Single tooth restoration with the one-tooth one-time technique

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Immediate implant placement and loading of a prosthesis in an edentulous jaw is an accepted treatment modality in dental practice worldwide. Optimisation of treatment time is an attractive option for both the treating implantologist and the patient; thus, a single-stage surgical procedure and new loading protocols have been explored. The implant's design, core material and surface modification are important device-related factors that may influence primary stability. All of these factors, as well as patient anatomy and bone quality, must be considered for immediate loading treatments. Scanning and milling techniques have opened up a new landscape for implant dentistry, enabling implant prosthetic dentistry to take a major step forward. Digital workflows are increasingly used, particularly for single-unit restorations, and they allow for straightforward and cost-effective protocols that improve patient satisfaction. One-tooth one-time is a technique developed to predictably place an implant in the molar area of the mandible, followed by immediate loading of a definitive prosthesis just hours after surgery, using the new Straumann BLX system and a digital workflow.

Initial situation

The patient presented to the office with a missing mandibular first molar (Figs. 1–4). His chief complaint was of pain on chewing on the respective side because of the pressure on the gingival tissue (Fig. 5). For this reason, he had begun chewing mainly on the opposite side and he thus wished to have the site restored as soon as possible. Considering that the patient presented with a well-balanced occlusion and the missing tooth was

Fig. 1: Extra-oral frontal view. **Fig. 2:** Intra-oral frontal view, in occlusion. **Fig. 3:** Intra-oral lateral view, in occlusion. **Fig. 4:** Mandible, occlusal view. **Fig. 5:** Region #46, occlusal view.

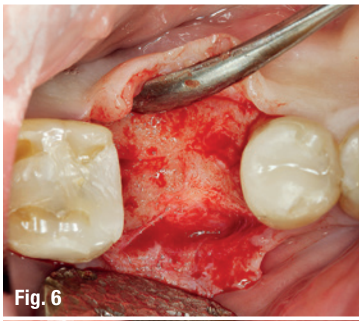
the only one missing, the one-tooth one-time technique would fulfil his primary wish and this option was discussed with the patient.

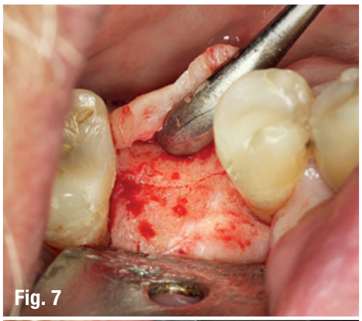
Treatment planning

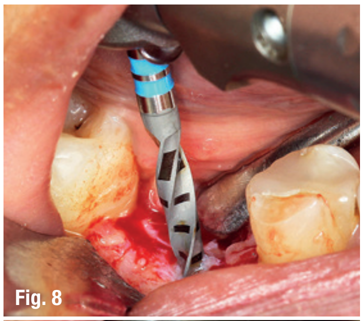
A CBCT scan was taken preoperatively, and it confirmed 13 mm of vertical bone between the inferior alveolar nerve and the coronal cortical margin of the mandible, as well as a minimum bone width of 6 mm. The implant selected for the surgical procedure was a Straumann BLX implant of Ø 5.5 x 10.0 mm. This would be followed by intra-oral scanning and the manufacturing of a hybrid ceramic crown, seated on a Straumann WB Variobase abutment and torqued to 35 Ncm.

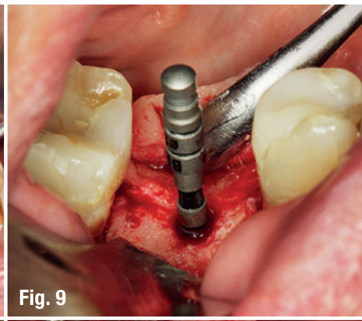
Surgical procedure

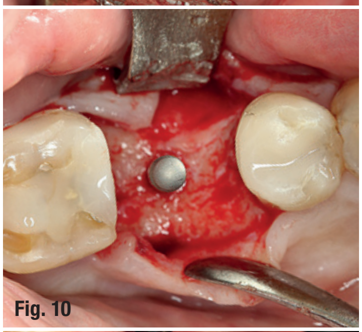
A flap was raised to expose the alveolar bone in the surgical area (Figs. 6 & 7). The ideal position for the implant had previously been selected with careful determination of the best 3D position via clinical assessment. A pilot hole (2 mm) was drilled to determine the bone density (Fig. 8). An alignment pin was placed to confirm the ideal 3D position and the preparation depth (Figs. 9 & 10). The width of the osteotomy was defined by clinical evaluation of the bone density and following the recommended drilling protocol (Figs. 11–13). The BLX implant was placed with the use of the ratchet and the Straumann surgical torque control device (Figs. 14 & 15). Because of the very engaging design, the implant reached a torque value of 55 Ncm (Fig. 16). The primary stability was further evaluated using the Implant Stability Quotient (ISQ) scale (Osstell, Integration Diagnostics; Figs. 17 & 18). The minimum ISQ value necessary for the implant to be sufficiently stable for immediate definitive loading is 60. The RB/WB BLX healing abutment (Ø 6.5 mm) was placed. The initial neck height of 2.5 mm was determined by the coronal bone anatomy. An advanced platelet-rich fibrin membrane was placed on the buccal surface of the implant to aid soft-tissue healing

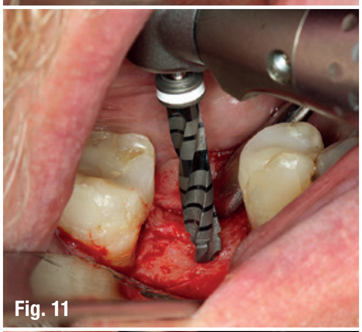


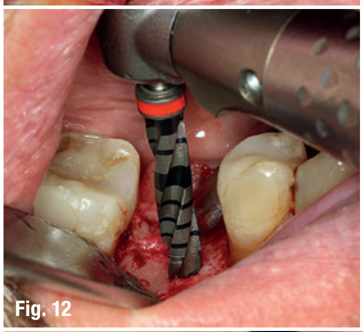


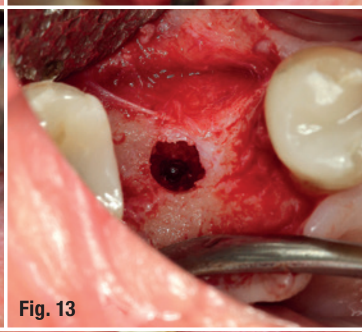


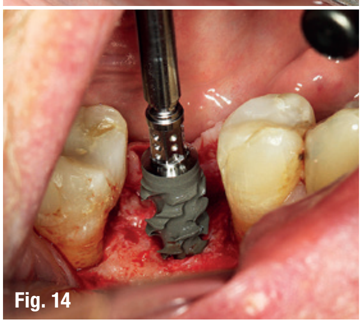












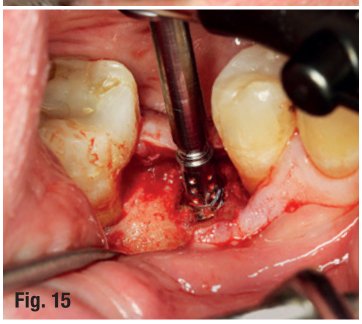
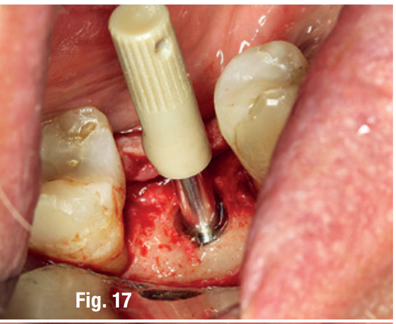


Fig. 6: Mucoperiosteal flap elevated, occlusal view. **Fig. 7:** Mucoperiosteal flap elevated, lateral view. **Fig. 8:** Initial osteotomy performed using Ø 2.2 mm drill. **Fig. 9:** Three-dimensional position confirmed by alignment pin, lateral view. **Fig. 10:** Three-dimensional position confirmed by alignment pin, occlusal view. **Fig. 11:** Osteotomy performed using Ø 3.2 mm drill. **Fig. 12:** Osteotomy performed using Ø 3.5 mm drill. **Fig. 13:** Osteotomy ready for implant placement. **Fig. 14:** Placement of the Straumann BLX implant initiated with a surgical ratchet. **Fig. 15:** Final implant position. **Fig. 16:** Torque value of 55 Ncm measured with surgical torque control device.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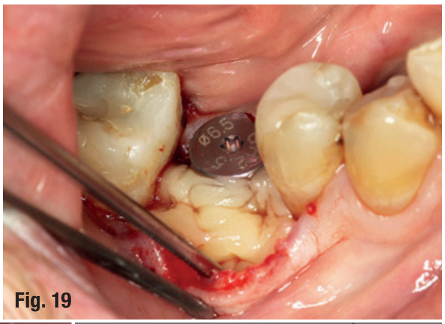
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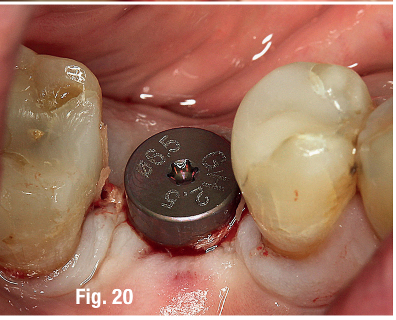
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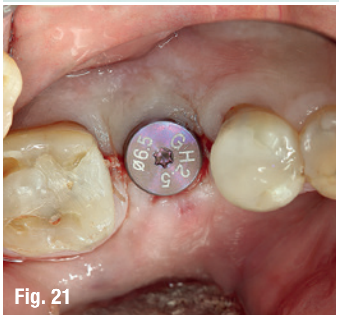
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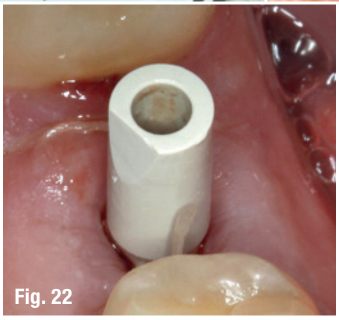
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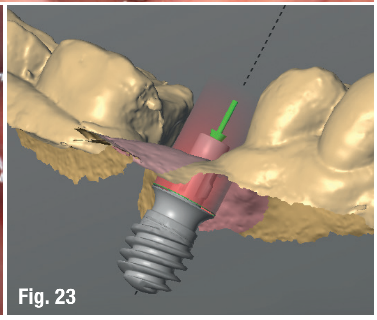
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Fig. 17: SmartPeg (Osstell) for measuring ISQ value in position. **Fig. 18:** ISQ value of 74 was measured—ideal for immediate loading protocols. **Fig. 19:** A-PRF membrane accommodated around RB/WB BLX healing abutment. **Fig. 20:** Soft-tissue properly sutured, lateral view. **Fig. 21:** Soft-tissue properly sutured, occlusal view. **Fig. 22:** Monotype scanbody in position for digital impression. **Fig. 23:** CAD of immediate final crown on WB Variobase.

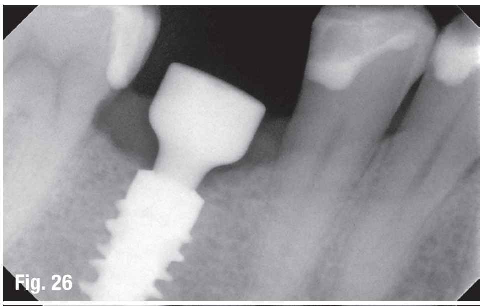
(Fig. 19). Sutures were placed to create a soft-tissue seal around the implant (Figs. 20 & 21). The patient was then transferred to the prosthodontist's office.

Prosthetic procedure

The prosthodontic and technical work followed a digital workflow that included a Dental Wings intra-oral scanner and CAD/CAM processing using Straumann CARES Digital Solutions. The intra-oral scanner captured the peri-implant mucosal architecture, including the neighbouring teeth, in a quadrant-like approach. A monotype scanbody was then screwed into the implant (Fig. 22), and the 3D implant position was determined. The corresponding opposite arch was scanned in the same way. Finally, the bite recording was also digitally trans-


Fig. 24


Fig. 25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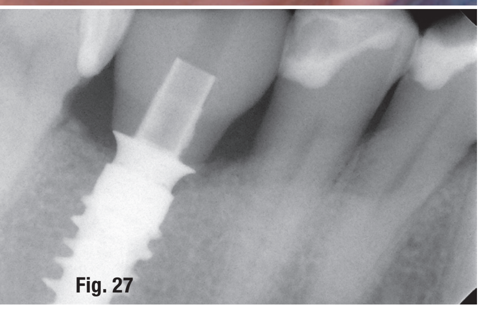
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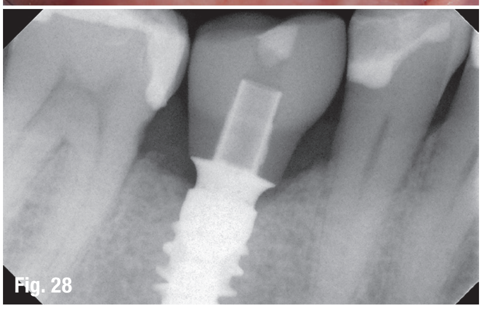
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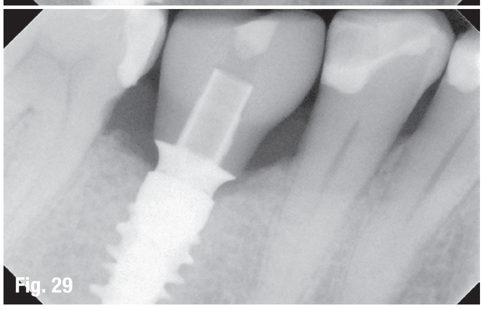
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Fig. 24: Final crown in position, occlusal view. **Fig. 25:** Final crown in position, lateral view. **Fig. 26:** Periapical radiograph immediately after implant placement and before crown seating. **Fig. 27:** Fifteen-day follow-up periapical radiograph. **Fig. 28:** Three-month follow-up periapical radiograph. **Fig. 29:** Six-month follow-up periapical radiograph.

ferred. Based on the STL file from the intra-oral scanner, a full-contoured crown was designed as a screw-retained dental hybrid ceramic (VITA ENAMIC IS-16L, VITA Zahnfabrik) and bonded with composite luting cement to a regular base/wide base (RB/WB) Variobase and produced digitally without any physical models or casting (Fig. 23). The virtual crown design was processed and produced with four-axis wet milling and grinding equipment (CARES C-Series, Straumann). After the crown had been milled, the restoration was cleaned with 95 % ethanol and, after further post-processing, polished and individually characterised. The prepared crown was then directly bonded to a WB Variobase extra-orally.

First the interproximal fit and then the marginal integrity of the restoration were clinically assessed. Identical continuity with dental floss was separately checked for the mesial and distal contact surfaces. Next, the occlusal scheme was checked statically and dynamically with shimstock, achieving light occlusal contacts. The restoration was screwed in with a torque of 35 Ncm, according to the implant manufacturer's recommendations. The screw access hole was sealed with PTFE tape and composite material (Figs. 24 & 25). A periapical radiograph was used to check the position of the implant after the procedure (Fig. 26). Follow-up radiographs were taken 15 days after the surgery when the sutures were removed (Fig. 27), and after three months (Fig. 28) and six months (Fig. 29).

Treatment outcome

For the one-tooth one-time technique, patient selection is key. The patient in this case had only one missing posterior tooth in the mandible and an otherwise well-balanced occlusal relation. It is critical to select an implant design that will ensure primary stability and enhanced bone-to-implant contact. Fully tapered implants favour this outcome. The Straumann BLX implant is designed for increased primary stability in order to enable immediate treatment protocols. The first requirement is that the implant should achieve primary stability, and thereafter a crown can be manufactured with a fully digital workflow. This has the added advantage of no impression material ever coming into contact with the surgical wound. Digital implant dentistry will soon have an enormous impact on daily dental practice because of its precision in replicating the structures in the mouth. Analogue methods using traditional impressions often produce inaccuracies. This new standard, as with all newly acquired knowledge, requires experience and familiarity with the products used. While some adjustments to the occlusal and interproximal contacts were needed, this was to a lesser extent than with the analogue method. Digital protocols lead to more predictable results and a more efficient workflow, which will help reduce costs and save time for both the patient and the dental team.

Conclusion

The one-tooth one-time technique has been demonstrated by means of a case of a missing mandibular first molar treated with an implant and restored with the definitive crown a few hours after the surgical procedure. This treatment modality has been shown to be a reproducible and predictable treatment option through the combination of the Straumann BLX implant system and its digital workflow.

about the authors

Dr Louwrens Swart completed his BChD at Stellenbosch University in South Africa in 1986 and his MChD in maxillofacial and oral surgery in 1994. His research interests include implant surgery and conscious sedation. He is President-elect of the Southern African Association of Osseointegration. He is in private practice in Cape Town in South Africa.

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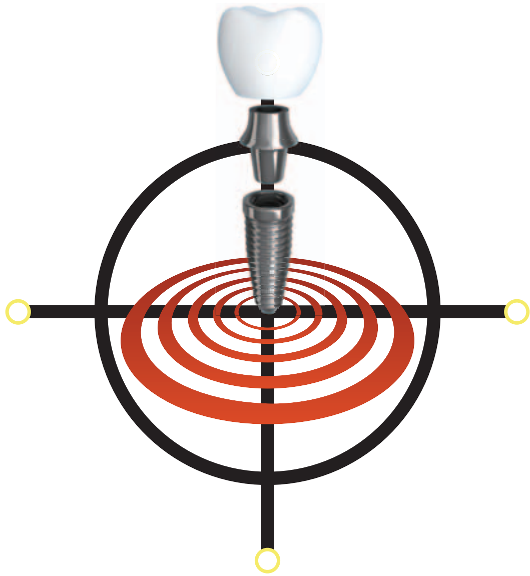

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