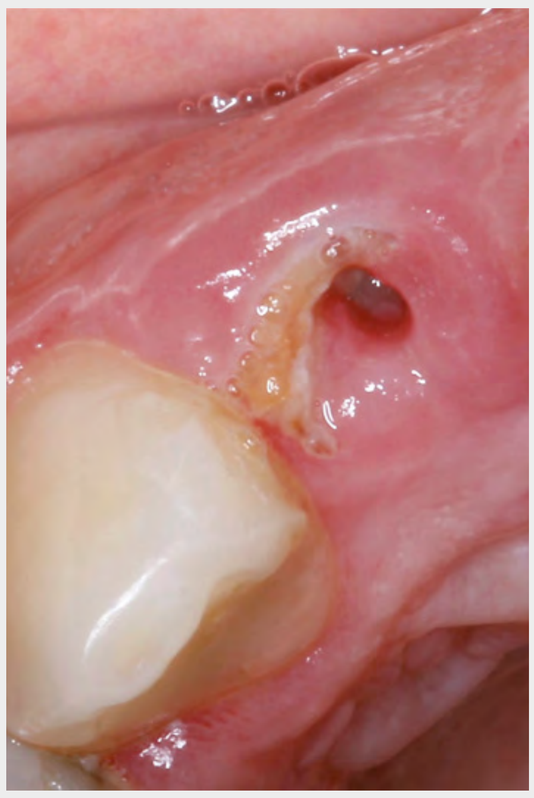
Profile
R. M., Female, 28 years old, Brasília, Brazil

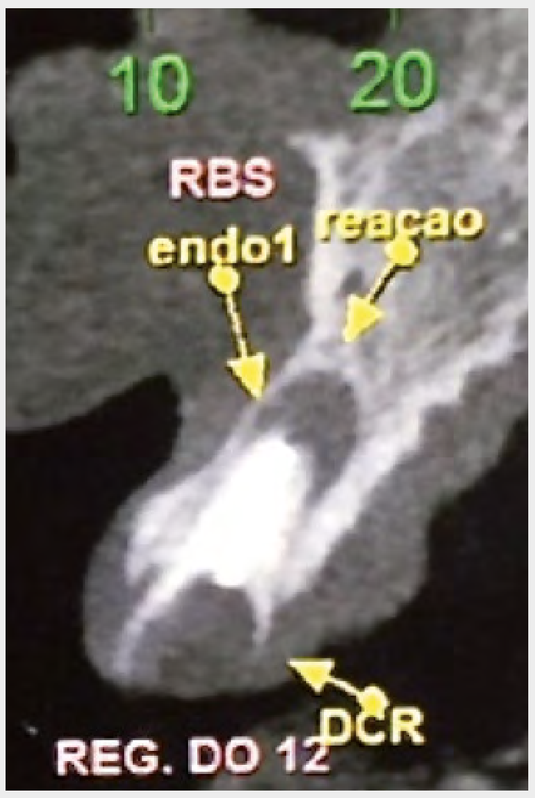
Clinical Situation
Tooth 12 presenting extensive root decay with peri-apical infection

Restorative Solution
Extraction, followed by immediate implant placement, immediate loading, provisional crown on a universal abutment with “one-abutment-one-time” concept, and finalized with a ceramic crown

Surgical products
CM Drive Acqua (3.5 × 13 mm)

Prosthetic products
CM Universal Abutment (3.3 × 6 × 2.5 mm)





Initial situation

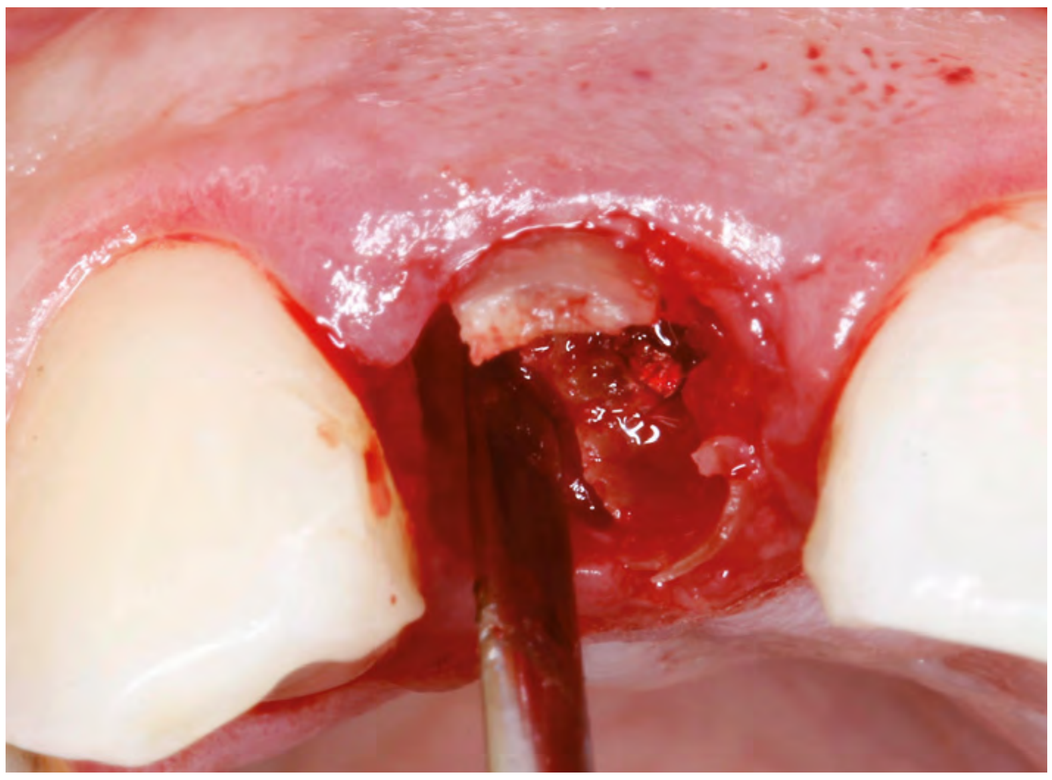
03/2015 **Tooth Extraction**

03/2015 **Implant Placement**

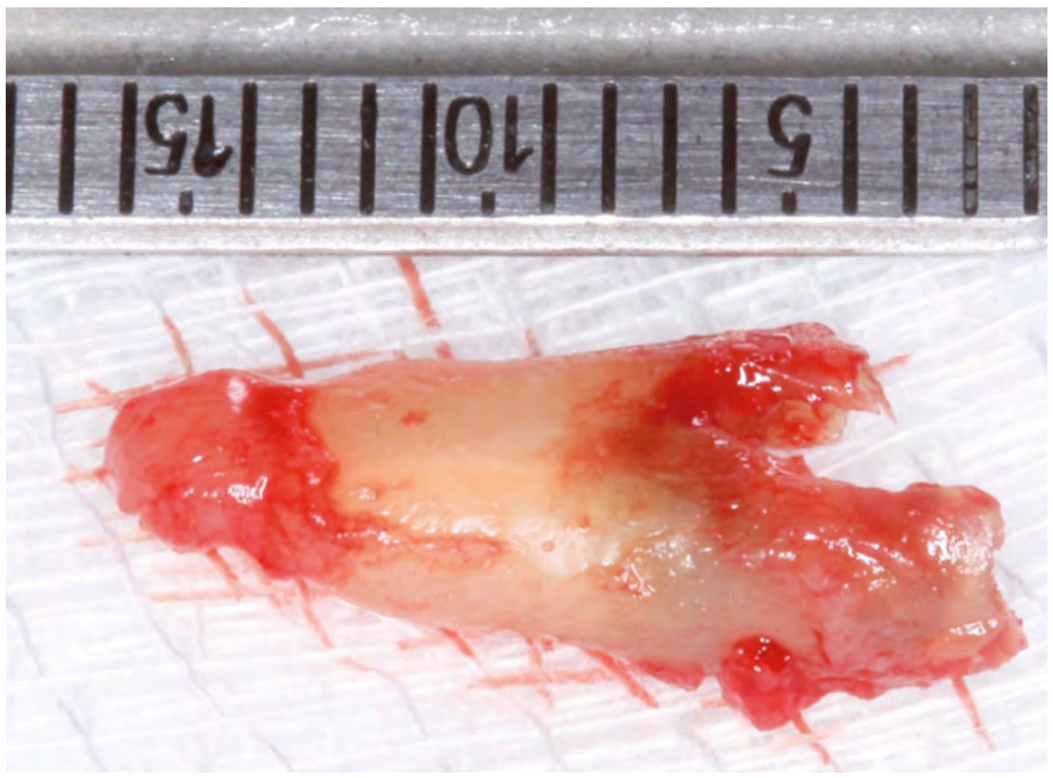
03/2015 **Provisional Restoration**

07/2015 **Final Restoration**

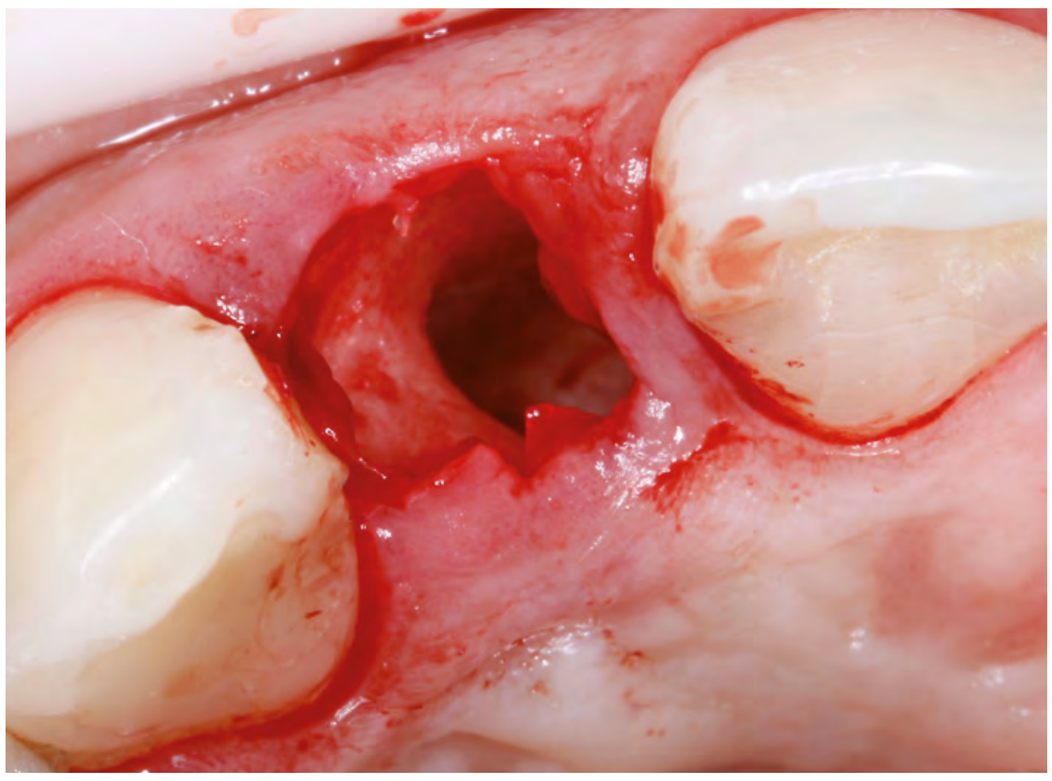
Dr. Christian Jarry Brasília, Brazil
Oral Surgeon, Periodontist – D.D.S., M.Sc., Ph.D



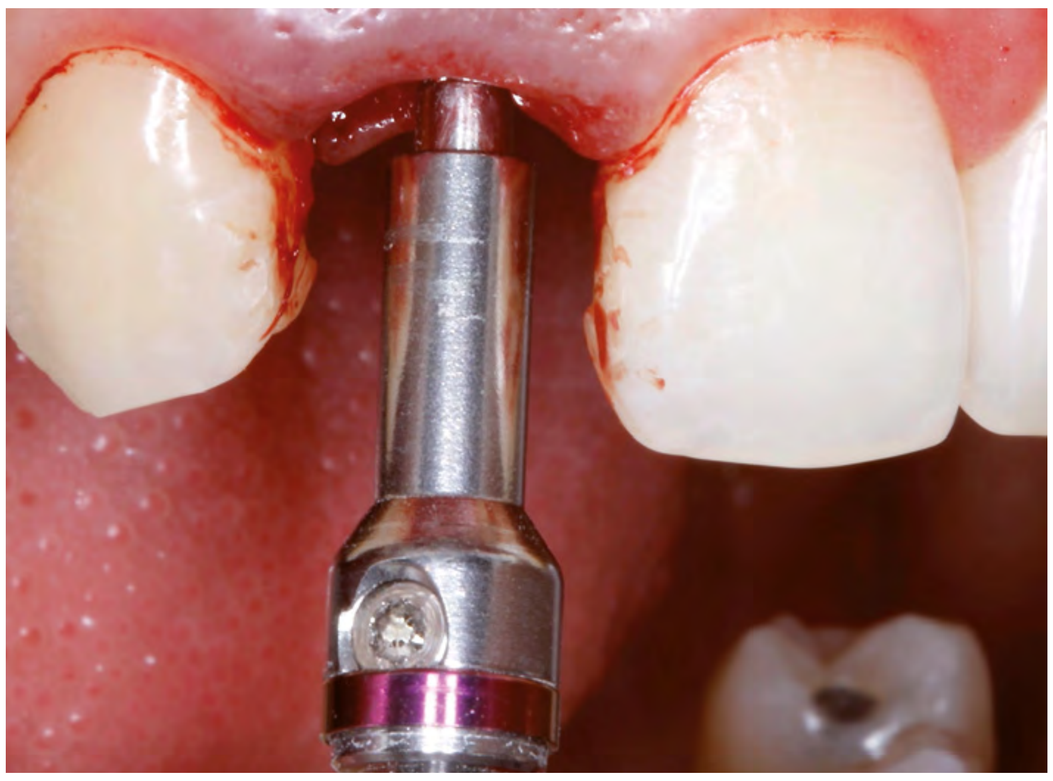
1. Minimally traumatic extraction with periotome



2. Extracted root

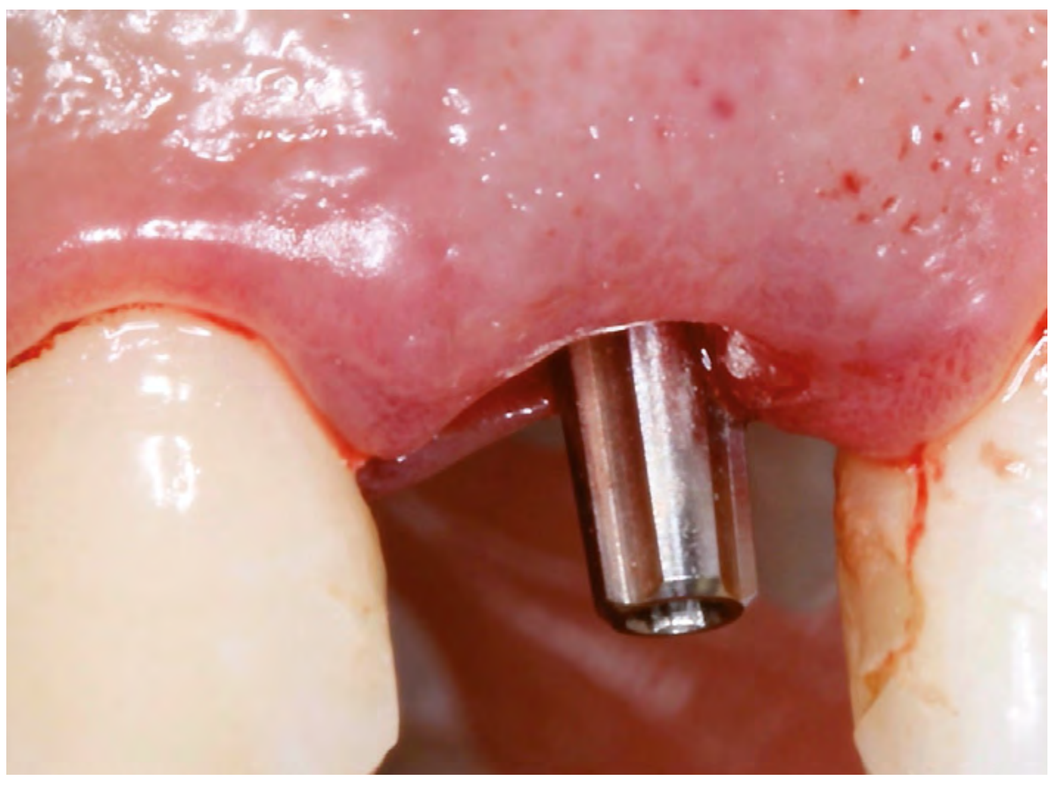


3. Extraction site – mesially oriented

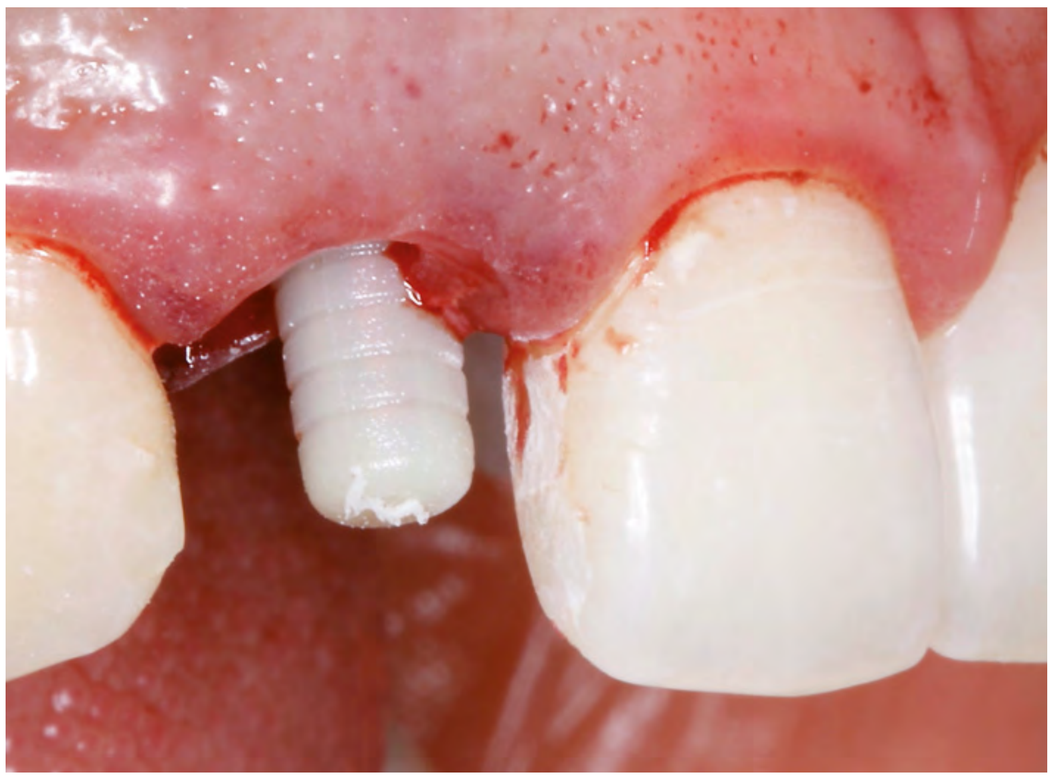


4. Implant bed preparation – drill extension

5. Implant placement



6. Abutment in place

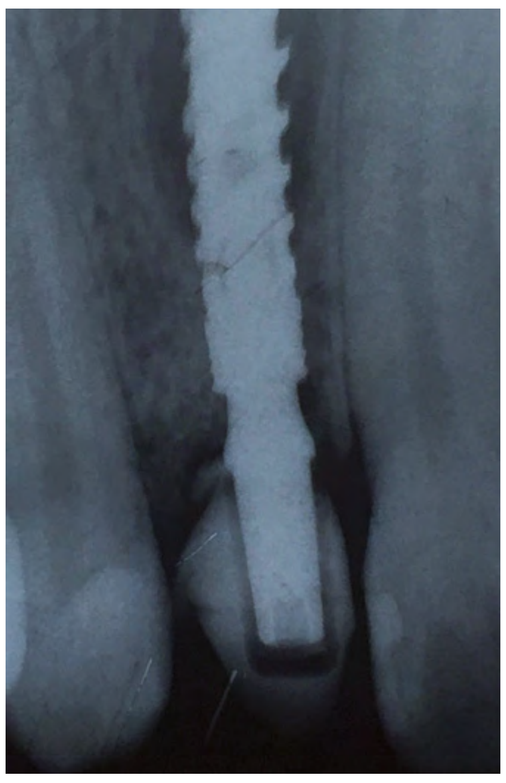


7. Universal Abutment provisional coping in place

8. Provisional universal abutment coping captured into prefabricated crown shell

9. Provisional restoration in place – occlusal view

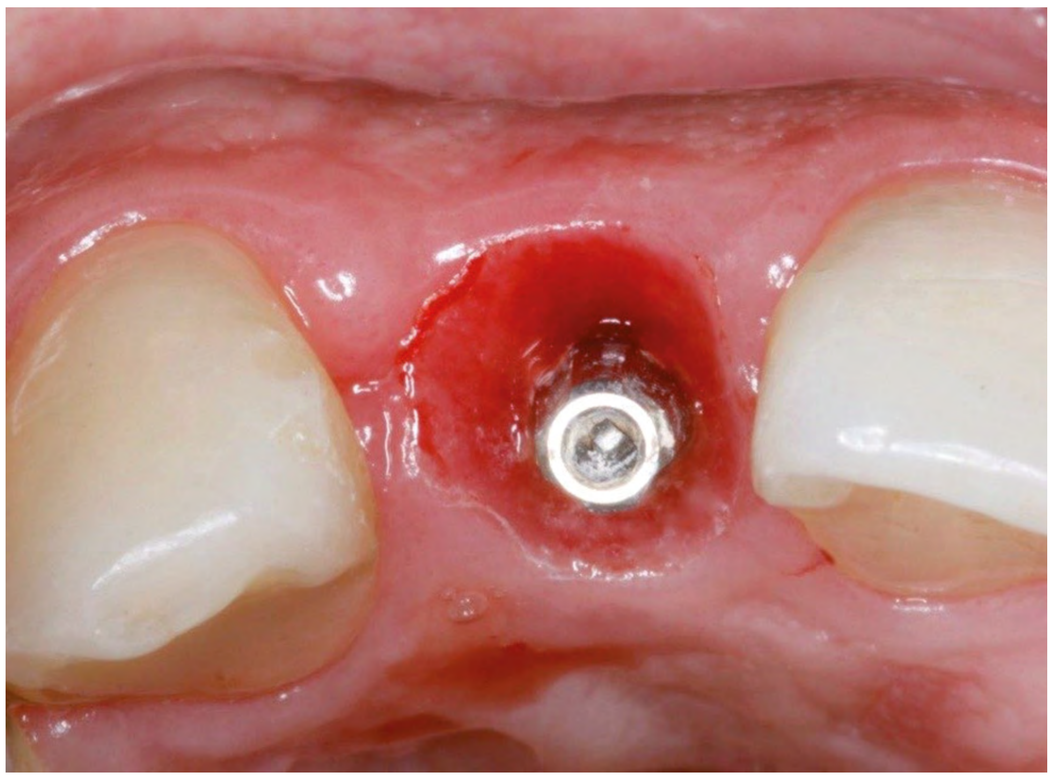
10. Provisional restoration in place – labial view



11. Immediate post op. X-ray

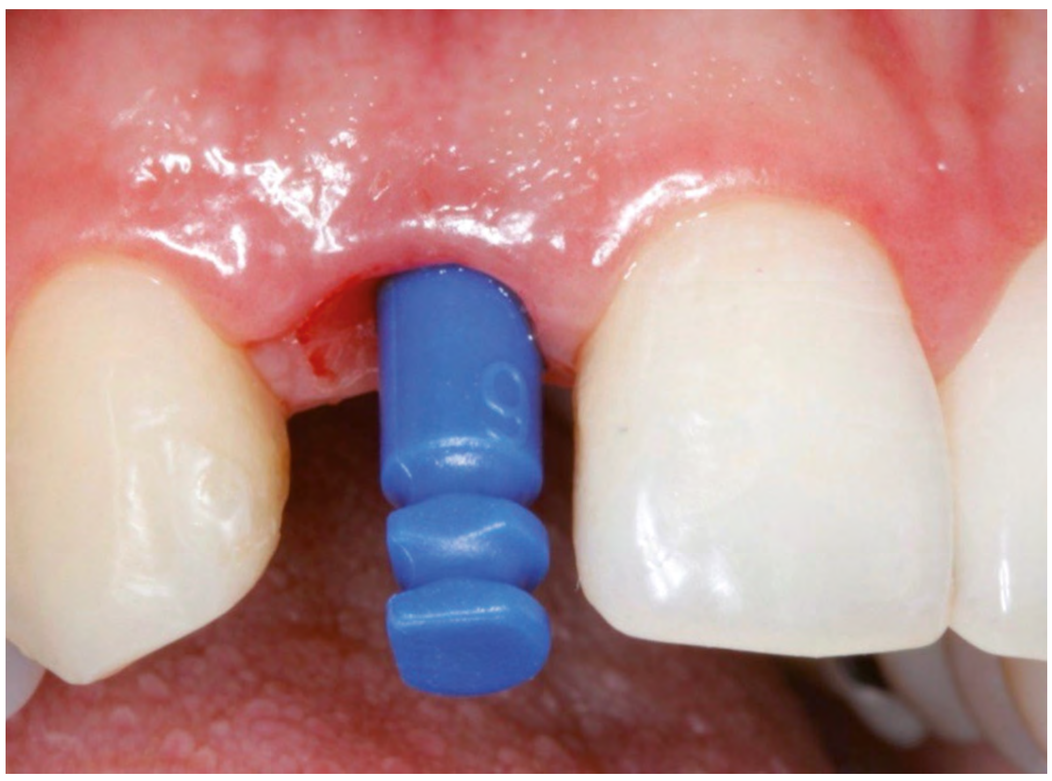
12. Provisional restoration occlusal view 4 months after surgery

13. 3 months post provisional restoration X-ray

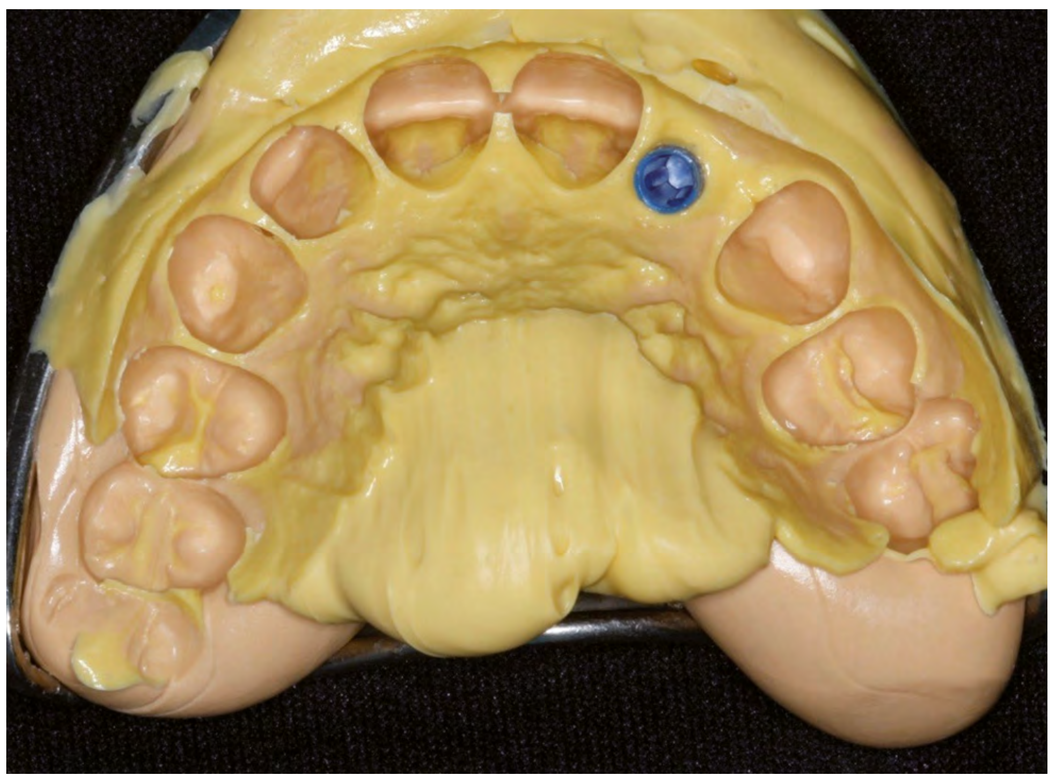


14. Great emergence profile 4 months after surgery

15. Stable soft-tissue contour 4 months after surgery



16. Universal abutment impression coping in place



17. Impression taken

18. Shade selection

19. Porcelain applied to Zirconia coping

20. Final restoration in place – Close-up

21. Final restoration – Extra-oral lateral view

22. 2-year follow-up X-ray

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	1 Implant	Conventional
Restorative Solution	Conventional	Metal – ceramic

CM Alvim NeoPoros

Profile
C. S., Female, 32 years old, Porto, Portugal

Clinical Situation
Internal resorption of tooth 11

Restorative Solution
Extraction, followed by immediate implant placement, immediate loading with a provisional crown on a universal abutment and bone substitute material. The case used “one-abutment-one-time” concept and finalized with a metal-ceramic crown.

Surgical products
CM Alvim NeoPoros (4.3 × 16 mm)
Xenograft

Prosthetic products
CM Universal Abutment Exact (3.3 × 4 × 3.5 mm)

Initial situation

02/2012 **Tooth Extraction**

02/2012 **Implant Placement**

02/2012 **Provisional Restoration**

01/2013 **Final Restoration**

Dr. Pedro Gomes Portugal
Master em cirurgia oral e implantologia pela universidade Paul Sebatier de Toulouse; Pos Graduação teorica e pratica em implantologia RBI Neodent®; Pos Graduação em restaurações estéticas aderidas pela shape dentistry academy

Dr. Miguel Braga Pinto Portugal
Mestre em Implantodontia pela Faculdade CPO São Leopoldo Mandic Campinas – SP – Brasil; Especialista em Periodontia HGeR Recife – PE – Brasil; Mestre em Reabilitação Oral ISCSN – Portugal

1. Pre-operative X-ray

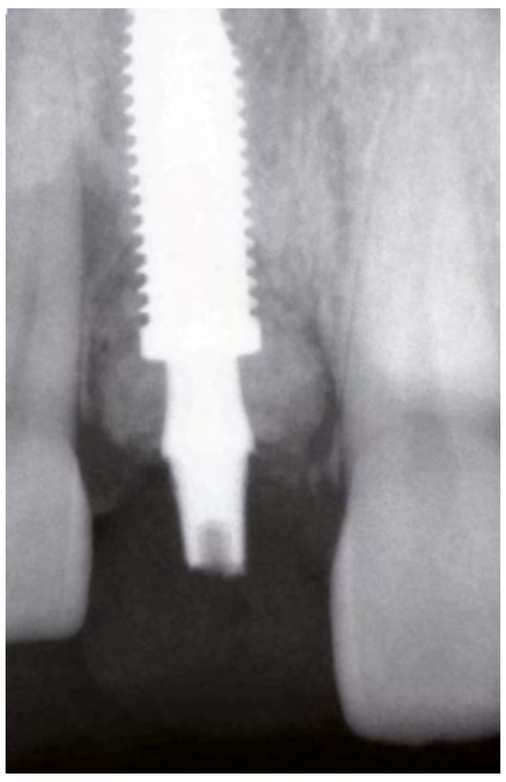
2. Tooth extraction

3. Implant and abutment in place

4. Post-operative X-ray

5. Xenograft material (Xenograft)

6. Immediate provisional restoration in place



7. Post provisional restoration X-ray

8. Provisional restoration 6-month after surgery

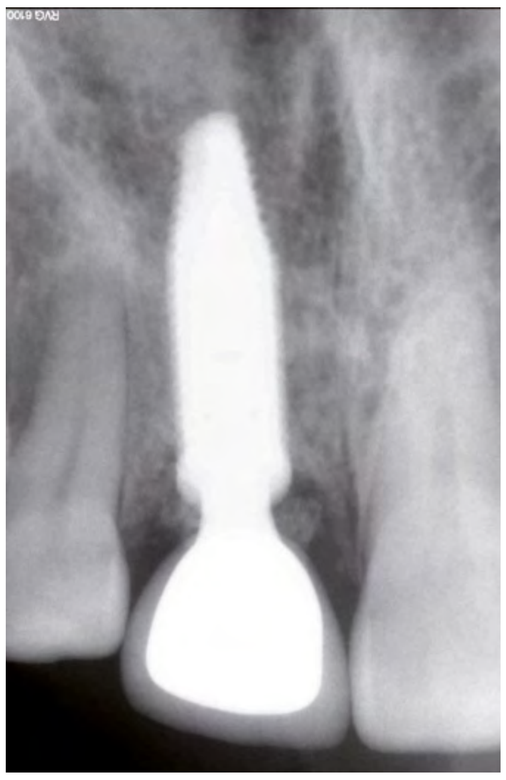
9. Provisional restoration 6-month after surgery – occlusal view

10. Stable soft tissue contour 6 months after surgery

11. Great emergence profile 6-month after surgery

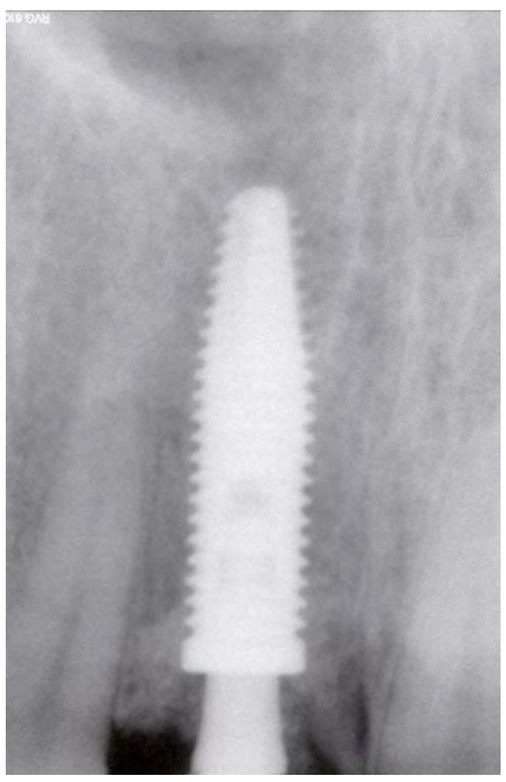
12. Final restoration 11 months after surgery

13. Final restoration



14. Final restoration X-ray

15. Extra oral frontal view



16. 4-year follow-up X-ray

17. 4-year follow up – intraoral frontal view

Clinical case

CM Drive Acqua

Summary	**Immediate loading protocol**	
Surgical Description	Maxilla	Anterior
	1 Implant	Conventional
Restorative Solution	Conventional	Zirconia / Ceramic

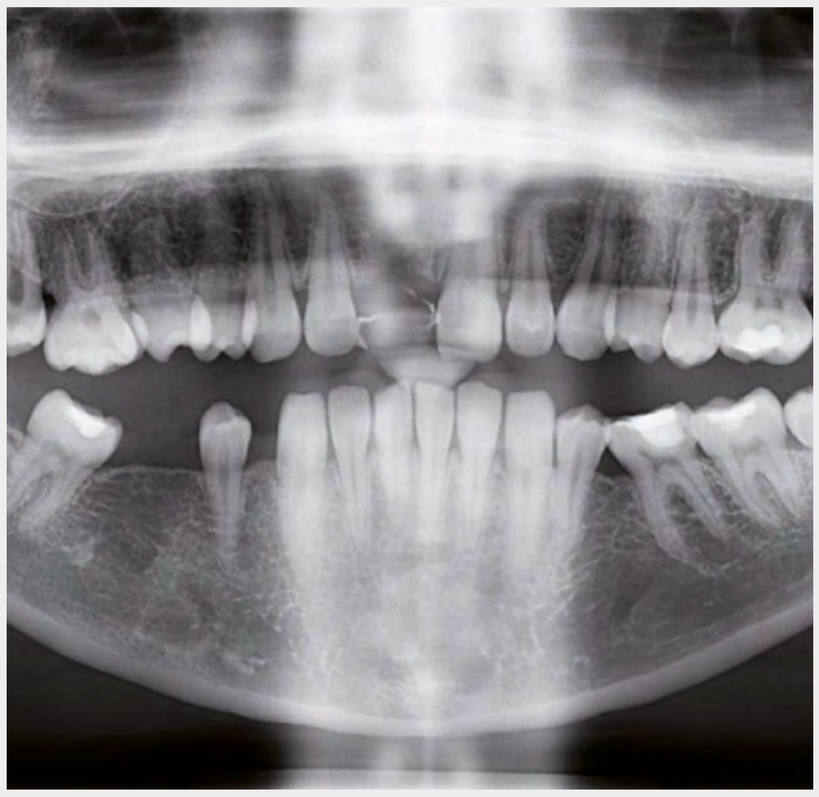
Profile
M.V., Female, 25 years old, Naples, Italy

Clinical Situation
Traumatic avulsion of tooth 11 due to a road-traffic accident which also let to the 21 incisal edge fracture. Tooth 11 was not found. An implant-supported prosthetic restoration was chosen. The patient presented to our dental practice the day after the accident demanding an immediate solution which obliged us to operate her within a few hours

Restorative Solution
Implant placement in support to an immediate zirconia/ceramic provisional crown, considering the esthetic needs of the patient and the short time available to produce it in laboratory.

Surgical products
CM Drive Acqua (4.3 × 11.5 mm)

Prosthetic products
CM Titanium Base Abutment



Initial situation

N/A **Tooth Extraction**

06/2016 **Implant Placement**

06/2016 **Provisional Restoration**

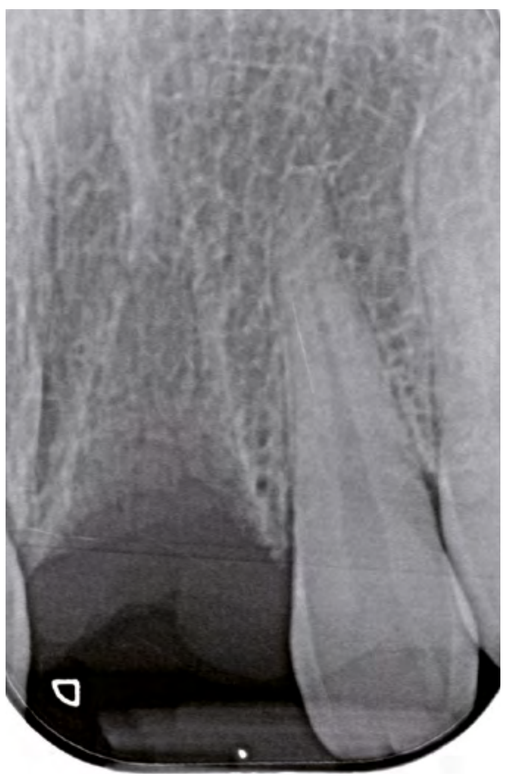
10/2016 **Final Restoration**

Dr. Angelo Marangini Italy

Graduated in dentistry, University of Naples Federico II in 1988; Contributor to the evolution of the cone metric connection in the Mac System in 1999; Specialized with Lode in Laser Therapy, University of Genova in 2005; Tutor at the Institute of Anatomy of Liège in 2010; Lecturer of bone grafting techniques in 2014 ~ 2016

1. Pre-operative extra oral frontal view

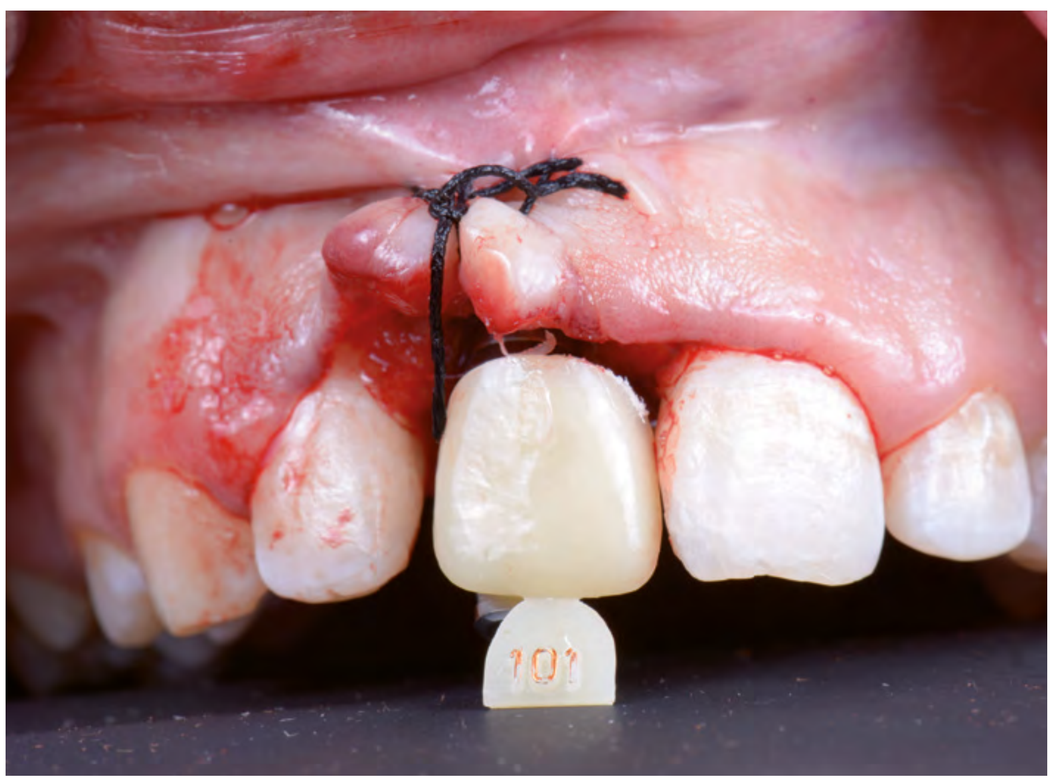
2. Pre-operative intra oral frontal view



3. Pre-operative X-ray

4. Post-operative X-ray

5. Abutment coping in place



6. Immediate provisional restoration in place

7. Immediate provisional crown on to the abutment coping – occlusal view

8. To improve the appearance of the provisional, super-colors and transparent paints were used directly at the chairside

9. Screw-retained provisional crown in position. Palatal suturing technique was performed to avoid visible suturing knots in the buccal side

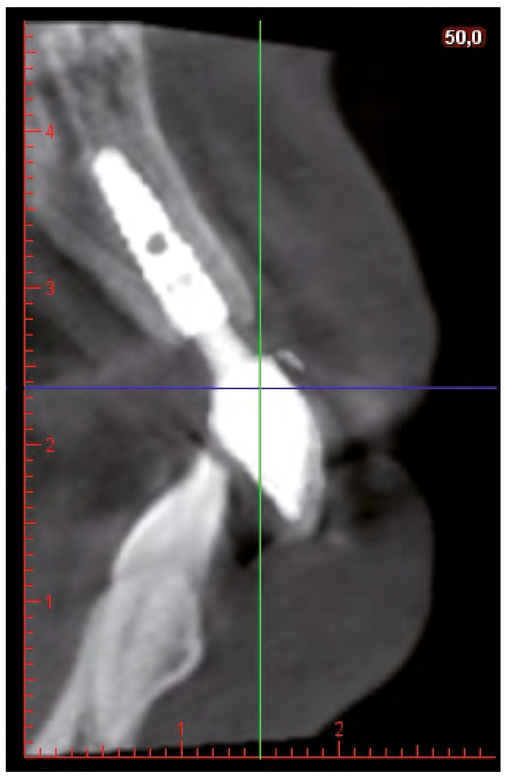
10. Immediate post-operative extra oral frontal view

11. Good soft-tissue healing one month after surgery

12. Zirconia coping on CM titanium base abutment

13. Crown seating

14. Final restoration 4 months after surgery



15. 1-year follow-up X-ray

16. 1-year follow up extra oral frontal view

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	1 Implant	Conventional
Restorative Solution	CAD/CAM	Zirconia ceramic crown

CM Drive Acqua

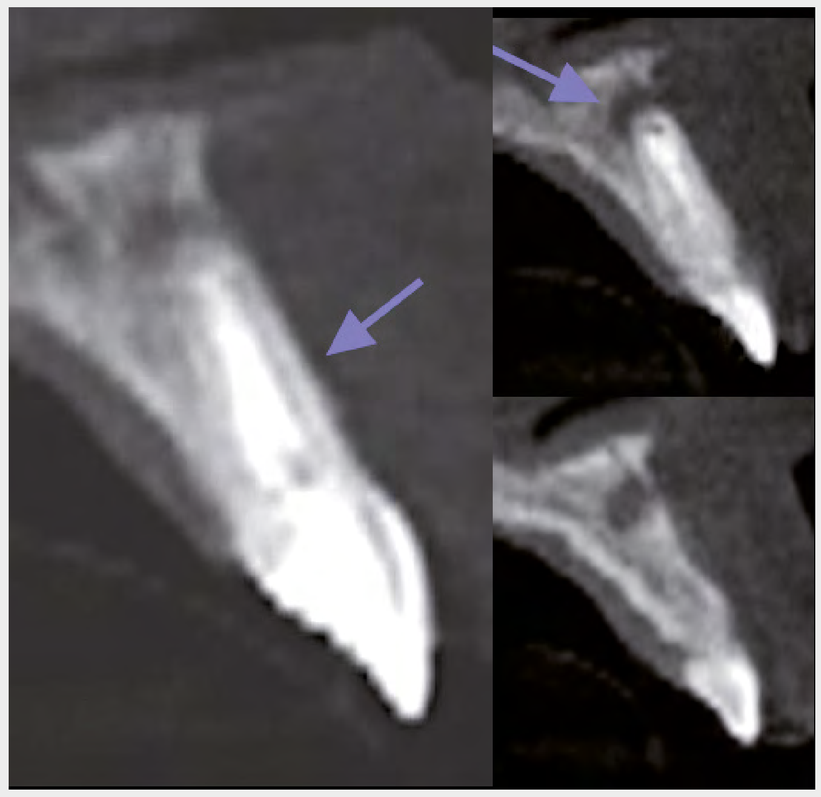
Profile
S.M., Female, 27 years old, Rio de Janeiro, Brazil

Clinical Situation
Fractured right central incisor with a critical buccal bone defect

Restorative Solution
Extraction, followed by immediate implant placement, immediate loading, provisional crown on universal abutment with “one-abutment-one-time” concept, finalized with a ceramic crown.

Surgical products
CM Drive Acqua (3.5 × 16 mm)

Prosthetic products
CM Universal Abutment Exact (3.3 × 6 × 2.5 mm)



Initial situation

09/2015 **Tooth Extraction**

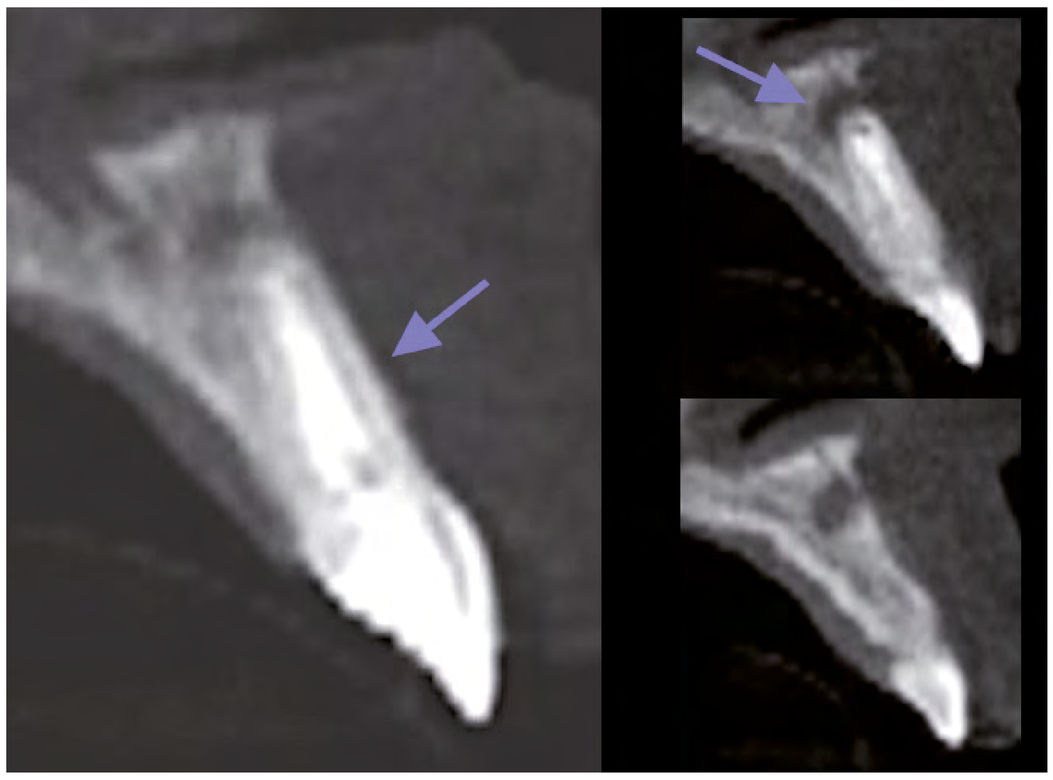
09/2015 **Implant Placement**

09/2015 **Provisional Restoration**

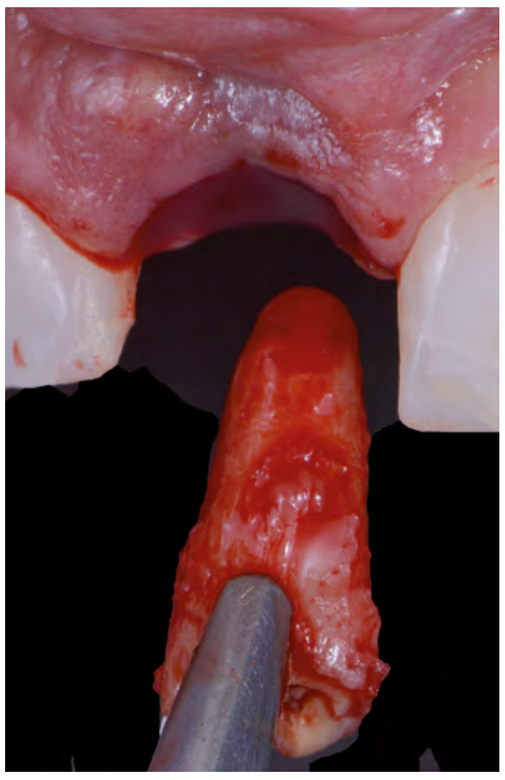
05/2016 **Final Restoration**

Dr. Marcos Motta Rio de Janeiro, Brasil
Periodontics/ Aesthetics & Prosthodontics

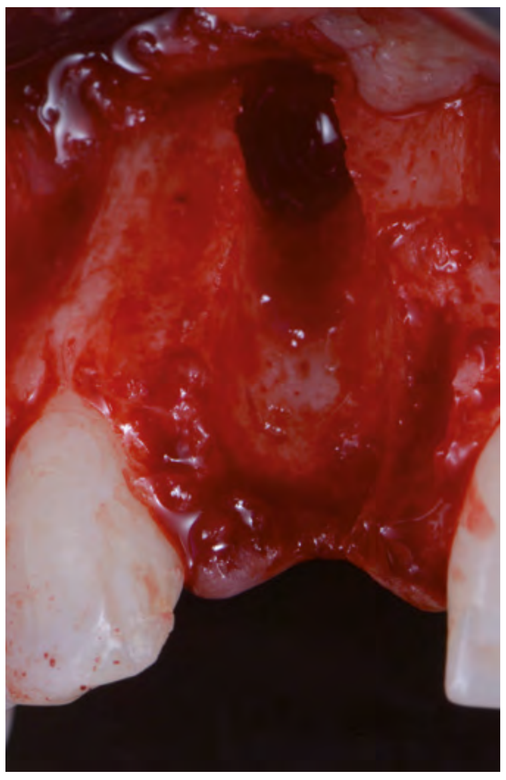
1. Pre-operative intraoral frontal view



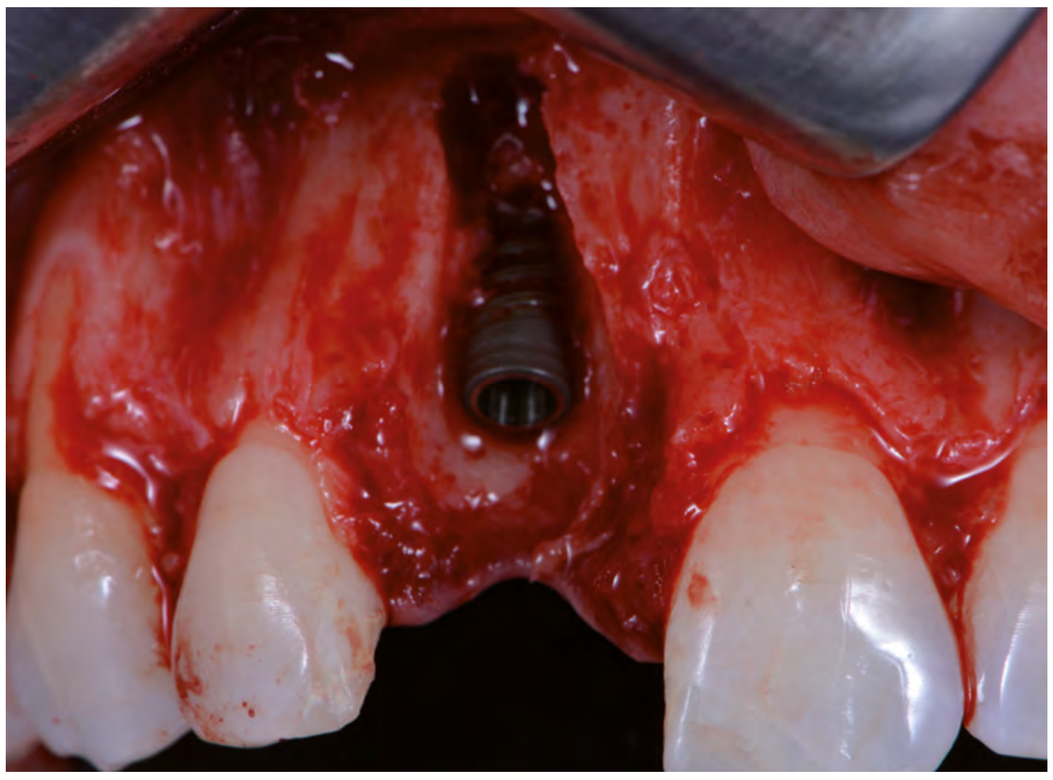
2. Pre-operative CBCT



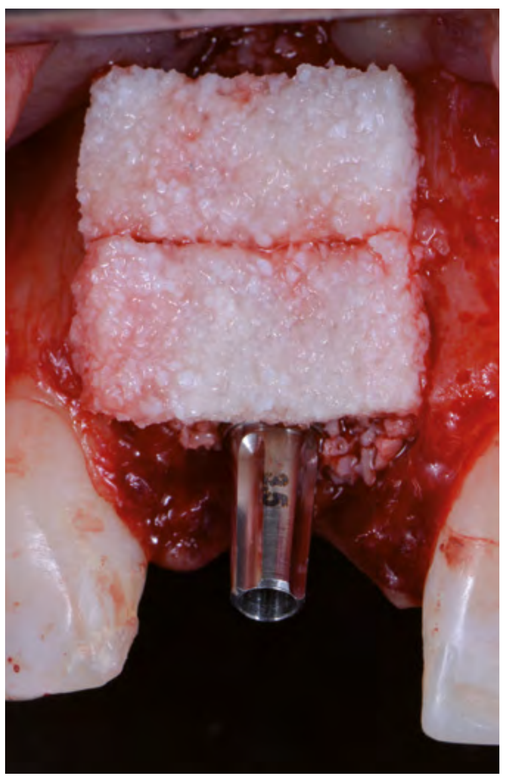
3. Tooth extraction



4. Bone defect

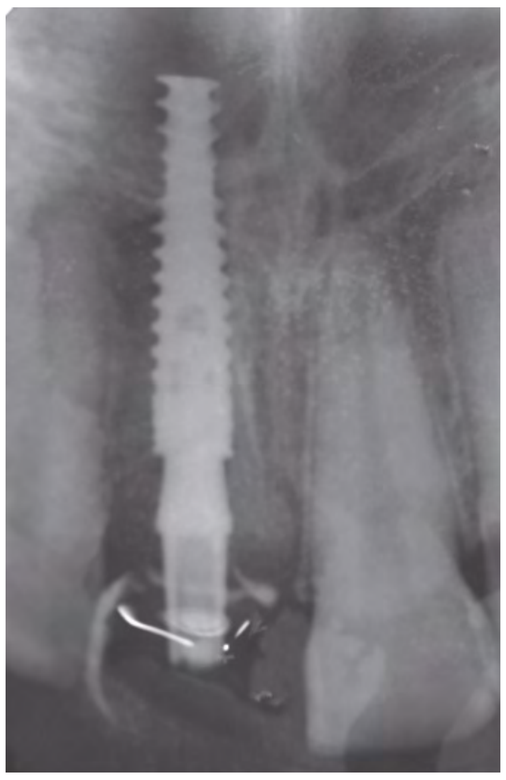


5. Implant in place

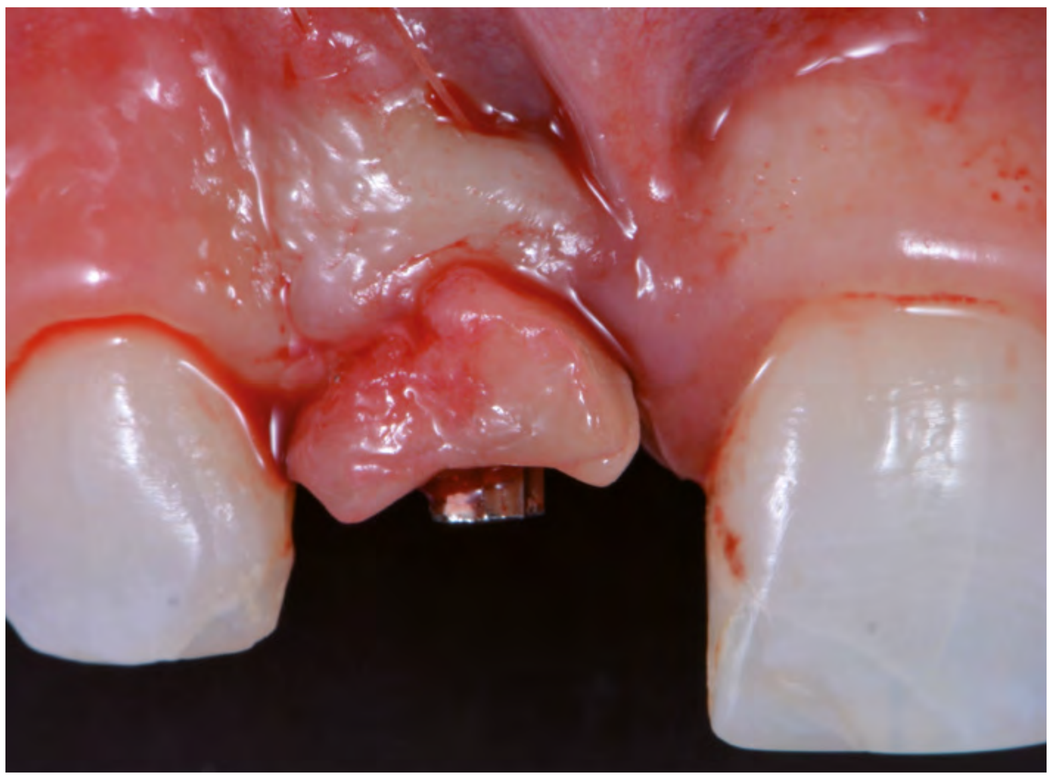


6. Abutment in place Guided bone regeneration: Bovine + Collagen Graft

7. Provisional restoration in place 2 weeks after surgery

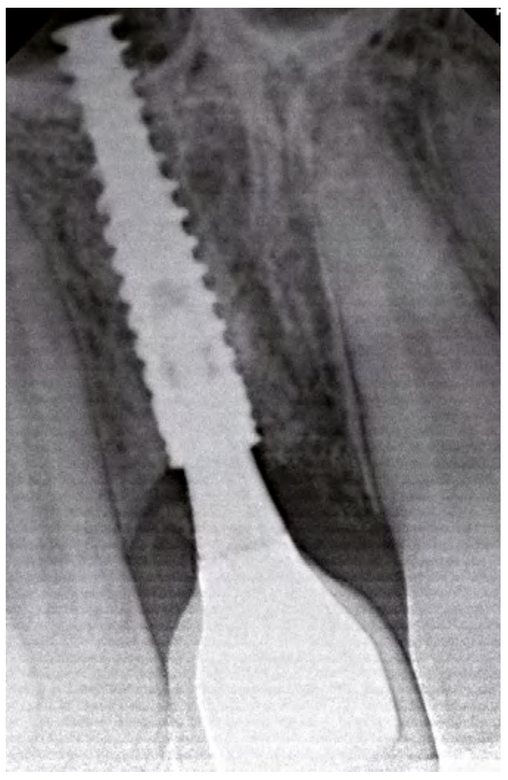


8. Post provisional restoration X-ray



9. Connective tissue grafting 4 months after implant placement

10. Final Restoration



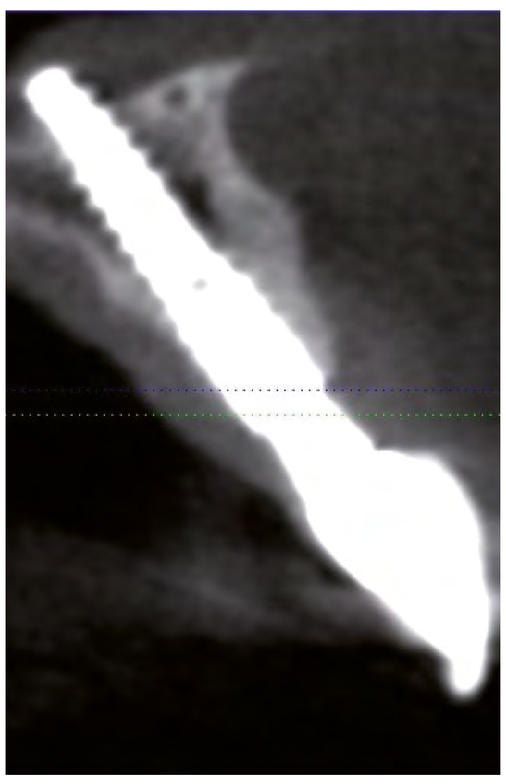
11. Final restoration X-ray

12. 6-month follow up

13. 1-year follow up – intraoral frontal view

14. 1-year follow up – occlusal view

15. 1-year follow up – extra oral frontal view



16. 13-month follow-up CBCT

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	1 Implant	Conventional
Restorative Solution	Conventional	Ceramic crown

CM Alvim NeoPoros

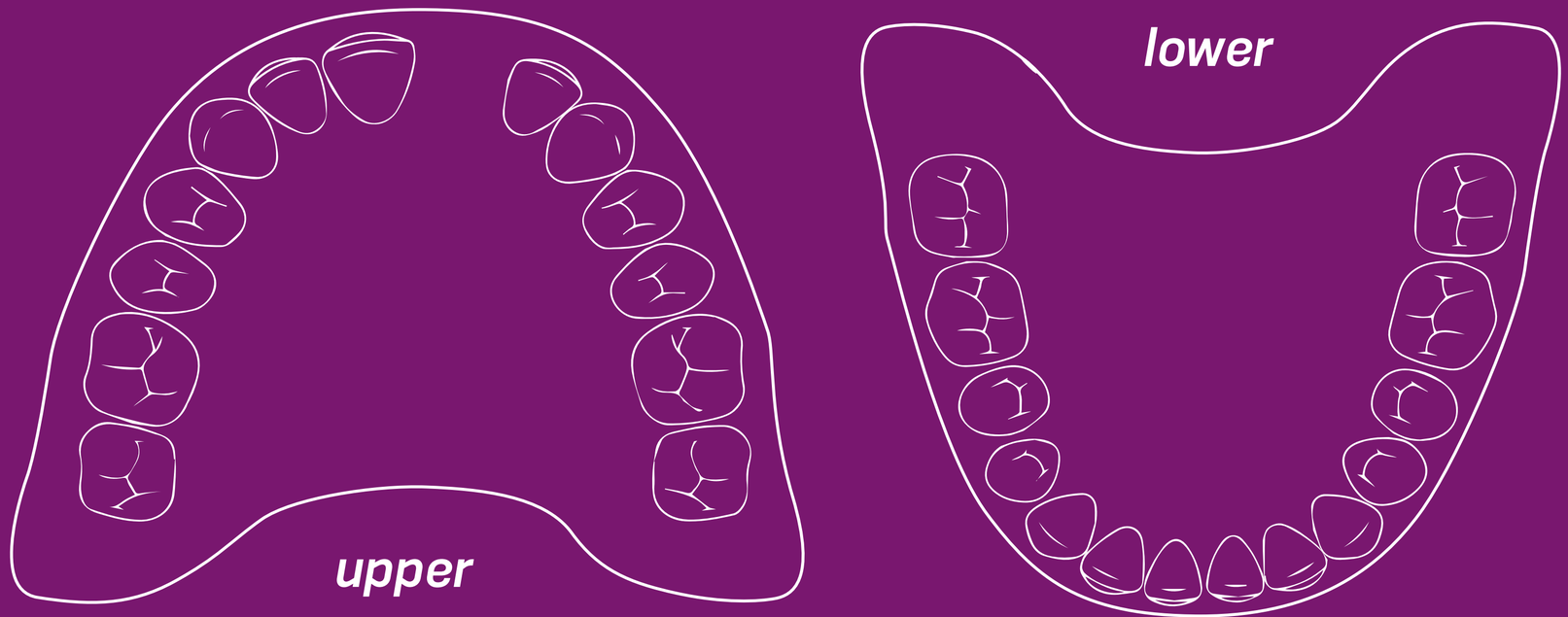
Profile
M. F., Female, 62 years old, Albufeira, Portugal

Clinical Situation
Left central incisor with a fractured root

Restorative Solution
Extraction, followed by immediate implant placement, bone grafting, immediate loading, provisional crown on a universal abutment with “one-abutment-one-time” concept, finalized with a ceramic crown

Surgical products
CM Alvim NeoPoros (3.5 × 16 mm)

Prosthetic products
CM Universal Abutment (4.5 × 4 × 5.5 mm)



Initial situation

11/2010 **Tooth Extraction**

11/2010 **Implant Placement**

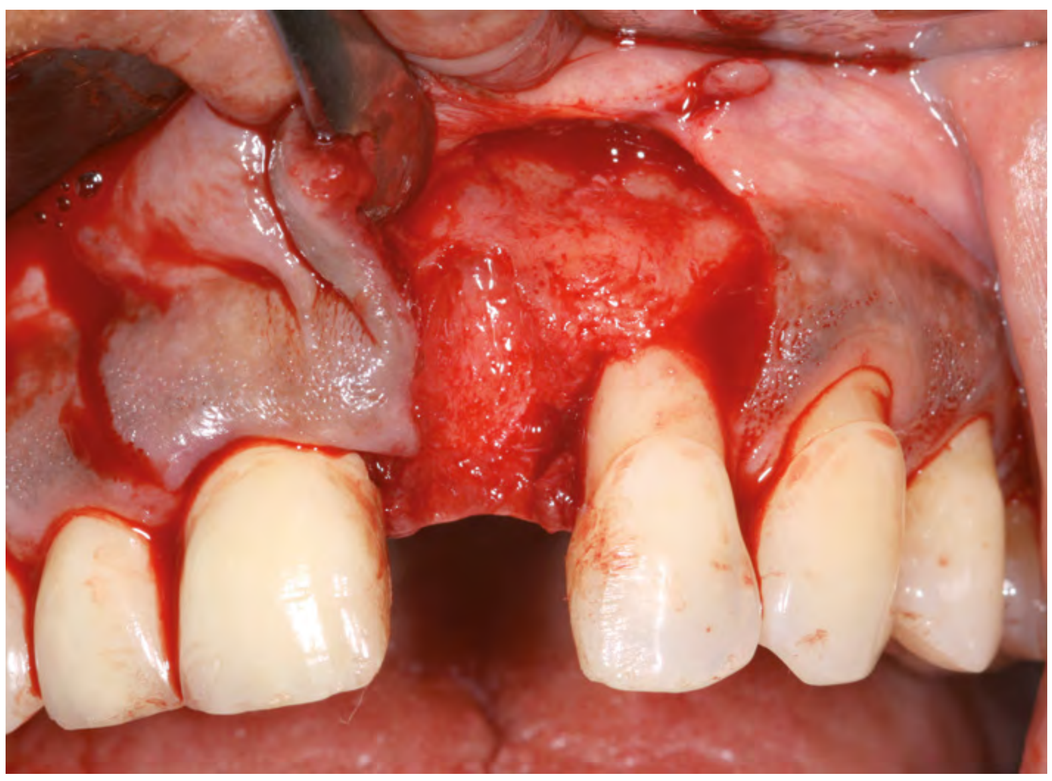
11/2010 **Provisional Restoration**

06/2017 **Final Restoration**

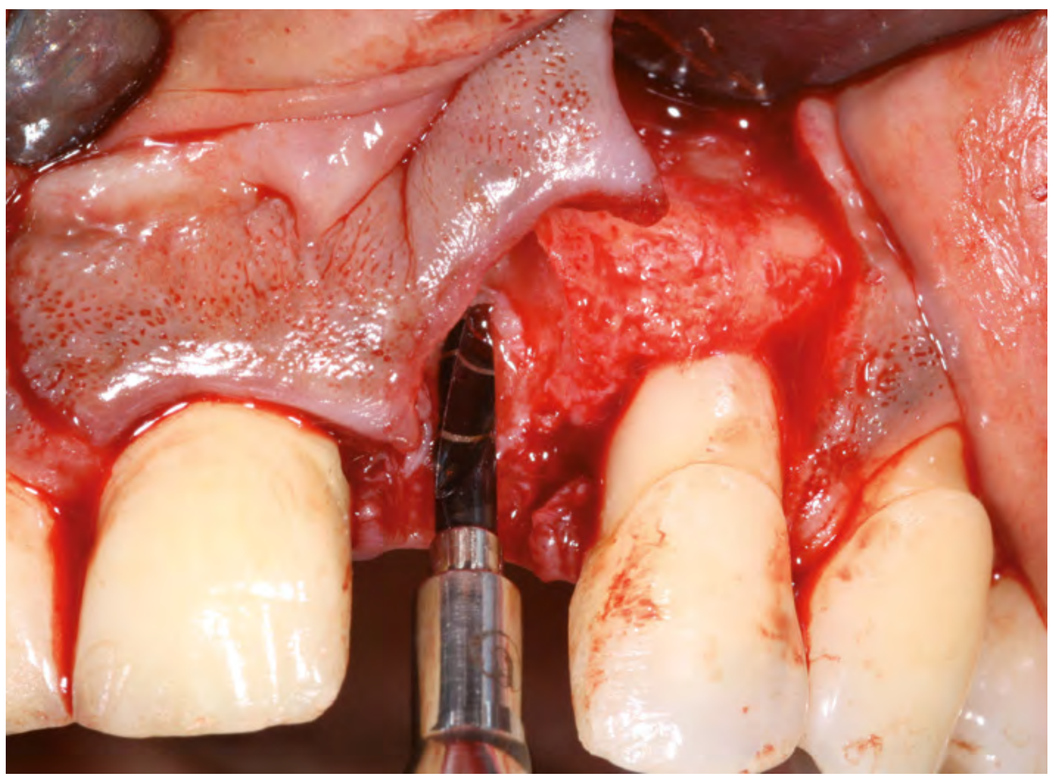
Dr. Sérgio Pereira Albufeira, Portugal
Oral Surgeon
Aesthetics & Prosthodontics

1. Pre-operative X-ray

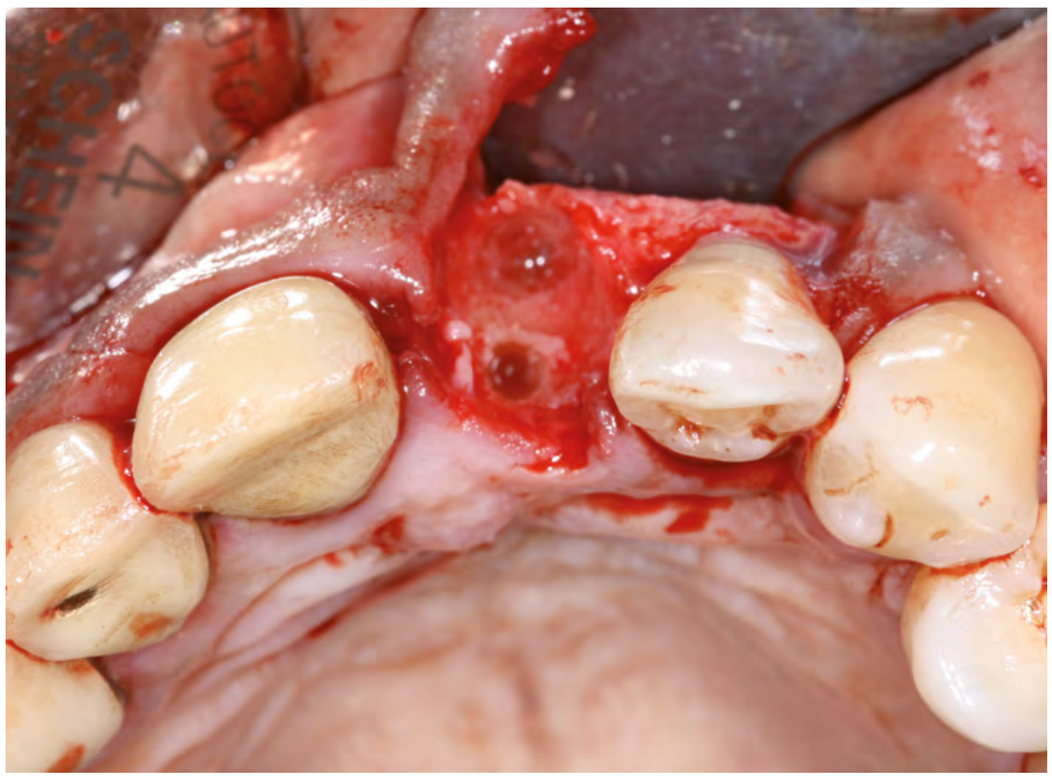
2. Tooth extraction



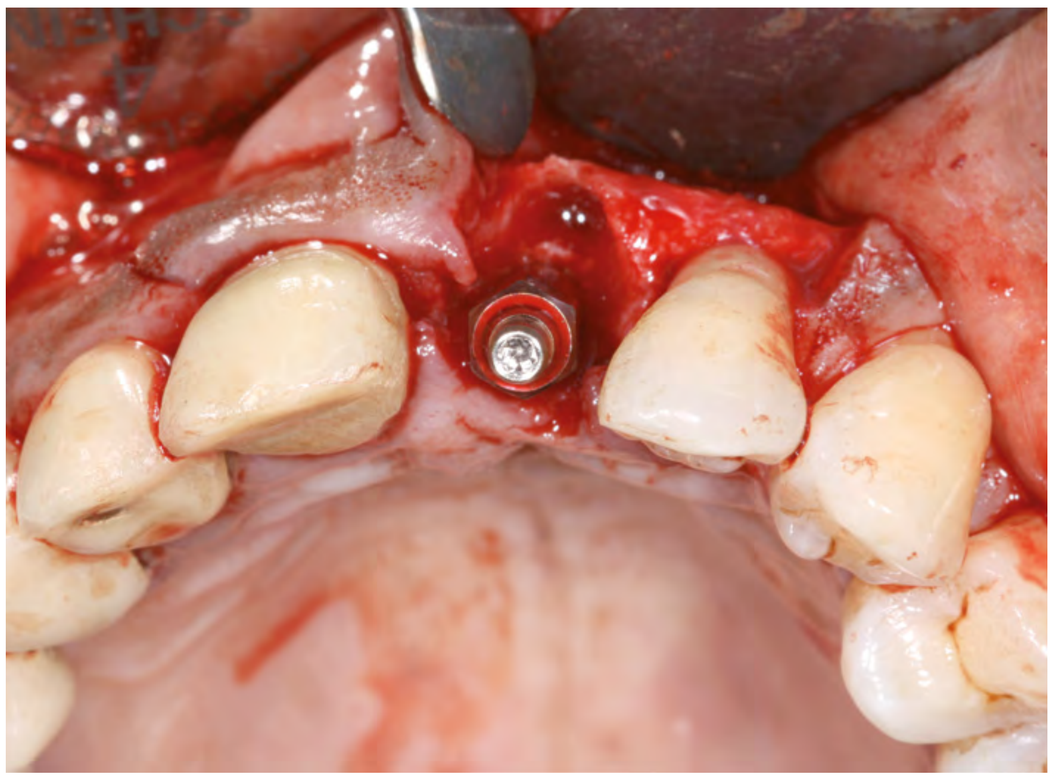
3. Flap procedure



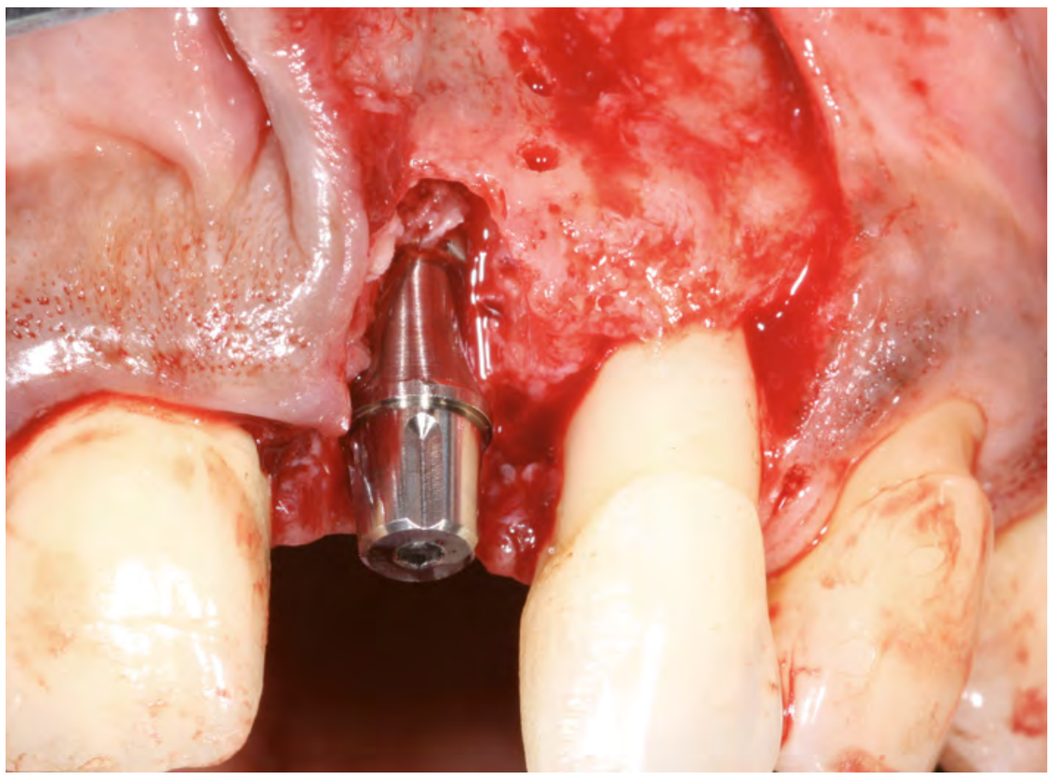
4. Implant bed preparation



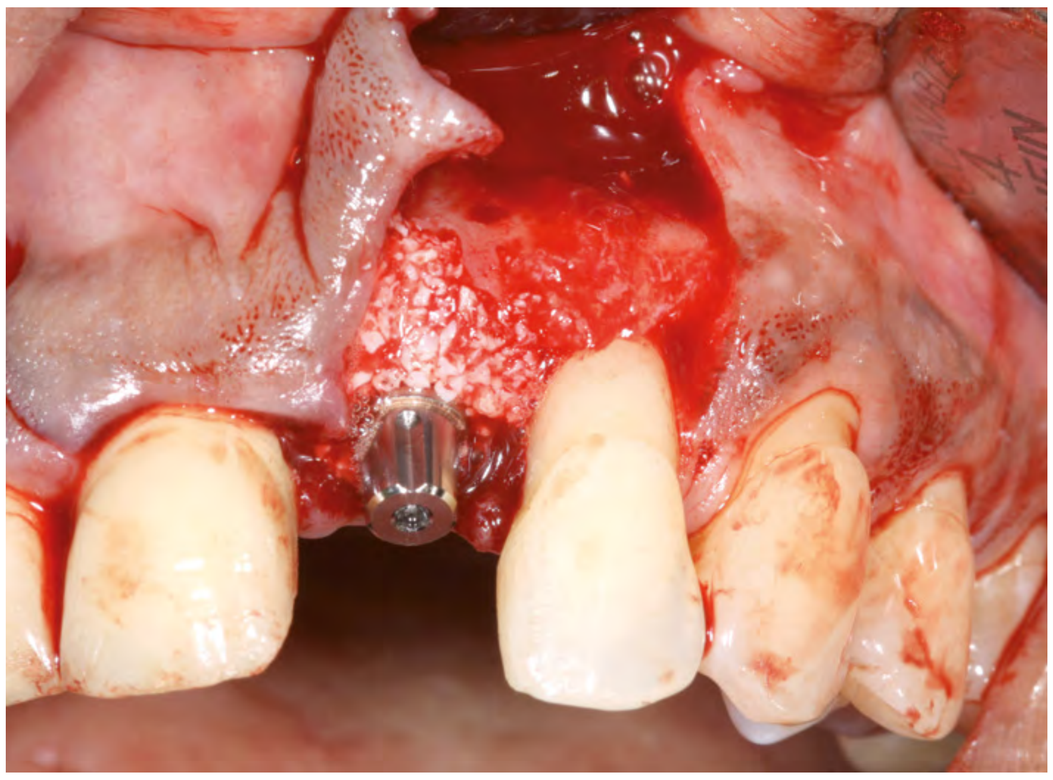
5. Extraction site plus initial implant bed preparation



6. Implant and abutment in place

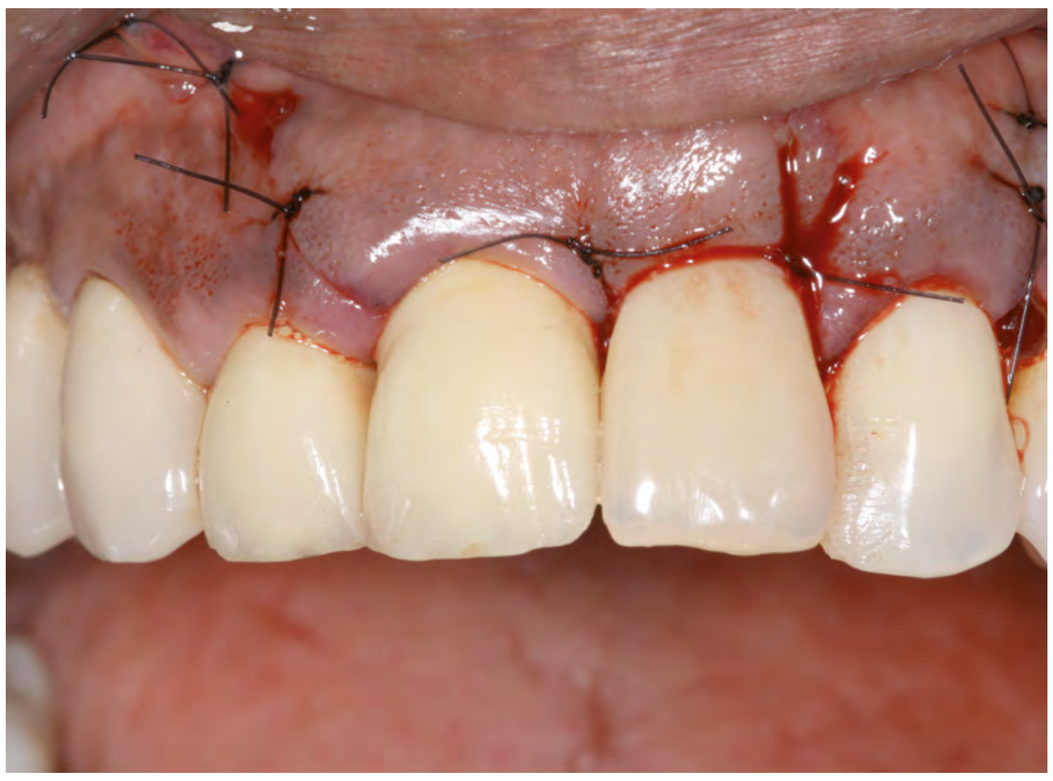


7. Full flap for bone grafting

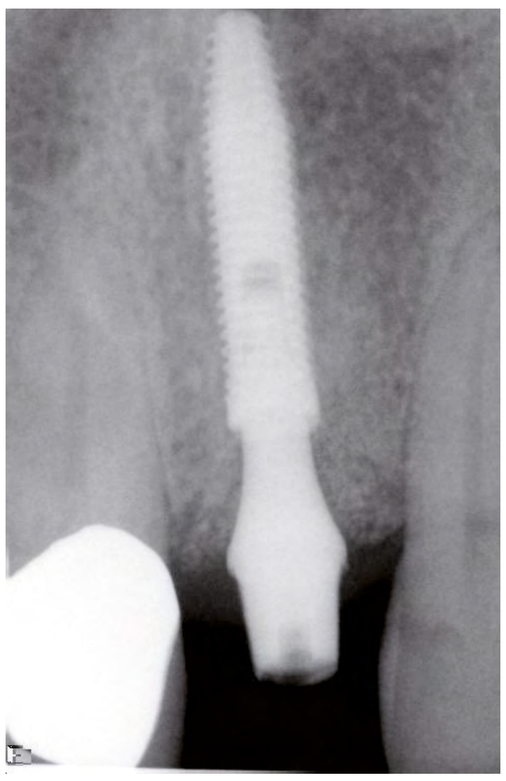


8. Bone grafting covering the implant and the abutment neck

9. Sutures and universal abutment impression coping in place



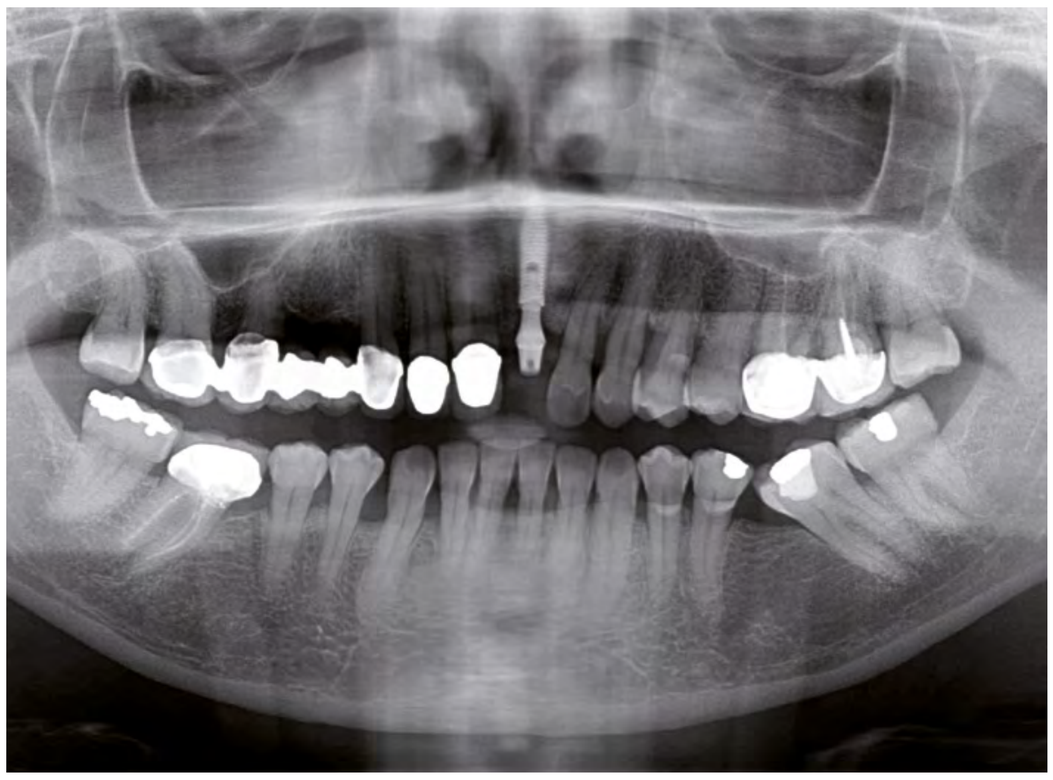
10. Immediate provisional restoration in place



11. Post-operative X-ray

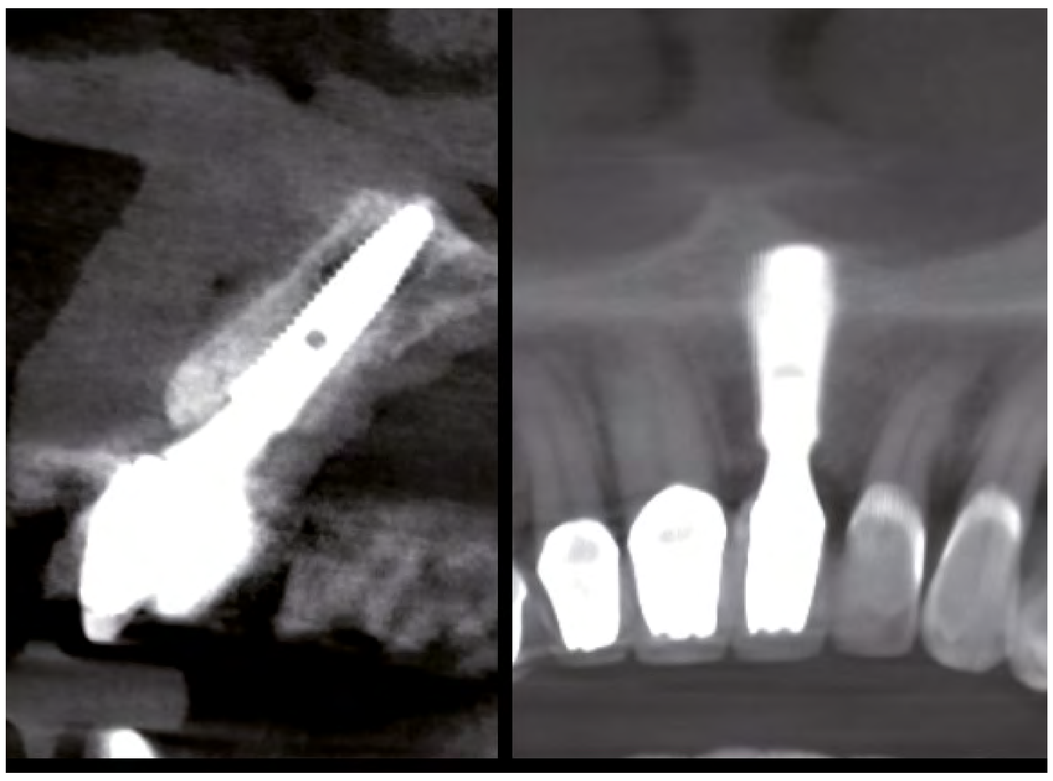
12. 6-month follow up – intraoral frontal view

13. 1-year follow-up X-ray



14. 5-year follow up X-ray

15. Final restauration 6 years and 7 months after surgery



16. 7-years follow-up CBCT

Clinical case

CM Alvim NeoPoros

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	1 Implant	Conventional
Restorative Solution	CAD/CAM	Zirconia ceramic crown

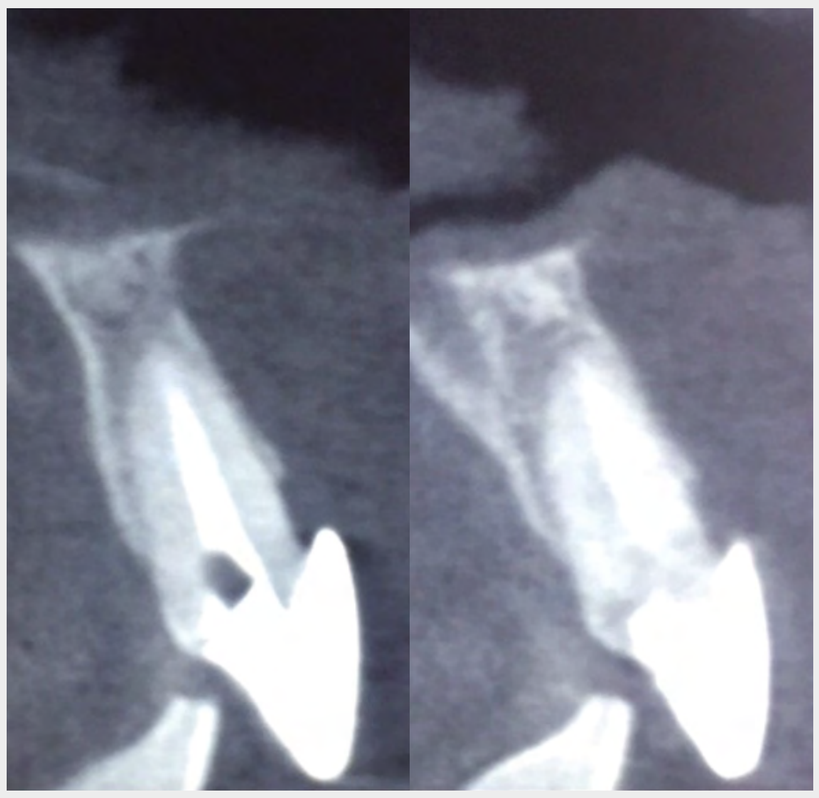
Profile
C.S., Female, 44 years old, Recife, Brazil

Clinical Situation
Root resorption in tooth 21

Restorative Solution
Extraction, followed by immediate implant placement, immediateloading, a provisional crown on a universal abutment, and finalized with a titanium base abutment and a zirconia ceramic crown.

Surgical products
CM Alvim NeoPoros (3.5 × 13 mm)

Prosthetic products
CM Titanium Base (3.5 × 4 × 1.5)
Titanium base with zirconia



Initial situation

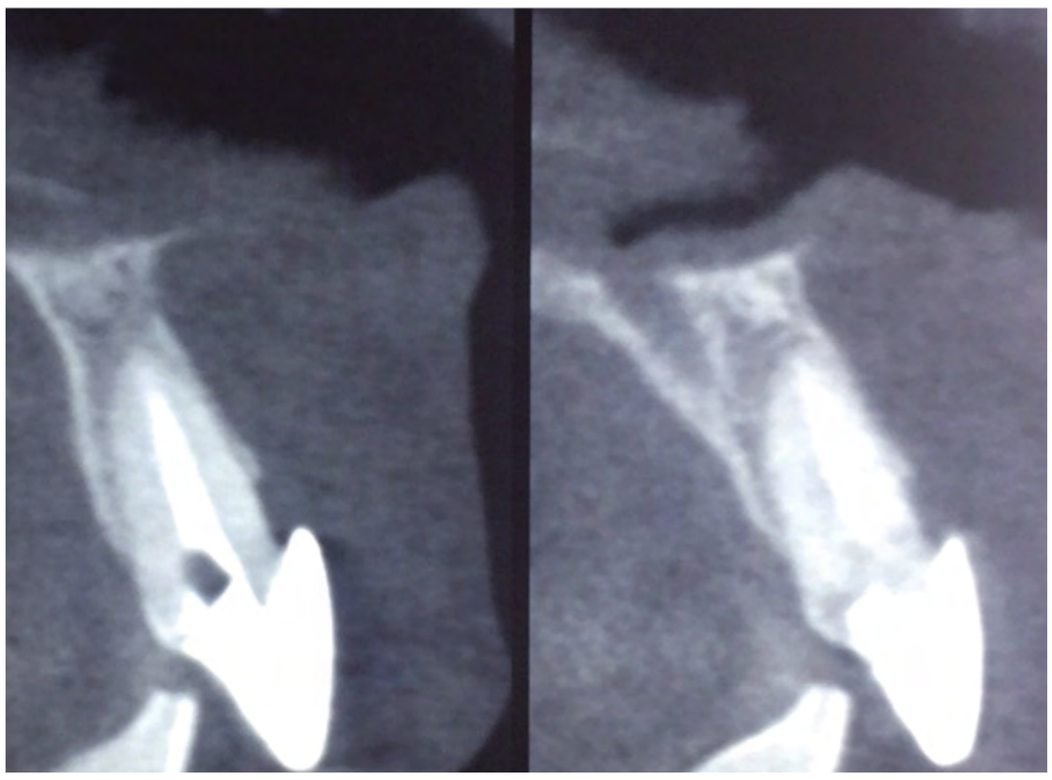
04/2016 **Tooth Extraction**

04/2016 **Implant Placement**

04/2016 **Provisional Restoration**

01/2017 **Final Restoration**

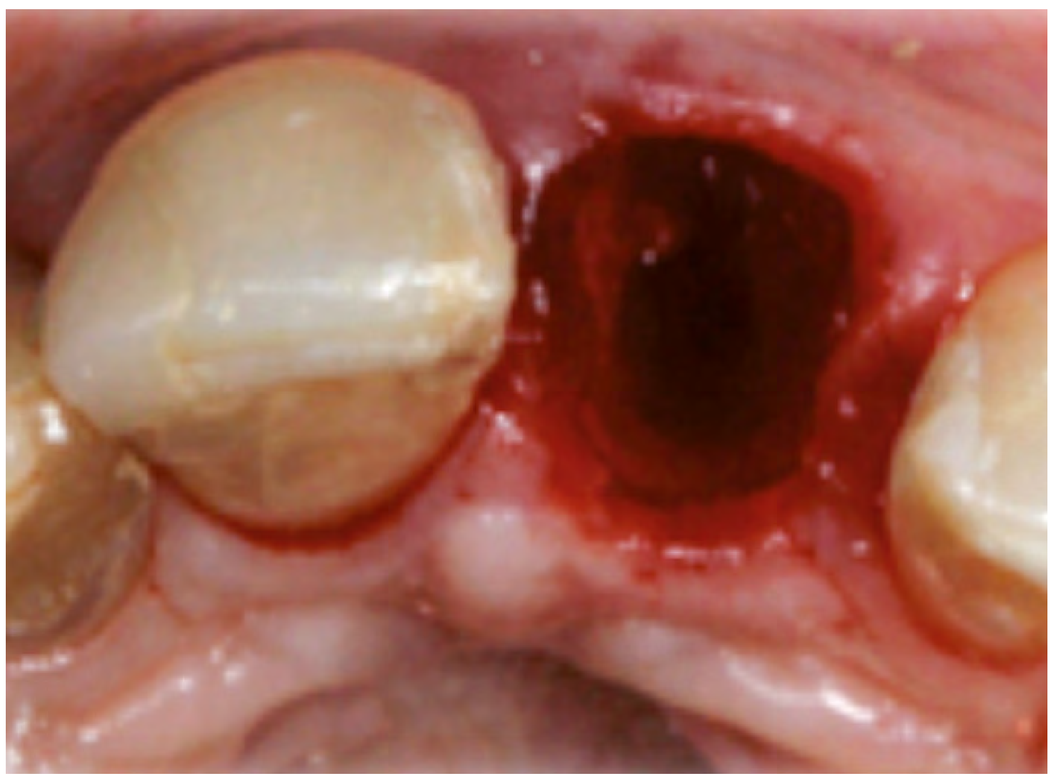
Dr. Rafael Siqueira Recife, Brazil
Dr. Reinaldo Siqueira Recife, Brazil
Dr. Miguel Braga Pinto Porto, Portugal
Dr. Paulo Santos Recife, Brazil
Dr. Bruno Cabral Recife, Brazil
Mr. Junior Lima Recife, Brazil



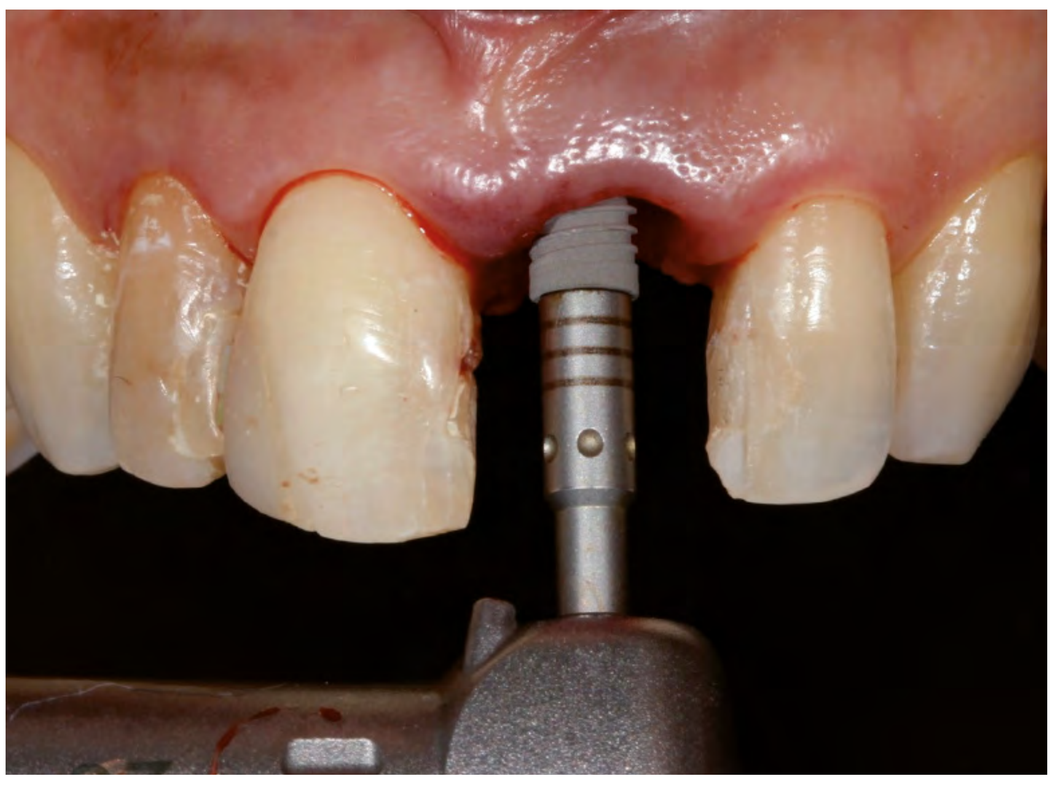
1. Pre-operative CBCT

2. Pre-operative intraoral frontal view

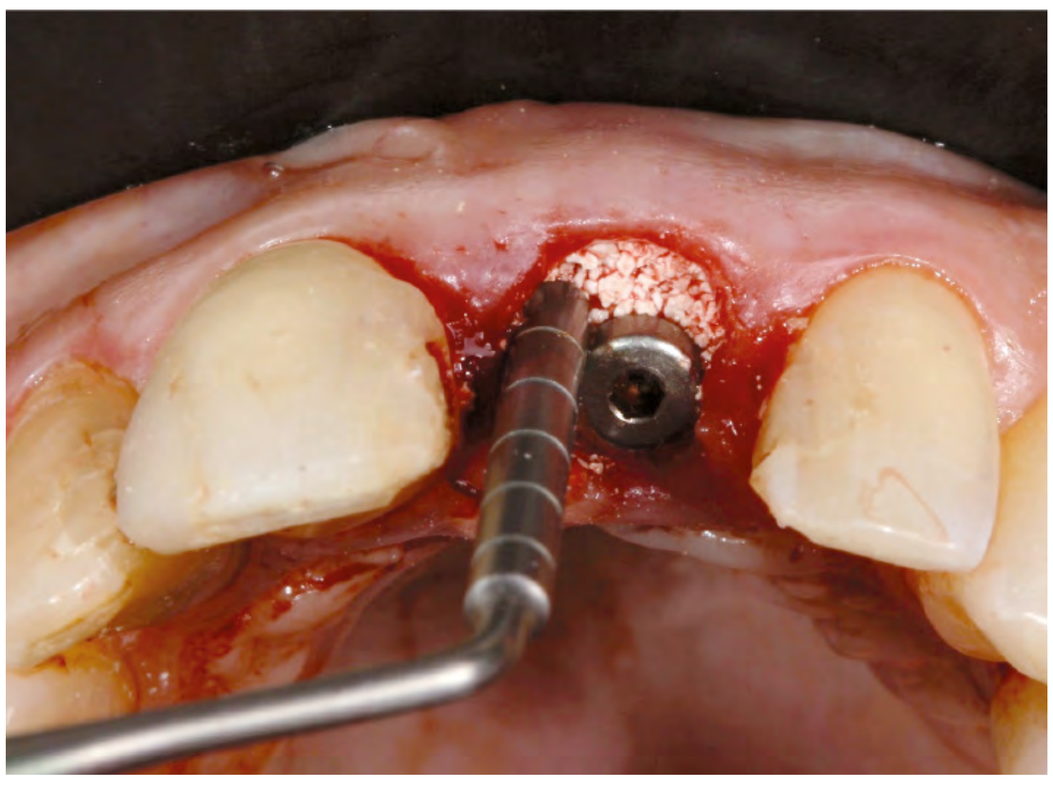
3. Extraction site – frontal view



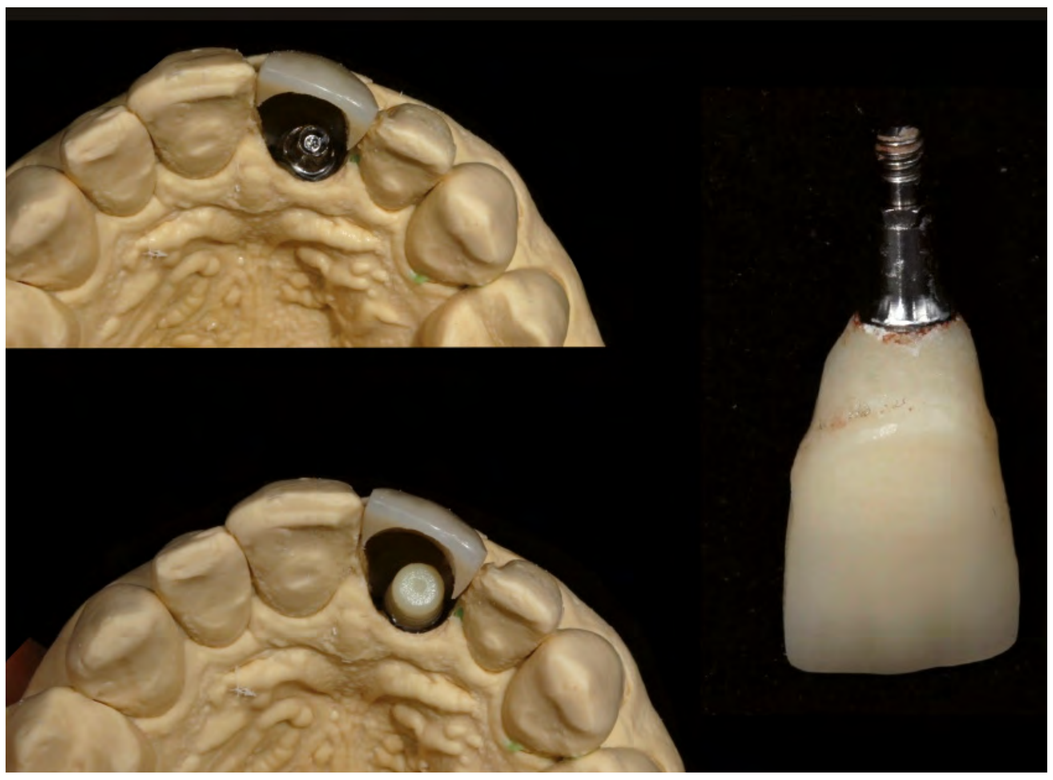
4. Extraction site – occlusal view



5. Implant placement



6. Gap management – Xenograft



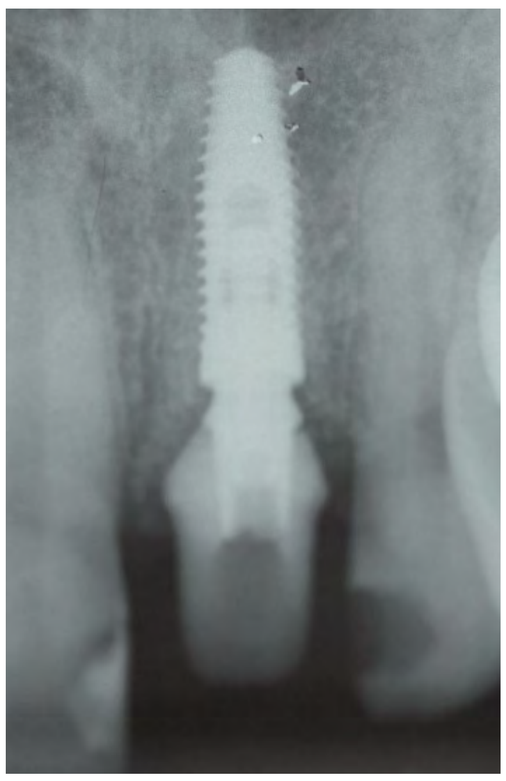
7. Provisional Restoration Procedure (Doorenet al., 2016)

8. Immediate provisional restorationin place

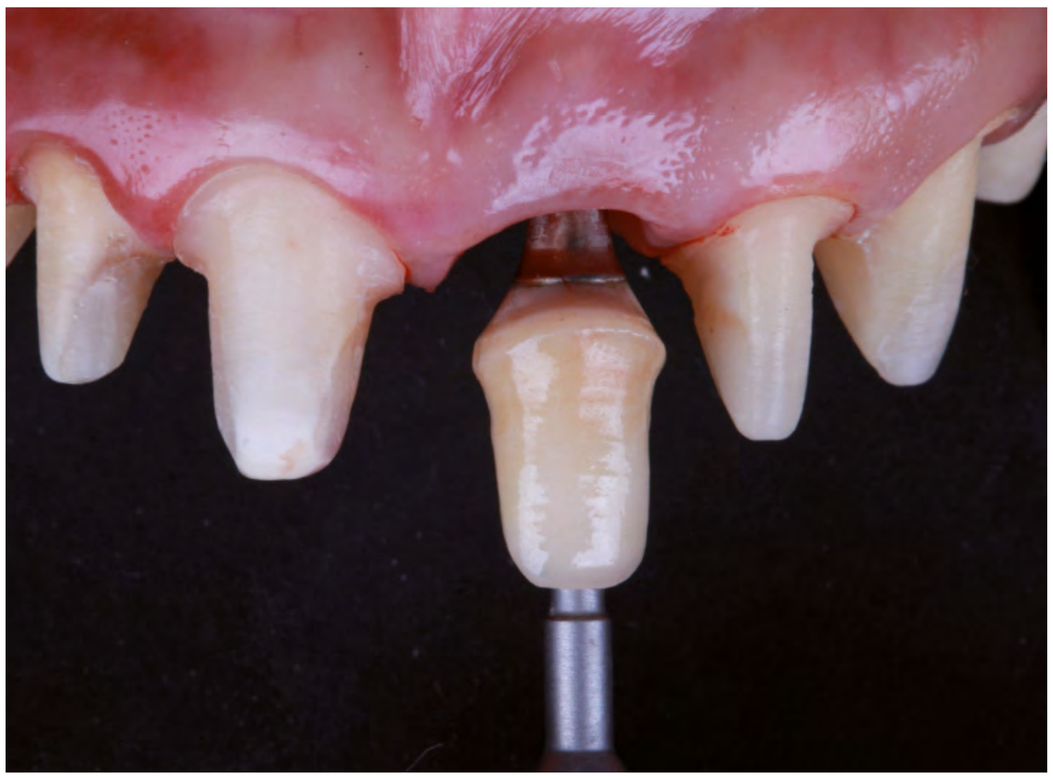
9. Provisional restoration 5-month follow up – intraoral frontal view

10. Stable soft tissue contour 5 months after surgery

11. Try in customized abutment intraorally



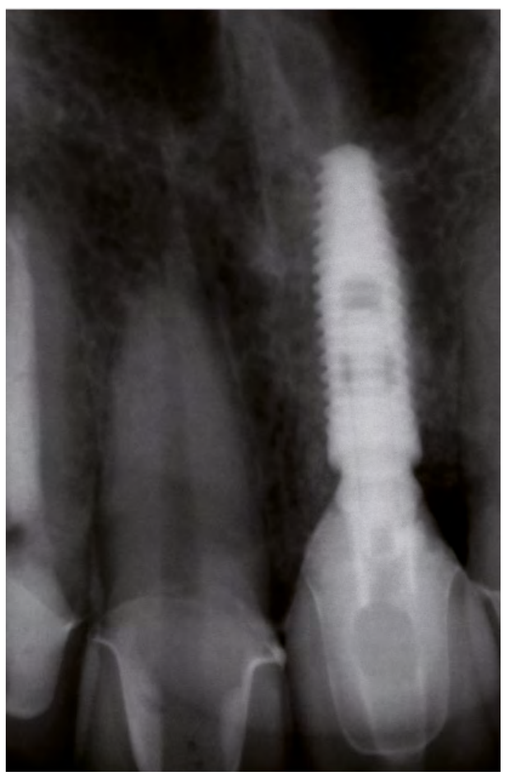
12. Try in customized abutment X-ray



13. Adjacent teeth preparation for upper-arch cosmetic treatment (color – A3)

14. Final restorations – After cementation

15. Final restoration close-up view



16. 1-year follow-up X-ray

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	1 Implant	Conventional
Restorative Solution	Conventional	Ceramic restoration

CM Alvim NeoPoros

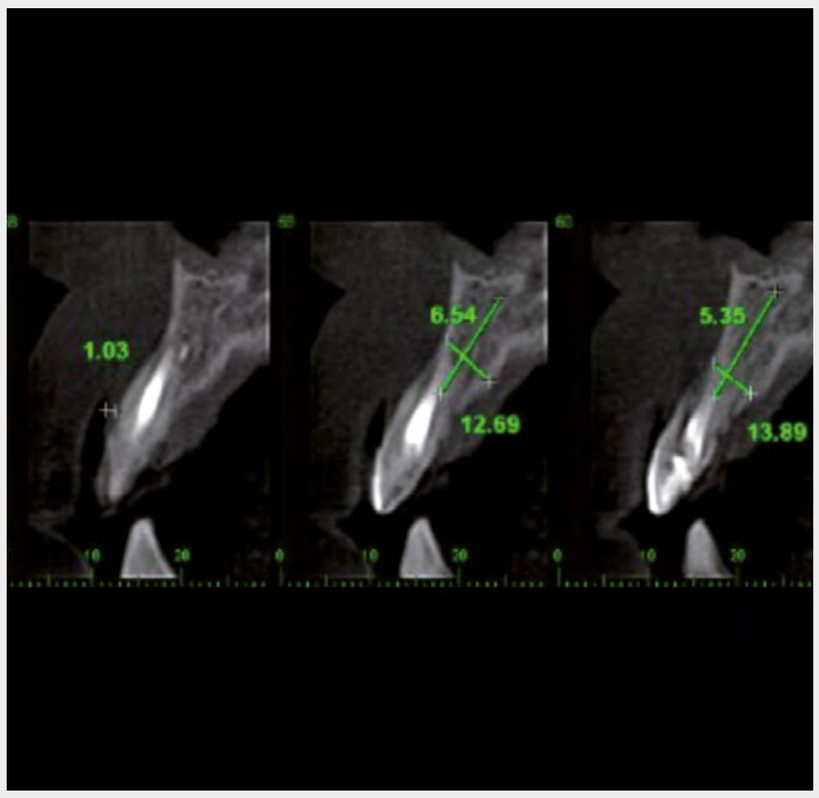
Profile
J.R.T., Male, 24 years old, Recife, Brazil

Clinical Situation
Root perforation in tooth 12

Restorative Solution
Extraction, followed by immediate implant placement, immediate loading, a provisional crown on a universal abutment with “one-abutment-one-time” concept, finalized with a ceramic crown.

Surgical products
CM Alvim NeoPoros (3.5 × 13 mm)

Prosthetic products
CM Universal Abutment (3.3 × 6 × 3.5 mm)



Initial situation

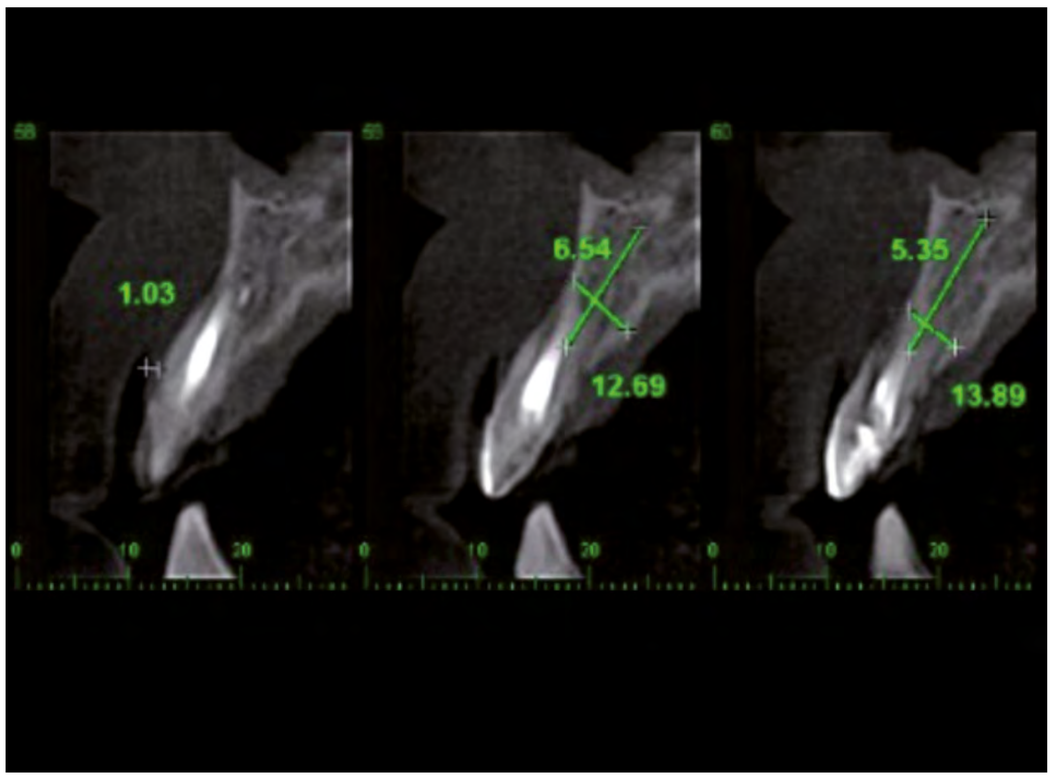
03/2016 **Tooth Extraction**

03/2016 **Implant Placement**

03/2016 **Provisional Restoration**

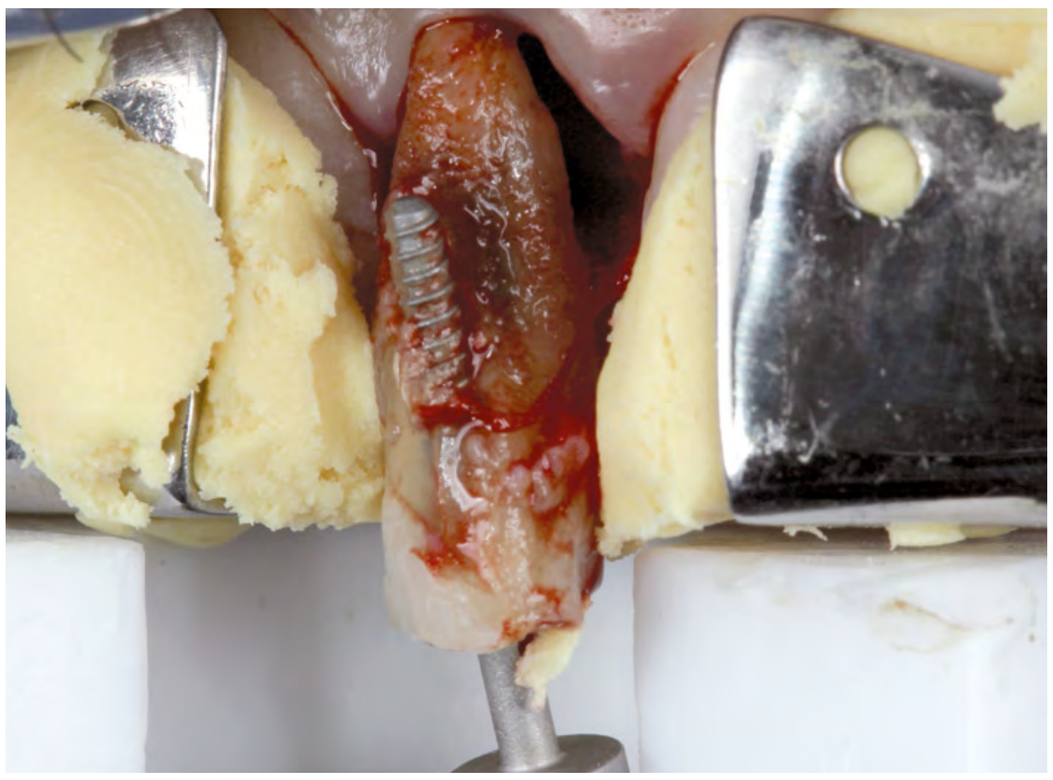
07/2016 **Final Restoration**

Dr. Rafael Siqueira Recife, Brazil
Dr. Reinaldo Siqueira Recife, Brazil
Dr. Miguel Braga Pinto Porto, Portugal
Dr. Paulo Santos Recife, Brazil
Dr. Bruno Cabral Recife, Brazil
Dr. Ricardo Pedrosa Recife, Brazil

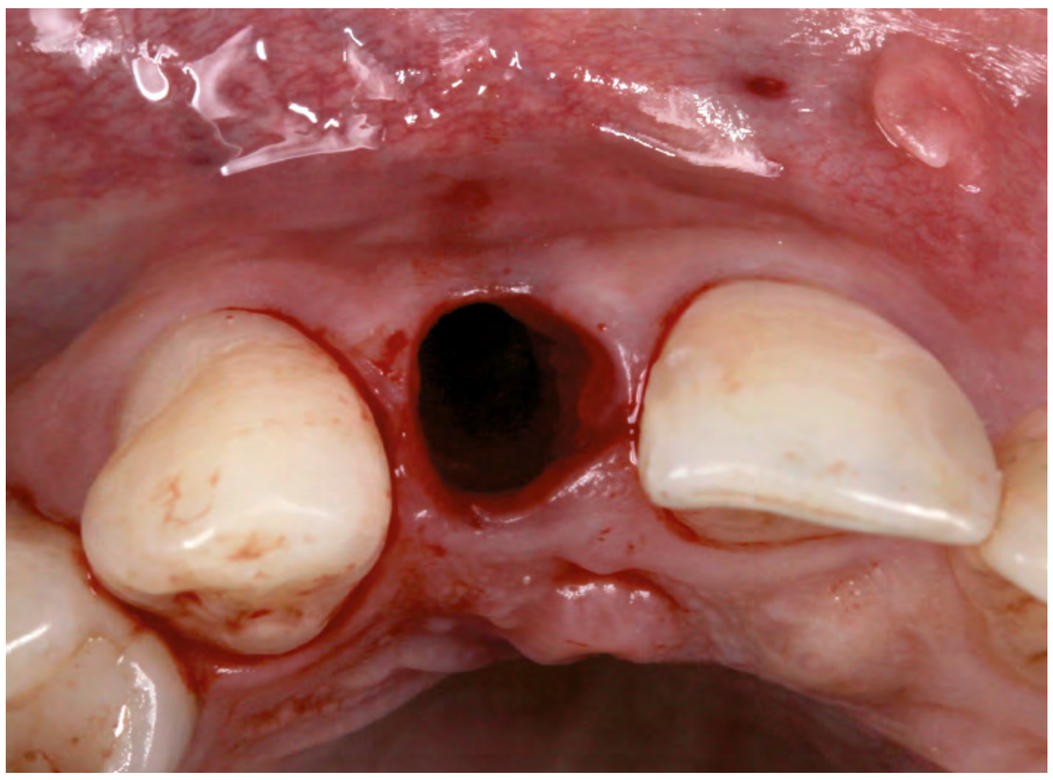


1. Pre-operative CBCT

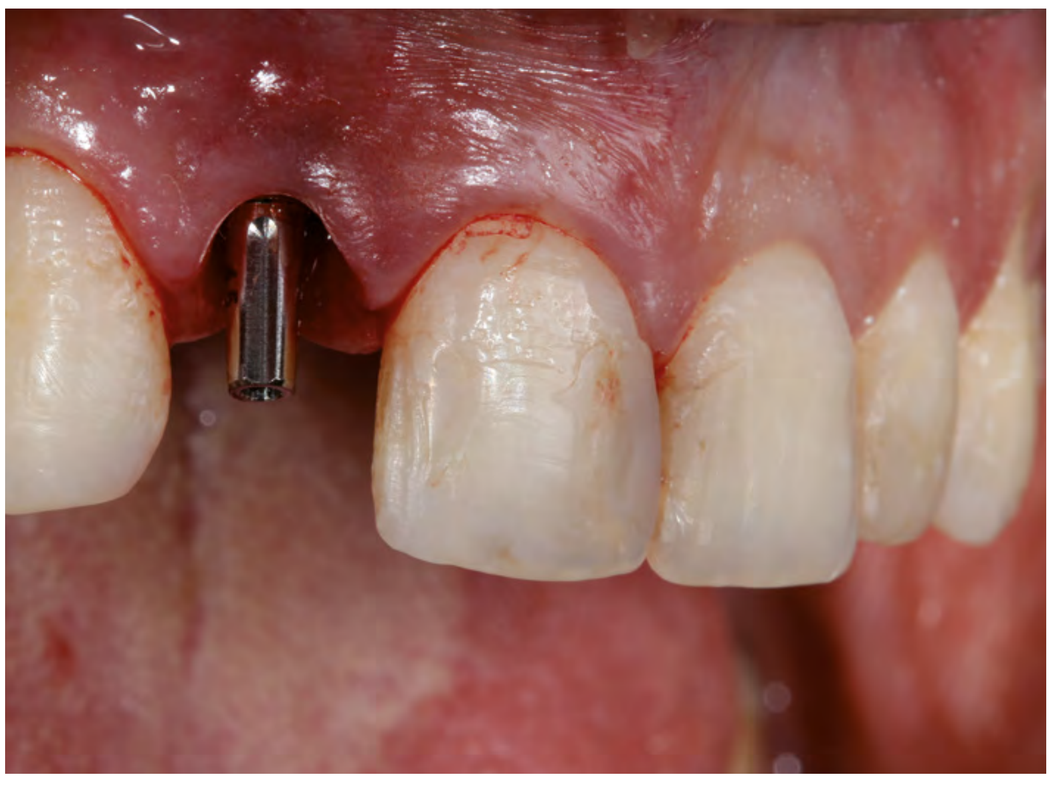
2. Pre-operative intraoral labial view



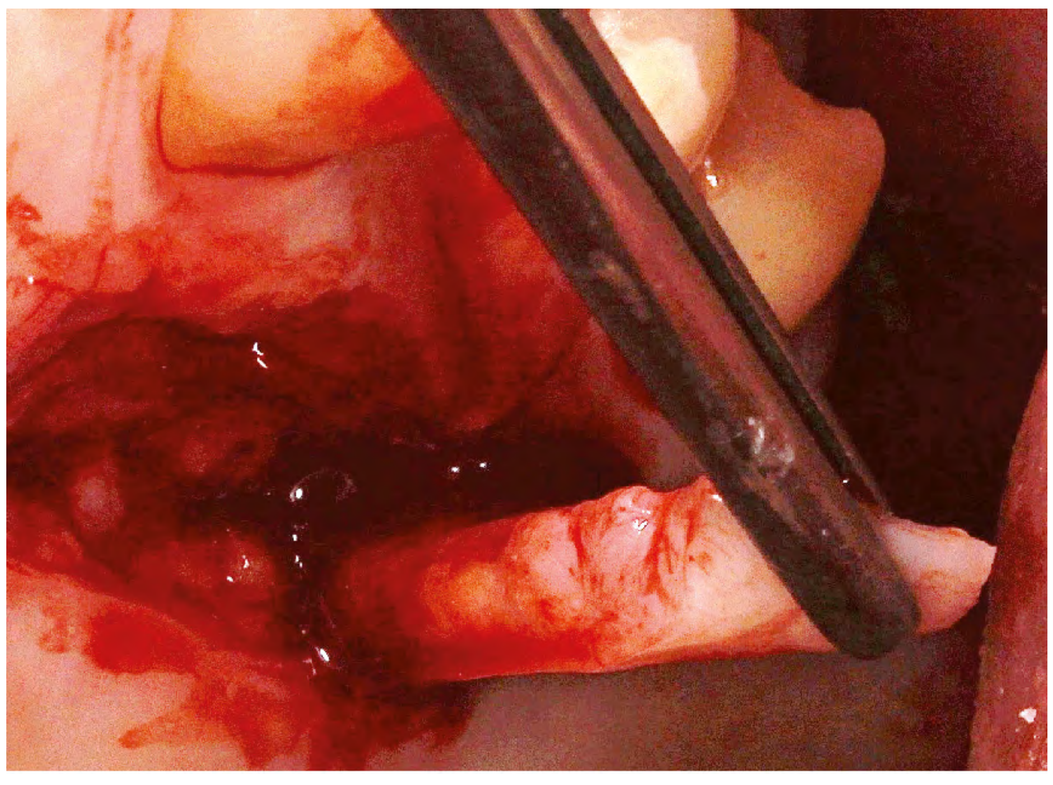
3. Minimally invasive tooth extraction



4. Extraction site – occlusal view



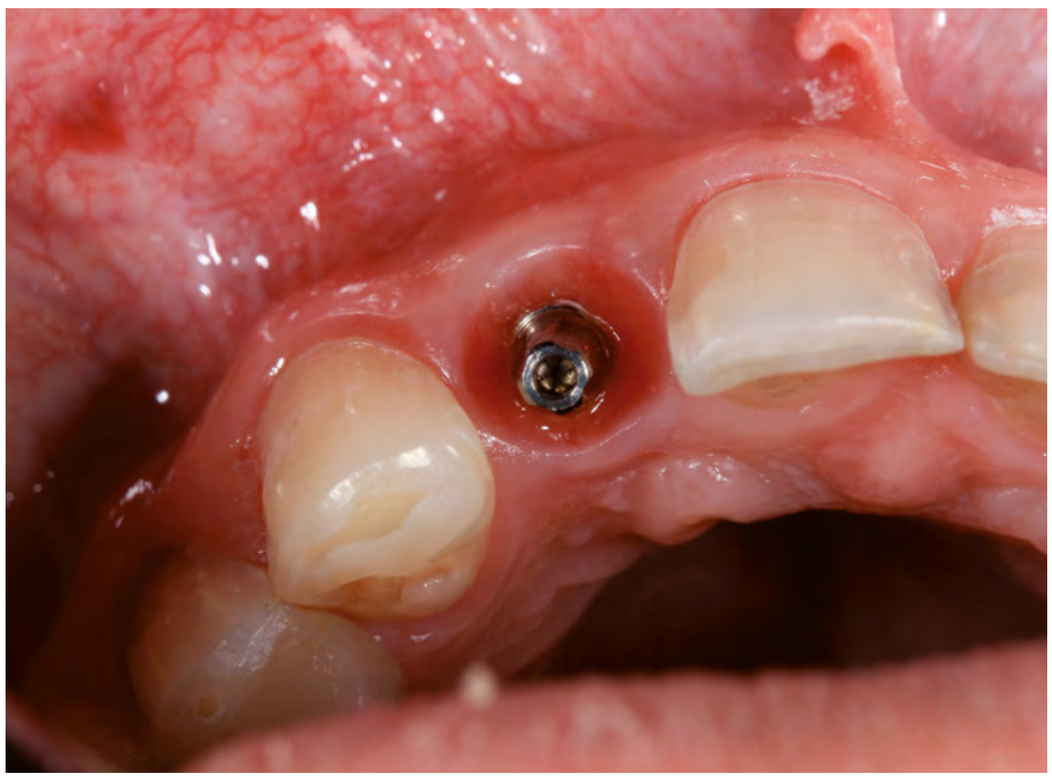
5. Implant and abutment in place



6. Connective tissue removed from the palate

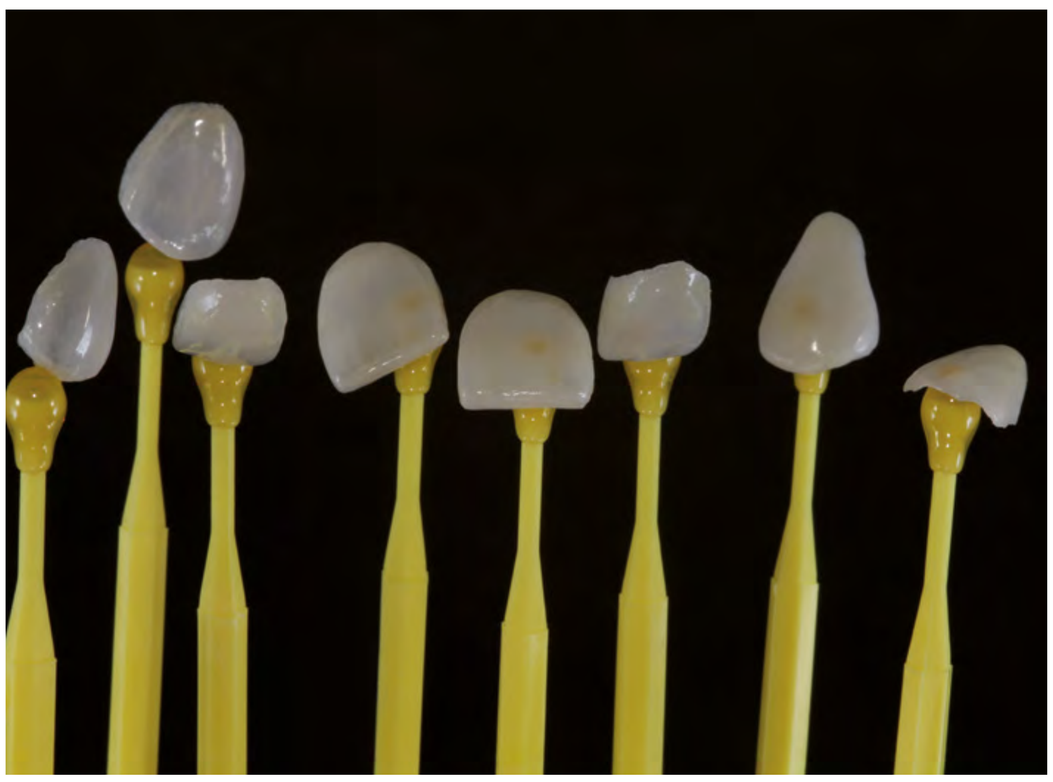
7. Connective tissue sutured and Immediate provisional restoration in place

8. 3-month follow up – intraoral labial view



9. Great emergence profile 3 months after surgery

10. Coping and veneer for the implant restoration



11. Veneer for the adjacent teeth

12. Checking abutment coping fit and color

13. Final restoration and veneer cementation 4 months after surgery

14. Final restoration close-up

15. 8-month follow up – intraoral frontal view

16. 8-month follow-up X-ray

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	1 Implant	Non guided surgery
Restorative Solution	CAD/CAM	Titanium abutments / zircona ceramic bridge

CM Drive NeoPoros

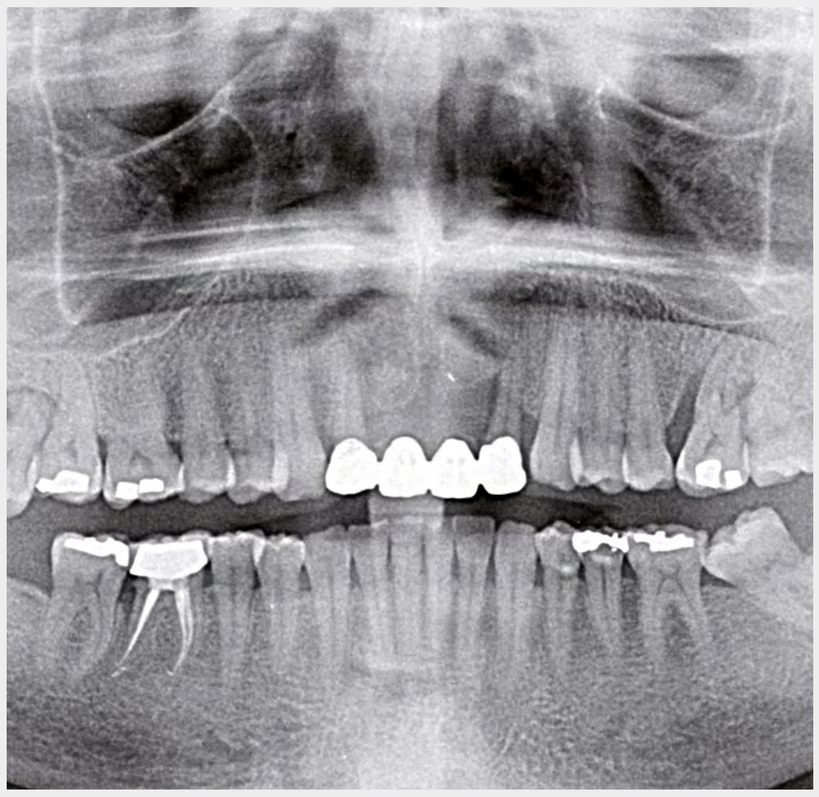
Profile
A. P., Male, 63 years old, Barcelona, Spain

Clinical Situation
Periodontal disease with bone loss and soft tissue retraction in anterior maxilla, teeth 12, 11, and 22.

Restorative Solution
Extractioin of tooth 12, 11 and 22, folowed by immediate implant placement in tooth 11. GBR and soft tissue grating are performed on the same day. Immediate temporization and final zironia ceramic bridge 6 months after surgery.

Surgical products
CM Drive NeoPoros (4.3 × 10 mm)

Prosthetic products
CM Universal Abutment Exact (4.5 × 4 × 2.5 mm)



Initial situation

09/2014 **Tooth Extraction**

09/2014 **Implant Placement**

09/2014 **Provisional Restoration**

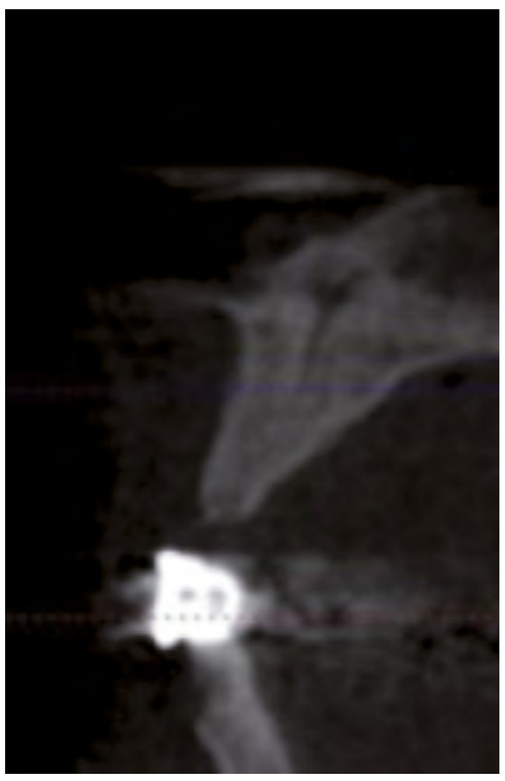
02/2015 **Final Restoration**

Dr. Enric Pintado Barcelona, Spain
Private practice in Manresa, Barcelona and Andorra; Graduated in dentistry in Universidad Odontologica Dominicana; Master in Implatologyand Prosthodontics by NYU and Loma Linda University

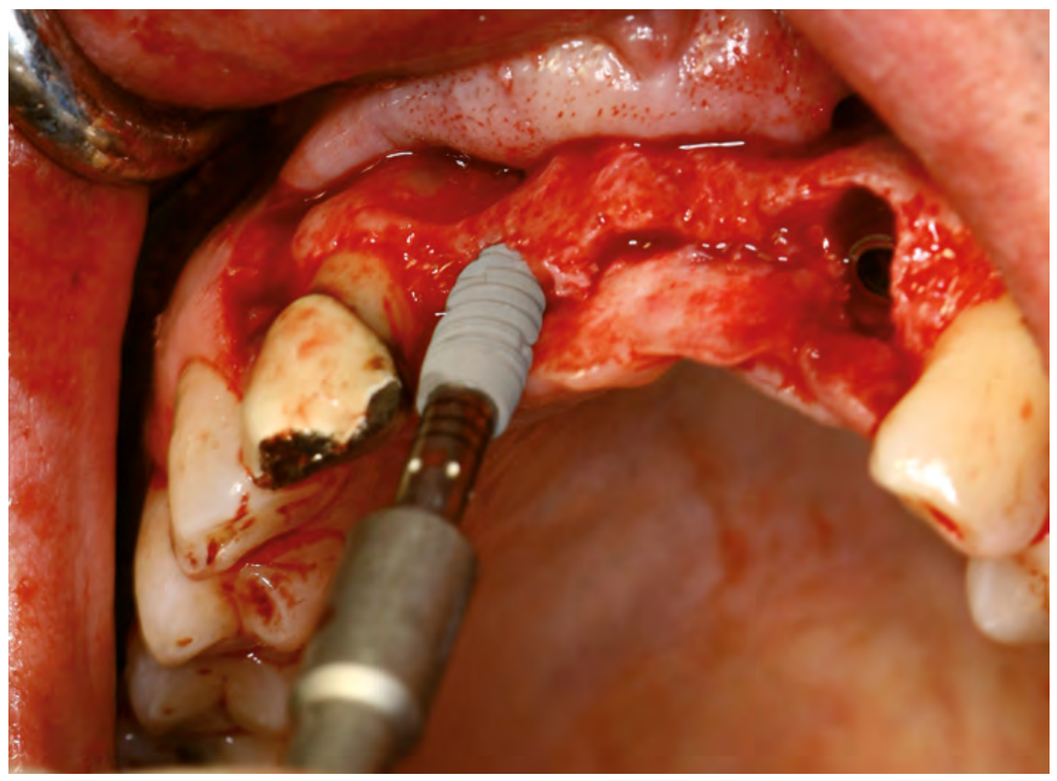
1. Pre-operative intraoral frontal view

2. Pre-operative intraoral occulsal view

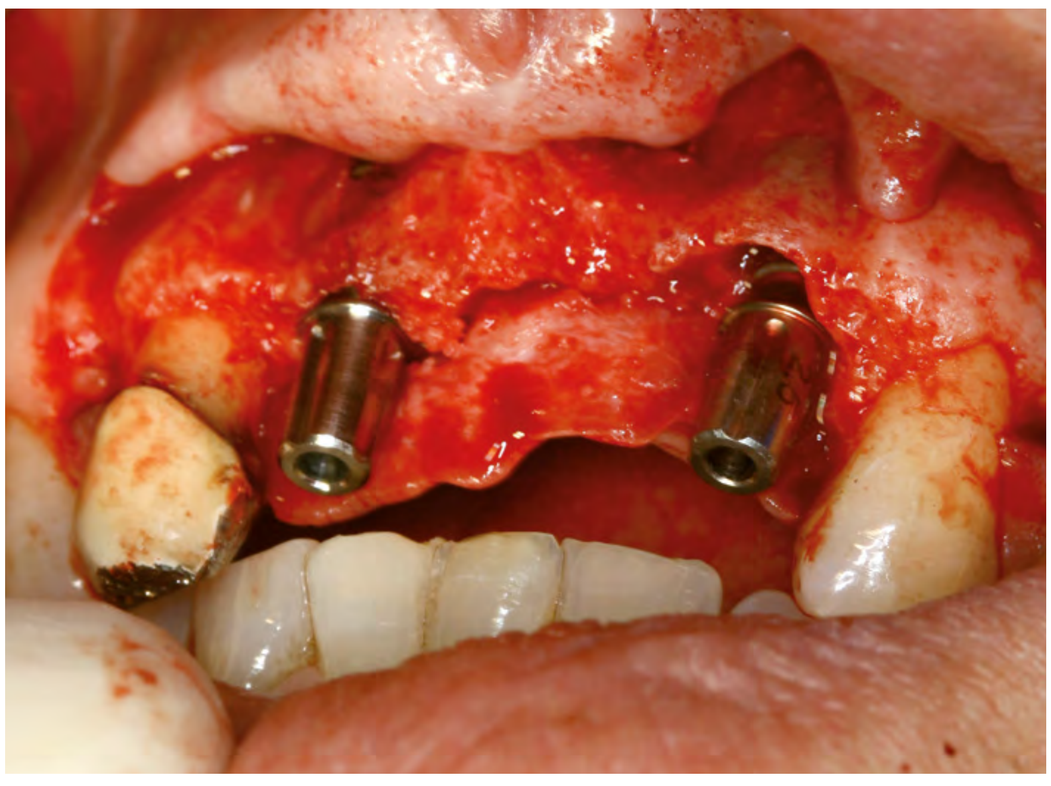
→



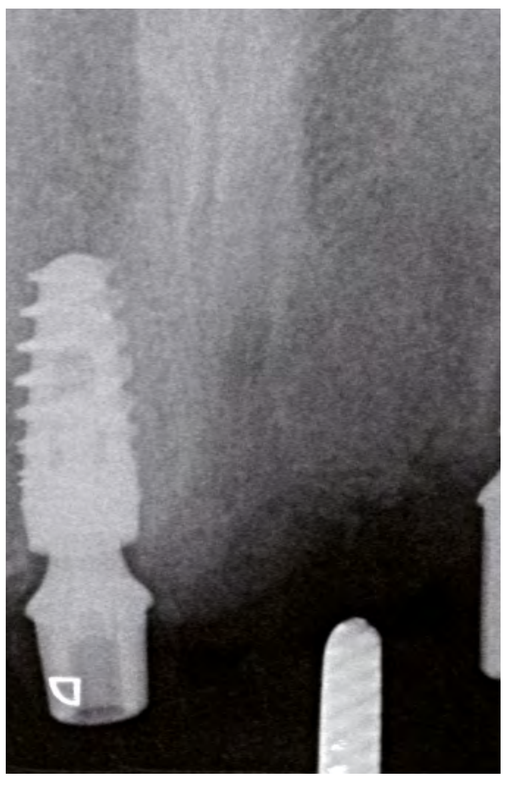
3. Pre-operative CBCT of tooth 11



4. Implant placement

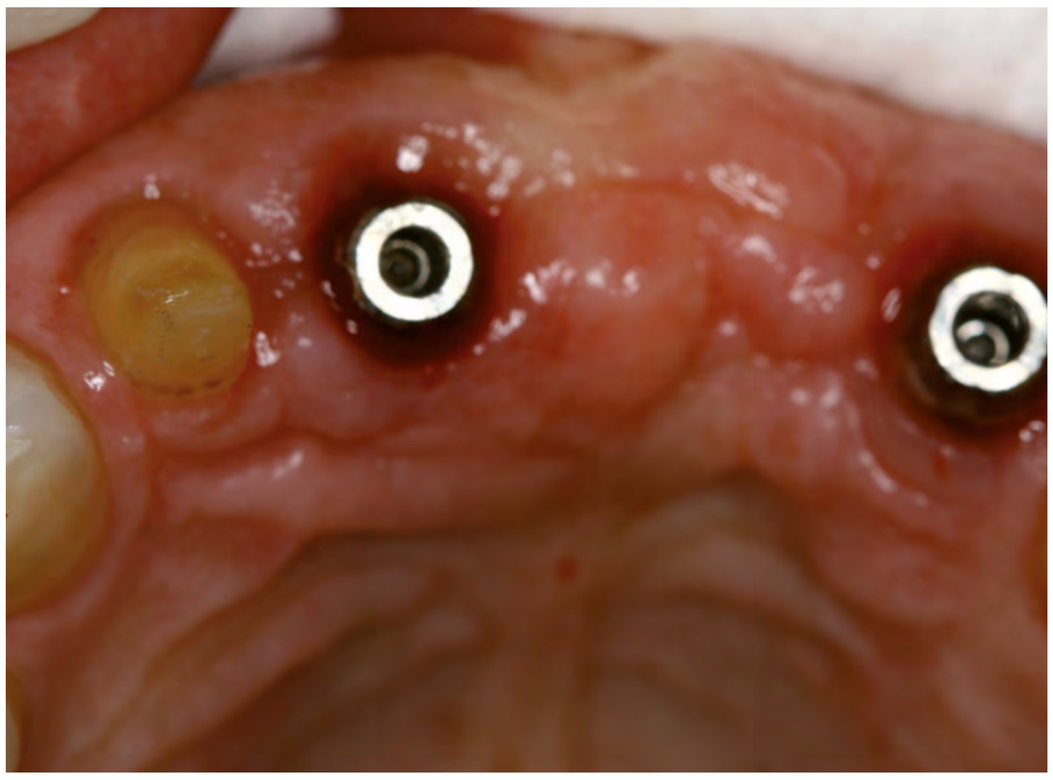


5. Abutment placement

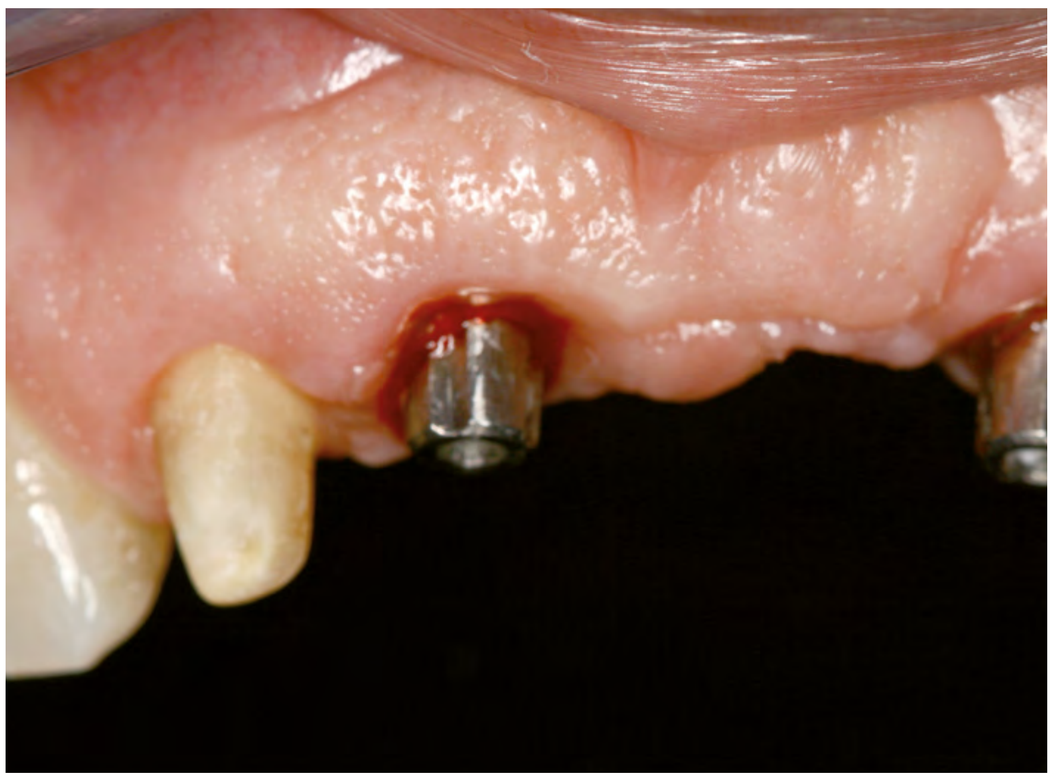


6. Post-operative X-ray

7. Immediate provisional bridge in place



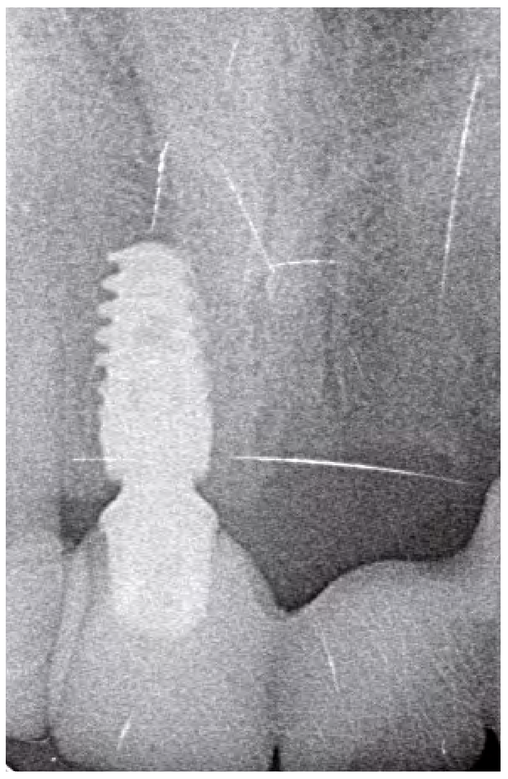
8. Good soft-tissue healing 5 months after surgery – Occulsal view



9. Good soft-tissue contour 5 months after surgery

10. Final restoration 5 months after surgery – intraoral frontal view

11. Final restoration intraoral occulsalview

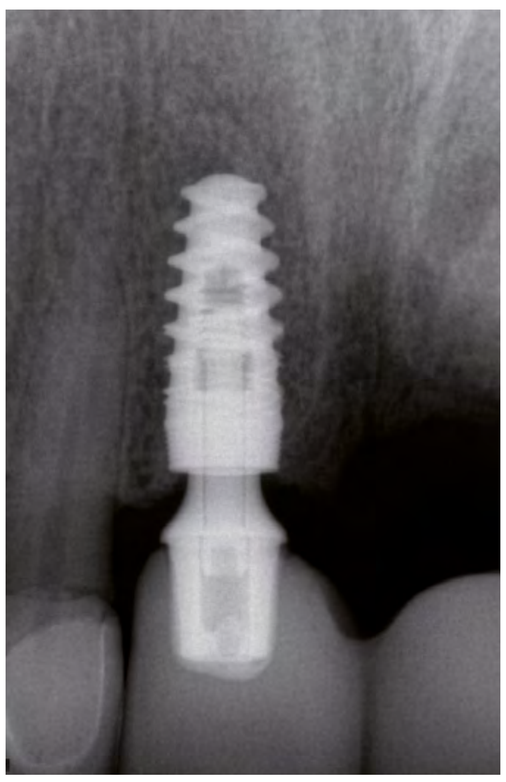


12. Final restoration X-ray

13. 1-year follow-up X-ray

14. 1-year follow up – intraoral frontal view

15. 1-year follow up – intraoral occlusal view



16. 2.5-year follow-up X-ray

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	2 Implants	Conventional
Restorative Solution	CAD/CAM	Provisional: PMMA Final: Ceramic

CM Drive Acqua

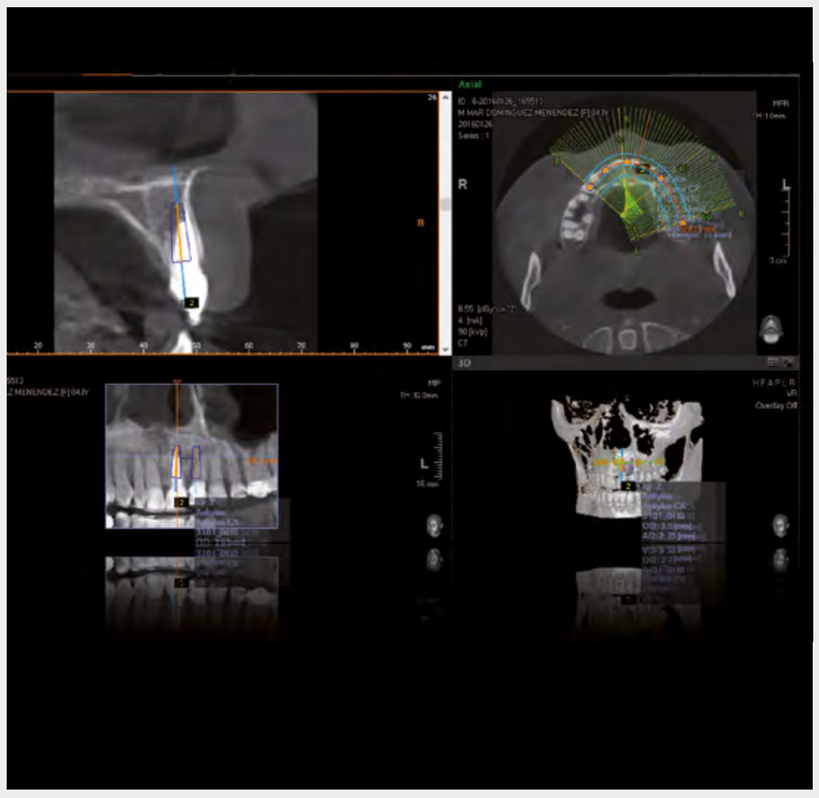
Profile
M. M., Female, 45 years old, Madrid, Spain

Clinical Situation
Dental fracture of tooth 21 and 22

Restorative Solution
Extraction, followed by implant placement and immediate temporization with full prosthetic digital workflow using titanium coping and customized zirconia coping.

Surgical products
CM Drive Acqua (3.5 × 10 mm)

Prosthetic products
CM Titanium Base (3.5 × 4 × 2.5 mm, 3.5 × 4 × 3.5 mm)



Initial situation

03 / 2016 **Tooth Extraction**

03 / 2016 **Implant Placement**

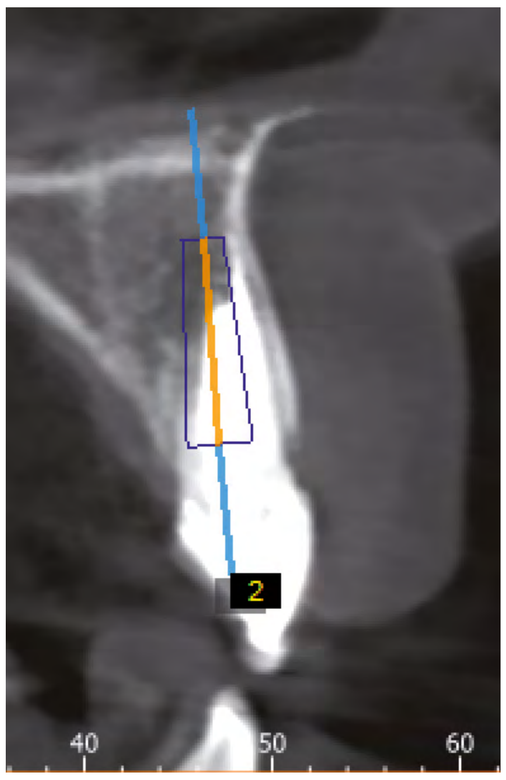
03 / 2016 **Provisional Restoration**

06 / 2016 **Final Restoration**

Dra. Arantza Rodriguez Madrid, Spain
Oral Surgeon

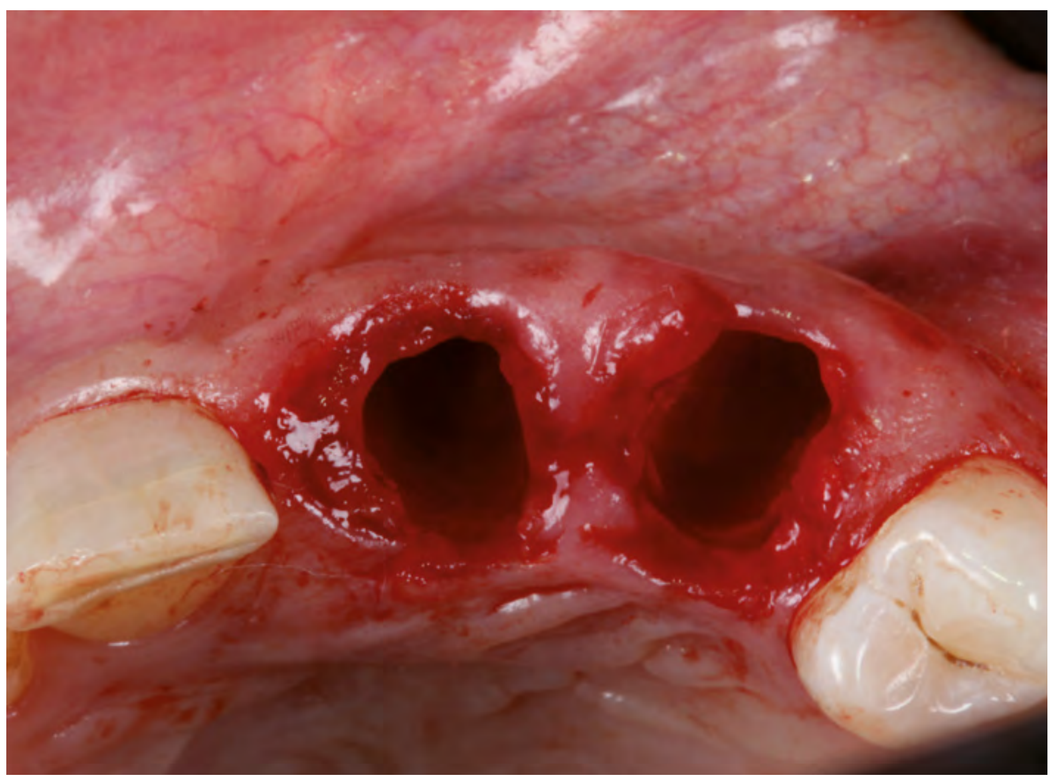
Dr. José Vallejo Madrid, Spain
Aesthetics & Prosthodontics

1. Intraoral frontal view

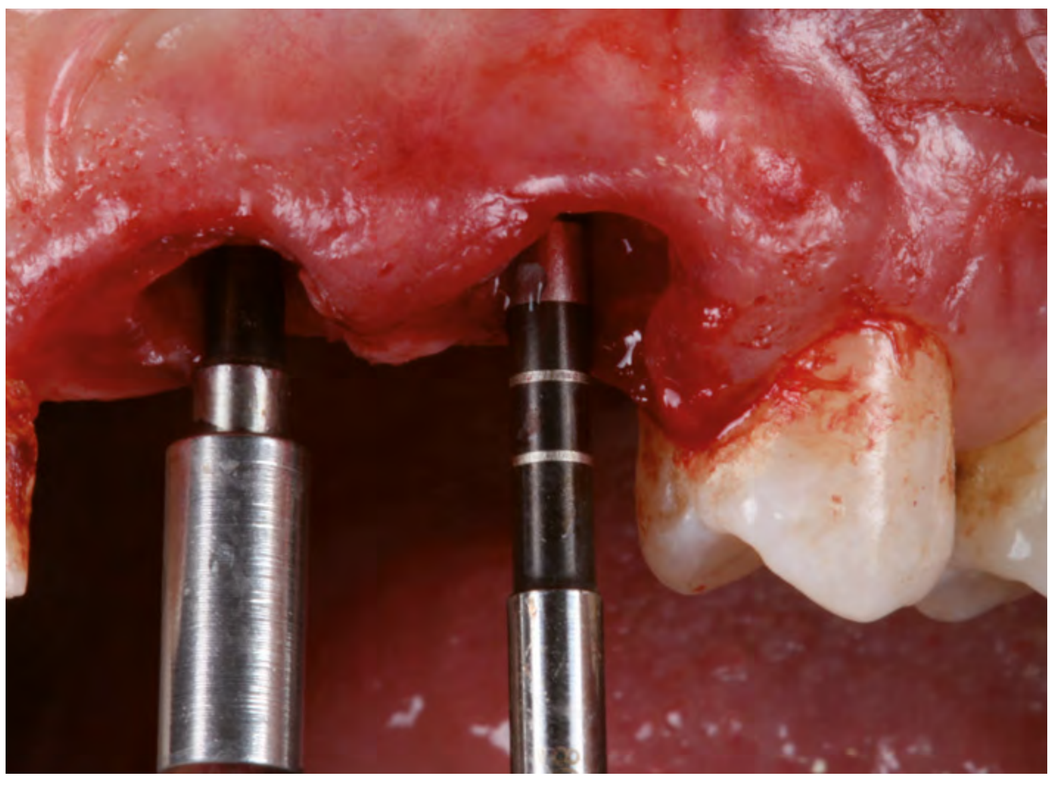


2. Pre-operative X-ray

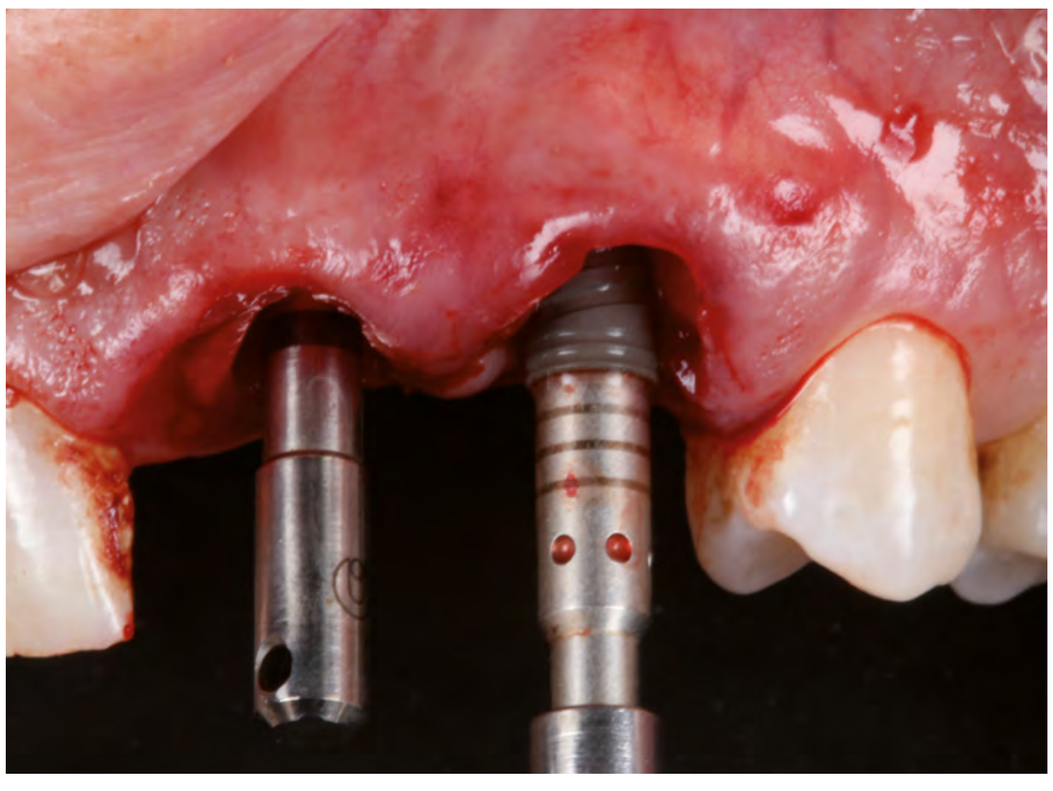
3. Pre-operative intraoral frontal view



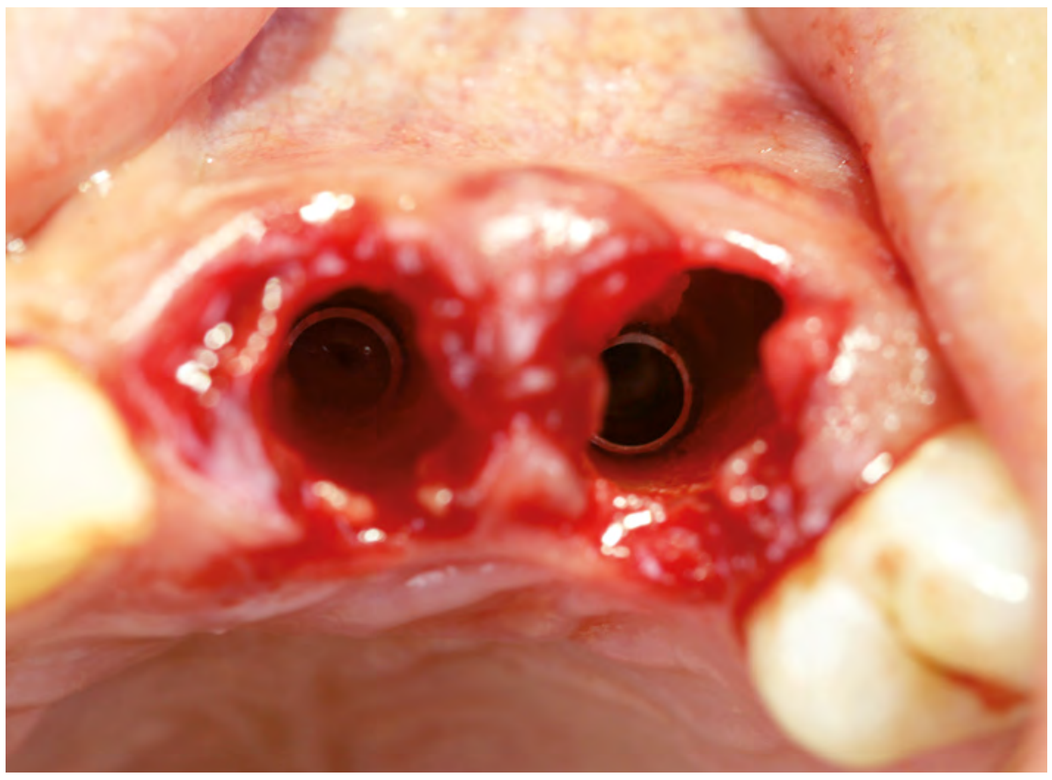
4. Extraction sites – Socket that shows the intended correction of dis-angulation



5. Implant bed preparation

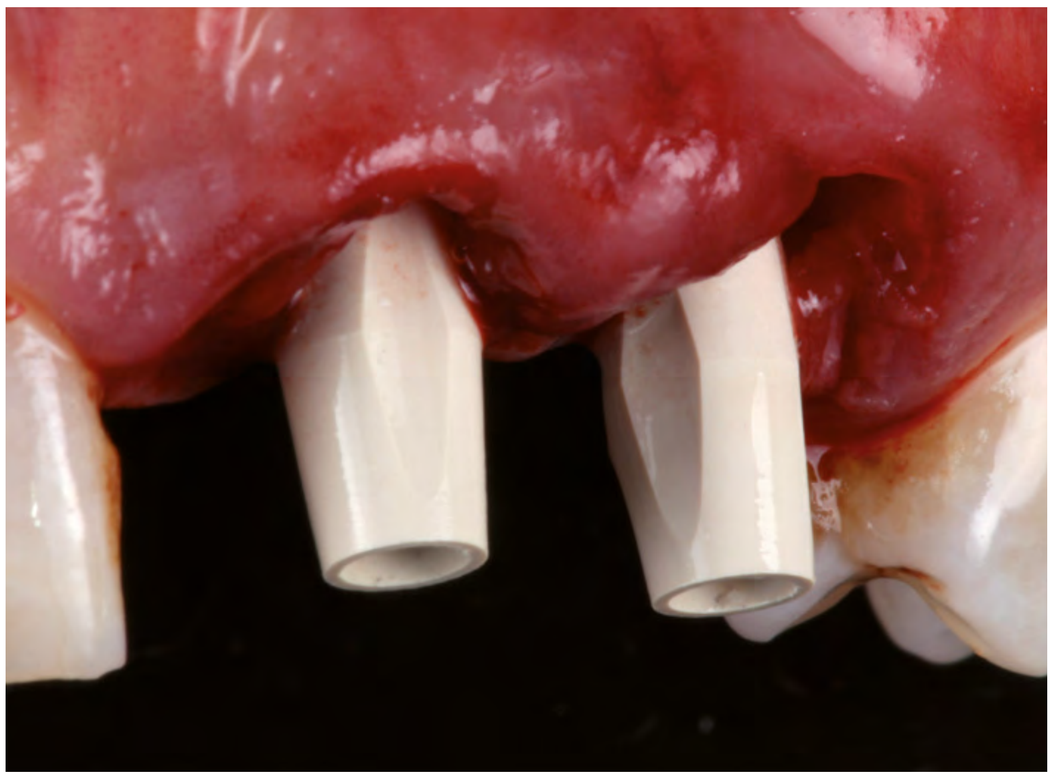


*6. Implant placement (Drive Acqua 3.5*10 mm) Tooth 21: 3mm subcrestal, Tooth 22: 2 mm subcrestal*

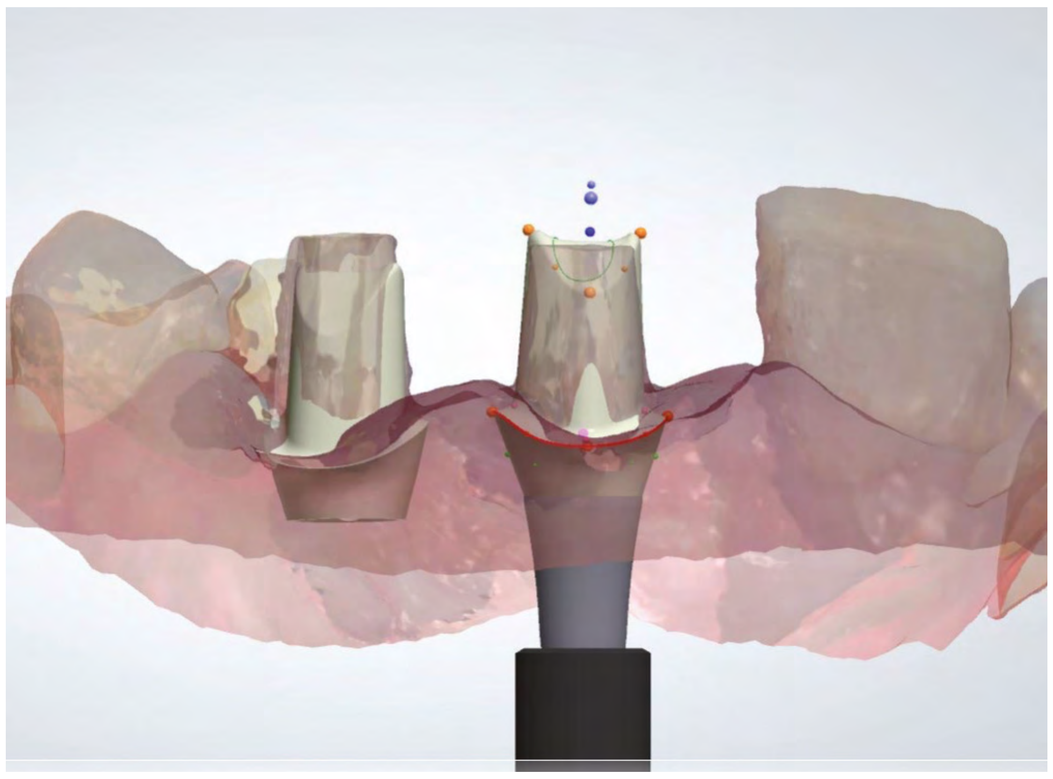


7. Implant in position

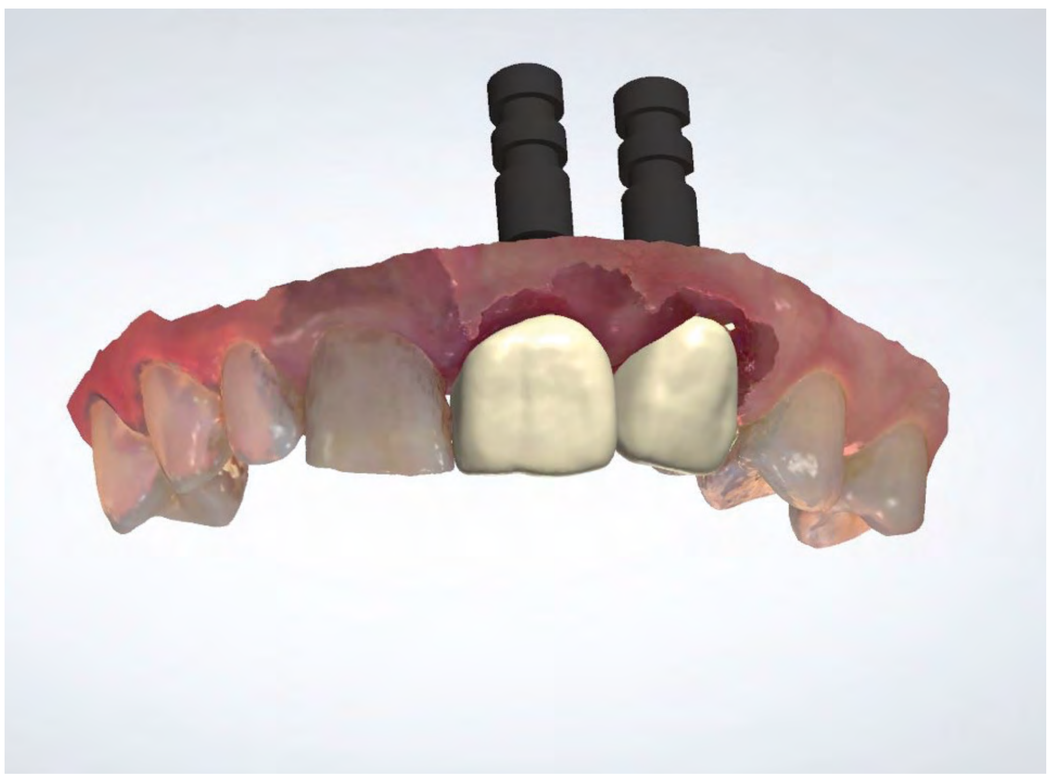
8. Post provisional restoration X-ray



9. Intraoral scan body for digital impression



10. CAD zirconia coping design



11. CAD temporary crown design

12. Abutment in place 4 hours after surgery due to zirconia sintering process

13. Immediate provisional restoration placement

14. Immediate provisional restoration in position

15. Good soft-tissue healing 4 days after surgery

16. Adjusting the provisional crowns to fit the best emerging profile 6 weeks after surgery

17. Final restoration 1 year after surgery

18. 1-year follow-up X-ray

Clinical case

CM Drive Acqua

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	2 Implants	Non guided surgery
Restorative Solution	Conventional workflow	Ceramic crown

Profile
H.B.M., Female, 18 years old, Curitiba, Brazil

Clinical Situation
External root resorption of central incisors after a previous trauma and tooth fracture

Restorative Solution
Extraction, immediate implant placement, immediate loading, provisional crown on an anatomical abutment with “one-abutment-one-time” concept, and finalized with a ceramic crown.

Surgical products
CM Drive Acqua (4.3 × 13 mm)

Prosthetic products
CM Anatomical Abutment (3.5 mm)

Initial situation

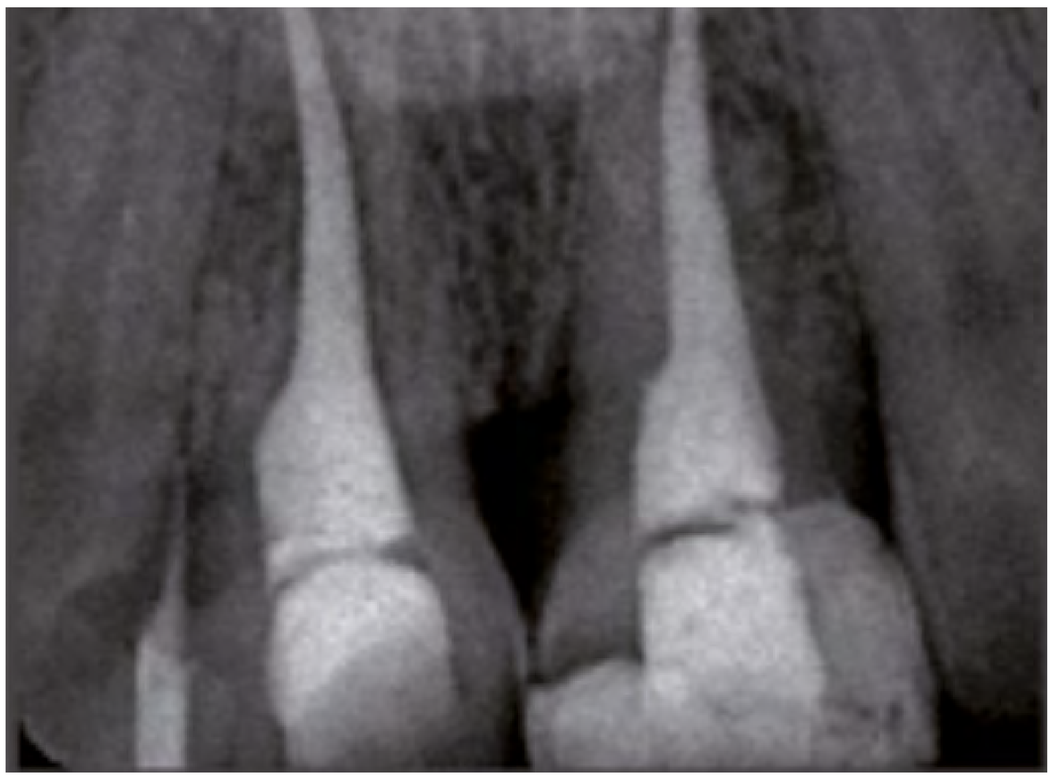
06 / 2014 **Tooth Extraction**

06 / 2014 **Implant Placement**

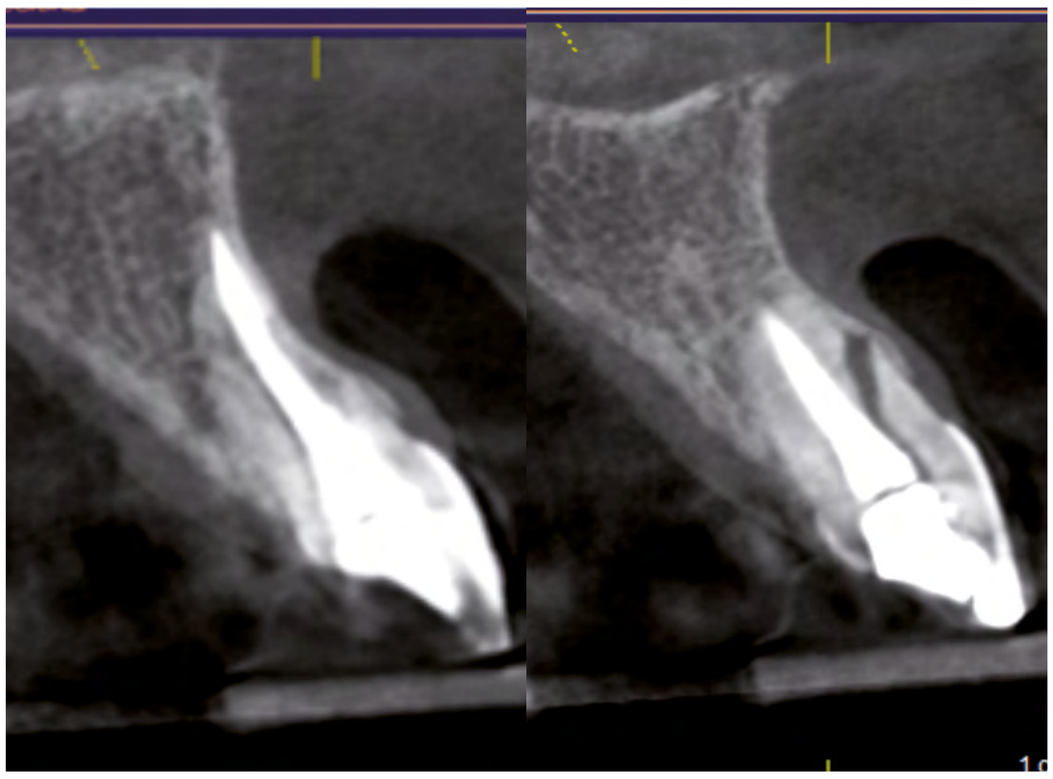
06 / 2014 **Provisional Restoration**

05 / 2015 **Final Restoration**

Dr. Geninho Thomé Curitiba, Brazil
Scientific President of Neodent®

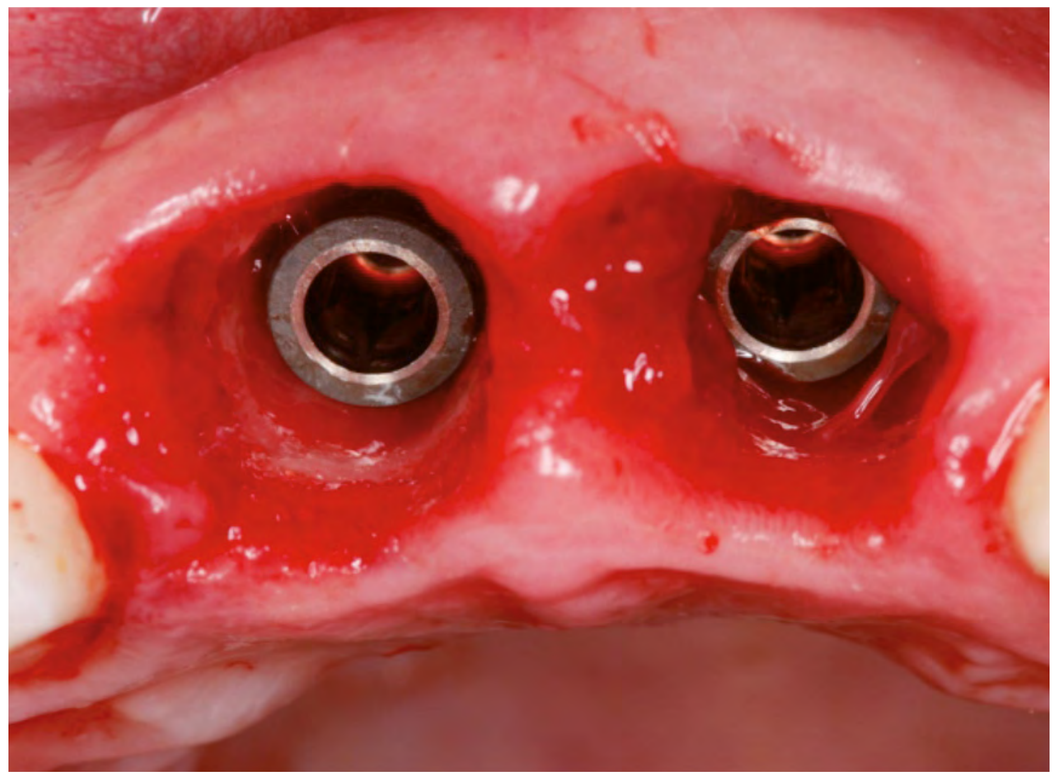


1. Pre-operative X-ray external root resorption in teeth 11 and 21



2. Pre-operative CBCT – root fracture (# 21)

3. Implant placement

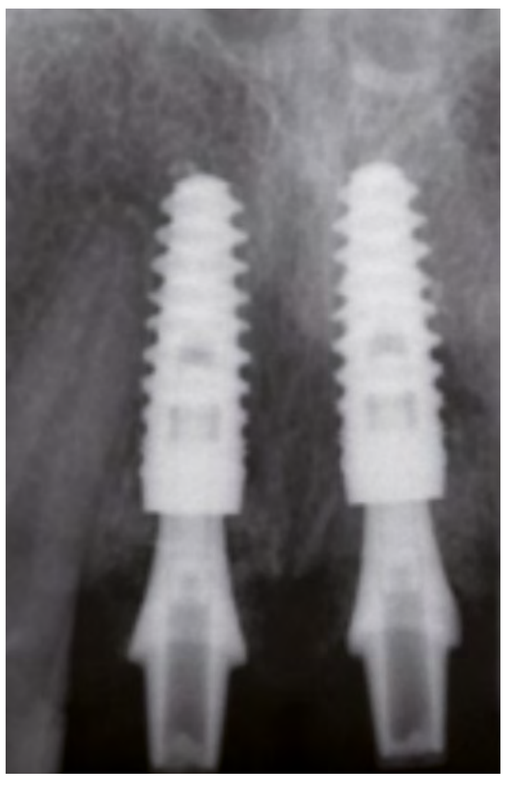


4. Both implants in place

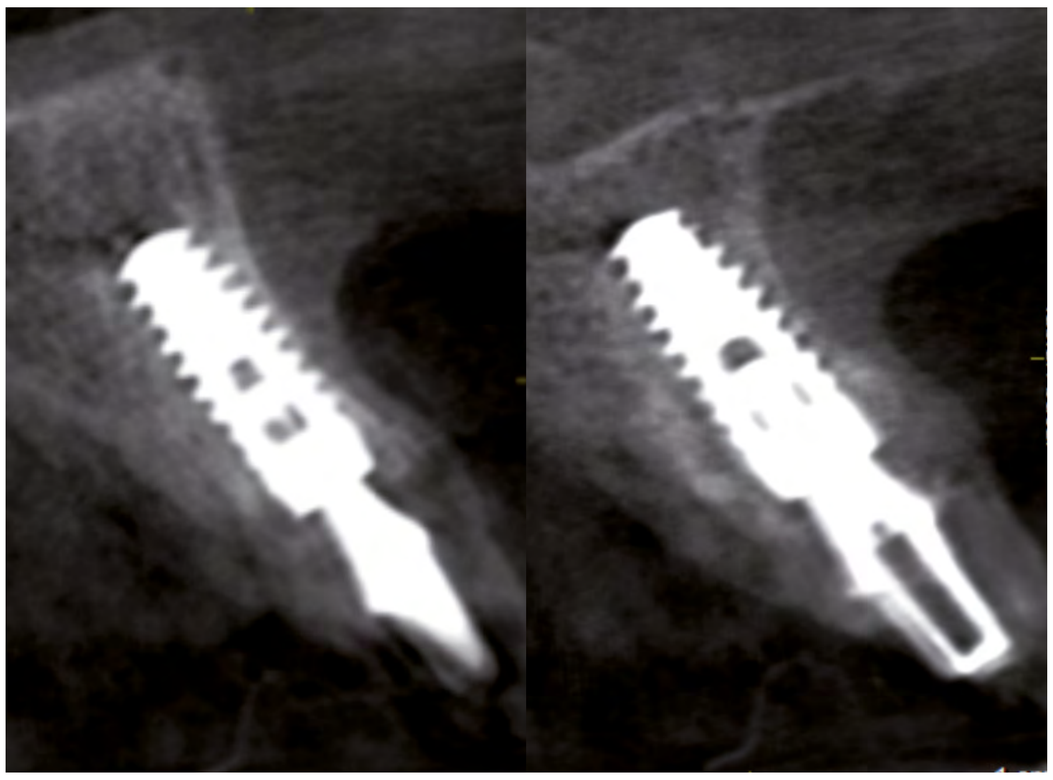
5. Post-operative X-ray

6. Post-operative CBCT

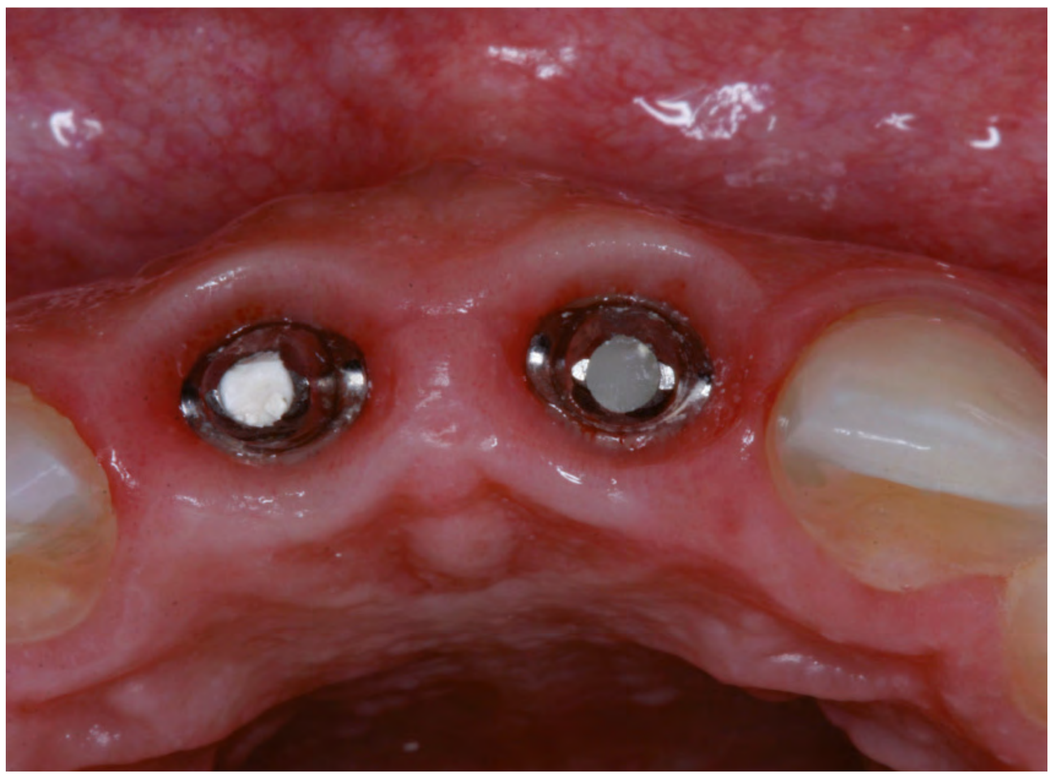
7. Immediate provisional restoration in place



8. Post provisional restoration X-ray

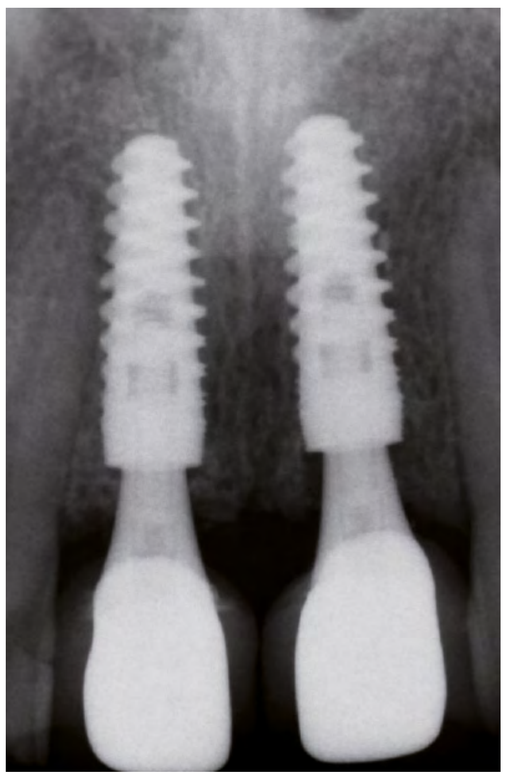


9. Post provisional restoration CBCT



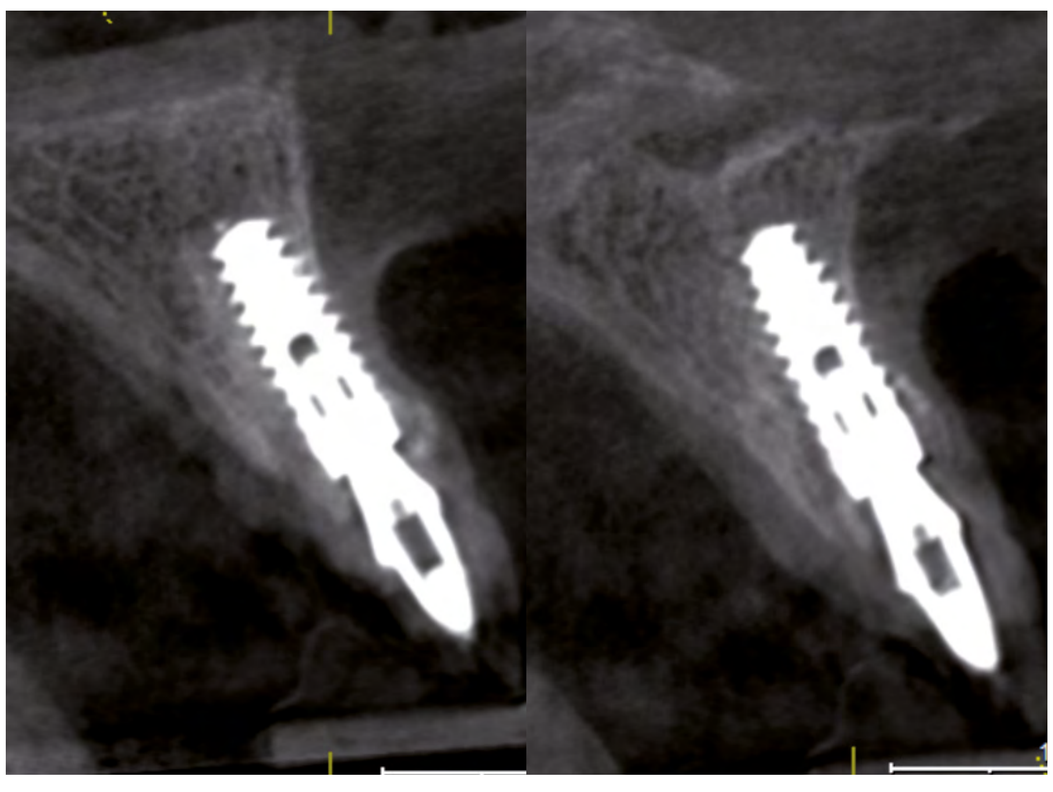
10. Stable gingival contour 11 months after surgery – Occlusal view of components CM anatomic abutment 3.5

11. Final restoration 11 months after surgery

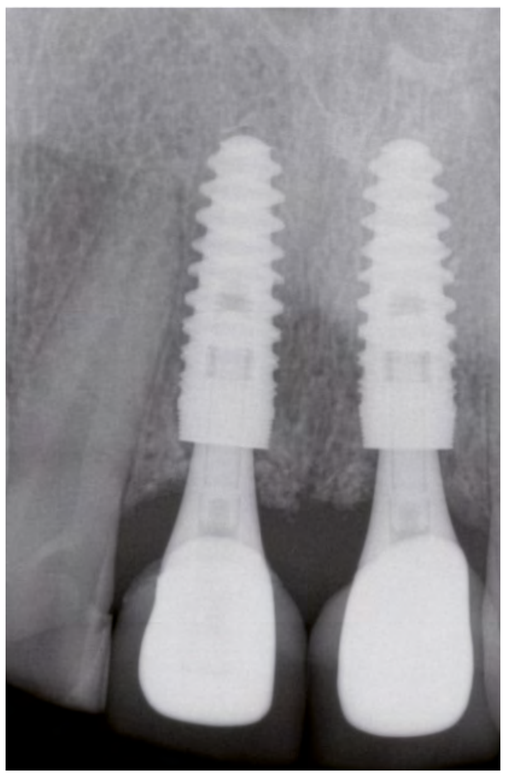


12. Final restoration X-ray

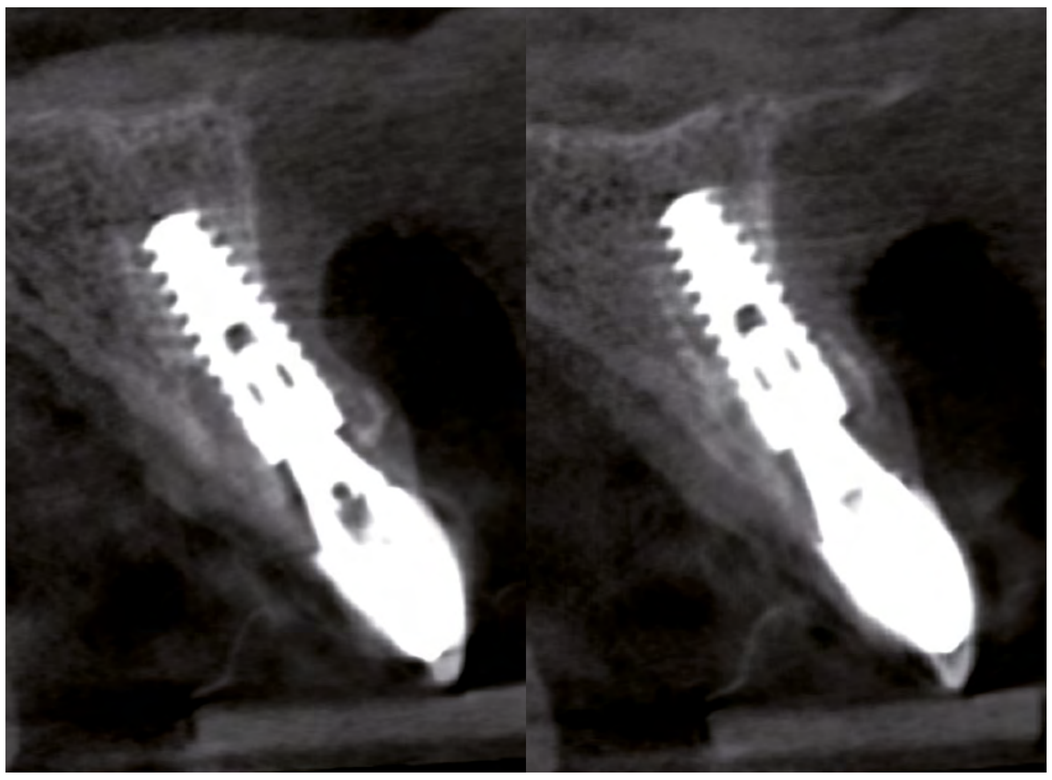
13. 1-year follow up – intraoral frontal view



14. 1-year follow-up CBCT (# 11 and # 21)



15. 3-year follow-up X-ray



16. 3-year follow-up CBCT (# 11 and # 21)

Clinical case

CM Drive Acqua

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	2 Implants	Non guided surgery
Restorative Solution	Conventional workflow	Ceramic crown

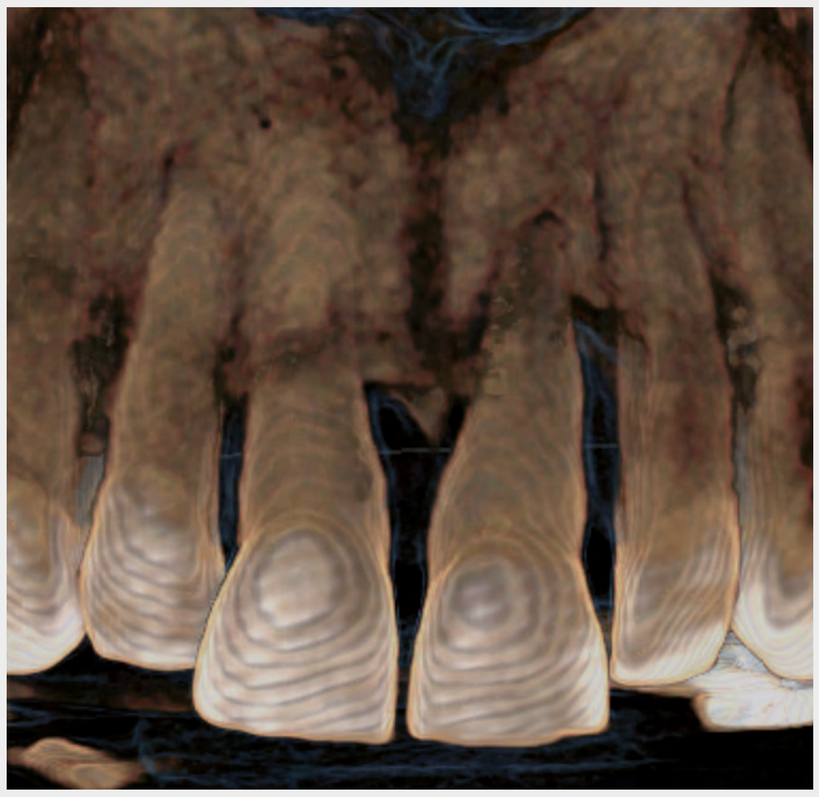
Profile
O. G., Male, 51 years old, Curitiba, Brazil

Clinical Situation
Severe periodontal disease and severe mobility in the central incisors

Restorative Solution
Extraction followed by immediate implant placement and bone grafting. Immediate temporaziation was performed using patient's tooth crown. After the healing period, conventional impression was taken and the case was finalized with a zirconia coping with a ceramic crown. "One-abutment-one-time" concept was used.

Surgical products
CM Drive Aqua (4.3 × 13 mm)

Prosthetic products
CM Universal Abutment Exact (3.3 × 6 × 3.5 mm)



Initial situation

07/2015 **Tooth Extraction**

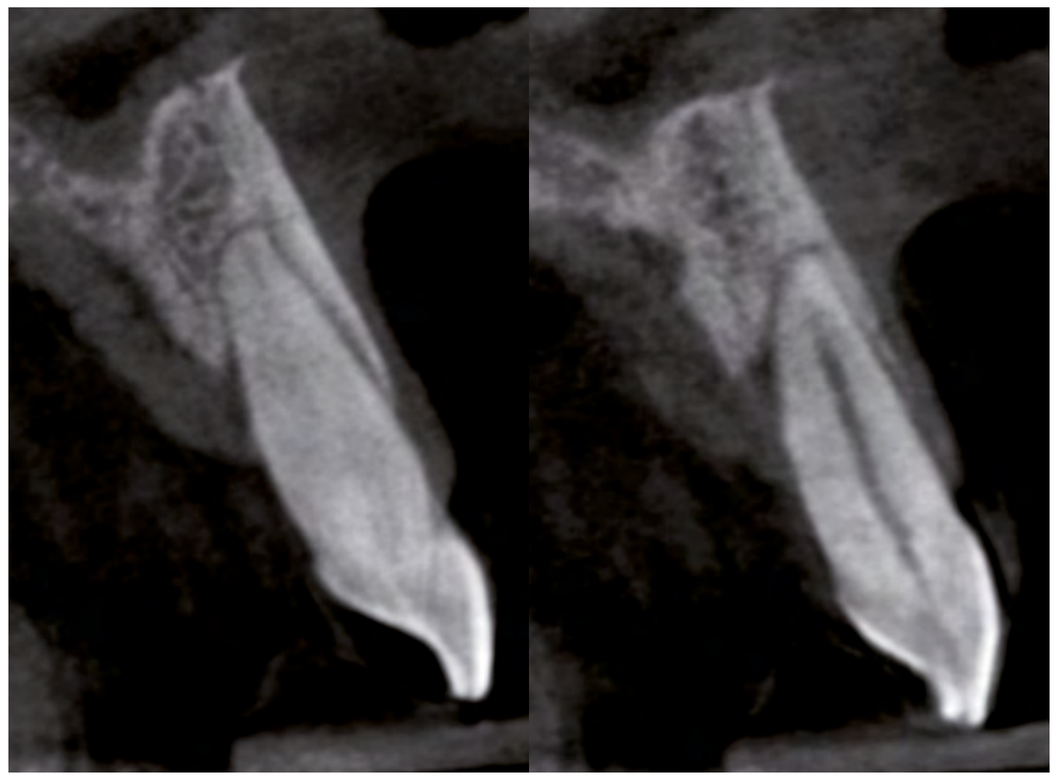
07/2015 **Implant Placement**

07/2015 **Provisional Restoration**

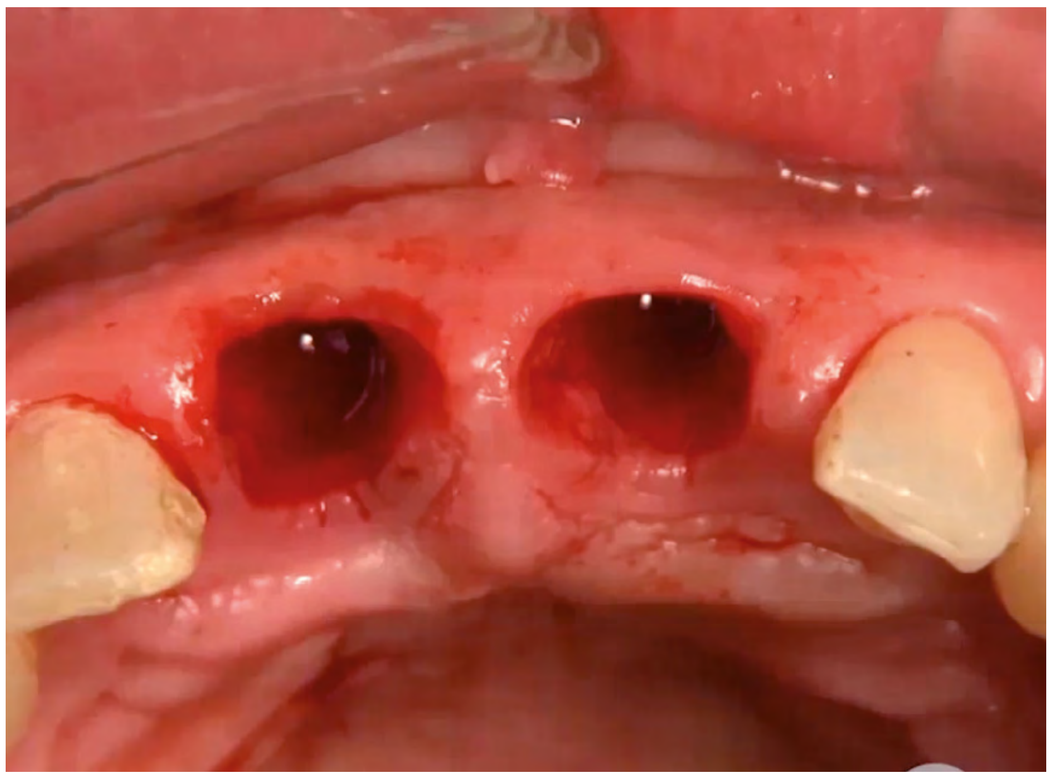
06/2016 **Final Restoration**

Dr. Geninho Thomé Curitiba, Brazil
Scientific President of Neodent®

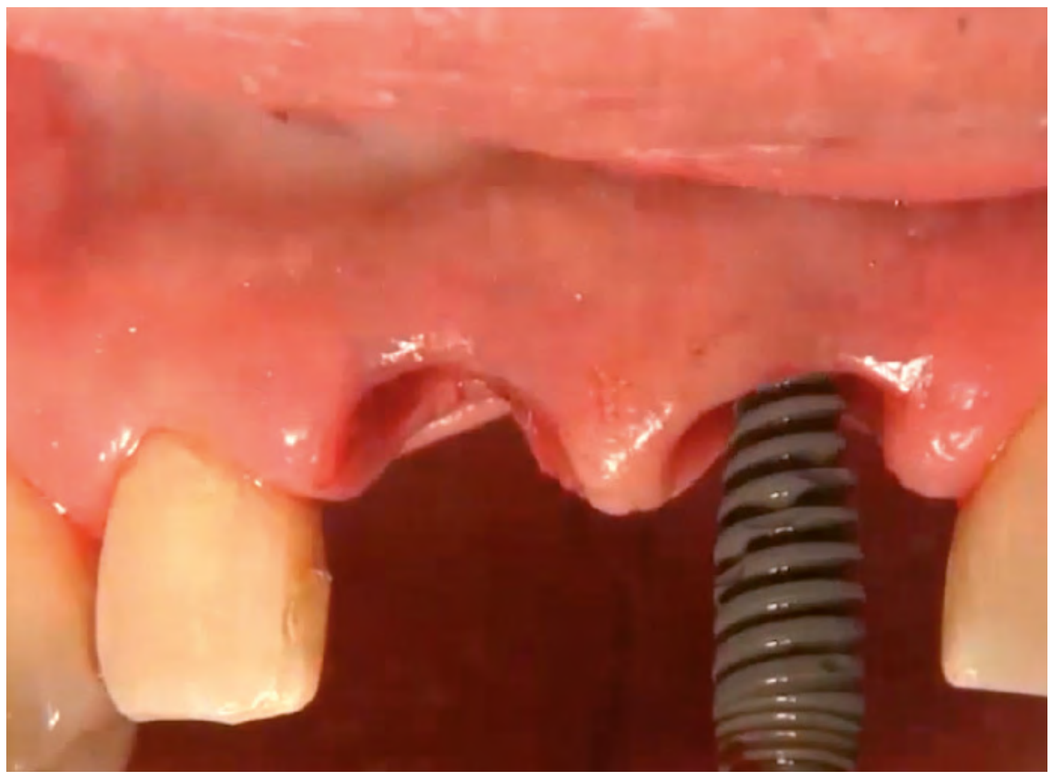
1. Pre-operative X-ray



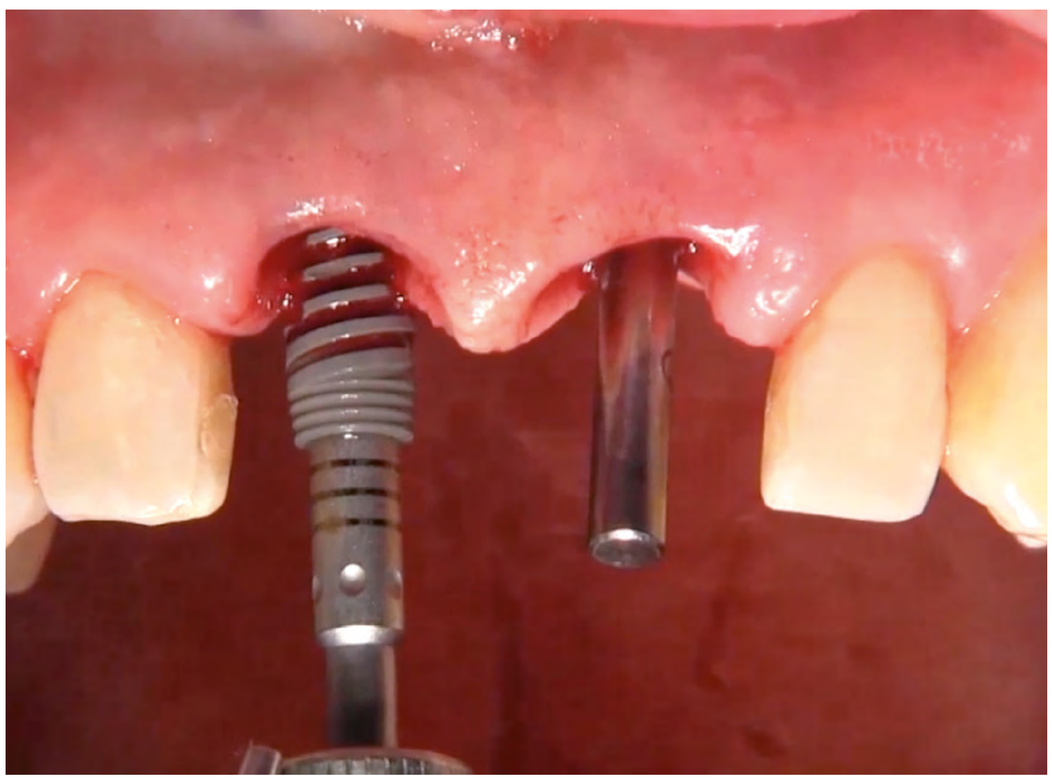
2. Pre-operative X-ray



3. Extraction sites



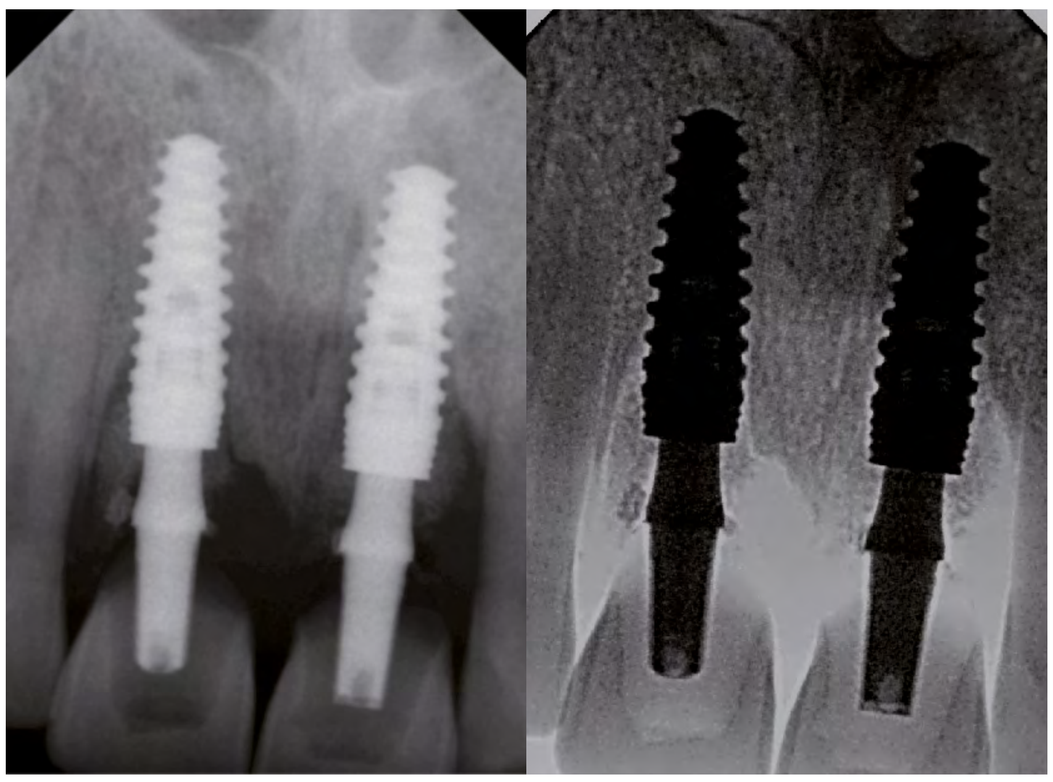
4. Implant placement



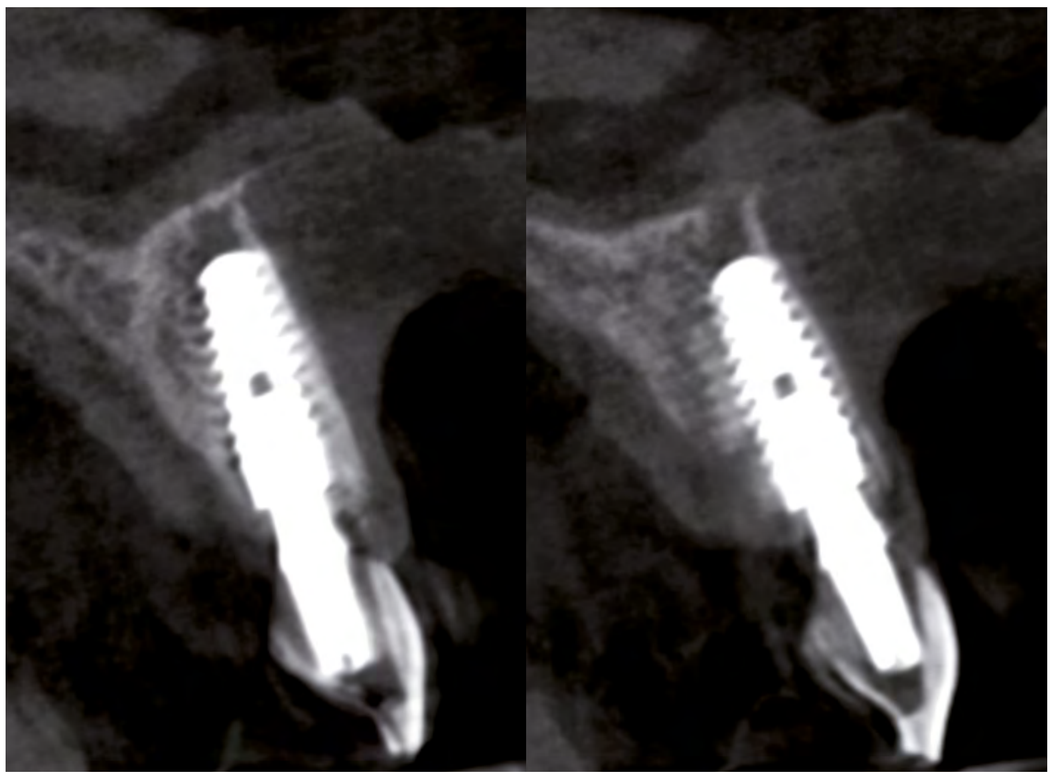
5. Implant placement CM Drive Aqua 4.3 × 13 mm

6. Teeth were cut to make the immediate provisional crown

7. Immediate provisional restoration in place



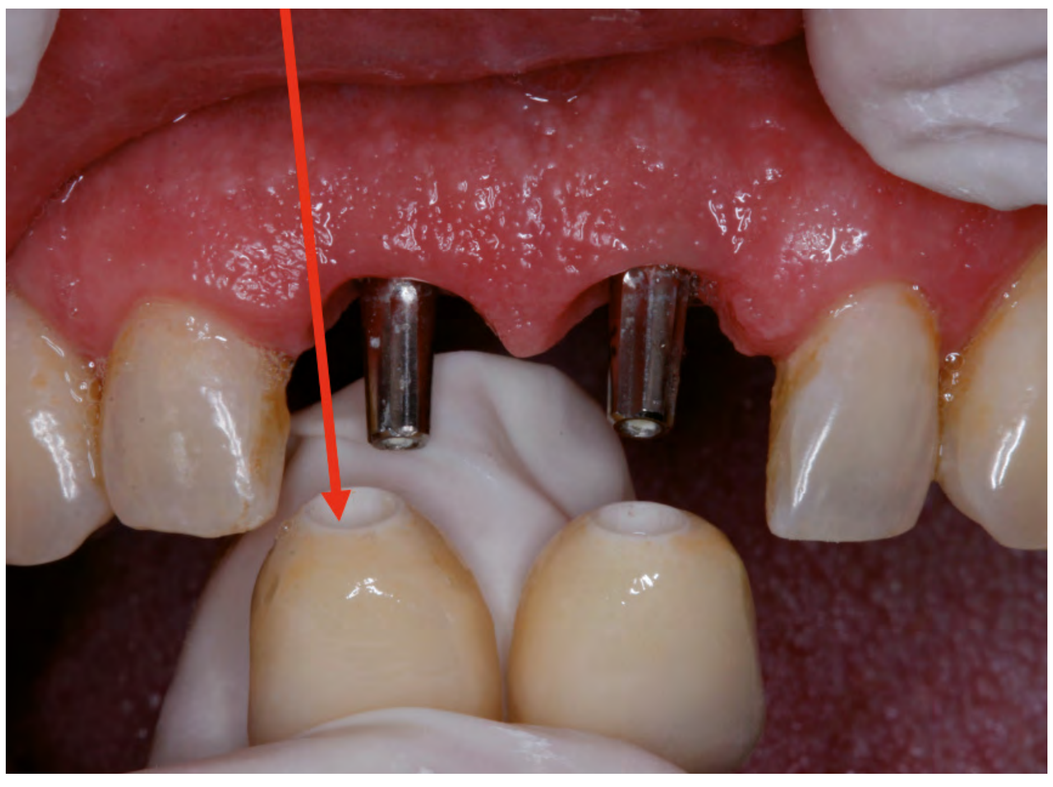
8. Post provisional restoration X-ray



9. Post provisional restoration CBCT

10. Provisional restoration 1 week after surgery – frontal view

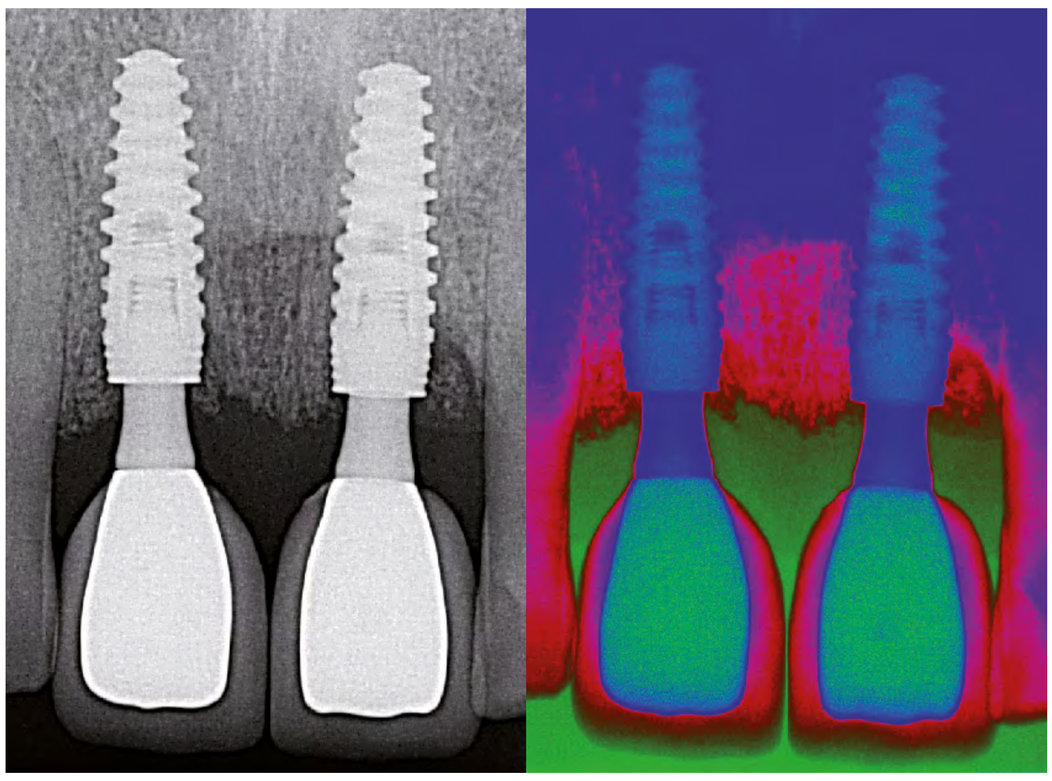
11. Provisional restoration 1 week after surgery – occlusal view



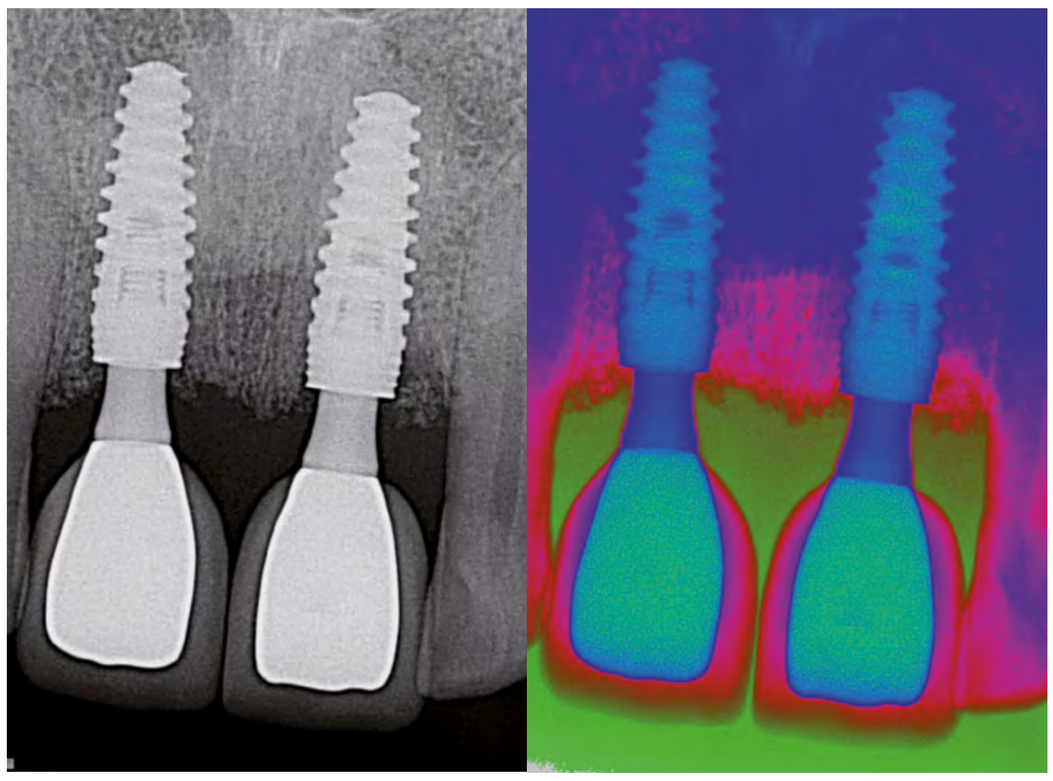
12. Final restoration 1 year after surgery

13. Final restoration 1 year after surgery – frontal view

14. Final restoration 1 year after surgery – occlusal view



15. 1-year follow-up X-ray



16. 1-year-and-10-month follow-up X-ray

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Posterior
	2 Implants	Conventional
Restorative Solution	Conventional	PFM

CM Alvim NeoPoros

Profile
A., Female, 43 years old, Albufeira, Portugal

Clinical Situation
Fixed bridge linking first and second pre molar with second pre-molar in cantilever. Fracture of the first pre-molar root

Restorative Solution
Extraction, followed by immediate implant placement, immediate loading with provisional crown on universal abutments with “one-abutment-one-time” concept, and finalized with porcelain-fused-to-metal (PFM) crowns

Surgical products
CM Alvim NeoPoros (4.3 × 16 mm)
CM Alvim NeoPoros (4.5 × 10 mm)

Prosthetic products
CM Universal Abutment (4.5 × 4 × 2.5 mm)
CM Universal Abutment (3.3 × 4 × 3.5 mm)

Initial situation

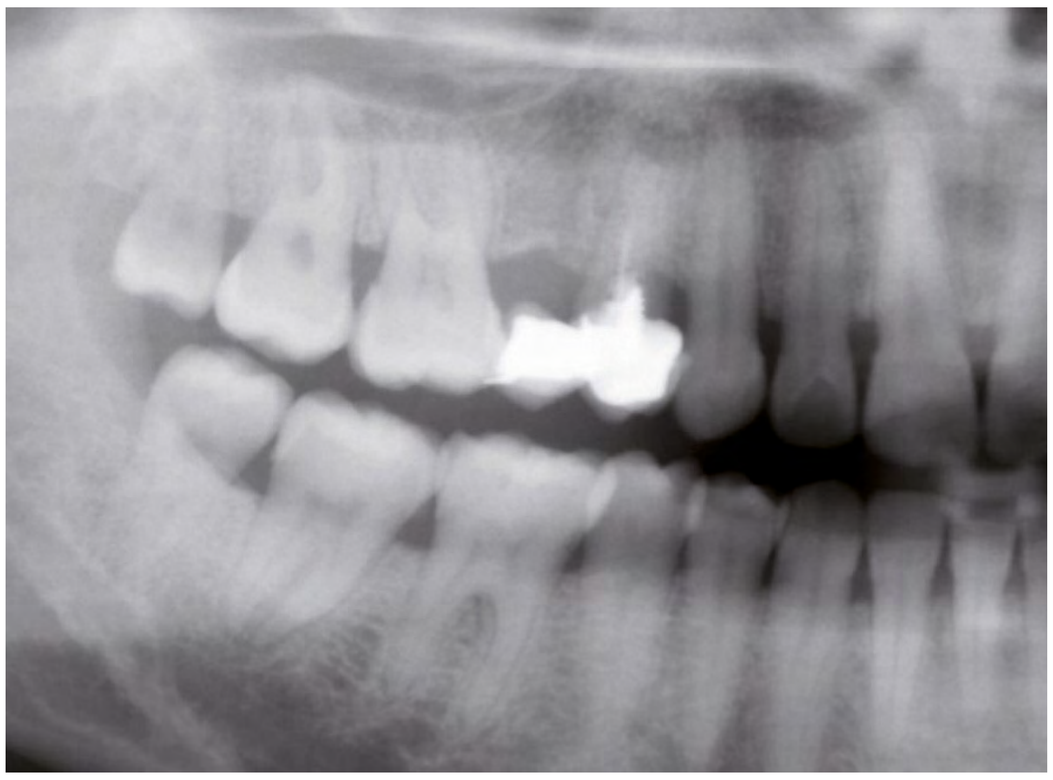
03 / 2007 **Tooth Extraction**

03 / 2007 **Implant Placement**

03 / 2007 **Provisional Restoration**

08 / 2007 **Final Restoration**

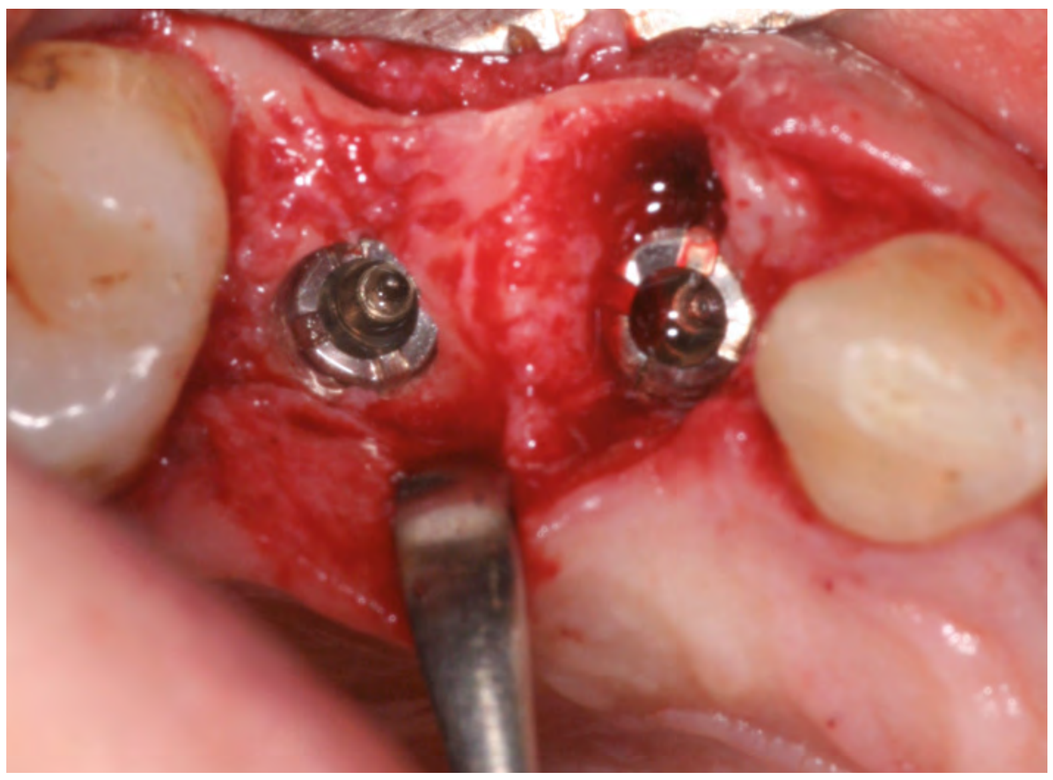
Dr. Sérgio Pereira Albufeira, Portugal
Oral Surgeon
Aesthetics & Prosthodontics



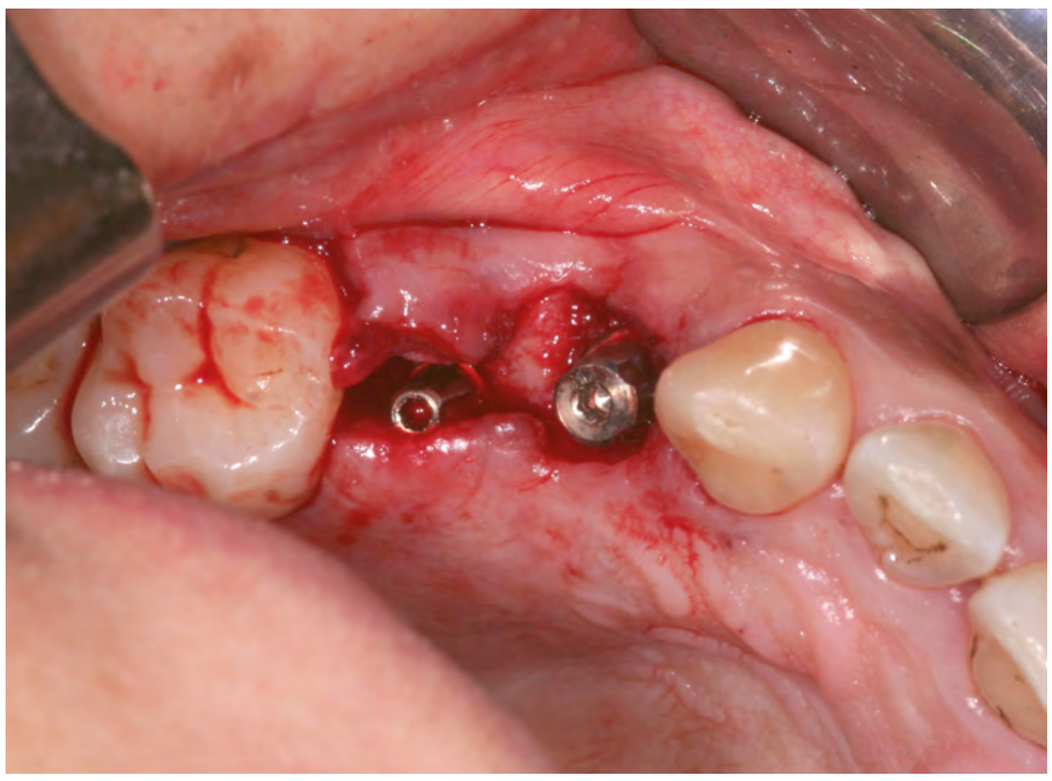
1. Pre-operative X-ray

2. Tooth extraction

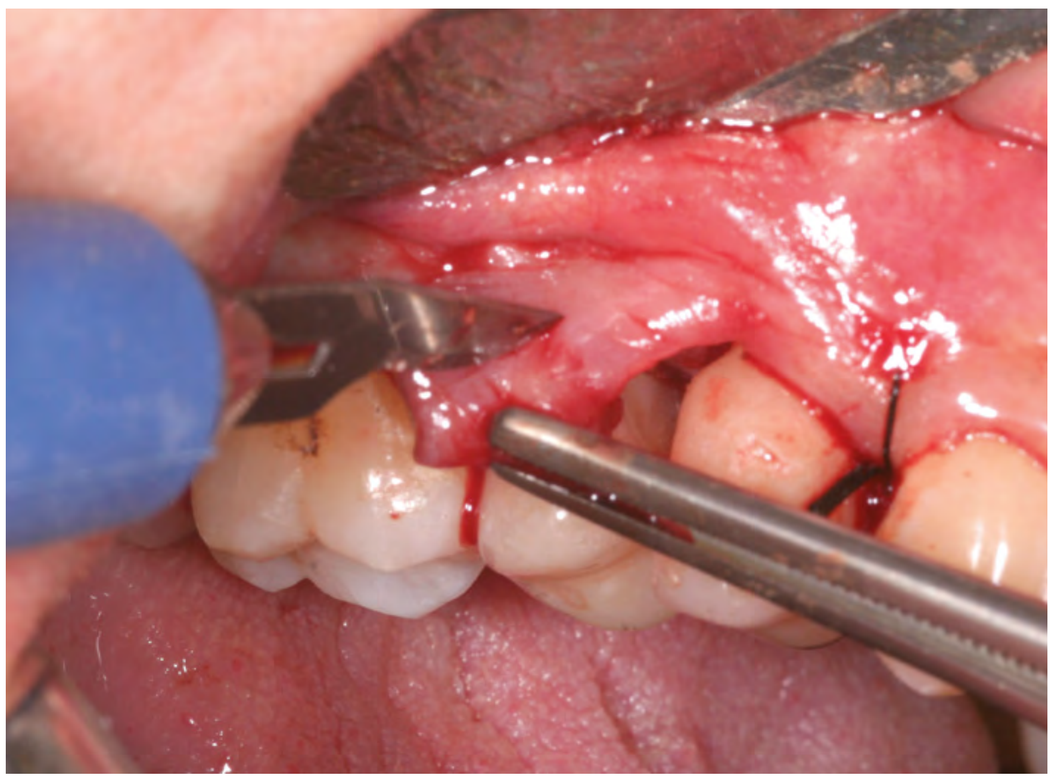
3. Extraction site



4. Implants in place with 2 mm sub-crestal

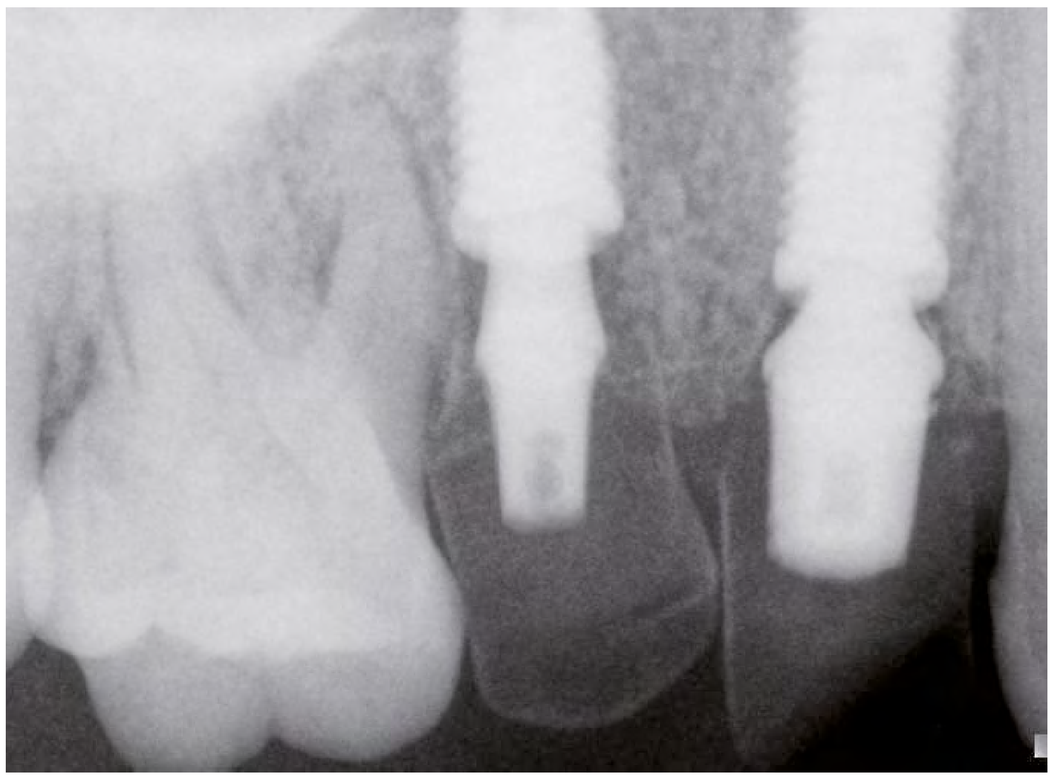


5. Abutment in place



6. Immediate provisional restoration and gingival plastic surgery

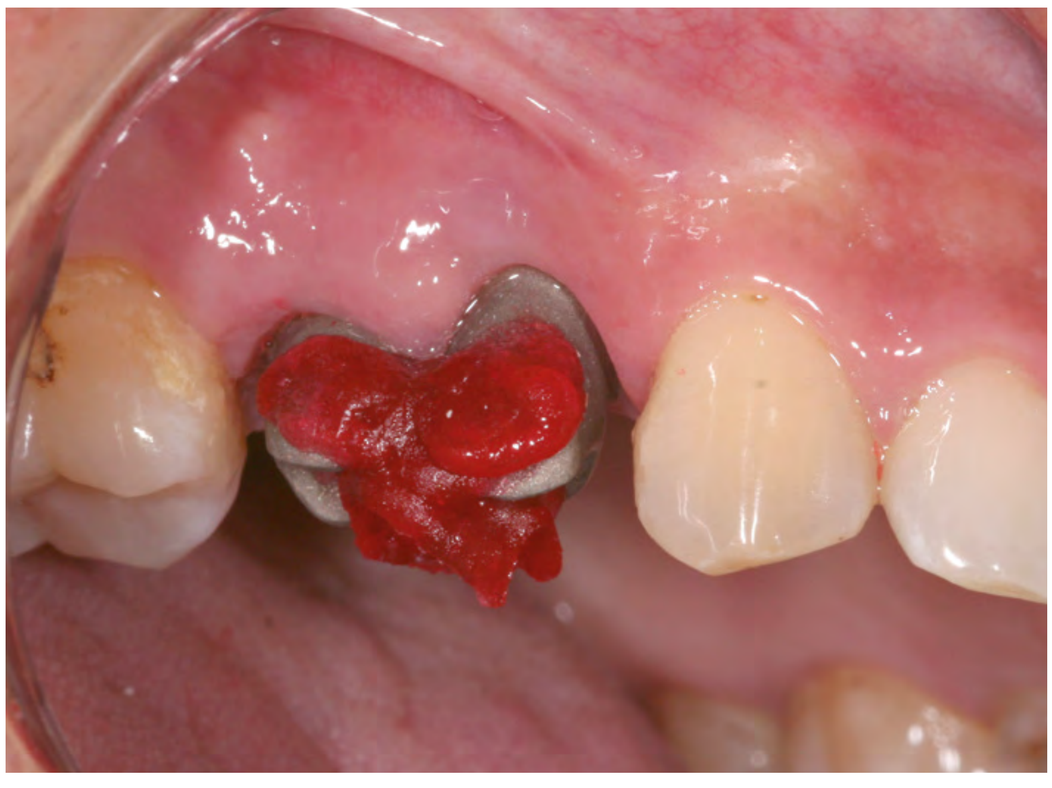
7. Immediate provisional restoration in place and sutures



8. Post provisional restoration X-ray

9. Great emergence profile 4 months after surgery

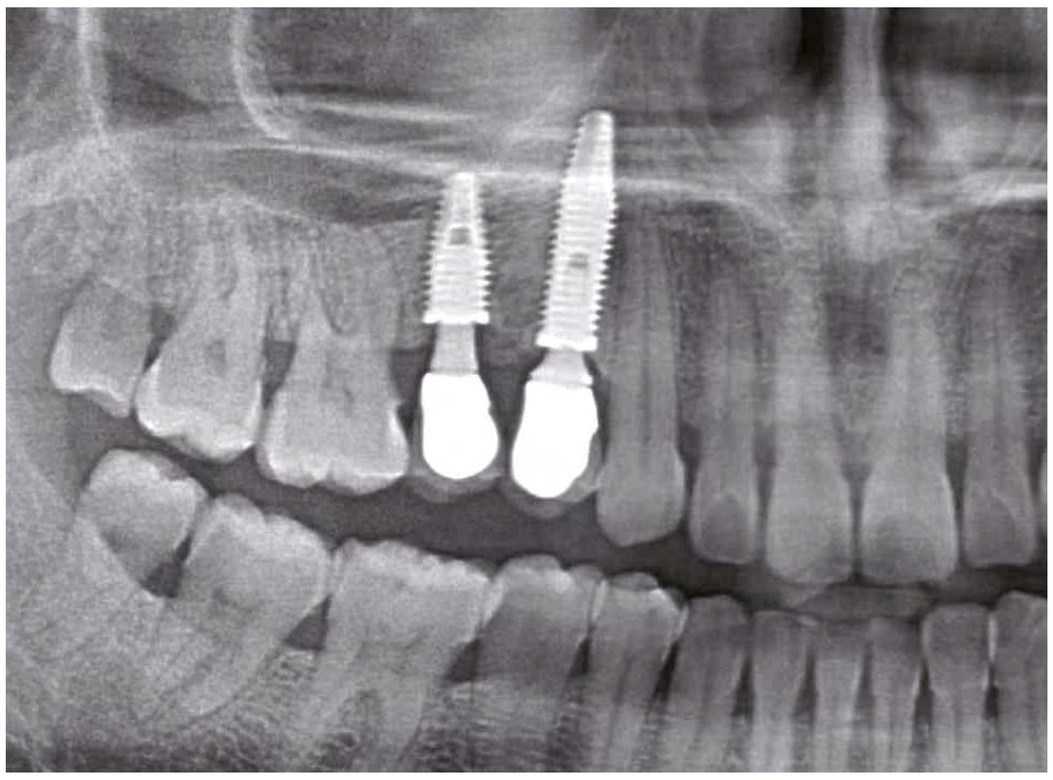
10. Stable soft tissue contours



11. Alloy coping seating test and occlusal registration

12. Final restoration – 6 month after surgery

13. 7-month follow-up X-ray



14. 9-year follow-up X-ray

15. 9-years follow-up intraoral buccal view

Clinical case

HE Zygomatic

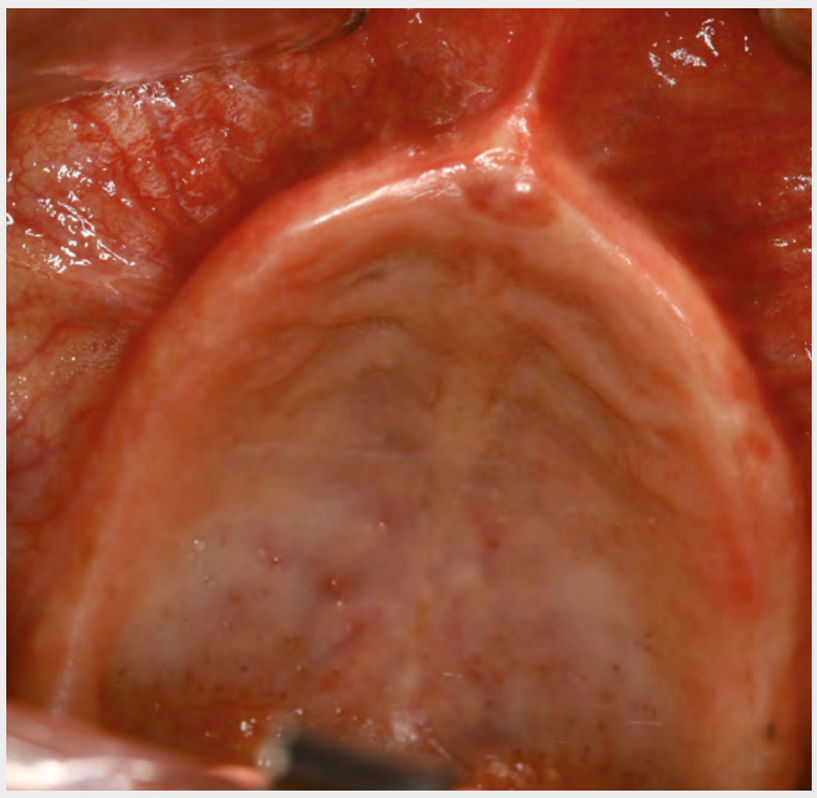
Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior
	4 Zygomatic implants (Maxilla)	Non guided surgery
Restorative Solution	CAD/CAM	Cobalt-chromium bar, Resin restoration

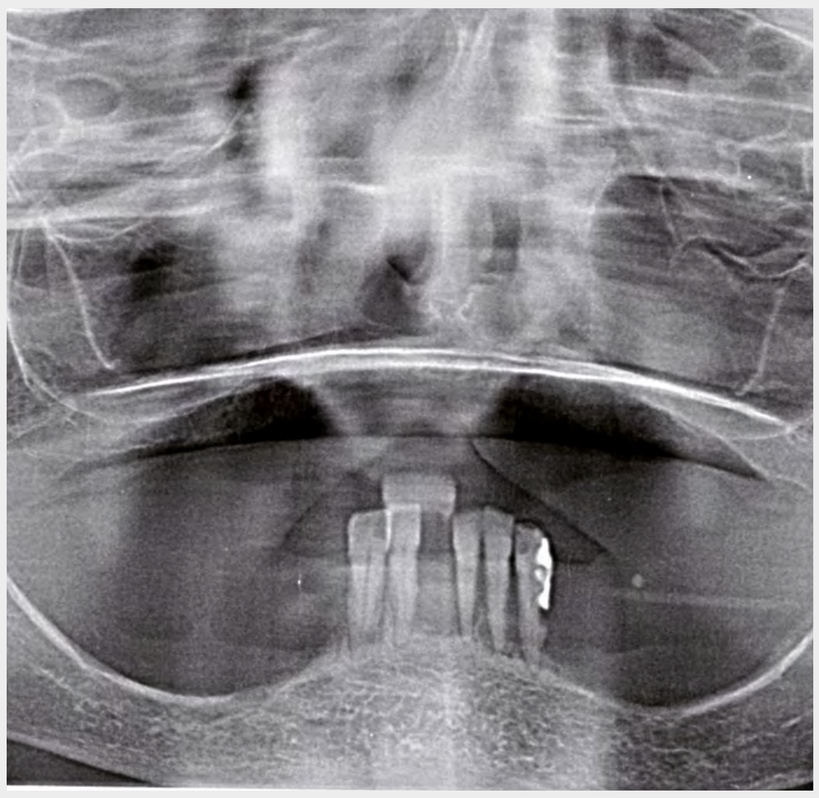
Profile
R. C., Female, 83 years old, Berga, Spain

Clinical Situation
Server bone resorption in the maxilla and partially edentulous with periodontal disease in the mandible

Restorative Solution
4 zigomatic implants in the maxilla. Fixed full arch temporary restorations on the same day of the surgery. Final restoration with metal-resin hybrid fixed prostheses.

Surgical products
HE Zygomatic (52.5 mm, 45 mm, 40 mm, 47.5 mm)





Initial situation

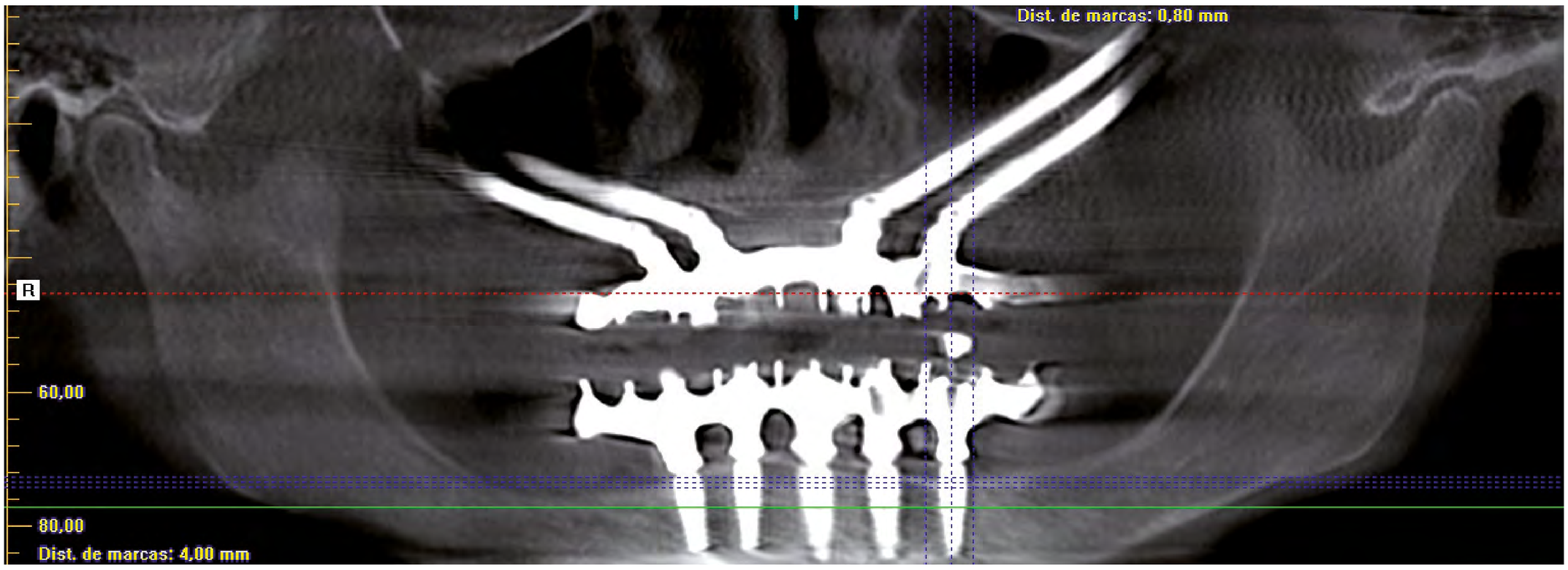
05 / 2014 **Tooth Extraction**

05 / 2014 **Implant Placement**

05 / 2014 **Provisional Restoration**

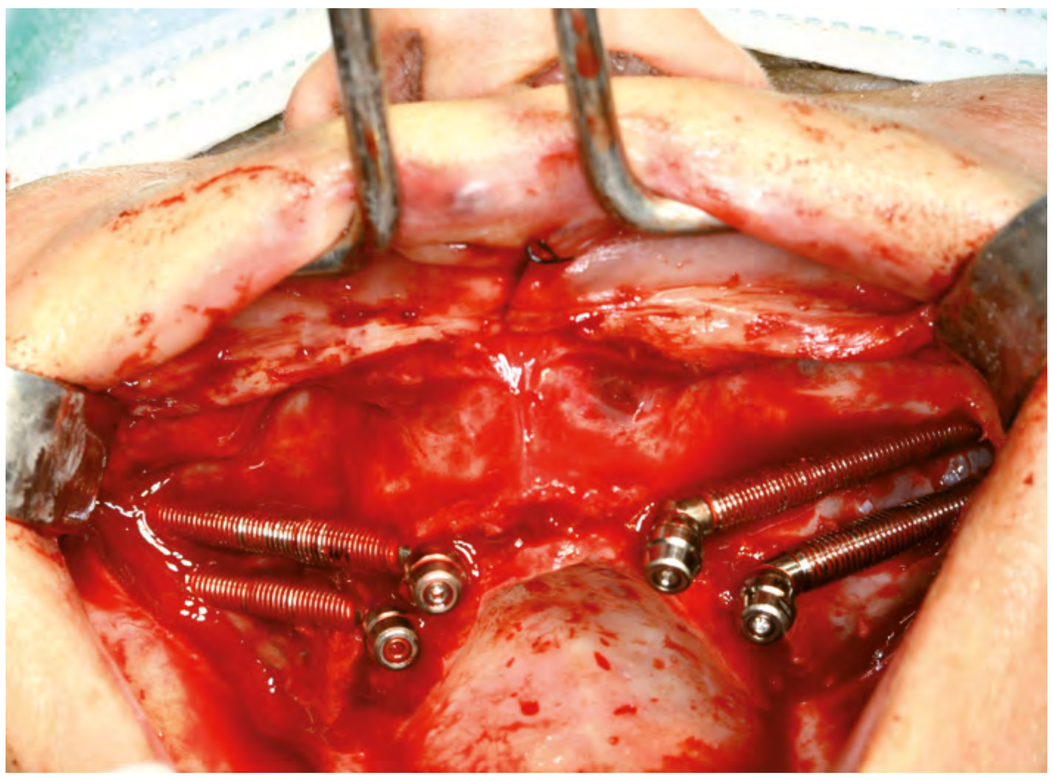
10 / 2014 **Final Restoration**

Dr. Enric Pintado Barcelona, Spain
Private practice in Manresa, Barcelona and Andorra; Graduated in dentistry in Universidad Odontologica Dominicana; Master in Implatologyand Prosthodontics by NYU and Loma Linda University

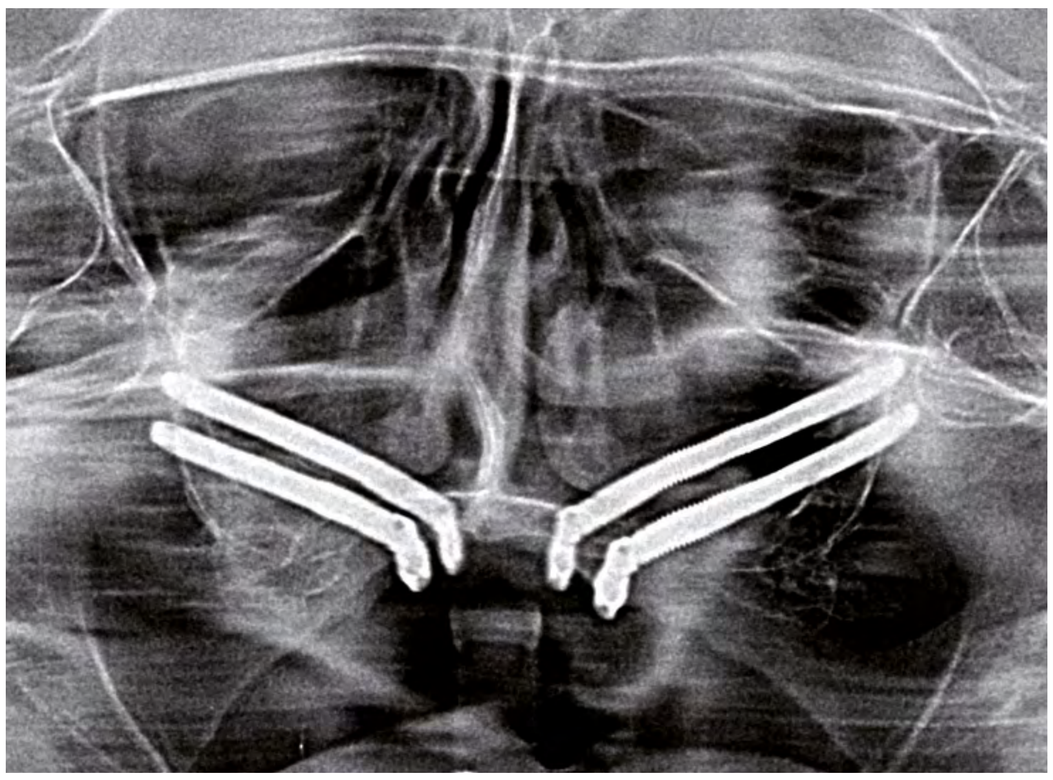


1. Pre-operative CBCT of tooth 11

→



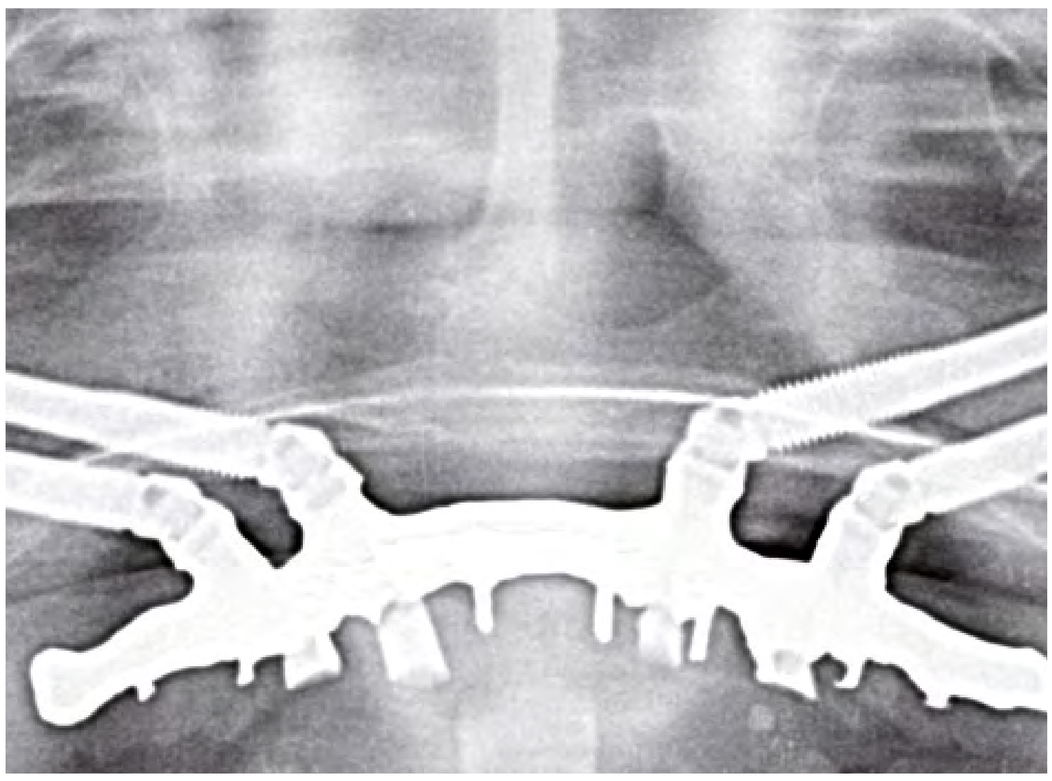
2. 4 zygomatic implants in place



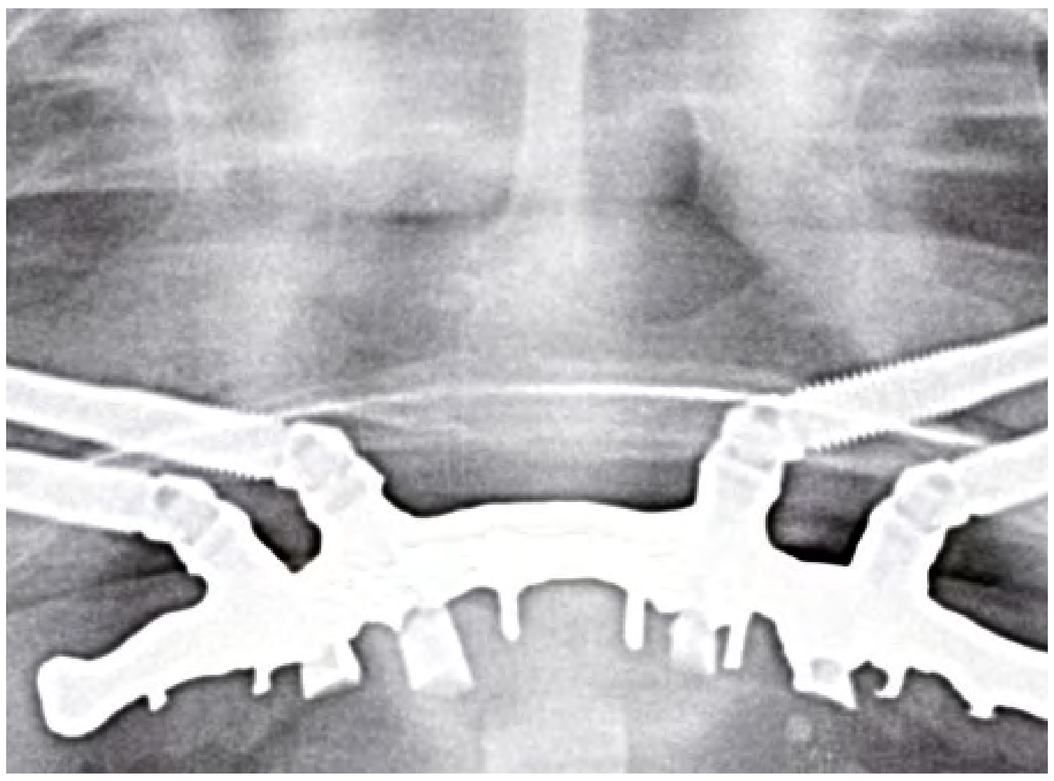
3. Immediate post-operative X-ray

4. Immediate provisional restoration in place

5. Final restoration – frontal view



6. Final restoration X-ray

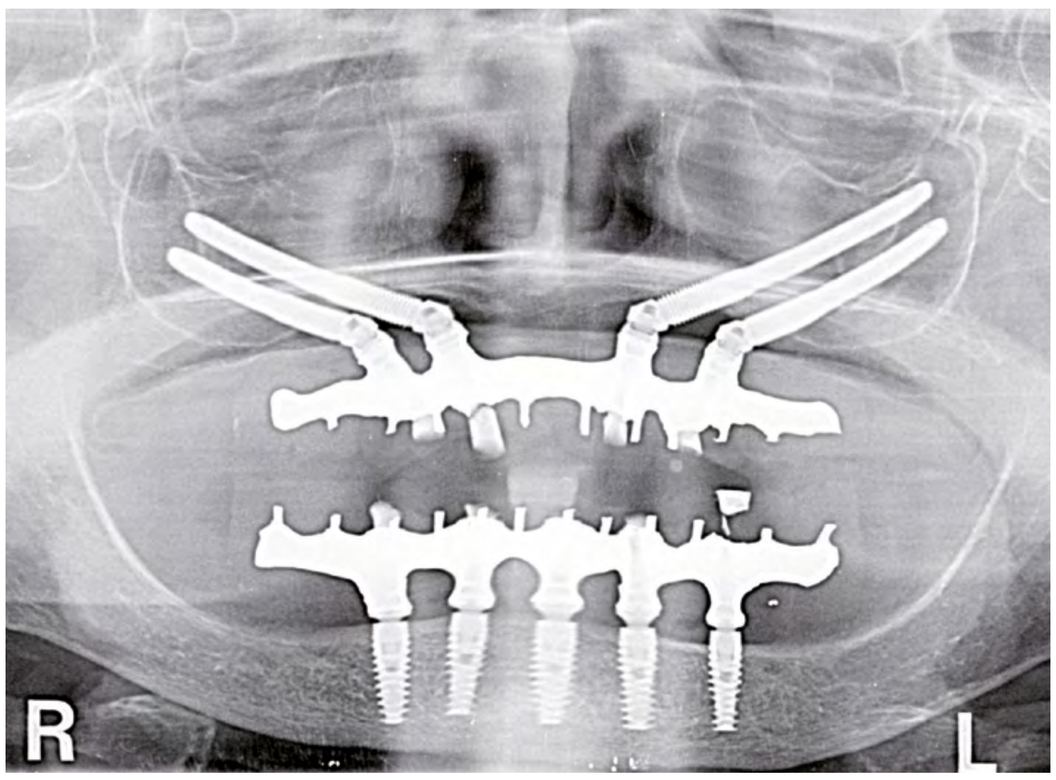


7. 1-year follow-up X-ray

8. 1-year follow up – occlusal view

9. 1-year follow up – intraoral right-side

10. 1-year follow up – intraoral left-side



11. 3-year follow-up X-ray

Clinical case

CM Drive NeoPoros,
CM Alvim NeoPoros

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Anterior and Posterior
	6 Implants	Conventional
Restorative Solution	Conventional	Metal – ceramic

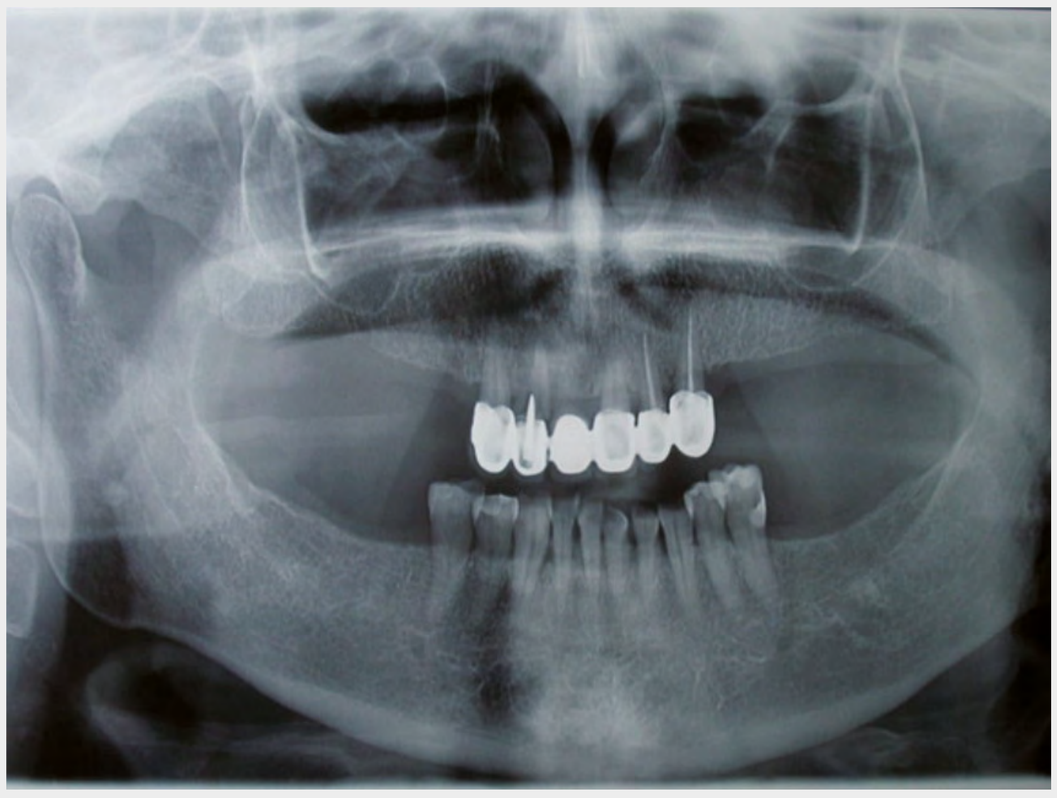
Profile
M.C., Female, 67 years old, Rome, Italy

Clinical Situation
Severe periodontal and carious disease in the maxilary anterior zone

Restorative Solution
Extraction of tooth 21 and 22, followed by immediate implant placement in the area of tooth 16, 14, 12, 22, 24, 26, and immediate provisional fixed full arch Final Prostheses after 3 months.

Surgical products
CM Drive NeoPoros (4.3 × 10 mm (tooth 16, 26))
CM Drive NeoPoros (3.5 × 10 mm (tooth 14, 24))
CM Alvim NeoPoros (3.5 × 10 mm (tooth 11, 21))

Prosthetic products
CM Universal Abutment Non-indexed 3.3 × 6 mm



Initial situation

02/2017 **Tooth Extraction**

02/2017 **Implant Placement**

02/2017 **Provisional Restoration**

05/2017 **Final Restoration**

Dr. Michele A Lopez Italy

Graduated in Medicine and Surgery, Università Cattolica del Sacro Cuore, Rome, in 1989; Obtained specialisation in Odontostomatology in 1993; Senior lecturer of the State University of San Marino; Patent holder of an implant shape and burs.

1. Pre-operative X-ray

2. Post provisional restoration X-ray

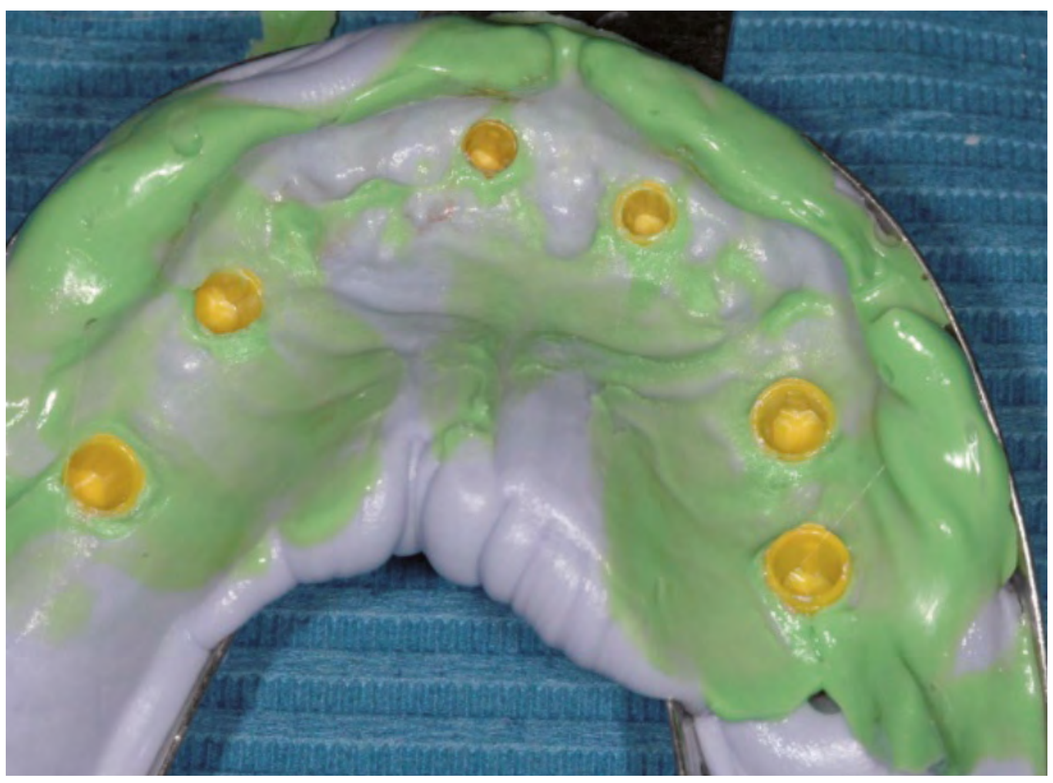
3. Temp abutment coping in place

4. Provisional restoration

5. Provisional restoration

6. Provisional restoration – intraoral frontal view

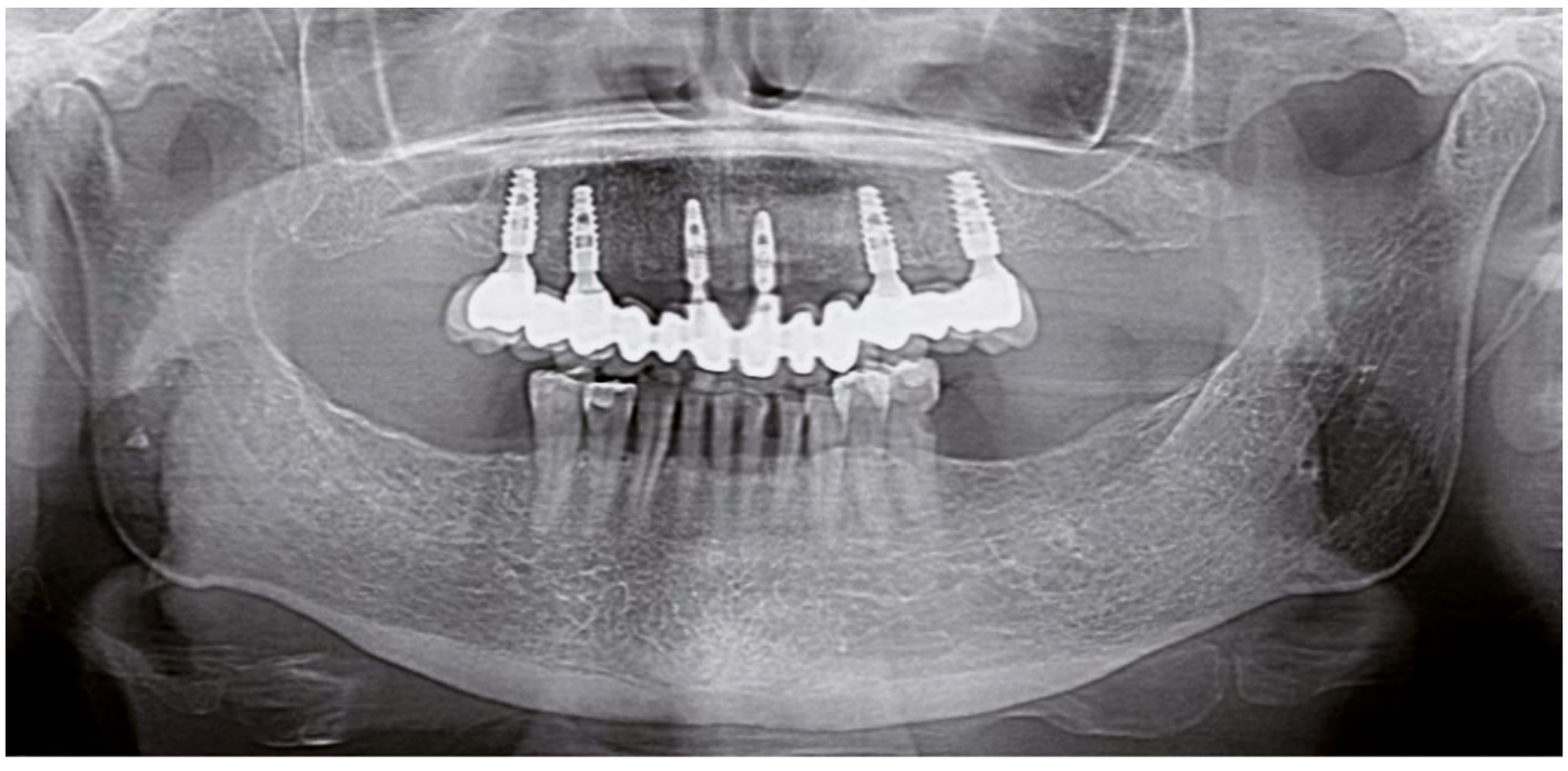
7. Healing aspect 3 months after surgery



8. Universal abutment impression coping in place

9. Final restoration intraoral frontal view

10. Final restoration extra oral frontal view



11. 7-month follow-up X-ray

Clinical case

Summary	Immediate loading protocol	
Surgical Description	Maxilla	Full Jaw
	6 Implants	Non guided surgery
Restorative Solution	CAD/CAM	PFM

CM Drive NeoPoros

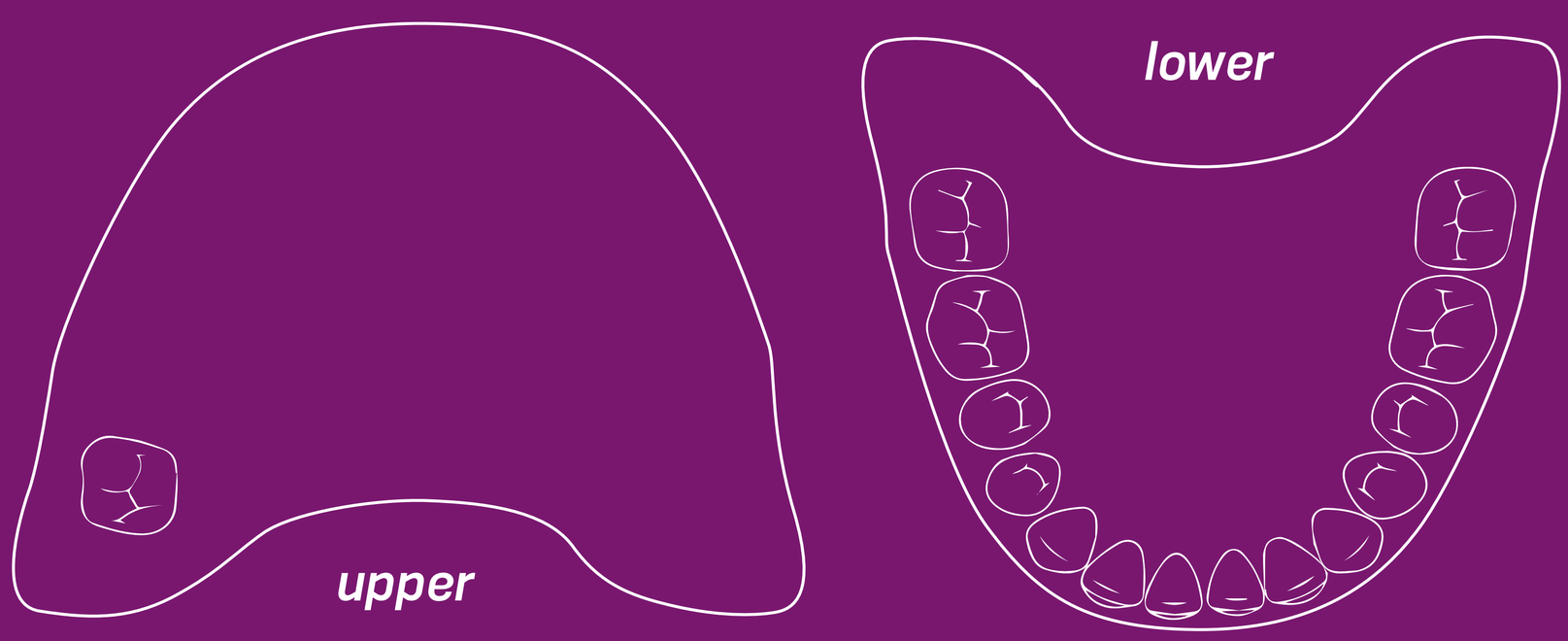
Profile
P.M., Male, 55 years old, London, UK

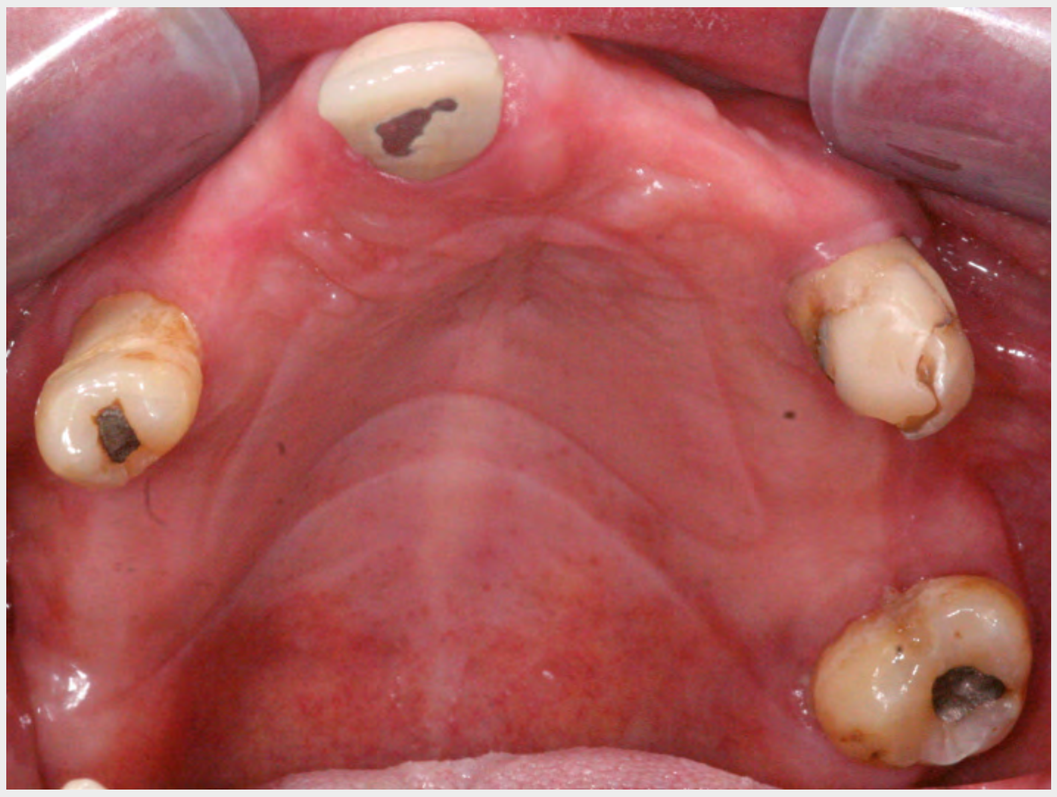
Clinical Situation
Patient presented with few upper teeth remaining using a removable partial prosthesis and was looking for a fixed implant solution. The unerupted canine tooth was left in situ.

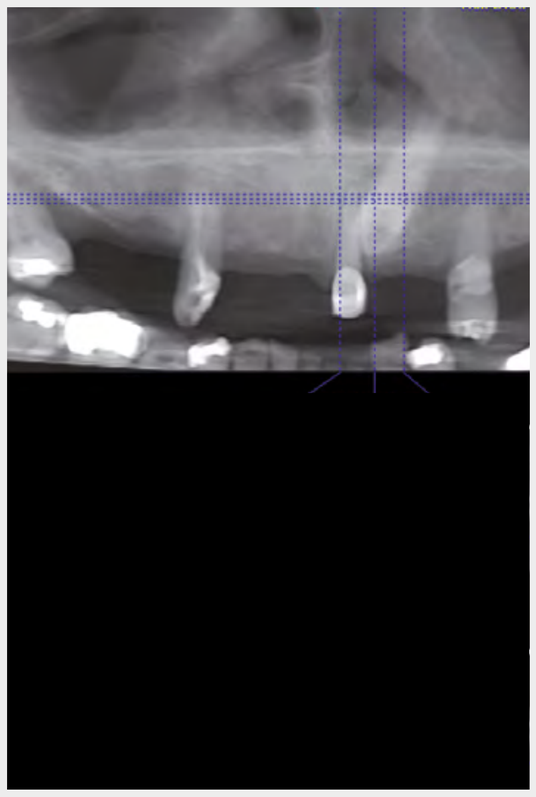
Restorative Solution
Extraction followed by immediate placement of 6 Neodent implants, selection of abutments and conversion of removable immediate prosthesis into a provisional immediate load prosthesis.

Surgical products
CM Drive NeoPoros (3.5 × 10 mm, 4.3 × 11.5 mm, 3.5 × 11.5 mm, 3.5 × 10 mm, 3.5 × 10 mm, 4.3 × 8 mm)

Prosthetic products
CM Mini Concial Abutment Non-Exact (1.5 mm height, 2.5 mm height, 2.5 mm height, 1.5 mm height, 3.5 mm height, 5.5 mm height)







Initial situation

05/2016 **Tooth Extraction**

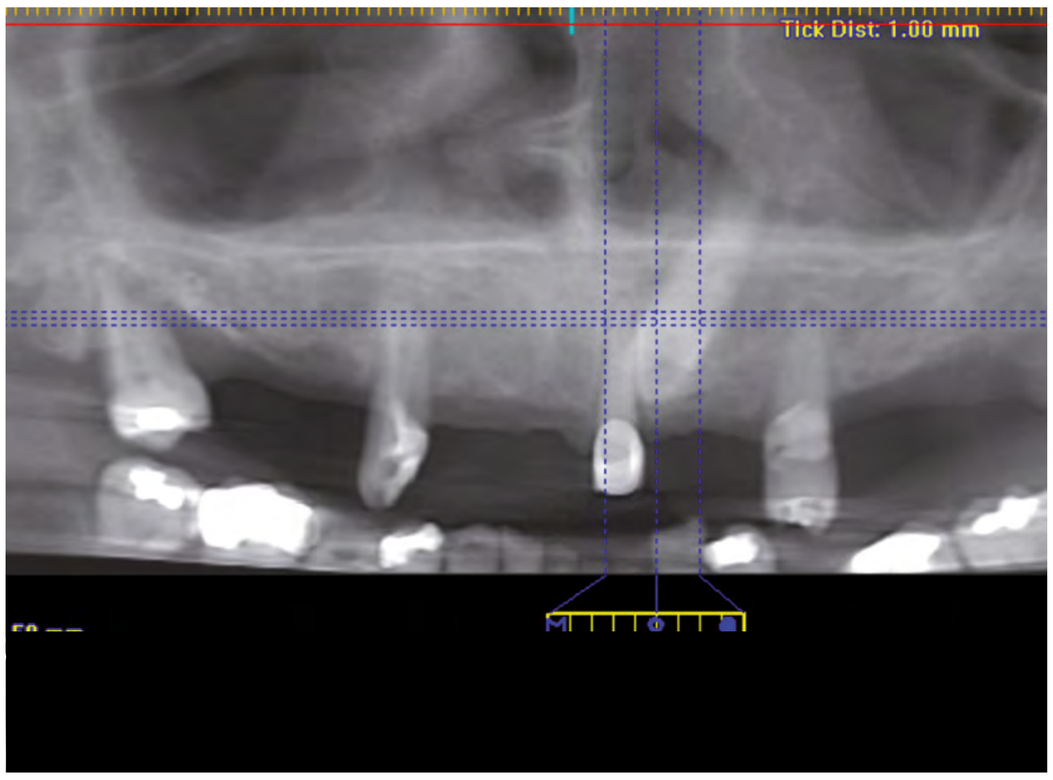
05/2016 **Implant Placement**

05/2016 **Provisional Restoration**

08/2016 **Final Restoration**

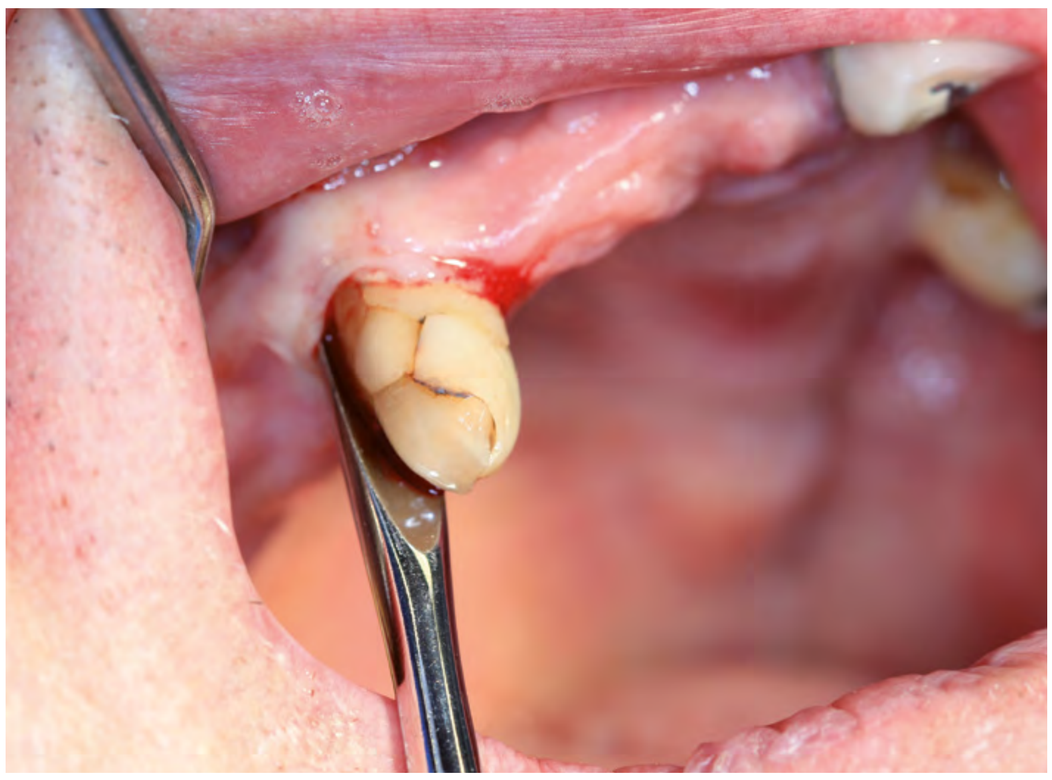
Dr. Nadeem Zafar London, UK
Qualified Guys Hospital, London 1994,
MSc Implantology, Eastmans Institute, London 2000
Director Perio Implant International

Dr. Alex Tahalani Romford, UK
Qualified at St. Bart's & The Royal London
School of Medicine and Dentistry, 2003,
Post graduate implant training at Warwick University.
Director and tutor, Perio Implant International

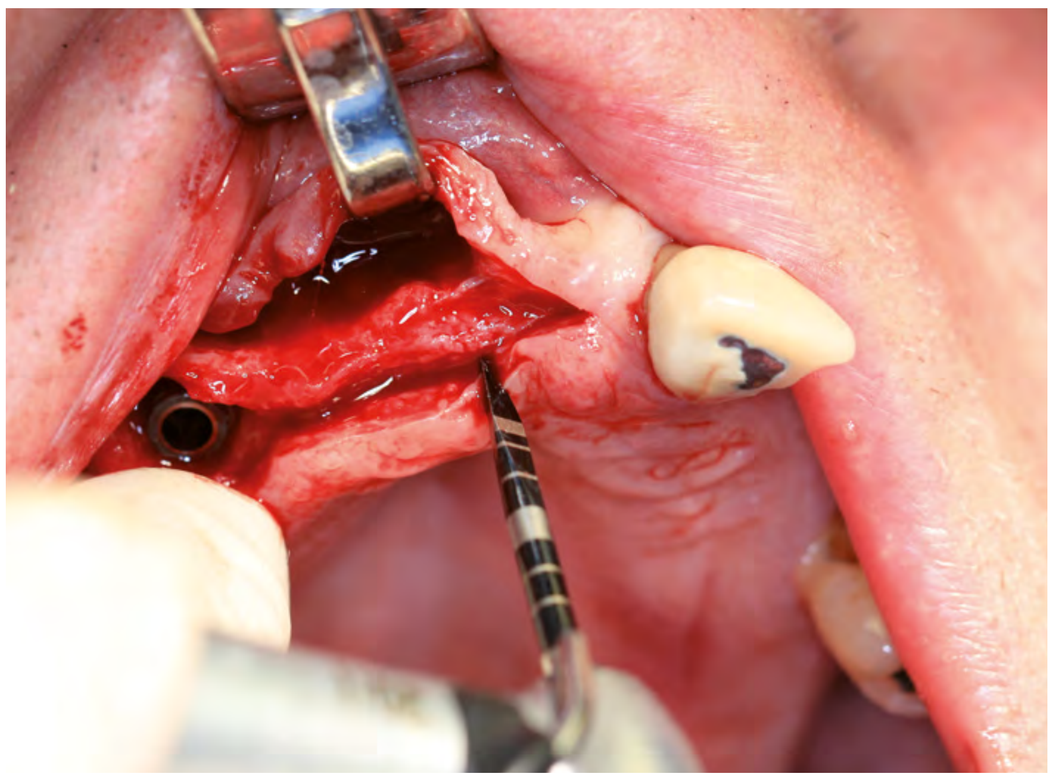


1. Pre-operative X-ray

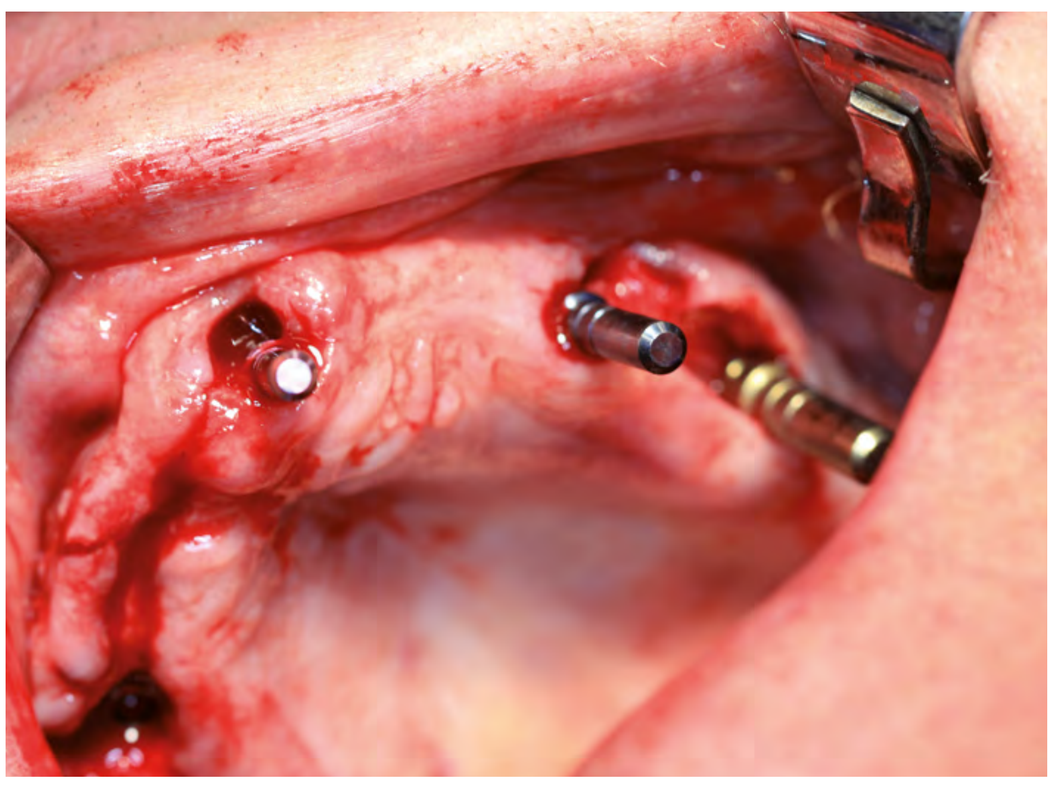
2. Initial situation intraoral frontal view



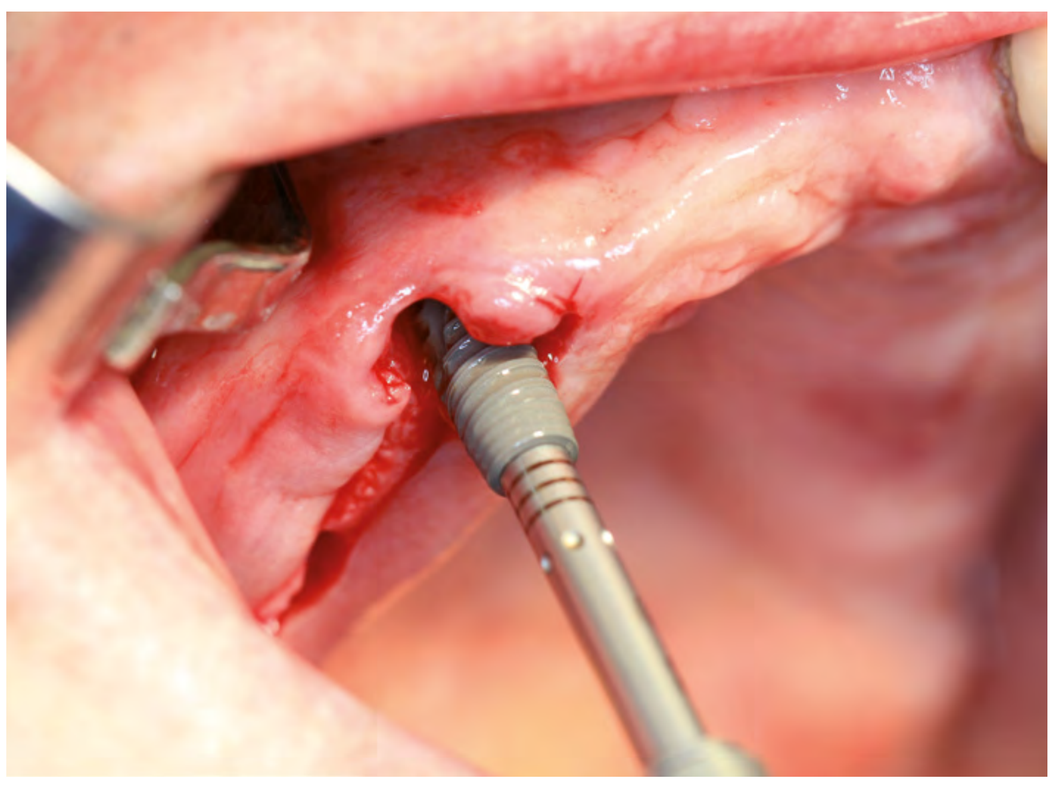
3. Tooth extraction



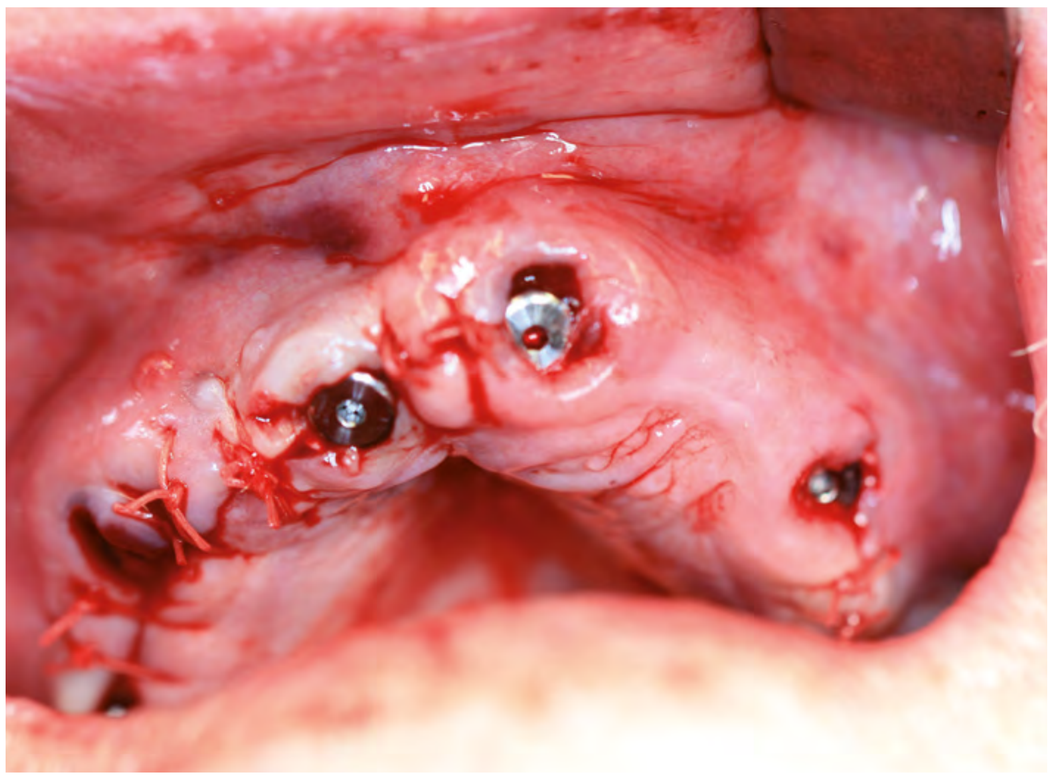
4. Implant site preparation



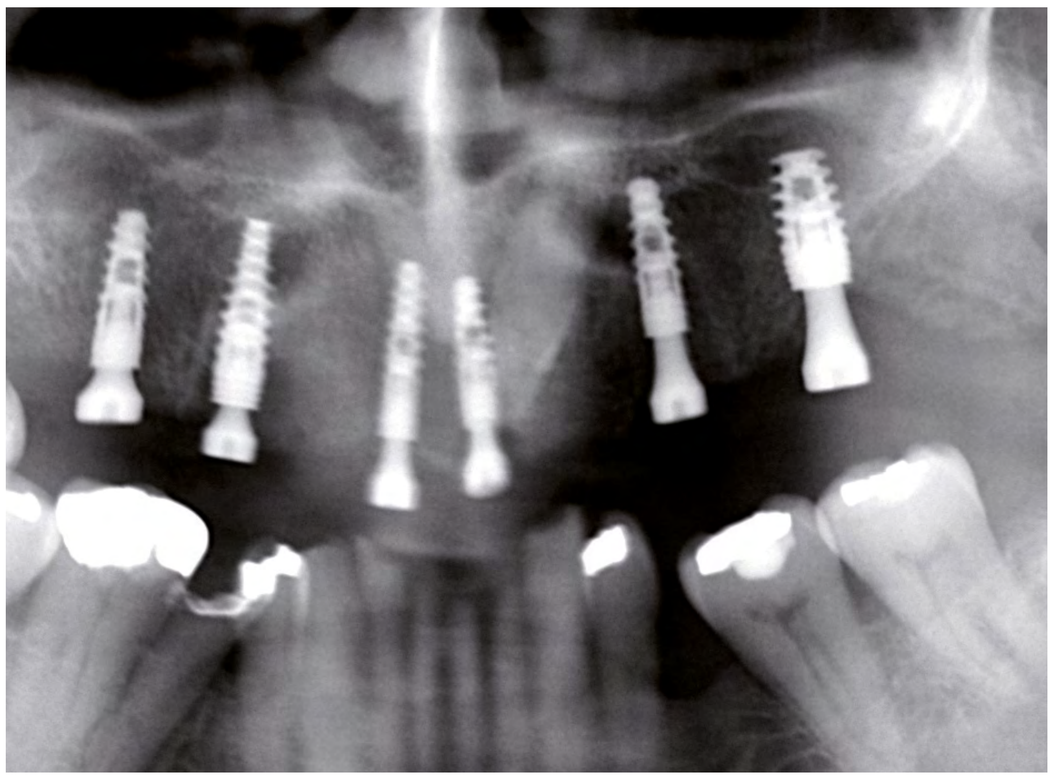
5. Guide pin (Direction indicator) insertion for angulation check



6. Implants in place

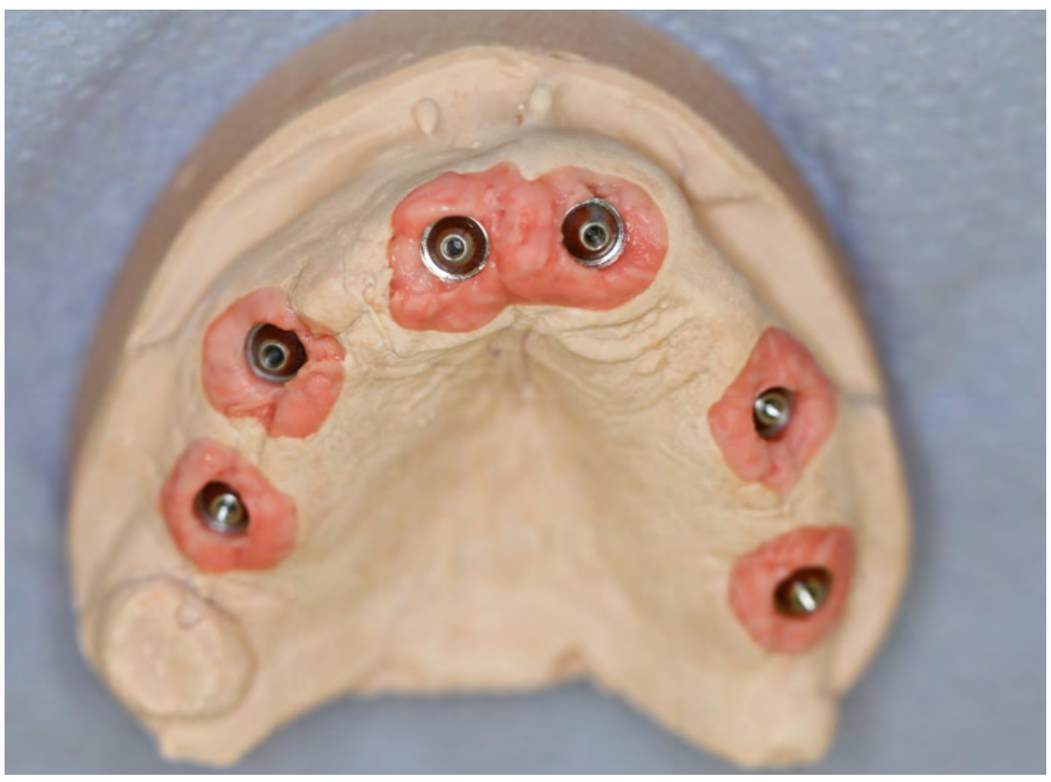


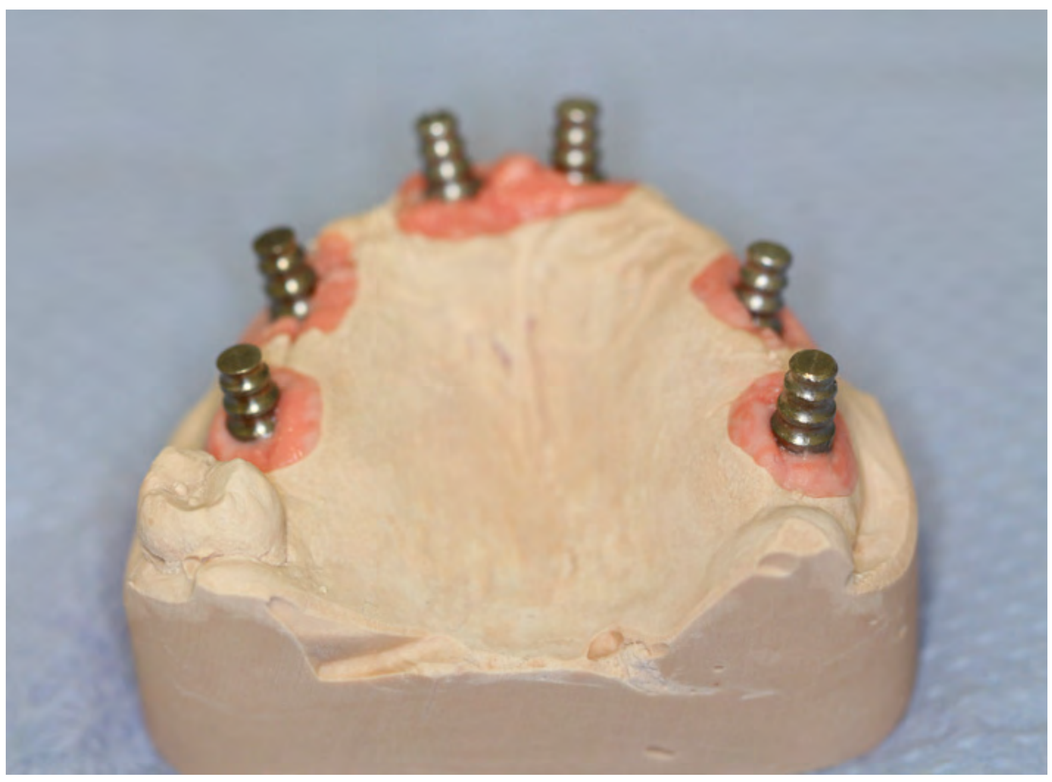
7. Healing abutments placed and sutured



8. Post Operative X-ray

9. Splinting for impression taking

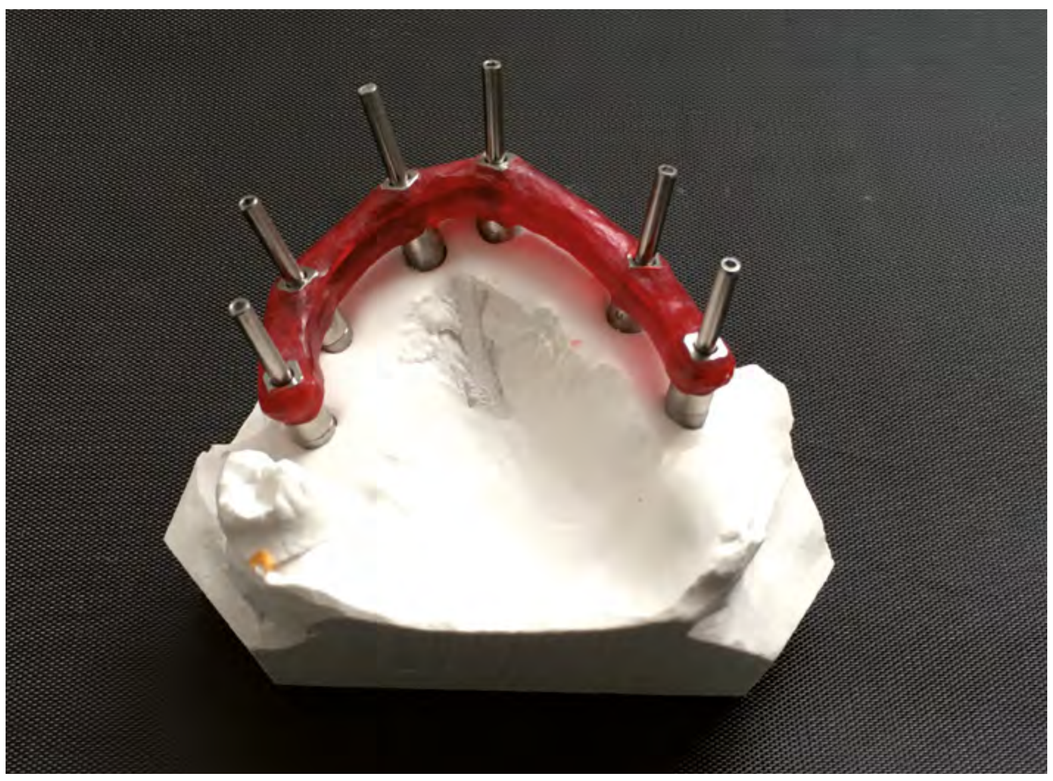




10. Patients returned few days after surgery for mini conical abutment and provisional restoration Model made for provisional restorations

11. Denture converted into provisional restorations

12. Provisional restoration in place Extra oral frontal view

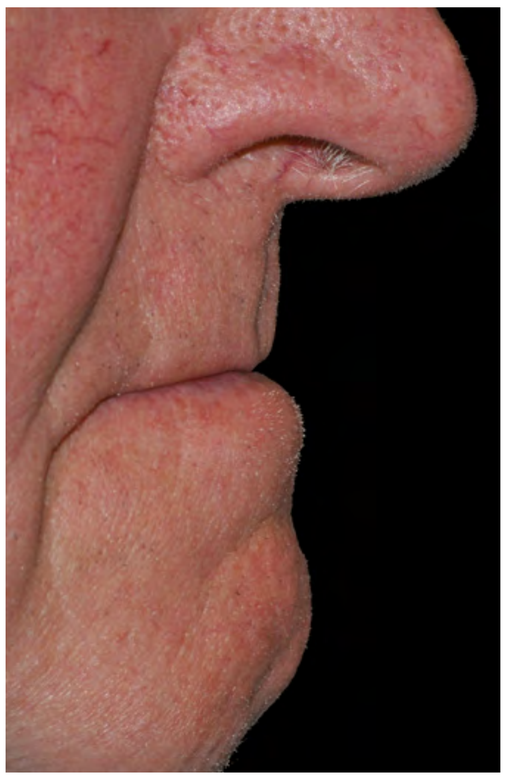


13. Verification jig made using open tray impression coping and Duralay 3 months after surgery

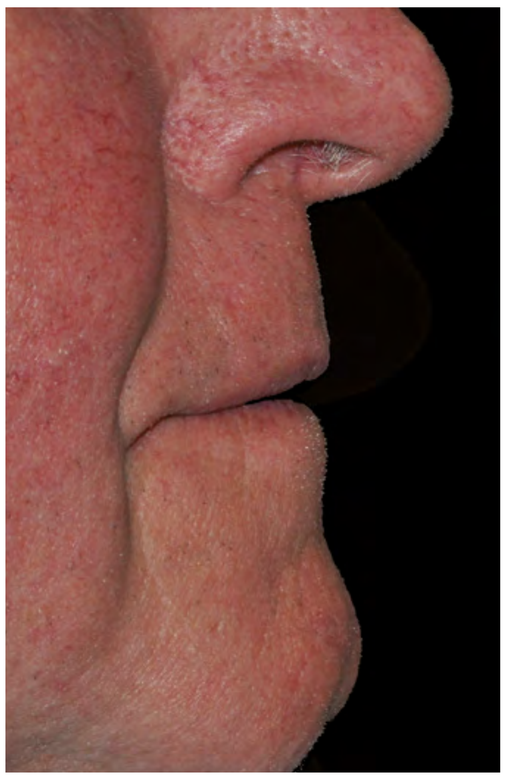
14. Metal framework designed with CADCAM and tryin; Bite registration taken

15. Metal framework designed with CADCAM

16. Metal framework with artificial gingiva and individual crowns



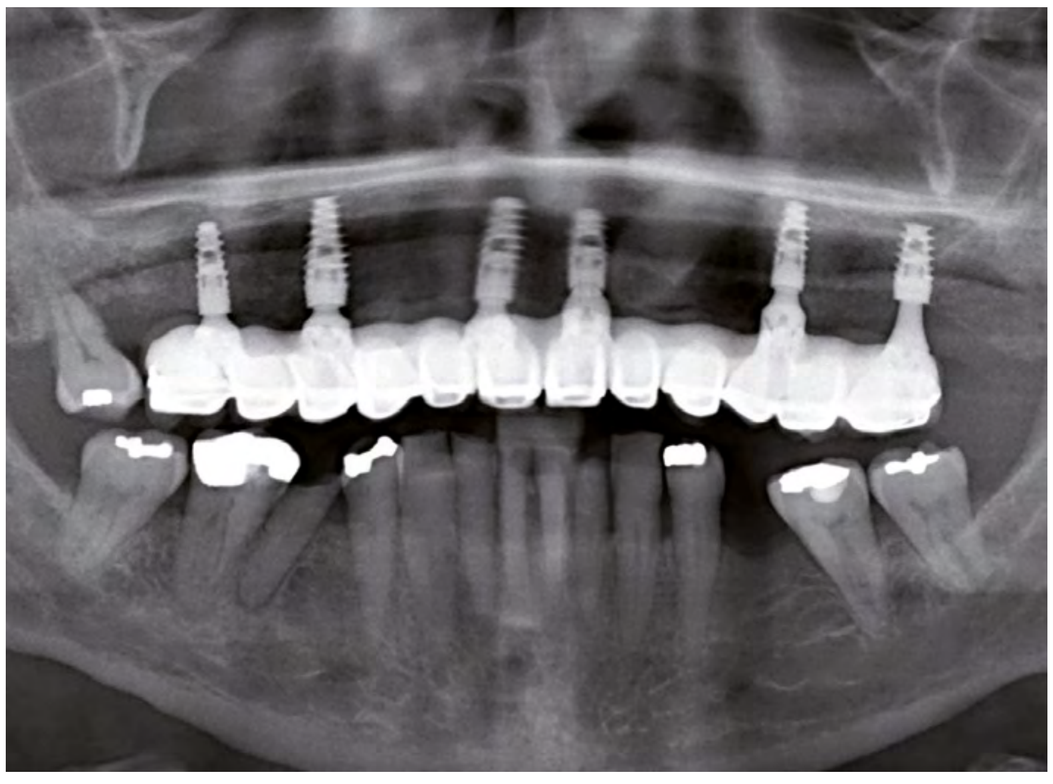
17. Pre-op facial profile



18. Post-op facial profile

19. Final restoration with individual crowns cemented

20. Photo of final restoration – Intra oral frontal view



21. Follow up 1 year X-ray peri-apical