Success factors for immediate implantation with immediate loading

A case example

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Fig. 1


Fig. 2

Fig. 1_Following fracture of the crown of tooth #22 treated with a root post, only remnants of the root remained. The patient did not want the neighbouring teeth ground.
Fig. 2_The panoramic radiograph shows, in addition to other findings (see text), the remnants of root 22 with incomplete root filling and a generalised horizontal bone defect. The reference ball for implant planning can be seen at position 22.

_The replacement of lost teeth with implants can be very time-consuming for patients. During the temporisation phase, aesthetic limitations often have to be accepted. The quickest and most patient-friendly option is immediate implantation with immediate temporisation. However, in order not to precipitate failure just as quickly, this form of treatment requires some experience and a working knowledge of the success factors.

Classical concepts that call for late implantation and load-free healing are increasingly being called into question. On the one hand, modern implant surfaces and designs now permit shorter healing times than were possible in the past. Usually, restoration is successful after just six to eight weeks.[1] This also leads to shorter overall treatment times for implantations in areas that are already fully healed or have been edentulous for some time. On the other hand, where possible and sensible, many experienced dentists and surgeons place implants in the fresh socket immediately after extraction. The major advantage of this approach for patients is treatment that is not only uniquely time-saving, but also less traumatic and costly. Immediate temporisation also provides direct soft-tissue


Fig. 3


Fig. 4

Fig. 3_The remnants of root 22 were removed with a periotome, while sparing the buccal lamella and soft tissue.
Fig. 4_Probing of the extraction socket showed intact bony walls, especially the buccal walls.

support with a natural-looking temporary restoration. Augmentation is usually performed at the same time as immediate implantation. This applies both to immediate temporisation and to transgingival or closed healing. If the tissue deficit is small, minor controlled tissue regeneration is sufficient. This can be achieved, for example, with the help of a slowly absorbed bone replacement material and a membrane. However, for larger defects this can be technically challenging owing, especially, to the frequent lack of soft-tissue volume.[1] In such a case, a two-session procedure is recommended with socket preservation and implantation in the augmented alveolar ridge or simultaneous implantation using suitable soft-tissue techniques to cover the implant cleanly.[2]

A requirement for successful immediate implantation with immediate temporisation is a largely intact bony alveolus, particularly an intact and sufficiently thick buccal lamella. Even with the use of 3-D radiology techniques, this cannot be determined with certainty until after extraction. Another requirement for the success of immediate implants is adequate primary stability of at least 35 Ncm.[3] During the process of osseointegration, the bone is able to convert mechanical forces into biological stimuli. In this context, the degree of bone expansion under force plays a key role. It is absolutely essential to avoid micro-trauma that could overstrain the interface between the implant and bone.[4]

Moreover, the risk of recession appears to be less in patients with thick gingival tissue than in patients with thin tissue.[5, 6] This can be easily determined with a PA probe inserted vestibularly into the sulcus. If the metal is visible through the tissue, the patient has a 'thin' gingival phenotype, otherwise a 'thick' one.[7] Finally, the choice of treatment also depends on extraneous factors such as the patient's laugh line, as well as his/her expectations with regard to aesthetics, cost and treatment time.

According to recent studies, if all these factors are taken into account, immediate temporisation—also in conjunction with immediate implantation—can achieve hard- and soft-tissue results that are just as stable as those obtained with conventional loading after three to six months.[8–12] The bone contact rate at the implant interface also appears comparable for immediate and late protocols.[11] However, in the case of immediate temporisation static and functional contact points should be avoided if possible. The risk of integrating the final restoration immediately is too great owing to unpredictable tissue changes during the healing phase.

_Case report

In a 66-year-old male patient, the crown of tooth #22 was fractured (Fig. 1). The tooth had been endodontically treated with insertion of an abutment post and crown about 15 years previously. The patient had no pain and there were no periapical abnormalities. However, in view of the slender root, a new post and crown did not appear advisable (Fig. 2). Because the patient did not want the neighbouring teeth ground ("I want a new lateral incisor. I certainly don't want the healthy neighbouring teeth ground"), only an implant came into consideration.

The panoramic radiograph showed incomplete filling of the root remnants, a generalised horizontal bone defect and endodontic and dental restorations in all four quadrants (Fig. 2). The pocket depth was neither unremarkable at 3 to 3.5 mm, nor was there bleeding on probing. The periodontitis was evidently accompanied by tissue recession, largely without pocket formation or acute inflammation. The soft tissue was somewhat rough and was classified as belonging to the 'thick' phenotype. Other findings were periodontitis originating from the pulp of tooth #45, an implant at position 44, tooth #37 inclined strongly into gap 36 and a retained tooth #38. There were no functional abnormalities. The patient did not smoke and, apart from pharmacologically controlled hypertension, was healthy. As a manager of an


Fig. 5


Fig. 6

Fig. 5_The implant (Replace Select Tapered, Nobel Biocare) is relatively short owing to the horizontal bone defect (10 mm with diameter 4.3 mm). The planned vertical apical position approximately corresponded to that of the extracted dental root.
Fig. 6_ The shoulder of the primarily stable (35 Ncm) inserted implant is located approximately 1 mm apical to the buccal crestal bone edge. The transverse position is approximately 1 mm palatal for optimum distance to the buccal lamella. The buccal orientation of one of the three internal channels can be clearly seen.
Fig. 7_ The radiograph shows the implant with the temporary abutment. The distance from the bone edge to the contact point of the crown is approx. 5 mm owing to marginal bone loss.
Fig. 8_The impression coping for open impression taking was screwed on. The implant position was transferred to the laboratory with the help of a plastic key.
Fig. 9_In the laboratory, the dental technician prepared a custom-made titanium abutment (Esthetic Abutment) and fashioned the temporary composite crown, which was cemented in place just 24 hours after implantation.

industrial company with attendant social obligations, the patient did not want a removable temporary restoration. Because he was also a busy man, it was desirable to insert an immediate implant with a temporary restoration within 24 hours, depending on the state of the post-extraction alveolus. This procedure involved a minimum number of appointments over a clearly defined period. With the help of the clinical findings and a planning template using a radiopaque steel ball (panoramic radiograph; Fig. 2), it was possible to determine the implant length and suitable diameter preoperatively.

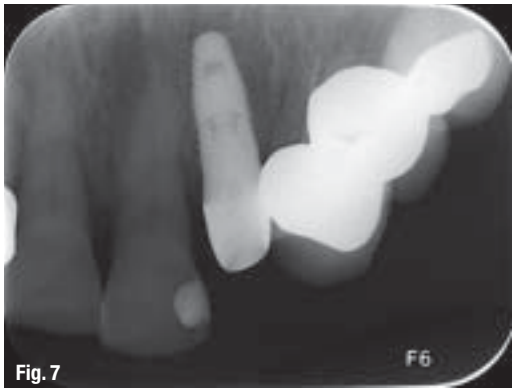
Fig. 7

During extraction with a periotome, great care was taken not to traumatise the hard or soft tissue unnecessarily (Fig. 3). Soft-tissue detachment was thus avoided. The tooth socket was then probed, revealing an intact buccal lamella (Fig. 4). The granulation tissue present was removed. There was no sign of acute inflammation. Figure 5 shows the size relationship of the extracted root remnants to the implant (Replace Select Tapered, Regular Platform 4.3 × 10 mm, Nobel Biocare). Figure 6 shows the implant inserted in its final position. The implant shoulder in the buccal direction was approximately 1 mm sub-crestal (see also Fig. 7) with a buccally oriented channel of the internal connector (Fig. 6).

The palatally displaced implant position, resulting in a safety distance of up to 2 mm to the buccal wall (bone jumping distance), can also be seen in Figure 6. Following implantation, the gap was augmented with a mixture of Bio-Oss (Geistlich) and endogenous bone. Endogenous bone was removed from the left tuber region with a bone scraper. A covering membrane was not used. The follow-up radiograph (Fig. 7) shows the correct distances to the neighbouring teeth and the vertical position, corresponding approximately to that of the extracted root (cf. Fig. 2).

The shape of the implant also closely matches the conical root shape. In this way, it is possible to avoid perforation of the facial alveolar wall, especially in patients with thin buccal bone. For this reason, the pilot hole should always be drilled palatally to the natural root tip, and expansion holes should be drilled while exerting pressure in the palatal direction. The area was prepared in accordance with the standard protocol. The implant was then inserted with a torque of 35 Ncm. With this primary stability achieved, the most important requirement for immediate loading was met. Because the patient wanted an immediate high-quality aesthetic restoration, fitting a laboratory-fashioned temporary crown of composite material


Fig. 8


Fig. 9

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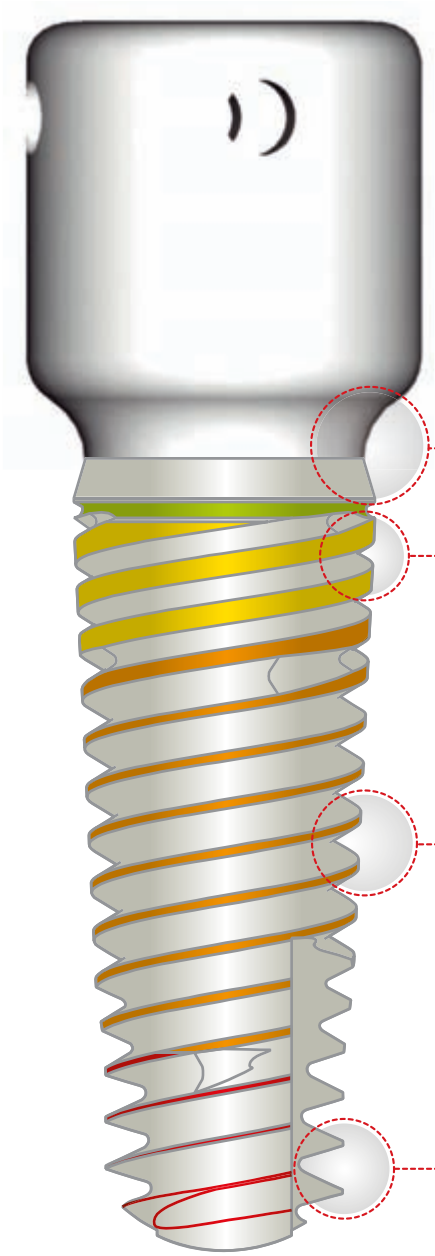

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Fig. 10


Fig. 11

Fig. 10_Two months later the soft tissue was stable and free of inflammation. The temporary crown was designed in such a way that there were no static or functional contact points.

Fig. 11_A new impression was taken another four weeks later. A zirconium dioxide abutment was screwed in, and the final full ceramic CAD/CAM crown was put in place. The patient was delighted with the result.

was planned. An open impression was taken with a custom tray (Fig. 8). In order to minimise the laboratory time required, the implant position was transferred to the original model by means of a plastic key (Pattern Resin, GC Europe). The titanium abutment used for the temporary crown (Esthetic Abutment) is characterised by scalloped edges that follow the soft-tissue contours and provide support (Fig. 9). In order to achieve further optimisation, the abutment was custom-made by the dental technician. However, it was still possible to make fine adjustments in situ with the help of rotating carbide-tipped instruments.

Just 24 hours after implantation, the custom abutment and the temporary composite crown were fitted (Figs. 9 & 10). Correct seating of the abutment on the implant was checked with the help of a dental radiograph (cf. Fig. 7). Care was taken when fashioning the crown to avoid static or dynamic contact points. This was rechecked in situ. The crown was then fixed in place with temporary cement (TempBond, Kerr Dental). The patient was also instructed to exert as little pressure as possible on the crown when eating.

Three months later, after a new impression had been taken, a custom Procera Esthetic Abutment (Nobel Biocare) was screwed into place, and the final full ceramic CAD/CAM crown was fixed using glass-ionomer cement (Fig. 10). The Periotest score for the implant was very good at this stage (-7).

_Result and prognosis

Despite the recession and less than optimum fit of the restorations of the neighbouring teeth, the crown blended in harmoniously with the surrounding teeth. Soft-tissue integration was also convincing. The immediate implantation with immediate temporary restoration yielded a quick, straightforward and aesthetically attractive result in just a few sessions and without a removable temporary restoration. This met the patient's wishes, and he was accordingly delighted with the result. Distress caused by the single surgical intervention was minimal. The prognosis of the restoration is also good. The literature shows that the procedure leads to stable long-term results in both the crestal bone and soft tissue.[13] The same applies to the Replace Select Tapered implant system used. In a case study with 66 implants in 48 patients, none of the implants was lost over a period of five years, and the hard and soft tissues remained healthy.[9] The biologically optimised TiUnite surface, which promotes fast and reliable deposition of bone cells, also contributed to this favourable outcome.[13, 14]

However, the procedure described here also carries risks. The outcome can be affected by errors in diagnosis, indication and execution. In the present case, only a panoramic radiograph with a reference standard was prepared in advance for diagnostic purposes. Because the circumstances of the case were ideal, more elaborate procedures were not required. If additional information and safety margins are desired, working with 3-D diagnostic techniques and possibly computer-aided implantation is recommended. In many cases, it is not necessary to prepare a flap. This spares the patient, as in the present case, and helps the peri-implantation tissue heal without complication.

The Replace Select Tapered implant system used is distinguished by a high degree of user friendliness. The well thought-out and straightforward procedure makes it particularly suitable for integration in modern implantological/surgical referral practices that aim to involve the prosthetist and dental technician actively in the treatment process._

Editorial note: A list of references is available from the publisher.

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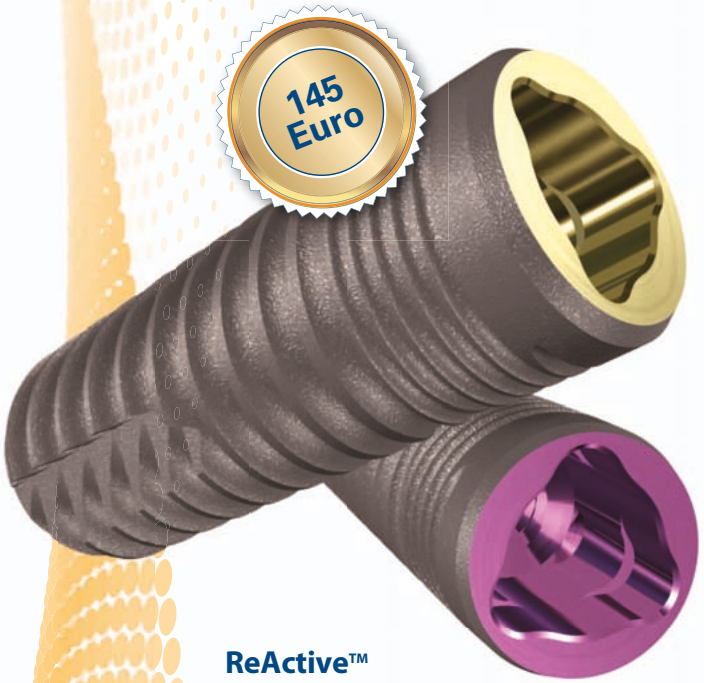

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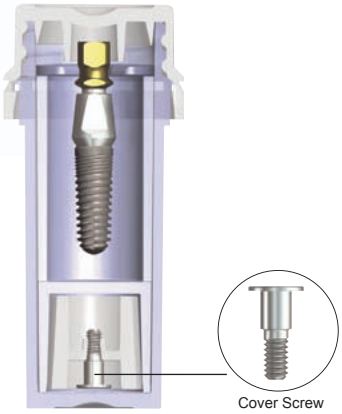

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