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PRECISION IN FIXATION

SURGICAL TECHNIQUE

# Hallux System 2.8



APTUS®  
Foot



# Hallux System

## 2.8

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# MTP-1 Arthrodesis Surgical Technique

## Using the APTUS 2.8 TriLock MTP Fusion Plate

Example and technique by **Lisca Drittenbass** and **Mathieu Assal**, Clinique La Colline, Geneva, Switzerland

### Typical Indications for MTP Fusions

- Primary osteoarthritis
- Secondary osteoarthritis, e. g. after previous hallux valgus surgery or after trauma
- Salvage procedure for severe hallux valgus/bunion deformity

### Preoperative Planning

In addition to standard small-joint instrumentation, the following items should be available in the operating room:

- Intra-operative fluoroscopy
- Powered hand piece with K-wire driver, three jaw chuck and oscillating saw
- Sterile plate for simulated weight-bearing

**Step 1**



Make a dorso-medial skin incision just medial to the cutaneous nerve. Expose the joint capsule and incise the capsule longitudinally.

**Step 2**



Expose the MTP-1 joint. Release the capsule dorsomedially. If possible, leave the lateral collateral ligament in place.



**Step 3**



**Proximal preparation:**  
Insert a 1.6 mm K-wire into the center of the 1<sup>st</sup> metatarsal head along the axis of MT-1.



Slide the proximal reamer (cone) over the K-wire and ream to remove all cartilage and sclerotic bone.

**Expert tip:**  
Let the reamer run at high speed before touching the bone.

**Step 4****Distal preparation:**

Place a small Hohmann retractor as depicted to help sublaxate the joint.

Insert a 1.6 mm K-wire into the center of the articular surface along the axis of the proximal phalanx.



Slide the distal reamer (cup) over the K-wire and ream to remove all cartilage and sclerotic bone. Do not apply too much pressure to avoid loss of control and excessive shortening.

**Note:**

Instead of using cup and cone reamers, the cartilage can also be removed by hand; alternatively the bone can be prepared with the oscillating saw resulting in two parallel cuts.

**Step 5**

Drill multiple small holes in the joint surface with the twist drill.

**Expert tip:**

Do not remove the drilling debris by irrigation. This is valuable autograft and will stimulate bony consolidation!

**Step 6**

Remove dorsal osteophytes with a small saw blade.

**Step 7**

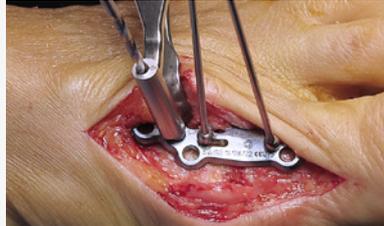
Choose the APTUS MTP Plate. For a typically arched foot, choose 5° dorsiflexion. In low arched and high arched feet, choose 0° or 10° respectively. Fix the plate preliminary in the desired position with the olive K-wires.

**Note:**

In patients with good bone quality, the proximal hole of the plate can be removed with the plate cutter.

**Step 8**

Check the position of the arthrodesis (5° valgus, 5–10° dorsiflexion, neutral rotation) with simulated weight-bearing.

**Step 9**

Fix the plate with screws.

**Expert tip:**

Start with the proximal center screw if no further compression via TriLock<sup>PLUS</sup> needs to be applied. This allows for rotation of the plate around this screw if varus or valgus needs to be further modified.

**Note:**

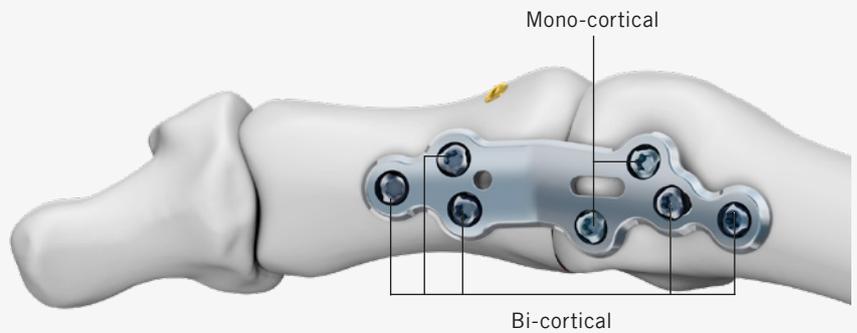
If you want to apply compression using TriLock<sup>PLUS</sup> or compression and distraction forceps for olive K-wires, please consult the surgical technique «Foot System 2.0–3.5 Step by Step».

**Step 10**



Complete the fixation. Avoid bicortical fixation of the two most distal screws in MT-1 to reduce the risk of sesamoid irritation.

**Overview of screw positioning**



**Note:**  
Place three screws in each bone fragment

**Step 11**



Insert a «Home Run Screw» (oblique metatarsophalangeal screw, e. g. a TriLock 2.8, 28–34 mm) from proximal to distal and plantar to dorsal.

**Note:**  
This screw is crucial for stability.  
**Expert tip:**  
Alternative placement from distal to proximal is possible, however, technically more demanding.

**Step 12**



Check the result with fluoroscopy (AP and lateral).

**Step 13**



Final control of the position with simulated weight-bearing.

**Step 14**



Resection of the medial exostosis with a small saw blade.  
The incision is closed in layers according to the surgeon's technique.

**Postoperative care**



Stiff sole used for 6 weeks with full weight-bearing as tolerated by the patient.

# MTP-1 Revision Arthrodesis Surgical Technique

## Using the APTUS 2.8 TriLock MTP Revision Plate

Example and technique by **Tim Schneider**, Melbourne Orthopaedic Group, Australia

### Typical Indications for MTP-1 Revisions with Bone Graft

MTP-1 joint arthrodesis where there is significant bone loss

1. Following Keller-Brandes resection arthroplasty
2. Following failed total arthroplasty
3. Following failed silastic arthroplasty
4. Following metatarsal bone loss from avascular necrosis

### Preoperative Planning

In addition to standard small-joint instrumentation, the following items should be available in the operating room:

- Intra-operative fluoroscopy
- Powered hand piece with K-wire driver, three jaw chuck and oscillating saw
- Sterile plate for simulated weight-bearing

### Case Presentation

- 66 year old female
- Significant hallux bone loss after a Keller-Brandes excision arthroplasty at the age of 18 with subsequent silastic implant at the age of 20
- Toe-fit prosthesis at the age of 64 for failed silastic implant
- Prosthesis loosening and subluxation required a prosthesis to arthrodesis while maintaining as much length as possible

Preoperative X-rays



**Step 1**



Remove the prosthesis and debride the cavity to the healthy bone.

Insert a K-wire (2 mm) to align the toe and establish the desired length of the toe after the arthrodesis.

Varus/Valgus and flexion positions can also be estimated.

**Step 2**



Determine the size of the bone graft to be harvested from the iliac crest.

Be sure to account for the concavity of excised bone in the metatarsal and phalanx.

**Step 3 (optional)**



Use bone cement to mold a template for the iliac autograft.

This will give a cast of the optimal bone graft shape with maximal bony fill.

Adjust for desired Varus/Valgus angle and dorsiflexion. Sit the toe just off a flat sterile plate surface as the cement sets.



Take care to cool the cement with saline to reduce heat damage.

Retract the K-wire from the distal fragment and remove the cement template.

**Expert tip:**

It is easier to insert or remove the cast from dorsal rather than medial, as the toe flexes more easily.

**Step 4**



Harvest the iliac crest cortico-cancellous bone graft ensuring it is large enough to recreate the shape of the bone cement template.



Use a small sagittal saw to sculpt the graft to match the shape of the template, leaving one or if possible two cortical surfaces for later screw fixation.

**Step 5**



Insert bone graft.

When using a medial incision, use a slot in the metatarsal to get the graft in.

Check Varus/Valgus and dorsiflexion positions.

Refix the toe with the K-wire in its optimal position.

**Step 6**



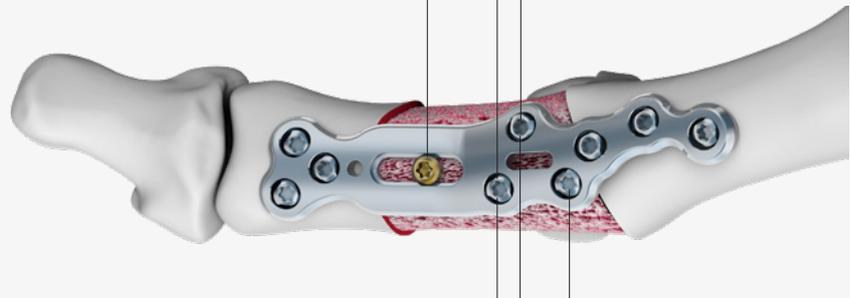
Choose the appropriately angulated plate. Fix the plate from distal to proximal with TriLock screws. Insert a cortical screw into the bone graft via the oblong hole.

**Expert tip:**

Polyaxial locking screws allow the fixation to fit around the K-wire. You can leave the K-wire during fixation.

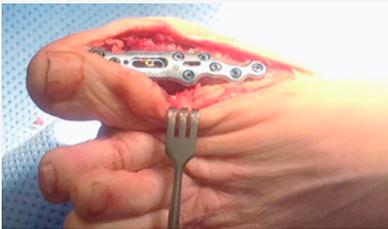
**Overview of screw placement**

Screw holes where screws may be able to be fixed into the bone graft



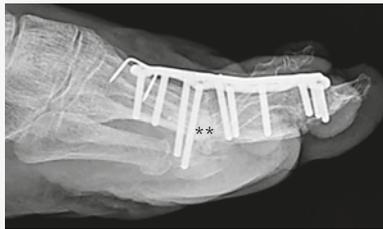
Screw holes where screws may be able to be fixed into the residual sesamoids

**Step 7**



Result of the operation. Note that the length of the first toe is maintained/restored.

**Step 8**



\*\* Note screws in the sesamoids

Routine wound closure in layers.

Postoperative X-ray and CT.

Postoperative care:

Week 0–2: Well padded dressing/elevate/non weight-bearing



Week 3–4: Non weight-bearing

Week 5–8: Gently start weight-bearing in an orthowedge off-loading shoe.

Week 9: Check CT for union and progress to full weight-bearing.

**Week 9**



Painless

Stable

Radiologically united

Still swollen

Progress to full weight-bearing

# Medial Lapidus Arthrodesis Surgical Technique

## Using the APTUS 2.8 TriLock Medial TMT-1 Fusion Plate

Example and technique by **Victor Valderrabano**, SWISS ORTHO CENTER, Swiss Medical Network – Schmerzklinik Basel, Switzerland

### Typical Indications for TMT 1 – 2 Fusions

- Severe hallux deformities
- Tarsometatarsal (TMT) – 1/2 instability
- Osteoarthritis TMT 1/2 joints
- Arch corrections

### Preoperative Planning

In addition to standard small-joint instrumentation, the following items should be available in the operating room:

- Intra-operative fluoroscopy
- Powered hand piece with K-wire driver, three jaw chuck and oscillating saw

### Case Presentation

- Hallux valgus
- TMT 1/2 instability
- Subluxation MTP-joints 2–3

**Preoperative X-ray**

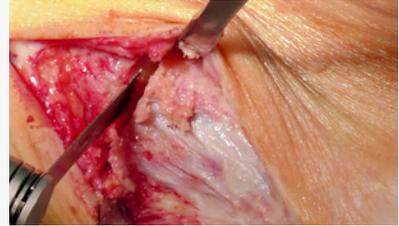


**Step 1**

Make a long incision in order to address all three levels. Take care not to harm the neurovascular bundle or the tibialis anterior tendon.

**Step 2**

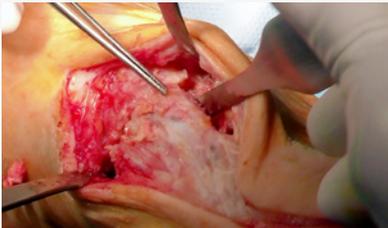
Perform a subchondral parallel cut to the joint surface on the base of MT-1.

**Step 3**

Perform a cut at the medial cuneiform perpendicular to the longitudinal axis of MT-2. Use this cut to achieve slight plantar flexion.

**Note:**

Take care to start with the cut within the cartilage in order to reduce shortening of the first ray.

**Step 4**

Prepare the lateral cortex of MT-1 and the medial cortex of MT-2 with an osteotome to allow for intermetatarsal bony fusion. Be careful not to harm the arteria or nervus dorsalis pedis.

**Step 5**

Perform a lateral release at MTP-1 joint.

**Expert tip:**

Using slight plantar flexion, it is easier to mobilize the capsule and the ligament.

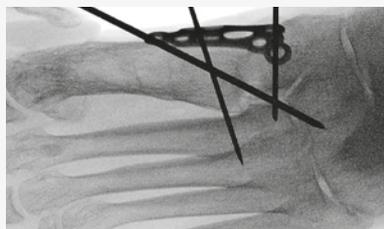
**Step 6**

Temporarily fix bones by driving a 1.6 mm K-wire from the base of MT-1 into the cuneiforme 2. Thus, the K-wire will not interfere with the screws until the final fixation with the plate is achieved.

**Illustration of ideal plate position**

Ideal position of medial TMT-1 plate in respect to the tibialis anterior tendon.

Put the plate on the bone and temporarily fix it using two (olive) K-wires.

**Step 7**

Insert a 1.6 mm K-wire on either side of the fusion site into the respective K-wire holes/slot of the plate.

**Step 8**

Use forceps to apply temporary compression on the fusion site.

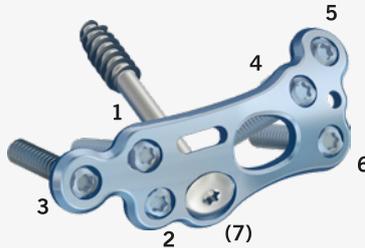
**Note:**

If you want to apply compression using TriLock<sup>PLUS</sup> or compression via forceps for olive K-wires, please consult the surgical technique «Foot System 2.0–3.5 Step by Step».

**Step 9**



Fix the plate with screws. If you plan to use compression via TriLock<sup>PLUS</sup>, start with the proximal screws.



Overview of screw positioning in the order of insertion without TriLock<sup>PLUS</sup>.

**Note:**  
Place three screws in each bone fragment.

**Step 10**



Decide if classical lapidus is indicated.  
Apply tactile pressure with your thumb and your index/middle finger in the

space between the heads of MT-1 and MT-2. If a gap opens under X-ray on the fusion site, a transfixation screw into MT-2 is indicated («classic Lapidus»).

**Step 11**



Fill space between base of MT-1 or MT-2 with either cancellous bone chips or bone material from other sites to achieve bony fusion.

**Step 12**



Pre-drill transfixation screw using the 2.8 twist drill (one orange ring).

**Expert tip:**  
Typically, about 20° upward angulation is needed for the ideal placement of the transfixation screw into MT-2.

**Step 13**



Insert a transfixation screw using the 2.8 screwdriver.

**Step 14**



Check under X-ray for tactile stability as described in step 10.

Now other steps, as Akin osteotomy or Weil osteotomies, can be performed.

**Step 15**



The incision is closed in layers as per surgeon's technique.

**Postoperative care:**  
Postoperative care and time to weight-bearing is the responsibility of the surgeon. Typically, patients start with 15 kg partial weight-bearing and transition to full weight-bearing after 6 weeks.

**Step 16**



Radiographic control at 6 weeks follow-up.

# Plantar Lapidus Arthrodesis Surgical Technique

## Using the APTUS 2.8 TriLock TMT-1 Plantar Fusion Plate

Example and technique by **Christian Plaass**, Clinic for Orthopaedic Surgery (Annastift Hospital), Hannover Medical School, Germany

### Typical Indications for TMT Fusions Include:

- Moderate to severe hallux valgus
- Primary or posttraumatic osteoarthritis of the TMT-1 joint
- Medial column instability with sag in the TMT-1 joint

### Preoperative Planning

In addition to standard small-joint instrumentation, the following items should be available in the operating room:

- Intra-operative fluoroscopy
- Powered hand piece with K-wire driver, three jaw chuck and oscillating saw

### Case Presentation

42 year old female with severe hallux valgus deformity and an intermetatarsal angle  $>18^\circ$

### Patient Positioning:

The patient should be positioned supine and the foot to be operated slightly elevated to allow for better rotation. The use of a tourniquet and preoperative antibiotics is recommended.

#### Step 1



Perform the soft tissue release according to standard surgical technique.

#### Step 2 – Skin incision



**Single medial approach:** Perform a medial approach on the medial foot boarder reaching from the cuneiforme to the center of the proximal phalanx of the great toe. To estimate the height of the incision, palpate the bones

of the medial column and place the incision in the lower third or alternatively orientate on the border of the dorsal to the plantar foot skin.

Avoid to injure and coagulate the veins of the medial foot boarder and lift the soft tissues dorsally as an envelope. This will reduce swelling.

**Alternatively perform a double incision:** One incision distally medial over the MTP-1 joint and one proximal over the TMT-1 joint. Place the incision slightly more plantar as for a single medial incision.

**Step 3**



Incise and release the MTP-1 joint capsule to expose the joint.

**Step 4**



Resect the exostosis sparingly.

**Step 5**



Dissect the capsule of TMT-1. Use blunt dissection to release the extensor hallucis longus tendon of the joint and retract the musculus abductor hallucis.

**Step 6**



Resection of TMT-1.

Use two Hohmann retractors to protect the soft tissues dorsally and the insertion of the tibialis anterior tendon plantarly. Open the joint capsule medially, sparingly resect the articular surface of TMT-1 either with an osteotome or an oscillating saw. Avoid shortening.

**Step 7**



Reduce MT-1 to correct the intermetatarsal angle.

Adjust MT-1 in the appropriate position and temporarily fixate with a 1.6 mm K-wire from distal-dorsal to proximal-plantar.

**Step 8**



Verify the correct position of MT-1 clinically and under fluoroscopy.

**Step 9**



Place an auto compression screw using the placed 1.6 mm K-wire as a guide for a 5.0 SpeedTip CCS. Fully insert the screw head to avoid soft tissue irritations.

**Note:**

A 4.0 transfixation screw (A-5936.xx) can be used alternatively as a lag screw. Countersink the screw head to avoid soft tissue irritations.

**Step 10**



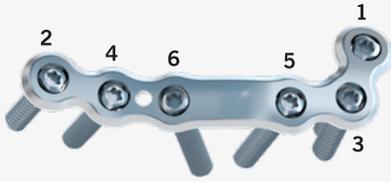
Apply the APTUS plantar TMT-1 plate. The plate should be positioned strictly plantar. The position of the plate is determined by the tibialis anterior tendon insertion. Place the plate lateral to it. If subtle contouring of the plate is required, use the 2.0–2.8 plate bending pliers with pins (A-2047). The self-holding drill guide (A-2826) can be used to position the plate. Additional soft tissue preparation may be necessary



to correctly place the plate.

**Expert tip:**

To check the position radiologically, the plate can be temporarily fixed using olive K-wires.

**Overview of order of insertion**

Insert the most proximal screw first without locking to secure the position of the plate. Then insert the most distal screw, as this eases finding the position of the plate along the axis. Insert the remaining screws and fixate the plate to the bone.

As a final step, lock the most proximal screw in the plate.

**Note:**  
Place three screws in each bone fragment.

**Step 11**

Fix the plate with locking screws. Bicortical fixation may be considered in the case of osteoporotic bone.

**Final result****Step 12**

Closure and postoperative protocol. The incision is closed in layers as per surgeon's technique. A well-padded postoperative splint is recommended for the first 10-14 days as the incision heals. Postoperative care and time to weight-bearing is the surgeon's responsibility.

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#### **MANUFACTURER & HEADQUARTERS**

Medartis AG | Hochbergerstrasse 60E | 4057 Basel/Switzerland  
P +41 61 633 34 34 | F +41 61 633 34 00 | [www.medartis.com](http://www.medartis.com)

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