

Extraction treatment using a palatal implant for anchorage

Aim: To describe the use of Straumann Orthosystem implants for orthodontic anchorage.

Methods: The Straumann Orthosystem consists of a titanium palatal implant and connected device, which can be used when absolute anchorage is required. In the present study the implant was placed in the midline at the junction of the alveolar process and hard palate. The implant was osseointegrated 13 weeks after placement. A palatal arch attached to the implant and upper first molar bands was used to provide stationary anchorage in a 23 year-old female with protruding upper anterior teeth and moderate crowding of both arches.

Conclusion: A palatal implant provides stationary anchorage for retraction of anterior maxillary teeth.

Aust Orthod J 2003; 19: 87–90

Introduction

The appliances used to reinforce maxillary anchorage include various forms of headgear, and transpalatal bars with/without a Nance palatal “button”. In the last decade experimental and clinical studies have shown that osseointegrated implants can be used as effective alternatives to these appliances.¹ Several types of implants, designed specifically for orthodontic purposes, are now available.^{1–9} Because implants placed in the alveolar process can interfere with subsequent tooth movement the hard palate has been used as the implant site.

Over 10 years ago Triaca *et al.*² experimented with a screw-type implant only 3 mm high, but 7.5 mm in diameter. They reported satisfactory results with respect to bone height, but an adverse soft tissue reaction. Block and Hoffmann,³ and Bondemark *et al.*⁴ subsequently introduced an even shorter and wider subperiosteal disc covered with a thick coat of hydroxyapatite (75µ) on the osseous surface, and a “cave” cylinder with an internal trimming structure that allowed the “Onplant” to be connected with the anchorage appliance. About 10 years ago the “Orthosystem” (Institut Straumann AG, Waldenburg, Switzerland) was introduced to the profession.^{5–7} This implant, which is a titanium sand-blasted and chemically treated SLA implant (SLA: sandblasted, large grit, acid-etched), has been the subject of a recent report by Giancotti *et al.*⁹ Recently Maino, Mura and Gianelly⁸ introduced a two-part titanium implant called the “Midplant”

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Received for publication: August 2002
Accepted: July 2003



Figure 1. Self-threading 6 mm long intra-osseous screw (SLA). The smooth transmucosal neck is visible between the thread and the insertion tool.



Figure 2. Healing cap held by the insertion tool, showing the screw used to engage the implant.



Figure 3. Pretreatment cephalometric radiograph of patient showing palatal implant.

(HDC, Sarcedo-VI, Italy). In common with the Straumann Orthosystem the Midplant consists of a self-tapping screw with a 5 mm diameter support flange or disc. Both the parts are also chemically treated (TPS: titanium plasma sprayed), and available in five lengths: 4.5 mm, 5.0 mm, 6.0 mm, 7.0 mm and 8.0 mm. Two titanium orthodontic connectors are available for the Midplant: a standard cylindrical connector which can be soldered to a transpalatal bar, and an auxiliary (a winged connection platform) with retaining holes for more flexible connection.⁸

The aim of this report is to describe the use of the Straumann Orthosystem to provide stationary anchorage in an adult patient with crowded and protruding teeth.

The implant system

Straumann Orthosystem implant used in this report consists of a pure titanium implant, a cap with integral screw to cover the end of the implant during healing, and a set of burs and instruments to insert and remove it. The implant consists of a 3.3 mm diameter titanium intra-osseous screw with a self-tapping thread, and with a smooth transmucosal neck (Figure 1). The latter is available in two lengths, either 2.5 mm or 4.5 mm, so that about 2 mm of the neck can project beyond the mucosal surface. The implant with the longer neck should be used in sites with thick

mucoperiosteum. The healing cap, in common with other implants, screws into the exposed end of the implant (Figure 2). The intraosseous screw is available in 4 mm and 6 mm lengths, and is sand-blasted and acid-etched to obtain good primary stability.

The first step in treatment planning is to assess the bone height on a lateral cephalometric radiograph. As a rule implants placed in the midline at the junction of the alveolar process and the hard palate will avoid contacting the roots of the upper incisors and perforating the hard palate (Figure 3).⁹ Implants placed more caudally in the midline may perforate the hard palate, and even the nasal mucosa. Most importantly, the implant should be placed at right angles to the mucoperiosteum and palatal bone, and it should project about 2 mm above the mucoperiosteum.

Following local anaesthesia of the site a trephine is used to remove a disc of mucoperiosteum. A pilot hole is prepared with a standard round bur, and completed with the profile drill supplied by the manufacturer. The implant is then screwed into the prepared bed, and the end covered with a healing cap. If desired a protective acrylic splint can be placed after surgery.⁹ Osseointegration takes about 13 weeks. When the implant is firm, the healing cap is replaced with an impression cap, and an impression



Figure 4a. Start of canine retraction using a transpalatal bar soldered to the implant connector and both molar bands.

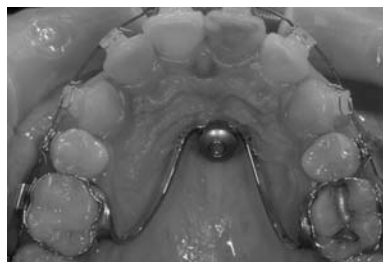


Figure 4b. Third phase of treatment for retraction of the incisors.



Figure 5a. Palate immediately following removal of the implant with the trephine.



Figure 5b. Implant.

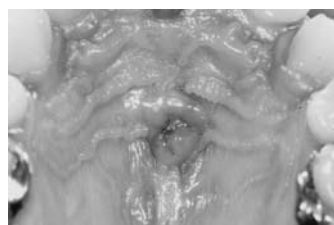


Figure 5c. Implant bed two weeks post-removal.

taken for laboratory fabrication of the appliance. This may consist of either a rectangular palatal bar soldered to a stainless steel cap screwed into the implant and to both upper molar bands or a distalising appliance attached directly to the implant.¹⁰

Case report

A 23 year-old female patient presented a Class I malocclusion with crowded and protruding upper and lower anteriors. Her chief complaints were protruding and crowded front teeth (Figure 3). The treatment plan was to extract maxillary and mandibular first premolars to provide space for correction of the crowding and upper protrusion, and to upright the lower incisors. In order to reinforce the posterior maxillary anchorage, as is usually required in this kind of malocclusion, a Straumann Orthosystem implant was placed in the midline of the palate. A rectangular palatal arch was soldered to the maxillary first molar bands and to the steel implant cap, and then screwed to the fixture. After aligning and levelling the arches, the maxillary canines were retracted with Class I

elastics (150 g) and sliding mechanics. The upper incisors were then retracted and the lower incisors uprighted with Class I forces (350 g) according to the Bidimensional Technique.¹⁰ The occlusal photographs illustrate different phases of the treatment using a Straumann Orthosystem palatal implant for posterior anchorage (Figure 4). At the completion of treatment the palatal implant was removed surgically with the aid of a trephine and by rotating it anticlockwise with the insertion tool. The wound healed uneventfully (Figure 5).

Conclusions

Palatal implants provide stationary anchorage, and can eliminate the need to wear headgear. The combination of implants and sliding mechanics with NiTi coil springs can reduce reliance on patient cooperation, and the teeth can be moved either mesially or distally. Implants will conserve anchorage during torquing movements, and may eliminate the need for some extractions.

Implants required for only part of the treatment may be left *in situ* until the finishing

phase of treatment when it is clear that additional posterior anchorage is no longer needed. The transpalatal bar can be removed and replaced with a healing cap at any stage during treatment.

Insertion and removal of this implant is straight-forward and without complications. Experience has shown that management of malocclusions requiring stationary anchorage and/or requiring maximum cooperation are greatly simplified using this device. It has been well-received by patients who have not reported any inconvenience or problems due to the implant.

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