Author Doug Campbell

3.9 Hand fractures

Implants and surgical technique

- Compact hand LC-DCP 2.0
- Headless compression screw (HCS) 3.0 mm
- Cortex screw 1.5 mm (lag screw technique)

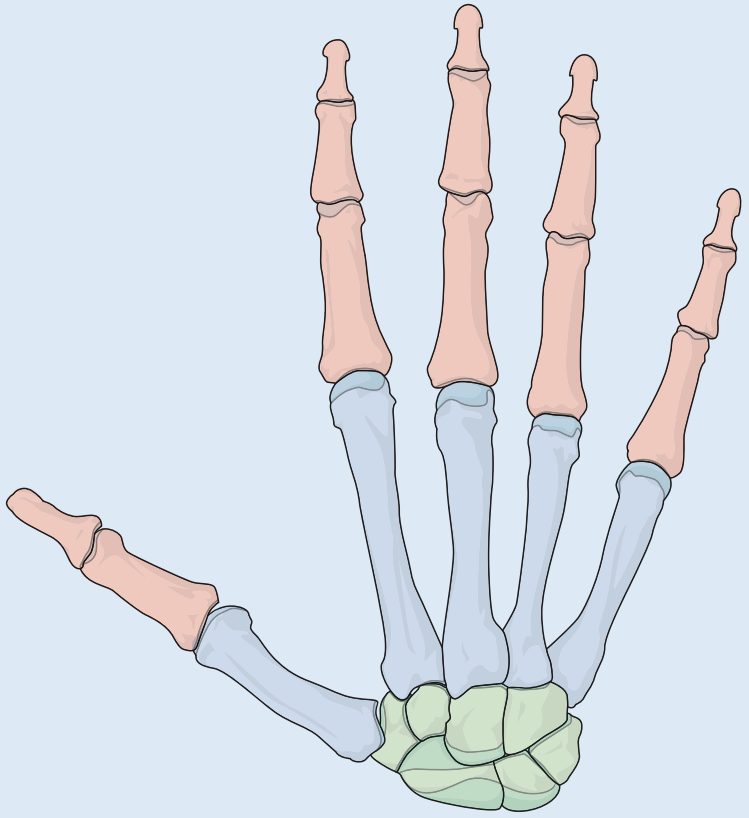
Cases

- Metacarpal shaft fracture
- Undisplaced scaphoid waist fracture
- Condylar phalangeal fracture

Introduction

- Hand fractures present a particular challenge because of the relative functional importance of the overlying soft tissues.
- Scar formation through a natural healing process delays rehabilitation and must be minimized by careful surgical technique, judicious fracture exposure, gentle handling, and prevention of drying of the soft tissues.
- Small bones require small implants, and accurate planning, placement, and insertion is vital in achieving stability.
- Surgical approaches must be performed through planes and areas which inflict the least damage to the gliding soft tissues.
- Simple swelling of a digit without fracture, laceration, or surgical exposure is sufficient to cause permanent stiffness of the small joints. Both injury and treatment will result in edema and stiffness which must be recognized and treated actively and aggressively by elevation, compression, and movement.
- Hand fracture patterns follow those of larger bones. Diaphyseal injuries can be transverse, oblique (long or short), spiral, or multifragmentary. Loss of alignment in rotation can result in the fingers 'crossing over' when fully flexed. Correcting rotational alignment is therefore a priority in managing hand fractures. Shortening of the bone can result in significant functional disturbance as the overlying muscles and tendons alter their tension.
- The need for early mobilization in an injured hand dictates that any operative treatment must achieve stable fixation, and be applied with a high degree of technical competency. Unlike other anatomical regions, it is not advisable to immobilize the hand until union is mature.
- If multiple structures in the hand are injured, the decision on how to manage the fractures will depend on which other structures are involved. For example, if a tendon repair is necessary, and that repair's rehabilitation demands movement, the skeletal repair must be stable enough at an early stage to permit rehabilitation of the tendon injury.

Müller AO/OTA Classification—hand fractures



The Müller AO/OTA Classification of hand fractures is complex. The carpus is classified as 24, the metacarpal is 25, and phalanges is 26. There are further subdivisions that are not illustrated here.

Author Doug Campbell

3.9.1 Metacarpal shaft fracture: stabilization with a dorsal compact hand LC-DCP 2.0

Surgical management

- Stabilization with dorsal compact hand LC-DCP 2.0

Alternative implants

- Compact hand LC-DCP 2.4 in a large adult
- LCP 2.0

1 Introduction

Fig 3.9.1-1a–b
a Preoperative x-ray: transverse fracture of shaft of fifth metacarpal.
b Postoperative x-ray: stabilization with LC-DCP 2.0.

- Metacarpal fractures are common. The most common fracture pattern is the neck fracture. This rarely requires intervention. Shaft fractures are more likely to require reduction and stabilization because for a given angulation they produce more shortening than in a neck fracture. This can influence extensor tendon function.
- The stability of the hand is most affected when a border (index or small finger) metacarpal has sustained an unstable fracture.
- Adjacent fractures can be approached through a single incision placed between the affected metacarpals.
- A dorsally placed compression plate will act as a tension band only if the palmar cortex is not fragmented.
- The results of internal fixation are good if an early program of active movement is prescribed.
- Occasionally, the implant will require removal once the fracture has healed. This is less likely with modern implant design and surface finishes.

2 Preoperative preparation

Operating room personnel (ORP) need to know and confirm:

- Site and side of fracture
- Type of operation planned
- Ensure that operative site has been marked by the surgeon
- Condition of the soft tissues
- Implant to be used
- Patient positioning
- Details of the patient (including a signed consent form and appropriate antibiotic and thromboprophylaxis)
- Comorbidities, including allergies

Instrumentation required:

- Compact hand set 2.0 mm
- 4-hole and 5-hole LC-DCP 2.0 mm
- General small orthopaedic instruments
- Micro drive or similar small compatible air or battery drill with attachments

Equipment:

- Standard operating table
- Large hand table
- Image intensifier (a small one is suitable if available)
- X-ray protection devices for personnel and patient
- Tourniquet with exsanguinator

3 Anesthesia

- This procedure is performed with the patient under regional (eg, axillary) or general anesthesia.

4 Patient and x-ray positioning

- Position the patient supine and if under regional anesthesia make him/her comfortable with pillows under the head and under the knees (Fig 3.9.1-2).
- The shoulder is only anesthetized by high block (interscalene or supraclavicular). Patients with coexistent shoulder pathology must be positioned carefully to avoid discomfort.
- Apply a well padded pneumatic tourniquet cuff around the upper arm.
- As the hand will tend to be semisupinated internally rotate the shoulder to allow the hand to be placed in an appropriate pronated position for surgery.
- Bring in the image intensifier from the opposite side of the hand table.

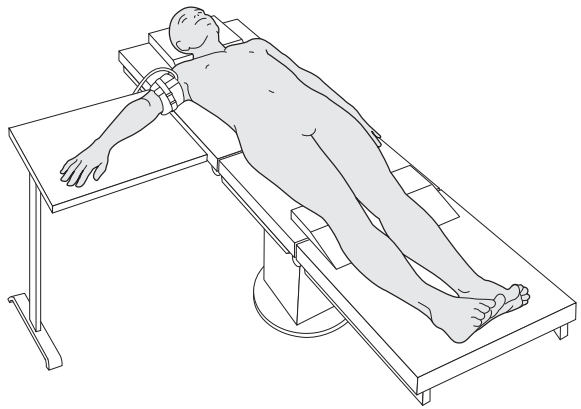


Fig 3.9.1-2

5 Skin disinfecting and draping

- Disinfect the entire hand, wrist, and arm with the appropriate antiseptic right up to the limits of the tourniquet cuff. This allows full exsanguination (Fig 3.9.1-3a).
- Preparation of the entire upper limb allows repositioning during surgery.
- If alcohol-based antiseptic is used, take care to ensure it does not run up under the tourniquet since skin damage can occur from prolonged contact with soaked material during surgery.

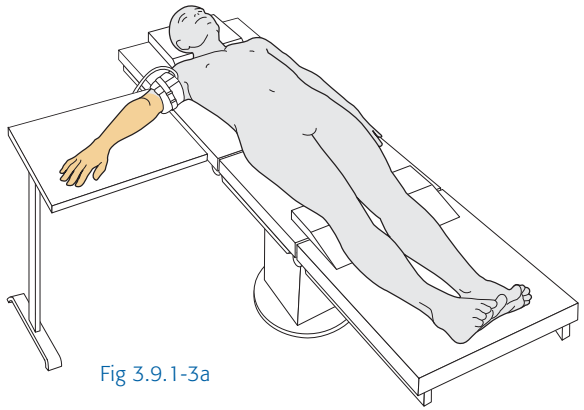


Fig 3.9.1-3a

- A single-use occlusive hand drape with expandable arm opening is recommended (Fig 3.9.1-3b).
- Drape the image intensifier.

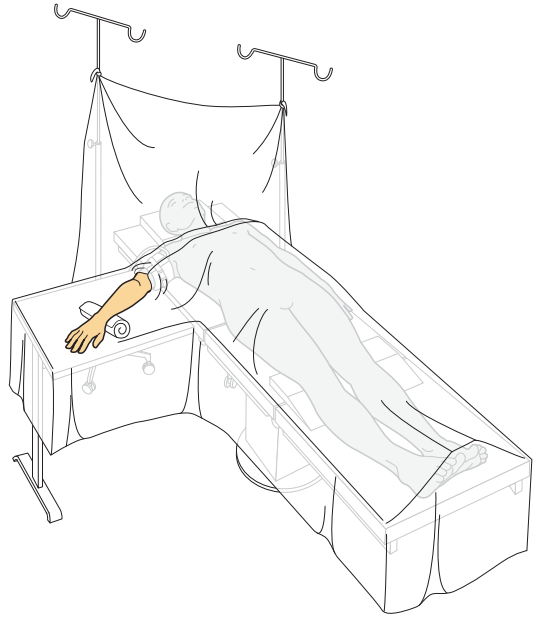


Fig 3.9.1-3b

6 Operating room set-up

- The surgeon sits beside the patient's head to gain a good view and access to the dorsum of the hand.
- The assistant sits opposite the surgeon.
- The ORP sits at the end of the hand table.
- Provide adjustable height stools and protective lead gowns for all personnel involved.
- Place the image intensifier display screen in full view of the surgical team and the radiographer (Fig 3.9.1-4).

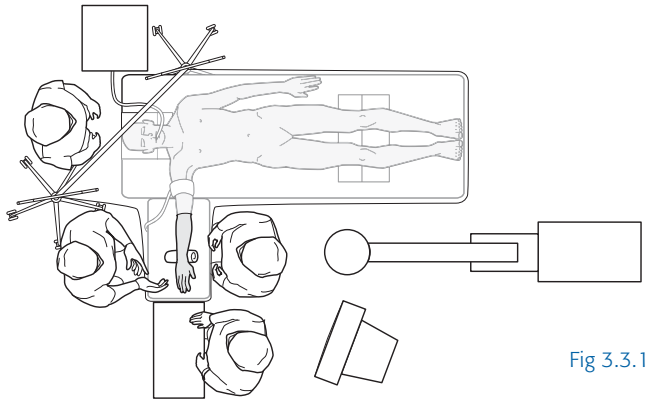


Fig 3.3.1-4

7 Instrumentation

Fig 3.9.1-5a Implants
1. LC-DCP 2.0 mm, 5 holes
2. Cortex screw 2.0 mm, self-tapping

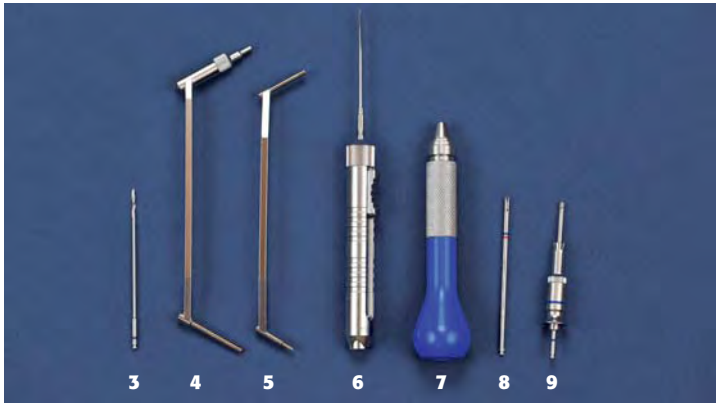


Fig 3.9.1-5b Instruments for fracture fixation with LC-DCP 2.0
3. Drill bit 1.5 mm
4. Universal drill sleeve 2.0 mm
5. Double drill sleeve 2.0/1.5 mm
6. Depth gauge
7. Handle with mini-quick coupling, medium
8. Screwdriver shaft, self-holding
9. Screwdriver shaft with holding sleeve

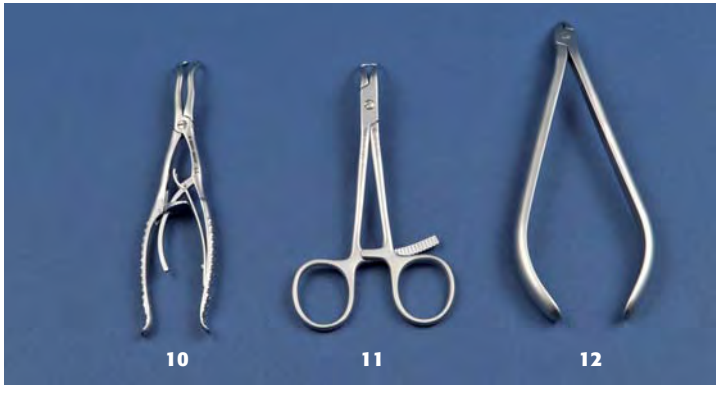


Fig 3.9.1-5c Instruments for reduction and contouring
10. Reduction forceps with points, narrow, soft lock
11. Stagbeetle forceps, small
12. Bending pliers, flat nosed, small

8 Procedure and technique—step-by-step

- Make a longitudinal incision over the dorsal aspect of the injured metacarpal or between adjacent injured metacarpals.
- Take care that the superficial approach identifies and protects small sensory nerve branches.
- Retract the extensor tendon. It may be necessary to divide the connections between adjacent extensor tendons (junctura tendinosum) to allow adequate retraction and appropriate visualization of the fracture. These structures must be repaired during closure.
- Open the periosteum longitudinally to reveal the fracture.
- Clean and reduce the fracture, removing hematoma, and interposed soft tissue.
- Confirm reduction using the image intensifier.
- Prebend a 5-hole LC-DCP 2.0 mm if the palmar cortex is not fragmented.
- Apply the LC-DCP on the dorsal surface of the metacarpal.
- Insert two 2.0 mm cortex screws on one side of the fracture, ensuring that the plate sits on the dorsal surface of the bone along its length. Using the 1.5 mm drill bit and the double drill sleeve, drill a 1.5 mm drill a hole in the neutral position, measure the depth, and insert a 2.0 mm self-tapping cortex screw (Fig 3.9.1-6a).
- Check the rotation of the digit.
- Make an eccentric 1.5 mm drill hole using the universal drill sleeve in the hole adjacent to the fracture (Fig 3.9.1-6b). Measure the depth and insert a 2.0 mm self-tapping cortex screw. Observe compression at the fracture site as the screw is tightened (Fig 3.9.1-6c).
- Insert a second cortex screw in the neutral position (Fig 3.9.1-6d).
- Perform and document a final x-ray check.
- Repair the periosteum with absorbable sutures.
- Close the wound.

Further information is available on AO Teaching video 22033: Transverse Fracture - Metacarpal II - 2.0/5-hole LC-DCP.

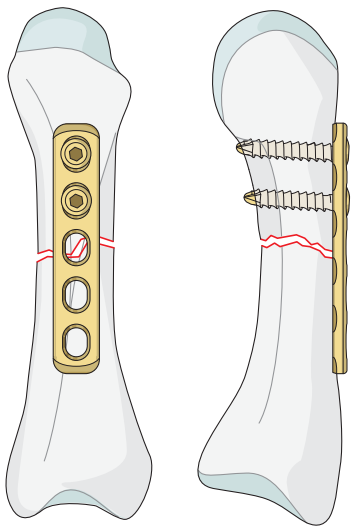


Fig 3.9.1-6a

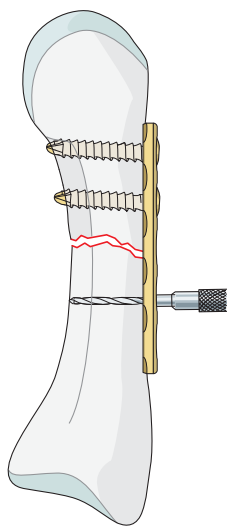


Fig 3.9.1-6b

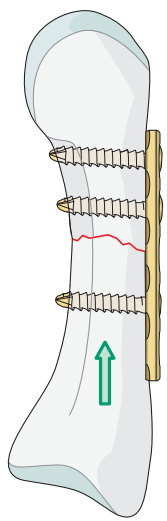


Fig 3.9.1-6c

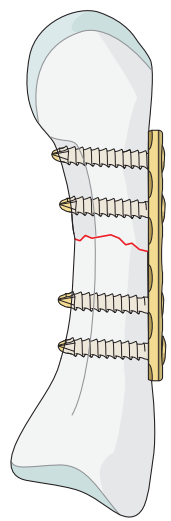


Fig 3.9.1-6d

9 Specific perioperative care

- Make sure preoperative antibiotics are given.
- Protect the patient's arm from sharp instruments and drill bits.
- Cool the drill bit during drilling with continuous saline lavage. Drill bits can get hot, especially if they are not sharp. This can cause bone necrosis. Overheated drill bits are more prone to breakage.
- Measure each screw accurately immediately before insertion.
- Ensure the screw is securely mounted on the screwdriver.
- Maintain sterility of the image intensifier drape throughout the procedure.

10 Specific postoperative care

- Ensure the upper limb remains protected until regional anesthesia has worn off.
- Check for, and document, the presence and/or return of sensibility to all digits.
- Check the capillary refill of all digits regularly in the hours after surgery.
- Place the limb in a high-arm sling and encourage it to be worn constantly for the first 72 hours.
- Arrange physical therapy before discharge.
- Perform x-ray checks in the early days of rehabilitation and repeat until healing is demonstrated.

11 ORP—key points

- Cross-check that details of the patient, side, marking, and site of surgery are correct.
- Check that the full range of implants and instruments are available.
- Check air-powered drill and supply.
- Check pneumatic tourniquet and its air supply.
- Measure the length of each screw carefully before insertion.
- Remember cooling while drilling.
- Document and reorder all implants used.

12 Surgeon—key points

- Cross-check that details of the patient, side, marking, and site of surgery are correct.
- Construct a preoperative plan for fixation and inform the ORP.
- Ensure adequate x-rays are available.
- Check rotation of the digits repeatedly throughout the procedure.
- Regularly check the reduction on the image intensifier.
- Confirm the implant position and screw lengths using the image intensifier.
- If necessary divide the junctura tendinosum (connections between the extensor tendons on adjacent rays) to adequately mobilize the extensor tendons. Repair these on closure.
- Write a clear and legible record of the procedure, including specific postoperative instructions

Author Doug Campbell

3.9.2 Scaphoid fracture: percutaneous fixation with 3.0 mm cannulated headless compression screw (HCS)

Surgical management

- Percutaneous fixation with 3.0 mm cannulated headless compression screw (HCS)

Alternative implants

- 3.0 mm or 2.4 mm cannulated screw

1 Introduction

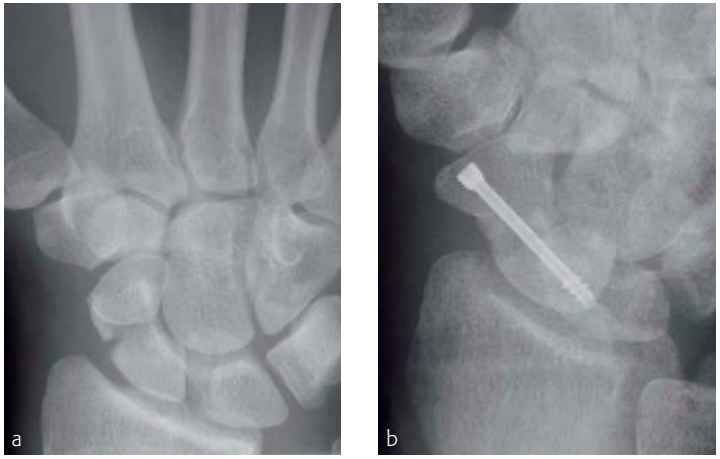


Fig 3.9.2-1a–b
a Preoperative x-ray: displaced transverse scaphoid fracture.
b Postoperative x-ray: stabilization with 3.0 mm cannulated headless compression screw (HCS).

- Fractures of the scaphoid and other carpal bones can be difficult to diagnose. The anatomical arrangement of this group of bones can make it difficult to see each bone individually on x-rays and multiple views, and further imaging such as CT or MRI is often required to confidently diagnose such injuries.
- Clinical symptoms and physical examination findings can vary from patient to patient. As a result, many patients with wrist pain after an injury are treated as if they have a fracture while awaiting either radiological proof or resolution of symptoms.
- The scaphoid has an unusual blood supply — entering the bone on the dorsal distal surface and flowing retrograde to the proximal pole. For this reason, fractures with displacement or those at the proximal end of the bone may well have a poor blood supply to the proximal part of the fracture. Such fractures are frequently managed by accurate reduction and stabilized by internal fixation to reduce the chances of nonunion.
- Some patients choose to have their undisplaced scaphoid fractures treated by percutaneous screw fixation. This allows them to spend less time in a cast, but it cannot be guaranteed that union will occur.
- Approximately 80–85% of undisplaced scaphoid fractures will heal when treated in a cast.
- The scaphoid bone lies obliquely across the wrist and its alignment changes with alteration of the position of the wrist. This can be used to the surgeon's advantage when performing percutaneous fixation.

2 Preoperative preparation

Operating room personnel (ORP) need to know and confirm:

- Site and side of fracture
- Type of operation planned (percutaneous or open approach)
- Ensure that operative site has been marked by the surgeon
- Condition of the soft tissues
- Implant to be used
- Patient positioning
- Details of the patient (including a signed consent form and appropriate antibiotic and thromboprophylaxis)
- Comorbidities, including allergies

Instrumentation required:

- Headless compression screw (HCS) 3.0 mm set
- Variety of screw lengths, both long and short thread
- General small orthopaedic instruments
- Small compatible air or battery drill with attachments

Equipment:

- Standard operating table
- Large hand table
- Image intensifier (a small one is suitable if available)
- X-ray protection devices for personnel and patient
- Tourniquet with exsanguinator

3 Anesthesia

- This procedure is performed with the patient under regional (eg, axillary) or general anesthesia.

4 Patient and x-ray positioning

- Position the patient supine and if under regional anesthesia make him/her comfortable with pillows under the head and under the knees.
- The hand is supine on a hand table (Fig 3.9.2-2).
- Apply a well padded pneumatic tourniquet cuff around the upper arm.
- Ensure the image intensifier has an uninterrupted path into and out of the surgical field.

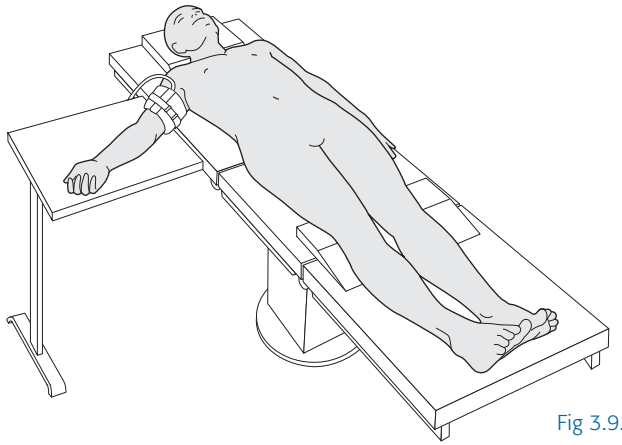


Fig 3.9.2-2

5 Skin disinfecting and draping

- Disinfect the entire hand, wrist, and arm with the appropriate antiseptic right up to the limits of the tourniquet cuff. This allows full exsanguination (Fig 3.9.2-3a).
- Preparation of the entire upper limb allows repositioning during surgery.
- If an alcohol-based antiseptic is used, make sure it does not run up under the tourniquet since skin damage can occur from prolonged contact with soaked material during surgery.
- A single-use occlusive hand drape with expandable arm opening is recommended (Fig 3.9.2-3b).
- For percutaneous insertion, it is critical to control the orientation of the scaphoid by positioning the wrist in extreme extension and ulnar deviation. This is best achieved over a rolled towel (Fig 3.9.2-3c–d).
- Drape the image intensifier.

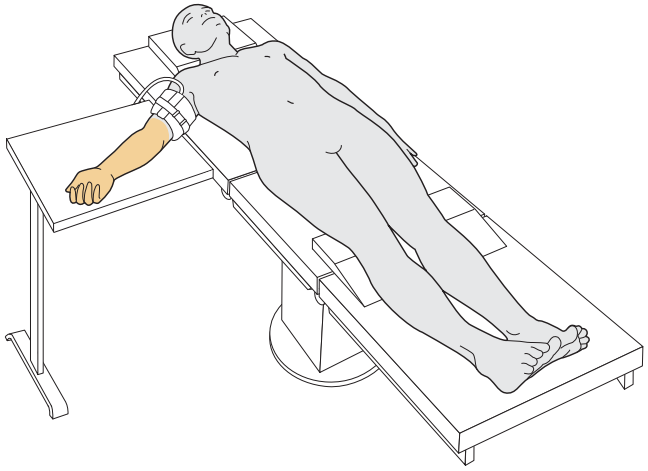


Fig 3.9.2-3a

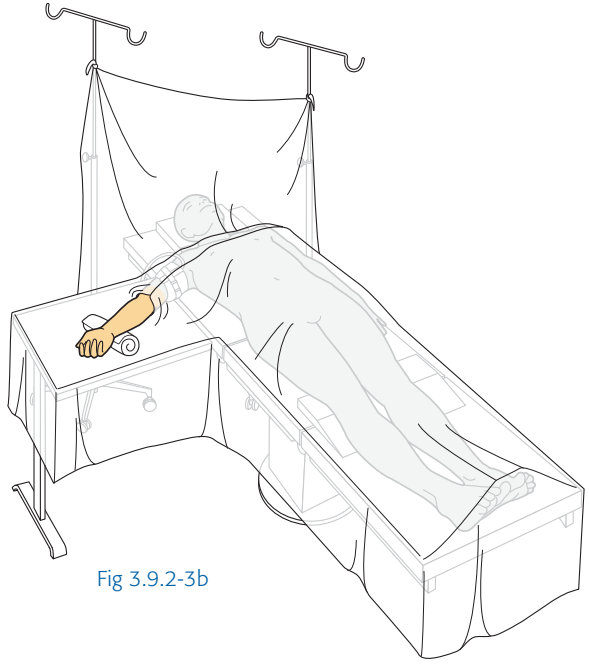


Fig 3.9.2-3b

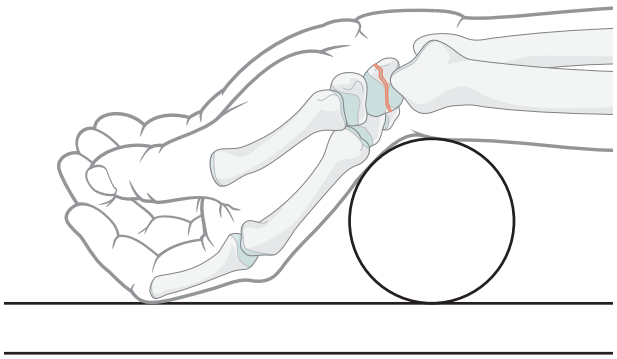


Fig 3.9.2-3c

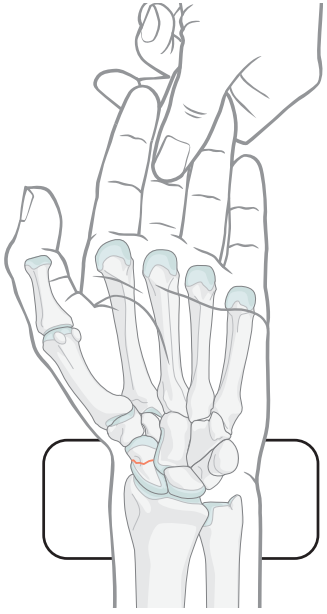


Fig 3.9.2-3d

6 Operating room set-up

- The surgeon sits at the end of the hand table to gain the best understanding of the anatomy and positioning of the scaphoid.
- The assistant sits in the patient's axilla to control the orientation of the wrist throughout the procedure.
- The ORP sits between the surgeon and the assistant.
- Provide adjustable height stools and protective lead gowns for all personnel involved.
- Place the image intensifier display screen in full view of the surgical team and the radiographer (Fig 3.9.2-4).

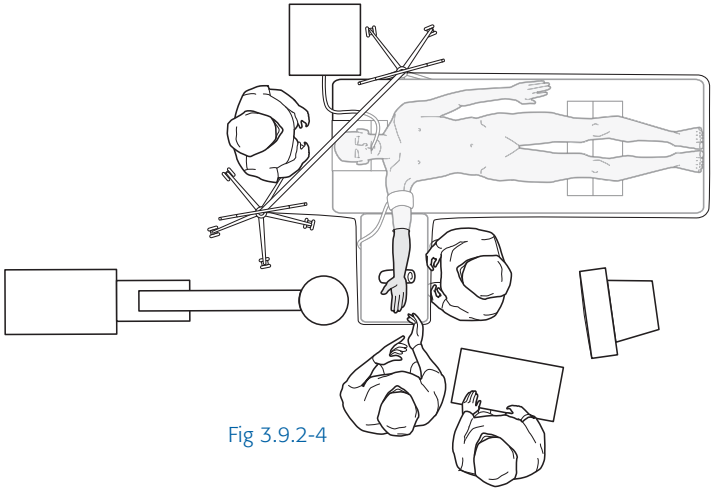


Fig 3.9.2-4

7 Instrumentation

Fig 3.9.2-5a Implants
1. Headless compression screws 3.0 mm, short and long thread

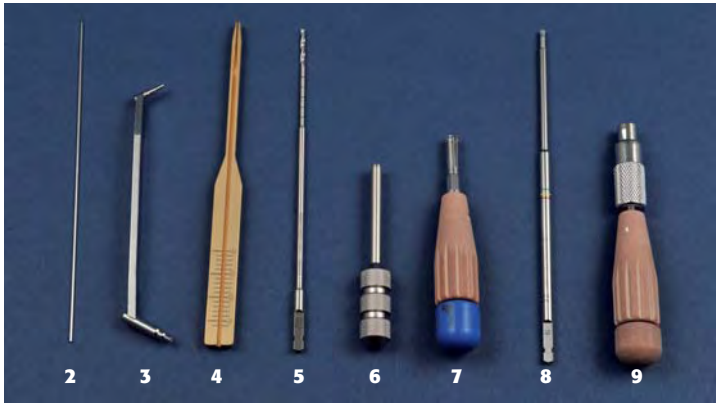


Fig 3.9.2-5b Instruments for fracture fixation with headless compression screw
2. Guide wire 1.1 mm, 150 mm long, with threaded tip
3. Double drill sleeve 2.0/1.1 mm
4. Direct measuring device for HCS
5. Cannulated drill bit 2.0/1.15 mm
6. Compression sleeve for HCS 3.0 mm
7. Handle for compression sleeve
8. Screwdriver shaft, cannulated
9. Handle with quick coupling

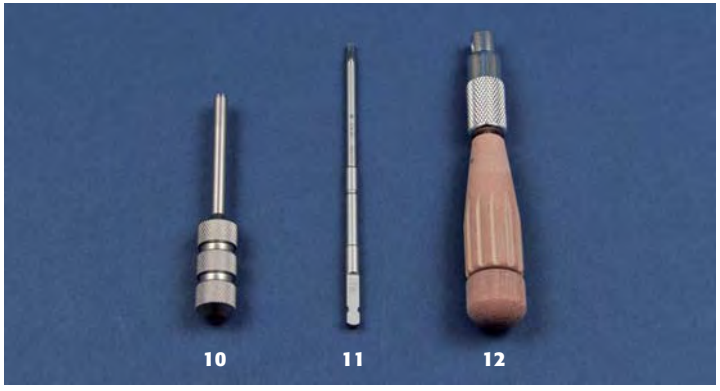


Fig 3.9.2-5c Instruments for implant removal
10. Compression sleeve for HCS 3.0 mm
11. Screwdriver shaft
12. Handle with quick coupling

8 Procedure and technique—step-by-step

- Using the image intensifier, position the wrist in full extension over a rolled towel so as to reduce the fracture and obtain the best angle for the guide wire insertion. Once the wrist has been placed in the optimum position, it must not be moved again until the guide wire has been inserted.
- Mark the skin with a surgical marking pen to demonstrate the scaphotrapezial joint, the radioscaphoid joint, and the long axis of the scaphoid only after achieving fracture reduction.
- Incision: make a 1 cm transverse incision over the scaphotrapezial joint. Use blunt dissection through the thenar muscles to enter the scaphotrapezial joint.
- The most important step in this procedure is to identify and choose the correct entry point. The entry point should be centrally in the distal pole of the scaphoid, so the implant will insert along the long axis of the bone, not obliquely across it. It is often necessary to remove the overhanging edge of the trapezial ridge with a rongeur or small osteotome to reveal the correct entry point (Fig 3.9.2-6a).
- Insert a 1.1 mm threaded guide wire with the corresponding double drill sleeve along the long axis of the scaphoid under the guidance of the image intensifier.
- Check the position of the guide wire on several views to ensure that the tip of the wire remains within the scaphoid (Fig 3.9.2-6b).

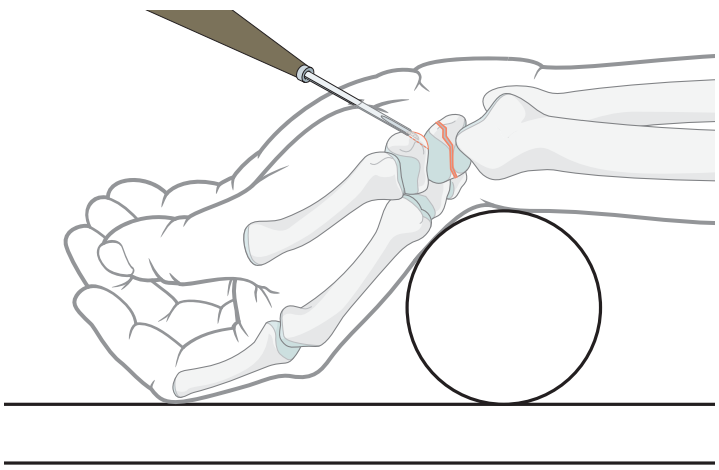


Fig 3.9.2-6a

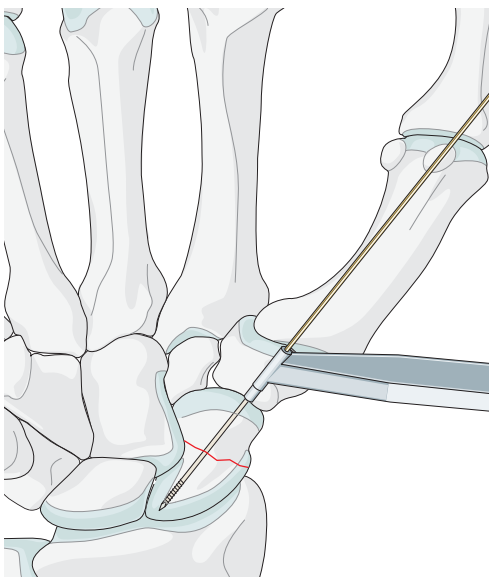


Fig 3.9.2-6b

- Slide the narrow end of the measuring device over the guide wire, and measure the depth of screw required (Fig 3.9.2-6c). Subtract 2 mm for countersinking and a further 1 mm (or more if indicated) to allow for compression at the fracture site.
- Determine the definitive screw length and thread length.
- Over drill the guide wire using the 2 mm cannulated drill bit and drill sleeve. Do not over drill the threaded portion of the guide wire (Fig 3.9.2-6d). Make sure that the guide wire is not inadvertently removed during this step.

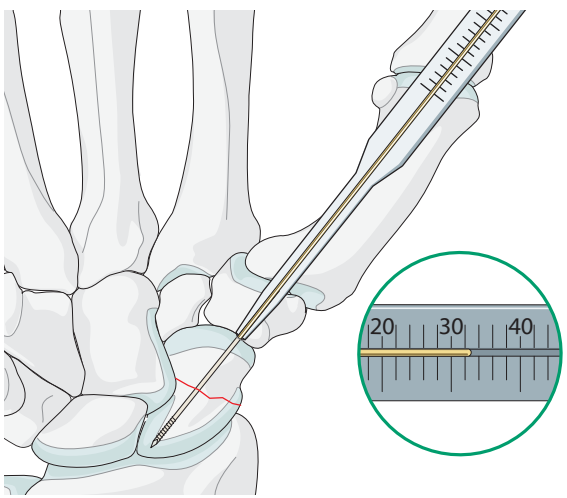


Fig 3.9.2-6c

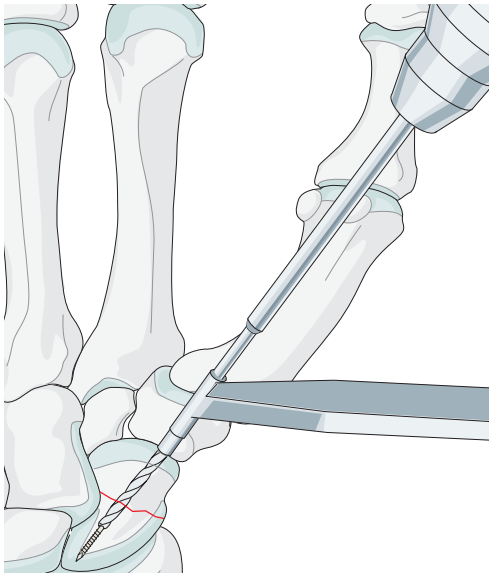


Fig 3.9.2-6d

- Screw the compression sleeve onto the head of the selected screw, and insert the handle for the compression sleeve (which clicks into place) into the sleeve/screw assembly. Using the sleeve/handle assembly introduce the screw over the guide wire (Fig 3.9.2-6e). Observe the screw's progress using the image intensifier.
- When the compression sleeve touches the scaphoid, further insertion will result in compression at the fracture site. This is because the sleeve hides the proximal threaded portion so the screw behaves as a lag screw (Fig 3.9.2-6f).
- When applying compression there is a danger of causing a rotational displacement of the fracture fragments due to the high torque resistance of dense cancellous bone. Inserting a second parallel antirotation guide wire can prevent this.
- When the desired amount of compression is achieved, remove the handle of the compression sleeve, and insert the cannulated screwdriver shaft with colored markings attached to the handle. When the screwdriver is correctly seated in the screw head recess, the green line will be visible at the collar of the compression sleeve (Fig 3.9.2-6g).

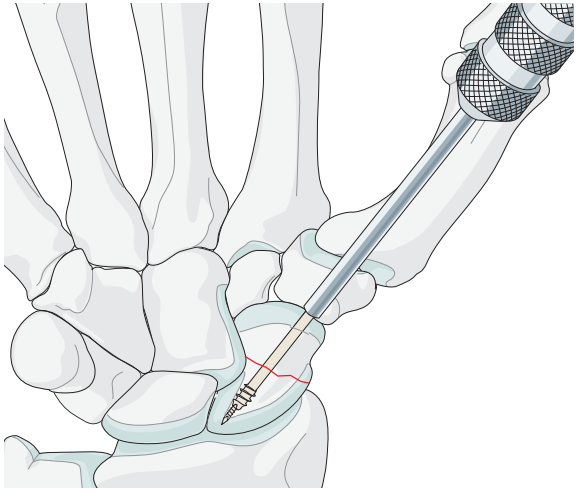


Fig 3.9.2-6e

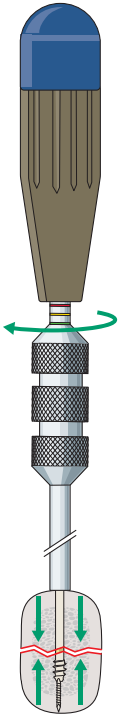


Fig 3.9.2-6f

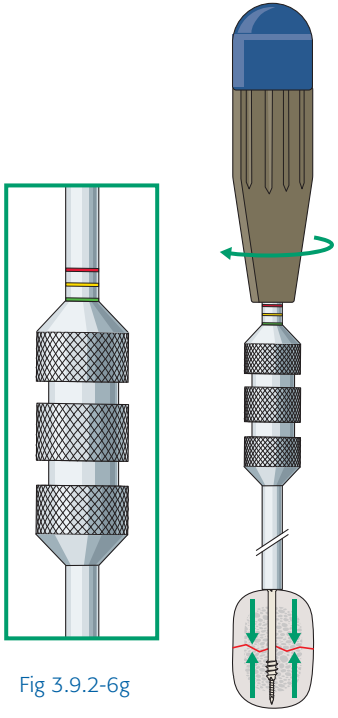


Fig 3.9.2-6g

- Hold the compression sleeve firmly between the fingers of one hand to prevent further rotation, and advance the screw by turning the screwdriver. Compression will be maintained by the compression sleeve as the screw is advanced into the bone. When the yellow line is level with the compression sleeve collar, the screw head is level with the bone surface. Further insertion until only the red line is visible represents 2 mm of countersinking (Fig 3.9.2-6h).
- Remove the guide wire (Fig 3.9.2-6i).
- Take and save copies of final x-rays in both planes.
- Close the wound.

Further information is available on AO Teaching video 22061: Scaphoid Fracture—Percutaneous Fixation with the 3.0 mm Headless Compression Screw (HCS).

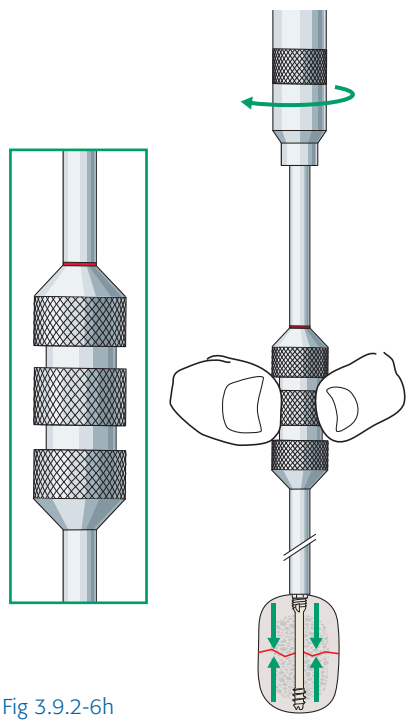


Fig 3.9.2-6h

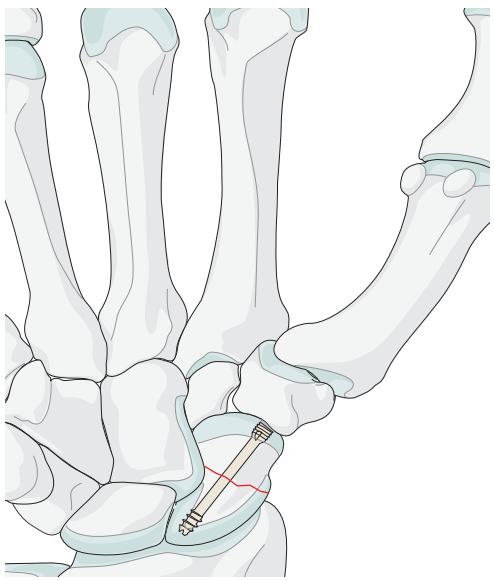


Fig 3.9.2-6i

9 Specific perioperative care

- Ensure preoperative antibiotic prophylaxis is given.
- Protect the patient's upper limb from sharp instruments and drill bits during surgery.
- Assign the assistant to be responsible for maintaining the selected position of the wrist throughout the procedure.

10 Specific postoperative care

- Ensure the upper limb remains protected until regional anesthesia has worn off.
- Check for, and document, the presence and/or return of sensibility to all digits.
- Regularly check the capillary refill of all digits in the hours after surgery.
- Place the limb in a high-arm sling and encourage the patient to wear it constantly for the first 72 hours.
- Perform x-ray checks to confirm implant placement, and repeat regularly until evidence of radiological union.

11 ORP—key points

- Cross-check that details of the patient, side, marking, and site of surgery are correct.
- Ensure that the full range of implants and instruments are available.
- Check the air-powered drill and supply.
- Check the pneumatic tourniquet and its air supply.
- Have several additional guide wires available.
- Provide a new guide wire for each attempt at insertion. They become blunt after use and are not reliable for repeated use.
- Discard guide wires after usage.
- Ensure the instruments are assembled correctly and given to the surgeon in the correct order.
- Carefully clean the cannulated drill bit. The guide wire will frequently stick within the drill bit and requires careful removal.
- Remember cooling while drilling.
- Document and reorder all implants used.

12 Surgeon—key points

- Cross-check that details of the patient, side, marking, and site of surgery are correct.
- Take time to position the wrist correctly and make accurate surface markings.
- Do not reposition the wrist after initial orientation.
- Concentrate on identifying and making the correct entry point.
- Repeat the insertion of the guide wire until its position is ideal.
- Do not over drill the threaded portion of the guide wire.
- Calculate the correct screw length carefully.
- Monitor the screw's progress with the image intensifier during insertion.
- Write a clear and legible record of the procedure, including specific postoperative instructions

Author Doug Campbell

3.9.3 Unicondylar phalangeal fracture: stabilization with 1.5 mm cortex screw

Surgical management

- Stabilization with 1.5 mm cortex screw applied as lag screw

Alternative implant

- 1.3 or 2.0 mm cortex screw (lag screw technique) depending on fragment size

1 Introduction

Fig 3.9.3-1a–b
a Preoperative x-ray: displaced partial articular fracture of distal end of proximal phalanges.
b Postoperative x-ray: stabilization with 1.5 mm cortex screw.

- Displaced articular phalangeal fractures are likely to result in painful, stiff joint function if not anatomically reduced. Early arthrosis is not uncommon.
- Fixation must be sufficiently stable to allow early movement.
- The anatomy of the finger joints demands a careful surgical approach.
- Lag screw fixation provides anatomical reduction, interfragmentary compression, and provides absolute stability to allow essential early rehabilitation.

2 Preoperative preparation

Operating room personnel (ORP) need to know and confirm:

- Site and side of fracture
- Type of operation planned
- Ensure that operative site has been marked by the surgeon
- Condition of the soft tissues
- Implant to be used
- Patient positioning
- Details of the patient (including a signed consent form and appropriate antibiotic and thromboprophylaxis)
- Comorbidities, including allergies

Instrumentation required:

- Compact hand set 1.5 mm and 1.3 mm
- General small orthopaedic instruments
- Micro drive or similar small compatible air or battery drill with attachments

Equipment:

- Standard operating table
- Large hand table
- Image intensifier (a small one is suitable if available)
- X-ray protection devices for personnel and patient
- Tourniquet with exsanguinator

3 Anesthesia

- Regional (eg, axillary) or general anesthesia is recommended. It is possible to perform this procedure with the patient under local anesthetic digital block, but it is unlikely to be comfortable and it is not easy to maintain a bloodless field.

4 Patient and x-ray positioning

- Position the patient supine and if under regional anesthesia make him/her comfortable with pillows under the head and under the knees (Fig 3.9.3-2).
- The shoulder is only anesthetized by a high block (interscalene or supraclavicular). Patients with coexistent shoulder pathology must be positioned carefully to avoid discomfort.
- Apply a well padded pneumatic tourniquet cuff around the upper arm.
- The hand will tend to be semisupinated. Internal rotation of the shoulder will allow the hand to be placed in an appropriate pronated position for surgery.
- Bring in the image intensifier from the opposite side of the hand table.

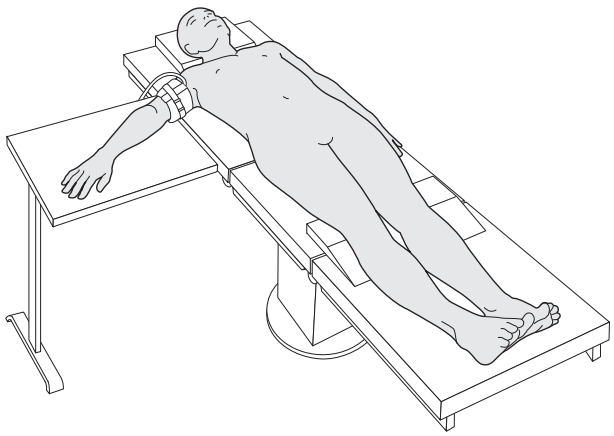


Fig 3.9.3-2

5 Skin disinfecting and draping

- Disinfect the entire hand, wrist, and arm with the appropriate antiseptic right up to the limits of the tourniquet cuff. This allows full exsanguination (Fig 3.9.3-3a).
- Preparation of the entire upper limb allows repositioning during surgery.
- If an alcohol-based antiseptic is used, make sure it does not run up under the tourniquet since skin damage can occur from prolonged contact with soaked material during surgery.
- A single-use occlusive hand drape with expandable arm opening is recommended (Fig 3.9.3-3b).
- Drape the image intensifier.

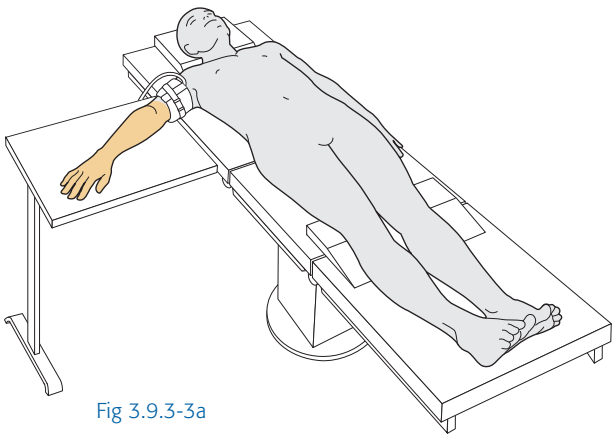


Fig 3.9.3-3a

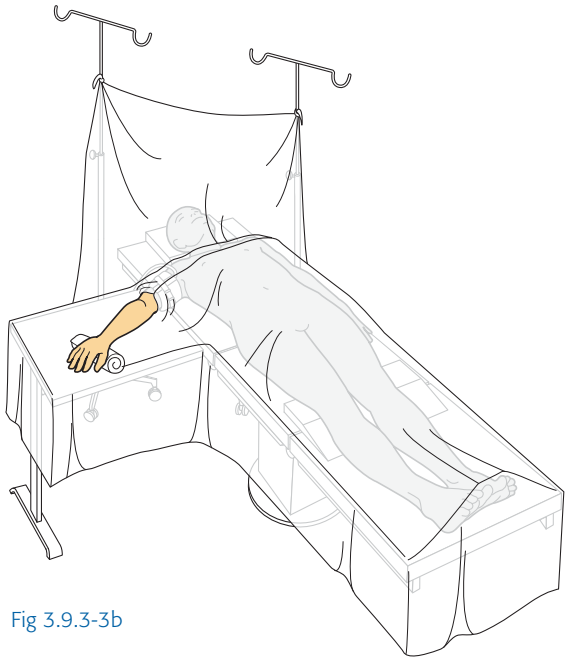


Fig 3.9.3-3b

6 Operating room set-up

- The surgeon sits at the head of the table to gain access to the dorsum of the finger.
- The assistant sits at the end of the hand table.
- The ORP sits between the surgeon and the assistant.
- Provide adjustable height stools and protective lead gowns for all personnel involved.
- Place the image intensifier display screen in full view of the surgical team and the radiographer (Fig 3.9.3-4).

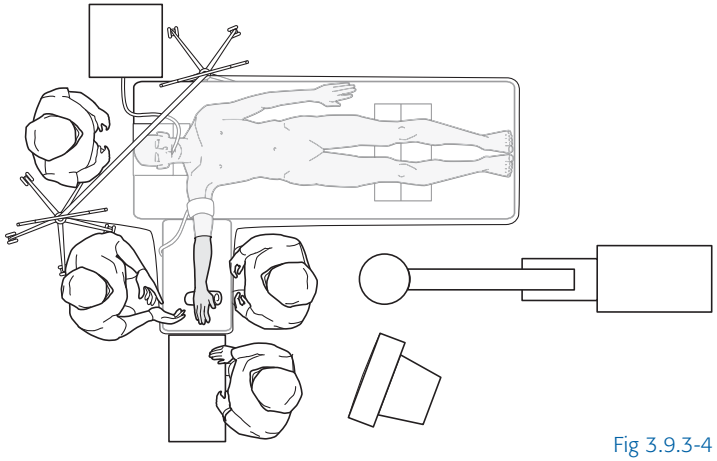


Fig 3.9.3-4

7 Instrumentation

Fig 3.9.3-5a Implants
1. Self-tapping screws 1.5 mm

Fig 3.9.3-5b Instruments for fracture fixation with 1.5 mm Cortex screw
2. K-wires 0.6 mm
3. Drill bit 1.5 mm
4. Drill bit 1.1 mm
5. Double drill sleeve 1.5/1.1 mm
6. Countersink 1.5–2.4 mm
7. Handle, with mini quick coupling
8. Depth gauge
9. Tap 1.5 mm
10. Screwdriver shaft, self-holding
11. Screwdriver shaft with holding sleeve

8 Procedure and technique—step-by-step

- Make a 1 cm mid-axial incision to avoid injury to the dorsal tendons and other gliding structures.
- Expose the fracture initially using blunt dissection being careful to avoid the neurovascular structures.
- Perform careful articular reduction using a pointed reduction forceps and a 0.6 mm K-wire if required. If a K-wire is used, do not put it where a lag screw will be placed (Fig 3.9.3-6a).
- Avoid injury to the collateral ligament by placing the screw proximal to the origin of the ligament.
- Use the lag screw technique. First drill the core hole through both fragments with the 1.1 mm drill bit and drill sleeve; measure the depth, then over drill the near fragment with a 1.5 mm drill bit to create the gliding hole (Fig 3.9.3-6b–d) and insert the appropriate screw.
- If the fracture geometry allows, place a second lag screw. This will help to control rotation of the fragment. This screw can be inserted at the site of a K-wire which had been used to hold the fracture reduction during insertion of the first screw. The hole made by the K-wire is over drilled using the 1.5 mm drill bit to create the gliding hole in the near cortex. The far cortex is drilled using the 1.1 mm drill bit (Fig 3.9.3-6e–f).
- Check the reduction using the image intensifier.
- Check the rotation of the fingers by clinically assessing their relative positions in flexion.
- Take and save copies of final x-rays in both planes.
- Close the wound.

Further information is available on AO Teaching video 22034: Unicondylar fracture—head of the proximal phalanx of the thumb - 2.0mm Lag Screw.

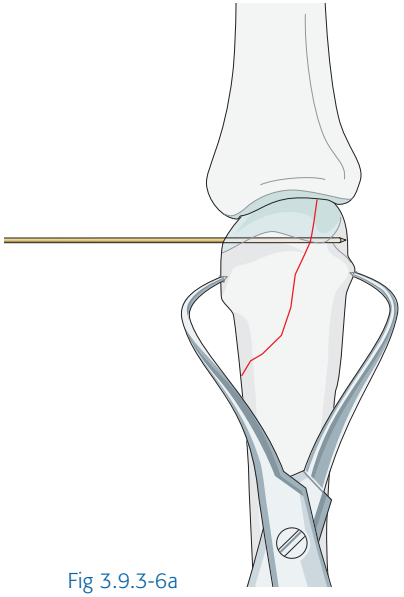


Fig 3.9.3-6a

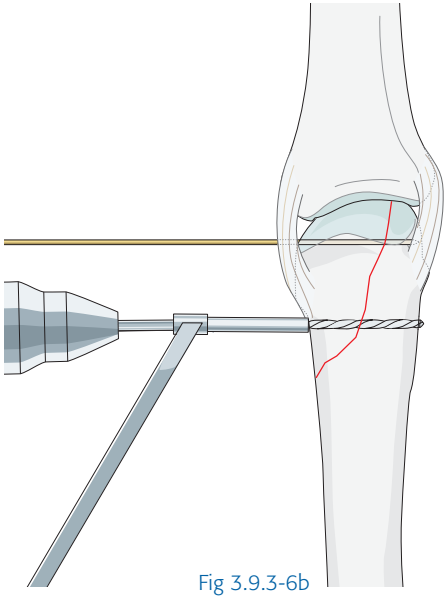


Fig 3.9.3-6b

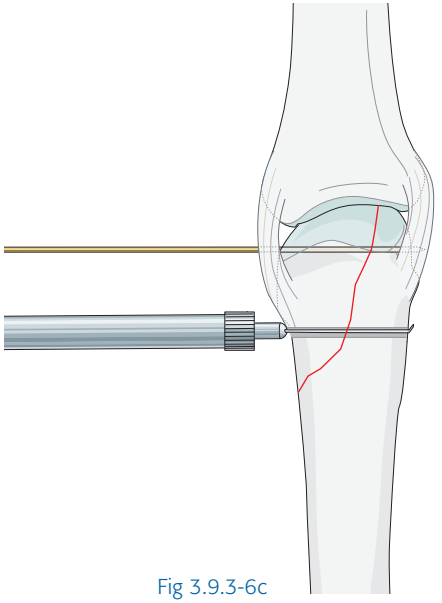


Fig 3.9.3-6c

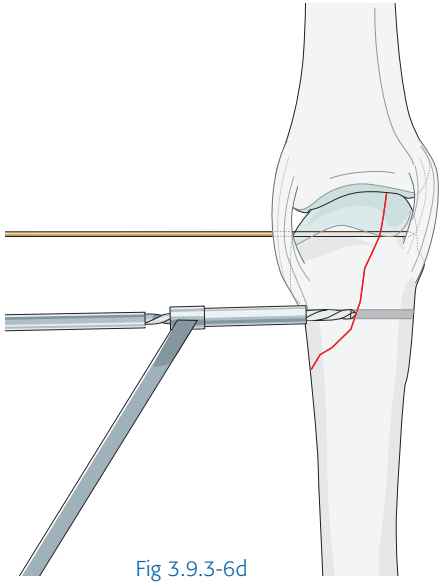


Fig 3.9.3-6d

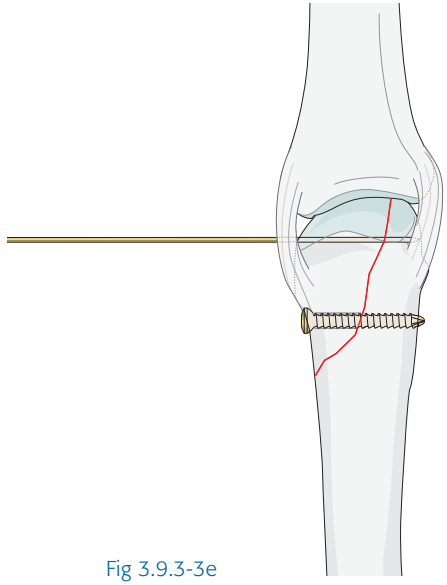


Fig 3.9.3-3e

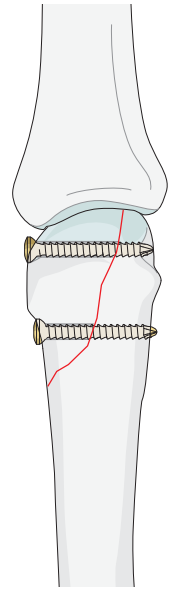


Fig 3.9.3-6f

9 Specific perioperative care

- Ensure preoperative antibiotics are given.
- Protect the patient's arm from sharp instruments and drill bits.
- Ensure correct drill bits are used in the correct order.
- Carefully cool the drill bit during drilling by continuous saline lavage. Drill bits can get hot, especially if they are not sharp. This can cause bone necrosis. Overheated drill bits are more prone to breakage.
- Accurately measure each screw immediately before insertion.
- Ensure the screw is securely mounted on the screwdriver.
- Maintain sterility of the image intensifier drape throughout the procedure.

10 Specific postoperative care

- Ensure the upper limb remains protected until regional anesthesia has worn off.
- Check for, and document, the presence and/or return of sensibility to all digits.
- Regularly check the capillary refill of all digits in the hours after surgery.
- Place the limb in a high-arm sling and encourage it to be worn constantly for the first 72 hours.
- Arrange early physical therapy, edema control, and range of motion exercises.
- Perform x-ray checks in the early days of rehabilitation and repeat until healing is demonstrated.

11 ORP—key points

- Cross-check that details of the patient, side, marking, and site of surgery are correct.
- Check that the full range of screws and instruments are available before surgery.
- Have spare drill bits of appropriate size available.
- Check the air-powered drill and supply.
- Check the pneumatic tourniquet and its air supply.
- Carefully measure screw length for each screw immediately before insertion.
- Remember cooling while drilling.
- Document and reorder all screws used.

12 Surgeon—key points

- Cross-check that details of the patient, side, marking, and site of surgery are correct.
- Construct a preoperative plan for fixation and inform the ORP.
- Ensure adequate x-rays are available.
- Check rotation of the digits repeatedly throughout the procedure.
- Regularly check the reduction on the image intensifier.
- Check the implant position and screw lengths using the image intensifier.
- Write a clear and legible record of the procedure, including specific postoperative instructions.