Temporary Single Palatal Implant for Denture Stabilization During Augmentation and Implant Procedure: A Case Report

Michael Stimmelmayr, Dr Med Dent, PhD
Daniel Edelhoff, Dr Med Dent, PhD
Josef Schweiger, MDT
Jan-Frederik Güth, Dr Med Dent, PhD

This case report introduces a temporary denture with reduced extension stabilized in the edentulous maxilla as a possible treatment method for patients with a severe gag reflex, allowing them to test the function, esthetics, and tolerance of the denture prior to hard tissue augmentation and implant placement. A 4-mm implant was placed in the central anterior palate and allowed to heal for 3 months. During the complete treatment period, a denture with reduced extension can be delivered on a fixed Locator abutment. This method was successfully applied in three patients, and the palatal implant remained stable until the final removable prosthesis could be delivered. Int J Periodontics Restorative Dent 2018;38:e105–e111. doi: 10.11607/prd.3600

To plan the number, position, and angulation of implants, a removable full denture is necessary because the vertical hard and soft tissue resorption requires esthetic planning to evaluate the tooth length and red and white esthetics. However, some edentulous patients have a severe gag reflex and cannot tolerate an implant-supported denture with reduced palatal extension. Though this is possible for the final denture, the process for temporization presents a challenge.

Because the treatment can take up to 15 months if two-stage hard tissue augmentation and implant placement is necessary, patients require a sufficient temporary solution. During bone and implant healing, pressure on the soft and hard tissues must be eliminated; thus, a full maxillary dental prosthesis usually has to be reduced in the areas of surgical intervention to avoid any pressure on the augmented tissues or implants. This means that the denture must be maximally extended to ensure function. This is a difficult challenge in most patients and an almost impossible one for those with a severe gag reflex. Accordingly, there are two alternative options: (1) wearing no denture during the complete treatment until the final denture is delivered, or (2) choosing...
an immediate-loading procedure of the implants in terms of an “All-on-4” or “All-on-6” concept. With these concepts, the treatment period would be reduced to only a few days. However, these concepts are not practicable if the bone volume is insufficient for placing implants or if the bone quality leads to an insufficient implant torque.

From experience with palatal implants in orthodontic therapy and their proper osseointegration, the idea developed to use a palatal implant as a temporary device for fixing temporary dentures in edentulous maxillae. This idea could be realized using 4-mm implants with a regular connection to fix a Locator abutment.

Today, there is no clinical or scientific evidence for this procedure in the edentulous maxilla. Some studies have described approaches using a single central implant in the edentulous mandible to stabilize a full denture. Comparing the results of Cheng et al and Bryant et al, there seems to be no difference in patient satisfaction when placing one or two implants. However, this study did not compare the results of dentures in the edentulous mandible supported by one vs two implants; instead, both approaches were compared to a complete absence of any mandibular implant. Thus, it can at least be concluded that one implant leads to a significant enhancement in comfort. Kern at al described that one-implant–supported mandibular overdentures showed higher rates of implant loss than overdentures supported by two implants. The same study also showed that the stability and kinematics of a full denture are better when supported by two implants than by one (ie, there are better results when the denture has a larger area of support).

With these results from the literature in mind, a plan was made to attempt fixing a reduced maxillary full denture on a single 4-mm palatal implant. It was known that this indication was not approved by the implant manufacturer. However, these implants were only used as temporary implants. The requirements of the Helsinki Declaration were observed, and patients gave informed consent to all surgical procedures.

**Case Report**

A 57-year-old man with general health restrictions, whose history of a heart attack resulted in multiple stents in the coronary vessels, presented in the office with insufficient maxillary and mandibular telescopic removable partial dentures (RPDs) and severe periodontitis (Fig 1).

**Treatment Planning**

After clinical and radiographic examination, the patient was informed that all remaining maxillary and most remaining mandibular teeth had to be extracted. The treatment plan was to place six implants in the maxilla and four implants in the mandible to support two RPDs. The first step—fabricating a temporary maxillary full denture before tooth extraction, followed by extending the mandibular RPD—was rejected by the patient. Because of a severe gag reflex, he declined the maxillary full denture and asked for an alternative treatment method. The combination of bone defects due to periodontitis, transversal ridge defects, and an extensive bilateral maxillary sinus did not allow an immediate-load “All-on-4” or “All-on-6” concept. Therefore, staged hard tissue augmentation and implant therapy, with an overall treatment time of approximately 12 months, was planned.
for the maxilla. To give the patient the possibility of wearing a reduced maxillary denture during the therapy, it was arranged to place a palatal temporary implant to stabilize the denture on an interim basis.

Placement of the Palatal Implant

Under local anesthesia (Ultracain DS, Sanofi-Aventis), soft tissue was punched in the midline of the hard palate in the sagittal region between teeth 13 and 14 and between 23 and 24 (World Dental Federation [FDI] tooth numbering system) (Fig 2). The thickness of the palatal soft tissue was measured with a periodontal probe (PCPNC North Carolina, Stoma), and the implant bed preparation was performed according to the manufacturer’s instructions. Beginning with two different round burs, the pilot drill with a diameter of 2.2 mm was aligned perpendicular to the palate and guided to a depth of 4 mm, plus the thickness of the palatal soft tissue (3 mm). Then, the bed preparation was performed with the 2.8-mm- and 3.5-mm-diameter burs to a length of 7 mm. After cutting the screw threads with a tap (3-mm depth), the implant (SLActive TL RNSP Ø4.1 mm / 4 mm, Straumann) was placed (Fig 3) and covered with a healing abutment (1-mm TL RN, Straumann).

Fabrication of the Temporary Denture and Tooth Extraction

After an osseointegration period of 3 months, the healing abutment was removed, the implant connection was rinsed with 0.2% chlorhexidine solution, and a Locator abutment (Zest Anchors RN Locato 1 mm, Straumann) was placed with a torque of 35 Ncm (Fig 4).

With a palatally reduced individual tray that was fabricated on the working casts, an alginate impression (Palgat Plus, 3M ESPE) was taken. Extraorally, the undercuts were removed with a 15 blade so the impression could be repositioned in the mouth. Then, the alginate in the area of the palatal implant was removed, and the tray was perforated with a drill. A Locator impression post (Zest Anchors RN Locator impression post, Straumann) was placed on the Locator abutment, and the impression was repositioned in the mouth (this technique was possible because the patient had only conical telescopic maxillary crowns, allowing alginate-impression repositioning). Subsequently, the impression post was fixed to the individualized tray with a polyether impression material (Impregum, 3M ESPE). Combining alginate and the polyether material for this impression technique was necessary to avoid unintentional extractions of the remaining periodontally compromised and mobile/insufficient teeth during the impression procedure.

If the patient had had regular mobile teeth, it would not have been possible to reposition the alginate impression without distortion. Had that been the case, a double-tray technique would have been utilized. First, a custom tray would be used to perform an initial polyether or silicone pick-up impression of the Locator and edentulous area, then an alginate impression would be performed over the first custom tray to pick up the initial impressions.

After arbitrary registrations of the facebow and centric relation, the casts could be mounted into the articulator. The reduced temporary
maxillary full denture with incorporated attachment housing was fabricated of polymethyl methacrylate (PMMA) (Fig 5).

After consulting the cardiologist, the patient was set on an international normalized ratio (INR) of 2.2, and all remaining maxillary teeth and multiple mandibular teeth (35, 42, 43, and 47 [FDI]) could be extracted. The sockets were cleaned of granulation tissue, and the temporary maxillary full denture was delivered. After a wound-healing period of 2 weeks, the mandibular RPD was relined and extended.

**Hard Tissue Augmentation, Sinus Elevation, and Implant Placement**

The temporary maxillary full denture with attachment housing was duplicated with clear acrylics and served as a template during surgical procedures. Cone beam computed tomography (Orthophos XG 3D, Dentsply Sirona) was carried out for diagnostics of surgical planning. Because of the severe periodontal bony defects and inflammation, a healing period of 4 months was observed postextraction.

After another consultation with the cardiologist, the INR remained at 2.2, and the patient was instructed to take antibiotics (amoxicillin, 1,000 mg, 3 pills), 400 mg ibuprofen, and 50 mg prednisolone 1 hour before surgery. Postaugmentation, ibuprofen was continued for 3 days and the antibiotics for 6 days (each three times daily).

At tooth sites 12 and 22, the planned implants (SLA BL RC Ø4.1 mm / 12 mm, Straumann) could be inserted with additional horizontal bone augmentation as well as layers of autogenous bone chips and demineralized bovine bone (BioOss 1 – 2 mm, Geistlich). At sites 13 to 16 and 23 to 26, lateral sinus augmentations were performed, each with a mixture of 50% autogenous bone chips and demineralized bovine bone (BioOss 0.25 – 1 mm, Geistlich). The autogenous bone was harvested on the oblique line on the left mandible. All bone grafts were covered with resorbable collagen membranes (BioGide, Geistlich), and the wounds were closed with coronally advanced flaps. Immediately after surgery, a panoramic radiograph (Orthophos XG 3D, Dentsply Sirona) was taken to monitor the surgical results (Fig 6).

Five months after sinus elevation, the implants at tooth sites 16, 14, 24, and 26 (each SLA BL RC Ø4.1 mm / 12 mm, Straumann) were placed. Additionally, four implants were placed in the mandible at tooth sites 35, 32, 42, and 45 (each SLA TL RN Ø4.1 mm / 12 mm, Straumann AG) (Fig 7). The patient’s INR was again set to 2.2, and he was instructed to take medication as described before. The wound healing was uneventful.

Prior to the final surgery, the implants in the mandible were restored with Novaloc abutments (TL RN, Straumann) and the denture was relined and fixed on the implants. Again, 5 months after implant placement in tooth sites 16, 14, 24, and 26, the second-stage surgery was performed under local anesthesia, and the remaining mandibular teeth (33 and 44) were extracted (Fig 7). After a wound-healing period of 3 weeks, the implants in the maxilla were restored with Novaloc abutments (TL RN, Straumann) and the temporary denture was relined and fixed on the implants. The Locator abutment on the temporary palatal implant was removed, and a cover screw was placed (Fig 8). The temporary palatal implant was removed under local anesthesia after the relining of the maxillary temporary denture. With help of maxillary premolar tongs, it could be unscrewed counter-clockwise quite easily.
The fabrication of the final implant-supported RPDs in the maxilla and mandible will be conducted in approximately 6 months.

Discussion

The short palatal implant for orthodontic treatment was first described by Wehrbein et al in 1996. In 2008, the second generation of orthodontic palatal implants, with a length of 4.2 mm and a diameter of 4.1 mm, was described with survival and success rates similar to regular dental implants. Jung et al showed a palatal implant failure rate of 6.7%. All failures occurred during the osseointegration period; there was no failure during orthodontic treatment. Overdrilling or lack of experience with short implants may be reasons for implant failure. The connection of the before-mentioned palatal implants was aligned to the Straumann Orthosystem, and no regular dental abutment could be placed.

Since the launch of a regular, 4-mm-length dental implant (SLActive TL SP RN Ø4.1 mm/4 mm, Straumann) with a regular prosthetic connection, it is possible to place all common abutments. Slotte et al showed a survival rate of 95.7% in the posterior mandible for these 4-mm implants after 1 year and 92.3% after 2 years; these survival rates are only slightly lower than those of 6- to 8.5-mm implants. However, in another study by Slotte et al, only 3- or 4-unit splinted fixed dental prostheses (FDPs) without pontics or cantilevers were inserted, and the survival rate after 5 years was 92.2%. The implant manufacturer (Straumann) does not approve use of 4-mm implants for single-tooth replacement or for fixation of RPDs. Nevertheless, the palatal implant in the present case was used, but only temporarily. The patient was informed and gave informed consent for the procedure.

To support a maxillary full RPD, a minimum of four implants covering a maximal area of support should be placed. Kern et al described that implant loss rates for maxillary overdentures fixed on three or fewer implants were significantly higher than those fixed on four implants (ie, lower implant numbers result in higher implant loss rates). Zembic et al, however, showed a high survival rate for overdentures supported by two maxillary implants and ball attachments, but follow-up was only...
1 year, and peri-implant bone loss was present around the implants after 1 year of function. The reason for this bone loss could be increased stress in the bone around the implants. Lahoti et al also described a higher stress around implants in the bone caused by single-implant–retained overdentures compared to two-implant–retained overdentures in the mandible. At present, there are no scientific data for single-implant–retained RPDs in the edentulous maxilla. In a systematic review, Alqutaibi stated that there is limited evidence that a single-implant overdenture is an alternative to a two-implant overdenture in the mandible, but Alqutaibi et al’s summary of mandibular overdenture data concluded: “Single-implant overdentures may be suggested as an alternative treatment modality for the rehabilitation of edentulous patients who cannot afford the cost of a two-implant overdenture.”

An alternative to temporary palatal implants could be provisional implants. However, there is less evidence about their success rates when used in the maxilla. Krennmair et al described loss rates of 36.2% in the maxilla, which were significantly higher than the mandibular loss rates of 10.5%. In another study, the use of splinted vs nonsplinted provisional implants in the maxilla was investigated. Four provisional implants were placed in the edentulous maxilla to support a temporary full dental prosthesis. The loss rate for nonsplinted provisional implants (37.5%) was significantly higher compared to the splinted provisional implants (9.3%). However, placing four provisional implants in an edentulous maxilla is impossible when the sinus is widely extended and/or the resorption in the anterior zone is severe. Placing only two nonsplinted provisional implants in the maxillary canine areas would provide linear support for the denture, but the loss rate would probably be quite high.

Finally, the kinematics of the prosthesis fixed on one single palatal implant and the degree of freedom with only one retention abutment must be discussed. If the Locator abutment is placed near the midline of the anterior third of the prosthesis (Fig 5), the overdenture will experience motion in both the anterior and posterior teeth when biting. This is a combination of diagonal and diametral loading protocols. Additionally, with that same Locator placement, there will be rotation on the prosthesis that increases when the implant is placed more distally, to the center of the overdenture. This means that there should be good tissue support that can be accessed through the palate’s vertical dimension.

In all three patients, the temporary palatal implants showed no signs of inflammation and remained stable until delivery of the final restoration. Patients showed high satisfaction with the treatment, and they could wear a reduced maxillary full denture during the complete treatment period despite their gag reflex. The patients experienced an esthetic benefit, felt safer in their daily lives, and were able to chew soft food. However, supporting a maxillary full denture with one palatal implant serves only as a temporary prosthesis when a complete extension of the denture cannot be tolerated by the patient and therefore has to be considered as an experimental approach, which must be balanced with the individual needs of each patient.

Conclusions

Within the limitations of this case report, a reduced maxillary full denture can be temporarily fixed and stabilized by one palatally inserted 4-mm Straumann implant and show successful results over a period of approximately 12 to 15 months. When a patient is unable to tolerate a normal extended maxillary full denture due to a severe gag reflex, this procedure may be discussed as an alternative to an immediate loading protocol.

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References


