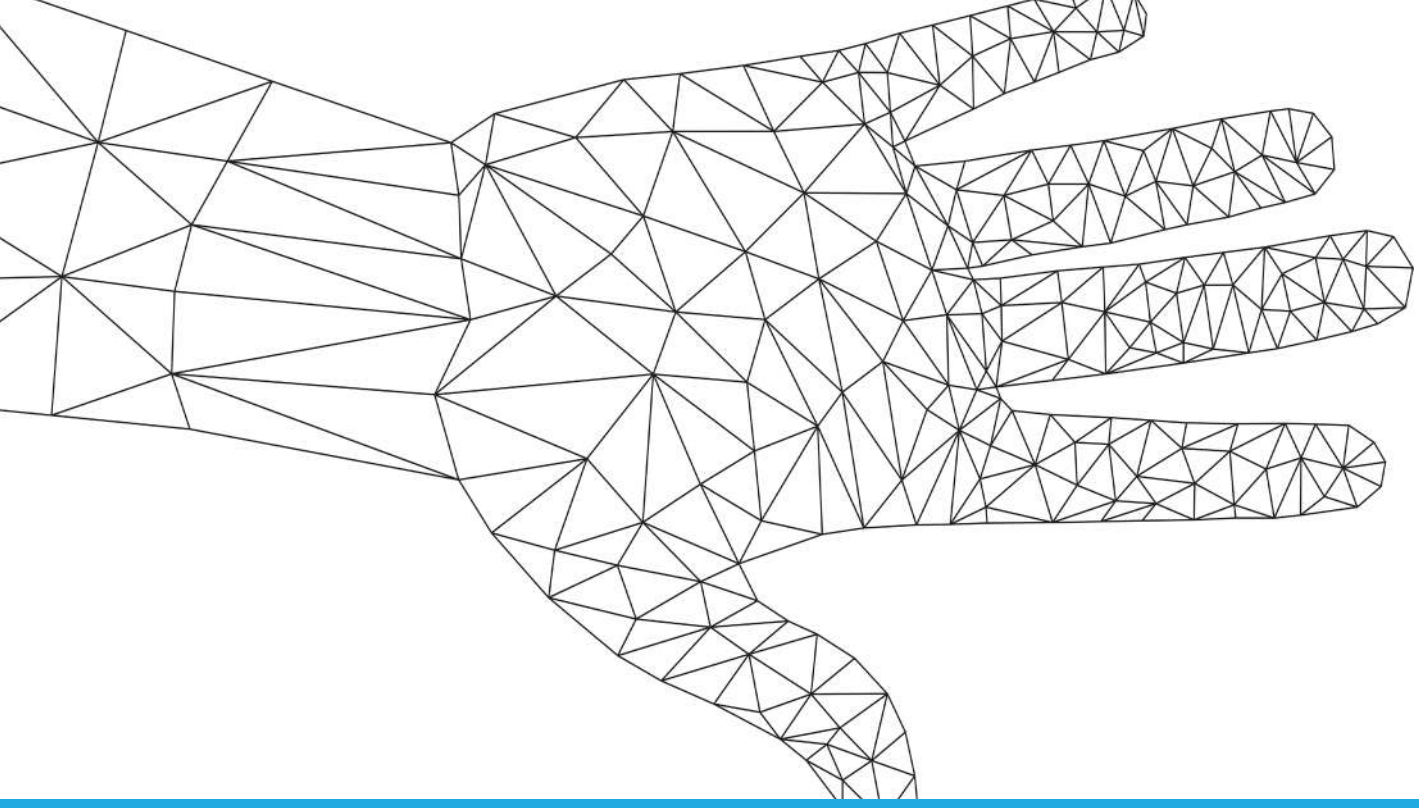


SURGICAL TECHNIQUES ON HAND & WRIST

Biointelligent osteosynthesis with Shark Screw®

Inhalt

IMPORTANT!
The description of the surgical techniques in this script shows surgical examples and serves as a teaching aid for clinical support in the use of Shark Screw® grafts. The teaching material alone is not a substitute for hands-on training. The use of the grafts, the surgical procedure as well as the postoperative treatment depend on the patient and must be decided individually by the treating physician for each case of application. In doing so, the physician must act after careful examination of the relevant medical literature, according to his/her training, experience and the general health condition of the patient(s).

Histomorphology

Co-Spaces inside each Shark Screw®

The natural architecture and biointelligent bone tissue of Shark Screw® with its channel and system provides a guidance structure for cells and cell fluids. Progenitor cells settle inside the allogeneic bone screw to continuously transform into the cells that the bone needs. This co-space for cells and nutrients is the basis for the formation of new stable bone tissue with arteries, veins, lymphatic vessels and nerves. It is the basic prerequisite for healing of a fracture or arthrodesis.

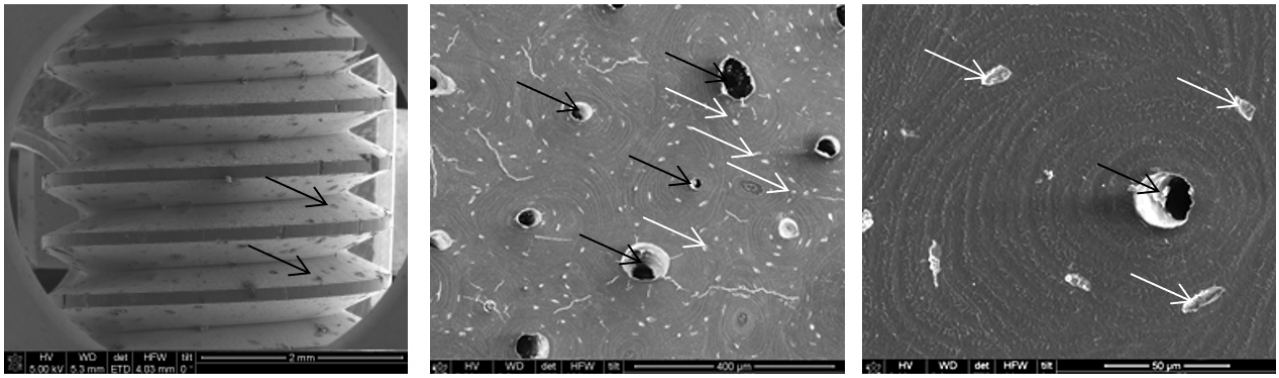
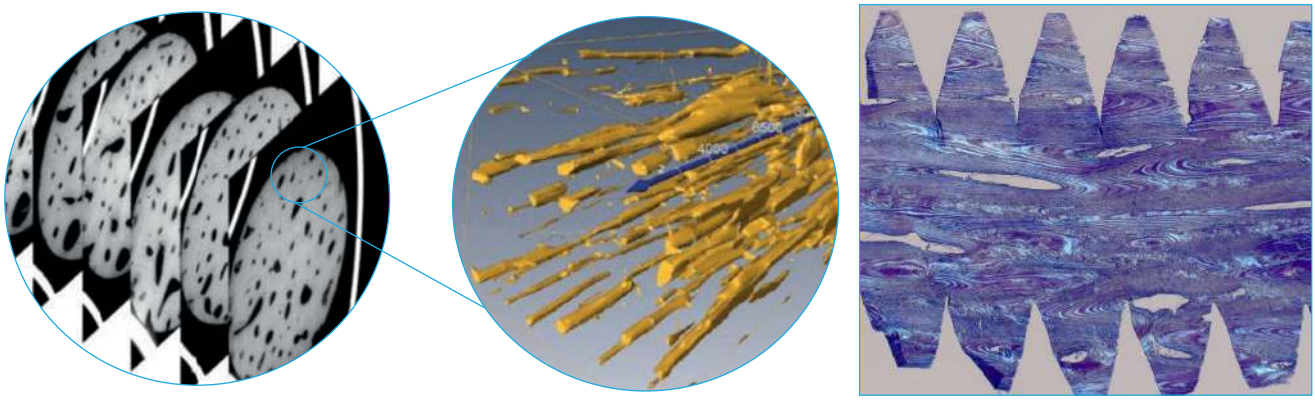


Illustration shows an electron micrograph of a Shark Screw®. From left to right: 1. view of a Shark Screw® | 2 & 3 view of osteons, Havers channels (black arrows), osteocytes (white arrows), concentric special lamellae as well as switching lamellae between the osteons Graz University of Technology FELMY-ZFE Institute for Electron Microscopy and Fine Structure Research (Prof. Dipl. Ing. Dr. H. Plank)

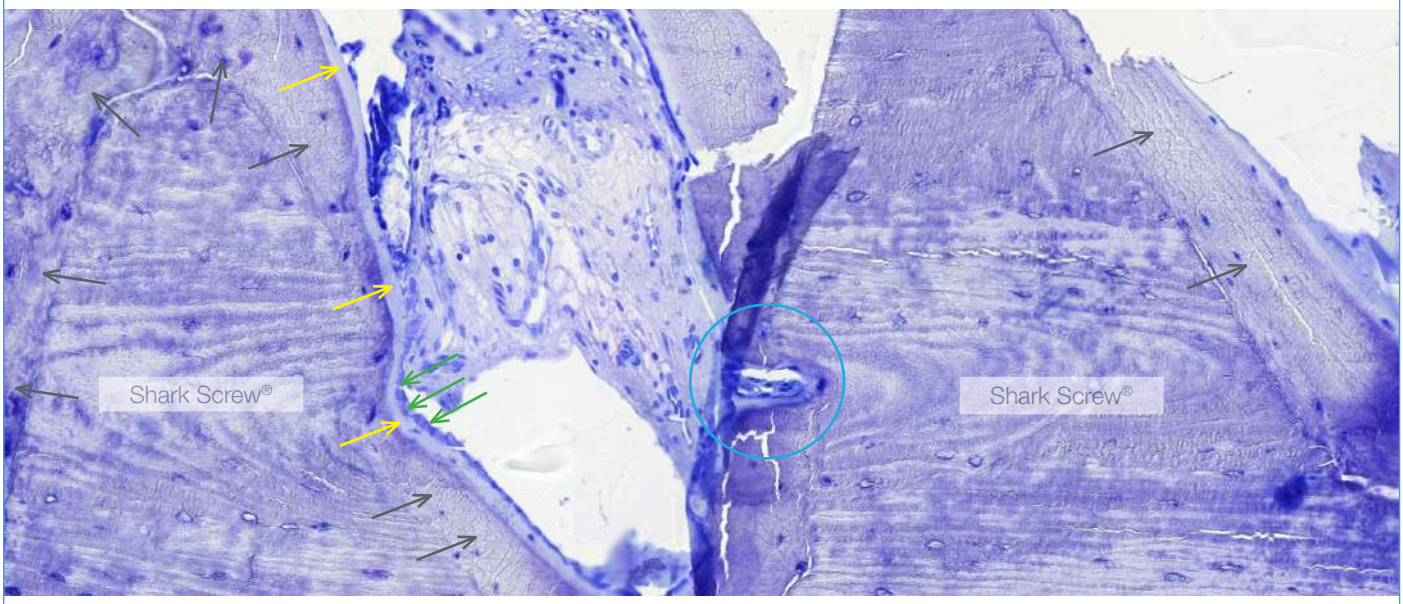


Inside each Shark Screw® are the Haversian canals, which are available as a guide structure for the bone healing processes. This channel system was visualized with the aid of electron microscopy, in which sequential sections with a step size of 200 µm were performed and subsequently the Shark Screw® was reconstructed in 3D. Right in blue: Histological image of a Shark Screw® after sterilization. The Havers canals are cell-free.

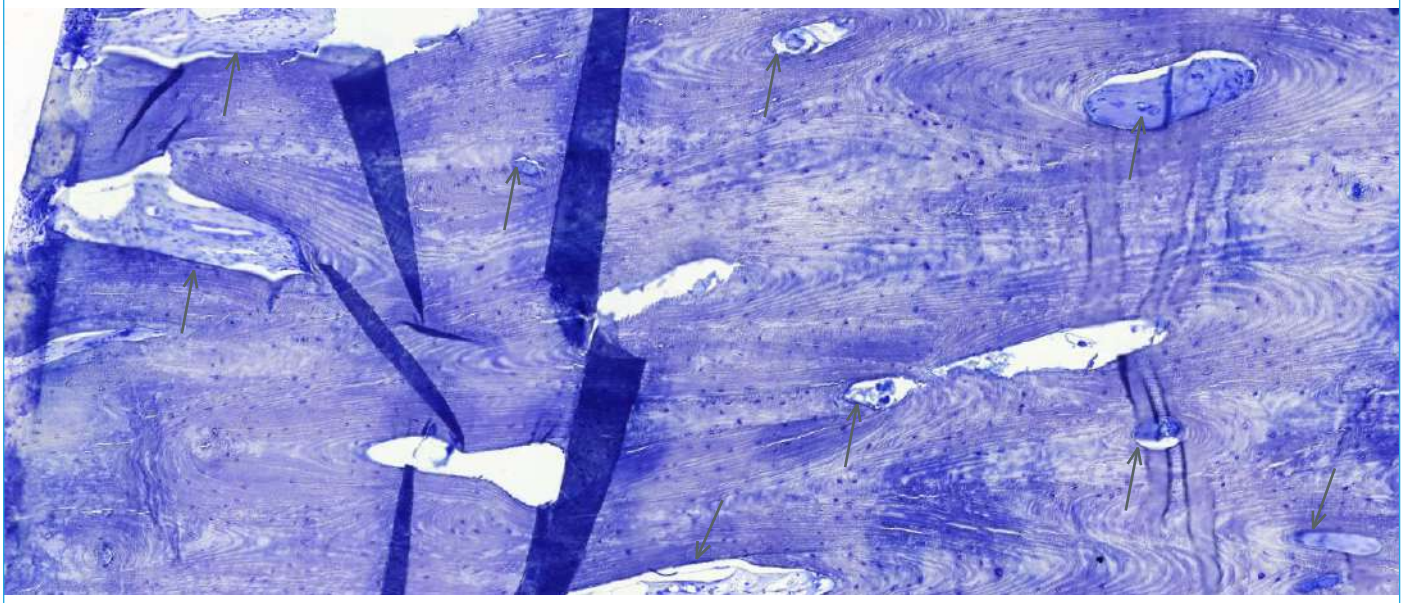
Histomorphology

Co-Spaces inside each Shark Screw®

Bone healing with the Shark Screw® was investigated on an explant 10 weeks postoperatively. The Shark Screw® was completely revascularized and colonized with all bone cells. New Haversian systems had formed. Lamellar bone formed along the threads as a sign of primary/direct bone healing. No inflammatory or rejection reactions were found.



Histological image of a thread of the Shark Screw®. The newly formed lamellar bone is positively attached to the thread of the Shark Screw® (gray arrows). Osteoid (light line/yellow arrows) and osteoblasts (green arrows) are attached to the lamellar bone. Osteocytes lie in the already finished, mineralized bone. Newly formed Haversian system between patient bone and Shark Screw® (circled). Fracture tapping (Rahn and Perren 1971). Patient bone and graft form a stable bone-haling unit (Elliott DS et al., 2016).

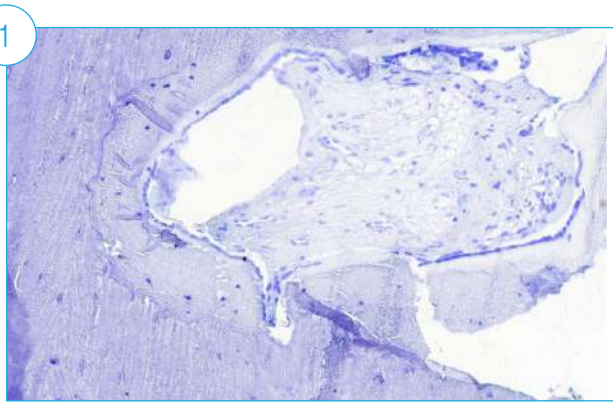


Vascularization of the Haversian canals of the Shark Screw®, section from the center of the graft (gray arrows).

What happens with Shark Screw® in the patient‘s bone?

The following images show the revascularization, cell colonization and remodeling process of Shark Screw®. The reprocessing was done by light microscopy (PD Dr. Mathias Werner Vivantes Berlin) and scanning electron microscopy (SEM) (Prof. Dipl-Ing. Dr. Harald Plank FELMI Graz) on an explant 10 weeks after the initial surgery.

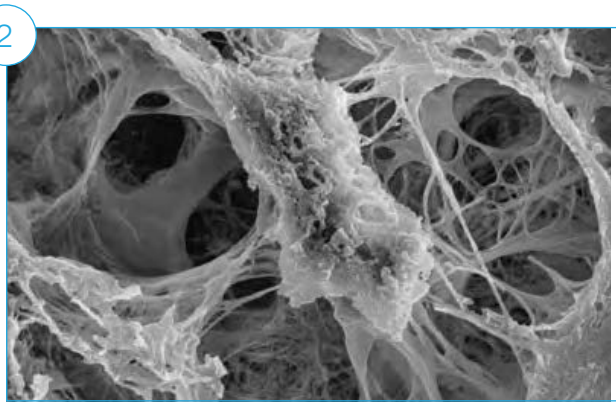
1



Thread of the Shark Screw® & patient bones

Highly structured lamellar bone fits to the thread contour without a connective tissue layer. There are no inflammation or rejection reactions. Patient bone and graft form a stable bone-haling unit. (Elliott DS et al., 2016)

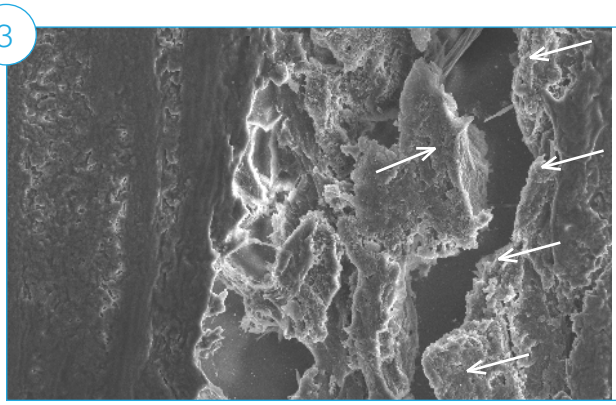
2



Mesenchymal stem cells & osteoprogenitor cells

These migrate into the Shark Screw® graft. There they find ideal conditions to differentiate into the cells that the body needs for bone healing - osteoblasts for bone formation and chondrocytes for cartilage formation.

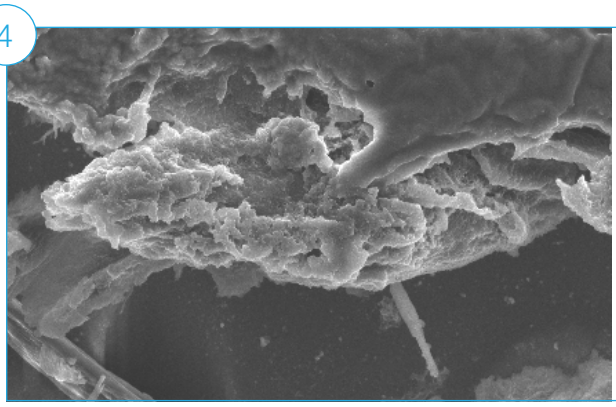
3



Osteoblasts

Osteoblasts (white arrows) form the basic bone substance and are primarily responsible for the organic matrix of the bone tissue. Countless biochemical substances, such as growth factors, hormones, messenger substances and proteins regulate bone healing inside the Shark Screw®.

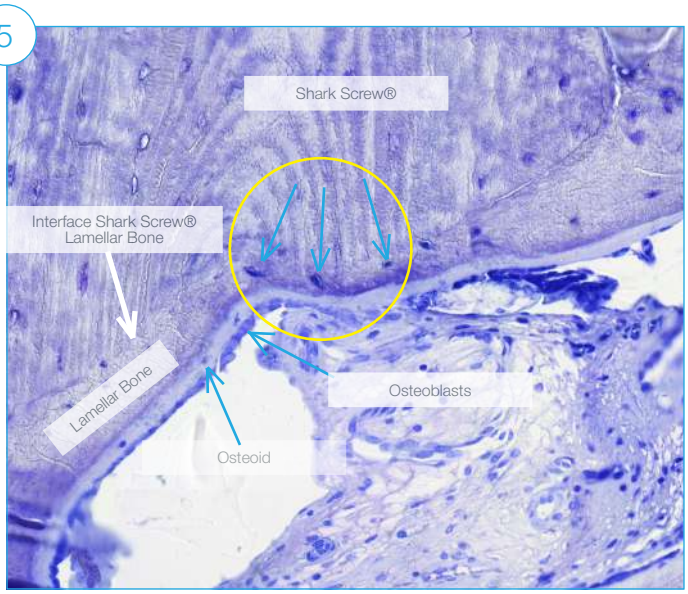
4



Osteoid producing osteoblast

These migrate into the Shark Screw® graft. There they find ideal conditions to differentiate into the cells that the body needs for bone healing - osteoblasts for bone formation and chondrocytes for cartilage formation.

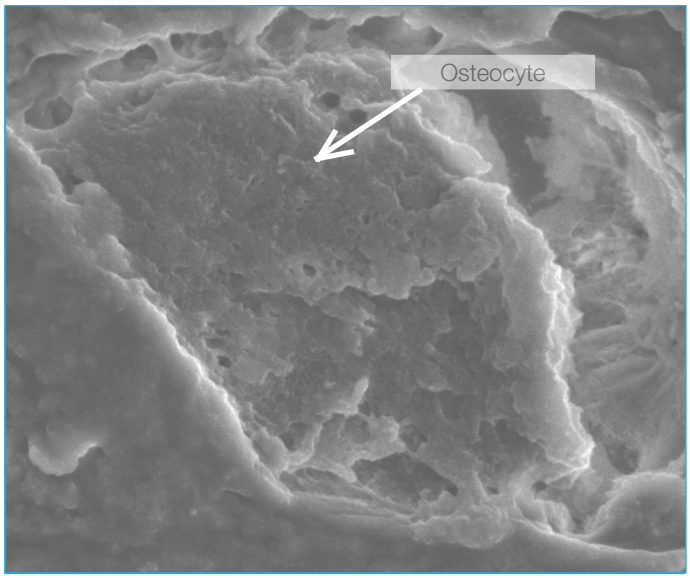
5



Thread of the Shark Screw® & patient bones

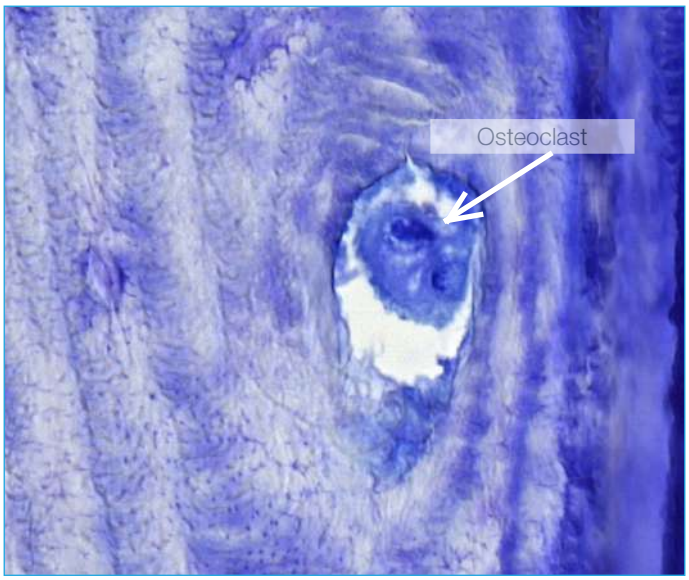
The yellow circle shows the osteocytes in light microscopy.

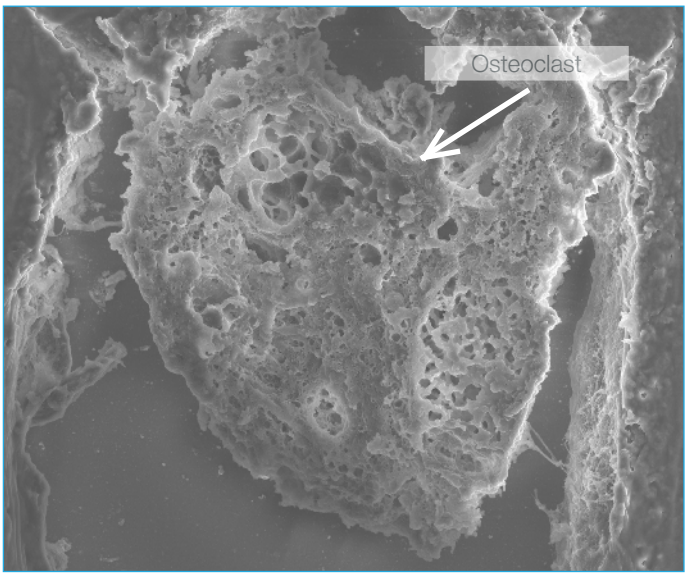
6



Osteocytes

Osteocytes are the most numerous cells in our bone, numbering about 42 billion. They are completely embedded in the bone and develop from osteoblasts. Their network of projections, with which they are connected to each other via canaliculi, is impressive. They secrete messenger substances that promote both bone formation and bone resorption. (Kurth A. & Lange U., Fachwissen Osteologie, 2018)





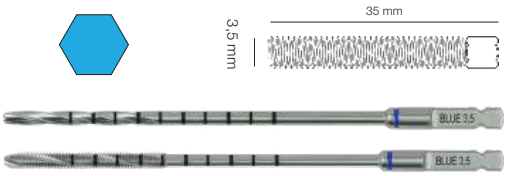
7 Osteoclasts

Osteoclasts, here in a Havers` system of the Shark Screw®, degrade the bone material of Shark Screw®. By secreting cytokines, osteoclasts can promote or inhibit the local recruitment, differentiation and activity of osteoblasts. These particular phagocytes are in constant exchange with osteocytes and osteoblasts and can significantly influence them (Sims, N. A., & Martin, T. J., 2014). This constant crosstalk among bone cells enables remodeling of the graft in patient bone.

READ THE PAPER NOW

Instruments

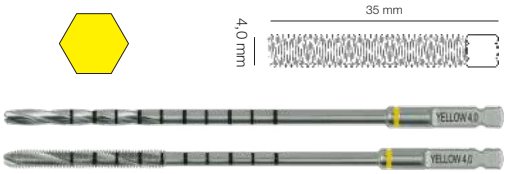
Shark Screw®



Shark Screw® cut 3,5mm Ø blue allograft screw

Cannulated driller for 3,5mm Ø Shark Screw® cut

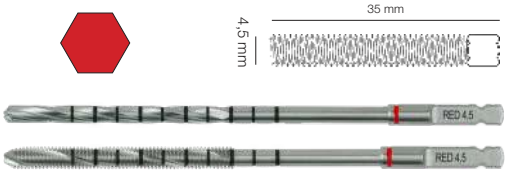
Cannulated thread die for 3,5mm Ø Shark Screw® cut



Shark Screw® cut 4,0mm Ø yellow allograft screw

Cannulated driller for 4,0mm Ø Shark Screw® cut

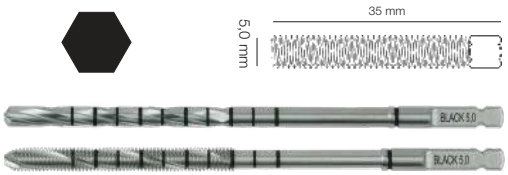
Cannulated thread die for 4,0mm Ø Shark Screw® cut



Shark Screw® cut 4,5mm Ø red allograft screw

Cannulated driller for 4,5mm Ø Shark Screw® cut

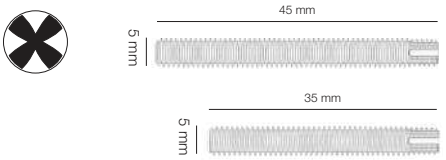
Cannulated thread die for 4,5mm Ø Shark Screw® cut



Shark Screw® cut 5,0mm Ø black allograft screw

Cannulated driller for 5,0mm Ø Shark Screw® cut

Cannulated thread die for 5,0mm Ø Shark Screw® cut



Shark Screw® diver 5,0mm Ø blue allograft screw

Cannulated driller for 5,0mm Ø Shark Screw® diver

Cannulated thread die for 5,0mm Ø Shark Screw® diver

General surgical technique

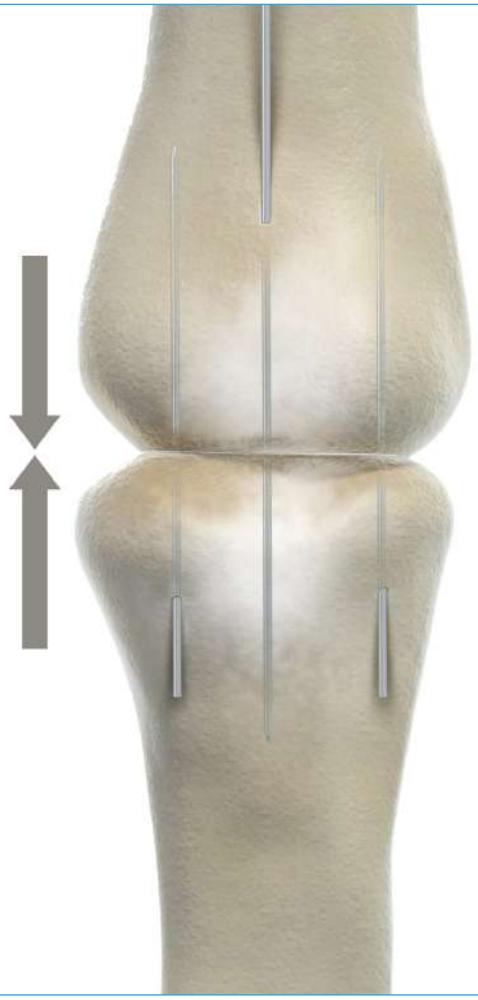
Shark Screw®

1

Freshening, reduction, compression

A surgery with the Shark Screw® always follows the same steps, regardless of the body region in which it is used. The fracture surfaces / the de-cartilaged, opposite joint surfaces / the osteotomy surfaces are freshened with a thin drill (1.0 or 1.5mm) and then adjusted to each other. They are brought under compression from the outside, possibly also with the aid of reduction forceps.

2



Positioning the 1.6mm k-wire

After reduction of the joint surfaces, set a 1.6 K-wire (KD), which represents the direction and position of the Shark Screw® to be inserted later. Primarily, a 1.6 Kirschner wire should always be used, as it cannot bend during insertion and is directionally stable. A 1.2 K-wire can bend during insertion and could be drilled off during over drilling! An interoperative X-ray check may be necessary to check the position of the guide wire.

Temporary 1.2 fixation K-wires

In addition, one or two thin K- wires (1.0 or 1.2 K-wire) are always placed temporarily. They are intended to hold the two pieces of bone to be fixed as stably as possible during drilling and tapping. They must be placed as far as possible in the marginal area so that they do not interfere with the drilling and tapping later. Now the two bone pieces can no longer change position and the specified compression is kept stable.

3

Setting the core drill hole

The 1.6 K-wire is now removed and replaced with a 1.2 K-wire, over which drilling can then be performed and the nut thread cut.
Drilling should always be done in stages to keep the heat generated during drilling to a minimum. The further drill strengths scrape off the surrounding bone areas with much less heat development, as these only remove very thin layers.

We start with the thinnest (blue) drill. This allows us to determine the ideal thickness of the graft for each individual region and recipient. We choose the graft to be as thick as possible because the load capacity increases with the diameter. The more mass of donor bone is available in the form of the screw-bone bridge, the more stably the two pieces of bone to be fixed are connected.

4

Tapping

After drilling the core hole, the nut thread is cut into the bearing bone with the matching tap (drill, tap and matching graft are marked by the same colour! e.g.: It was drilled out to yellow. Consequently, the thread must also be cut with yellow, and the yellow graft must be used).

5

Rinsing the canal

After thread cutting, the thread canal must be carefully rinsed with physiological saline solution, as all bone remaining in the canal must be completely removed.

6

Screwing in the Shark Screw® graft

Now the matching Shark Screw® graft can be screwed in almost without resistance using the screwdriver (make sure that the screw is in the correct axial position when it is placed on the drill channel!) Under no circumstances should the head of Shark Screw® cut itself be screwed into the threaded channel, as this would burst the channel. The Shark Screw® is held in place solely by the self-locking effect of the fine thread and never by the screw head. In contrast to Shark Screw® cut, the head of Shark Screw® diver can screwed deep into the bone using the coupling screwdriver below bone level. In these cases, the screw head does not need to be sawn off and serves as an additional bone bridge. After inserting Shark Screw®, screw parts that protrude above the bone level are cut off with the oscillating saw.

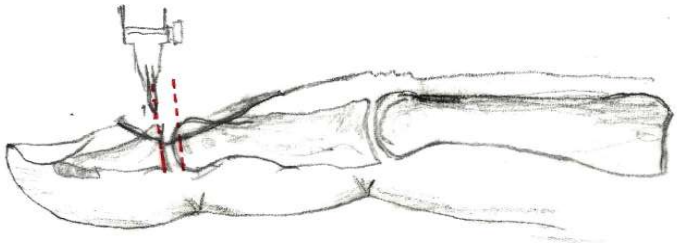
!

If small boneparts remain in the nut thread, they may prevent the screw from being screwed in. If resistance is encountered intraoperatively, it must not be overcome by force under any circumstances. In the event of major resistance, the screw should be removed, the thread recut, rinsed and then the screw reinserted. Shark Screw® screws cannot be re-sterilized. They must be inserted directly from the original sterile packaging without prior manipulation. Depending on the length of a sawed-off, remaining Shark Screw® cut piece, it can be reused in the same operation on the same patient. (e.g. for a Weil osteotomy on several toes).

1

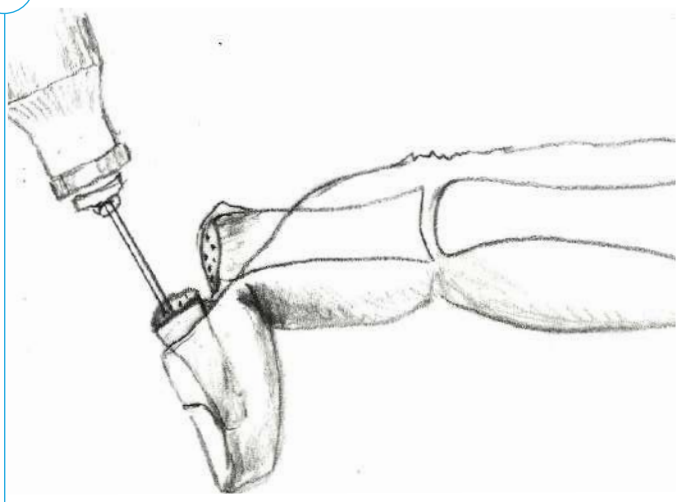
Step 1: If arthrodesis of the DIP joint in the extended position is desired, the Shark Screw® must be inserted distally via the fingertip. Y-shaped skin incision for free access to the joint. The incision is extended proximally, to approximately 2cm distal to the proximal interphalangeal joint. First, we remove the dorsal exophytes with the luer. After cutting the collateral ligaments, we remove the remaining lateral and possibly volar exophytes.

2



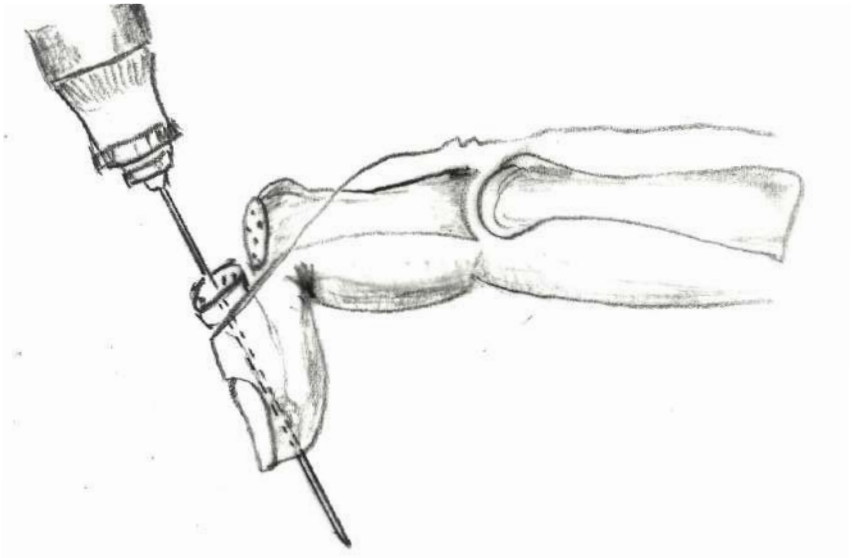
Step 2: We remove the cartilage with the luer, a sharp spoon or scraping movements with the oscillating saw. Sometimes this works better under maximum flexion of the DIP joint.

3



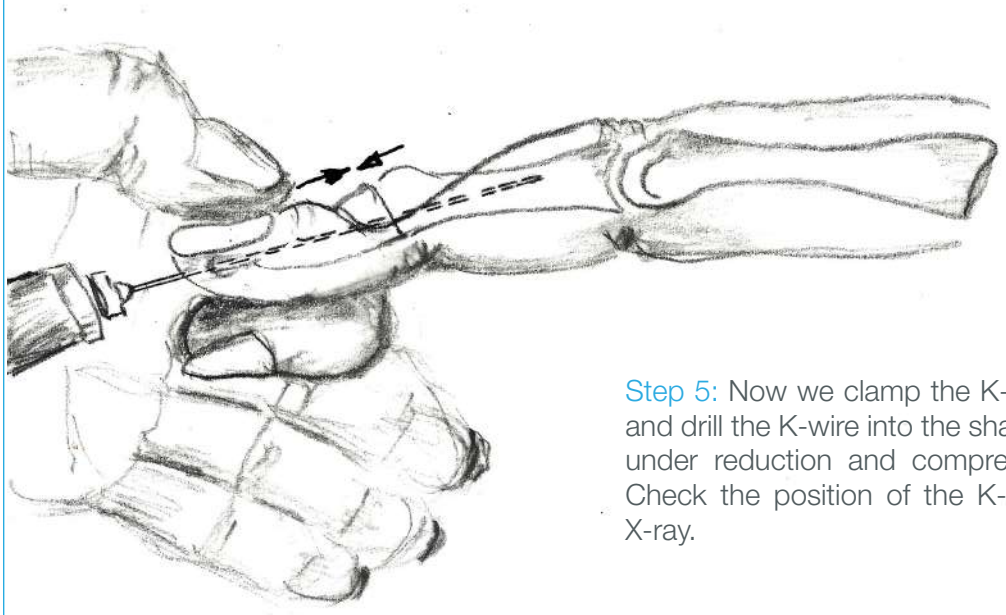
Step 3: We then freshen the sclerotic bone of the two DIP articular surfaces with the tip of a K-wire or a thin drill.

4



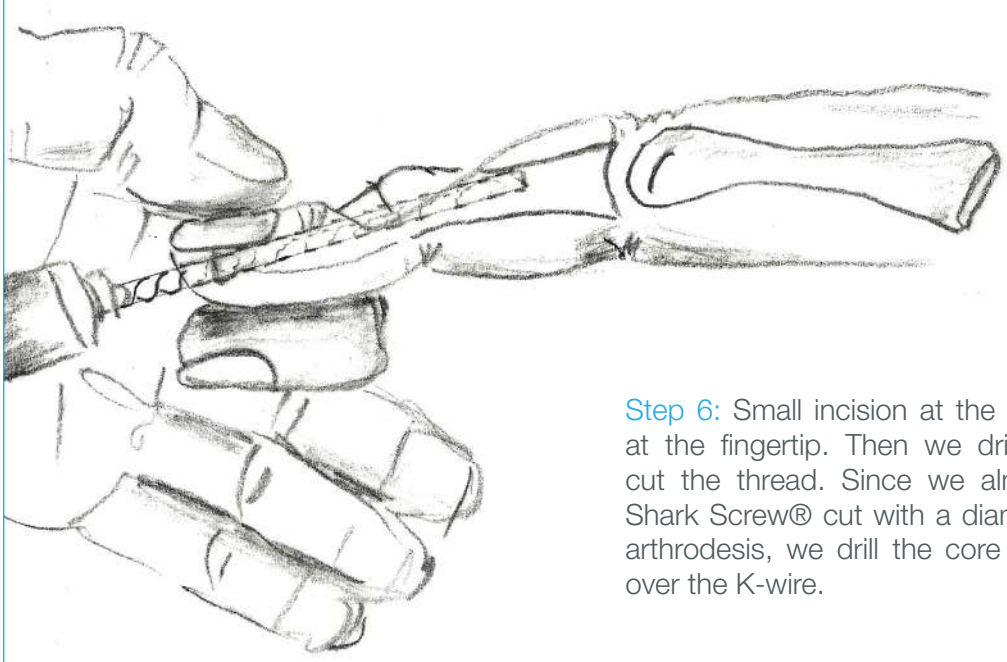
Step 4: Next step we check the position of the arthrodesis and the rotation of the de-cartilaged joint. We insert a double-pointed 1.2 Kirschner wire coming from proximally into the center of the base of the distal phalanx and drill it centrally through the shaft of the distal phalanx until it exits centrally at the fingertip through the skin.

5



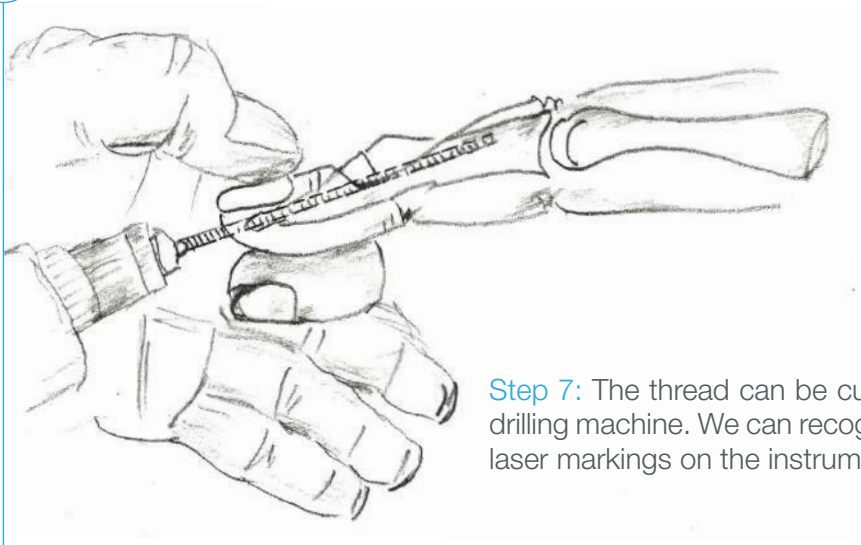
Step 5: Now we clamp the K-wire coming from distal and drill the K-wire into the shaft of the middle phalanx under reduction and compression of the DIP joint. Check the position of the K-wire with interoperative X-ray.

6



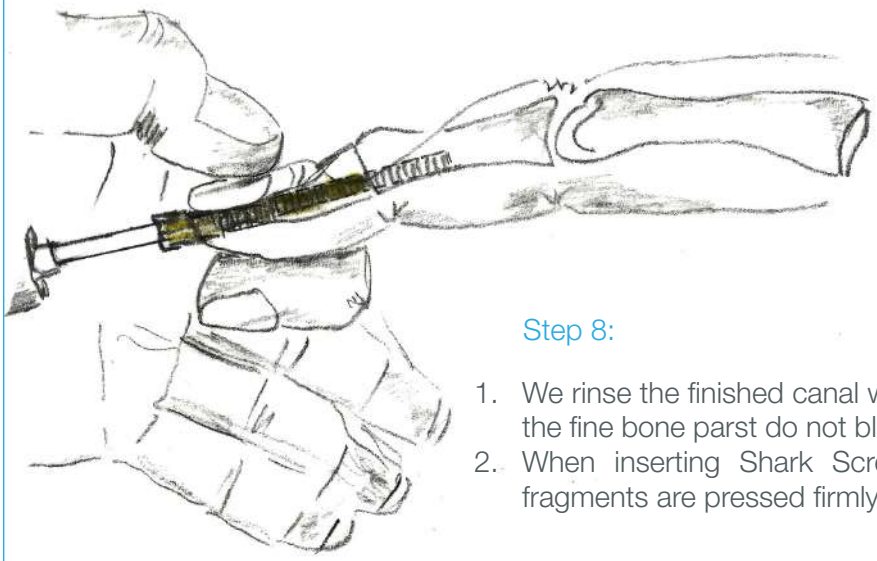
Step 6: Small incision at the exit point of the K-wire at the fingertip. Then we drill over the K-wire and cut the thread. Since we almost exclusively use a Shark Screw® cut with a diameter of 3.5mm for DIP arthrodesis, we drill the core hole with the blue drill over the K-wire.

7



Step 7: The thread can be cut either manually or with the help of a drilling machine. We can recognize the desired drilling depth from the laser markings on the instrument.

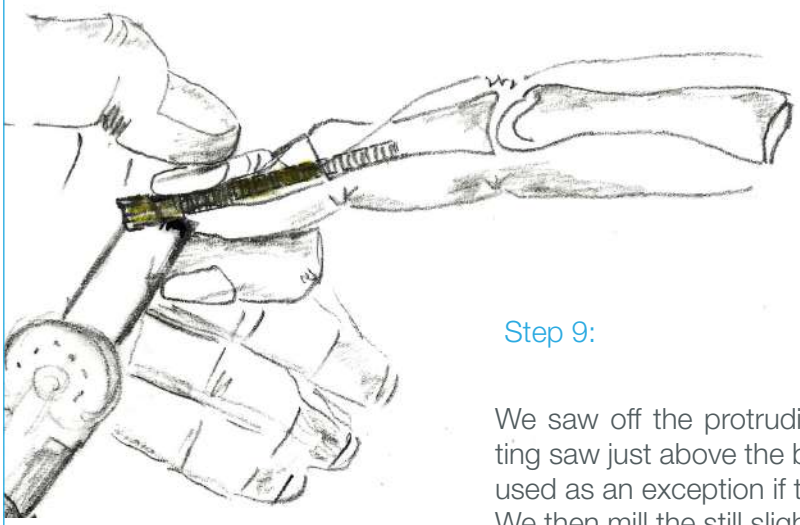
8



Step 8:

1. We rinse the finished canal with physiological saline solution so that the fine bone parst do not block when Shark Screw® is screwed in.
2. When inserting Shark Screw®, we make sure that the bone fragments are pressed firmly together.

9



Step 9:

We saw off the protruding material of the screw with an oscillating saw just above the bone surface. Alternatively, the luer can be used as an exception if there is no space for sawing.
We then mill the still slightly protruding graft bone back to the level of the surrounding bone surface.

Post-treatment*

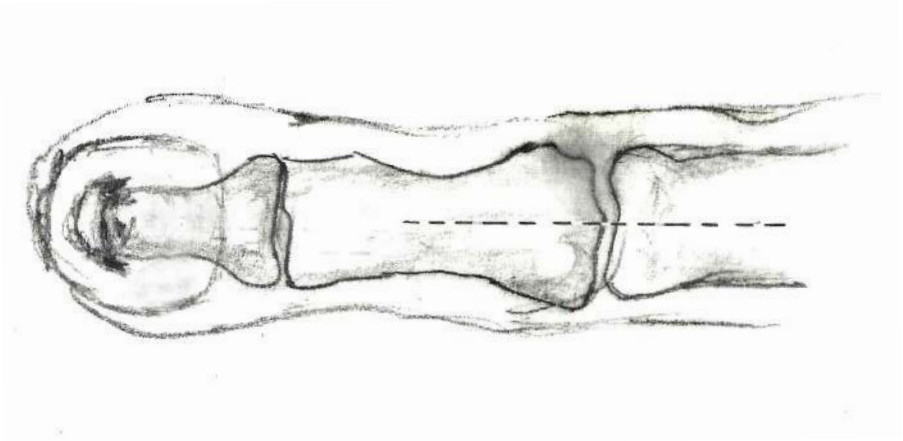
Postoperative treatment may vary from patient to patient, but in most cases a short plaster splint or Stark's splint is recommended for 4 weeks. For another 2 weeks the operated finger should not be loaded. Support by occupational therapy.

WATCH
VIDEO
NOW

PIP arthrodesis

Surgical technique

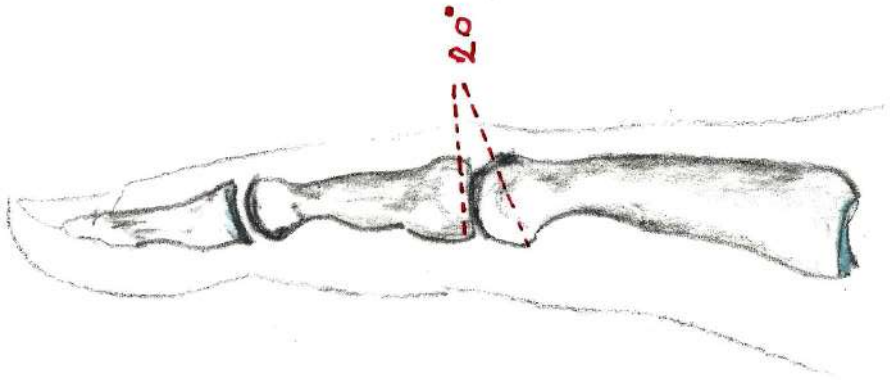
1



Step 1:

Straight skin incision directly over the PIP joint for clear access to the joint. Length of skin incision: 10mm distal to the PIP joint starting to approximately 20mm proximal to the PIP joint. The extensor aponeurosis is split longitudinally and the dorsal and lateral exophytes are removed with the luer. After cutting the collateral ligaments, we remove the remaining lateral and possibly volar exophytes.

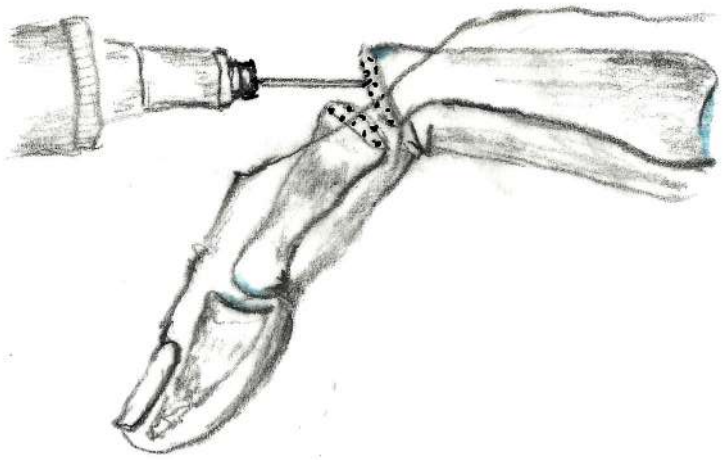
2



Step 2:

1. Depending on the destruction of the joint surface portions, we remove the cartilage with the luer and thus create congruent joint surfaces, or we use an oscillating saw to cut two osteotomies at an angle of 20° to each other (on the 2nd and 3rd fingers).
2. If the arthrodesis is performed on the 4th and 5th fingers, the osteotomy angle should be increased to approximately 30° (guideline values). Of course, the individual angle is discussed before surgery with the patient.
3. During the osteotomy, the PIP joint is kept maximally flexed.

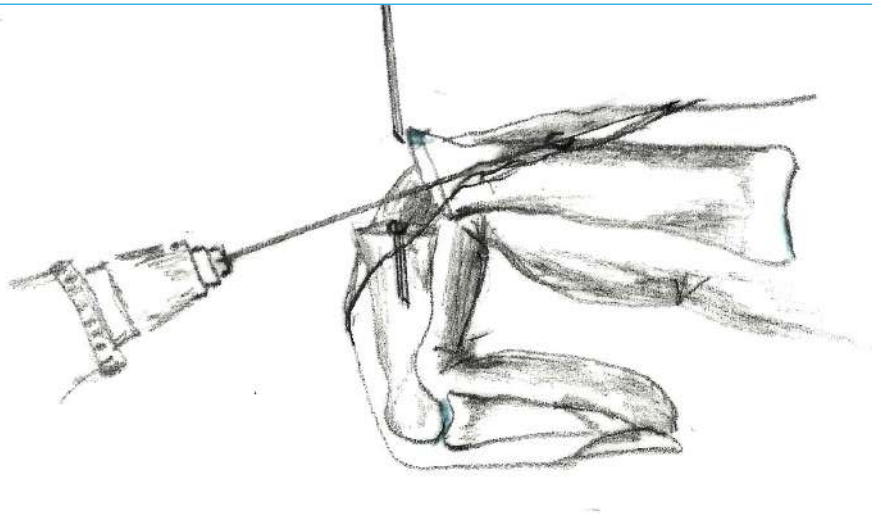
3



Step 3:

1. We then freshen the sclerotic bone of both joint surfaces with the tip of a K-wire or a thin drill.
2. Now we check the flexion position of the arthrodesis as previously agreed with the patient. We also check the rotation and whether the de-cartilaged and refreshed joint surfaces are lying flat on each other.

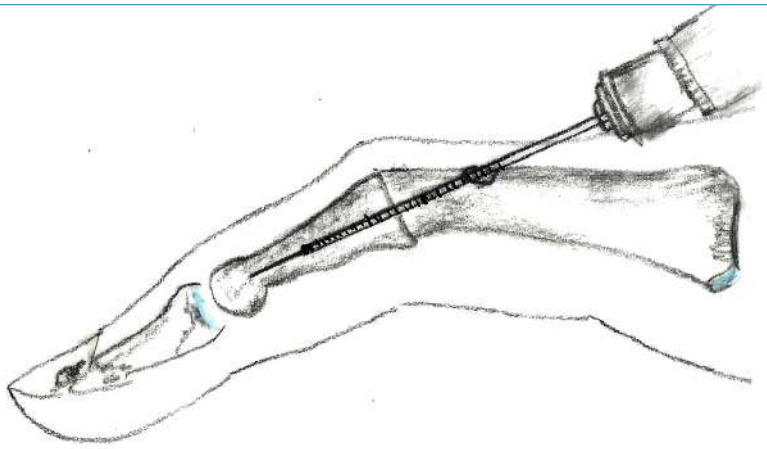
4



Step 4:

We insert a double-pointed 1.2 K-wire coming from distally, observing the later desired flexion, into the center of the trochlea of the proximal phalanx and drill it centrally through the shaft of the proximal phalanx until it emerges approximately 15mm-18mm from the PIP joint through the dorsal cortex of the proximal phalanx.

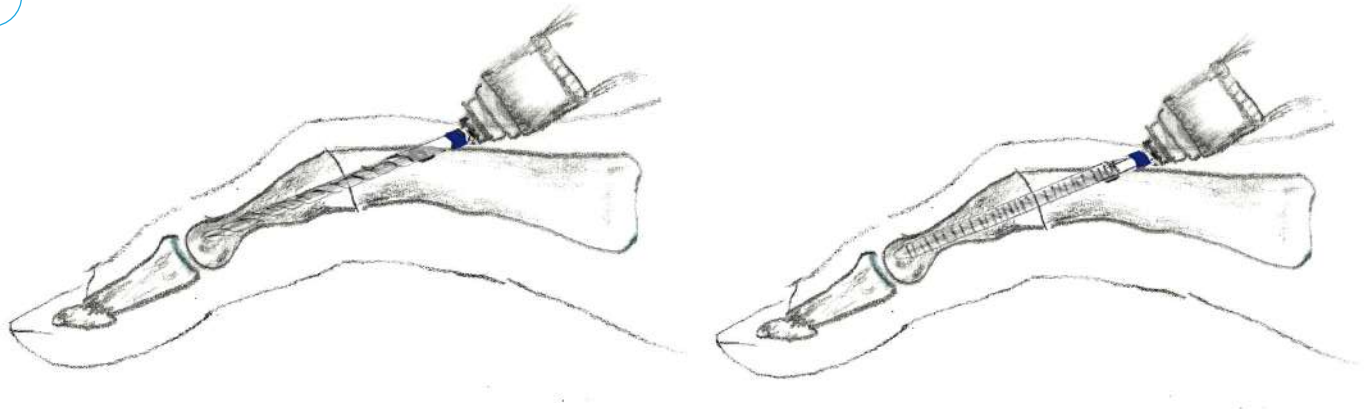
5



Step 5:

Now we clamp the K-wire coming from proximal and drill the K-wire centrally, under reduction and compression of the PIP joint into the shaft of the middle phalanx. Checking the position of the K-wire in interoperative X-Ray.

6



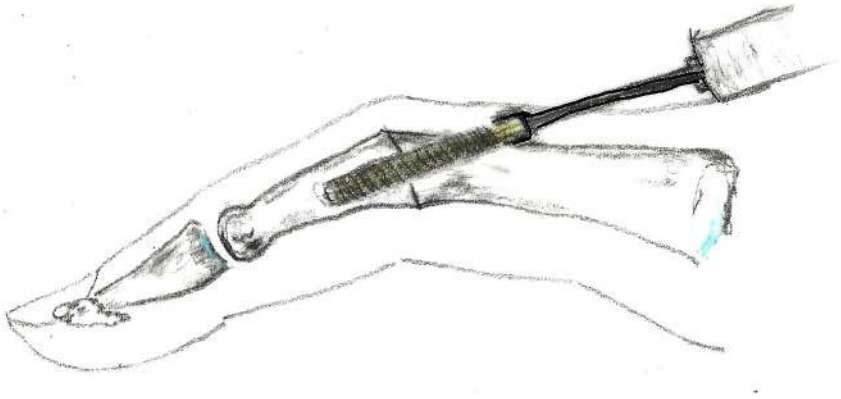
Step 6:

1. Then drill the core hole from proximal over the K-wire and cut the thread. We start with the thinnest drill, the blue drill. Step by step, we approach the optimum (largest possible) diameter while drilling.
2. The thread can be cut either manually or with the help of a drilling machine. We can recognize the desired drilling depth from the laser markings on the side.

!

Ensure that there is a stable bone bridge of at least 10mm between the entry point of the Shark Screw® cut into the proximal phalanx and the PIP joint. If the bone bridge is shorter, there is a risk that it will break through during drilling and tapping.

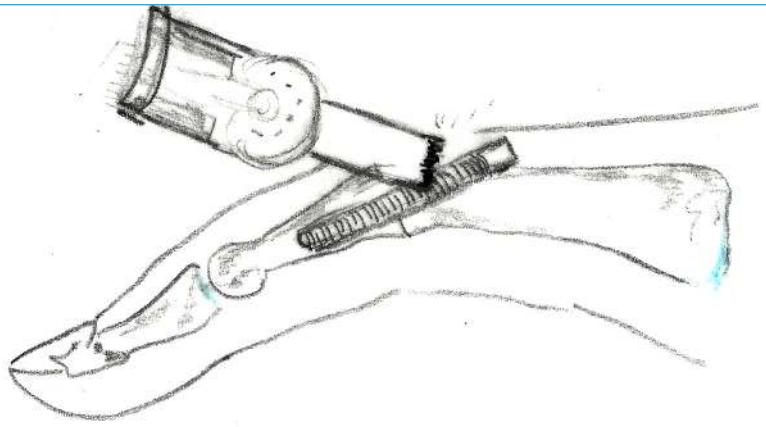
7



Step 7:

We rinse the finished canal with physiological saline solution so that the fine bone parts do not block when the Shark Screw® is screwed in. When inserting the Shark Screw®, we make sure that the bone fragments are pressed firmly together.

8



Step 8:

We saw off the protruding material of the screw at the bone surface with an oscillating saw. We then mill the still slightly protruding graft bone back to the level of the surrounding bone surface.

Post-treatment*

Postoperative treatment may vary from patient to patient, but in most cases a short plaster splint or Stark's splint is recommended for 4 weeks. For another 2 weeks the operated finger should not be loaded. Support by occupational therapy.





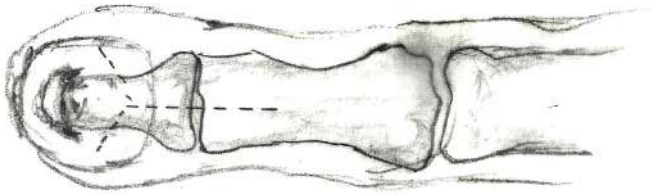

Clinical case study of a PIP arthrodesis

The clinical case shows a radiographic follow-up of a PIP arthrodesis. X-rays from left to right: AP preoperative | preoperative lateral | postoperative with short softcast | 6 months postoperative | 12 months postoperative | 12 months postoperative lateral

Clinical case atudy of a PIP arthrodesis

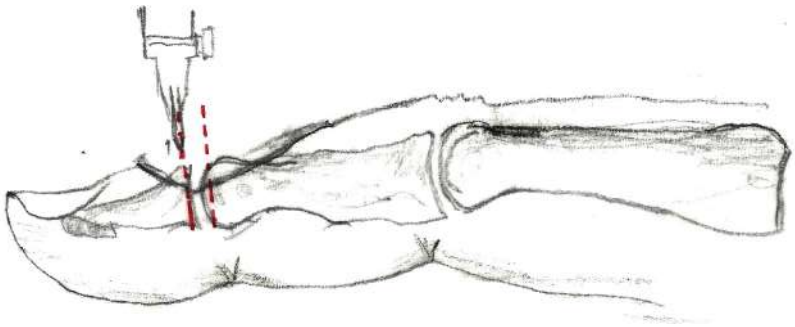
The clinical case shows a radiographic follow-up of a PIP arthrodesis. X-ray images from left to right: preoperative (scleroderma with severe flexion deformity of the PIP joints 2 - 5 | postoperative (Z.n. corrective urostotomy and arthrodesis of the PIP joints 2 - 5 | 8 weeks postoperative | 1 year postoperative

1



1. Y-shaped skin incision for free access to the joint. The incision is extended proximally, to approximately 2cm distal to the MCP I joint.
2. First, we remove the dorsal exophytes with the luer. After cutting the collateral ligaments, we remove the remaining lateral and possibly volar exophytes.

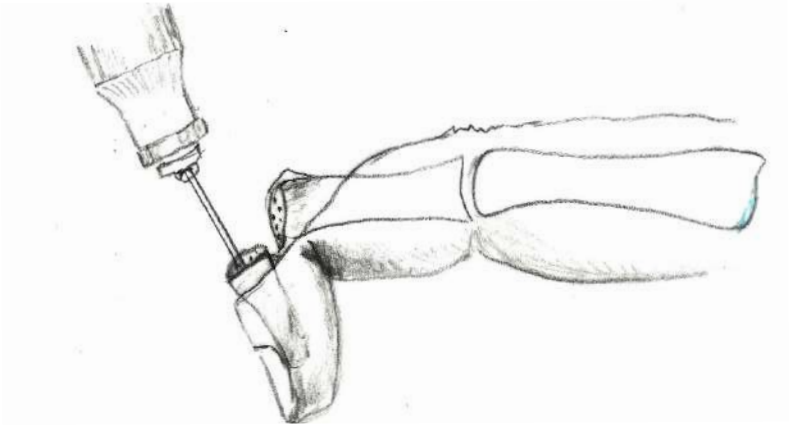
2



Step 2:

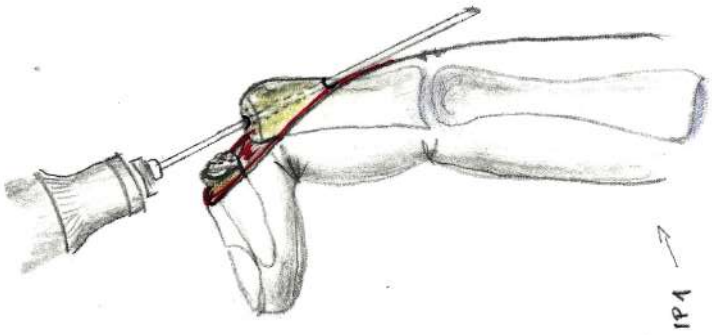
Now remove the cartilage with the luer, a sharp spoon or the oscillating saw. This usually works better if the IP joint is kept maximally flexed.

3



1. We then ream the sclerotic bone of the two IP joint surfaces with the tip of a K-wire or a thin drill.
2. Now we check the flexion position of the arthrodesis (10-20° flexion and slight opposition, no ulnar reduction!) as previously agreed with the patient. We also check the rotation and whether the de-cartilaged, refreshed joint surfaces come to lie flat on each other.

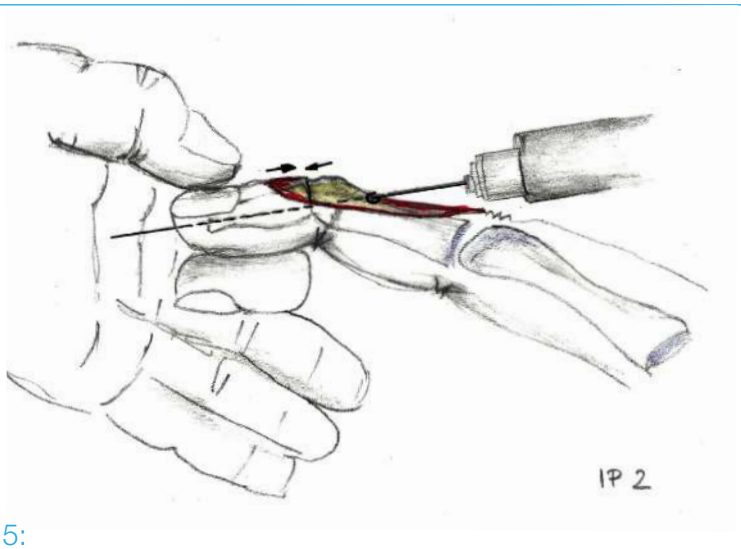
4



Step 4:

Now insert a double-pointed 1.2 Kirschner wire, coming from distally, observing the later desired flexion, into the center of the trochlea of the proximal phalanx and drill it centrally through the shaft of the proximal phalanx until it emerges approximately 15mm-18mm from the IP joint, through the dorsal cortex of the proximal phalanx.

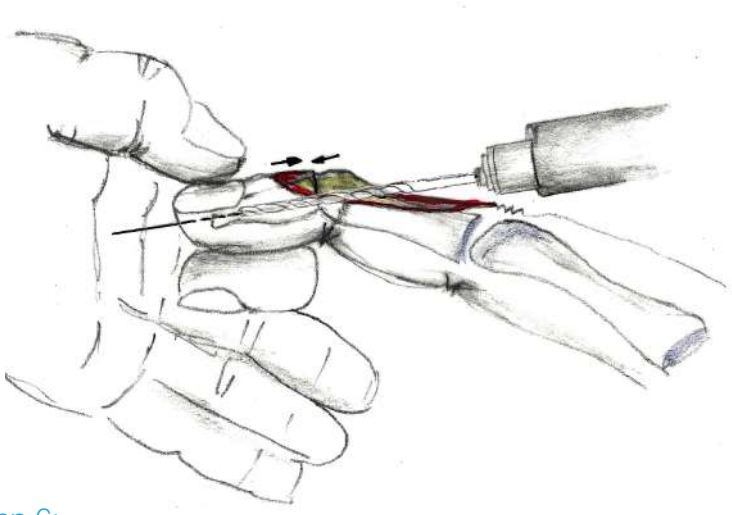
5



Step 5:

Now we clamp the K-wire coming from proximal and drill the K-wire centrally, under reduction and compression of the IP joint into the shaft of the distal phalanx until the K-wire passes through the tip of the thumb. Check the position of the K-wire in the interoperative X-ray.

6



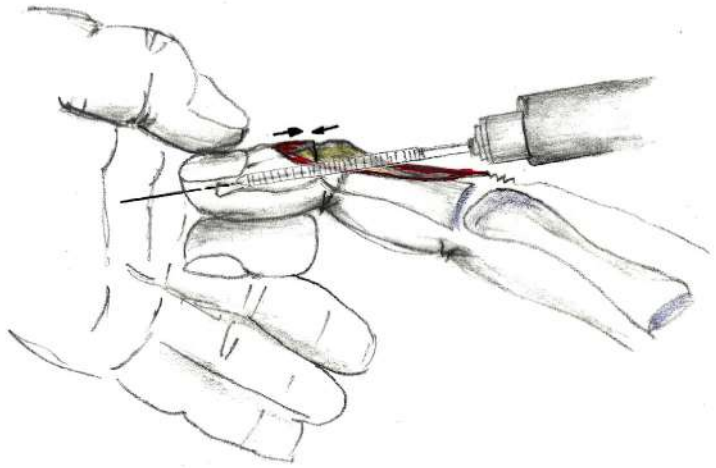
Step 6:

Then the core hole is drilled from proximal over the K-wire and the thread is cut. We start with the thinnest drill, the blue drill. Step by step, we approach the optimum (largest possible) diameter while drilling.

!

Ensure that there is a stable bone bridge of at least 10mm between the entry point of the Shark Screw® cut into the proximal phalanx and the IP joint. If the bone bridge is shorter, there is a risk that it will break through during drilling and tapping.

7



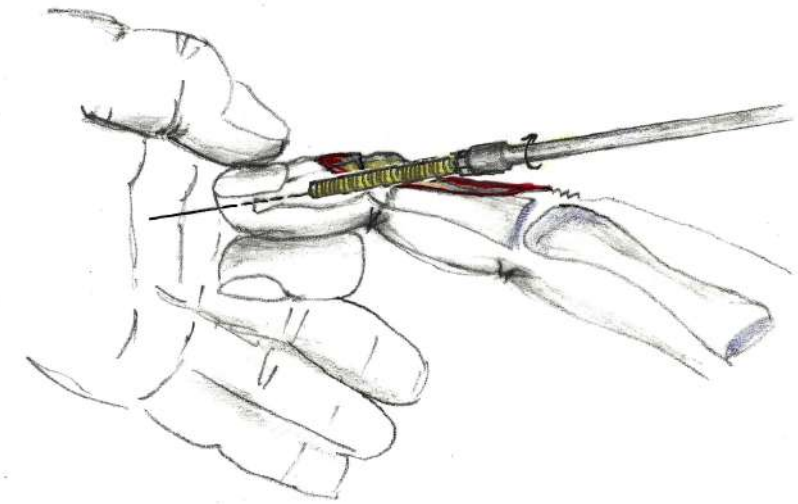
Step 7:

The thread can be cut either manually or with the help of a drilling machine. We can recognize the desired drilling depth from the lateral laser markings.

!

Before inserting the Shark Screw®, the drill canal must be thoroughly rinsed with physiological saline solution. This prevents the screw from becoming wedged due to the fine bone chips when it is screwed in.

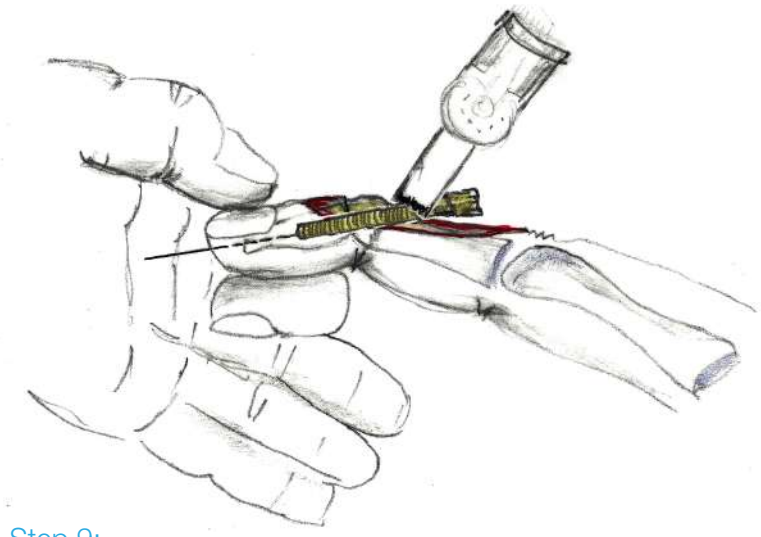
8



Step 8:

When inserting the Shark Screw®, we make sure that the bone fragments are pressed firmly together.

9



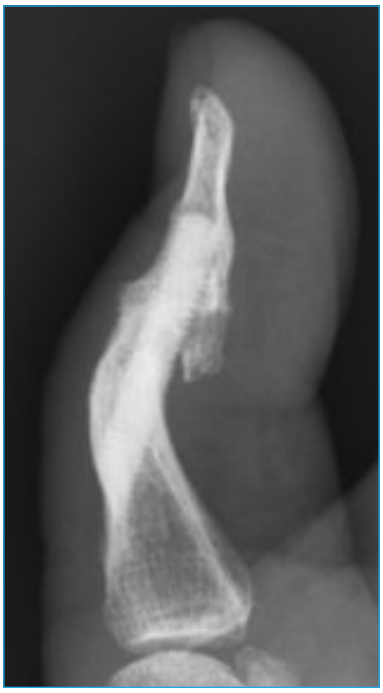
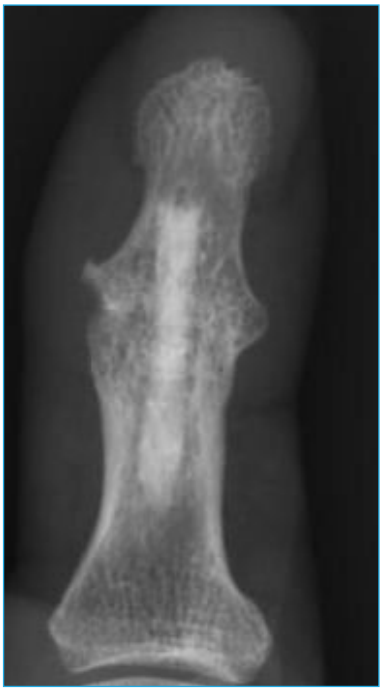
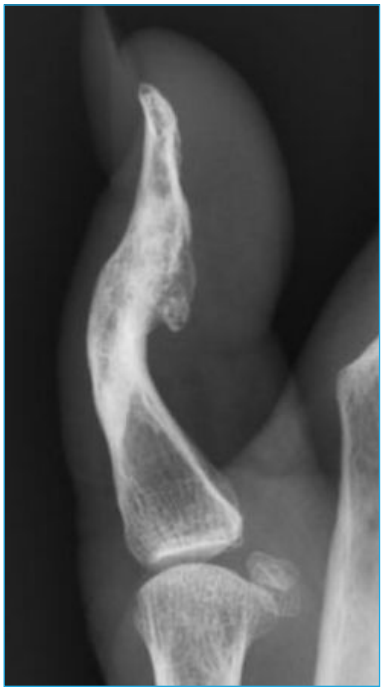
Step 9:

Now saw off the protruding material of the screw at the bone surface with an oscillating saw. Then we mill the still slightly protruding graft bone back to the level of the surrounding bone surface.

Postoperative treatment*

Postoperative treatment may vary from patient to patient, but in most cases a short plaster splint or Stark's splint is recommended for 4 weeks. For another 2 weeks the operated finger should not be loaded. Support by occupational therapy.



Clinical case study of a IP arthrodesis on the thumb with Shark Screw®

The clinical case shows an X-ray follow-up of an IP arthrodesis of the thumb with the Shark Screw® cut. X-rays from left to right: preoperative ap | preoperative lateral | postoperative ap | postoperative lateral | 3 months postoperative ap | 3 months postoperative lateral | 1 year postoperative ap | 1 year postoperative lateral





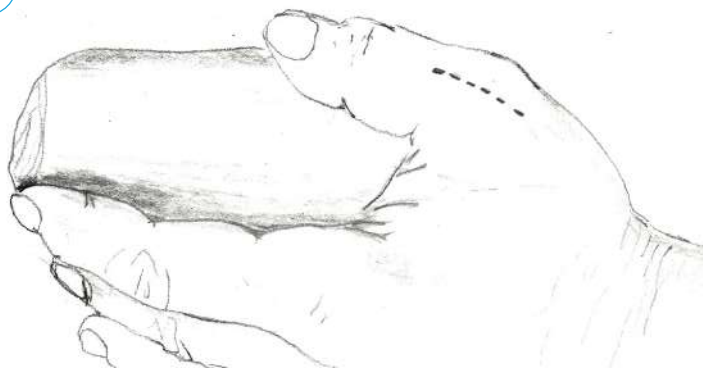

Clinical case study of a IP arthrodesis on the thumb with Shark Screw®

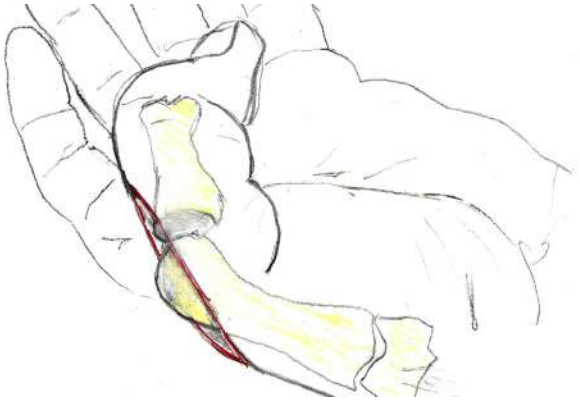
The clinical case shows an X-ray follow-up of an IP arthrodesis of the thumb with the Shark Screw®. X-ray images from left to right: | preoperative lateral | | preoperative lateral | postoperative with positioning in a short bycast lateral | postoperative with positioning in a short bycast ap | 1 year postoperative lateral | 1 year postoperative ap

MCP I arthrodesis

Surgical technique

1

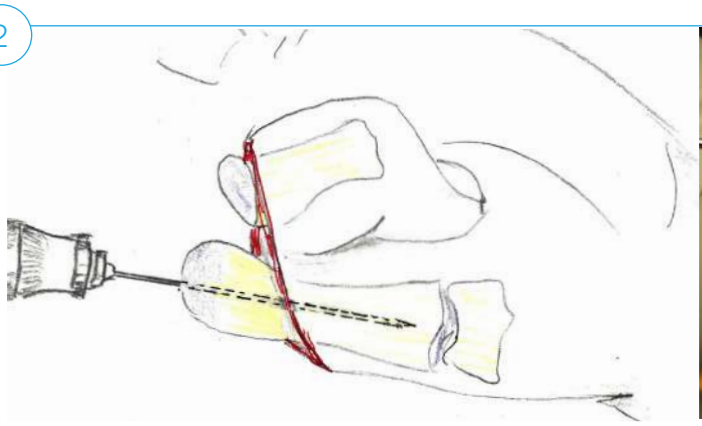


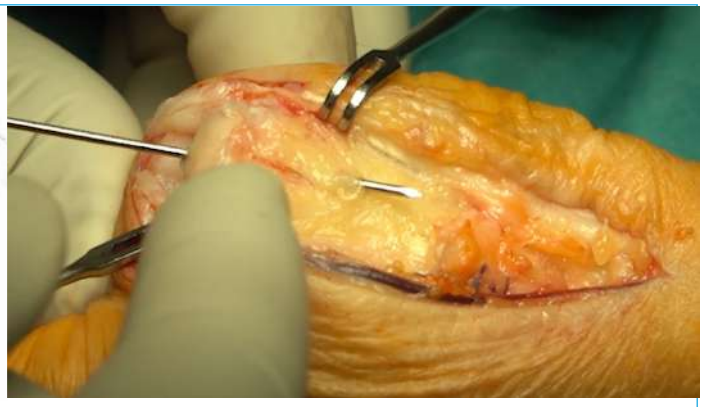


Step 1:

First make a straight dorsal skin incision over the metacarpophalangeal joint of the thumb. We split the extensor aponeurosis longitudinally, cut the collateral ligaments, and expose the 1st metacarpal by opening the joint. The exophytes are removed.

2

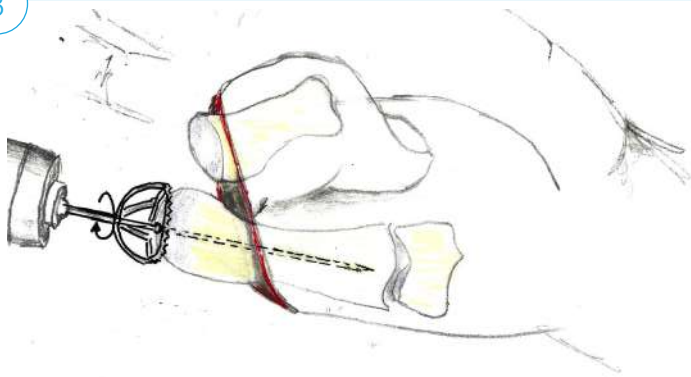


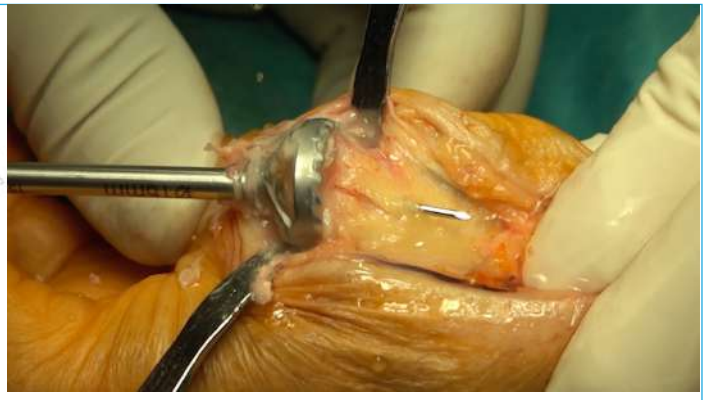


Step 2:

From distal we insert a 1.6 K-wire deep into the shaft of the metacarpal centrally over the metacarpal head. The K-wire corresponds to the later position of the Shark Screw® cut and perforates the dorsal cortex of the first metacarpal bone between 15mm and 20mm proximal to the MCP I joint, depending on the desired arthrodesis angle.

3

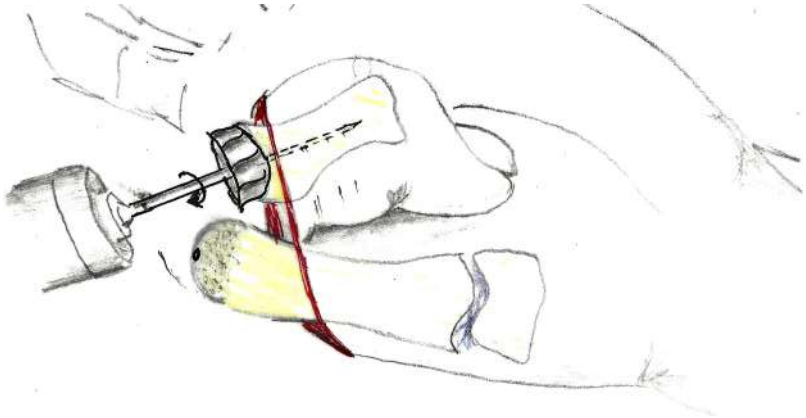




Step 3:

A 16mm cup reamer is slid over the K-wire and used to remove the remaining cartilage and the sclerotic subchondral bone until the interface with the cancellous bone is reached.

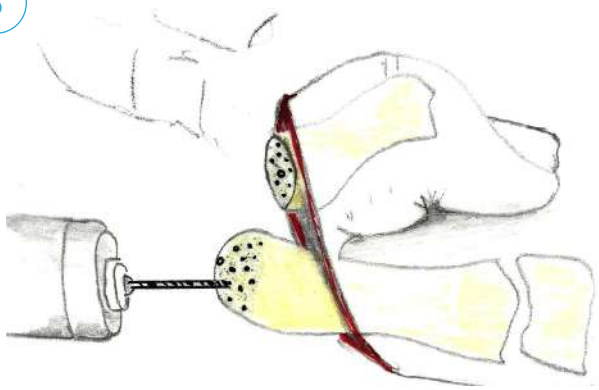
4

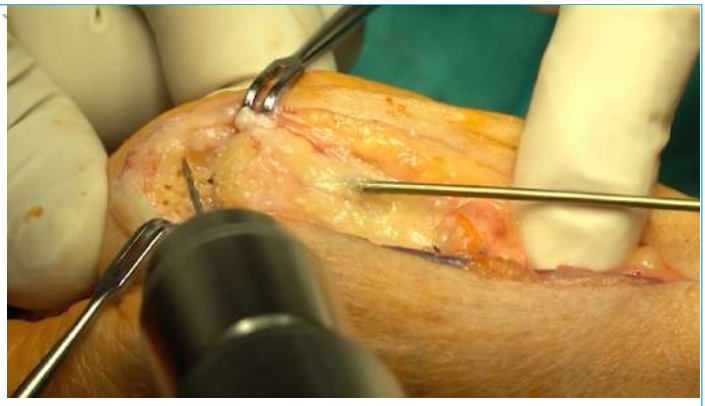


Step 4:

We also drill a central 1.6 K-wire into the base of the distal phalanx, where we use the cone-reamer to remove the cartilage, to reach subchondral bone.

5

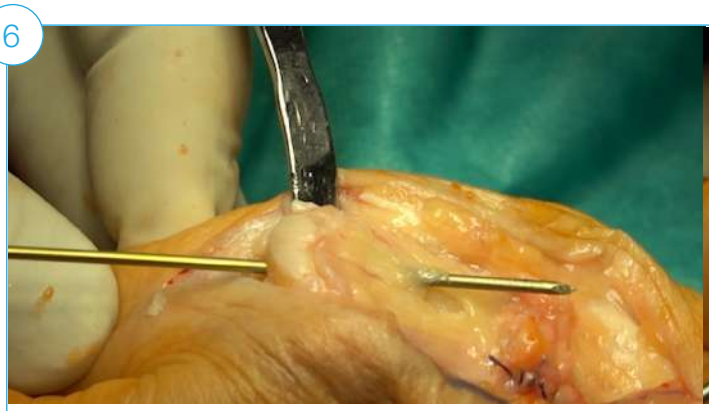




Step 5:

Using a thin 1mm drill or a thin K-wire, we freshen the partially sclerotic bone. The drill parts remains in place.

6



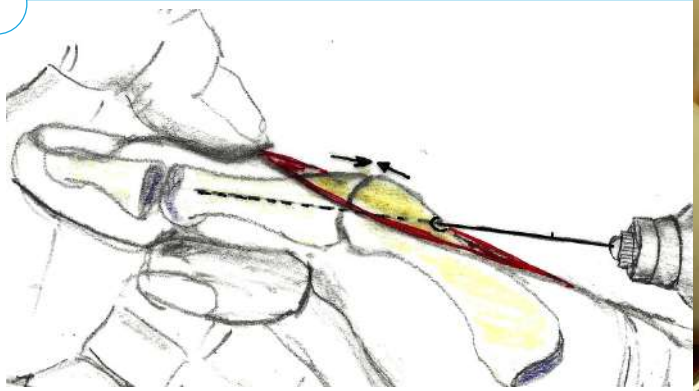
Step 6:

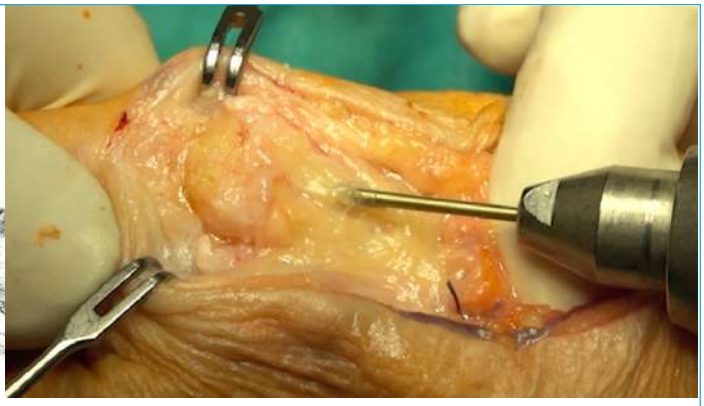
The 1.6 K-wire determines the direction and position of the subsequent Shark Screw® cut and should have an approximate angle of 10°-20° between the proximal phalanx and MC I. The 1.6 K-wire is advanced from the centre of the MC head towards the MC I shaft. The exit point of the KD must be at least 15mm from the arthrodesis gap to ensure that the standing cortical bridge is thick enough. After drilling and tapping, 10mm of the dorsal cortical bridge should still be left! With the drilling machine now the former joint surfaces are set to each other at the desired angle.

!

Ensure that at least 10mm to 15mm of cortical bone is left between the entry of the Shark Screw® cut inserted later and the arthrodesis gap so that the cortical bone bridge cannot break out.

7

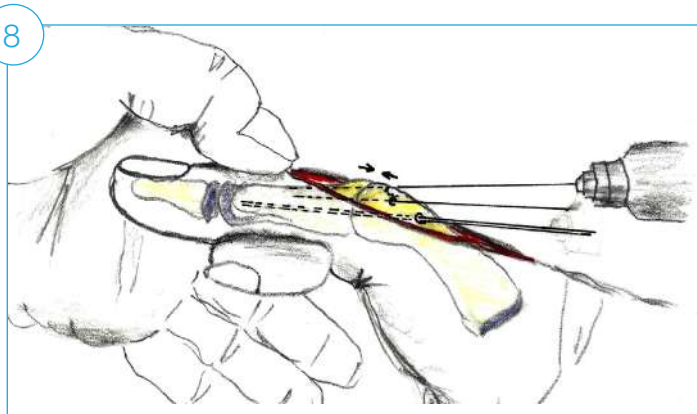




Step 7:

1. The former articular surfaces of the metacarpophalangeal joint of the thumb are placed under compression and the K-wire is drilled into the shaft of the proximal phalanx from proximal over the metacarpophalangeal joint of the thumb.
2. Interoperative X-ray control

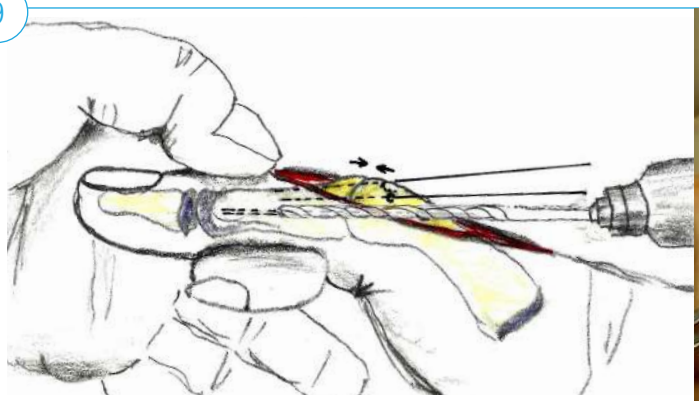
8



Step 8:

To ensure that nothing can slip during drilling and threading, we temporarily insert two 1.0 or 1.2 K-wires to additionally fix the metacarpophalangeal joint of the thumb. The two K-wires are inserted as far ulnar or radial as possible so that they are not in the way later during drilling.

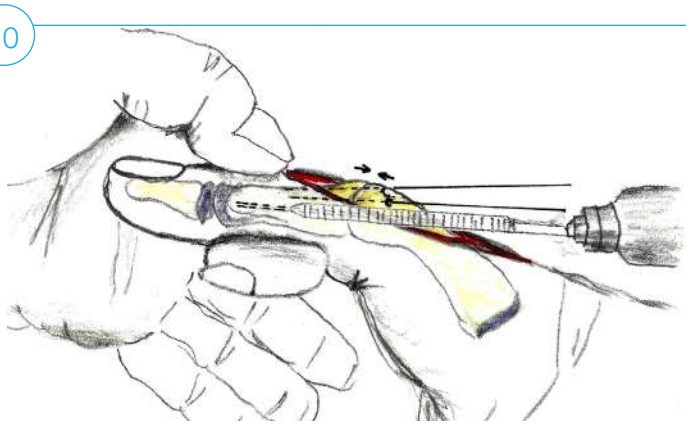
9



Step 9:

Now we exchange the thick 1.6 K-wire for a 1.2 K-wire over which we drill out step by step until the desired diameter is reached. We start with the thinnest drill, the blue drill. Depending on the size of the bone, we decide which diameter of Shark Screw® cut to use. We always try to use the largest possible graft in terms of diameter. This is the only way to ensure that a maximum amount of bone material bridges the arthrodesis gap.

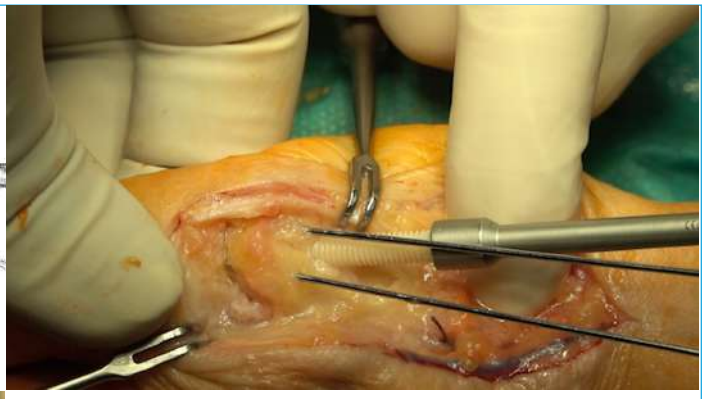
10



Step 10:

After the core drill hole is set, the thread is cut over the K-wire and carefully rinsed, because even small chips could prevent Shark Screw® cut from screwing in. To prevent the bone from becoming hot, we cut the thread slowly. We can read the depth of the drill and the tap from the laser markings.

11



Step 11:

The Shark Screw® cut graft is screwed in and the protruding screw material is sawed off at bone level with an oscillating saw.
Now we can remove the temporarily placed K-wires. Shark Screw® cut should ensures rotationally stable arthrodesis. The compression is kept stable by the screw graft. The screw graft is within the bone and does not protrude anywhere above the bone level. The surrounding soft tissues, tendons, nerves, and vessels are spared.

Postoperative treatment of MTP I arthrodesis

Postoperative treatment may vary from patient to patient, but in most cases a short thumb plaster splint for 4 weeks. Only after 8 weeks may the arthrodesis slowly be increasingly loaded. Support by occupational therapy.

WATCH
VIDEO
NOW






Clinical case study of MTP I arthrodesis

The clinical case shows an X-ray follow-up of an MTP I arthrodesis with the Shark Screw®. X-ray images from left to right: preoperative lateral | preoperative ap | postoperative lateral | postoperative ap | 6 months postoperative lateral | 6 months postoperative ap | 2 years postoperative lateral | 2 years postoperative ap





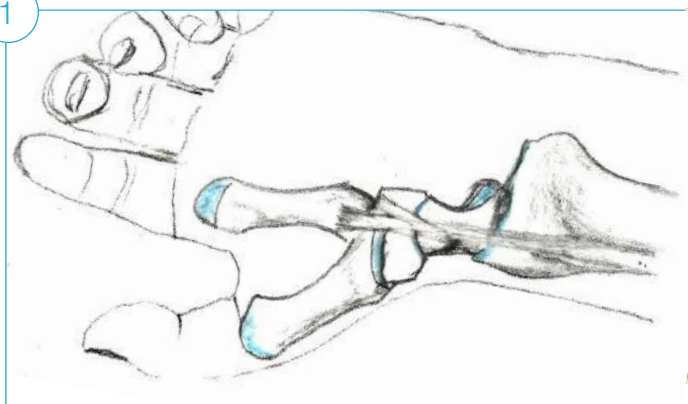
Clinical case study of MTP I arthrodesis

The clinical case shows an X-ray follow-up of an MTP I arthrodesis with the Shark Screw®. X-ray images from left to right: preoperative ap (thumb metacarpophalangeal joint unstable in severe ricarthrosis) | preoperative lateral | postoperative ap (MCP I arthrodesis and simultaneous resection-suspension arthroplasty of the thumb saddle joint | postoperative lateral | 6 months postoperative | 6 months postoperative | 11 months postoperative | 11 months postoperative

Scaphoid fracture/ non union

Surgical technique palmar approach

1



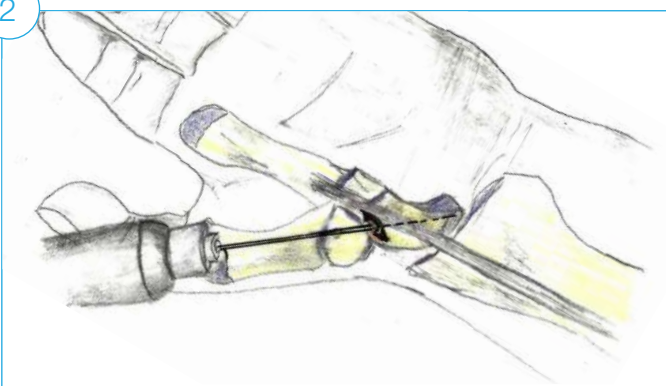
Step 1:

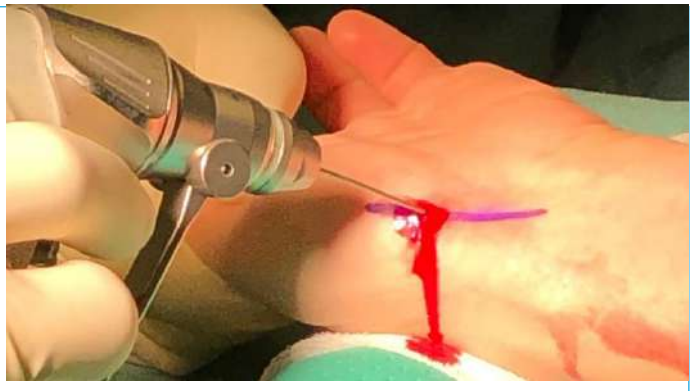
All surgical steps are performed under continuous interoperative X-ray control.

Straight, longitudinal, short (approx. 0.5cm) skin incision over the scaphotrapezial joint at the radial border of the tendon of the flexor carpi radialis muscle, distal to the rascette.

After skin incision, bluntly probe with scissors and spread.

2





Step 2:

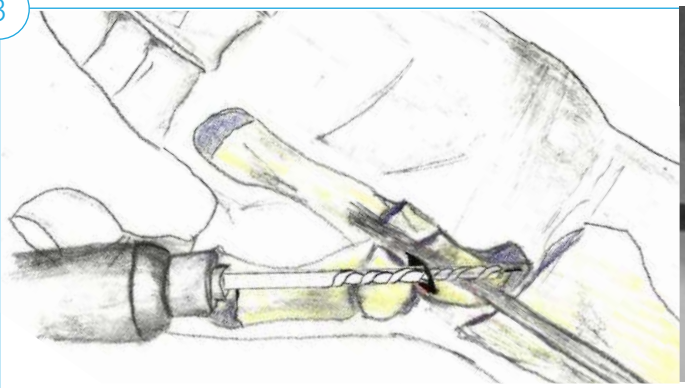
Using interoperative X-ray, the K-wire is inserted from palmar-radial over the scaphoid tuberosity toward the proximal pole of the scaphoid.

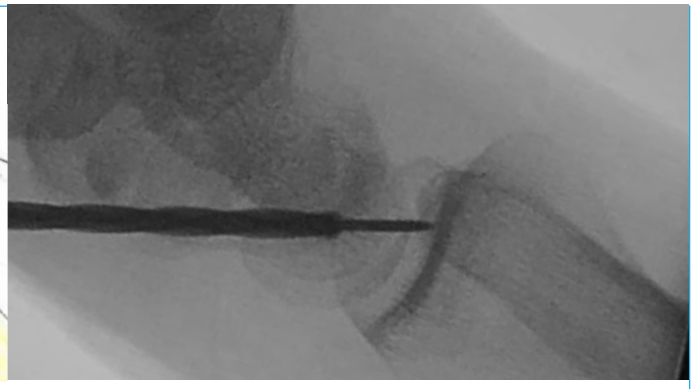
To control the exact position of the K-wire, at least three (X-Rays) must be made (dorso-palmar, lateral, Stecher) with rotation of the forearm.

Scaphoid fracture/ non union

Surgical technique palmar approach

3



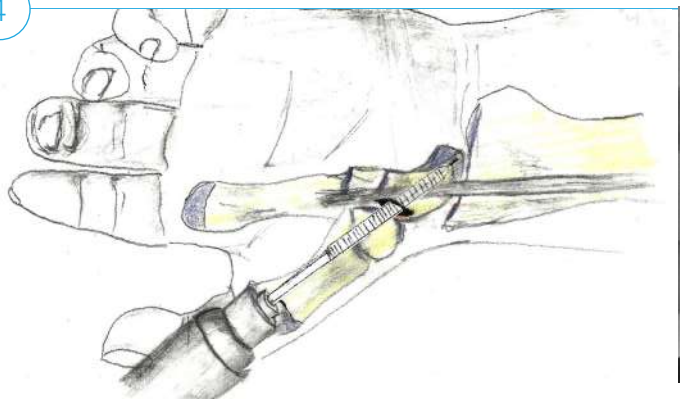


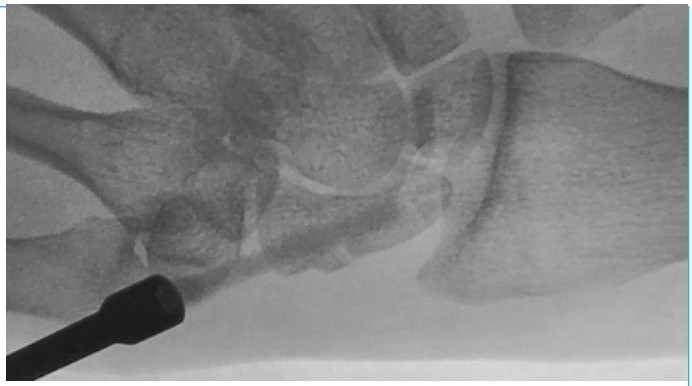
Step 3:

Now we drill the core hole over the KD.

Since we almost exclusively use a Shark Screw® cut with a diameter of 3.5 mm for osteo-synthesis of the scaphoid, we drill the core hole with the blue drill.

4





Step 4:

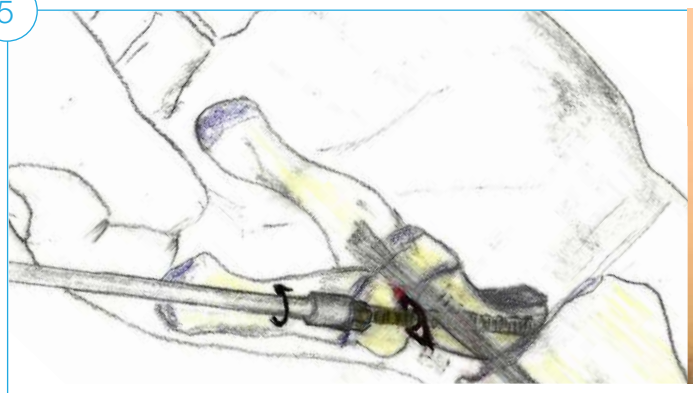
The thread for the 3.5mm Shark Screw® cut is also cut with the blue tap also with the drill, the last threads should be cut by hand for better control. We can see the desired drilling and thread depth from the laser markings on the side.

We rinse the finished canal with physiological saline solution so that the fine bone chips do not block when screwing in the Shark Screw® cut.

Scaphoid fracture/ non union

Surgical technique palmar approach

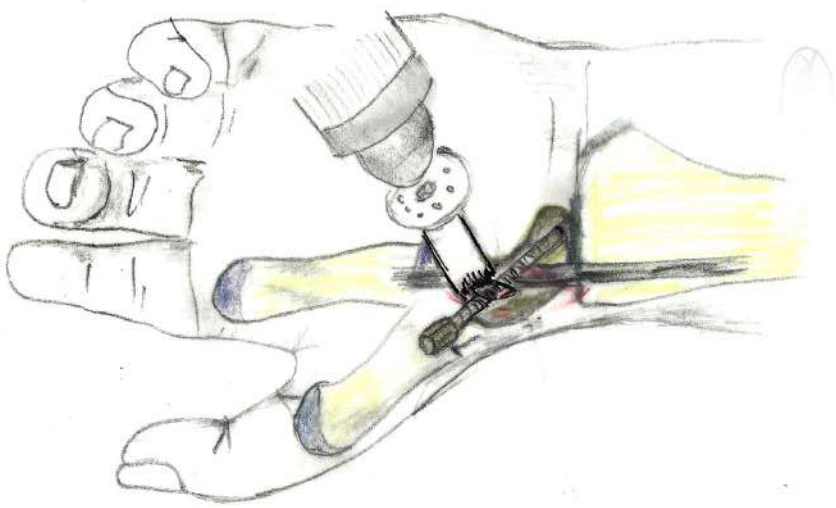
5



Step 5:

Now Shark Screw® cut is screwed in without much resistance using the hexagon screw-driver, also under X-ray control.

6



Step 6:

Using a narrow retractor, the skin incision is moved proximally and at the same time the wrist is flexed so that a very narrow oscillating saw can be used to saw off the protruding material of the screw just above the bone surface.

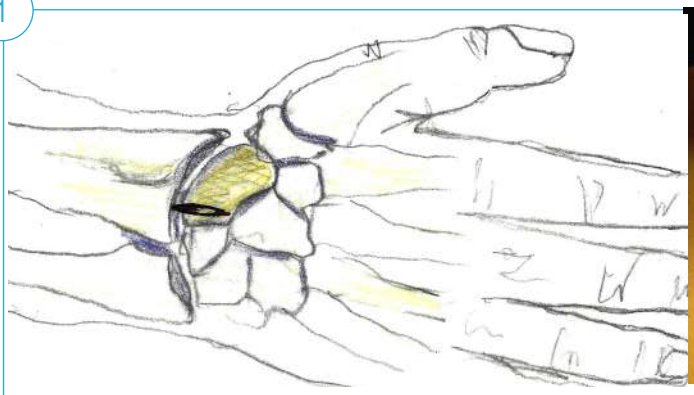
Postop management*

Postoperative treatment may vary from patient to patient, If possible, patients are treated without fixation or cast, but depending on the stability of the injury
sometimes a cast is applied for 2 weeks, in case of pseudarthrosis / non-union up to 6 weeks.

Scaphoid fracture/ non union

Surgical technique dorsal approach

1

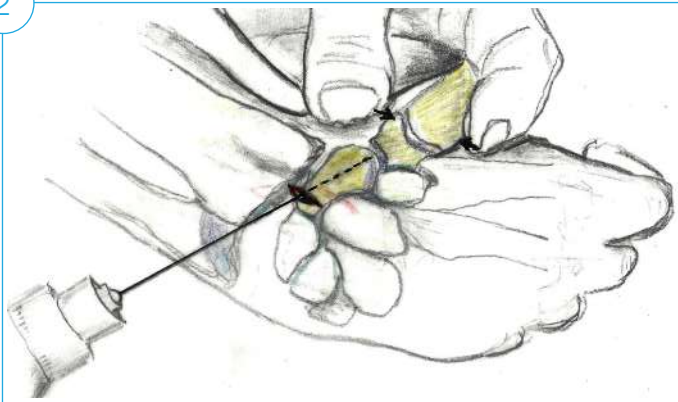


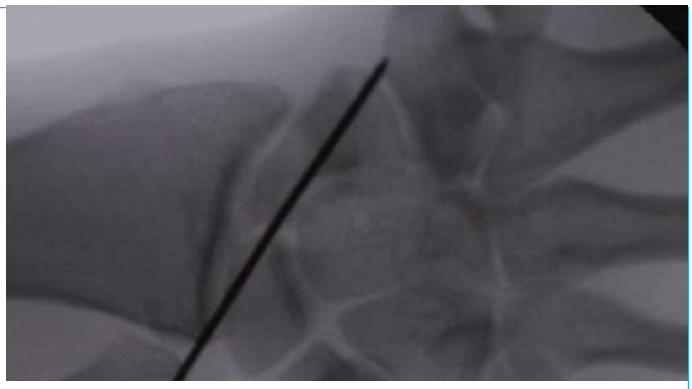
Step 1:

In most fractures, especially those without dislocation, treatment can be performed with a small skin incision.

We make a longitudinal skin incision ulnar to the immediate vicinity of the dorsal radial tuberosity (lister). Underneath this, the retinaculum extensorum and the wrist capsule is opened, sparing the scapholunate ligament.

2





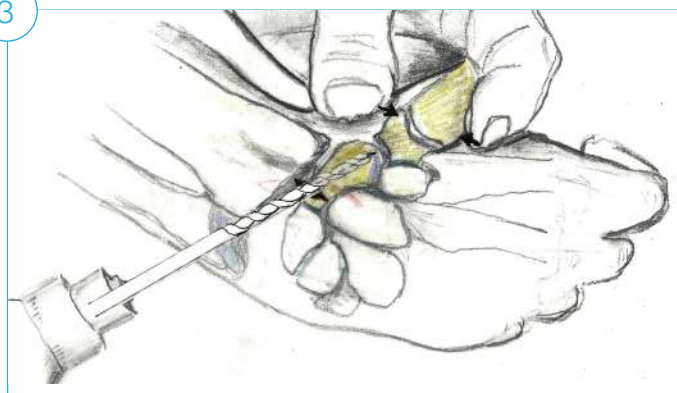
Step 2:

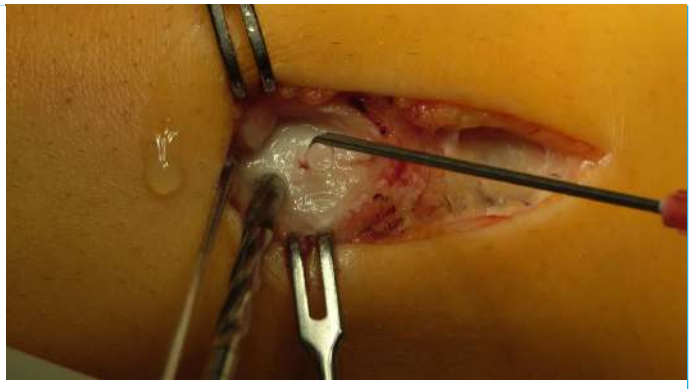
The surgeon‘s thumb and index finger encompass the thumb saddle joint. The wrist is flexed and the 1.2 KD is drilled in over the proximal scaphoid pole, aiming the K-wire toward the centre of the thumb saddle joint or thumb ray. Then image intensification, which should include at least three planes of projection (dorsopalmar, lateral, Stecher) and fluoroscopy with rotation of the forearm.

Scaphoid fracture/ non union

Surgical technique dorsal approach

3



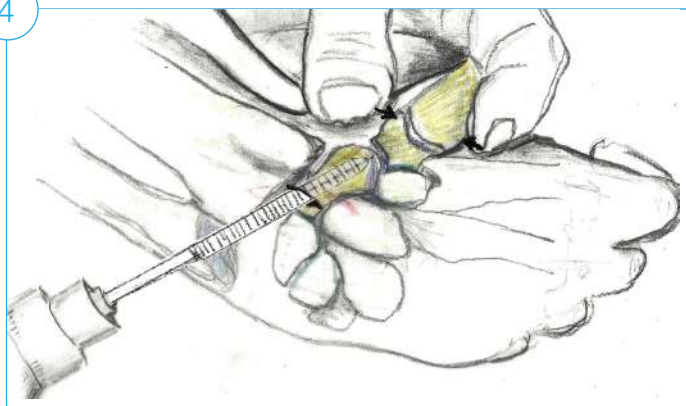


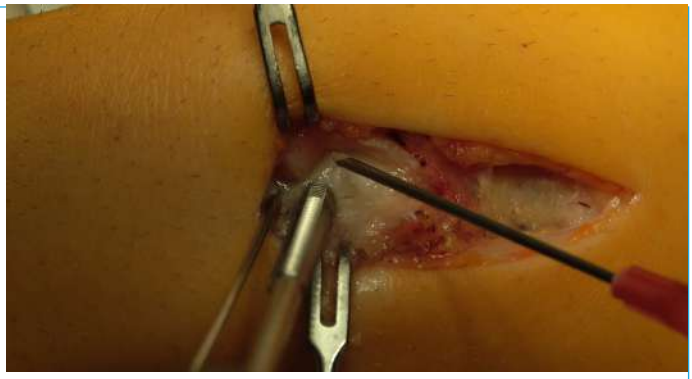
Step 3:

Now we drill the core hole via the K-wire.
Since we almost exclusively use a Shark Screw® cut with a diameter of 3.5 mm for osteosynthesis of the scaphoid, we drill the core hole with the blue drill.

We can recognize the desired drilling and thread depth from the lateral laser markings.

4





Step 4:

The thread can be cut either manually or with the aid of a drill. The thread for the 3.5mm Shark Screw® cut is also cut with the blue tap.

We rinse the finished canal with physiological saline solution so that the fine bone chips do not block when screwing in the Shark Screw® cut.

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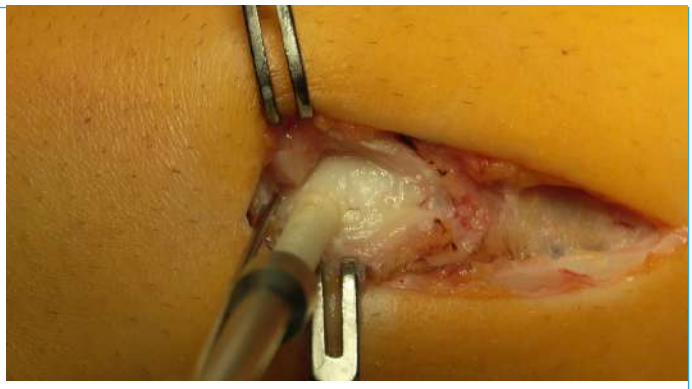
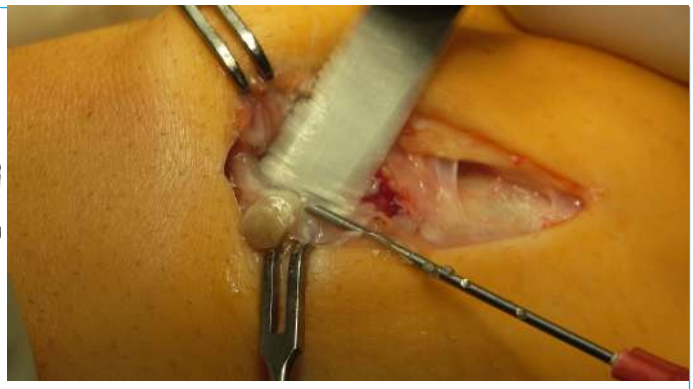
5



Step 5:

Now the Shark Screw® cut is screwed in without much resistance using the hexagon screwdriver.

6



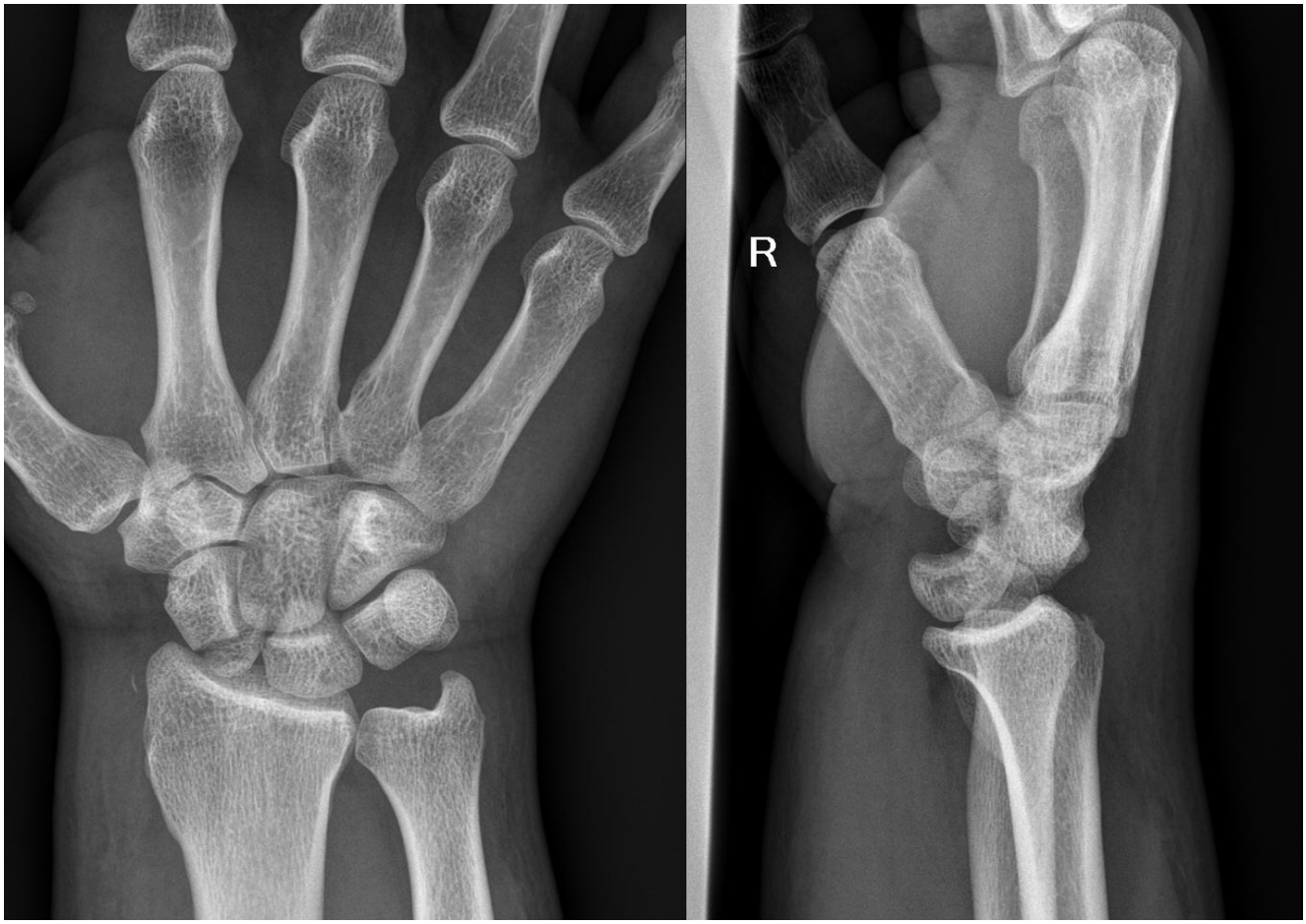
Step 6:

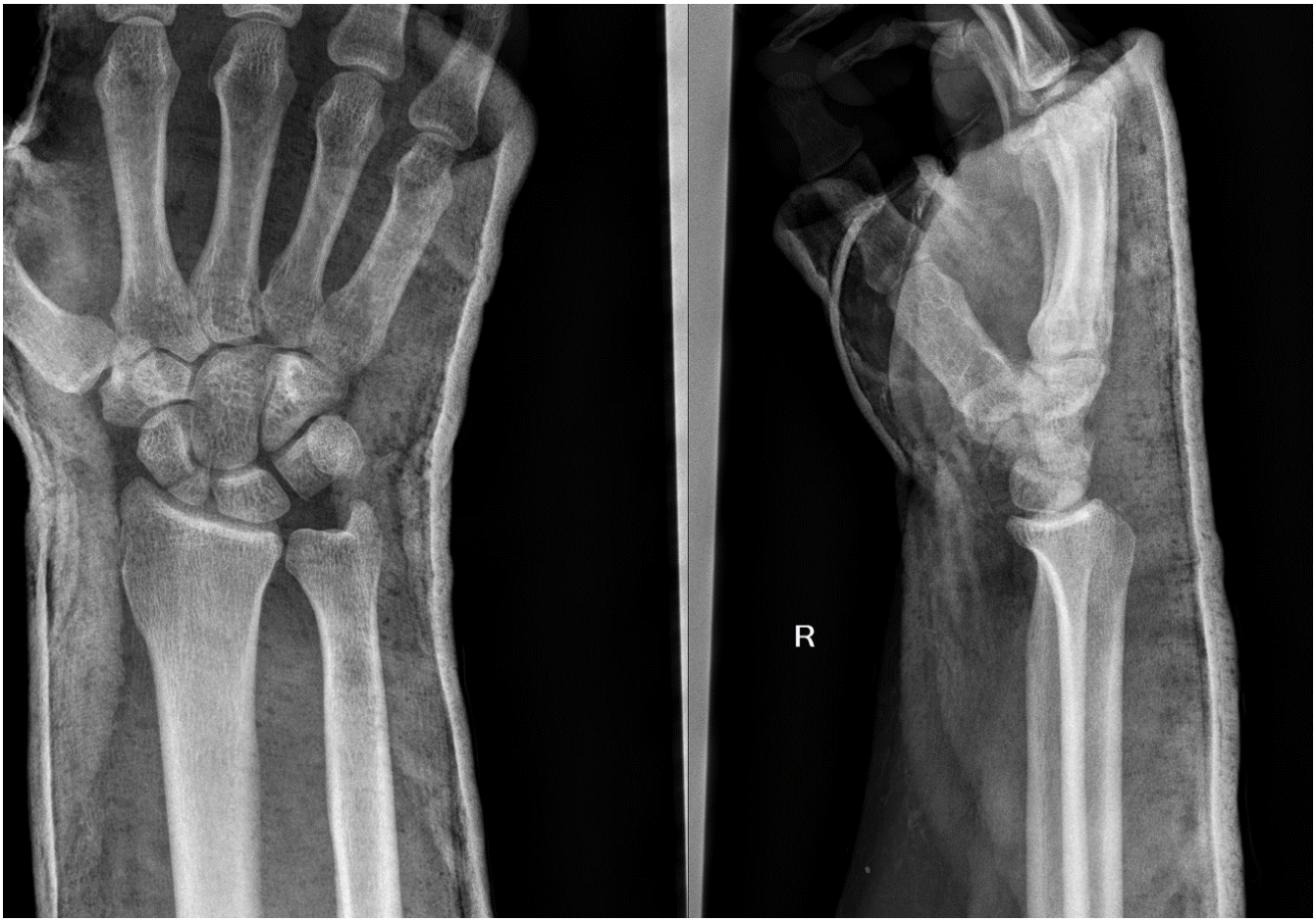
1. Now saw off the protruding material of the screw with an oscillating saw just above the bone surface.
2. Then mill the still slightly protruding Shark Screw® cut back to the level of the surrounding bone surface.
3. The subchondral border lamella is also grasped by the Shark Screw® cut at the entry point, but it must not protrude beyond the cartilage surface under any circumstances. If necessary, Shark Screw® cut can be milled back under the cartilage surface using a small high speed mill.

Postop management*

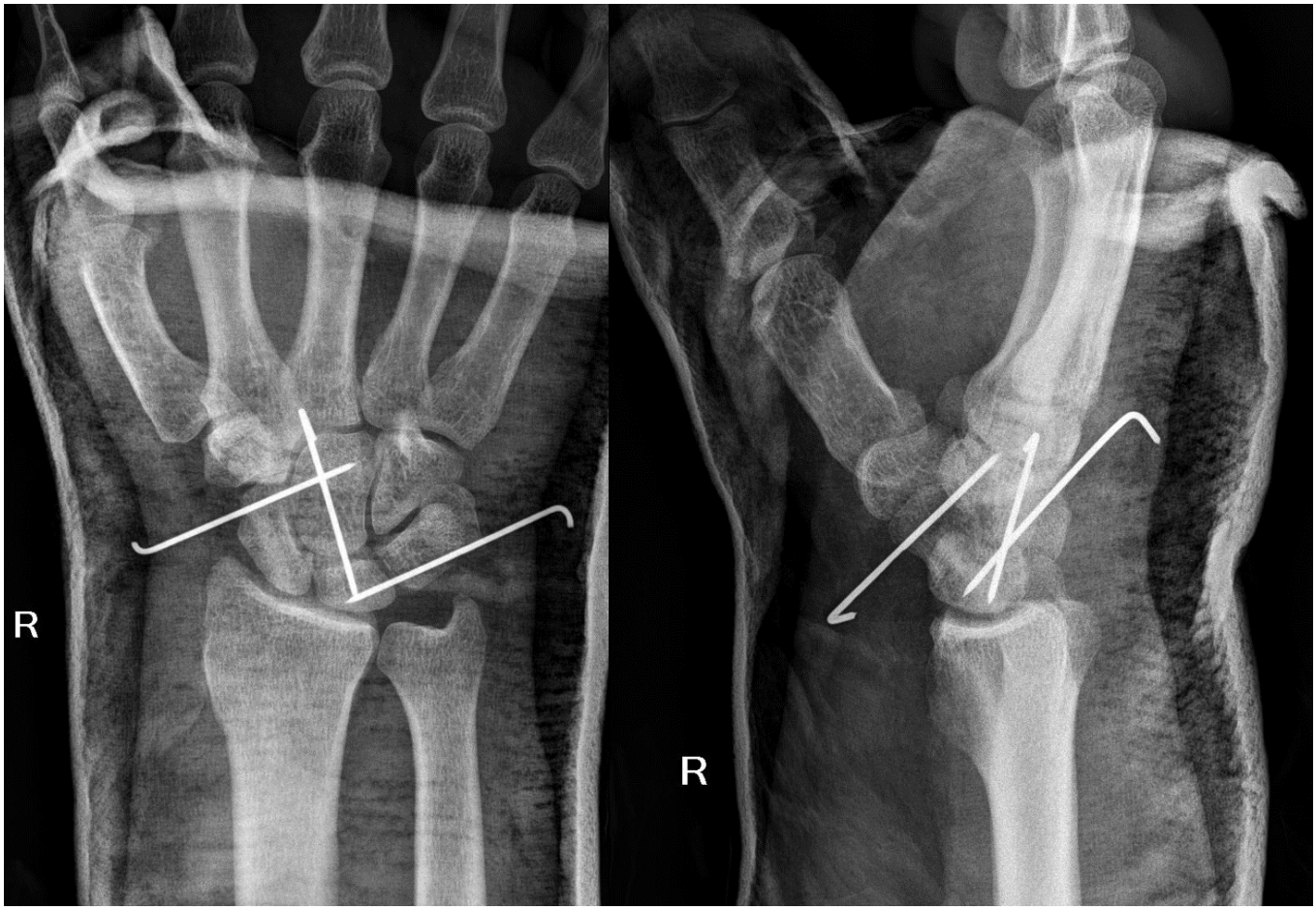
Postoperative treatment may vary from patient to patient, If possible, patients are treated without fixation or cast, but depending on the stability of the injury
sometimes a cast is applied for 2 weeks, in case of pseudarthrosis / non-union up to 6 weeks.

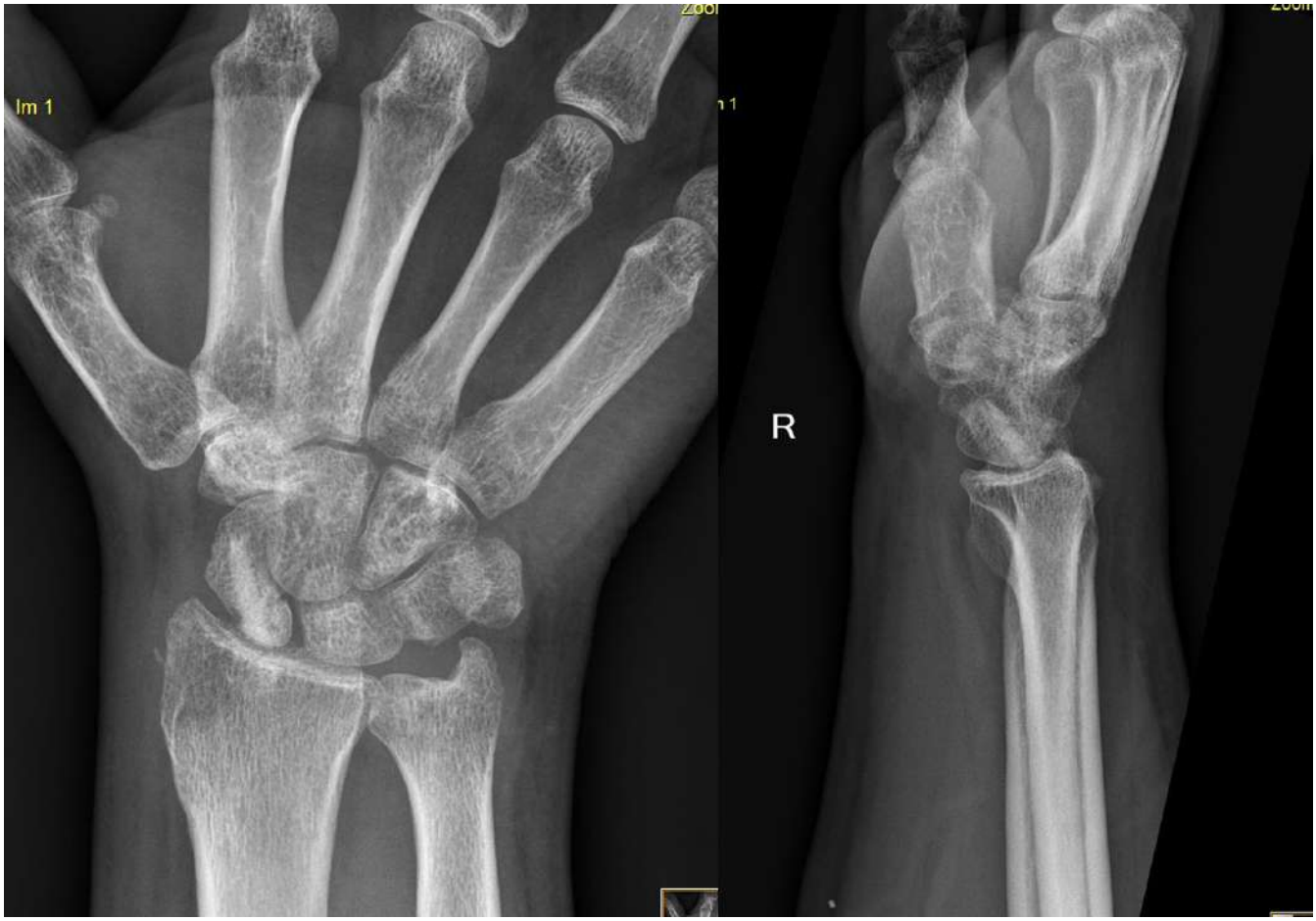
Scaphoid fracture/ non union





Scaphoid fracture/ non union





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IMPORTANT!

The description of the surgical techniques in this script shows application examples and serves as a teaching aid for clinical support in the use of Shark Screw® grafts. The teaching material alone is not a substitute for hands-on training. The use of the grafts, the surgical procedure as well as the postoperative treatment depend on the patient and must be decided individually by the treating physician for each case of application. In doing so, the physician must act after careful examination of the relevant medical literature, according to his/her training, experience and the general health condition of the patient(s).

IT IS YOUR SHARK SCREW® STORY...