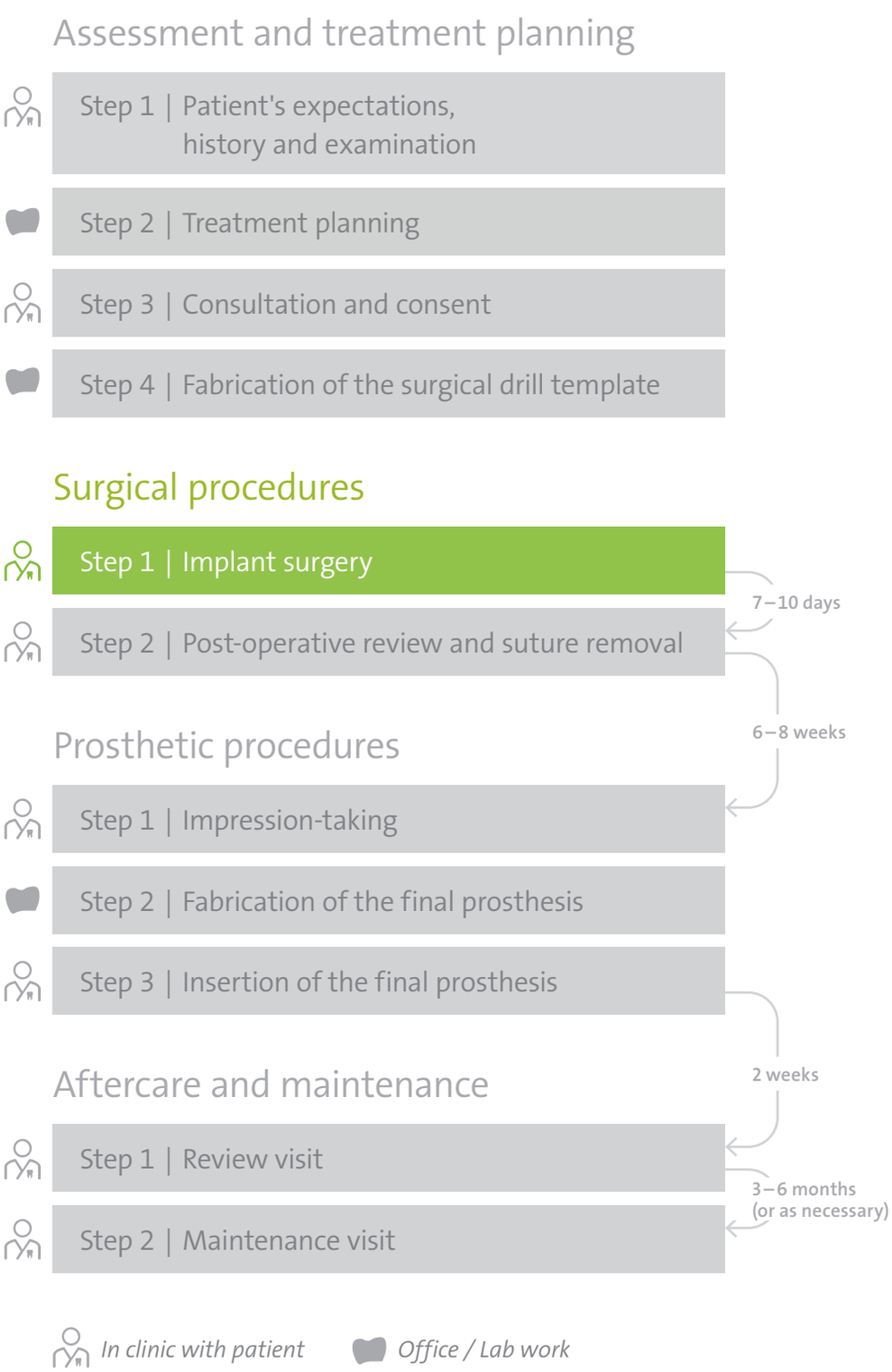
Stage 2 | Surgical procedures

Step 1
Implant surgery

straumann
simply doing more

Surgical procedures

Step 1 | Implant surgery



Contents

Introduction 4

Learning objectives 5

1. Pre-operative part 6

1.1 Surgical instrument set-up 6
1.2 Patient preparation and premedication 10

2. Intra-operative part 11

2.1 Local anesthesia 11
2.2 Incision and flap elevation 12
2.3 Surgical procedures for Straumann® Standard Plus (SP) Implants 16
2.4 Surgical procedures for Straumann® Bone Level Tapered (BLT) Implants 42

3. Post-operative part 71

3.1 Ideal post-operative behavior 72
3.2 Medication and other aids 72
3.3 Management of post-operative complications 73
3.4 Suture removal and additional information 75

Introduction

Implant surgery is similar to many other oral surgical procedures. It starts with appropriate preparation for the surgery. Like other oral surgical interventions, working under sterile conditions is mandatory. Implant placement normally requires raising a soft tissue flap, preparing the implant bed by drilling the alveolar bone, placement of the implant and Healing Cap or Healing Abutment respectively, followed by adequate closure of the wound.

Good preparation of the surgery and instruments under sterile conditions is critical to reduce the risk of infection.

Learning objectives

- Know how to prepare the patient for surgery by providing appropriate antibiotic prophylaxis, premedication, antiseptic mouthrinse and adequate local anesthesia at the surgical site.
- Be familiar with drilling procedures and its general considerations.
- Know how to assess bone quality, perform an appropriate incision to raise a full-thickness flap and expose the bone.
- Be able to place the implant in the correct three-dimensional position.
- Know what to inform the patient about post-operative aftercare, medication and oral hygiene measures.
- Know what complications can occur intra- or post-operatively and how to handle such situations.

The procedure for implant placement consists of three parts:

1. Pre-operative part

2. Intra-operative part

3. Post-operative part

1. Pre-operative part

A suitable room for surgical procedures under hygienic conditions is recommended to reduce the risk of infection, although a strictly sterile operatory is not necessary for successful implant osseointegration[1]. The patient should be covered with sterile drapes, and the surgeon and dental assistant should be dressed in sterile attire. The presence of a second non-sterile assistant can be useful during surgery.

All members of the dental team should be working under sterile conditions, but a second non-sterile assistant can help as a runner during the surgery.

1.1 Surgical instrument set-up

Example of a surgical tray set-up.

Check all instruments for completeness and function.
An adequate stock of implants and sterile spare instruments should always be available.

Personal Protective Equipment (PPE) for the dentist and dental assistant

1. Surgical gloves (sterile)
2. Surgical mask
3. Safety goggles
4. Head cover
5. Surgical gown (sterile)

Personal Protective Equipment

Video: Personal Protective Equipment (PPE) and sterile gowning

Other instruments

1. Dental mirror
2. Flap retractor
3. Lip retractors
4. Surgical suction cannula

Other instruments

General instruments

1. Anesthesia syringe/needle
2. Dental tweezers (diamond)
3. Dental tweezers (regular)
4. Anatomic tweezers (straight)
5. Periodontal probe
6. Dental probe
7. Dental mirror

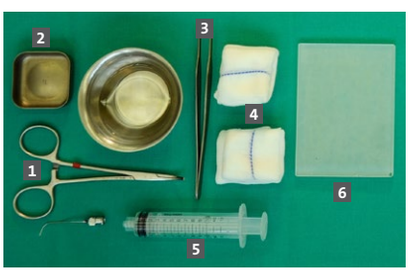
General instruments

Flap elevation

1. Surgical scalpels (No. 12 and 15 blades; Microblade)
2. Periosteal elevator
3. Scaler
4. Curettes

Instruments for flap elevation

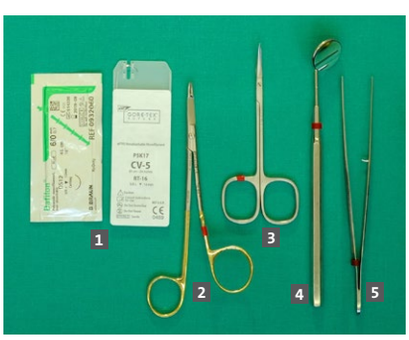
Additional instruments



1. Clamp
2. Titanium bowl
3. Titanium tweezers
4. Sterile gauzes
5. Irrigation syringe
6. Small glass mixing plate

Additional instruments

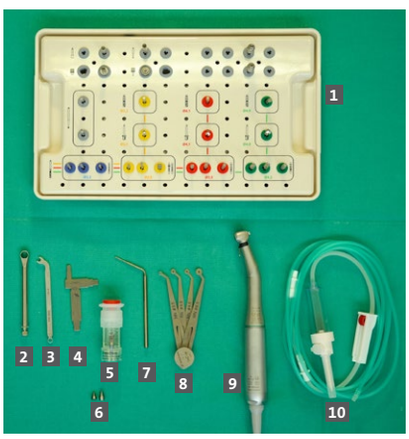
Wound closure



1. Suture material
2. Needle holder
3. Scissors
4. Dental mirror
5. Surgical tweezers

Instruments and suture material for wound closure

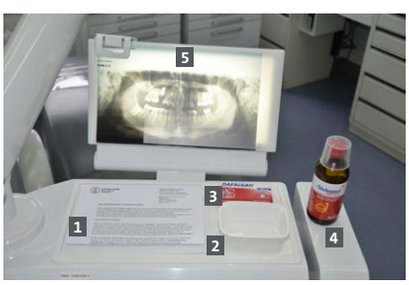
Drilling and implant insertion



1. Straumann® Basic Surgical Cassette
2. Ratchet
3. Holding Key
4. Diagnostic T
5. Planned implant in sterile container
6. Healing Cap or Healing Abutment
7. Bulb-headed probe
8. Implant Distance Indicator
9. Surgical motor and contra-angled hand-piece
10. Tubing for sterile saline

Instruments for implant bed preparation and implant placement

Planning tools/medication



1. Post-operative patient information
2. Surgical drill template in disinfected mouthrinse (chlorhexidine)
3. Pre- and post-operative medication
4. Chlorhexidine mouthrinse
5. OPG or periapical X-ray

Planning tools and medication

1.2 Patient preparation and premedication

- **Antiseptic mouthrinse**
  The patient should rinse his or her oral cavity with an antiseptic mouthrinse (chlorhexidine-digluconate 0.12 %) for 1 minute[2].

- **Analgesics and anti-inflammatory medication**
  In order to reduce pain and swelling after the operation, the use of pre-operative analgesics and anti-inflammatory agents is recommended[3].

- **Antibiotic prophylaxis**
  This is not indicated in healthy patients if a straightforward surgical procedure is expected[4]. It may be indicated in high-risk patients (such as those with heart conditions which predispose them to risk of infective endocarditis; or those with prosthetic joints who may be at risk for developing infections at the site of the prosthesis) based on recommendations of national medical societies. It is always best to clarify with the patient's physician on this requirement before the day of the surgery.

Prepare the patient with the following prophylaxis if necessary:
- Antiseptic mouthrinse
- Analgesics and/or anti-inflammatories
- Antibiotics

2. Intra-operative part

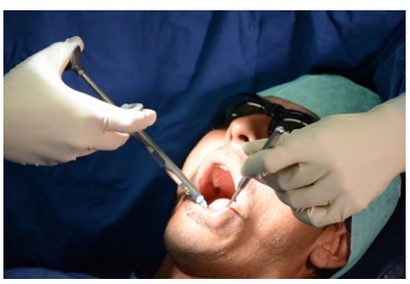
The ultimate goal is to perform a minimally traumatic implant surgery with a predictable outcome on the patient. This involves avoidance of any unnecessary tissue damage, as well as minimizing any contamination of the implant site with intraoral or extraoral bacteria.

Goal: Minimally traumatic surgical implant placement.

The following steps are described in this section:

2.1 Local anesthesia
2.2 Incision and flap elevation
2.3 Surgical procedures for Straumann® Standard Plus (SP) Implants
2.4 Surgical procedures for Straumann® Bone Level Tapered (BLT) Implants

2.1 Local anesthesia



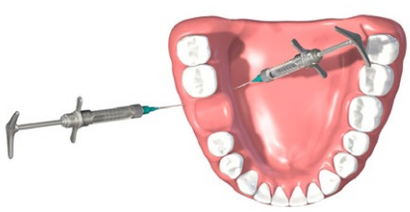
Appropriate local anesthesia is a prerequisite for a safe and painless surgical intervention.

Good local anesthesia provides patient comfort and safety.

Maxilla

- Perform a local buccal and palatal infiltration.
- Additionally, a palatal nerve block of the upper posterior maxillary nerve (at the maxillary tuberosity) is required.

Maxilla: Buccal and palatal infiltrations are required. Also consider blocking the upper posterior maxillary nerve if necessary.



Mandible

- Perform a local inferior alveolar / lingual nerve block.
- Infiltrate around the long buccal nerve and mental nerve if necessary.

Mandible: Inferior alveolar/ lingual nerve block. Also consider blocking the long buccal nerve & mental nerve if necessary.

2.2 Incision and flap elevation

Incision and flap elevation should:

- Be as minimally traumatic as possible.
- Provide adequate visibility and access to the implant bed.

Raise a flap with minimal trauma to provide adequate access to the implant site.

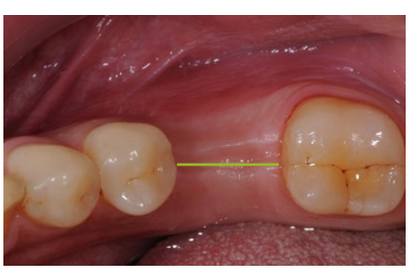
You can use different blades to perform the incisions to gain access to the implant site.

1. Microblade: This is recommended especially in esthetically sensitive areas and thin biotypes. They allow precise incision especially in the sulcular area.
2. Blade No. 12
3. Blade No. 15

Select a suitable blade to perform the incision.

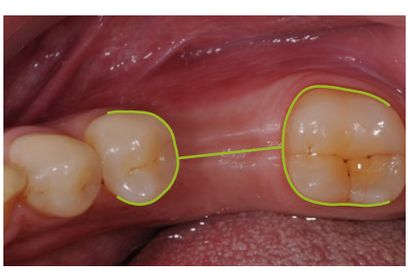
Step-by-step procedure

2.2.1 For a single-tooth gap: Use blades No. 12 and 15



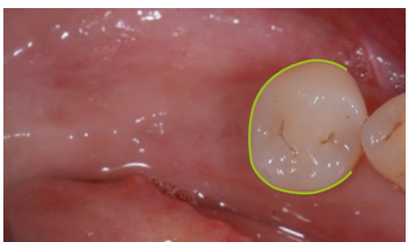
- Make a **mid-crestal** (horizontal) ridge incision extending mesially or distally into the sulcus of the adjacent teeth.

Start with a mid-crestal incision and widen the flap around the sulcus of the adjacent teeth.

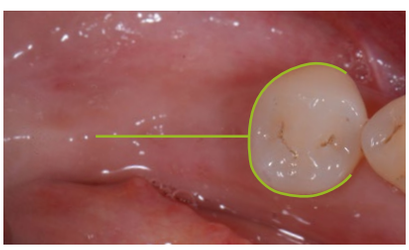


- Continue with **sulcular incisions** around both adjacent teeth to the implant bed. On the distal tooth, start the incision from the distobuccal aspect and continue to the distolingual / distopalatal aspect. On the mesial tooth, start from the mesiobuccal aspect and continue to the mesiolingual / mesiopalatal aspect.

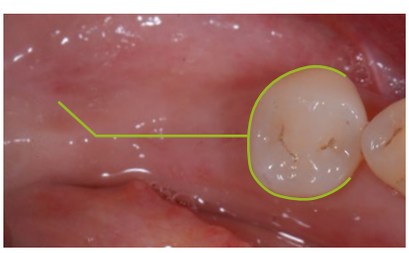
2.2.2 For a free-end situation: Use blades No. 12 and 15



- Start with a **sulcular incision** around the mesial tooth from the mesiobuccal aspect to the mesiolingual/mesiopalatal side.



- Continue with a **mid-crestal ridge incision** of about 2 cm distally to the planned implant position. Ideally a band of keratinized mucosa of at least 2 mm should be present buccally and lingually or palatally to the incision.



- A vertical releasing incision may be placed at the distal end of the mid-crestal incision. This incision allows more access to the bony site and facilitates flap closure afterwards.

Flap in free-end situation:
- Sulcular incision
- Mid-crestal incision extending 2 cm distally to planned implant position
- Vertical releasing incision

⚠ **Caution:** When you make an incision, always use a single incision technique and sharp instruments.

2.2.3 Flap elevation and assessment of bony site

Use the instruments for flap elevation

- A full-thickness mucoperiosteal flap should be raised from the mesial towards the distal aspect, using a periosteal elevator.

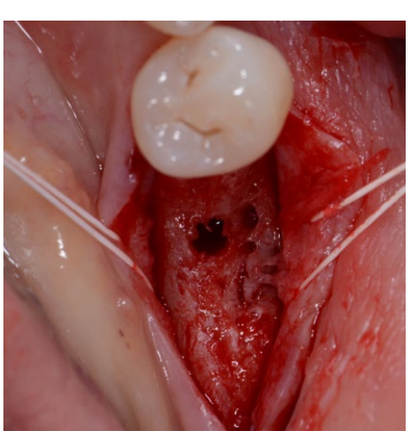
Always raise a full thickness mucoperiosteal flap using the periosteal elevator in contact with the bone.

- The entire periosteum is properly released from the bone buccally and in some parts of the palatal or lingual aspect.
- Elevate the flap sufficiently far apically to provide adequate visibility and access to the implant site.

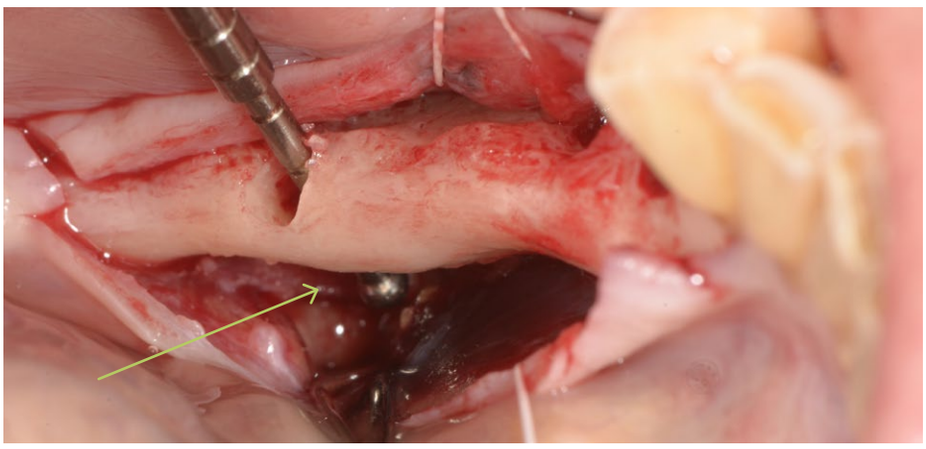
Elevation of the flap should provide good visibility and access to the planned implant site.

- Remove all soft tissue remnants from the bone to have a clean field of view.
- Assess the anatomy of the bony ridge. Check for any bony concavities to avoid perforation during the osteotomy.

Remove all soft tissue remnants and assess the anatomy of the exposed ridge.



In this image shown here, the post-extraction healing process is still ongoing. Soft tissue attachments can be seen. When raising the flap, the periosteal elevator should always be in contact with bone.
To remove any scar tissue or soft tissue attachments, you may use the curettes or scalers. Sometimes you may need to use the scalpel to cut and lift the initial part of the flap before application of the periosteal elevator. This is often found if the healing process is still ongoing after extraction of the tooth.



⚠ **Caution:** Make sure to identify and protect important anatomical structures such as the inferior alveolar nerve, if it is in the vicinity.

- The base of the flap should not be twisted, stretched or perforated since this may compromise healing.
- Concavities and lingual undercuts in the ridge can differ in size in patients and in different parts of the jaw.
- In this image, accidental penetration of the lingual wall of the mandible has occurred.

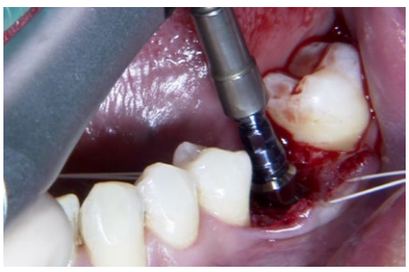
Protect important anatomical structures.

Do not twist, stretch or perforate the base of the flap.

If you are working with Standard Plus (SP) Implants, please click here

If you are working with Bone Level Tapered (BLT) Implants, please click here

2.3 Surgical procedures for Straumann® Standard Plus (SP) Implants



For drilling and implant insertion, use the Straumann® Basic Surgical Cassette which has been set up with instruments for SP Implants.

2.3.1 General considerations and overview of drilling procedures

Important general points about the drilling procedure.

- Use sharp drills only. Do not use cutting instruments more than 10 times. Use the surgery tracking sheet to help you track the number of times your drills have been used.
- Use an intermittent drilling technique.
- Use only light pressure.
- Respect drilling sequence and use drills in ascending order.
- Do not exceed speed limits.
- Ensure ample cooling of drills with pre-cooled (5 °C / 41 °F) physiological sterile saline solution (NaCl) or Ringer's solution.
- Choose the appropriate drilling procedure for different bone types.

Bone quality can be initially assessed from the radiograph by observing the bony trabeculae. When doing the initial drilling with the **Round Bur**, the bone quality can also be assessed by tactile sensation.

- Prepare the implant bed in an accurate three-dimensional position using a **surgical drill template**. Always keep to the same axis of insertion, and use only vertical intermittent movements without any horizontal movements when preparing the implant bed.
- Clean and rinse the implant bed thoroughly with cooled sterile saline after each drilling step.

Assess the bone quality from the radiograph.

Use a surgical drill template and intermittent drill technique with ample cooling.

Caution: Bony tissue should not be exposed to overheating. Drilling in bony tissue may increase temperature at the site and can cause necrosis. The threshold level for irreversible bone damage lies around 47 °C / 117 °F applied for > 1 min[5]. Take special care to continuously check the depth of the implant bed using a round-headed probe, to avoid damage to sensitive anatomical structures and avoid perforation of the cortical plate. Avoid unnecessary re-entries and excessively slow drill progression.

Take care not to overheat the bone when drilling.

Overview of implant bed preparation for SP Implants

Steps	Instrumentation
1. Basic implant bed preparation	
Ridge preparation	Round Bur
Twist drilling	Pilot Drill 1 (ø 2.2 mm) Alignment Pin Pilot Drill 2 (ø 2.8 mm) Depth Gauge Twist Drill PRO (ø 3.5 mm) Depth Gauge Twist Drill PRO (ø 4.2 mm) Depth Gauge
2. Fine implant bed preparation	
Profile drilling	SP Profile Drill
Tapping	S/SP Tap

Basic implant bed preparation involves ridge preparation and twist drilling. For twist drilling, the endosteal diameter of the implant (3.3/4.1/4.8 mm) – not the implant type or the bone class – determines which instruments have to be used.

Fine implant bed preparation involves profile drilling and tapping. For tapping, the implant type (SP) and the bone class determine which instruments have to be used.

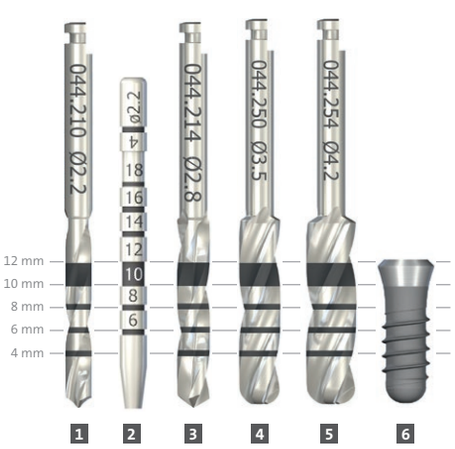
Implant bed preparation includes:

1) Basic implant bed preparation (using Round Burs, Pilot and Twist Drills)
2) Fine implant bed preparation (using SP Profile Drills and Taps where necessary)

Tapping may not be required in all cases.

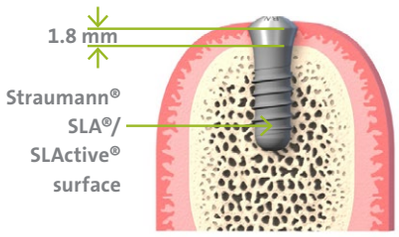
Caution: Do not use a Pilot Drill or Twist Drill larger than the endosteal diameter of the implant.

2.3.1.1 Depth marks on Straumann instruments for SP Implants



1. Pilot Drill 1, Ø 2.2 mm
2. Alignment Pin, Ø 2.2 mm
3. Pilot Drill 2, Ø 2.8 mm
4. Twist Drill PRO, Ø 3.5 mm
5. Twist Drill PRO, Ø 4.2 mm
6. Straumann® Standard Plus Implant, Ø 4.1 RN, length 10 mm

Straumann instruments have depth marks in 2 mm intervals, starting at 4 mm from the tip of the drill, that correspond to the available implant lengths. There is a thick dark marking between 10 mm and 12 mm. The lower edge of this thick dark marking corresponds to 10 mm and the upper edge to 12 mm.

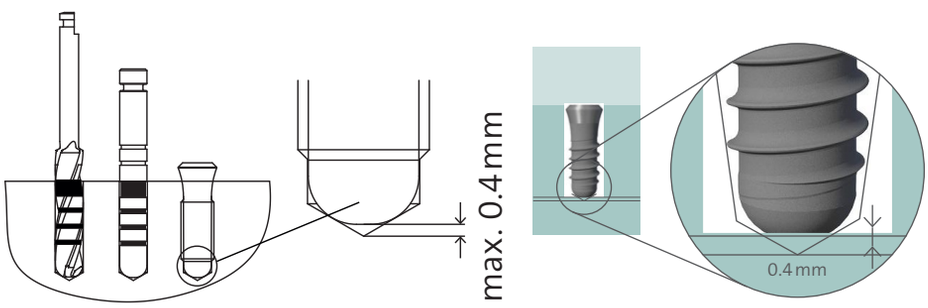


Straumann® Standard Plus Implants have a smooth neck section of 1.8 mm and are submerged in the bone as far as the margin of the Straumann® SLA® or Straumann® SLActive® surface.

SP Implants have a smooth collar of 1.8 mm in height. Insert the implant up to the margin between this smooth collar and the rough implant surface.

Caution: Due to the function and design of the drills, the drill tip is 0.4 mm longer than the insertion depth of the implant. This additional length must be taken into consideration during treatment planning to ensure important anatomical structures are not affected.

Consider that the drill tip is 0.4 mm longer than the insertion depth of the implant.



2.3.1.2 Drill speeds

These are the recommended drill speeds for implant bed preparation and insertion of SP Implants:

Drill speeds for implant bed preparation.

Standard Plus (RN/WN) Implant							
	Basic implant bed preparation				Fine implant bed preparation		
SP	Round Burs and Pilot Drills 1 Ø 2.2 mm	Pilot Drills 2 Ø 2.8 mm	Twist Drills Ø 3.5 mm	Twist Drills Ø 4.2 mm	SP Profile Drills	S/SP Taps	Insertion of implant
Max. rpm	800	600	500	400	400	15	15

2.3.2 Basic implant bed preparation

- All drills are available in a short and a long version.
- The following table displays the short multi-use drills used with the SP Implants:

Overview of short multi-use drills used with Standard Plus Implants

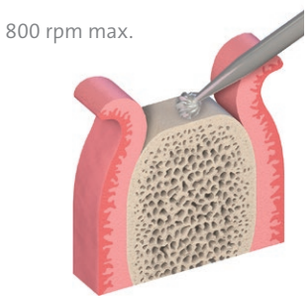
Instrumentation for basic implant bed preparation					Endosteal ⌀ (mm)		
Step	**Art. No.**	**Product**	**max. rpm**		**⌀ 3.3**	**⌀ 4.1**	**⌀ 4.8**
1 Ridge preparation	044.004	Round Bur, ⌀ 3.1 mm	800				
2 Mark implant position	044.022	Round Bur, ⌀ 1.4 mm	800				
	044.003	Round Bur, ⌀ 2.3 mm					
	044.004	Round Bur, ⌀ 3.1 mm					
3 Mark implant axis	044.210	Pilot Drill 1, short, ⌀ 2.2 mm	800				
	046.704	Depth Gauge, with Distance Indicator, Ø 2.2/2.8 mm					
4 Prepare implant bed to ⌀ 2.2 mm	044.210	Pilot Drill 1, short, ⌀ 2.2 mm	800				
	046.703	Alignment Pin, ⌀ 2.2 mm					
5 Prepare implant bed to ⌀ 2.8 mm	044.214	Pilot Drill 2, short, ⌀ 2.8 mm	600				
	046.705	Depth Gauge, Ø 2.8 mm					
6 Prepare implant bed to ⌀ 3.5 mm	044.250	Twist Drill PRO, short, ⌀ 3.5 mm	500				
	046.706	Depth Gauge ⌀ 3.5 mm					
7 Prepare implant bed to ⌀ 4.2 mm	044.254	Twist Drill PRO, short, ⌀ 4.2 mm	400				
	046.707	Depth Gauge ⌀ 4.2 mm					

Step-by-step procedure for basic implant bed preparation

For the following steps, it is best to use a surgical drill template to help you place the implant in the correct three-dimensional position and orientation:

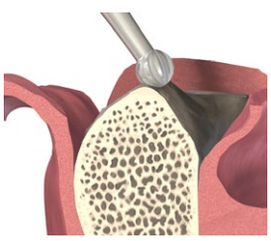
Video: Implant surgery with the Standard Plus (SP) Implant

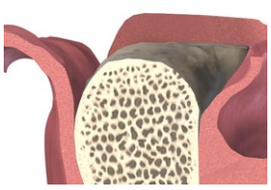
Step 1 – Prepare the alveolar ridge



- Carefully reduce and flatten the chosen area of the ridge with the large Ø 3.1 mm Round Bur to provide a flat bone surface and a sufficiently wide area of bone to place the implant.

Flatten the ridge with the large Ø 3.1 mm Round Bur (max. 800 rpm).





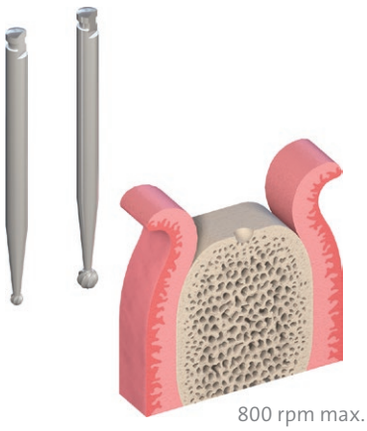
- Re-shape or re-contour moderate bone defects (eg. knife-edge) with the large Round Bur to provide adequate bone width for implant placement. If you are unsure about a significant bone defect, please refer the patient to a specialist.

Caution: The amount of bone removed must be considered and the selected implant length needs to be adjusted.

An excavator can also be used to remove any soft tissue remnants to smoothen the bony ridge.

Remove any soft tissue remnants with an excavator.

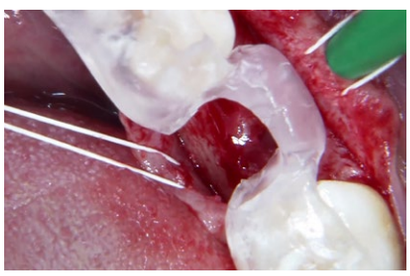
Step 2 – Mark the implantation site



800 rpm max.

- With the help of the surgical drill template pre-fabricated by your dental technician, check and mark the chosen implantation site with the Ø 1.4 mm Round Bur.
- If necessary, widen and correct the position of the mark with the Ø 3.1 mm Round Bur.

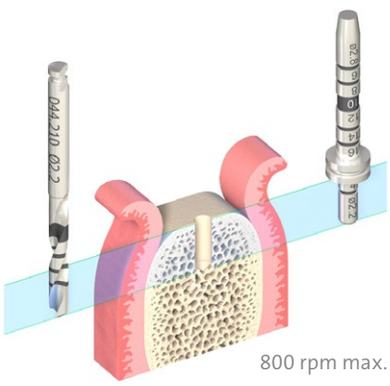
Mark the implant site using the surgical drill template and Ø 1.4 mm Round Bur (max. 800 rpm).



We strongly recommend you to work with a surgical drill template. However, if you decide not to use a surgical drill template, you can use the Implant Distance Indicator to check and mark the site of implantation.

The Implant Distance Indicator can also be used to check and mark the implant site.

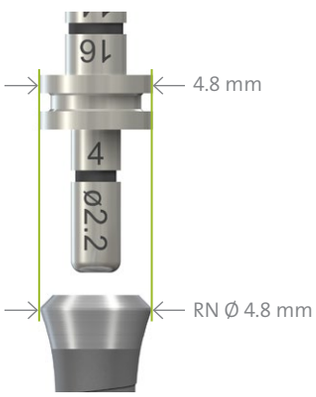
Step 3 – Mark the implant axis



- With the Ø 2.2 mm Pilot Drill 1, mark the implant axis by drilling to a depth of about 6 mm.
- Insert the short side of the Depth Gauge with Distance Indicator, Ø2.2/2.8 mm to check for correct implant axis orientation.

Drill with the Ø 2.2 mm Pilot Drill 1 to a depth of 6 mm (max. 800 rpm).

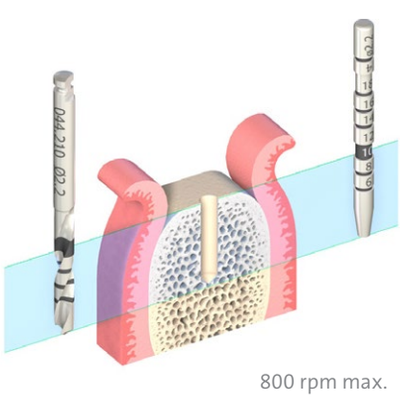
Check the implant axis and position of the future implant with the Ø 2.2 mm Depth Gauge with Distance Indicator.



- The shoulder diameter of the Depth Gauge with Distance Indicator is Ø 4.8 mm and helps to visualize and check the probable position of the future implant shoulder.

The shoulder of the implant should be 2 mm below the prospective crown margin, to allow for a sufficient emergence profile. Using the surgical drill template, you will be able to visualize this position.

Step 4 – Prepare the implant bed to Ø 2.2 mm



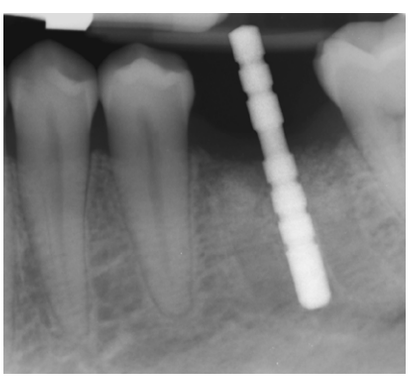
- Use the Ø 2.2 mm Pilot Drill 1 to prepare the implant bed to the final preparation depth. If necessary, correct any unsatisfactory implant axis orientation.
- Use the Ø 2.2 mm Alignment Pin to check the implant axis and preparation depth.

Drill with the Ø 2.2 mm Pilot Drill 1 to the final depth (max. 800 rpm) and check the axis and depth with the Ø 2.2 mm Alignment Pin.

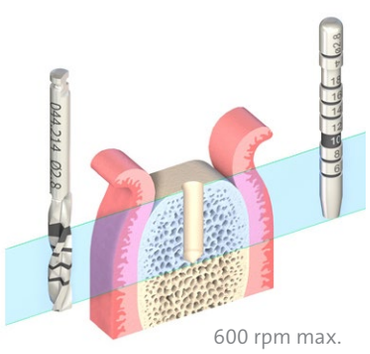


At this point, you may take a precautionary X-ray, particularly with vertically reduced bone availability. Insert the Ø 2.2 mm Alignment Pin into the drilled area, which allows a comparative visualization of the drill hole in relation to the anatomical structures.

Optional:
Take a radiograph with the Ø 2.2 mm Alignment Pin in the implant bed.



Step 5 – Widen the implant bed to ∅ 2.8 mm

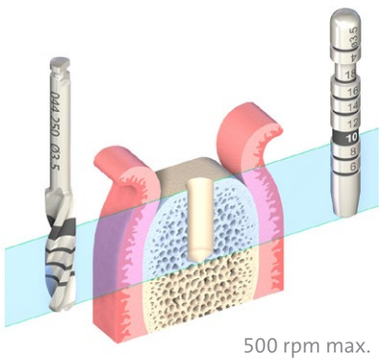


- Continue with the **∅ 2.8 mm Pilot Drill 2** to prepare and widen the implant bed.
- If necessary, correct the implant bed position and axis.
- Use the ∅ 2.8 mm **Depth Gauge** to check the preparation depth and axis.

Widen the implant bed with the Ø 2.8 mm Pilot Drill 2 (max. 600 rpm) and check the axis and depth with the Ø 2.8 mm Depth Gauge.

Step 6 – Widen the implant bed to ∅ 3.5 mm

For SP Implants with endosteal diameters of ∅ 4.1 mm and ∅ 4.8 mm:



- Continue to widen the implant bed with the ∅ 3.5 mm Straumann® Twist Drill PRO.
- Use the ∅ 3.5 mm Depth Gauge to check the preparation depth and axis.

Widen the implant bed with the Ø 3.5 mm Twist Drill PRO (max. 500 rpm).

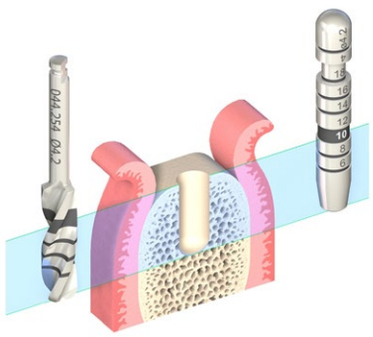
Check the axis and depth with the Ø 3.5 mm Depth Gauge.

Caution: For an SP Implant with an endosteal diameter of ∅ 4.1 mm, basic implant bed preparation ends here. Continue with the fine implant bed preparation.

Stop basic implant bed preparation here if you plan to use a Ø 4.1 mm SP Implant.

Step 7 – Widen the implant bed to ∅ 4.2 mm

For SP Implants with an endosteal diameter of ∅ 4.8 mm:



400 rpm max.

- Continue to widen the implant bed with the Ø 4.2 mm Straumann® Twist Drill PRO.
- Use the ∅ 4.2 mm Depth Gauge to check the preparation depth and axis.
- Continue with the fine implant bed preparation.

Widen the implant bed with the Ø 4.2 mm Twist Drill PRO (max. 400 rpm) and check the axis and depth with the Ø 4.2 mm Depth Gauge.

2.3.3 Fine implant bed preparation

Fine implant bed preparation comprises of:

2.3.3.1 Profile drilling

2.3.3.2 Tapping

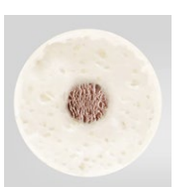
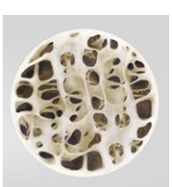
These procedures depend on:

- The implant type (SP)
- The endosteal diameter of the implant (Ø 3.3 mm, Ø 4.1 mm, Ø 4.8 mm)
- The bone class (Type 1-4)

Fine implant bed preparation depends on:
- Implant type
- Endosteal diameter of the implant
- Bone class

There are specific Profile Drills and Taps for each endosteal diameter of the SP Implant line.

Cross sectional view of different types of bone quality[6]

Type 1	Type 2	Type 3	Type 4
Very hard bone	Hard bone	Soft bone	Very soft bone
Homogenous cortical bone	Thick cortical bone with marrow cavity	Thin cortical bone with dense trabecular bone of good strength	Very thin cortical bone with low density trabecular bone of poor strength
			

Definition of different bone classes.

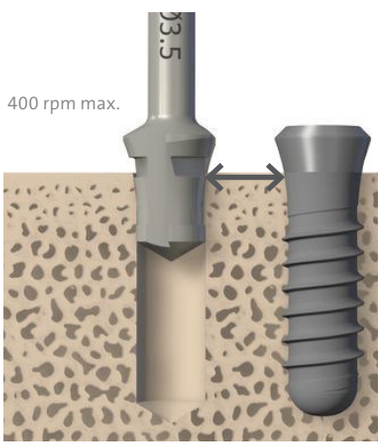
2.3.3.1 Profile drilling

- The Profile Drill prepares the implant bed for the SP Implant.
- SP Implants require profile drilling and this is independent of the bone class.
- The Straumann® Standard Plus Profile Drills are suitable only for the corresponding implant type.
- All SP Profile Drills are available in a short and a long version.

Use the SP Profile Drill corresponding to the prepared width of the implant bed at max. 400 rpm.

The SP (RN/WN) Profile Drills:

- are laser-marked to show the corresponding prepared width of the basic implant bed.
- should be used with a maximum drill speed of 400 rpm.



Insert the Straumann® Standard Plus Profile Drill up to where the lower part of the notch meets the bone level.
This corresponds to the junction of the machined neck of the planned SP Implant and the SLActive®/SLA® surface.

The SP Profile Drill should be inserted up to where the lower part of the notch meets the bone level.

Caution: Due to the unflared neck portion, the ∅ 4.8 mm RN Standard Plus Implants are inserted without profile drilling.

SP Ø 4.8 mm RN
SLActive®/SLA®

Ø 4.8 mm SP RN Implants require no profile drilling.

2.3.3.2 Tapping

Straumann® Standard and Standard Plus Taps	
	Tap for Adapter
	
S/SP Taps are used in the coronal area only or over the full depth of the implant bed, depending on implant diameter and bone class (see table below)	
15 rpm max.	

- Prepares the implant bed for a **specific** thread type.
- Is an **optional** step that gives the surgeon the flexibility to adjust the surgical protocol **according to the** → bone class to help achieve optimal primary stability.
- Tapping is recommended in **dense bone** and with **large-diameter implants (Ø 4.8 mm)**, in order to keep to the desired insertion torque.
- Straumann® S/SP (RN/WN) Taps are to be used only for the corresponding implant type.

Use the S/SP Tap corresponding to the prepared width of the implant bed at max. 15 rpm.

The table below summarizes the suggested Tap usage:

Tapping according to bone class		SP Implants Endosteal diameter		
Bone Class		Ø 3.3 mm	Ø 4.1 mm	Ø 4.8 mm
Type 1	Very hard bone	Full	Full	Full
Type 2	Hard bone	Coronal	Coronal	Full
Type 3	Soft bone			Full
Type 4	Very soft bone			Full

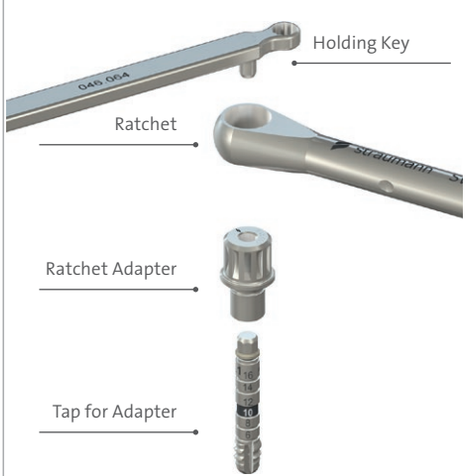
Coronal = thread tapping in the coronal area of the implant bed
Full = thread tapping over full depth of the implant bed

Tapping is necessary for some bone classes and endosteal diameters of SP Implants.

Two types of adapters are available for the Straumann® Taps:

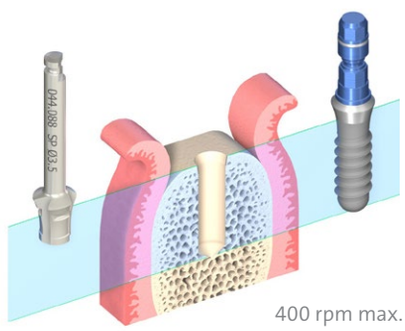
- Straumann® Adapter for Handpiece
- Straumann® Adapter for Ratchet

You may choose to tap with the Handpiece or the Ratchet.

Tapping with Handpiece	Tapping with Ratchet
Connect the Tap for Adapter to the Handpiece via the Handpiece Adapter. Do not exceed 15 rpm.	For tapping with the Ratchet connect a Ratchet Adapter to the Tap for Adapter. After inserting the Tap into the cavity, the Ratchet is placed on its coupling and the thread is tapped with a slow rotating movement. The Holding Key is used as a stabilizer to maintain the direction of tapping during the procedure.
	

Step-by-Step procedure for fine implant bed preparation with Straumann® Standard Plus Implants

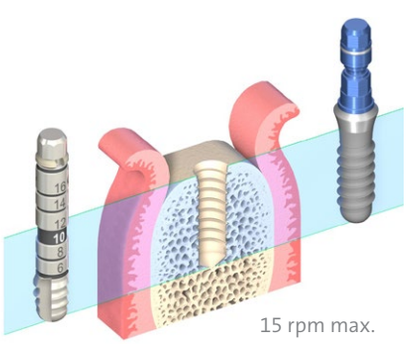
Step 1 – Profile drilling



- Shape the coronal part of the implant bed with the Standard Plus Profile Drill.
- Insert the Standard Plus Profile Drill up to the planned implant shoulder level.

Insert the Profile Drill at max. 400 rpm up to where the lower part of the notch meets the bone level.

Step 2 – Tapping the thread in hard bone



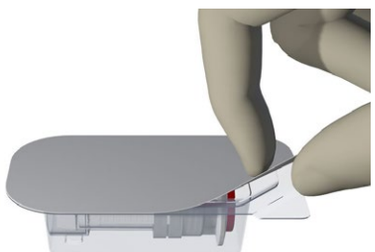
- Tap the implant bed with the S/SP Tap according to the bone class and the endosteal diameter.
- **Cooling is not required for this step.**

If tapping is required, use the S/SP Tap at max. 15 rpm.

2.3.4 Implant placement

Opening the implant package

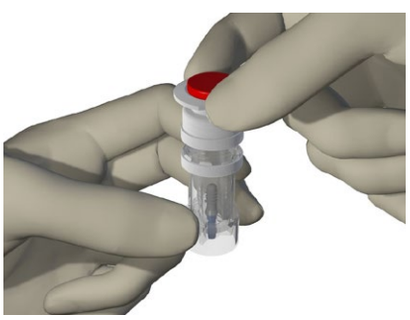
Sterile barrier system: Blister



Step 1 – Open the blister and remove the vial

Open the blister only immediately before placing the implant to ensure sterility.

⚠ **Caution:** The blister ensures the sterility of the implant. Do not open the blister until immediately prior to implant placement.

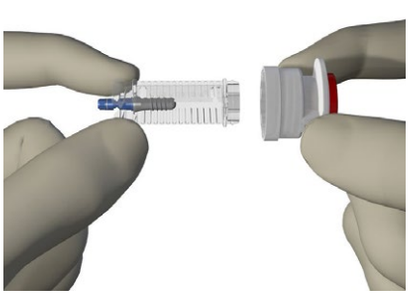


Step 2 – Open the vial
Turn the lid in counterclockwise direction.

SLActive® only: Keep the vial upright to prevent the liquid from flowing out.

Open the lid in a counterclockwise direction. Hold the vial upright to prevent spilling of the NaCl solution from the SLActive® vial.

⚠ **Caution:** If the implant carrier is not firmly attached to the lid, screw in the lid once again.



Step 3 – Detach the implant carrier
Detach the implant carrier from the lid by pulling it off manually.

⚠ **Caution:** (for SLActive® only):
After removing the implant from the solution, the chemical activity of SLActive® is ensured for 15 minutes.

Do not leave the SLActive® Implant exposed for more than 15 minutes.

Sterile barrier system: Vial

Step 1 – Open the safety cap
Open the safety cap of the sterile vial.

Open the vial only immediately before placing the implant to ensure sterility.

Caution: The vial ensures the sterility of the implant.

Step 2 – Remove the implant from the carrier
Detach the implant carrier from the vial by pulling it off manually.

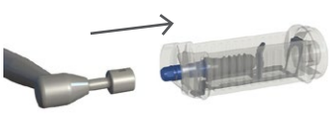
- The implant can be placed with the contra-angled handpiece or manually with the Ratchet.
- Do not exceed the recommended maximum speed of 15 rpm when using the Handpiece.
- An insertion torque of 35 Ncm is recommended to place the implant.

SP implant placement with the Handpiece

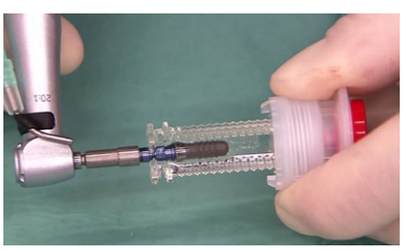
The following step-by-step instructions show how a Straumann® Standard Plus Implant with Loxim™ Transfer Piece is placed with the contra-angled Handpiece:

Video: Placement of the Standard Plus (SP) Implant with the Handpiece

Step 1 – Attach the Handpiece Adapter



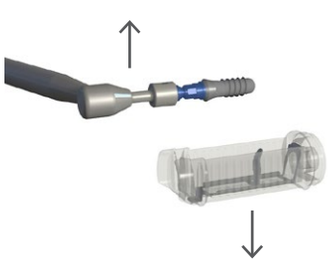
- Hold the enclosed part of the implant carrier.



- Attach the Handpiece Adapter to the blue Loxim™ Transfer Piece. A click will be heard or felt when the Adapter is attached correctly.

Click on the Handpiece Adapter to the Loxim™ Transfer Piece.

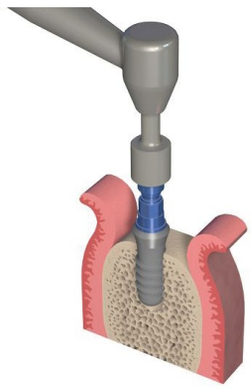
Step 2 – Remove the implant from the carrier



- Simultaneously, pull down the implant carrier and lift the implant out of the implant carrier (keep your arms steady).

Lift the implant carefully out of the carrier in a direction parallel to the implant carrier.

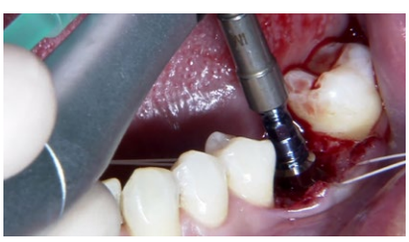
Step 3 – Place the implant



15 rpm max.

- Place the implant with the Handpiece into the implant bed.
- Move the implant into its final position with a maximum of **15 rpm** turning it clockwise.
- **Cooling is not required for this step.**

Insert the implant at max. 15 rpm.

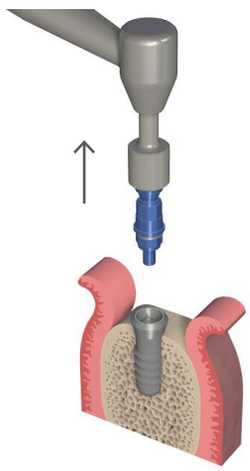


⚠ **Caution:** Vertical position corrections using reverse rotations (counterclockwise) may lead to a decrease in primary stability.

- An **insertion torque of 35 Ncm** is recommended to place the implant.
- The Loxim™ is provided with a pre-determined breaking point to prevent damage to the inner configuration of the implant, and to ensure the integrity of the connection with the prosthesis.

Consider the recommended insertion torque of 35 Ncm.

Step 4 – Remove the Handpiece Adapter and Loxim™ Transfer Piece

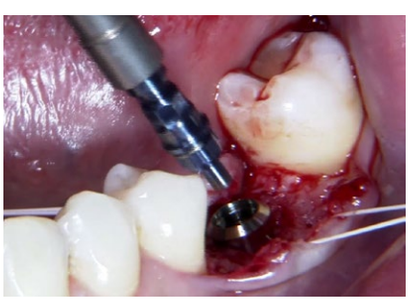


- After insertion, the Loxim™ Transfer Piece is detached with the Handpiece Adapter.

Detach the Loxim™ Transfer Piece when the implant is in its final position.

The Loxim™ can easily be re-inserted to finish an uncompleted implant placement until the implant is fully inserted. If the implant needs to be removed during implant surgery, the Loxim™ allows for counterclockwise turns.

The Loxim™ can be re-inserted for further adjustment of the implant position.

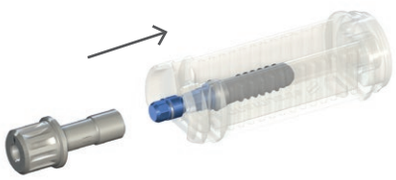


If you are placing a Standard Plus Titanium SLA® Implant with a screw-retained transfer part, click here for more information on the removal of a screw-retained transfer part.

SP implant placement with the Ratchet

The following step-by-step instructions show how a Straumann® Standard Plus Implant with Loxim™ Transfer Piece is placed with the Ratchet:

Step 1 – Assemble the Ratchet and the Torque Control Device

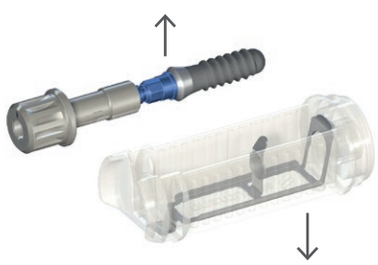


Step 2 – Attach the Ratchet Adapter

- Hold the enclosed part of the implant carrier. Attach the Ratchet Adapter to the blue Loxim™ Transfer Piece.
- A click will be heard or felt when the Adapter is attached correctly.

Click the Ratchet Adapter onto the Loxim™ Transfer Piece.

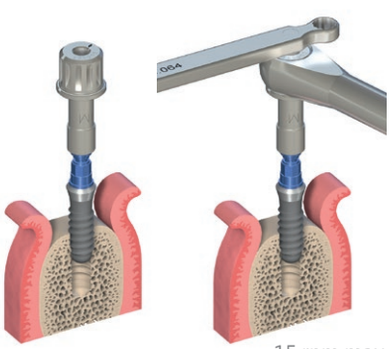
Step 3 – Remove the implant from the carrier



- Simultaneously, pull down the implant carrier and lift the implant out of the implant carrier (keep your arms steady).

Lift the implant carefully out of the carrier.

Step 4 – Place the implant



15 rpm max.

- Place the implant with the Ratchet into the implant bed.
- Move the implant into its final position with a maximum of **15 rpm** turning it clockwise.

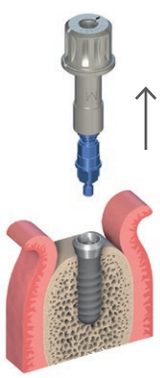
Place the implant with the Ratchet at max. 15 rpm.

Caution: Vertical position corrections using reverse rotations (counterclockwise) may lead to a decrease in primary stability.

- An **insertion torque of 35 Ncm** is recommended to place the implant.
- The Loxim™ is provided with a pre-determined breaking point to prevent damage to the inner configuration of the implant, and to ensure the integrity of the connection with the prosthesis.

Consider the recommended insertion torque of 35 Ncm.

Step 5 – Remove the Ratchet Adapter and Loxim™ Transfer Piece



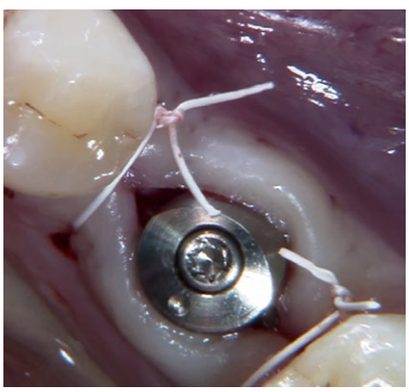
- Remove the Ratchet while holding the Adapter at the bottom, and then detach the Adapter-Loxim™ assembly.

Detach the Loxim™ Transfer Piece when the implant is in its final position.

The Loxim™ can easily be re-inserted to finish an uncompleted implant placement until the implant is fully inserted. If the implant needs to be removed during implant surgery, the Loxim™ allows for counterclockwise turns.

The Loxim™ can be re-inserted for further adjustment of the implant position.

2.3.5 Soft tissue management

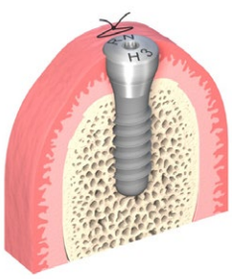


In transmucosal healing, the flap does not completely close over the implant site, but rather is sutured around the Healing Cap. This is less invasive and removes the necessity for a two-stage procedure.

Avoid a two-stage procedure by closing the flap transmucosally around the Healing Cap.

A versatile portfolio of Healing Caps is available for all Straumann implants enabling soft tissue sculpturing during transmucosal healing. The healing components are recommended for intermediate use. After the soft tissue healing phase they are replaced with the appropriate final restoration.

Healing Caps are recommended for intermediate use.

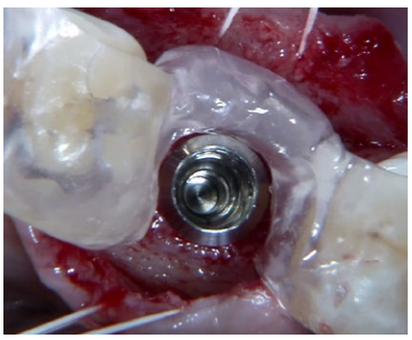


Products/Instruments required:

1. Healing Caps
2. SCS Screwdrivers
3. Periodontal probe
4. Dental mirror
5. Chlorhexidine gel or sterile petroleum jelly

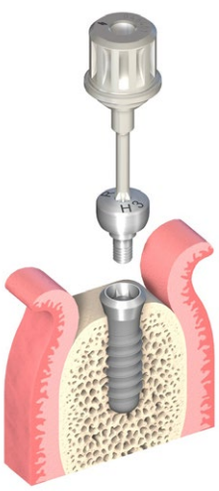
Products and instruments required for the insertion of the Healing Cap

2.3.5.1 Insertion of Healing Cap



- Ensure that the internal configuration of the implant is clean and bloodless; otherwise problems may occur when trying to remove the Healing Cap.

Clean the internal configuration of the implant.



- Insert the Healing Cap with the SCS Screwdriver.
- The friction fit of the SCS Screwdriver secures the components to the instrument during insertion and ensures safe handling.

- Hand-tighten the Healing Cap.

Apply chlorhexidine gel or sterile petroleum jelly to the Healing Cap before screwing it into the implant. This makes subsequent removal easier.

Apply chlorhexidine jelly or sterile petroleum jelly before hand-tightening the Healing Cap.

2.3.5.2 Transmucosal wound closure

Products/instruments required:

1. Suture material
2. Needle holder
3. Scissors
4. Dental mirror
5. Surgical tweezers

Saline can be used for irrigation if needed.

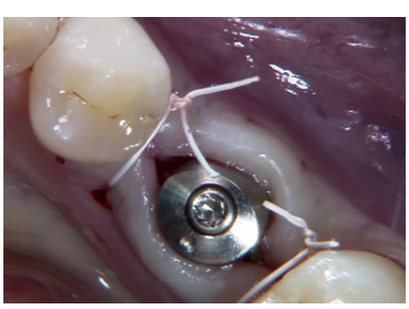
Video: Transmucosal wound closure

- The non-epithelialized side of the flap should be approximated to the Healing Cap (soft tissue approximation).

Align the non-epithelialized side of the flap against the Healing Cap.

- The wound margins are closed in a tension-free and minimally traumatic manner. The sutures must not be tied too tightly.

Tension-free wound closure is required.



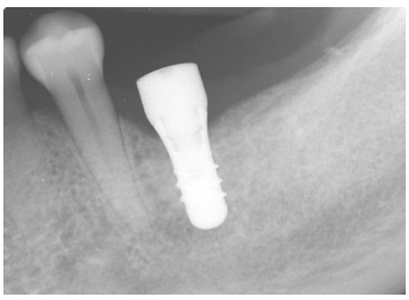
- One single interrupted suture is placed on either side of the Healing Cap respectively so that the wound margins are approximated without tension.

Place single interrupted sutures on both sides of the Healing Cap.

The use of non-absorbable suture material is recommended (e.g., Polyamide or Teflon®).

Use a non-resorbable suture material.

Teflon® is a registered trademark of The Chemours Company FC, LLC, US



- Take a post-operative X-ray of the implant to record the immediate post-operative status.
- The sutures should be removed after 7–10 days.

Take a post-operative radiograph.

Remove sutures after 7-10 days.

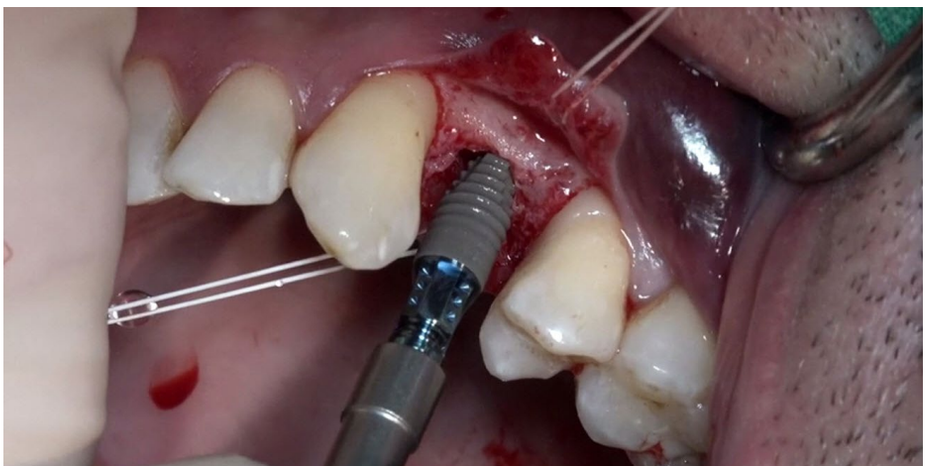
When suturing the wound, it is advisable to record the number of sutures for future reference during **suture removal**. Sutures should be at least 3-4 mm apart.

Record the number of sutures used for future reference.

Caution: Do not leave the ends of a suture in a submucosal position, as this may lead to a foreign body reaction and infection! For further information about the **management of intra-operative complications**, please click here.

Ensure that the ends of the sutures are not in a submucosal position.

2.4 Surgical procedures for Straumann® Bone Level Tapered (BLT) Implants



For drilling and implant insertion, use the Straumann® Basic Surgical Cassette which has been set up with instruments for BLT Implants.

2.4.1 General considerations and overview of drilling procedures

Important general points about the drilling procedure.

- Use sharp drills only. Do not use cutting instruments more than 10 times. Use the surgery tracking sheet to help you track the number of times your drills have been used.
- Use an intermittent drilling technique.
- Use only light pressure.
- Respect drilling sequence and use drills in ascending order.
- Do not exceed speed limits.
- Ensure ample cooling of drills with pre-cooled (5 °C / 41 °F) physiological sterile saline solution (NaCl) or Ringer's solution.
- Choose the appropriate drilling procedure for different bone types.

Bone quality can be initially assessed from the radiograph by observing the bony trabeculae. When doing the initial drilling with the **Round Bur**, the bone quality can also be assessed by tactile sensation.

- Prepare the implant bed in an accurate three-dimensional position using a **surgical drill template**. Always keep to the same axis of insertion, and use only vertical intermittent movements without any horizontal movements when preparing the implant bed.
- Clean and rinse the implant bed thoroughly with cooled sterile saline after each drilling step.

Assess the bone quality from the radiograph.

Use a surgical drill template and intermittent drill technique with ample cooling.

Caution: Bony tissue should not be exposed to overheating. Drilling in bony tissue may increase temperature at the site and can cause necrosis. The threshold level for irreversible bone damage lies around 47 °C / 117 °F applied for > 1 min[5]. Take special care to continuously check the depth of the implant bed using a round-headed probe, to avoid damage to sensitive anatomical structures and avoid perforation of the cortical plate. Avoid unnecessary re-entries and excessively slow drill progression.

Take care not to overheat the bone when drilling.

Overview of implant bed preparation for BLT Implants

Steps	Instrumentation
1. Basic implant bed preparation	
Ridge preparation	Round Bur
Drilling	BLT Pilot Drill (Ø 2.2 mm) Alignment Pin BLT Drill (Ø 2.8 mm) Depth Gauge BLT Drill (Ø 3.5 mm) Depth Gauge BLT Drill (Ø 4.2 mm) Depth Gauge
2. Fine implant bed preparation	
Profile drilling	BLT Profile Drill
Tapping	BLT Tap

Basic implant bed preparation involves ridge preparation and drilling. The endosteal diameter of the implant (Ø 3.3 / 4.1 / 4.8 mm) and the bone class determine which instruments have to be used.

Fine implant bed preparation involves profile drilling and tapping. For tapping, the implant type (BLT) and the bone class determine which instruments have to be used.

Implant bed preparation includes:

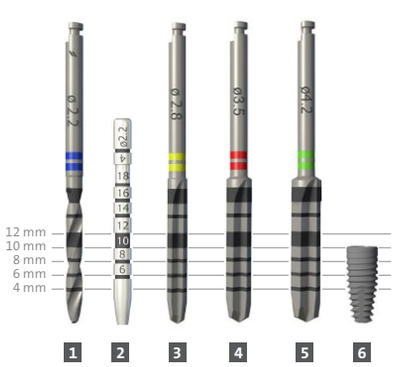
1. Basic implant bed preparation (using Round Burs, BLT Pilot Drill, and BLT Drills)
2. Fine implant bed preparation (using BLT Profile Drills and Taps where necessary)

Tapping may not be required in all cases.

⚠ **Caution:** Do not use a BLT Drill larger than the endosteal diameter of the implant.

2.4.1.1 Depth marks on Straumann instruments for BLT Implants

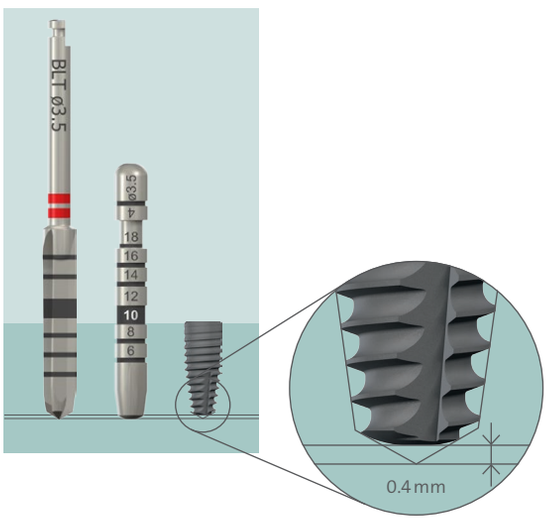
Straumann instruments have depth marks in 2 mm intervals, starting at 4 mm from the tip of the drill, that correspond to the available implant lengths. There is a thick dark marking between 10 mm and 12 mm. The lower edge of this thick dark marking corresponds to 10 mm and the upper edge to 12 mm.



1. BLT Pilot Drill, Ø 2.2 mm
2. Alignment Pin, Ø 2.2 mm
3. BLT Drill, Ø 2.8 mm
4. BLT Drill, Ø 3.5 mm
5. BLT Drill, Ø 4.2 mm
6. Bone Level Tapered Implant, Ø 4.1 mm, 10 mm

Caution: Due to the function and design of the drills, the drill tip is 0.4 mm longer than the insertion depth of the implant. This additional length must be taken into consideration during treatment planning to ensure important anatomical structures are not affected.

Consider that the drill tip is 0.4 mm longer than the insertion depth of the implant.



2.4.1.2 Drill speeds

These are the recommended drill speeds for implant bed preparation and insertion of BLT Implants:

Drill speeds for implant bed preparation.

Bone Level Tapered (NC/RC) Implant							
	Basic implant bed preparation				Fine implant bed preparation		
BLT	Round Burs and Pilot Drills Ø 2.2 mm	BLT Drills Ø 2.8 mm	BLT Drills Ø 3.5 mm	BLT Drills Ø 4.2 mm	BLT Profile Drills	BLT Taps	Insertion of implant
Max. rpm	800	600	500	400	300	15	15

2.4.2 Basic implant bed preparation

- All drills are available in a short and a long version.
- The following table displays the short multi-use drills used with the BLT Implants:

Overview of short multi-use drills used with Bone Level Tapered Implants

Instrumentation for basic implant bed preparation for BLT Implants					Endosteal Ø (mm)		
Step	**Art. No.**	**Product**	**max. rpm**		**Ø 3.3**	**Ø 4.1**	**Ø 4.8**
1 Ridge preparation	044.004	Round Bur, Ø 3.1 mm	800				
2 Mark implant position	044.022	Round Bur, Ø 1.4 mm					
3 Mark implant axis	026.0001	BLT Pilot Drill Ø 2.2 mm, short					
	046.704	Depth Gauge, with Distance Indicator, Ø 2.2/Ø2.8 mm					
4 Prepare implant bed to Ø 2.2 mm	026.0001	BLT Pilot Drill Ø 2.2 mm, short					
	046.703	Alignment Pin, Ø 2.2 mm					
5 Prepare implant bed to Ø 2.8 mm	026.2200	BLT Drill Ø 2.8 mm, short	600				
	046.705	Depth Gauge Ø 2.8 mm					
6 Prepare implant bed to Ø 3.5 mm	026.4200	BLT Drill Ø 3.5 mm, short	500				
	046.706	Depth Gauge Ø 3.5 mm					
7 Prepare implant bed to Ø 4.2 mm	026.6200	BLT Drill Ø 4.2 mm, short	400				
	046.707	Depth Gauge Ø 4.2 mm					

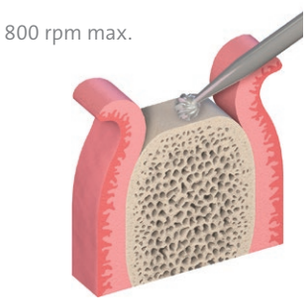
In Type 4 (very soft) bone: the implant bed is under-prepared

Step-by-step procedure for basic implant bed preparation

For the following steps, it is best to use a surgical drill template to help you place the implant in the correct three-dimensional position and orientation:

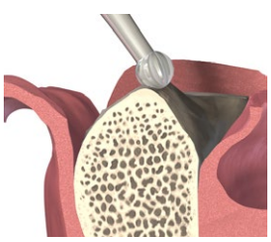
Video: Implant surgery with a Bone Level Tapered (BLT) Implant

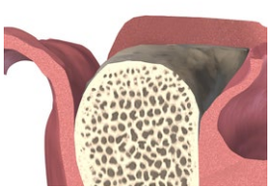
Step 1 – Prepare the alveolar ridge



- Carefully reduce and flatten the chosen area of the ridge with the large Ø 3.1 mm Round Bur to provide a flat bone surface and a sufficiently wide area of bone to place the implant.

Flatten the ridge with the large Ø 3.1 mm Round Bur (max. 800 rpm).





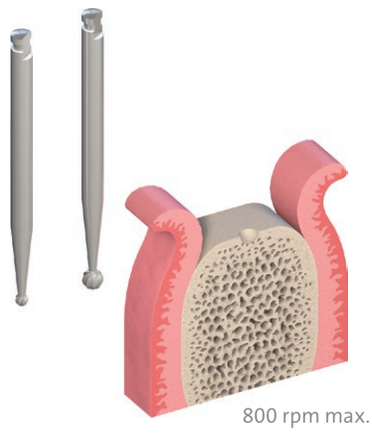
- Re-shape or re-contour moderate bone defects (eg. knife-edge) with the large Round Bur to provide adequate bone width for implant placement. If you are unsure about a significant bone defect, please refer the patient to a specialist.

Caution: The amount of bone removed must be considered and the selected implant length needs to be adjusted.

An excavator can also be used to remove any soft tissue remnants to smoothen the bony ridge.

Remove any soft tissue remnants with an excavator.

Step 2 – Mark the implantation site



800 rpm max.

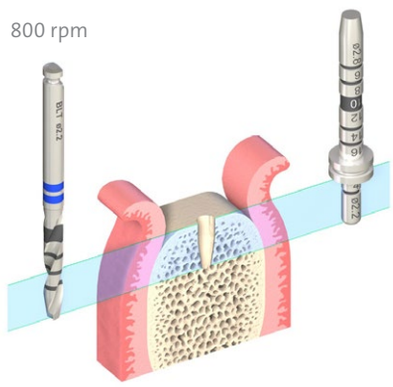
- With the help of the surgical drill template pre-fabricated by your dental technician, check and mark the chosen implantation site with the ∅ 1.4 mm Round Bur.
- If necessary, widen and correct the position of the mark with the Ø 3.1 mm Round Bur.

Mark the implant site using the surgical drill template and Ø 1.4 mm Round Bur (max. 800 rpm).

We strongly recommend you to work with a surgical drill template. However, if you decide not to use a surgical drill template, you can use the Implant Distance Indicator to check and mark the site of implantation.

The Implant Distance Indicator can also be used to check and mark the implant site.

Step 3 – Mark the implant axis



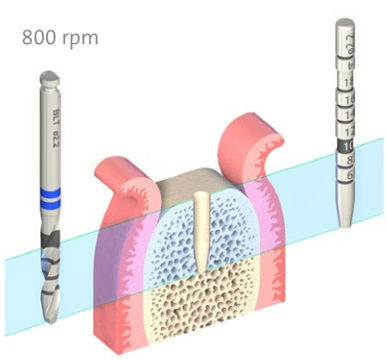
- With the Ø 2.2 mm BLT Pilot Drill, mark the implant axis by drilling to a depth of about 6 mm.

Drill with the Ø 2.2 mm BLT Pilot Drill to a depth of 6 mm (max. 800 rpm).

- Insert the short side of the Depth Gauge with Distance Indicator, Ø2.2/2.8 mm to check for correct implant axis orientation.

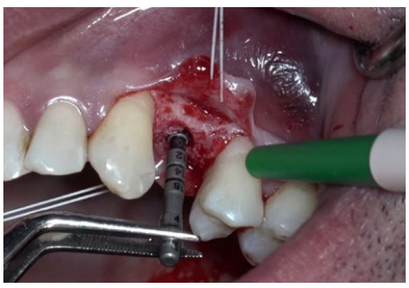
Check the implant axis and position of the future implant with the Depth Gauge with Distance Indicator, Ø 2.2/2.8 mm

Step 4 – Prepare the implant bed to Ø 2.2 mm



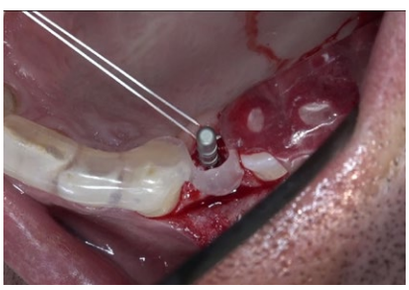
- Continue using the Ø 2.2 mm BLT Pilot Drill to prepare the implant bed to the final preparation depth. If necessary, correct any unsatisfactory implant axis orientation.

Drill with the Ø 2.2 mm BLT Pilot Drill to the final depth (max. 800 rpm).



- Use the Ø 2.2 mm Alignment Pin to check the implant axis and preparation depth.

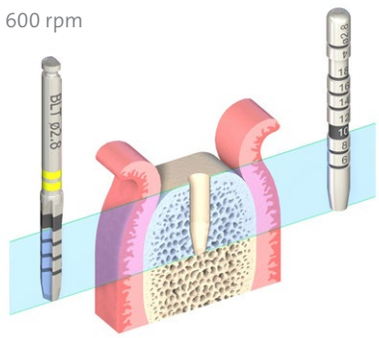
Check the axis and depth with the Ø 2.2 mm Alignment Pin.



At this point, you may take a precautionary X-ray, particularly with vertically reduced bone availability. Insert the Ø 2.2 mm Alignment Pin into the drilled area, which allows a comparative visualization of the drill hole in relation to the anatomical structures.

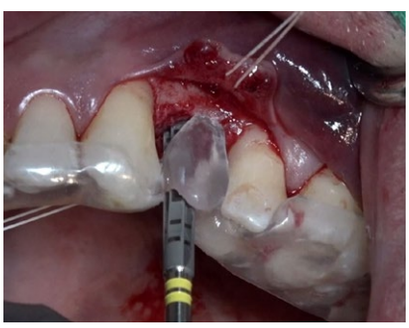
Optional:
Take a radiograph with the Ø 2.2 mm Alignment Pin in the implant bed.

Step 5 – Widen the implant bed to ∅ 2.8 mm



- Widen the implant bed with the ∅ 2.8 mm BLT Drill.
- If necessary, correct the implant bed position and axis.

Widen the implant bed with the Ø 2.8 mm BLT Drill (max. 600 rpm).

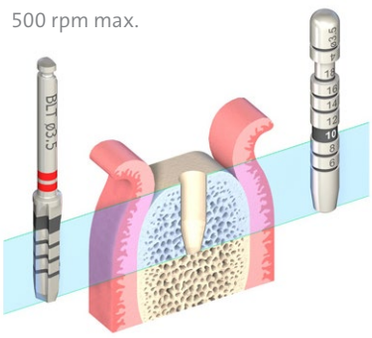


- Use the ∅ 2.8 mm Depth Gauge to check the preparation depth and axis.

Check the axis and depth with the Ø 2.8 mm Depth Gauge.

Step 6 – Widen the implant bed to ∅ 3.5 mm

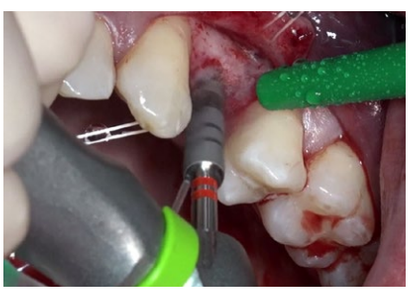
For BLT Implants with endosteal diameters of ∅ 4.1 mm and ∅ 4.8 mm:



- Continue to widen the implant bed with the Ø 3.5 mm BLT Drill.
- Use the ∅ 3.5 mm Depth Gauge to check the preparation depth and axis.

Widen the implant bed with the Ø 3.5 mm BLT Drill (max. 500 rpm).

Check the axis and depth with the Ø 3.5 mm Depth Gauge.

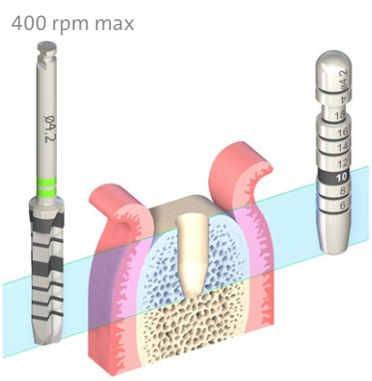


Caution: For a BLT Implant with an endosteal diameter of Ø 4.1 mm, basic preparation ends here. Continue with the fine implant bed preparation.

Stop basic implant bed preparation here if you plan to use a Ø 4.1 mm BLT Implant (not indicated in the molar region)

Step 7 – Widen the implant bed to ∅ 4.2 mm

For BLT Implants with an endosteal diameter of ∅ 4.8 mm:



- Continue to widen the implant bed with the Ø 4.2 mm BLT Drill.
- Use the ∅ 4.2 mm Depth Gauge to check the preparation depth and axis.
- Continue with the fine implant bed preparation.

Widen the implant bed with the Ø 4.2 mm BLT Drill (max. 400 rpm) and check the axis and depth with the Ø 4.2 mm Depth Gauge.

2.4.3 Fine implant bed preparation

Fine implant bed preparation comprises of:

2.4.3.1 Profile drilling

2.4.3.2 Tapping

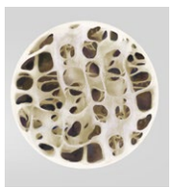
These procedures depend on:

- The implant type (BLT)
- The endosteal diameter of the implant (Ø 3.3 mm, Ø 4.1 mm, Ø 4.8 mm)
- The bone class (Type 1-4)

Fine implant bed preparation depends on:
-Implant type
-Endosteal diameter of the implant
-Bone class

There are specific Profile Drills and Taps for each endosteal diameter of the BLT Implant line.

Cross sectional view of different types of bone quality[6]

Type 1	Type 2	Type 3	Type 4
Very hard bone	Hard bone	Soft bone	Very soft bone
Homogenous cortical bone	Thick cortical bone with marrow cavity	Thin cortical bone with dense trabecular bone of good strength	Very thin cortical bone with low density trabecular bone of poor strength
			

Definition of different bone classes.

2.4.3.1 Profile drilling

- The Profile Drill prepares the implant bed for the BLT Implant.
- The Straumann® Bone Level Tapered Profile Drills are suitable only for the corresponding implant type and diameter.
- All BLT Profile Drills are available in a short and a long version.

Use the BLT Profile Drill corresponding to the prepared width of the implant bed at max. 300 rpm.

The BLT (NC/RC) Profile Drills:
- are laser marked and color-coded to show the corresponding diameter of the implant to be used.
- should be used with a maximum drill speed of 300 rpm.

300 rpm max.

Straumann® Bone Level Tapered Profile Drill

Shape the coronal part of the implant bed with the corresponding BLT Profile Drill.

The BLT Profile Drill should be inserted up to where the shoulder of the drill meets the bone level.

2.4.3.2 Tapping

Straumann® Bone Level Tapered Taps	
	Tap for Adapter
	
Caution: If a BLT Tap is used, it should always be inserted over the full depth of the implant bed.	
15 rpm max.	

- Prepares the implant bed for a **specific** thread type.
- Is an **optional** step that gives the surgeon the flexibility to adjust the surgical protocol **according to the** bone class to help achieve optimal primary stability.
- Tapping is recommended in **dense bone**, in order to **keep the insertion torque in a desirable range**.
- Straumann® BLT (NC/RC) Taps are to be used only for the corresponding implant type and diameter, and should be inserted over the full depth of the implant bed!

Use the BLT Tap according to the bone class and the corresponding implant endosteal diameter at max. 15 rpm.

The table below summarizes the suggested BLT Tap usage:

Tapping according to bone class		BLT Implants Endosteal diameter		
Bone Class		∅ 3.3 mm	∅ 4.1 mm	∅ 4.8 mm
Type 1	Very hard bone	Full	Full	Full
Type 2	Hard bone			
Type 3	Soft bone			
Type 4	Very soft bone			

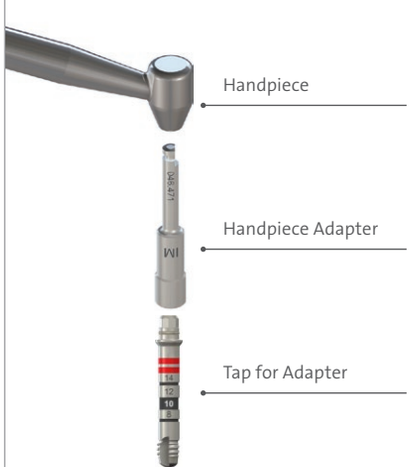
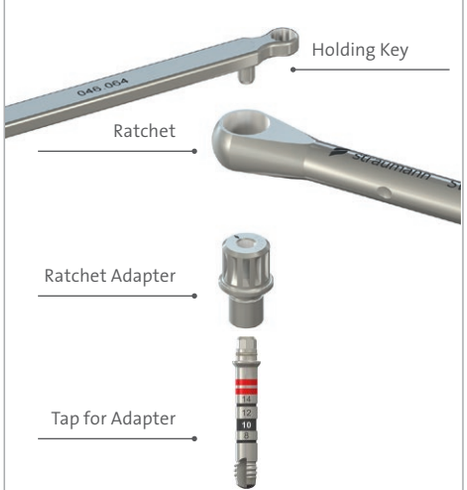
Full = thread tapping over full depth of the implant bed

Tapping is necessary for some bone classes and endosteal diameters of BLT Implants.

Two types of adapters are available for the Straumann® Taps:

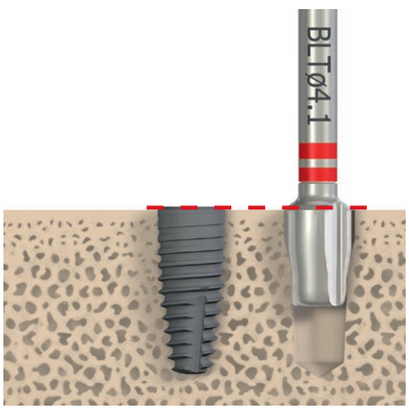
- Straumann® Adapter for Handpiece
- Straumann® Adapter for Ratchet

You may choose to tap with the Handpiece or the Ratchet.

Tapping with Handpiece	Tapping with Ratchet
Connect the Tap for Adapter to the Handpiece via the Handpiece Adapter. Do not exceed 15 rpm.	For tapping with the Ratchet connect a Ratchet Adapter to the Tap for Adapter. After inserting the Tap into the cavity, the Ratchet is placed on its coupling and the thread is tapped with a slow rotating movement. The Holding Key is used as a stabilizer to maintain the direction of tapping during the procedure.
	

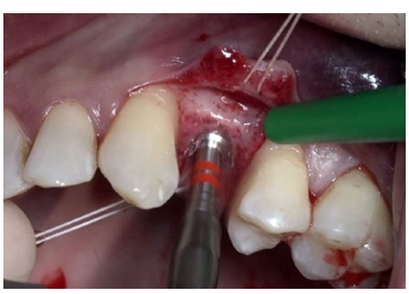
Step-by-Step procedure for fine implant bed preparation with Straumann® Bone Level Tapered Implants

Step 1 – Profile drilling

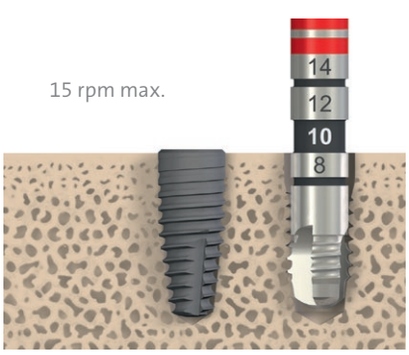


- Shape the coronal part of the implant bed with the Bone Level Tapered Profile Drill of the corresponding diameter of the implant.
- Insert the BLT Profile Drill up to where the shoulder of the drill meets the bone level.

Insert the BLT Profile Drill up to where the shoulder of the drill meets the bone level.



Step 2 – Tapping the thread in hard bone



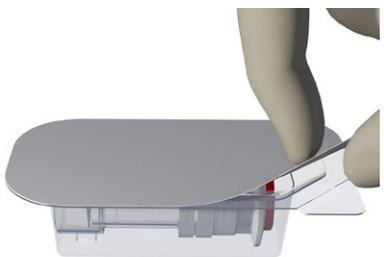
- In very hard bone (Class 1), use the BLT Tap with the corresponding diameter of the implant.
- Precut the threads over the full depth of the implant bed.
- **Cooling is not required for this step.**

Tap the implant bed at max. 15 rpm when the bone is very hard (Class 1).

2.4.4 Implant placement

Opening the implant package

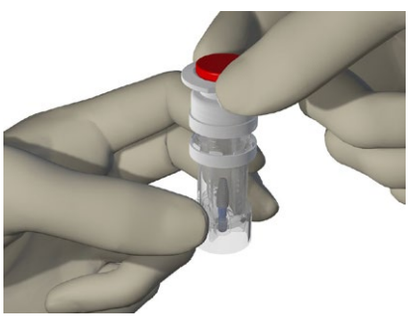
Sterile barrier system: Blister



Step 1 – Open the blister and remove the vial

Open the blister only immediately before placing the implant to ensure sterility.

Caution: The blister ensures the sterility of the implant. Do not open the blister until immediately prior to implant placement.

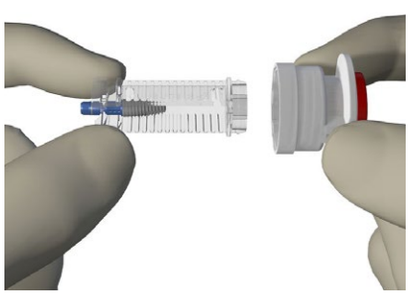


Step 2 – Open the vial
Turn the lid in counterclockwise direction.

SLActive® only: Keep the vial upright to prevent the liquid from flowing out.

Open the lid in a counterclockwise direction. Hold the vial upright to prevent spilling of the NaCl solution from the SLActive® vial.

Caution: If the implant carrier is not firmly attached to the lid, screw in the lid once again.



Step 3 – Detach the implant carrier
Detach the implant carrier from the lid by pulling it off manually.

Caution: (for SLActive® only):
After removing the implant from the solution, the chemical activity of SLActive® is ensured for 15 minutes.

Do not leave the SLActive® Implant exposed for more than 15 minutes.

Sterile barrier system: Vial

Step 1 – Open the safety cap
Open the safety cap of the sterile vial.

Open the vial only immediately before placing the implant to ensure sterility.

Caution: The vial ensures the sterility of the implant.

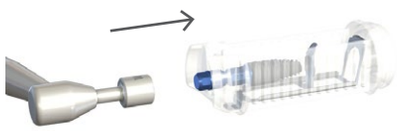
Step 2 – Remove the implant from the carrier
Detach the implant carrier from the vial by pulling it off manually.

- The implant can be placed with the contra-angled handpiece or manually with the Ratchet.
- Do not exceed the recommended maximum speed of 15 rpm when using the Handpiece.
- An insertion torque of 35 Ncm is recommended to place the implant.

BLT implant placement with the Handpiece

The following step-by-step instructions show how a Straumann® Bone Level Tapered Implant with Loxim™ Transfer Piece is placed with the contra-angled Handpiece:

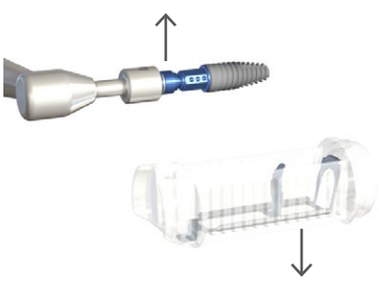
Step 1 – Attach the Handpiece Adapter



- Hold the enclosed part of the implant carrier.
- Attach the Handpiece Adapter to the blue Loxim™ Transfer Piece. A click will be heard or felt when the Adapter is attached correctly.

Click the Handpiece Adapter onto the Loxim™ Transfer Piece.

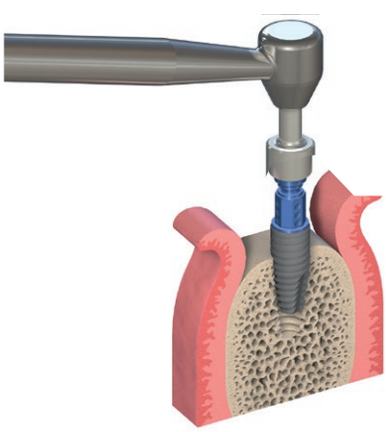
Step 2 – Remove the implant from the carrier



- Simultaneously, pull down the implant carrier and lift the implant out of the implant carrier (keep your arms steady).

Lift the implant carefully out of the carrier.

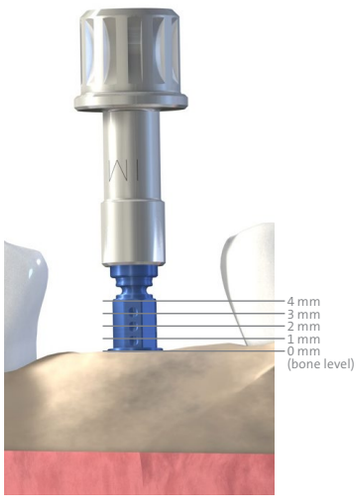
Step 3 – Place the implant



- Place the implant with the Handpiece into the implant bed.
- Move the implant into its final position with a maximum of **15 rpm** turning it clockwise.
- **Cooling is not required for this step.**

Insert the implant at max. **15 rpm**.

Step 4 – Correct implant orientation



- While approaching the final implant position, line up the dots of the transfer piece orofacially.
- This positions the four protrusions of the internal connection for ideal prosthetic abutment orientation.
- A quarter turn to the next drilled holes corresponds to a vertical displacement of 0.2 mm.
- The round markings in the Loxim™ Transfer Piece indicate the distance to the implant shoulder in 1 mm steps.

Line up the dots of the Loxim™ Transfer Piece orofacially.

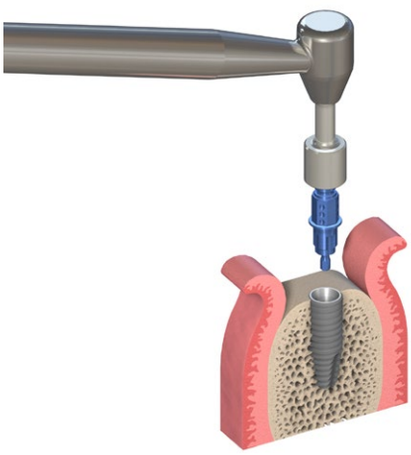
A quarter turn to the next drilled dots is equal to 0.2 mm displacement.

Caution: Vertical position corrections using reverse rotations (counterclockwise) may lead to a decrease in primary stability.

- An **insertion torque of 35 Ncm** is recommended to place the implant.
- The Loxim™ is provided with a pre-determined breaking point to prevent damage to the inner configuration of the implant, and to ensure the integrity of the connection with the prosthesis.

Consider the recommended insertion torque of 35 Ncm.

Step 5 – Remove the Handpiece Adapter and Loxim™ Transfer Piece



- After insertion, the Loxim™ Transfer Piece is detached with the Handpiece Adapter.

Detach the Loxim™ Transfer Piece when the implant is in its final position.

The Loxim™ can easily be re-inserted to finish an uncompleted implant placement until the implant is fully inserted. If the implant needs to be removed during implant surgery, the Loxim™ allows for counterclockwise turns.

The Loxim™ can be re-inserted for further adjustment of the implant position.

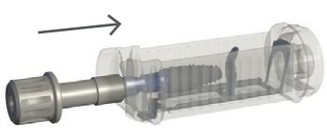
BLT implant placement with the Ratchet

The following step-by-step instructions show how a Straumann® Bone Level Tapered Implant with Loxim™ Transfer Piece is placed with the Ratchet:

Video: Manual placement of the Bone Level Tapered (BLT) Implant with the Ratchet.

Step 1 – Assemble the Ratchet and the Torque Control Device

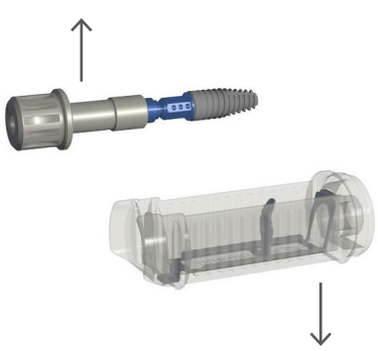
Step 2 – Attach the Ratchet Adapter



- Hold the enclosed part of the implant carrier. Attach the Ratchet Adapter to the blue Loxim™ Transfer Piece.
- A click will be heard or felt when the Adapter is attached correctly.

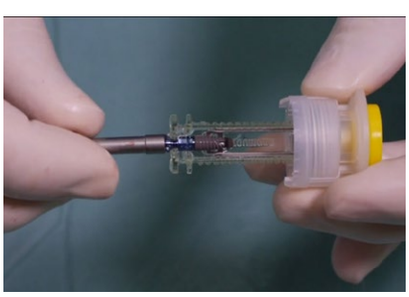
Click the Ratchet Adapter onto the Loxim™ Transfer Piece.

Step 3 – Remove the implant from the carrier

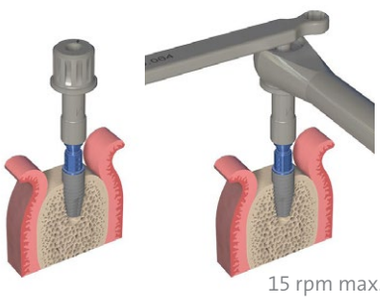


- Simultaneously, pull down the implant carrier and lift the implant out of the implant carrier (keep your arms steady).

Lift the implant carefully out of the carrier.



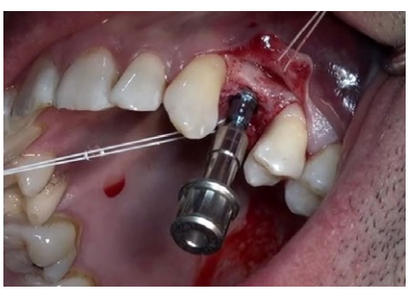
Step 4 – Place the implant



15 rpm max.

- Place the implant with the Ratchet into the implant bed.
- Move the implant into its final position with a maximum of **15 rpm** turning it clockwise.
- **Cooling is not required for this step.**

Place the implant with the Ratchet at max. 15 rpm.

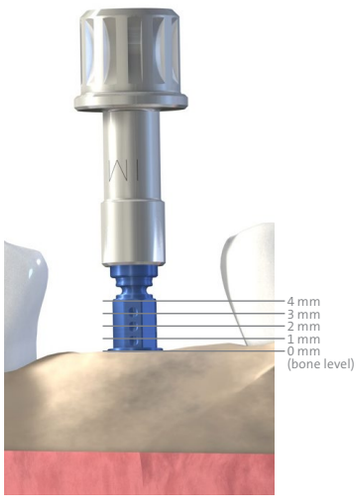


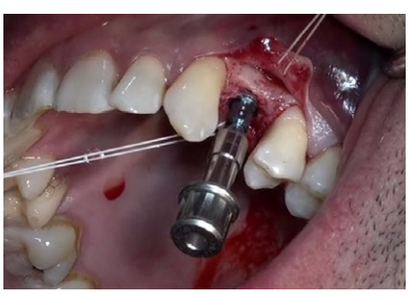
Caution: Vertical position corrections using reverse rotations (counterclockwise) may lead to a decrease in primary stability.

- An **insertion torque of 35 Ncm** is recommended to place the implant.
- The Loxim™ is provided with a pre-determined breaking point to prevent damage to the inner configuration of the implant, and to ensure the integrity of the connection with the prosthesis.

Consider the recommended insertion torque of 35 Ncm.

Step 5 – Correct implant orientation





- While approaching the final implant position, line up the dots of the transfer piece orofacially.
- This positions the four protrusions of the internal connection for ideal prosthetic abutment orientation.
- A quarter turn to the next drilled holes corresponds to a vertical displacement of 0.2 mm.
- The round markings in the Loxim™ Transfer Piece indicate the distance to the implant shoulder in 1 mm steps.

Line up the dots of the Loxim™ Transfer Piece orofacially.

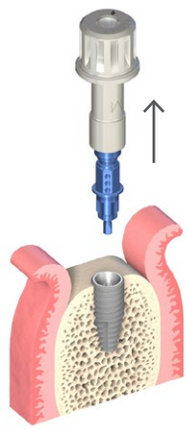
A quarter turn to the next drilled dots is equal to 0.2 mm displacement.

⚠ **Caution**: Vertical position corrections using reverse rotations (counterclockwise) may lead to a decrease in primary stability.

- An **insertion torque of 35 Ncm** is recommended to place the implant.
- The Loxim™ is provided with a pre-determined breaking point to prevent damage to the inner configuration of the implant, and to ensure the integrity of the connection with the prosthesis.

Consider the recommended insertion torque of 35 Ncm.

Step 6 – Remove the Ratchet Adapter and Loxim™ Transfer Piece



- Remove the **Ratchet** while holding the Adapter at the bottom, and then detach the Adapter-Loxim™ assembly.

Detach the Loxim™ Transfer Piece when the implant is in its final position.

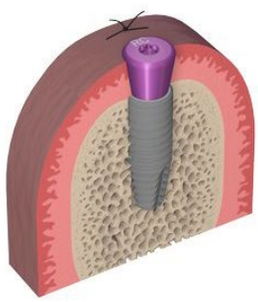
The Loxim™ can easily be re-inserted to finish an uncompleted implant placement until the implant is fully inserted. If the implant needs to be removed during implant surgery, Loxim™ allows for counterclockwise turns.

The Loxim™ can be re-inserted for further adjustment of the implant position.

2.4.5 Soft tissue management

In transmucosal healing, the flap does not completely close over the implant site, but is sutured around the Healing Abutment. This is less invasive and removes the necessity for a two-stage procedure.

Avoid a two-stage procedure by closing the flap transmucosally around the Healing Abutment.



A versatile portfolio of Healing Abutments is available for all Straumann implants enabling soft tissue sculpturing during transmucosal healing. The Healing Abutments are recommended for intermediate use. After the soft tissue healing phase they are replaced with the appropriate final restoration.

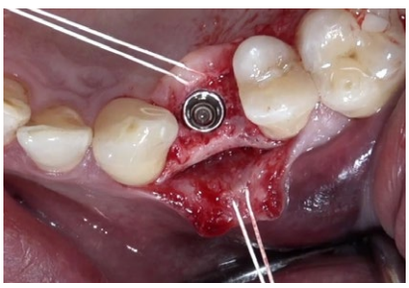
Healing Abutments are recommended for intermediate use.

Products/instruments required:

1. Healing Abutments
2. SCS Screwdrivers
3. Periodontal probe
4. Dental mirror
5. Chlorhexidine gel or sterile petroleum jelly

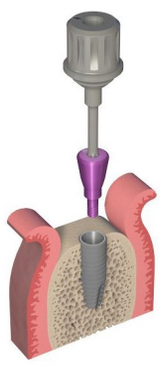
Products and instruments required for the insertion of the Healing Abutment

2.4.5.1 Insertion of Healing Abutment

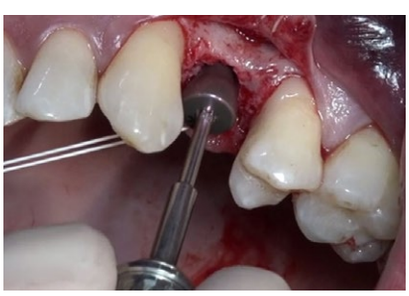


- Ensure that the internal configuration of the implant is clean and bloodless; otherwise problems may occur when trying to remove the Healing Abutment.

Clean the internal configuration of the implant.



- Insert the Healing Abutment with the Straumann® SCS Screwdriver.
- The friction fit secures the components to the instrument during insertion and ensures safe handling.



- Hand-tighten the Healing Abutment.

Apply chlorhexidine gel or sterile petroleum jelly to the Healing Abutment before screwing it into the implant. This makes subsequent removal easier.

Apply chlorhexidine jelly or sterile petroleum jelly before hand-tightening the Healing Abutment.

2.4.5.2 Transmucosal wound closure

Products/instruments required:

1. Suture material
2. Needle holder
3. Scissors
4. Dental mirror
5. Surgical tweezers

Saline can be used for irrigation if needed.

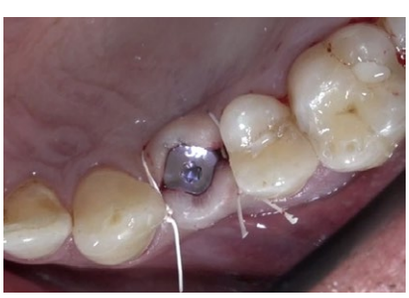
Video: Transmucosal wound closure

- The non-epithelialized side of the flap should be approximated to the Healing Abutment (soft tissue approximation).

Align the non-epithelialized side of the flap against the Healing Abutment.

- The wound margins are closed in a tension-free and minimally traumatic manner. The sutures must not be tied too tightly.

Tension-free wound closure is required.



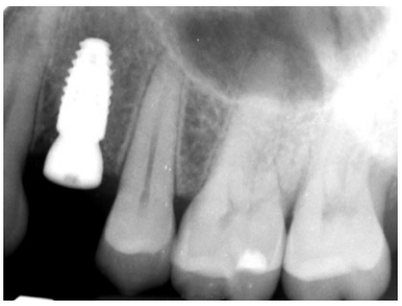
- One single interrupted suture is placed on either side of the Healing Abutment respectively so that the wound margins are approximated without tension.

Place single interrupted sutures on both sides of the Healing Abutment.

The use of non-absorbable suture material is recommended (e.g., Polyamide or Teflon®).

Use a non-resorbable suture material.

Teflon® is a registered trademark of The Chemours Company FC, LLC, US



- Take a post-operative X-ray of the implant to record the immediate post-operative status.
- The sutures should be removed after 7–10 days.

Take a post-operative radiograph.

Remove sutures after 7-10 days.

When suturing the wound, it is advisable to record the number of sutures for future reference during suture removal. Sutures should be at least 3-4 mm apart.

Record the number of sutures used for future reference.

Caution: Do not leave the ends of a suture in a submucosal position, as this may lead to a foreign body reaction and infection!
For further information about the management of intra-operative complications, please click here.

Ensure that the ends of the sutures are not in a submucosal position.

3. Post-operative part

After implant surgery, you should give the following verbal and written information to the patient: Post-operative patient information

3.1 Ideal post-operative behavior

3.2 Medication and other aids

3.3 Management of post-operative complications

3.4 Suture removal and additional information

3.1 Ideal post-operative behavior

Advise the patient to:

- Stop smoking completely during the healing period.
- Refrain from drinking any alcohol for at least 2 days after surgery.
- Abstain from eating until the local anesthesia has ceased, to prevent burning or biting his or her lips, cheeks or tongue.
- Not disturb the surgical site by touching it with his or her tongue, lips, fingers or any other objects.
- Refrain from intense sports and physical work activities for at least 3 days after surgery to prevent bleeding and swelling.
- Avoid tooth-brushing directly in the surgical site.
- Avoid rinsing or spitting out vigorously during the first 24 hours after surgery.
- Maintain adequate oral hygiene and plaque control by rinsing 2-3 times a day (after the first 24 hours) with the recommended antiseptic mouthwash until the next visit when sutures are removed.

Important post-operative instructions for the patient.

3.2 Medication and other aids

Advise the patient to use:

- Non-steroidal anti-inflammatory drugs (NSAIDs) for 3 days or more for pain relief. If the patient is allergic to or cannot take NSAIDs, an alternative analgesic should be prescribed for him or her.
- Chlorhexidine mouthrinse 0.12 % 3 times daily for 2 weeks after surgery. This should be started on the second day after surgery.

Post-operative medication for the patient.

3.3 Management of post-operative complications

Advise the patient on these possible and expected complications:

3.3.1 Bleeding

- Once local anesthesia ceases, some bleeding can occur. Slight bleeding from the surgical site can occur during the first 2 days. Assure the patient that this is normal.
- If there is any bleeding, the patient should apply light pressure with gauze.
- If the bleeding does not stop, the patient should call the dentist or seek emergency help.

Ensure any uncontrolled bleeding is managed at the hospital.

3.3.2 Pain and swelling

- The patient should take the prescribed analgesics and cool the area on a regular basis during the first 3 days after surgery.

Expect some pain and swelling for a few days after surgery.

3.3.3 Trismus

- Temporary difficulty in normal mouth opening can occur during the first 2 weeks after surgery, due to inflammation of the muscles of the jaw joint.
- Heat therapy, analgesics, soft diet and muscle relaxants (if necessary) can help during the acute phase.
- If the patient is still experiencing symptoms after 4 weeks, referral to a specialist for further management may be required.

Monitor any difficulties in normal opening of the mouth.

3.3.4 Bruising

Reassure the patient that this can sometimes happen after surgery. It may take weeks for bruising to disappear completely.

Warn the patient of possible post-operative bruising.

This patient experienced some bruising after surgery, in her left cheek and under her left eye.

Key factors which can help to reduce post-operative complications	
Pre-operative part	• Healthy periodontal tissues which allow precise incision, handling and closure of mucosal flaps. • Full mouth bleeding and plaque scores below 20 %. • Smoking counseling to help the patient not to smoke during the healing period. • Avoid treatment in patients with systemic factors such as diabetes, immunosuppression, cardiovascular diseases, liver and kidney diseases, which may impair the patient's wound healing.
Intra-operative part	• Avoid releasing incisions if possible. • Use sharp instruments and always perform a minimally traumatic surgical procedure. • Achieve tension-free wound closure.
Post-operative part	• Provide adequate medication and antiseptic prophylaxis (such as chlorhexidine mouthrinse) to reduce the risk of infection and promote good wound healing.

Key factors to reduce post-operative complications.

3.4 Suture removal and additional information

- The patient should be informed that the sutures will be removed 7-10 days after surgery, depending on the healing of the surgical site. The patient should already have this review appointment before the day of surgery.
- Give the patient an emergency contact number in case of urgent complications, such as fever, massive swelling, abnormal bleeding or persistent anesthesia.
- Contact the patient by phone one day after surgery, to check if he or she understood all this information provided, and is following the instructions.

Important points to note when discharging the patient.

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Surgical Procedures

Step 1 | Implant Surgery

DISCLAIMER

Straumann® Smart is a blended training and education program focused on the education of general dentists who want to become surgically active in the field of dental implantology. The program is limited to information pertaining to straightforward implant cases and focuses on a reduced portfolio of products that are suitable for the treatment of such cases.

All clinical Straumann® Smart content – such as texts, medical record forms, pictures and videos – was created in collaboration with Prof. Dr. Christoph Hämmerle, Prof. Dr. Ronald Jung, Dr. Francine Brandenberg-Lustenberger and Dr. Alain Fontolliet from the University of Zürich, Clinic for Fixed and Removable Prosthodontics and Dental Material Science, Switzerland.

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International Headquarters
Institut Straumann AG
Peter Merian-Weg 12
CH-4002 Basel, Switzerland
Phone +41 (0)61 965 11 11
Fax +41 (0)61 965 11 01
www.straumann.com

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