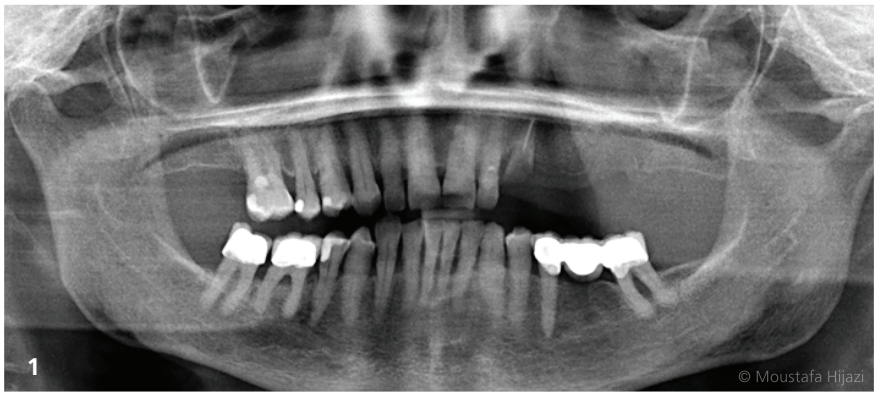
Biological bone regeneration using the tenting-pole technique

Bone augmentation and implant rehabilitation in an 82-year-old patient

Moustafa Hijazi, MSc, MSc, Germany

This article presents the comprehensive and successful treatment of an 82-year-old female patient with severe, advanced bone loss in the maxilla. The treatment was carried out in several carefully planned stages and combined contemporary bone regeneration techniques with a customised implantological approach. Bone augmentation, a procedure used to restore lost alveolar bone volume, played a central role in the overall treatment concept.

Advanced biomaterials and surgical techniques were employed throughout the course of treatment. Of particular significance was the use of EthOss, a biphasic synthetic bone graft substitute whose osteoconductive and resorbable properties support the rapid formation of the patient's own new bone. In addition, the tenting-pole suture technique was utilised. This specialised suturing method, performed with resorbable sutures, supports optimal wound healing, contributes to stabilisation of the graft material, and reduces the risk of post-operative complications.



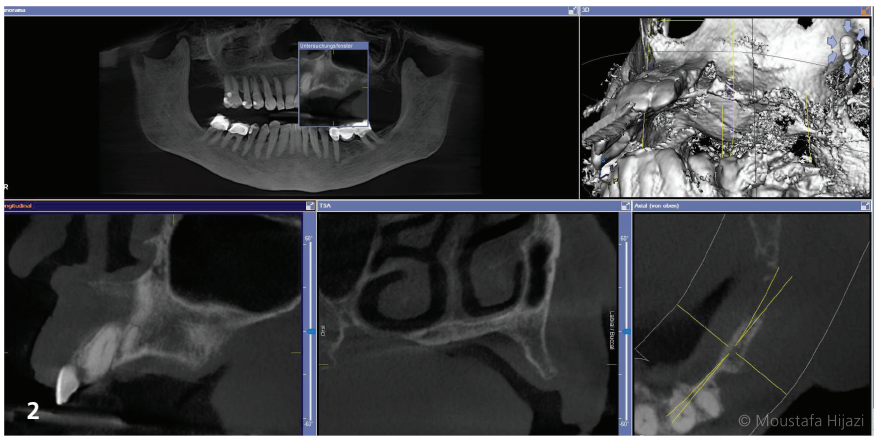


Fig. 1: Panoramic radiograph provided by the referring general dental practitioner. – **Fig. 2:** Initial situation on CBCT imaging.

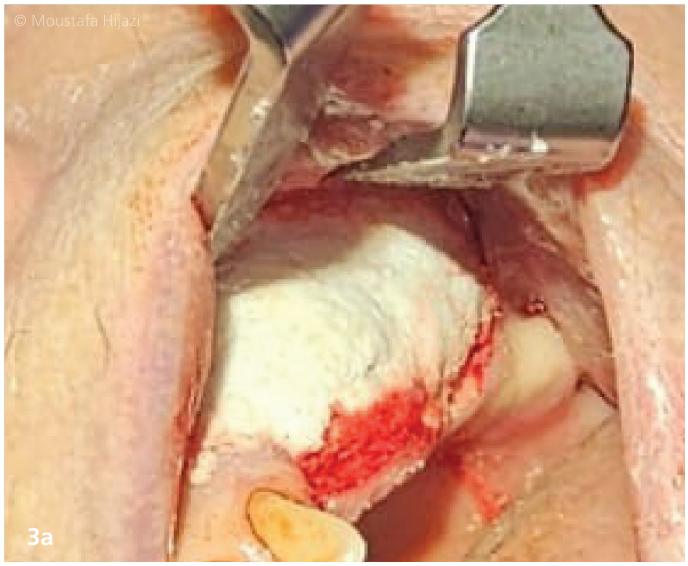
This precisely coordinated treatment approach made a substantial contribution to the successful clinical outcome and enabled long-term stabilisation of the implant-supported restoration. The present article outlines each phase of treatment, the materials employed, and the clinical results achieved, thereby offering valuable insights into the potential of modern oral surgical therapies in the management of complex cases.

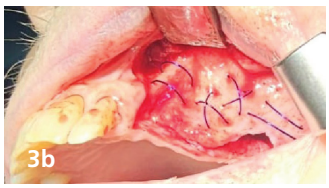
Medical history and initial situation

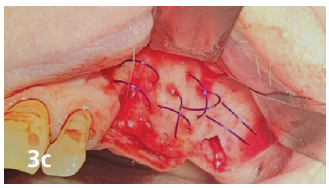
An 82-year-old female patient presented to our clinic seeking a fixed prosthetic restoration in the left maxilla. Clinical and radiographic assessment revealed a retained root remnant in region 23, together with pronounced bone loss in region 27 following a previous extraction performed by the referring general dental practitioner. In view of the extent of the alveolar atrophy, immediate implant placement was not feasible, and comprehensive biological pre-implant bone regeneration was therefore planned.

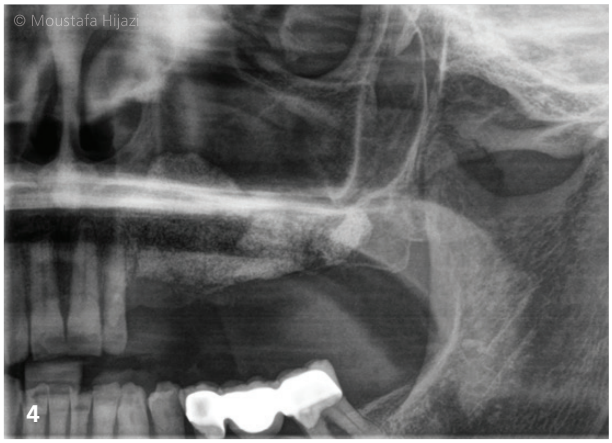
Treatment concept and planning

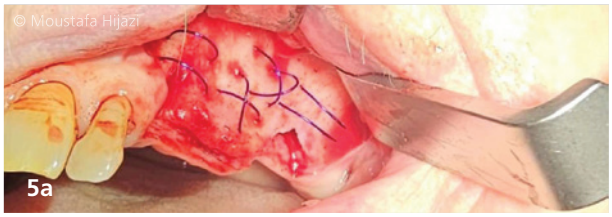
A thorough diagnostic work-up, including cone beam computed tomography (CBCT), was undertaken in order to assess the osseous defect and guide treatment planning. Based on these findings, a two-stage therapeutic concept was established. Phase 1 comprised bone regeneration with lateral and crestal augmentation, followed by Phase 2, which involved implant placement in regions 23, 24 and 26 after complete osseous regeneration had been achieved.

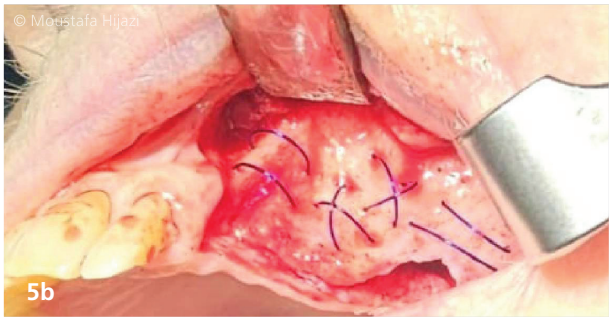




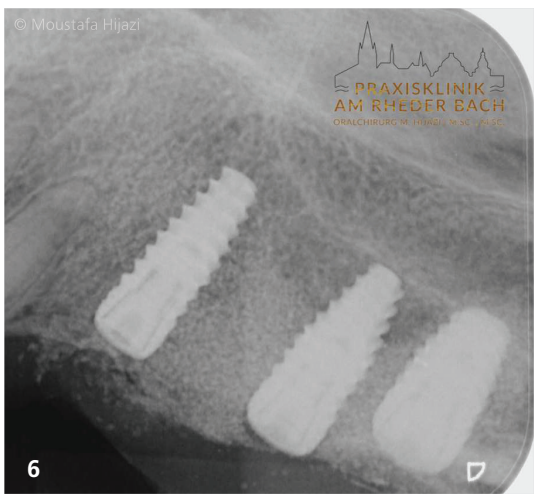


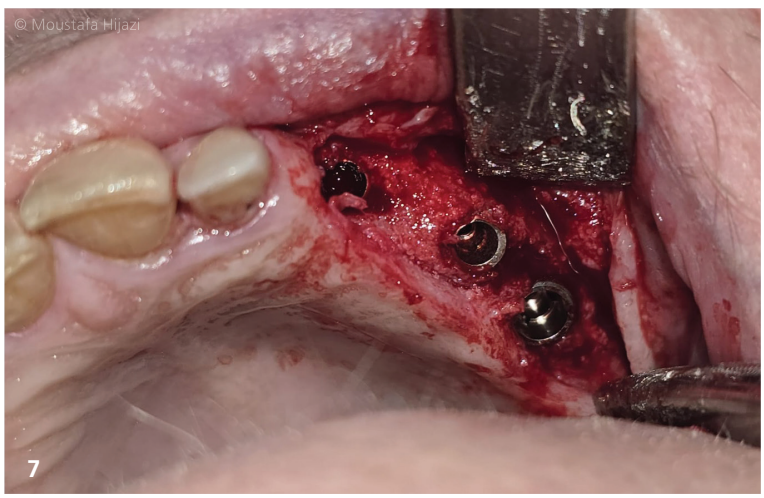






Figs. 3a–c: Intraoperative view of the augmentation procedure **(a)**. Tenting-pole suture technique **(b+c)**. – **Fig. 4:** Postoperative radiograph: review following augmentation of the left maxilla. – **Figs. 5a+b:** Fixation using PDS suture. – **Fig. 6:** Postoperative radiograph of the implants. – **Fig. 7:** Implants following second-stage surgery.





* The articles in this category are provided by the manufacturers or distributors and do not reflect the opinion of the editorial team.

Bone augmentation: an innovative regenerative approach

Bone augmentation was performed using EthOss as the grafting material, consisting of 65% beta-tricalcium phosphate and 35% calcium sulphate, a composition that is currently unique in this form, in combination with a Geistlich Bio-Gide membrane (20 × 30 mm). Stability of the augmented site was ensured using the tenting-pole suture technique, thereby providing structural support for the graft material and promoting favourable conditions for wound healing and bone regeneration.

Distinctive features of the tenting-pole suture technique

The PDS II 2/0 suture (purple) is a synthetic, monofilament, resorbable suture material specifically developed for use in surgical procedures requiring prolonged wound support. It is distinguished by its high tensile strength and predictable resorption profile, thereby ensuring sustained stability throughout the critical phases of wound healing. The monofilament structure facilitates smooth passage through tissue, enables even distribution of tension, and reduces the risk of suture rupture and local tissue irritation.

Technical specifications

- Manufacturer's designation: PDS II Suture or Luxcryl PDO
- Material: Polydioxanone (PDS)
- Suture size: 2/0
- Needle type: CT-1 (36 mm taper needle)
- Suture length: 150 cm
- Colour: Purple (for improved intraoperative visibility)
- Resorption time: Approximately six months

Because of its slow resorption characteristics, PDS II is particularly suitable for surgical indications in which extended stabilisation is essential, including bone augmentation, soft-tissue reconstruction and orthopaedic procedures.

Advantages of the tenting technique

1. **Slow and controlled resorption**
   The suture material is gradually resorbed by the body over an extended period, thereby providing long-term support during the critical phases of healing.
2. **Monofilament design**
   The smooth, single-strand structure minimises the risk of tissue trauma and infection while facilitating suture placement and knot handling.
3. **High tensile strength**
   PDS II sutures provide sustained stability, which is particularly important in procedures such as bone grafting, where secure fixation of the graft material is essential.
4. **Biocompatibility**
   The material is well tolerated and elicits only a minimal inflammatory response, thereby supporting favourable wound healing.
5. **Time-saving and biologically advantageous**
   In contrast to tenting screws, the sutures do not require removal. This avoids disruption of the healing process, reduces scar formation, and promotes more uneventful soft-tissue recovery.

Application in bone augmentation

In the present case, the PDS II suture was used to achieve stable fixation of the bone graft. Small perforations were created in the bone, through which the suture was passed in a tent-like configuration. This approach ensured even distribution of tension and enhanced stability of the augmented site. The resorbable nature of the suture eliminates the need for a secondary procedure for material removal and supports the natural regenerative process of the tissue.

Clinical experience and evidence

Clinical experience and published reports by Prof. Dr Peter Fairbairn, Dr Nabil Benabadji and other leading implantologists indicate that the use of PDO sutures can significantly reduce complication rates. Stabilisation techniques employing this type of suture material appear to contribute substantially to improved implant prognosis and may support shorter healing periods.

Key characteristics and clinical advantages of PDS II suture in contemporary surgical practice

- The grafted bone is stabilised using PDS II 2/0 suture material, which serves as a resorbable support element for the augmentation.
- Small perforations, approximately 2 mm in depth, are created in the bone using a bur measuring 2 mm in length and 1 mm in diameter. These perforations allow secure passage and positioning of the suture.
- In the molar region, the PDS suture is arranged in a tent-like configuration in order to provide vertical support and maintain the augmented volume.
- In the premolar and canine regions, the suture is positioned in a curved, parallel configuration, allowing adaptation to the anatomical contour of the alveolar ridge while ensuring stable fixation of the graft material.
- According to the manufacturer, the resorption period is approximately six months, providing prolonged stabilisation during the critical phases of healing and bone maturation.
- The principal function of the suture is to act as a stabilising element for the augmentation, helping to maintain graft position, protect the regenerative space, and support predictable healing.

Implant placement and delayed treatment course

Following successful bone augmentation in 2023, implant placement had initially been scheduled for approximately

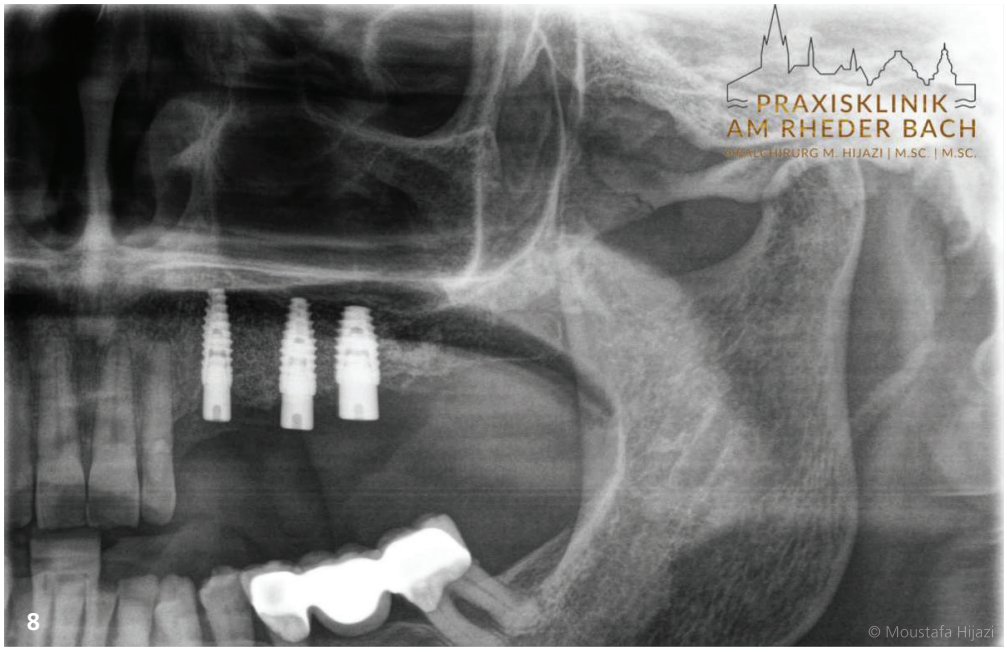


Fig. 8: Postoperative radiograph: implants following second-stage surgery.

12 months later, in April 2024. Owing to the patient's medical condition and personal commitments, however, the procedure had to be postponed until 21 October 2024. Despite this delay, the augmented site was found to be in excellent condition at the time of implant surgery: the regenerated bone was well mineralised and had largely been converted into vital native bone.

Implant placement on 21 October 2024

Under local anaesthesia, three Camlog implants (CONELOG Bone Level PROGRESSIVE-LINE) were successfully placed:

- Region 23: implant diameter 3.8 mm
- Region 24: implant diameter 4.3 mm
- Region 26: implant diameter 5.0 mm

To further optimise crestal bone volume, relining was performed using 1 g of EthOss bone substitute material. This step was feasible because the additional augmentation was carried out on a foundation of newly regenerated native bone. This measure supported the long-term stability of the implants and promoted sustained bone regeneration in the peri-implant region.

Second-stage surgery and final restoration

During second-stage surgery, three cylindrical healing abutments (4 mm) were placed. At follow-up, all implants demonstrated optimal osseointegration. The next phase of treatment will involve restoration with a fixed bridge.

Advantages of the chosen technique

The selected treatment approach offered several noteworthy advantages:

- No additional bone harvesting required
- This avoided the need for invasive autologous grafting procedures.
- Reduced complication rate
- More even load distribution achieved with PDS suture stabilisation may contribute to improved healing and fewer post-operative complications.
- Cost efficiency and reduced treatment burden

No further surgical intervention was required for removal of stabilisation elements, thereby reducing overall treatment complexity.

Conclusion

This case demonstrates that even in complex clinical situations, long-term successful outcomes can be achieved through the use of modern augmentation and implantological techniques. The combination of advanced grafting materials, membrane protection and resorbable tenting-pole stabilisation enabled predictable bone regeneration and successful implant placement in an elderly patient with severe alveolar atrophy. The patient is expected to benefit from improved masticatory function, enhanced prosthetic stability and a significantly improved quality of life.

References

FZA Moustafa Hijazi, MSc ,MSc
Praxisklinik Am Rheder Bach
info@kieferchirurgie-rhede.de
www.kieferchirurgie-rhede.de