Fabrication of an overdenture using retentive anchors
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The user is also obliged to study the latest developments of the Straumann® Dental Implant System and its applications regularly.

Please note
The descriptions given are insufficient to allow immediate use of the Straumann® Dental Implant System. Guidance in the handling of these instruments by a doctor experienced in their use is strongly recommended.

Validity
Upon publication of this brochure, all previous versions are superseded.

Availability
Not all products listed in this brochure are available in all countries.

Caution
Our products must be secured against aspiration when used intraorally (e.g. use of a throat pack is recommended).

Delivery
Federal law restricts these devices to sale by or on the order of a dentist or physician.

Units per package
Unless stated otherwise, there is one unit in each package.

Documentation
You can obtain detailed instructions on the Straumann® Dental Implant System from your Straumann representative.

Definition
SLA® = Sand-blasted, Large grit, Acid-etched

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Description of the symbols on labels and instructions for use
LOT Lot/batch number
REF Article number
STERILE R Sterile by gamma irradiation
STERILE Non-sterile
X Do not use on patients
2 Do not reuse
Protect from exposure to strong light or heat
Refer to instructions for use
Use before expiration date

Colored warning labels
YELLOW ➡ CAUTION: In case of danger or unsafe handling that might cause slight bodily injury or damage to property.

ORANGE ➡ WARNING: In case of danger that might cause severe bodily injury or death.

RED ➡ DANGER: In case of danger that may cause immediate severe bodily injury or death.
Straumann is the exclusive industrial partner of the ITI (International Team for Implantology) in the areas of research, development, and education.

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Planning principles
Implant-borne full dentures require thorough planning of the surgical and technical procedures. The number and positions of the implants as well as the design of the denture and occlusion should take the anatomical, functional, and hygienic aspects into account. The static/dynamic conditions govern the selection of the retentive units (Besimo, 1993).

Recall appointments
Hybrid dentures with resilient retention units must be examined at intervals of approximately 3 months to ensure harmful excursions of the denture are eliminated in their early stages (possible methods: relining, activating/replacing the matrix, checking the occlusion). In cases of poor oral hygiene, the patient should undergo thorough scaling and polishing, as well as re-instruction and motivation to maintain the necessary high level of oral hygiene. If the patient is co-operative, the interval between check-ups can be increased.
Retentive anchor

Introduction

Purposes of anchors:

- Securing the prosthesis against excursive forces and those which would dislodge the saddles
- Distribution of shear forces
- To transfer the masticatory forces as axially as possible from the denture to the implant

Description/Function

The retentive anchor abutment works in conjunction with the movable attachments. Retentive units that permit rotary movement of the denture in one or more directions and/or vertical translational movements are termed mobile units.

The mobile connector shortens the lever arm of the tilting forces exerted on the implant. The implants must always be placed at an angle of 90° to the occlusal plane to ensure that they are loaded axially. Precisely designed occlusal surfaces – balanced occlusion with freedom-in-centric (Geering et al., 1993) – and optimum design of the denture fitting surface also influence the stability of the denture and the distribution of the masticatory forces (Worthington et al., 1992). We recommend that a new denture always be fabricated as part of the treatment plan or after the provision of implants (Mericske-Stern, 1988).

Indications for retentive anchors

- Use with Standard implants Ø 4.1 mm, RN (Regular Neck)
- Resilient anchorage in the edentulous maxilla and mandible in conjunction with two implants to ensure the degrees of freedom
- Insufficient space available (in such cases, bars often cause the anterior section to be extended too far linguually thus restricting the space available for the tongue and impeding its function)
- In cases of severely tapering anterior arches and/or jaws (Geering et al., 1993)

Retentive anchors are not for use in the following applications:

- Combined tooth-/implant-borne restorations
- Use of more than two implants per jaw
- In conjunction with attachments exhibiting a different degree of resilience
- If the implants are not vertical to the occlusal plane
- In cases where the implants have been positioned in the arch in such a way as to prevent a tangential axis of rotation
- In unfavorable ridge situations
“Patient” initial situation
Edentulous lower jaw with two Standard implants Ø 4.1 mm, RN (Regular Neck) replacing the canines with retentive anchor abutments (048.439).

Important: To ensure that the retentive anchors function properly over a long period of time, the implants must be placed as parallel as possible to one another and vertical to the occlusal plane to create a tangential axis of rotation.

The retentive anchor has a square neck to accommodate the driver. It is inserted into the implant with a force of 35 Ncm. Measured from the upper edge of the implant shoulder, the retentive anchor is 3.4 mm high.

RN = Regular Neck (implants that have a 4.8 mm restorative platform)

Taking an impression of the retentive anchor

The impression is taken with an elastomeric impression material (polyvinylsiloxane or polyether rubber) directly over the anchor, without any impression components.

Important: In view of its low resistance to tearing, a hydrocolloid is not suitable for this application.
To ensure stability, the production and integration of a metal reinforcement in the full lower denture is recommended. Sufficient space must be left for securing the matrices.

The teeth should be set up using the occlusal concept for full dentures.

**Producing the model**

Transfer pins are positioned in the impression and the cast is produced in special, type 4 (DIN 13911) hard plaster. The impression of the retentive anchor provides the square/spherical stud of the transfer pin with sufficient retention in the impression.
The principle of function of the Elliptical Matrix:
The Elliptical Matrix is used for the fixation of removable resilient full dentures on Straumann implants in conjunction with the retentive anchor. It consists of a titanium housing (pure titanium grade 4) with a gold lamella retention insert (Elitor®, Au 68.6%, Ag 11.8%, Cu 10.6%, Pd 4.0%, Pt 2.5%, Zn 2.5%, Ir < 1%). The insert is screwed into the titanium housing.

When there is insufficient space, the wings of the titanium housing can be modified individually. However, a minimum diameter of 3.6 mm must be maintained in order to ensure the retention of the housing in the resin.
Adjusting the retentive force

The screwdriver (046.154) is required for activating, deactivating, and removing the lamella retention insert. The instrument is pushed with the correct alignment into the lamella retention insert as far as it will go. The retentive force is adjusted by rotation (increased by turning clockwise and reduced in the opposite direction). The initial retention force is approximately 200 g, which is also the minimum that can be set. The maximum retention force is approximately 1400 g. The lamella retention insert must not project out of the housing. If retention is lost, the insert can be replaced without having to remove the titanium housing from the denture.

Slight deviations from these average values are possible due to the unavoidable manufacturing tolerances of the lamella retention insert and retentive anchor. If signs of wear are evident on the retentive anchor, the retention force may no longer apply, and the retentive anchor must be replaced.

Caution:
Always begin with the preset retention force of 200 g (matrix as supplied) and adjust it accordingly based on the patient’s comfort level and clinical requirements.

The connection between tightening angle and retention force:

- 0° = 1,400 g. (3.08 lb) (tightened as far as it will go)
- 90° = 700 g. (1.54 lb)
- 180° = 500 g. (1.10 lb)
- 270° = 300 g. (0.66 lb)
- 360° = 200 g. (0.44 lb) (delivery condition)

Clockwise rotation = increase retention force
Counterclockwise rotation = decrease retention force

* Slight deviations from these average values are possible due to the unavoidable manufacturing tolerances of the lamella retention insert and retentive anchor. If signs of wear are evident on the retentive anchor, the retention force may no longer apply, and the retentive anchor must be replaced.
Before curing the matrix into the denture, the lamella should be tightened just enough so that it remains stable on the retentive anchor during processing.

**Important:**
When trying the denture in the patient, always start with the lowest retention force. The retention force is adjusted by rotating the lamella retention insert and must be done in small increments until the desired retention force is obtained. Otherwise, excessive retention forces may cause difficulties when removing the denture from the mouth.
Fabrication of a new full lower denture with metal reinforcement and two titanium matrices

“The patient” initial situation
Edentulous lower jaw with two Standard implants Ø 4.1 mm, RN (Regular Neck) replacing the canines with retentive anchor abutments (048.439).

Model starting situation (procedure identical as previously described for “Fabrication of a full lower denture with metal reinforcement and two Elliptical Matrices”).

The titanium matrix (048.450) consists of a titanium alloy (Ti-6Al-4V), hardness HV5 Vickers 350–385. The titanium matrix is available preassembled and consists of the following individual components: housing, spring ring, threaded top (from left to right).
Unlike the Elliptical Matrix, the titanium matrix makes use of a spring ring with a defined extraction force of 700–1,100 g. If retention is lost, the spring ring can be replaced.

To replace the spring ring, the threaded top on the titanium matrix is unscrewed counter-clockwise using the corresponding screwdriver (048.452), and the spring ring is changed.

The threaded top is then screwed back in place hand-tight.
The titanium matrices can be polymerised into place as follows:

Method A
Before positioning the matrices on the transfer pins in the model, the original housing is unscrewed and replaced with a plastic threaded mounting ring (048.454V4). The undercuts are blocked out with wax. The plastic ring is 3/100 mm wider in diameter than the titanium matrix housing and acts as a spacer for it. This prevents too tight a fit of the titanium threaded ring on the polymerised acrylic. After polymerisation, the threaded mounting ring is replaced by the titanium housing once more.
Method B
The denture is polymerised with special acrylic spacers only (048.451V4). First, the undercuts are blocked out with wax. Once the denture is ready, the spacers are removed and the dentist can polymerise the titanium matrices into place directly in the patient’s mouth. The spacers are also used to produce the model for the metal reinforcement.
Method C
Before being positioned on the edge of the threaded ring, the titanium matrix must be coated with a thin film of die spacer. This ensures that the housing can be released later without excessive force being exerted.

Important: With all three methods, the titanium matrices (or spacers) must also always be positioned on the transfer pins with their axes aligned (parallel to the path of insertion) and the undercuts blocked out.

The finished denture with titanium matrices integrated in the metal framework.

Important: Once the denture is complete, it must be checked to ensure no acrylic has penetrated the matrix. To do this, the housing should be removed and the inner configuration with the spring should be cleaned.
Removal of titanium matrix from an existing denture
To replace an entire titanium matrix, the housing and spring ring must first be removed. The tip of a special extractor (048.453) is then heated over a Bunsen burner and screwed into the threaded top. The top can then be withdrawn from the acrylic denture.
The retentive anchor abutments are inserted into the implants with a force of 35 Ncm. The existing denture is then hollowed out in the region of the anchors. The opening created allows the acrylic to flow in and around the matrices. The Elliptical Matrices positioned on the retentive anchors must not touch the denture after hollowing.

**Polymerisation of the Elliptical Matrix in the patient’s mouth after implantation and osseointegration:**

The existing full lower denture prior to modification.

The retentive anchor abutments are inserted into the implants with a force of 35 Ncm. The existing denture is then hollowed out in the region of the anchors. The opening created allows the acrylic to flow in and around the matrices. The Elliptical Matrices positioned on the retentive anchors must not touch the denture after hollowing.
After positioning the Elliptical Matrices on the retentive anchors, a small piece of rubber dam is placed over the matrices to block out the undercut created between the lower edge of the matrix and the abutment. This prevents the acrylic from flowing into the internal matrix configuration, which could lead to “locking” the denture in the patient’s mouth.

Important: The matrices must be aligned (parallel to the path of insertion).
The prepared denture is then fixed in the mouth and the acrylic is flowed through the perforation.

The modified denture with the polymerised Elliptical Matrices.
Hybrid dentures with retentive anchors should be checked at approximately three-month intervals to eliminate damaging denture movements by appropriate measures at an early stage. If the alveolar ridge resorbs after a prolonged wearing time, the denture may sink. This leads to a loss of resilience of the matrices and so to greater stress on the retentive anchor/implants. Relining then becomes necessary.

Relining is carried out directly over the retentive anchors. Care should be taken to ensure that the denture is sitting correctly (retentive anchor/matrix connection). The dental technician then positions the transfer pins (048.109-1) in the Matrices (titanium or Elliptical matrix) in the denture and produces the relining model (see page 5, Producing the model).

After relining, the matrices should be checked for acrylic that may have flowed into them and for their functionality. It must also be possible to activate/deactivate the Elliptical Matrices. After polymerisation, the Elliptical and titanium matrices are opened with the relevant screwdriver and the internal configuration is cleaned.

**Important:** These measures are vital to ensure the optimum function of the relined, implant-borne retentive anchor denture. If the function of the matrix is impeded, this can damage the implant/anchor.
### Recommended choice of implant

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<th>Retentive anchor with titanium matrix</th>
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<td><strong>Abutments and laboratory parts</strong></td>
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<td>Retentive anchor 048.439</td>
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<tr>
<td>Ratchet 046.119</td>
<td>Ratchet 046.119</td>
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<td>Torque control device 046.049</td>
<td>Torque control device 046.049</td>
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<td>Driver for retentive anchor 046.069</td>
<td>Driver for retentive anchor 046.069</td>
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<td><strong>Instruments</strong></td>
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<td>Transfer pin 048.109-1</td>
<td>Transfer pin 048.109-1</td>
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<td><strong>Fabrication of denture</strong></td>
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<td>Replacement spring rings 048.455 V4</td>
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<td><strong>Insertion of final restoration</strong></td>
<td><strong>Insertion of final restoration</strong></td>
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<tr>
<td>Screwdriver 046.154</td>
<td>Screwdriver 046.452</td>
</tr>
<tr>
<td></td>
<td>Extractor 048.453</td>
</tr>
</tbody>
</table>

V4 = 4 components per pack

Edentulous: retentive anchor

Recommended implant: Standard implant Ø 4.1 mm or 4.8 mm, RN (Regular Neck)
Case presentation:
Courtesy of
G. S. Solnit, DDS, MS
Beverly Hills, CA
## Product Overview

### Retentive anchors

<table>
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<th>Article</th>
<th>Dimension</th>
<th>Material</th>
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<tbody>
<tr>
<td>048.439</td>
<td>Retentive anchor abutment</td>
<td>Height 3.4 mm</td>
<td>Titanium</td>
</tr>
<tr>
<td>046.069</td>
<td>Retentive anchor driver</td>
<td>Length 19.0 mm</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>048.109-1</td>
<td>Transfer pin for retentive anchor</td>
<td>Length 18.0 mm</td>
<td>Stainless steel</td>
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### Elliptical Matrix with adjustable retention

<table>
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<th>Article</th>
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<th>Material</th>
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<tbody>
<tr>
<td>048.456</td>
<td>Elliptical Matrix</td>
<td>Height 3.2 mm</td>
<td>Elitor®/titanium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ø 3.6 mm</td>
<td></td>
</tr>
<tr>
<td>048.457</td>
<td>Spare lamella retention insert</td>
<td>Height 2.6 mm</td>
<td>Elitor®</td>
</tr>
<tr>
<td>046.154</td>
<td>Screwdriver</td>
<td>Length 37.0 mm</td>
<td>Stainless steel</td>
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### Titanium matrix with defined retention

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<tr>
<td>048.450</td>
<td>Titanium matrix for retentive anchor</td>
<td>Height 3.1 mm</td>
<td>Titanium alloy</td>
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<tr>
<td>048.451V4</td>
<td>Spacer for titanium matrix</td>
<td>Height 3.5 mm</td>
<td>Plastic</td>
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<td>048.452</td>
<td>Screwdriver for titanium matrix</td>
<td>Length 60.0 mm</td>
<td>Stainless steel/anodized aluminum</td>
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<td>048.453</td>
<td>Extractor for titanium matrix</td>
<td>Length 100.0 mm</td>
<td>Stainless steel</td>
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<td>048.454V4</td>
<td>Threaded mounting ring for titanium matrix</td>
<td>Height 2.2 mm</td>
<td>Plastic</td>
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<tr>
<td>048.455V4</td>
<td>Spacer for 048.450</td>
<td></td>
<td>Stainless steel</td>
</tr>
</tbody>
</table>
Mericske-Stern R.  
Clinical evaluation of overdenture restorations supported by osseointegrated titanium implants: a retrospective study.  

Mericske-Stern R.  
Forces on implants supporting overdentures: a preliminary study of morphologic and cephalometric considerations.  

Mericske-Stern R, Steinlin-Scharfer T, Marti P, Geering AH.  
Periimplant mucosal aspects of ITI implants supporting overdentures. A 5 year longitudinal study.  

Worthington P, Brånemark PI.  