Fixed implant-supported prostheses

Minimally invasive immediate rehabilitation of the anterior maxilla

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This paper discusses a case of continuous absence of maxillary anterior teeth which is treated by immediate implant-supported prostheses. The simple plate made preoperatively was used for flapless implant surgery. Temporary restorations induce soft tissue forming and ultimately achieve better aesthetic results.

A middle aged female patient presented at Dalian Stomatological Hospital for a consultation to repair the continuous absence of maxillary anterior teeth (11, 21, 22) with implants. The oral examination and the cone beam computed tomography (CBCT) were carried out and an impression was obtained. When the plaster cast was available, a diagnostic wax-up was made and hot press was used to form a simple plate. A non-impression transfer device called (die) was made on the plaster model. Flapless implant surgery was conducted with the guide of the plate; two bone-level implants were placed. The immediately fabricated prosthesis was placed on the same day. The definitive prosthesis was placed after a healing time of six months.

During the following period, individual implant stability and soft tissue response to the provisional prosthesis were good. When the definitive prosthesis was done after six months, excellent aesthetic results were achieved with the papilla by filling the interdental space, resulting in an absence of the black triangle and a harmoniously scalloped gingival margin.

Fig. 1: Frontal view of the partially edentulous area.
Fig. 2: Occlusal view of the partially edentulous area.
Fig. 3: CBCT radiograph of 11.
Fig. 4: CBCT radiograph of 22.
Fig. 5: Diagnostic wax-up.
Fig. 6: Simple plate fixed on the plaster model.
Fig. 7: Non-impression transfer die made of acrylic resin.


Fig. 1


Fig. 2

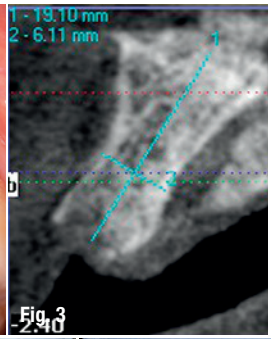

Fig. 3

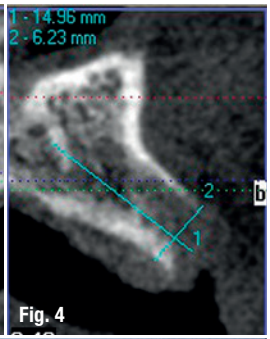

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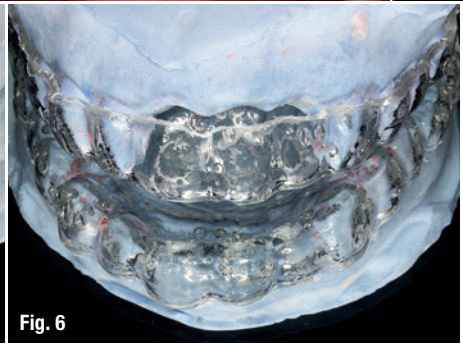
Fig. 5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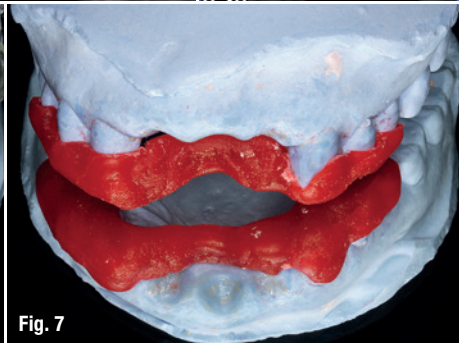
Fig. 7

Materials and methods

General condition

A 52-year-old female patient with missing two central incisor and one left lateral incisor (11, 21, 22). These teeth were extracted three months ago due to heavy caries. The patient requested implant therapy. The extraction points were healed and the gingiva was healthy. cone beam computed tomography (CBCT) showed sufficient bone height and width in the edentulous span, with 19.1 mm in height and 6.1 mm in width at the right central incisor alveolar bone, 14.9 mm in height and 6.2 mm in width at the left lateral incisor. The patient was in good health and had no history of bruxism or other bad oral habits. The diagnosis was a dentition defect of the maxilla.

Treatment design

Two implants were placed in sites 11 and 22, immediate rehabilitation of the three teeth with a two-implant supported bridge and final prosthesis was made after six months.

Materials

One implant system (BEGO Semados RSX-Line, BEGO, Germany) and acrylic resin (PATTERN RESIN, Japan) were applied.

Treatment protocol

1. Clinical examination was conducted before surgery. Assess of the quality and quantity was based on the CBCT. All conditions were fit the criteria for implant surgery.
2. Two impressions were made with polyether silicone rubber and two plaster model were obtained. One was used to make the diagnostic wax-up on the edentulous sites and then hot press was applied to form a simple plate to guide the implants to be placed in an optimal position. A non-impression transfer die was made on the other one using acrylic resin, and two holes were made on sites 11 and 22 of the model.
3. The die was tried in by the clinician to ensure stability. Plate and die were soaked in liquid with 75 per cent of alcohol for thirty minutes.
4. Implant placement was performed under local anaesthesia (4% articaine with 1:100,000 adrenaline). The simple plate was used to guide the implant to be placed in an optimal position. Then flapless implant surgery was conducted , two implants were placed at the sites of 11 and 22 (BEGO Semados RSX 3.75 mm × 15 mm).The ISQ value of the two implants were 80 and the primary stability was


Fig. 8


Fig. 9


Fig. 10

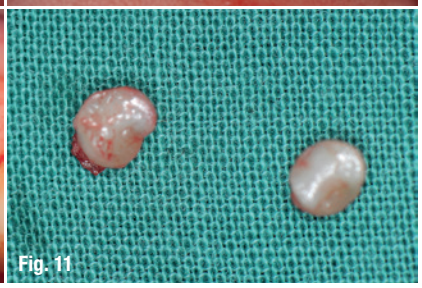
Fig. 11

Fig. 8: Trying the wax-up.
Fig. 9: Simple plate assisting in determining the implant position.
Fig. 10: Flapless technology with punch.
Fig. 11: The soft tissue removed.


Fig. 12

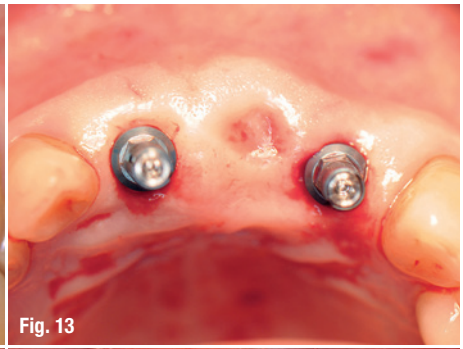
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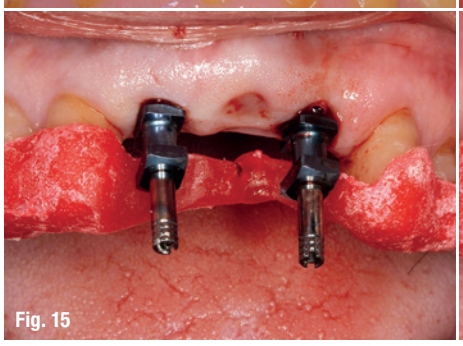
Fig. 14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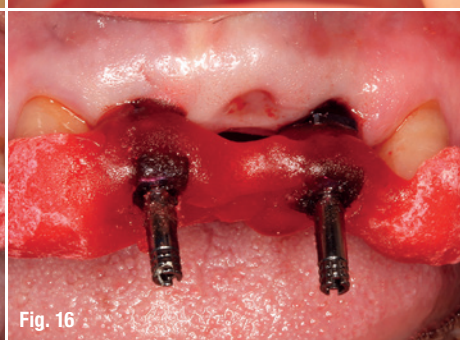


Fig. 16


Fig. 17

Fig. 12: Frontal view of the implants.
Fig. 13: Occlusal view of the implants.
Fig. 14: Placing of the open-tray impression posts.
Fig. 15: Placement of the die.
Fig. 16: Combination of posts and die with acrylic resin.
Fig. 17: Three-dimensional position of the implants.

Fig. 18: Provisional prosthesis.
Fig. 19: Frontal view of the provisional prosthesis.
Fig. 20: Implant-protected occlusion.
Fig. 21: Frontal view after ten days.
Fig. 22: Frontal view after one month after surgery.
Fig. 23: Appearance of the fistula after two months post-surgery.

gained. The abutments and open-tray impression posts were fixed onto the implants before suture.

5. In the prosthetic procedure, the clinician connected the open-tray impression posts and the die with acrylic resin. Then the three dimensional position of the implants was transferred onto the plaster model. Implants were replaced and the remaining gap was filled with acrylic resin. After the placing of the healing abutments onto the implants and shade selection, the patient was able to take a break. The polymeric porcelain (Ceramage) screw-retained provisional prosthesis (PSTTiA, BEGO, Germany) was manufactured at the laboratory and delivered to the clinician within three or four hours.
6. The prosthesis was inserted after being delivered to the clinician. When adjusting the occlusion, implant-protected occlusion guidelines were followed. The screw holes were closed with light-curing resin.
7. Antibiotics (amoxicillin and ornidazole) were given daily for three to five days after surgery. The patient was educated to maintain oral health. The evaluation of implant stability, oral hygiene, occlusion and soft tissue was conducted every four weeks. The surface of the provisional prosthesis was adjusted to induce a good shape of the gingiva. A fistula appeared at the buccal surfaces of the soft tissue after two months of the surgery. Fortunately, periapical radiography showed good osseointegration. After treated with hydrogen peroxide and minocycline hydrochloride for several times, it was therefore healed.
8. Based on the good osseointegration of the periapical radiography, the good stability of the im-

Fig. 24: Periapical radiograph two months later.
Fig. 25: Frontal view three months later.
Fig. 26: Frontal view five months later.
Fig. 27: Frontal view six months later.
Fig. 28: Occlusal view six months later.
Fig. 29: Periapical radiograph six months later.

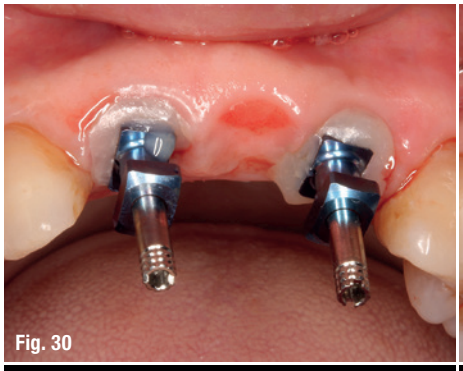
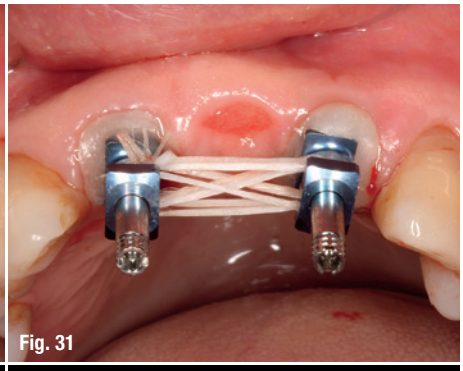


Fig. 30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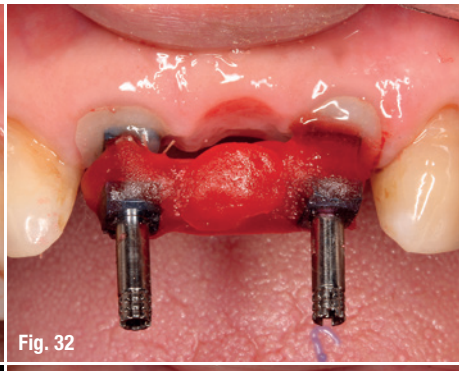
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Fig. 33


Fig. 34


Fig. 35

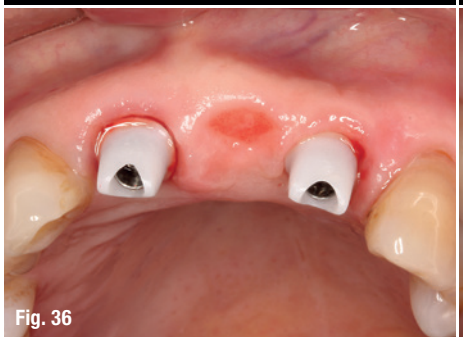


Fig. 36


Fig. 37


Fig. 38

plants and high ISQ (ISQ of 11 and 22 were 78 81, respectively), the final restoration protocol was conducted six months after implants placement. The final abutments (PS CATi, BEGO, Germany) and prosthesis were made of zirconia.

Results

Evaluation methods

Assessment of the soft tissue and prosthesis was based on the pink aesthetic score (PES) and white aesthetic score (WES) put forward by Fürhauser and Belser, respectively. Variables of the pink and white aesthetic scores are shown in tables 1 & 2.

Analysis

The PES and WES were 14 and 10, respectively. All variables got maximum scores. The patient was highly satisfied with form, colour, translucency and surface texture.

Discussion

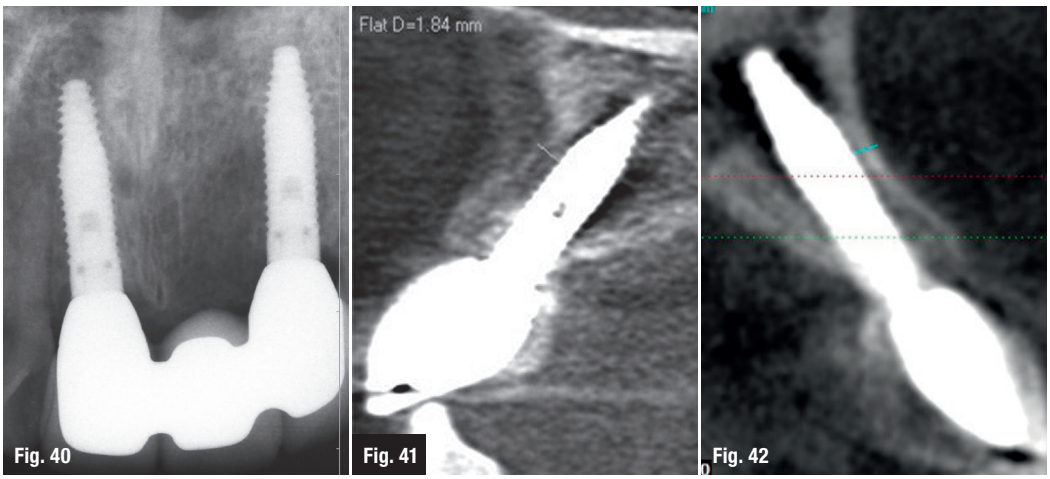
Flapless technology

Over the past decade in oral surgery, the concept of minimally invasive surgery has been established, consisting in taking advantage of advancements experienced in diagnostic techniques and specific surgical instruments, to perform surgical procedures infringing as little damage as possible to the patient by minimal incisions or even flapless(punch). There are many advantages that have made flapless surgery a technique increasingly demanded and used by clinicians in implantology. Flapless surgery prevents the reflection of soft tissues and the absence of suture reducing the surgical trauma. As a result, the necessary wound healing process is minimal. It also leads to minimal interference on the blood supply, as a consequence of higher osseointegration (greater contact between bone and


Fig. 39

Fig. 30: Placement of the open-tray impression posts.
Fig. 31: Connecting the posts with dental floss.
Fig. 32: Connecting the posts with acrylic resin.
Fig. 33: Personalised zirconia abutments.
Fig. 34: All-ceramic zirconia crowns.
Fig. 35: Zirconia abutments fixed onto the implants.
Fig. 36: Occlusal view of the zirconia abutments.
Fig. 37: Frontal view of the final prosthesis.
Fig. 38 & 39: Occlusal view of the final prosthesis.

Fig. 40: Periapical radiograph showing excellent precision.
Fig. 41: Periapical radiograph of 11 after one year.
Fig. 42: Periapical radiograph of 22.



implant (BIC), less periimplant bone loss and less gingival inflammation. Another advantage of flapless surgery that both the clinician and patient appreciate is the significant reduction in intraoperative and postoperative bleeding. The absence of flap and suturing greatly simplifies the surgery, shortening its duration in most of the cases. For these reasons, patients will feel more comfortable and less swelling, pain and other complications in and after the surgery.

However, one should always notice that this type of surgery requires special concentration as it comes from a technique without direct vision of the bone. This implies the importance of a preoperative design of the precise position of the implants. And strict inclusion criteria should be established. The following principles must be observed in the flapless procedure:

1. More keratinised tissue must be present (at least 5.0 mm) because the flapless procedure requires the actual removal of some of the tissue; and
2. more bone width (at least 4.5 mm) must be available without undercuts of more than 15°. Since visibility is more limited when using the flapless technique, it is more difficult to ensure that the implant is positioned in the centre of the crestal bone. In the reported case, a patient with sufficient bone volume and good health was chosen, and preoperative design was made through the CBCT radiograph and the wax-up. The surgery

Variables of the pink esthetic score

Variables		Absent	Incomplete	Complete
Mesial papilla	Shape vs. reference tooth	0	1	2
Distal papilla	Shape vs. reference tooth	0	1	2
Level of soft tissue margin	Level vs. reference tooth	Major discrepancy > 2 mm	Minor discrepancy 1–2 mm	No discrepancy < 1 mm
Soft tissue contour	Natural, matching reference tooth	0	1	2
Alveolar process	Alveolar process deficiency	0	1	2
Soft tissue color	Color vs. reference tooth	0	1	2
Soft tissue texture	Texture vs. reference tooth	0	1	2
Maximum total PES 14				

Table 1

Variables of the white esthetic score

Variables	Major discrepancy	Minor discrepancy	No discrepancy
Tooth form	0	1	2
Tooth volume/outline	0	1	2
Color (hue/value)	0	1	2
Surface texture	0	1	2
Translucency	0	1	2
Maximum total WES 10			

Table 2

was conducted by an experienced surgeon and a simple plate was used to assist the position of the implant.

Immediate loading

Traditionally, implant treatment is based on a two-stage protocol with a healing period of three to six months during which the implants are submerged to achieve osseointegration. Recently, this clinical suggestion has been challenged. Numerous clinicians now advocate immediate or early loading of implants. The advantages of immediately loaded implants are clear: they require shorter treatment periods and allow immediate recovery of function and aesthetics. The clinical performance and prognosis of the single-stage surgical protocol are known to be comparable to the traditional two-stage method. There are some articles reporting a cumulative survival rate of 95 %, which is investigated immediately loaded single implants.

Results from these studies suggest that immediate loading could achieve equal success rates to those found in delayed loading. Many studies reported a greater satisfactory rate and less marginal bone loss in patients with immediate loading compared to delayed loading. Another benefit of this technology is its improvement of aesthetics and function in partially edentulous patients, especially patients with absence of anterior tooth. In addition, we can get better soft tissue morphology with the adjustment of the provisional prosthesis. In our case, the patient lost her anterior tooth of the maxilla and had high demands on her appearance. For these reasons, immediate loading was the best therapy for her.

Conclusion

With strictly selected indications, carefully designed treatment plans, and a carefully conducted operation, flapless implant surgery with immediate restoration in the aesthetic area can be a satisfying therapy.

With the maturing of dental planting techniques, immediate restoration after implant surgery has become a field of interest in clinical treatment and scientific research. Conventional rehabilitation with implant-supported prostheses have a long period of waiting before the patients receive the upper prosthesis—this period differs between six to twelve months. This may have some kind of aesthetics, function, pronunciation, and mental health effects on patients with a missing anterior maxilla tooth. Many studies have shown that implant survival rate and marginal bone loss of immediate restoration were not statistically significant compared to conventional rehabilitation. Immediate reconstruction can greatly reduce the time the patient has to spend with an incomplete dentition. Furthermore, the provisional prosthesis can shape the morphology of the soft tissue and achieve effects desired by patient and clinician._

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