Cystic lesion management with enucleation and reconstruction followed by delayed implant placement for maxillary premolars

A step-by-step workflow

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Introduction

It is common practice to use delayed implant placement in patients whose teeth have been lost due to infection in the site. In case of long-term pre-existing infections, there is always a possibility that the implants will be negatively affected. According to Resnik and Misch, this occurs primarily because of the microbial interference in the healing process caused by pre-existing inflammation.[1] Pre-existing inflammatory conditions such as periodontitis will release inflammatory factors, increasing the risk of secondary infection.[2,3] However, animal research, human case reports and case series, and prospective studies have confirmed that there is no difference in the success rates of delayed implant placement in sites associated with chronic periapical pathology and immediate implant placement in similar conditions.[4,5] This case report aims to illustrate the workflow involved in managing a cystic lesion around a maxillary first premolar with a staged grafting approach and delayed implant placement.

A delay in implant placement is often accompanied by residual bone resorption, compromising the bone volume and causing a more significant labial or lingual discrepancy between the implant and the prosthesis.[6,7] Therefore, to preserve the alveolar bone level and to reduce the treatment time, an immediate implant placement approach is becoming a popular choice compared with the delayed approach.[6] In this clinical case, despite the advantages of immediate implant placement, we decided on delayed implant placement to avoid the

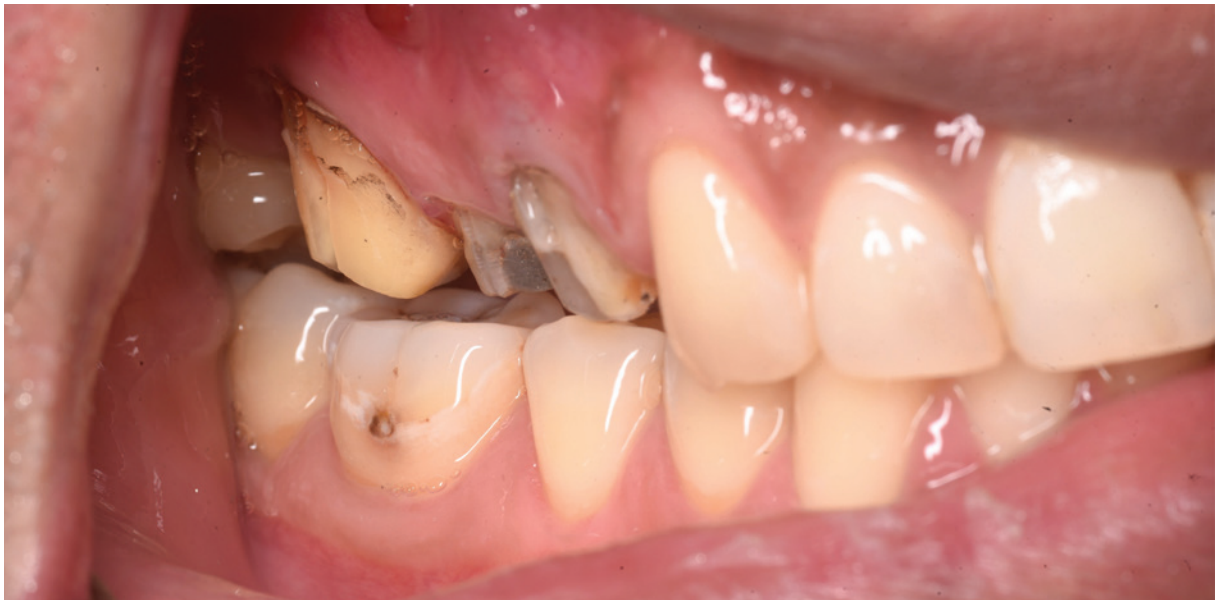

Fig. 1: Pre-op clinical situation, showing a small, localised swelling deep in the vestibule next to the first premolar and a cross bite.

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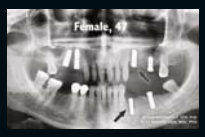

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possible risk of microbial interference in the healing process.[1] Additionally, we preferred delayed implant placement because the size of lesion was large and there was insufficient bone for immediate implant stability.[1] Furthermore, the implant diameter, selected on the basis of the planned emergence profile and interdental space, appeared to be too small to enable the implant to have adequate contact with any residual, non-augmented bone.[8,9] This is why we finally decided to leave the bone to heal unloaded without the stress of simultaneous osseointegration, choosing a staged, delayed approach.

Case presentation

A 30-year-old non-smoker with no chronic disease presented to our clinic with a history of conservative periodontal treatment and with the main complaint of dull pain in the maxillary right first premolar region. The patient was systemically healthy and extensively evaluated for clinical signs, suitability for implant treatment and the risk of postoperative complications. Clinical examination revealed healthy gingival tissue in most areas and discoloured crowns of teeth #15 and 16, requiring restoration (Fig. 1). The preoperative CBCT scan showed a circumscribed radiolucency of approximately 9 × 6 mm at the periapical region of tooth #14. It also showed endodontic treatment on both teeth #15 and 16. Prior to the surgery, thorough medical consultation was done and possible risks of and alternatives to the treatment were explained to the patient.

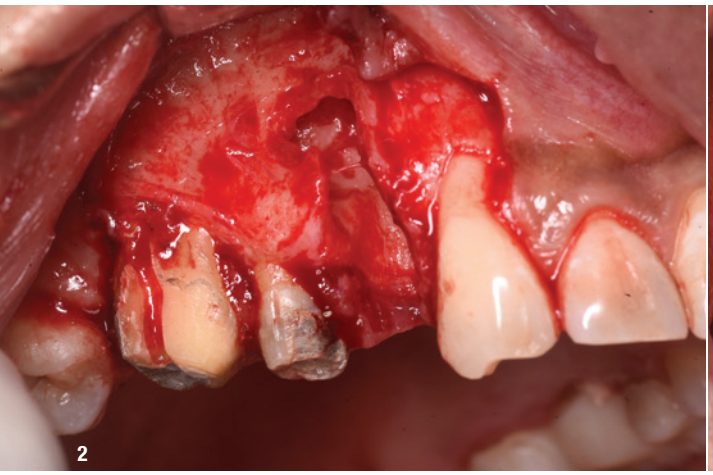
Surgical procedure

One hour before the surgical procedure, the patient received a prophylactic dose of 1 g amoxicillin and performed a 2-minute rinse with 0.2% chlorhexidine. The aim of the surgical protocol was to eliminate the pathology before placing the implant and to maximise the soft and hard tissue available for primary healing and bone augmentation. Under sterile conditions, local anaesthesia (2% lidocaine hydrochloride with 1:80,000 adrenaline) was administered before tissue separation and extraction. Surgical access to the cyst was obtained through an incision mesial to the canine, respecting the papillae, to the distal sulcus of tooth #16. A full-thickness flap was carefully elevated using a periosteal elevator. Tooth #14 was extracted atraumatically using forceps and elevators, and the cystic defect was exposed simultaneously. Enucleation of the lesion was carried out, followed by socket degranulation using curettes and saline solution for irrigation (Fig. 2).

The extraction socket was filled with a highly porous anorganic porcine bone mineral matrix (MinerOss XP, BioHorizons Camlog; Fig. 3).[10] MinerOss XP has high porosity, allowing for optimal osteoconductivity and adequate space for new bone deposition. Scanning electron microscope studies have shown that its porous structure is close to that of natural bone mineral.[10] Additionally, its rough surface facilitates cell adhesion and spread for bone ingrowth.[10]

The graft was then covered with Mem-Lok resorbable collagen membrane (BioHorizons Camlog; Fig. 3), which served as an effective barrier membrane for bone regeneration. This resorbable collagen membrane is engineered from highly purified Type I bovine collagen, which provides a predictable resorption period of 26–38 weeks.[11] The defect was then closed with a #4/0 resorbable suture thread.

The patient was prescribed antibiotics for seven days and a chlorhexidine mouthrinse for two weeks. We demonstrated a roll–stroke brushing technique and encouraged the patient to maintain good oral hygiene.



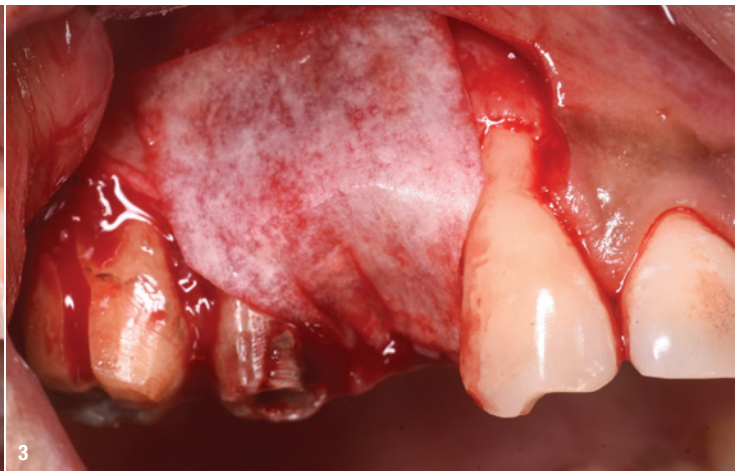
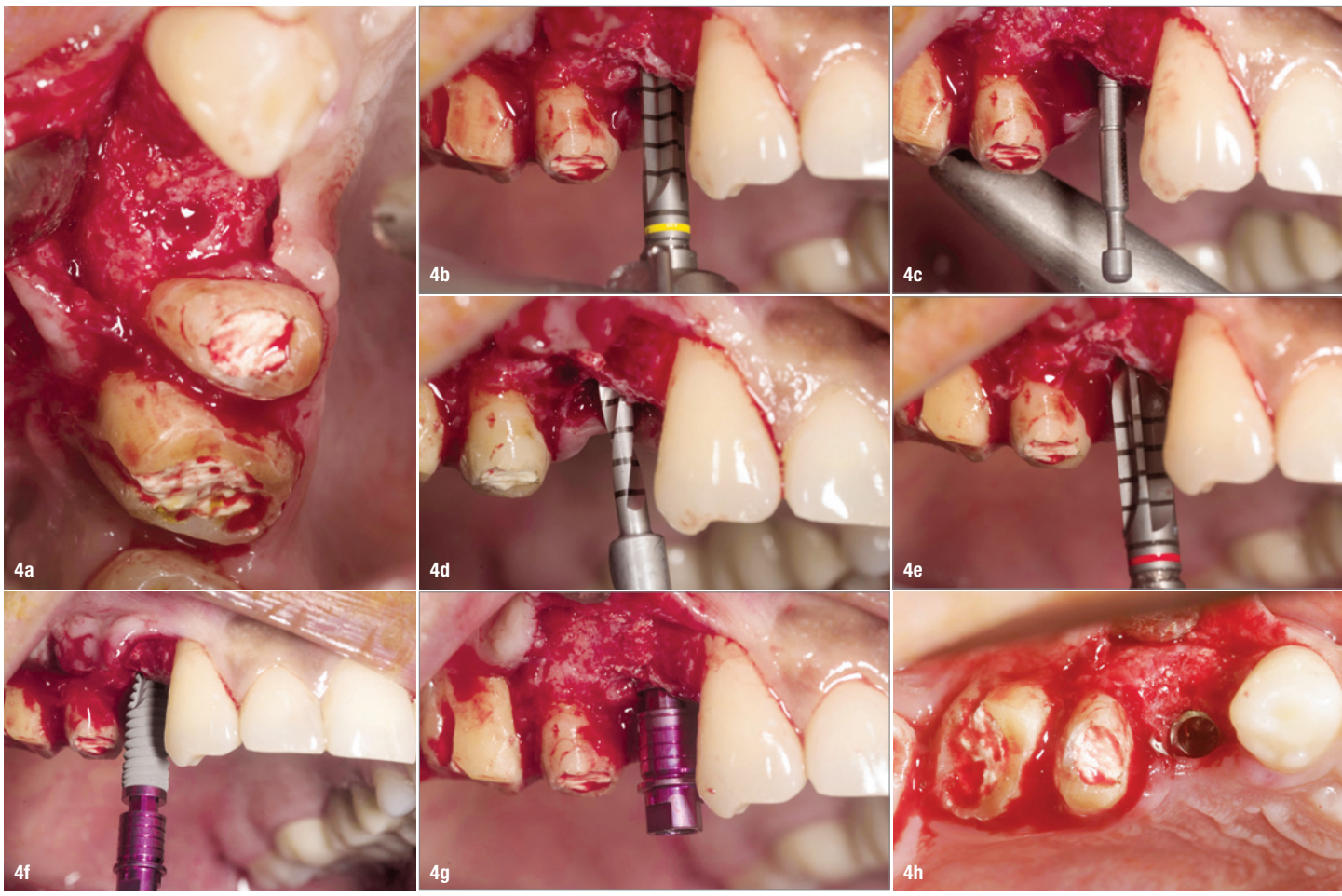


Fig. 2: Incision with extension from the mesial part of tooth #13 to the distal sulcus of tooth #16 and full-thickness flap preparation. Situation after tooth extraction and meticulous debridement of the cystic lesion. **Fig. 3:** The graft was covered with a collagen membrane to serve as an effective barrier for guided bone regeneration.



Figs. 4a–h: Preparation of the osteotomy site and placement of the implant. **Fig. 5:** Intra-oral periapical radiograph confirming the correct position of the implant and cylindrical healing abutment.

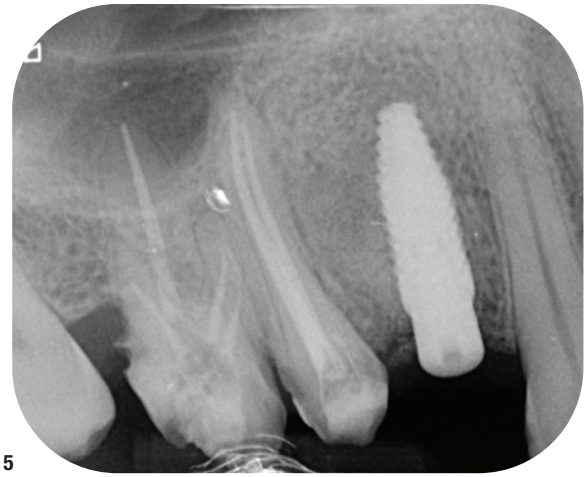
There were no adverse clinical symptoms reported by the patient, and healing was satisfactory. Implant placement was planned in the premolar region after six months. We opted for a single surgical protocol for load-free and non-submerged healing to ensure predictable osseointegration.

Results of guided bone grafting procedure

A radiographic examination after six months showed that the previously infected area had filled completely with bone. The control CBCT scan revealed bone of 9.16 mm in width buccolingually and bone of 6.29 mm in width coronally. Clinically, the area had healed well with no further symptoms or complications, and the site was covered with healthy gingiva and sufficient bone into which to place an implant.

Implant site preparation

The placement of the implant was planned to follow the visual orientation on the CBCT scan. Upon reflecting of a full-thickness flap, the osteotomy site was prepared efficiently using a few well-aligned drilling steps. The initial pilot drill was checked for appropriate axial position and distance relative to the adjacent teeth using a guide pin. With the corresponding flex drills, the diameter of the implant bed was expanded under copious irrigation. The final drill was the profile drill used to match the coronal geometry of the implant with the implant bed. After the sequential drilling, a CONELOG PROGRESSIVE-LINE implant of 4.3 × 13.0 mm (BioHorizons Camlog)



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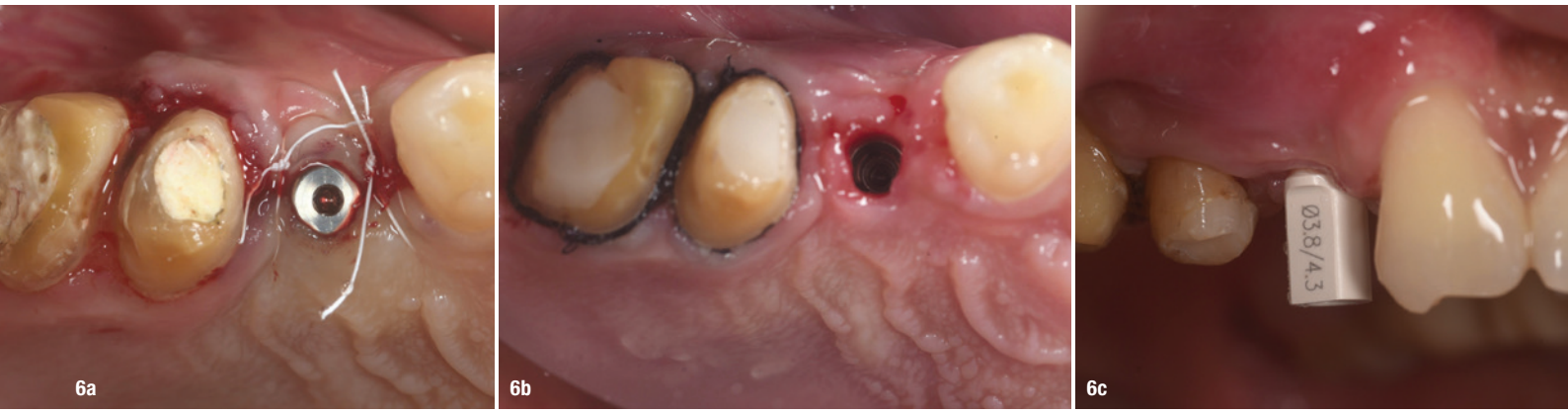


Figs. 6a–c: Wound closed with single interrupted sutures **(a)**. Tissue demonstrating excellent healing after removal of the healing abutment **(b)**. CONELOG scan body screwed on to the CONELOG PROGRESSIVE-LINE implant to register the 3D position of the implant **(c)**.

was placed in slightly subcrestal position (Fig. 4) employing a screw-mounted post.

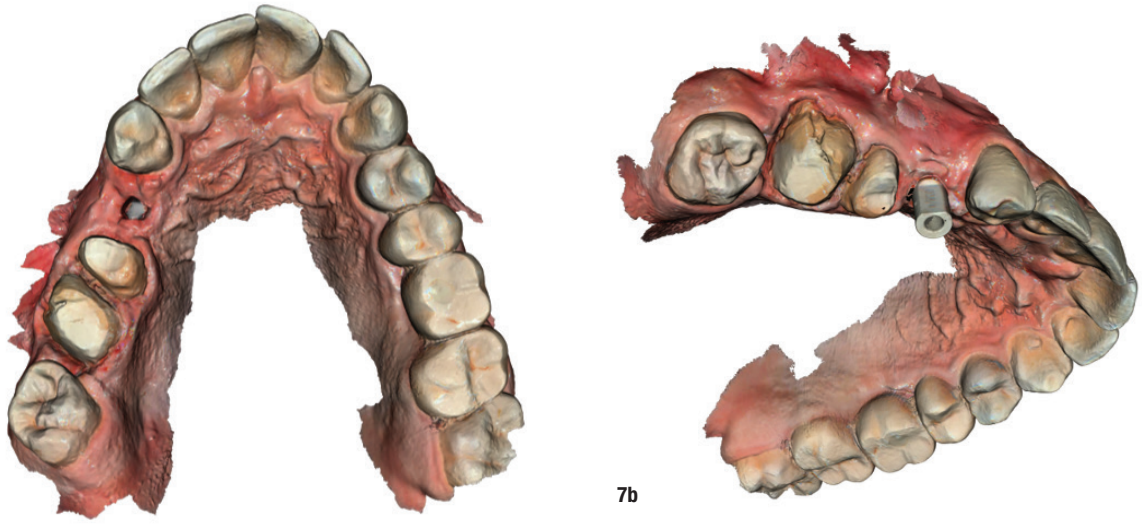
The screw-mounted post is very helpful in situations requiring intra-operative correction of the 3D position of the implant that might be necessary during insertion, for instance, next to the sinus or in very soft bone. Owing to the coronal anchorage thread of the CONELOG PROGRESSIVE-LINE implant, high primary stability could be achieved—even in the very soft bone of the maxilla and in the augmented area. Implant torque during placement was up to 40 Ncm. The correct position of the implant and the cylindrical healing abutment (of 4 mm in gingival height) was confirmed by an intra-oral periapical radiograph (Fig. 5). The flap was readapted and the wound closed with single interrupted sutures using #4/0 Cytoplast PTFE thread (BioHorizons Camlog).

Restoration of the implant

The patient was recalled four months later. Radiographic examination of the implants showed that the implant had fully osseointegrated. After removal of the cylindrical healing abutment, the tissue demonstrated good healing, and the site was ready to be restored (Figs. 6a–c). A CONELOG scan body was screwed in to register the 3D position of the implant. The implant was scanned intra-orally using an optical scanner, and the data was then sent to the laboratory for the prosthetic restoration (Fig. 7). A custom model was printed in the laboratory, and a straight CONELOG Esthomic abutment of 1.5–2.5 mm in gingival height served as a base for the zirconia structure. The definitive zirconia restoration was bonded to this structure, resulting in a screw-retained and retrievable full-contour crown (Figs. 8a–c). The post-restorative intra-oral radiograph done on the same day as the prosthetic crown delivery showed a satisfactory fit of the zirconia crown and the ideal preservation of the coronal bone in the interproximal area (Figs. 9a–10b).

Discussion

Dimensions of the lesion and inadequate morphology and non-effective debridement of the area are some of the factors that need to be considered when placing an



Figs. 7a & b: Intra-oral scans of the implant.

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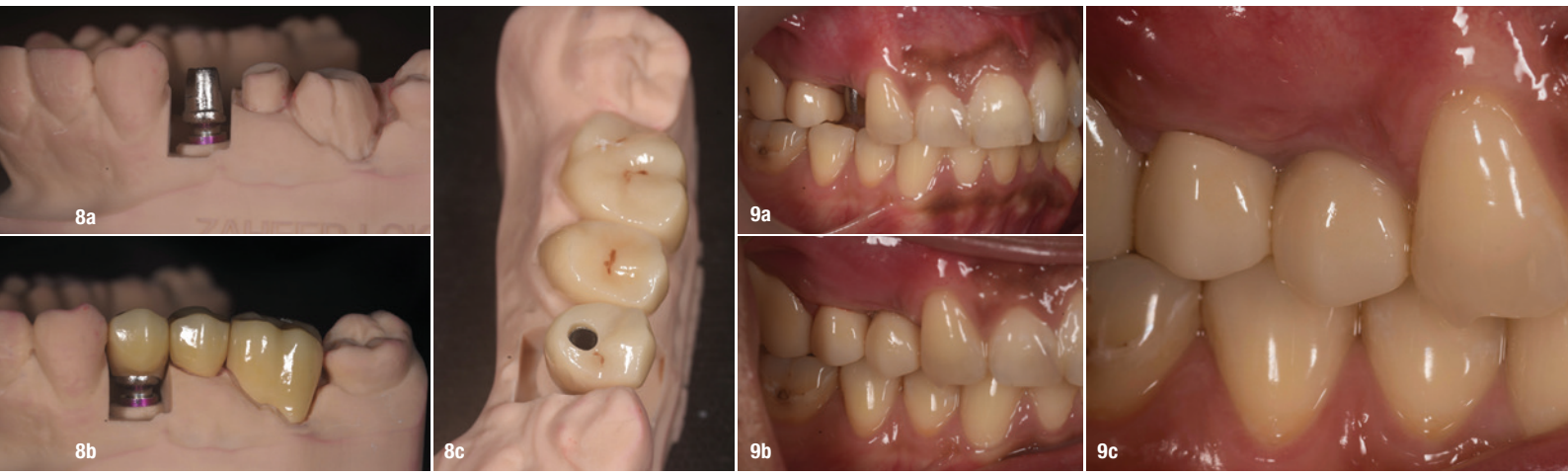


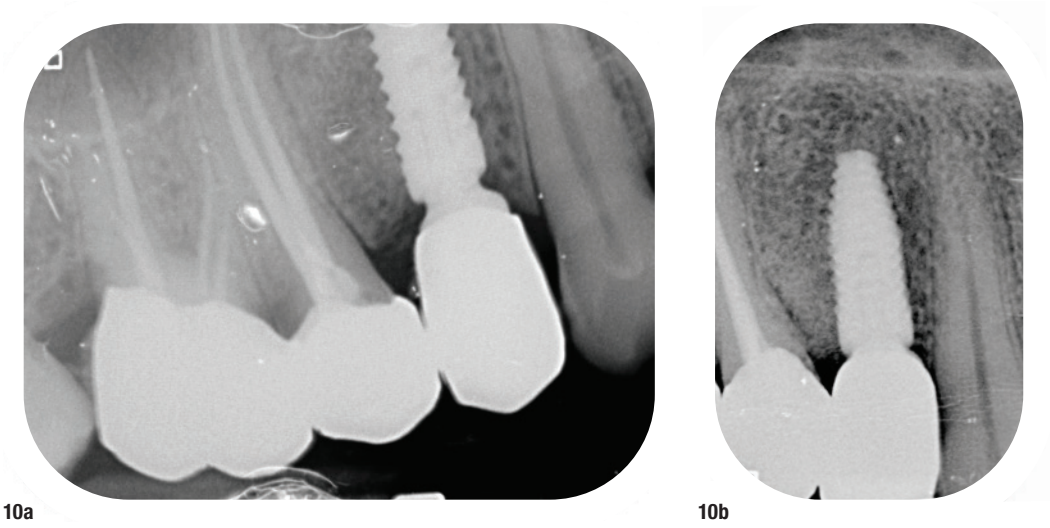
Figs. 8a–c: CONELOG Esthomic abutment **(a)** and definitive zirconia restorations on the model **(b & c)**. **Figs. 9a–c:** Final post-restorative images, lateral view.

implant in the area of pre-existing infected cysts. This case report has demonstrated that the placement of an implant in the area of a pre-existing infected cyst requires antibiotic administration and thorough alveolar debridement at the site of the cyst. We opted for the approach of Chen et al. considering that immediate implantation involves the risk of contamination of the implant by the residual infection, which can affect the process of osseointegration.[12]

However, the discussion is ongoing. Some authors support immediate placement into infected extraction sockets, as they consider the benefits of reduced bone resorption and treatment time superior to the potential negative effect on osseointegration.[13] However, very little clinical data is available for immediate implant placement in infected cysts.

Even if the design of the implants has been improved when it comes to reliable achievement of high primary stability—such as you can expect from the implant system used in this case—many authors still claim that a minimum of 3–5 mm of residual apical bone is necessary to stabilise an immediately placed implant.[14, 15] In the current case, a pre-extraction CBCT scan of the available apical bone showed that the cyst size was greater than the implant diameter selected, based on the limited interdental space and the planned emergence profile of the implant site. Using a wider-diameter implant would have required placing it more apically to stabilise it. This and the fact that osseointegration might be limited in an infected area finally led to the decision of a staged approach.

Therefore, we decided in this case to first increase the available bone by staged guided bone regeneration. The bone grafting material facilitates new bone deposition and the adhesion of bone cells and their ingrowth.[16] The implant loading was delayed for three months to avoid the risk of interference with the new bone formed at the implant–bone interface resulting from surgical trauma.[17]



Figs. 10a & b: Final post-op radiograph on the same day of definitive restoration.

Conclusion

This clinical case study concluded that guided bone regeneration followed by delayed implant placement in the infected cyst site produces predictable outcomes. As long as the infected site is meticulously debrided, the newly formed bone can be loaded with an implant in a short time frame. Implants designed to reliably reach high primary stability help to provide confidence when placed in soft and newly formed bone.

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Dr Ali Tunkiwala is a director of Impart Education, a continuing education academy in Mumbai in India, which nurtures motivated clinicians toward predictable, evidence-based dental practice through extensive training and lectures. Since obtaining his master's degree in prosthetic dentistry in 1998, he has focused on placing and restoring implant cases efficiently using conventional and digital techniques. He has maintained a dental practice for over 25 years in Mumbai, where he spends most of his time conducting implant and aesthetic dentistry procedures, as well as full-mouth rehabilitation. Besides being an accredited member of the American Academy of Cosmetic Dentistry and a fellow and diplomate of the International Congress of Oral Implantologists since 2005, Dr Tunkiwala is a fellow and diplomate of the Indian Society of Oral Implantologists. He also serves on the editorial board of various journals in dentistry.

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Literature