

New Trauma Products from AO Development



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DUE TO VARYING COUNTRIES' LEGAL AND REGULATORY APPROVAL REQUIREMENTS PLEASE CONSULT THE APPROPRIATE LOCAL PRODUCT LABELING FOR APPROVED INTENDED USE OF THE PRODUCTS DESCRIBED IN THIS BROCHURE. ALL DEVICES IN THIS BROCHURE ARE AOTK APPROVED. FOR LOGISTICAL REASONS, THESE DEVICES MAY NOT BE AVAILABLE IN ALL COUNTRIES WORLDWIDE AT THE DATE OF PUBLICATION.



Dear reader,

This TK News issue will focus on new trauma techniques and information around these, plus a few selected items from Spine and CMF which are major innovations for these specialties, as the ProDisc in Spine, or the MatrixNeuro System in CMF.

In the lead article of this issue, Philipp Lobenhoffer, the chairman of the Knee Expert Group (KNEG) will give you a comprehensive overview of the latest developments for osteotomies around the knee. The revival of the osteotomy technique worldwide was driven by the innovations of the KNEG. Their tremendous achievements were honoured by the AO Foundation with the TK Recognition Award 2006.

With the approval of the Expert Lateral Femoral Nail System, the expert nail family is now almost complete. Only the Hindfoot Arthrodesis Nail is still in development, but should be available in the near future. The range of anatomically precontoured plates with the locking compression technology has been expanded by the Proximal Femoral Hook Plate, Medial Proximal Tibia Plate as well as the Anterolateral Distal Tibia and Medial Distal Tibia Plates. In hand, the Headless Compression Screw (HCS) allows controlled closure and compression of a fracture gap. Once the desired compression is achieved, the head is sunk by means of the screwdriver. In total, 41 new products were approved in 2006 for General Trauma.

With the regional structures now fully implemented, the network of the TK-System includes some 120 renowned surgeons from almost all parts of the world. Regional representatives in the Expert Groups are assuming an increasingly active role and fostering involvement in regional events. We expect a significant impact of the regions in future developments which can be already observed by certain new projects in the TK-System.

The column Portrait features Rogier Simmermacher from The Netherlands who has done a lot of research and development as well as teaching on intramedullary nailing in the proximal femur. I would like to encourage you to follow his example and to share your talents with us. You may approach the AO anytime if you have an idea for the improvement of patient treatment as he did.

Once again, I would like to stress that none of the product descriptions in this publication are a substitute for the AO's OP techniques or the AO teaching tools. You can obtain more detailed information on these products from the AO or your local distributor.

If you have any comments or questions on the articles or the new methods and devices, please don't hesitate to contact me.

Yours faithfully,

Norbert P Haas

Philipp Lobenhoffer, Alex Staubli, Ronald van Heerwaarden

OSTEOTOMY AROUND THE KNEE WITH TOMOFIX



Fig 1
Biplanar osteotomy technique for open wedge osteotomy of the tibia.

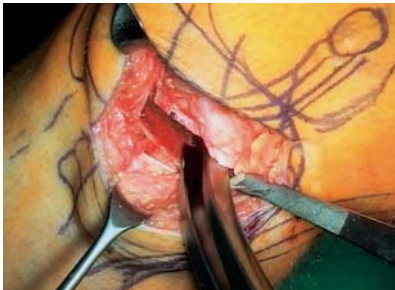


Fig 2
The osteotomy is opened and a spreader is inserted posteromedially. Remark the anterior osteotomy plane stays in contact.

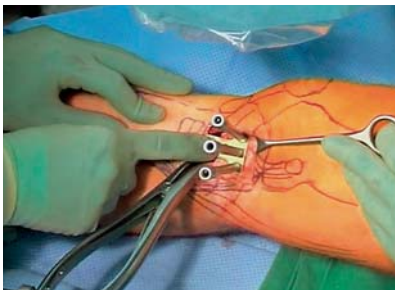


Fig 3
The TomoFix implant is inserted in a subcutaneous pocket avoiding extensive dissection.

Osteotomy around the knee has regained interest in the last years. The effect of malalignment on joint overload and osteoarthritis of the knee is well recognized, and the positive effect of correction of malalignment especially in the metaphyseal areas of tibia and femur on pain and function has been proven. The development of the TomoFix implants and the related instruments and techniques has popularized osteotomy in the German-speaking countries. The techniques have now also spread to the Asian world. The authors present an update on tibial and femoral osteotomy using the TomoFix implants.¹

High tibial osteotomy (HTO)

High tibial osteotomy is a widely accepted technique in the treatment of varus malalignment and medial osteoarthritis of the knee since the work of Marquet and Coventry. Middle and long-term results are good if the indications are respected and an adequate correction is achieved. Corrective osteotomy of the proximal tibia may be performed by a subtractive technique (closed wedge), by a barrel-vault (dome) osteotomy or by an additive technique (open wedge). The closed wedge technique with removal of a bone wedge through a lateral approach and fixation with staples, a plate or a tension-band system has, until recently, been the most popular. Disadvantages of this technique are the risk of peroneal nerve injuries, the need for osteotomy of the fibula or separation of the proximal tibiofibular joint, and of detachment of the extensor muscles. Large corrections cause significant shortening of the leg and an offset of the proximal tibia, which may compromise placement of the tibial component of a total knee replacement. Open wedge osteotomy from the medial side can be performed without any muscle detachment, the correction can be fine-tuned during the procedure, and no leg shortening occurs. Whereas this technique was described some time ago, few surgeons used this method, since the harvest of bicortical bone grafts from the pelvic crest to fill the osteotomy caused significant morbidity. However, open wedge osteotomy has regained interest with the development of stable implants which enable the surgeon to fix the correction and to avoid bone grafts in most cases.

Technique (Fig 1–6)

The correction is planned on a long-leg standing x-ray. After surgery, the mechanical axis should pass through a point 63% on the lateral side of the total width of the tibial plateau in the frontal plane. A transverse or slightly oblique incision is used to avoid damage to the saphenous nerve. The distal fibers of the medial collateral ligament are detached from the tibia. Under fluoroscopic control, two wires are placed in the proximal tibia marking the transverse osteotomy plane. The cut usually starts at the upper margin of the pes anserinus and ends at the tip of the fibula on the lateral side. The wires are placed exactly parallel

¹ We would like to appreciate the important input to the project from C DeSimoni, R Babst, A Gächter, P Holzach, A Wymenga, M Wagner, B Norris, B Teitge, R Takeuchi and T Sawaguchi, mostly members of the AO Knee Expert Group (KNEG).

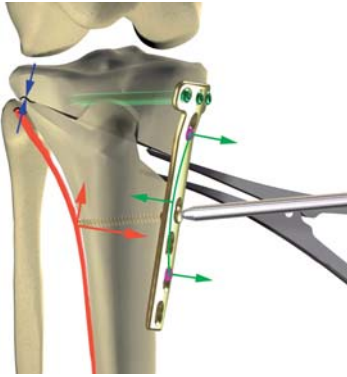


Fig 4
Insertion of a lag screw below the osteotomy allows for compression of the lateral hinge, increasing the stability significantly.



Fig 5
A 10 mm osteotomy gap 6 weeks postoperative. Patient walking full weight bearing.



Fig 6
Radiographic control 2 years later. The gap has filled by spontaneous bone formation.

to the tibial plateau thus taking into consideration the individual tibial slope of the patient. An incomplete cut of the posterior two-thirds of the proximal tibia is performed with an oscillating saw guided by the wires. Continuous irrigation avoids burn injury to the bone. A second osteotomy is now performed in the anterior third of the tibia in an angle of 100° ending above the patellar tendon insertion. A smaller saw blade is used and the complete anterior cortex is cut exactly in the frontal plane. The osteotomy is now gradually opened by inserting flat chisels or a spreader-chisel into the posterior osteotomy cleft. This process may take some minutes and can usually be completed without fracture of the lateral cortex. A bone spreader is now placed in the posteromedial edge of the tibia and the chisels are removed. The leg is extended and the correction is checked with the fluoroscope. A long metal rod is placed between center of the hip joint and center of the ankle joint. The projection of this rod should be at the planned point of correction on the tibial plateau lateral of the midline. Eccentric collapse of the medial joint space may cause accidental overcorrection. In this case pressure on the foot may simulate loading and body weight. The correction can be fine-tuned by opening or closing the spreader. The TomoFix Medial Tibia Plate is now placed in a subcutaneous pocket. The implant is precontoured and usually fits well to the bone surface. The distance holders avoid compression of the medial collateral ligament and the pes anserinus. Three proximal bolts are placed near the subchondral sclerosis zone. The position of the bolts is adapted to the anatomy of the proximal tibia giving optimum purchase for the bolts. An oblique lag screw is inserted distal to the osteotomy. This screw in the first combination hole allows careful compression of the lateral osteotomy hinge and pretensioning of the implant. A stab incision is created on the shaft and the implant is fixed monocortically with bolts. The lag screw and the distance holders are replaced by bolts. The medial collateral ligament is released longitudinally to reduce medial compartment pressure and the wound is closed in layers. An overflow drain may be used. Clinical and experimental work has proven that when this technique is closely followed, corrections up to and over 15 mm can be performed without bone grafting or use of bone substitutes.

The patient is mobilized on crutches on day one after surgery. Partial weight bearing is allowed from the beginning. Biomechanical and RSA studies have proven that postoperative loading of the implant by body weight in standard partial weight bearing and early full weight-bearing conditions did not cause loss of correction. Our group now allows the patients to walk without crutches as soon as the postoperative pain allows after this type of surgery. Members of the Knee Expert Group (KNEG) have presently implanted over 1,500 TomoFix medial tibia. The results are extremely positive in respect to osteotomy healing, implant failure, and surgical complications.



Fig 7
TomoFix MDF for varus femur osteotomy. Watch the angulation of the distal bolts.



Fig 8
The plate allows for correct bolt placement in the distal femur from medial.



Fig 9
Anteromedial incision for distal femur osteotomy. This incision can always be used for secondary knee procedures in the future.

Distal femoral varus osteotomy

The goal of distal femoral varus osteotomy is to shift the mechanical leg axis from the lateral to the medial compartment. There are various possibilities for surgical correction of valgus malalignment. Open wedge lateral osteotomy or dome osteotomies of the distal femur have been widely used in recent years. Unfortunately, local complaints occurred in many cases mostly caused by the fixation methods (ie, frequent irritations of the iliotibial tract and loss of correction). Therefore new improved surgical technique based on an incomplete medial closing wedge osteotomy with an internal plate fixator was developed.

Technique (Fig 7–13)

An anteromedial skin incision is used. This skin incision can be reused and expanded during subsequent knee surgery. The vastus medialis muscle is dissected from the septum, the medial patellofemoral ligament (MPFL) and the distal insertion of the vastus medialis muscle are partially incised. Two blunt Hohmann retractors are placed around the distal femur. The oblique osteotomy starts in the medial supracondylar area and ends in the lateral condyle, approximately 10 mm inside the lateral cortex. For guiding the closing wedge osteotomy of the distal femur a specific saw guide will be available soon. Alternatively, it is possible to use K-wires inserted under image intensifier control to mark the bone cuts. The saw cuts are made with retractors protecting the soft tissue and vessels. The wedge is removed and the height and depth of the osteotomy can be measured. At this time it is possible to make modifications concerning the wedge size. Closing the wedge must be done gradually by gentle compression of the lower leg laterally, and stabilizing the knee joint medially near the area of osteotomy. This may take several minutes to enable plastic deformation of the lateral cortex to close the osteotomy gap. Leg alignment is checked radiologically after closing with a rigid alignment bar positioned between hip and ankle center. The bar representing the weight-bearing line should pass the preoperatively defined mechanical axis. The plate is inserted from distal under the vastus medialis muscle. The distal drill holes are oriented in a 20° angle inclination on the frontal plane to avoid a posterior perforation of locking head screws in the distal femur. The distal four bolts are placed. A lag screw is positioned in the dynamic hole directly above the osteotomy for compression of the osteotomy site. The screw should be tightened carefully using the image intensifier. The plate is now fixed to the shaft with bolts monocortically, and the lag screw is replaced by a bolt bicortically. The wound is closed in layers after insertion of a drain. The patient is mobilized on the first day after surgery. Partial weight bearing is recommended for 6 weeks, active movement of the knee is enhanced. Biomechanical testing confirmed superior stability of medial closing wedge techniques as compared to lateral open wedge techniques and favourable axial and torsional loading characteristics of the TomoFix medial distal femur (MDF) plate. The plate is now available, as well as a booklet on the operative technique.



Fig 10
Medial subvastus exposure of the distal femur.

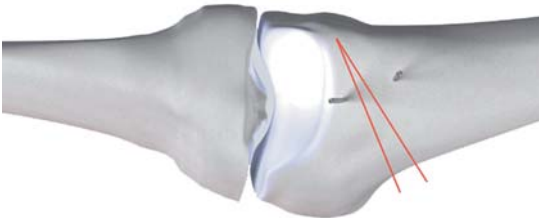


Fig 11
Closed wedge osteotomy of the distal femur for correction of valgus deformity.

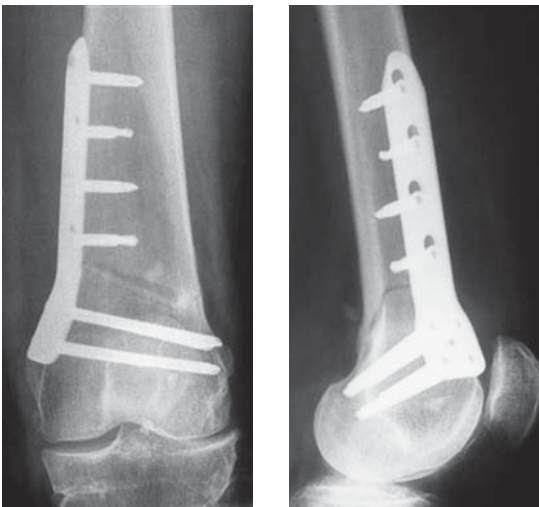


Fig. 12 & 13
10 mm closing wedge osteotomy of the distal femur with TomoFix. Patient walking full weight bearing.

Perspectives

The KNEG is working on further improvements to the implants. The TomoFix Medial Tibia Shaft will get slimmer, as the combination holes on the shaft will be exchanged against simple locking holes. The edges will be rounded to help avoid morbidity from the implant. These design modifications have been tested biomechanically and no disadvantages have been recognized against the present plate design. In addition, a smaller version of the plate is presently in preparation, mainly adapted to the specific anatomy of the Asian proximal tibia. Development of this plate is strongly supported by the input of our Japanese friends R Takeuchi and T Sawaguchi. First prototypes will undergo biomechanical testing in the near future.

The implants and techniques presented here have increased the safety and comfort of osteotomy procedures significantly. However, many problems still exist. Questions of planning and intraoperative reproduction of the desired correction are still open. The role of computer-aided planning and surgery is not yet defined, and the importance of osteoinductive substrates to enhance bone healing is not yet known. Finally, the ideal candidate for osteotomy must still be defined, since alternative treatment rationales like chondrocyte transplantation, collagen meniscus implantation, spacer implantation and unicompartmental knee replacement are in concurrence in a significant number of cases.

An extensive 3 day osteotomy course will take place from the 1st to the 3rd of December during the 2007 AO Courses in Davos and the authors would like to invite interested surgeons to participate and discuss new developments of osteotomy around the knee.

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Norbert Südkamp

NEW UPPER EXTREMITY PRODUCTS



LCP Clavicle Hook Plate

The LCP Clavicle Hook Plate is a fixation system with angular stability for both lateral clavicle fractures and acromioclavicular joint injuries. It is indicated for luxation of the AC-joint (Type III, classified by Tossy, or Type III, IV, and V, classified by Rockwood) and lateral shaft fracture of the clavicle (Type II, classified by Neer, or Type II, classified by Jäger and Breitner).

The design of the LCP Clavicle Hook Plate includes several new features compared to the existing Clavicle Hook Plate. It implements the LCP concept with elongated combination holes (threaded hole for locking head screws (LHS) and dynamic compression unit (DCU) for cortex screws). Further improvements are a precontoured plate shaft (12° angulation) for better anatomic fit, undercuts, tapered plate end and rounded edges, a hook offset of 5 mm, and tapered hook geometry.

The LCP Clavicle Hook Plate will be provided in four different lengths, with 1–4 elongated LCP combination holes in the shaft portion. These allow the application of 3.5 mm locking head screws as well as 3.5 mm cortex or 4.0 mm cancellous bone screws. The hook will be offered in three different sizes; 12, 15, and 18 mm.

The new trial implants for intraoperative implant size determination are made out of stainless steel (to be visible under image intensification) and will be offered in a right and left version with three different hook sizes (12, 15, and 18 mm). The hook has the same dimensions as the LCP Clavicle Hook Plate implant. The trial implants are particularly important for use in conjunction with sterile packaged implants.



Fig 1a–b
Preoperative x-rays

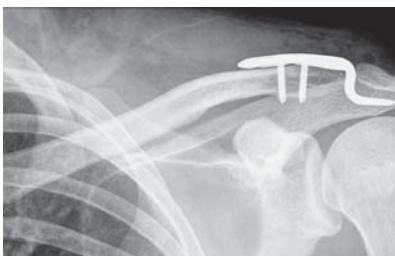


Fig 2
Postoperative x-rays

Case provided by Norbert Südkamp, Freiburg im Br.



Fig 3
Follow-up x-ray after 10 weeks. Beginning ossification in coracoclavicular ligament.



Fig 4
Follow-up x-ray after 5 month. Stable AC joint, full function. Persisting ossification in coracoclavicular ligament without clinical relevance.



LCP Olecranon Plate: line extension

The Olecranon Plate is part of the elbow system, it has a precontoured anatomical fit and provides high stability. Indications for this new plate are complex extra- and intraarticular olecranon fractures, especially with distal extension beyond the coronoid process, fractures of the proximal ulna, nonunions of the proximal ulna, and osteotomies.

The Olecranon Plate is now also available in a 12-hole version which extends the range of plates to six lengths with 2, 4, 6, 8, 10, or 12 LCP combination holes in the shaft for 3.5 mm locking head screws. Alternately, 3.5 mm cortex or 4.0 mm cancellous bone screws can be used. The Olecranon Plate is available in a right and left version. The plate is available in stainless steel and titanium.

2.8 mm LCP Drill Guide Long and 2.8 mm Calibrated Drill Bit

The 2.8 mm LCP Drill Guide Long, and the 2.8 mm Calibrated Drill Bit are used together for easy drilling and measuring of 3.5 mm locking head screws in the 3.5 mm LCP plates and the proximal humerus plates (PHILOS). The length can be measured directly from the drill guide and drill bit to save time during the OR.

The 2.8 mm LCP Drill Guide is 118 mm long which enables the surgeon to grip it more easily. The 2.8 mm Calibrated Drill Bit is 248 mm long. The drill bit features a 2.8 mm drill tip and a 4.5 mm body with calibration. The 4.5 mm body of the drill bit allows ease of reading the calibration. The calibration measures from 10–95 mm in a bold etch. The design of the drill guide and drill bit ensures that the measurement is accurate, and therefore, the screw will be in the appropriate length.



Jesse Jupiter, Doug Campbell, Martin Langer

NEW HAND PRODUCTS



Headless Compression Screw (HCS) 3.0 mm

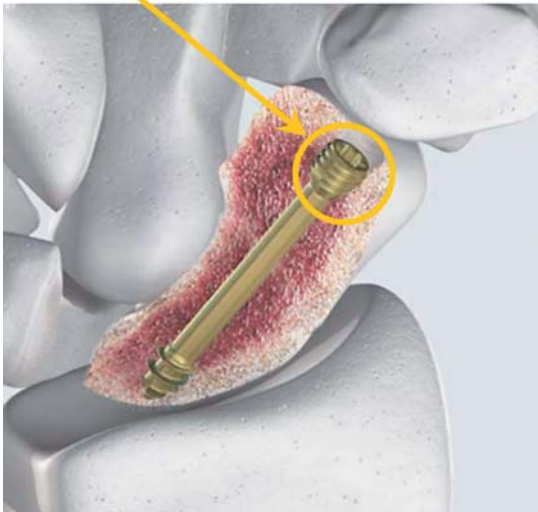
Intraarticular fractures (eg, scaphoid fractures) are best fixed with implants which can be countersunk under the bone surface for protection of the joint surface and adjacent soft tissues. Existing headless screws can be placed below the bone surface but offer only limited control of interfragmentary compression. The 3.0 mm cannulated screw with threaded washer can be used as a lag screw whilst being placed below the bone surface. It provides good interfragmentary compression, but has the disadvantage of a large head diameter which makes it difficult to use in small bones (eg, proximal pole fractures of the scaphoid). The new 3.0 mm Headless Compression Screw has a similar shaft size when compared to 3.0mm cannulated screws, but a smaller head diameter. Unlike other headless screws, the HCS is applied as a lag screw, which allows the surgeon to control closure and the degree of closure of the fracture gap.

The 3.0 mm HCS is indicated for fractures and nonunions, arthrodeses, unionectomies, and osteotomies of small bones. The use of the Headless Compression Screw in heavily porotic bone is not recommended because of insufficient thread purchase and the likelihood of loss of stable fixation.

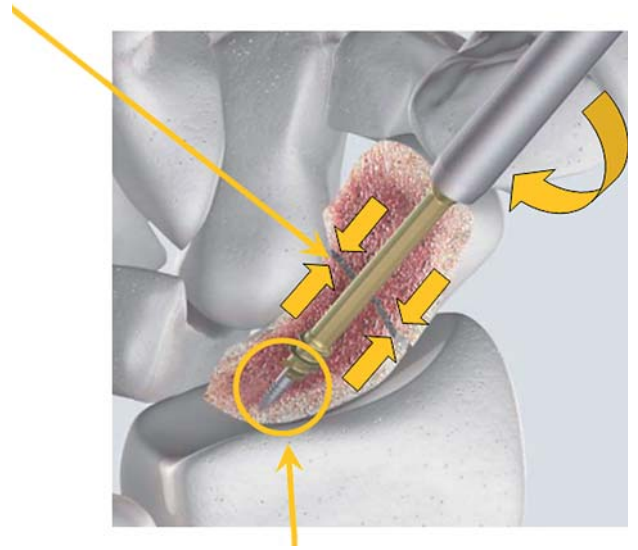
The main feature of the HCS system is the control of closure and compression of a fracture gap, which is achieved by means of the compression sleeve. Once the desired compression is achieved, the screw is advanced into the bone using the screwdriver, and the head is sunk.

The leading and trailing threads of the HCS both have the same pitch. This is to ensure that controlled compression can only be applied by means of the compression sleeve. The trailing thread has a double-start to ensure that the compression sleeve attaches to the trailing thread more readily. The cannulation of the screw allows minimally invasive insertion, as well as more accurate placement of the drill bit and, therefore, the screw. The leading thread tip is self-drilling as well as self-cutting. The trailing thread is also self-cutting. The screw is available in stainless steel and titanium. In addition, there are short and long thread screws to provide extra stability in larger bone fragments. The short threaded screws come in lengths from 10–30 mm in 1 mm increments and from 30–40 mm in 2 mm increments. The long thread screws come in lengths from 16–30 mm in 1mm increments and from 30–40 mm in 2 mm increments.

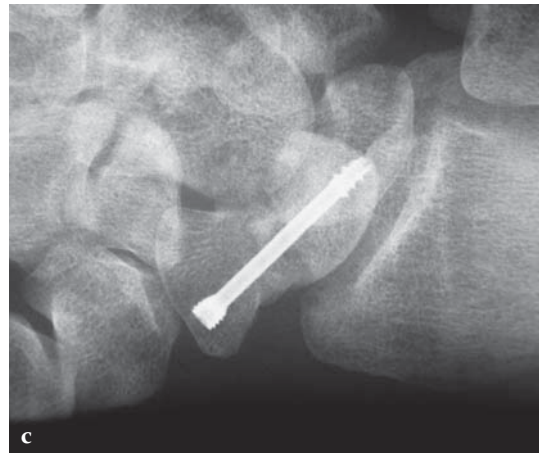
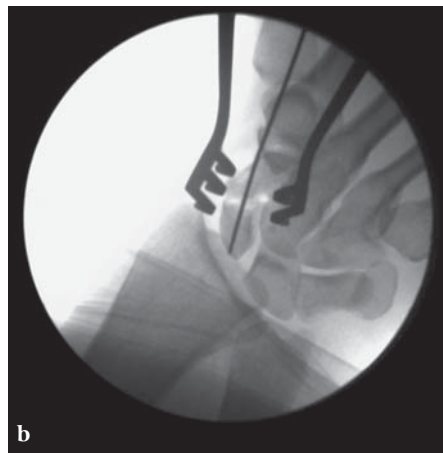
No soft-tissue and cartilage damage because of headless design



Controlled closure and compression of fracture gap thanks to innovative instrumentation



Precise screw placement over guide wire due to cannulated screw design



Acute scaphoid fracture treated percutaneously with the 3.0 mm HCS

- a preop AP
- b intraop AP
- c 2 wks obl

Case provided by D Campbell, Leeds



LCP Radial Head Plates 2.4

The LCP Radial Head Plates 2.4 are indicated for extraarticular and intraarticular fractures of the proximal radius and multifragmented radial neck fractures. The Radial Head Plates have a limited contact low profile, a narrow width to stay in the “safe zone”, and are precontoured for better anatomical fit. They will be available in three lengths with 2, 3, or 4 LCP combination holes in the shaft for 2.4 mm locking head screws. Alternately, 2.4 mm and 2.7 mm cortex screws can be used. The proximal part of the plate with 5 round locking holes allows the setting of a maximum number of locking head screws. The position and the screw angle are anatomically adapted and enable the optimum setting of fractures. The shaft features one elongated sliding hole for optimal positioning of plate.

There will be two plates available in the set: LCP Radial Head Neck Plate 2.4 and a LCP Radial Head Rim Plate 2.4.



The Radial Head Neck Plate 2.4 sits more distal than the Rim Plate on the radial head. It fits both radius. All the proximal screws are angled toward the far cortex of the radial head and screws also diverge axially. This also provides a buttressing support to the articular surface.

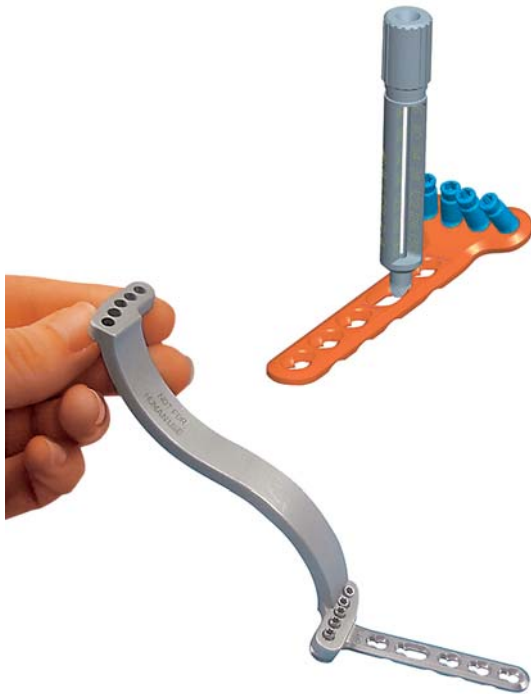
The Radial Head Rim Plate 2.4 will be available in both left and right and has a 5° tilt to match the radial head. The plate offers divergent screw angles axially providing a buttress for the radial head.

Both plates are 1.8 mm thick and tapered to 0.75 mm thickness. They are available in stainless steel and titanium. All plates are fully compatible with the LCP Distal Radius 2.4 set.

Radial Head Neck Plate



Radial Head Rim Plate



LCP Extraarticular Volar Distal Radius Plate: additional instruments

The short 1.8 mm threaded drill guide and insertion handles are instruments for use with the LCP Extraarticular Volar Distal Radius Plate, 4- and 6-hole versions.

The drill guides thread into all locking holes of all Volar Distal Radius Plates, or other plates where 2.4 mm and 2.7 mm locking head screws are used. The drill guide ensures that a screw hole is drilled at the correct angle in the head of an extraarticular plate. Multiple drill guides can be attached at one time in the head of the plate. They allow K-wire insertion. The drill guides are made from stainless steel and come with a T8 Stardrive® recess.

The insertion handle is used with the short 1.8 mm threaded drill guides to position the Extraarticular Volar Distal Radius Plate correctly, and holds the plate in place while drilling. It is designed to keep the surgeon's hand out of the field of view of the C-arm. The material of the handle is aluminum. 4-hole and 5-hole handles are available. One end of the handle is used with right plates and the other end is used with left plates.

Air Pen Drive

The Air Pen Drive (APD) is a pen-shaped high speed, air-driven surgical power tool for small and micro bone surgery.

The set contains a machine washable hand piece, an air hose, 27 attachments (similar to those of the Electric Pen Drive (EPD), already available), as well as similar accessories, such as cutting tools, irrigation nozzles, irrigation tubing, etc. The range of application covers trauma (hand, foot, and shoulder), spine, neuro, as well as craniomaxillofacial surgery.

The APD is the first air-powered high-speed system with integrated irrigation for the prevention of heat necrosis during cutting. Unlike the EPD it does not require a console, and is therefore easier for the OR staff to assemble and handle. In case of enhanced bone resistance the APD's torque decreases, providing the surgeon with an authentic sense of drilling.

It is both a robust and light-weight device. It can be used either with the detachable hand switch, with telescopic extension for better control, or with a foot switch with a large pedal and an extra button for irrigation. The air hose is 3 m in length.

Other important features are:

- Quick and easy fixation and loosening of tools (click-in wherever possible)
- Quick and stable coupling of attachments on hand piece through cone coupling
- Torque-limited screw insertion



Keith Mayo

NEW PELVIC PRODUCTS



Spring Plate 3.5

The Spring Plate 3.5 is intended for pelvic and acetabular reconstructive surgery. The plate is 10 mm wide and 1.2 mm thick. The bone surface has two 1.5 mm sharp teeth and a concave surface that is prebent to a 50 mm radius. It comes in lengths of 1–4 holes and will be available in stainless steel.

The Spring Plate 3.5 is intended to help reduce and stabilize small bone fragments when the fragments are too small to use a screw. Comminuted posterior wall fractures of the acetabulum are the most common indication. Plate function is achieved by sinking the teeth into the small fragments as a screw is tightened through one of the screw holes adjacent to the fracture margin. The screw transfers the prestress of the concave plate to a compressive force on the fragments, essentially acting as a permanent clamp. Alternatively this effect can be achieved with the low-profile pelvic reconstruction plate 3.5 which overlies the provisionally placed spring plate. As the reconstruction plate is lagged to the bone, the fracture fragments are compressed.

The Spring Plate may also be used occasionally in periarticular extremity applications.

18-year-old male—missed injury

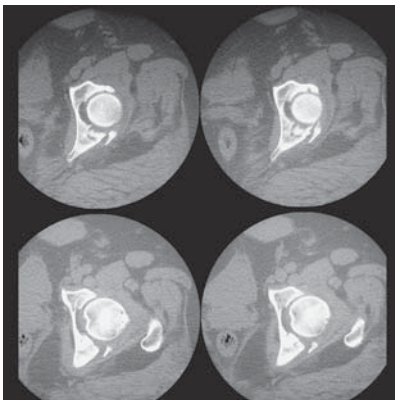


Fig 1
CT scans 8 weeks following injury date showing extensive marginal impaction and relatively small posterior rim fragments.

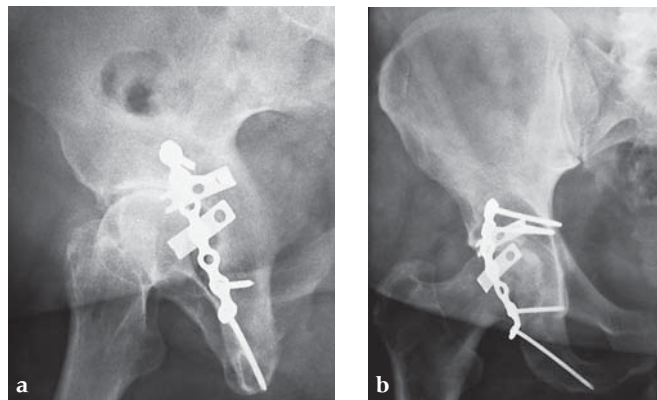


Fig 2a–b
6 month follow-up AP and obturator oblique x-rays showing reconstruction plate buttressing two spring plates. The superior plate is a modified one-third tubular plate and represents the forerunner of the production plate which is seen inferiorly. Joint space narrowing likely represents combined presurgical cartilage loss and secondary subsidence of elevated and grafted areas of marginal impaction.

Case provided by Keith Mayo, Tacoma



Aluminum Radiolucent Retractors

The Aluminum Radiolucent Retractors are intended for soft-tissue retraction during osteosyntheses. They allow fluoroscopic imaging without the need to remove and reinsert critical retractors. These are identical in design to current stainless steel versions used for extremity or hip and pelvis surgery.

Dankward Höntzsch, Dean Lorich, Christoph Sommer, Phil Kregor, Keith Mayo, Michael Blauth, Sean Nork

NEW LOWER EXTREMITY PRODUCTS

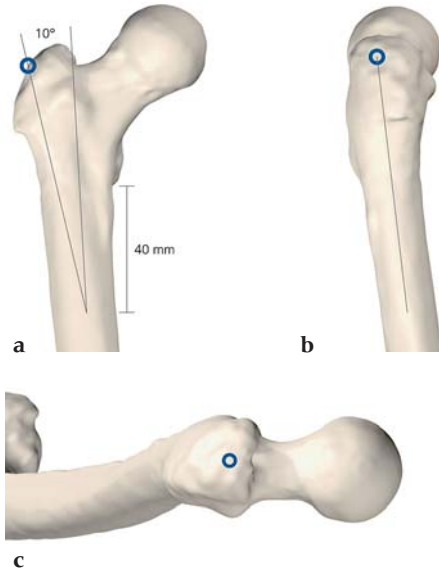


Fig 1a–c

Expert Lateral Femoral Nail (LFN)

The Lateral Femoral Nail (LFN) allows a lateral entry site through the greater trochanter. The anatomic design is based on a femoral canal study. The helical shape has a 10° femoral anteversion.

The AO chose a lateral entry point because of the easy access to the entry site. This lowers the risk for an avascular necrosis in adolescents. No splitting of the gluteus medius is needed and the damage of the gluteal medial tendon attachment minimized. Furthermore, the medial wall of the trochanter major is left intact.

The insertion point for the LFN is approximately 20 mm lateral to the center of the medullary canal, and 10° lateral to the greater trochanter, as measured from a point about 40 mm distal to the lesser trochanter (Fig 1). It is recommended to use the flexible reamer. The insertion follows the helical design: at the beginning the aiming arm shows anterior and turns continuously 90° helical to the lateral position at the end position.

The LFN is cannulated and will be available in two versions, either with standard and recon locking or with standard locking alone (only in US). The locking options have been enhanced. In proximal locking, the following options exist:

- 120° antegrade locking hole
- Transverse slot for either static or dynamic locking
- Two 6.5 mm recon locking holes (recon locking nail)

There are three distal locking options:

- Two transverse, lateral to medial holes
- One oblique distal locking hole offers enhanced stability of distal fractures

Indications for the LFN with standard locking (Fig 2) are:

- Shaft fractures
- Impending pathologic fractures
- Nonunions, malunions

Indications for the LFN with recon locking (Fig 3) are:

- Ipsilateral neck/shaft fractures
- Subtrochanteric fractures
- Shaft fractures
- Impending pathologic fractures
- Nonunions, malunions



Fig 2

Fig 3

The LFN is available in a left and right version with diameters from 9–16 mm and lengths from 300–480 mm in 20 mm increments.

Cannulated, Stardrive® end caps prevent ingrowth of soft tissue and facilitate nail extraction. The end caps can also be used to increase nail lengths.

The 5.0 mm and 6.0 mm standard locking screws feature a double-lead thread for ease of insertion. The thread is closer to the screw head which provides better bone purchase in the near cortex and improved stability.

For the recon locking nail, 6.5 mm recon screws are available.

The LFN, as part of the expert nail family, allows the use of many instruments from the other systems such as drill sleeves, screwdrivers, depth gauges etc. The LFN has a color coding system to ease handling.

**34-year-old male—polytrauma—traffic accident—
AO Classification 32-C3**

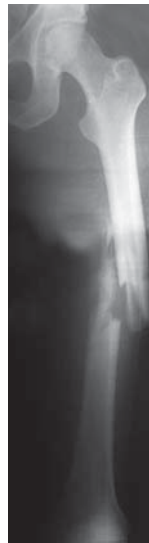


Fig 1
X-ray pre-operative

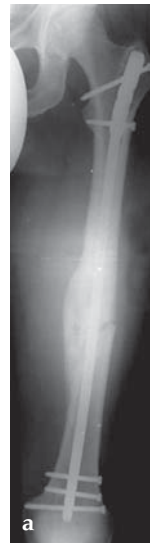


Fig 2a–b
X-rays 18 weeks postoperative



Fig 3a–b
X-rays 8 months post-operative

53-year-old male—fallen in the bus—AO Classification 32-B1.1

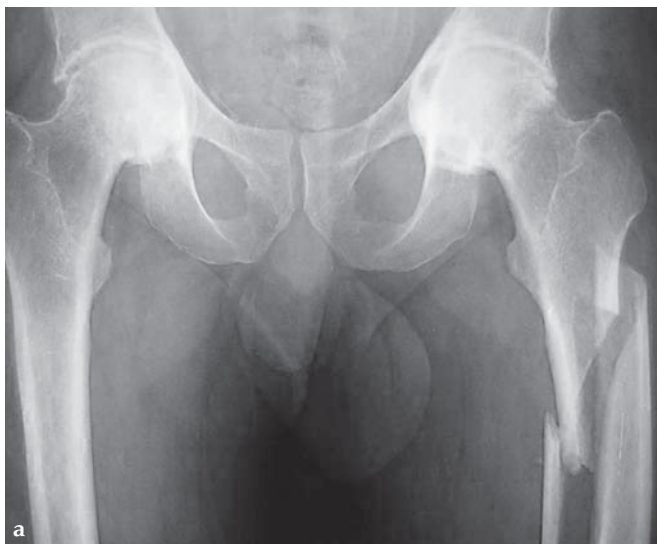


Fig 1a–b
X-rays preoperative



Fig 2a–b
X-rays 8 days post-operative



Fig 3a–b
X-rays 12 months postoperative

Cases provided by Hermann Bail, Berlin



Trochanteric Fixation Nail (TFN): line extension

The Trochanteric Fixation Nail (TFN) is a cannulated, intramedullary nail system with a helical blade, end caps, locking bolts and screws. All of the implants are made of titanium alloy. The TFN system is indicated for stable and unstable fractures of the proximal femur including per-trochanteric, basal neck fractures, as well as a combination of these.

The TFN is available in two sizes, short in lengths of 170 mm and 235 mm, and long in lengths of 300–460 mm. Additional to the existing diameters of 10 mm, 11 mm and 12 mm, the TFN is now also available in 14 mm diameter.

The 11.0 mm Titanium helical blade provides improved resistance to varus collapse and rotational control of the head-neck fracture segment. The result is superior life to cut-out versus single screw fixation and reduced bone removal versus a traditional hip screw. The helical blade is now available in additional lengths of 75 mm, 125 mm and 130 mm. A choice from 75–130 mm in 5 mm increments en-ables selection of the appropriate blade according to the patient's anatomy.

LCP Dynamic Hip Screw (DHS)

The LCP DHS is a modification of the existing DHS. It allows for angular stable fixation with the bone due to the new combination holes in the shaft. Furthermore, undercuts and a bullet nose at the distal end have been added to all plates. The surgical technique of the LCP DHS is the same as for the DHS, except that the bullet nose allows for an easier MIPO technique. The LCP DHS plate has an increased pull-out resistance due to angular stability which is especially useful in osteoporotic bone.

The indications are basically the same as for the DHS, pertrochanteric and intertrochanteric fractures of type 31-A in the AO Classification, and femoral neck fractures 31-B, in conjunction with the use of an antirotation screw.

The LCP DHS is available in stainless steel and titanium. Plates with up to 20 holes (long barrel length) and up to 6 holes (short barrel length), are available for all angles.





Universal Locking Trochanter Stabilization Plate

The Universal Locking Trochanter Stabilization Plate is intended to treat stable and unstable intertrochanteric, subtrochanteric, pertrochanteric, and basilar neck fractures when used in conjunction with the Dynamic Hip Screw (DHS) or the LCP Dynamic Helical Hip System (DHHS) side plates with 4 or more holes.

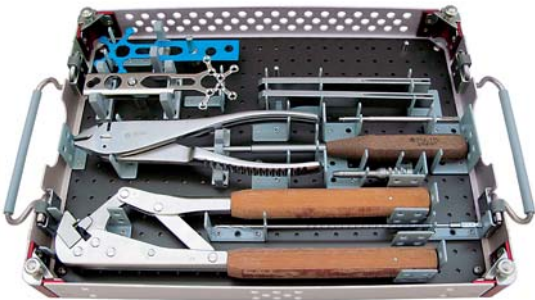
Using the plate limits the possibility of varus deformation of the proximal fragment, with cut out of the screws and medialization of the distal femoral fragment, without impairing function and dynamization capacity of the DHS.

The Universal Locking Trochanter Stabilization Plate limits diaphyseal medialization by fastening onto the greater trochanter relief. The additional proximal internal fixation can be achieved by using 3.5 mm locking head screws. Cerclage is still possible.

With the introduction of the DHHS and the combination holes, the existing Locking Trochanter Stabilization Plate designed for use with the DHS only, had to be adapted.

The changes of the Universal Locking Trochanter Stabilization Plate are:

- In the proximal hole of the plate shaft the size of the slot/cut out was enlarged to allow for placement of the DHHS compression screw, which is bigger than the DHS compression screw.
- The second most distal hole was enlarged to accommodate screw placement in both DHS and DHHS.
- The most distal hole was changed to a double hole for affixing the plate to the bone through both the DHS and DHHS, which enlarges the plate.





LCP Proximal Femoral Hook Plate 4.5

The LCP Proximal Femoral Hook Plate 4.5 is a stainless steel plate with a limited-contact profile. The proximal portion of the plate is anatomically contoured to approximate the lateral profile of the proximal femur with two proximal hooks for engaging the greater trochanter. The proximal screw hole accepts 7.3 mm cannulated locking and 7.3 mm cannulated conical screws, oriented at 95° to the plate shaft. The second locking hole accepts a 5.0 mm cannulated locking screw, oriented at 110° to the plate shaft and is angled to converge with the proximal 7.3 mm screw. The remaining screw holes are combination holes and accept 4.0 mm or 5.0 mm locking head screws in the threaded portion or 4.5 mm cortex screws in the dynamic compression unit (DCU).

The LCP Proximal Femoral Hook Plate 4.5 is indicated for fractures in the peritrochanteric and subtrochanteric region of the femur that have in common a primary fracture plane that can be tensioned (compressed) utilizing the plate to create a load sharing construct. The most frequent of these patterns are the reverse obliquity and transverse (true intertrochanteric) fractures. The typical insertion technique involves seating of the trochanteric hooks followed by proximal screw insertion (taking into account frontal and sagittal alignment). The side plate is then reduced to the shaft with an atraumatic plate reduction forceps. Horizontal plane alignment (rotation) is then verified and the plate is tensioned utilizing the articulated tension device (ATD). Side plate fixation follows.

The plate is also useful for ipsilateral combinations of the above patterns with shaft fractures. Nonunions and malunions in this region that meet the criteria of compressibility are also well suited to this plate.

An additional important indication is periprosthetic fracture about the femoral component of a total hip arthroplasty. The trochanteric fixation of the plate (both hook and screws) affords improved proximal fixation, in many cases limiting the need for circlage wires and screws angled around the stem. Compression of primary fracture planes remains desirable in the periprosthetic setting, but is often not possible and does not limit the utility of the plate in this clinical setting.

The Plate is available in lengths of 133–385 mm, or 2–16 holes.

83-year-old male—trapped under tree he had cut down—IDDM, HTN, CAD, etc—Jehovah’s witness—on Plavix



Fig 1a–b

Open procedure hosp day 2

- EBL 350cc
- Prox wound to fracture, distal to tension

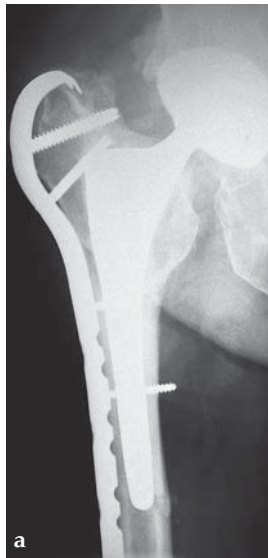


Fig 2
6 weeks post-operative

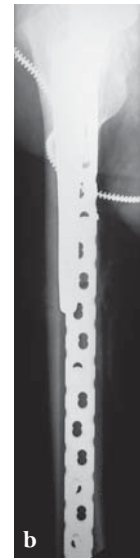


Fig3a–c
4 and 5 months postoperative

46-year-old female with an transverse intertrochanteric fracture

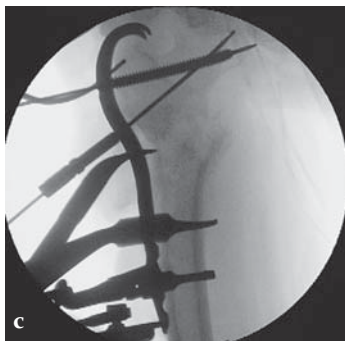
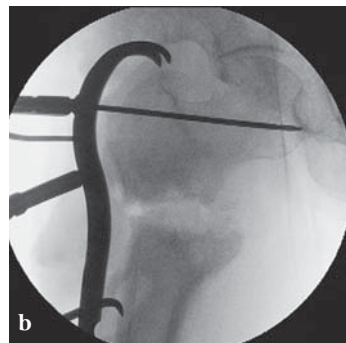
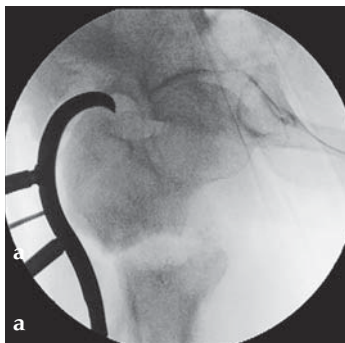
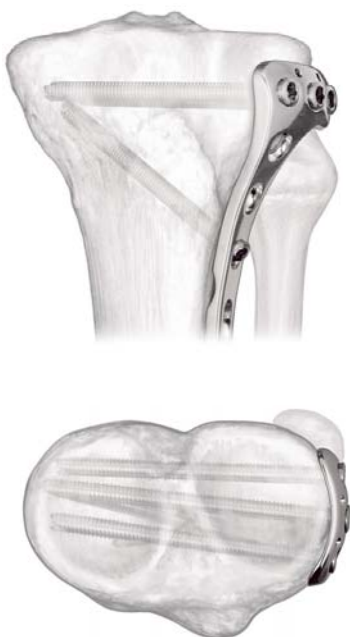


Fig 1a–c
Intraoperative x-rays with ATD attached



Fig 2a–b
X-rays 6 months after surgery

Cases provided by Keith Mayo, Tacoma



Expert Tibia Nail System (TNS): End Cap with extended tip

The Expert Tibial Nail System (TNS) is an intramedullary nailing system which covers the indications of the PTN and the UTN/CTN, plus more proximal and more distal indications. The TNS has a 10° bent which eases nail insertion and extraction, and gives the nail a better anatomic position in the intramedullary canal.

The existing “golden” End Caps are designed to lock with the most proximal locking screw to create a fixed angle construct. They may also be used to extend nail height if the nail has been overinserted. Because of the many locking options and the short thread profile of the End Cap, an exact axial alignment of nail, End Cap and screw driver is needed to engage. Especially if the nail translates slightly posterior underneath the tibial plateau, insertion of the End Cap may become difficult. Furthermore, achieving a perfect axial alignment to the top of the nail may be difficult if a proximal locking screw is not used.

The new “gray” End Caps have a longer tip to help guide the End Cap into the top of the nail, making it easier to insert. Furthermore, the “gray” End Caps have a lead-in design so when inserted, the End Cap automatically aligns with the top of the nail. The End Caps are cannulated for use over a guide wire. Available lengths are 0, 5, 10, and 15 mm.

LCP Proximal Tibia Plate 4.5: line extension

The LCP Proximal Tibia Plate 4.5 is intended for treatment of non-unions, malunions, and fractures of the proximal tibia, including simple, comminuted, lateral wedge, depression, medial wedge, bicondylar, combinations of lateral wedge and depression, and fractures with associated shaft fractures.

The LCP Proximal Tibia Plates 4.5 are available in stainless steel and titanium with a limited-contact profile. The proximal portion of the plate is anatomically contoured to approximate the lateral profile of the proximal tibia. The shaft screw holes are 4.5 mm locking compression holes. The plates come in a left and right version. They are now also available in 16-, 18-, and 20-hole lengths (298–370 mm), in addition to the existing 4–14-hole lengths (82–262 mm).

LCP Medial Proximal Tibia Plate 3.5 and 4.5

The LCP Medial Proximal Tibia Plates 3.5 and 4.5 are part of the LCP periarticular plating system. They are intended to buttress metaphyseal fractures of the medial tibia plateau, split-type fractures of the medial tibia plateau, medial split fractures with associated depressions and split or depression fractures of the medial tibia plateau. The plates may also be used for fixation of the proximal quarter (lateral and medial) of the tibia as well as segmental fractures of the proximal tibia. The 4.5 version may also be used for fixation of nonunions and malunions of the medial proximal tibia and tibia shaft, as well as opening and closing wedge tibial osteotomies.

The plates have a limited contact profile. The plate head is anatomically contoured to approximate the anteromedial proximal tibia. The plates feature 3 locking screw holes proximally, with trajectories parallel to the joint. These proximal locking head screws also converge in the lateral condyle. The 2 angled locking screw holes in the proximal part of the shaft converge with 2 of the proximal screws in the head of the plate.

The 3 convergent threaded screw holes in the head of the plate 4.5 accept 5.0 mm cannulated locking and 5.0 mm cannulated conical screws, while the plate 3.5 accepts 3.5 mm locking and 3.5 mm conical screws. The screw-hole pattern allows a raft of subchondral locking head screws to buttress and maintain reduction of the articular surface. This provides fixed angle support to the tibial plateau. Additionally, there are two 2.0 mm K-wire holes available for preliminary fixation with K-wires or meniscal repair with sutures.

Both plates are available in left and right versions. The 3.5 plate system is available from 2–20-hole lengths, the 4.5 version from 2–16-hole lengths. All plates come in either stainless steel or titanium.



57-year-old male—motor accident

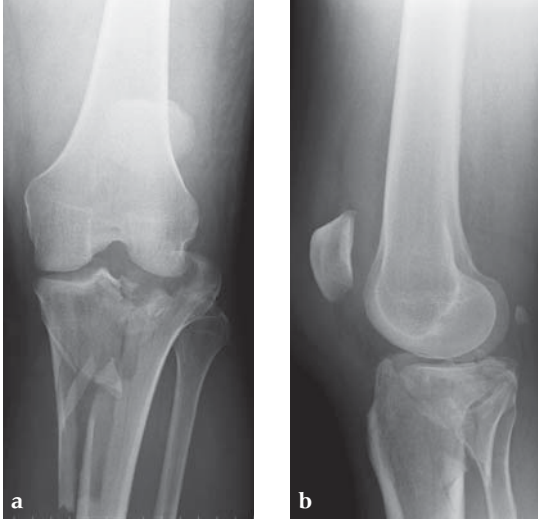


Fig 1a–b
Preoperative x-rays

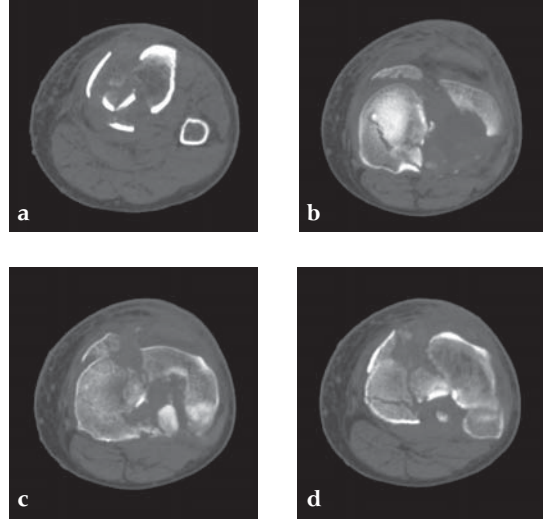


Fig 2a–d
Preoperative CT



Fig 3
Postoperative x-rays

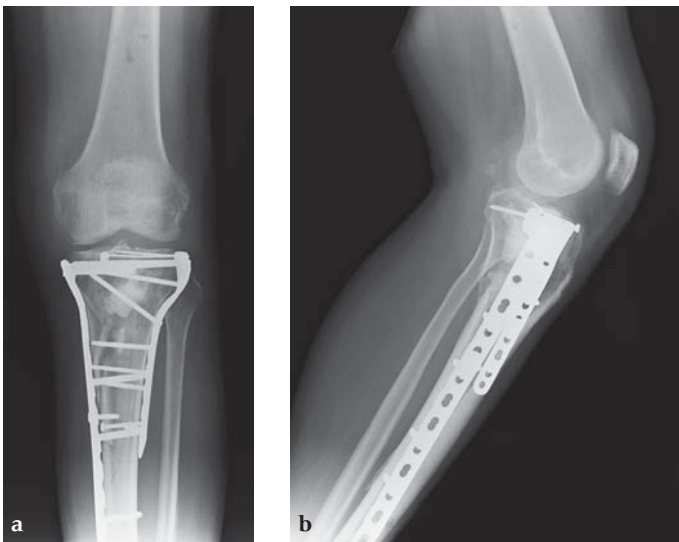
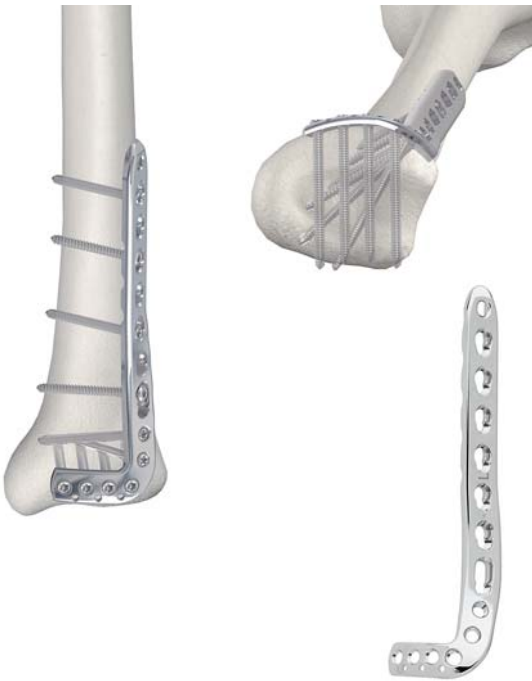


Fig 4a–b
6 weeks follow-up

Case provided by Phil Kregor, Nashville



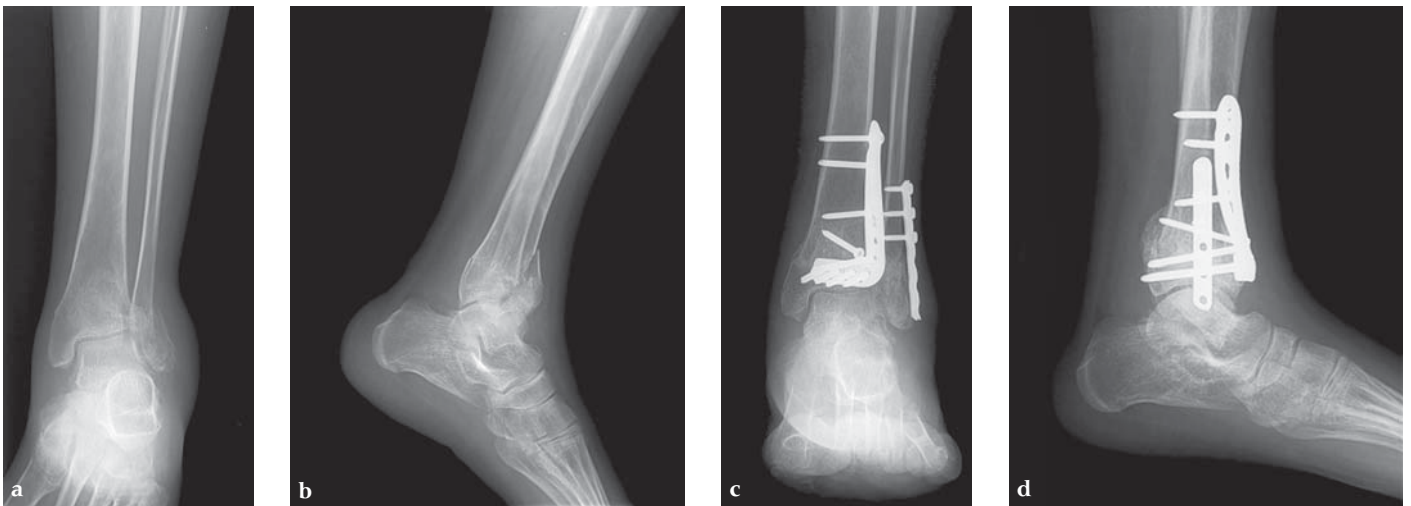
LCP Anterolateral Distal Tibia Plate 3.5

The LCP Anterolateral Distal Tibia Plates 3.5 are indicated for fixation of fractures, osteotomies, nonunions and malunions of the distal tibia, particularly in osteopenic bone, and in cases with bad soft tissue or wounds at the anteromedial side. The plate has a 60° twist in the shaft to fit to the distal tibia anatomy. The plate width in the shaft was increased, and a proximal hole added for compression or distraction with the articulated tension device. The 3.6 mm shaft thickness tapers to 2.5 mm distally. The plate has a low profile which is optimal for the anterior surface of the distal tibia with little soft-tissue coverage.

An increased variety of distal screw options enables screw placement according to the fracture pattern. 4 distal screw holes are angled 7° inferiorly to capture the posterior malleolus, Volkman's triangle and the Chaput fragment. 3 K-wire holes in the head, parallel to the joint, accept 2.0 mm K-wires to temporarily fix the plate to the distal tibia, temporarily reduce articular fragments, and show proximity to the joint.

The plate is available in lengths from 80–288 mm, shaft holes from 5–21, and comes in either stainless steel or titanium.

28-year-old woman had a high energy motor vehicle collision and sustained an isolated distal left tibial fracture.



a–b Preoperative x-rays AP and lateral

c–d Follow-up x-rays at 4 months after treatment with the anterolateral distal tibial plate and fibular plating



LCP Medial Distal Tibia Plate w/o tab 3.5

The LCP Medial Distal Tibia Plates 3.5 are indicated for fixation of complex intra- and extraarticular fractures and osteotomies of the distal tibia.

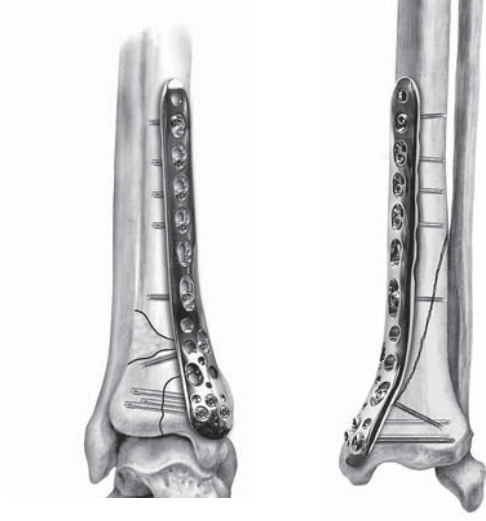
The LCP Medial Distal Tibia (LCP MDT) has a lower profile distally which is optimal for the medial side of the distal tibia where there is often little soft-tissue coverage. Since certain fracture patterns require more distal screw options, the LCP MDT has three diverging distal screws above the joint that capture the anterior and posterior fragments and place the plate more distally. The 3 distal locking head screws diverge across the subchondral bone. The distal locking holes accept 3.5 mm locking head screws, 2.7, 3.5 and 4.0 mm cortex screws.

Additionally, 2 combination holes were added distally in the head of the plate to allow placement of cancellous and cortex screws. These 2 combination holes distally accept 3.5 mm locking head, 3.5 mm or 4.0 mm cortex, or 4.0 mm cancellous bone screws. The distal K-wire hole accepts a 1.6 mm K-wire.

The plate shaft has been widened to 13.5 mm, which is comparable to a narrow LC-DCP 4.5. At the proximal end of the plate, an articulated tension device (ATD) hole was added to allow for compression and distraction using the articulated tensioning device.

The plate shaft ranges from 4–14 combination holes.

The LCP MDT 3.5 is available in stainless steel (316L) and titanium.



29-year-old female after a motor vehicel crash



Fig 1a–b
Multiple fractures, including this right closed distal tibial metaphyseal fracture

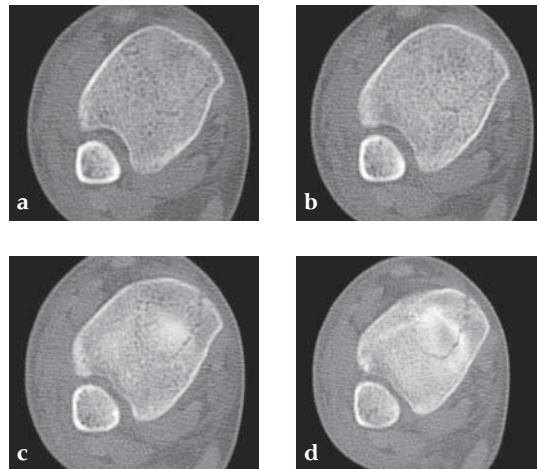


Fig 2a–d
CT scan confirming the nondisplaced fracture extension into the distal tibial articular surface

29-year-old female after a motor vehical crash (cont)

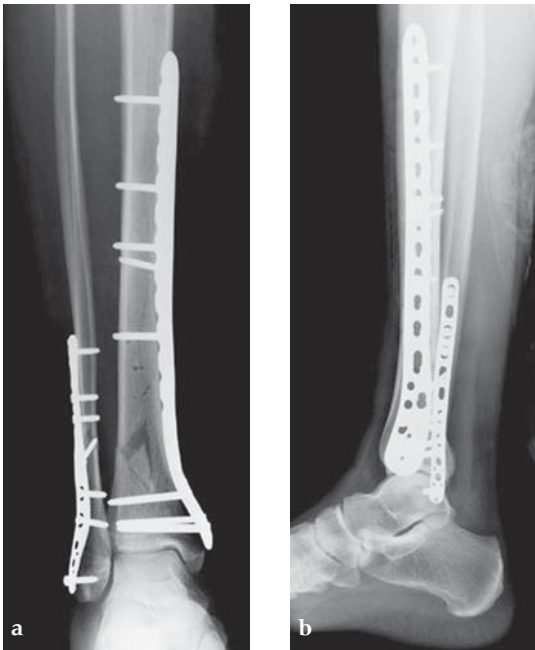


Fig 3a-b

The fibula was reduced and stabilized through a posterolateral surgical approach. A small anterior incision was used to apply multiple clamps and to access the fracture reduction. A medial locked distal tibial plate was placed adjacent to the anteromedial surface of the tibia through a 4 cm distal incision. Multiple proximal screws were placed through small incisions overlying the plate. The postoperative x-rays demonstrate the reduction.

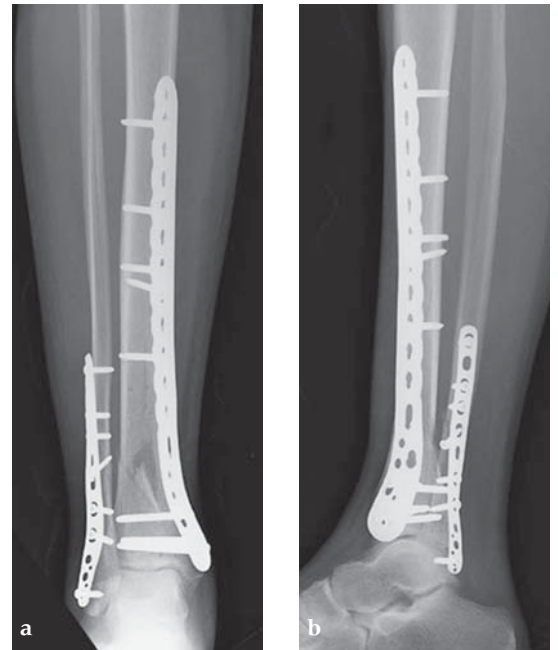


Fig 4a-b

Healing proceeding uneventfully as shown in the 6-month x-ray

Case provided by Sean Nork, Washington



LCP Attachment Pin 6.0 mm

The 6.0 mm LCP Attachment Pin is an instrument used for attaching a plate to a clamp or rod to manipulate plate. It is a reduction aid used to provide a method of attaching a locking plate to the femoral distractor. The pin fits in the threaded portion of the standard 5.0 mm LCP hole. The pin has a 6.0 mm shaft to interface with the clamp and three flats for use with a T-handle chuck.



Cannulated Conical Screw 7.3 mm

The 7.3 mm Cannulated Conical Screws were first introduced together with the Locking Condylar Plate. The screws are partly threaded, self-drilling and self-tapping and made from stainless steel. Until now, the available lengths have ranged from 40–90 mm.

For surgeons who wish to go through the 4.5 mm LCP proximal femur plates to gain compression in the neck and head of the femur, additional lengths from 100–145 mm in 5 mm increments are now available.



Hexagonal Screwdriver Shaft 200 mm

Shorter screwdriver shafts are now available for use with the 6.5/7.3 mm cannulated screw set in tight areas. The new 200 mm Hexagonal Screwdriver Shafts are offered either solid or cannulated. They are made of stainless steel.



Periprosthetic Locking Screw 5.0 mm

Periprosthetic Locking Screws are intended for use monocortically with locking compression plates (LCP) for the fixation of fractures when an intramedullary component is in place. The screws are used to gain as much purchase in the bone as possible, without hitting the prosthesis. The existing Periprosthetic Locking Screws in 8–12 mm lengths are primarily used in the 4.5 mm broad plate, the 4.5 mm locking condylar plate, and the LISS, where periprosthetic fractures are involved. Longer periprosthetic screws in 14 mm and 18 mm length are now available. The Periprosthetic Locking Screws have a bunt-nose tip to allow bony contact with more screw threads. They have a T25 Stardrive® recess and are self-tapping. They are available in stainless steel and titanium.



T15 and T25 Hex Cerclage Buttons

The existing Hex Cerclage Buttons do not fit Stardrive® recesses since their pins are larger. Therefore, new T15 and T25 Hex Cerclage Buttons were designed to fit both Stardrive® and hex recesses at the same time. The new T15 Cerclage Button replaces the former 2.5 mm Cerclage Button, the T25 replaces the 3.5 mm Cerclage Button.

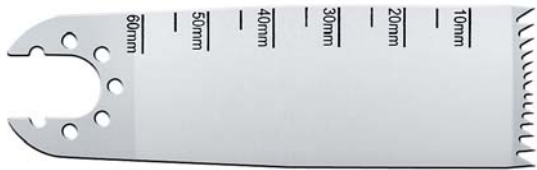


Cannulated Seating Chisel for adult angled blade plate

The Cannulated Seating Chisel is an instrument indicated for the creation of a seating pathway for an adult angled blade plate. The Cannulated Seating Chisel features a cannulation for use with a 2.5 mm threaded guide wire, spade point 230 mm, and etched markings to provide direct blade length measurement on the chisel.

Philipp Lobenhoffer

NEW KNEE PRODUCT



Self Centering Saw Blade with parallel opposing teeth

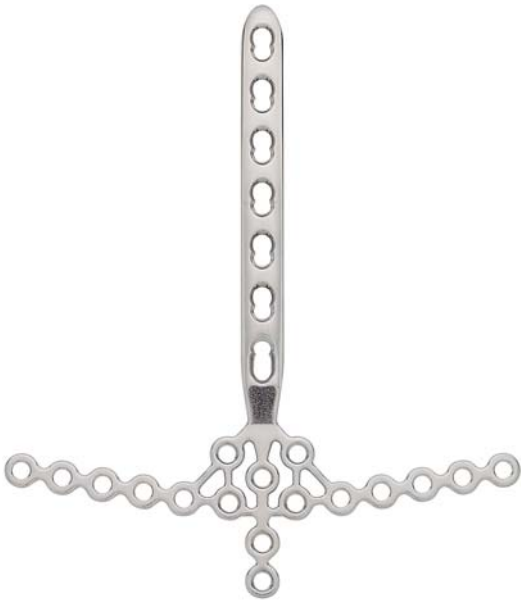
The Self Centering Saw Blades with parallel opposing teeth (aggressive) are indicated for total hip and total knee replacement. They have a better saw performance (more cut in less time), better saw controllability by a self-centring effect, lower temperature development of the saw blade, and perfect saw feeling. They ensure precise control within the cutting block due to the aggressive design of parallel opposing teeth.

The blades are available sterile and nonsterile and in the following dimensions.

Useable Length (mm)	Width (mm)	Thickness of cut (mm)
95.2	19	0.90
95.5	25	0.90
60.5	25	0.90
95.5	19	1.25
95.5	25	1.25
95.5	19	1.40
95	25	1.40
91.5	12.5	0.90

Andy Sands

NEW FOOT PRODUCTS



LCP Pilon Plate

The treatment of multifragmentary fractures of the distal tibia with joint involvement, especially in combination with poor bone quality, is challenging. The double plating technique and the cloverleaf plate have a high rate of unsatisfactory results. Small fragments often cannot be secured with screws, extensive soft-tissue stripping is needed and the plate profile is thicker.

The LCP Pilon Plate is indicated for any fracture around the distal tibia, especially intraarticular and comminuted fractures. The LCP Pilon Plate is highly versatile. It can be used for either the left or right tibia because it can be easily contoured for precise anatomical fit and adaptation to the fracture. Unnecessary plate holes can be removed by a cutting device. The LCP Pilon Plate can be placed either in anterolateral or medial position. The plate has 5 locking holes in each arm, 2 distal locking holes, and a "web-like" design distally with 5 locking holes. Combined with the possibility of using both locking head and standard screws in different dimensions (3.5 mm locking head screws, 2.7, 3.5, and 4.0 mm cortex screws), the surgeon has many options to choose from for the fixation of different fractures around the distal tibia.

The LCP Pilon Plate is available in a 7- or 9-hole LCP shaft version. The new version of the LCP Pilon features an unscaloped plate shaft which makes the plate stiffer and biomechanically more stable. The bending pliers and cutter have been modified accordingly. The plate is available in stainless steel and titanium.

21-years-old male fell from a height of 5 m (under influence of ethanol 1.3 g/l, cannabis +)



This Pilon fracture was classified as 43-C3.2. In emergency: provisional fixation by external fixator tibia-calcaneus. ORIF on day 5 after trauma: a lateral S shaped incision for the fibula and the chaput tubercle, and a large anteromedial one,

following the tibial crest and slightly curved below the medial malleolus. Large femoral distractor tibia-talus used intraoperatively. No plaster cast.

Case provided by Patrick Cronier, Angers

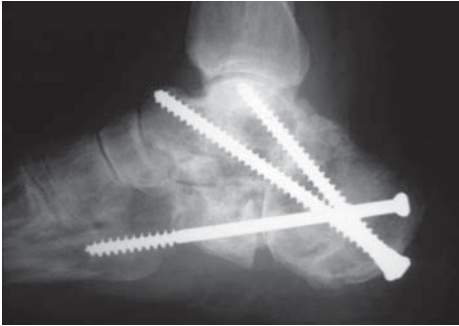


Cancellous Screw 6.5 mm with 4.0 mm core diameter

The 6.5 mm Cancellous Screw with 4.0 mm core diameter is indicated for foot and ankle fusions.

The 4.0 mm core diameter provides for 35% more strength in bending and 37% in torsion when compared to the standard 6.5 mm Cancellous Screw. The screws are fully threaded. The low profile screw head reduces soft-tissue irritation. It uses a 3.5 mm hex. The screw is available in stainless steel and titanium.

The screws are available in lengths from 60–130 mm.



Case provided by Andy Sands, New York

Dankward Höntzsch

NEW EXTERNAL FIXATOR PRODUCTS



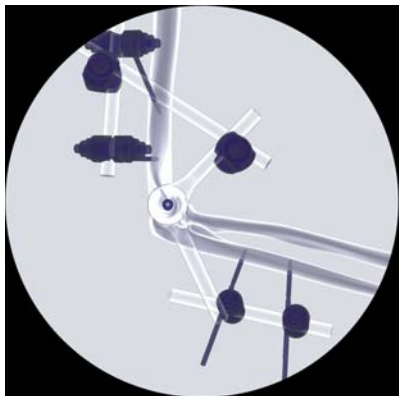
Elbow Hinge Fixator

Complex injuries of the elbow may in some cases exhibit persistent instability despite soft-tissue (ligament) reconstruction and fracture fixation. An unstable elbow may therefore need to be additionally protected and mobilized early to restore adequate function as quickly as possible.

The Elbow Hinge Fixator allows a stable and joint-bridging fixation of unstable elbows. It enables an early postoperative, physiological-like (flexion/extension) movement of the elbow joint. It is indicated for delayed treatment of a dislocated and stiff elbow, persistent instability of the elbow, elbow instability following complex ligament injuries, reduced, unstable elbow fractures, and additional stabilization of post-operative unstable internal fixation.

The Elbow Hinge Fixator consists of two carbon fiber rods, which are interconnected by means of a riveted bolt to allow a hinge-like movement. The cylindrical ends of the hinged device can be connected to the standard large and medium carbon fiber rods by means of rod-to-rod (11 mm) or combination (11 mm/8 mm) clamps. The hinged rod is made of a radiolucent material, carbon fiber reinforced PEEK, which allows a better visualization of the injury site. Only the cannulated riveted bolt is made of stainless steel to provide sufficient stability and to help identify the anatomical flexion-extension axis of the elbow joint.

The Elbow Hinge Fixator is compatible with the existing external fixator components.



65-years-old female—luxation and resection of radial head



Fig 1
Intraoperative x-ray

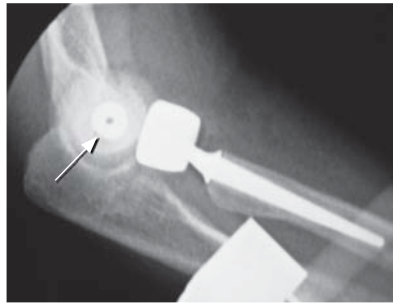


Fig 2
Postoperative x-ray

Case provided by Dankward Höntzsch,
Tübingen



Fig 3
Assembly of External Fixator
with Hinged Rod



Fig 4a-b
After removal



Medium Open Compressor

The Medium Open Compressor is an intraoperative and postoperative instrument which clamps onto the rods of an external fixation frame and provides compression or distraction. It is similar in design to the existing Large Open Compressor and Small Open Compressor which are used for the Large (11 mm diameter) and Small (4 mm) External Fixators. The Medium Open Compressor operates with either an 8 mm or 6 mm diameter rod making it compatible with the Medium External Fixator and the Low Profile Wrist Fixator. The Medium Open Compressor comes in stainless steel. One turn achieves 1 mm of either compression or distraction. It has an 8 mm external hex and an 3.5 mm internal hex.

Theddy Slongo

NEW PEDIATRIC PRODUCTS



LCP Pediatric Hip Plate

The LCP Pediatric Hip is intended for use in pediatrics (children and adolescents from 2–16 years) and for small stature adult patients. Indications include intertrochanteric varus and valgus osteotomies, derotation osteotomies, combined intertrochanteric correction osteotomies, as well as femoral neck and pertrochanteric fractures.

The LCP Pediatric Hip adapts to the anatomy of the adolescent proximal femur. It features universal design for the left and right side. All implants are made of stainless steel and are available in two sizes: small for children from 4–8 years (depending on their physical development) and large for children from 8–16 years and small stature adults. The design of the plates for varus/valgus osteotomies, derotation osteotomies, as well as fracture stabilization is different as every plate is designed according to the special requirements.

The varus osteotomy plates have an offset (8 mm for small and 10 mm for large plates). All plates have 3 locking head screw holes in the upper part of the plate and 3 combination holes in the shaft, except for the fracture stabilization plate which has 4 holes in the shaft.

The two plates for varus osteotomies are available with either a 100° or a 110° screw angle which allows for placement of the proximal head screws in the center of the proximal head axis. The plate for valgus osteotomy is available with a 150° screw angle. The plate for trauma and derotation osteotomy has a 120° screw angle, according to a lower Centrum-Collum-Diaphysis (CCD) angle.

Depending on the indication, the LCP Pediatric Hip can be applied in two different surgical techniques:

If a maximal varus correction needs to be achieved, as for the treatment of adolescents with neuromuscular disease and “nonwalking children”, the so called “fixed neck/shaft CCD angle technique” is recommended. The plate defines the correction through the fixed plate-screw angle (100° or 110°). This ensures optimal placement of the screws in the proximal head as well as a perfect correction.

If a defined-planned correction has to be performed, the calculated neck/shaft CCD angle technique is more appropriate. In this case, the selection of the optimal plate in the preoperative planning determines the placement of the proximal head screws according to the plate. This technique is recommended for idiopathic malpositions, morbus perthes, etc.

4-years-old female, CP, good walker

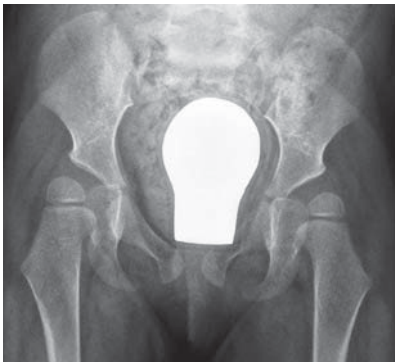


Fig 1
Hip instability due to severe hip dysplasia and severe coxa valga



Fig 2
Abduction shows an acceptable containment; a 35° varus OT bilateral in combination of a triple OT on the right is planned

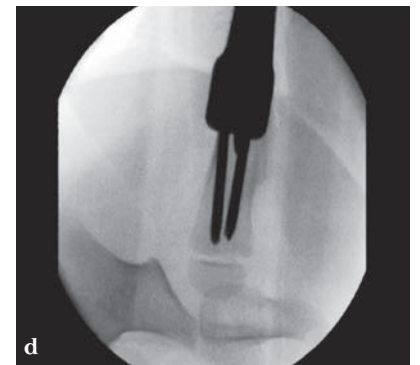
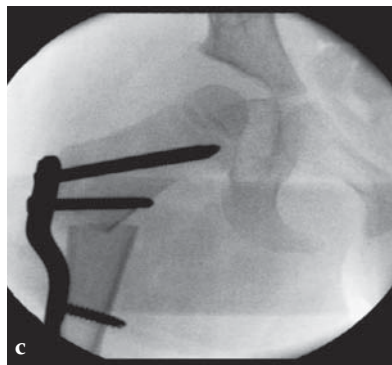
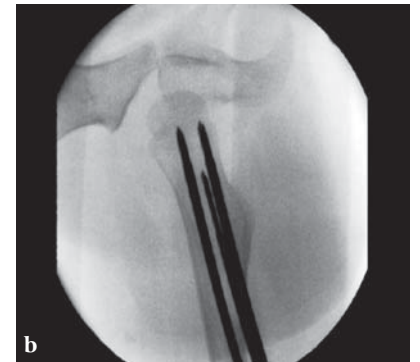


Fig 3a-d
a-b Intraoperative x-ray
c-d Postoperative x-ray with planned correction

Case provided by Teddy Slongo, Berne

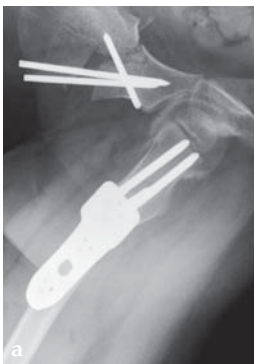


Fig 4a-b
Postoperative x-ray with planned correction

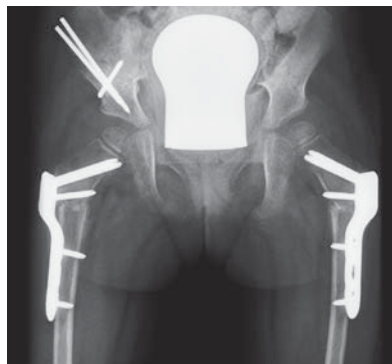


Fig 5
X-ray after 7 weeks, postoperative treatment with hip spica due to triple OT show good healing

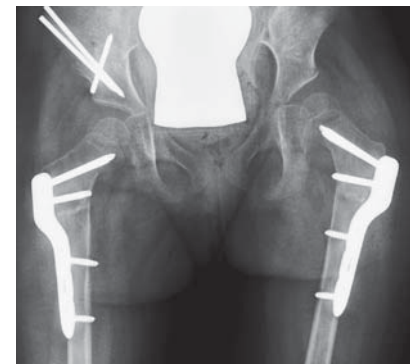


Fig 6
X-ray after 11 weeks, in turn the child can run well. The triple OT is now planned on the left!

Christian Ryf, Markus Arigoni

NEW BIOMATERIALS



chronOS Inject: An injectable, osteoconductive solution for metaphyseal fractures

Prior to the introduction of LCP, many fractures with concomitant bone defects had to be treated with either autologous bone or a bone substitute to support bone healing and subsequent fusion. Although LCP reduced the number of fractures in need of bone grafts, there still remains a considerable number of impact fractures with a critical size bone defect close to the joint that make LCP fixation difficult. In these cases, the use of bone or a bone substitute is recommended.

In the mid-eighties, brushite cements were investigated, named after the end-product of the setting reaction: brushite, also called dicalcium phosphate dihydrate. Since then, several *in vitro* and *in vivo* studies have been performed, but brushite cements were never used clinically. In the mid-nineties, the first calcium phosphate cement formulations were made available. Despite the good clinical performance, some users became disappointed with the slow resorption rate and the poor handling characteristics of these materials. Considering the fast remodelling rate and the good biocompatibility of brushite cements, chronOS Inject was developed to solve these problems, providing surgeons with the option to use an injectable, fast remodelling calcium phosphate cement.

The challenge was to design an easily injectable, fully resorbable and simple and safe to handle biphasic bone substitute. The result of the development, chronOS Inject, consists of a fast resorbable brushite matrix in combination with β -tricalcium phosphate granules (chronOS). All components of chronOS Inject are completely synthetic.

Injectability

Irregular, metaphyseal bone defects can be completely filled with chronOS Inject using a minimally invasive technique. The fluid mechanics are unique due to the addition of sodium hyaluronate as part of the liquid component. The biotechnologically produced sodium hyaluronate is the most physiological and biocompatible carrier known. Studies have indicated positive effects on bone healing. In order to allow for optimal flow characteristics, the rheology of chronOS Inject was extensively tested in internal AO studies.

Resorption

chronOS Inject resorbs and remodels. Apelt et al (2004), Kümmerle et al (2005), Oberle et al (2005) and Theiss et al (2005) state that resorption of brushite calcium phosphates in a sheep model is mainly based on macrophage activity. The brushite matrix dissolves in the interface between implant and bone (osteoid), thus permitting excellent vascularization and the ingrowth of new bone. The spherical β -TCP granules resorb more slowly than the brushite matrix and act as an anchor for

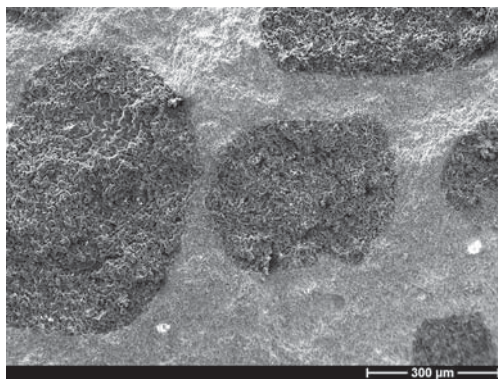


Fig 1
REM micrograph of hardened chronOS Inject. The β -TCP granules are visible as dark, circular areas within the (lighter) brushite matrix.

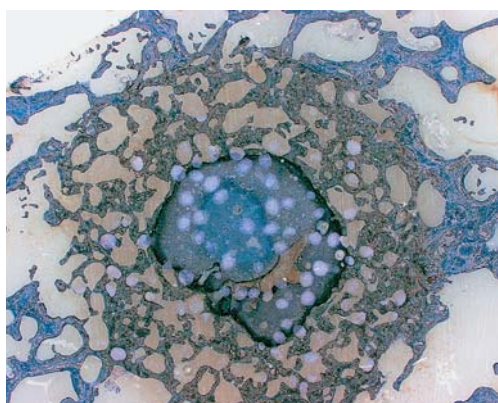


Fig 2
Histology of a bone defect filled with chronOS Inject 24 weeks postoperative (drill hole \varnothing 8mm, distal femur of an adult sheep). New bone formation occurs from the periphery toward the centre.

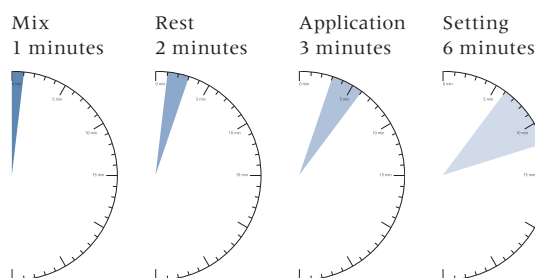


Fig 3
Work phase of chronOS Inject.

new bone. In the first phase of resorption, the brushite matrix dissolves in the area of the osteoid, and in the second phase, the β -TCP granules are completely transformed into lamellar bone within 6–18 months. Resorption takes place radially from the periphery to the center.

Ease of handling

chronOS Inject is a ready to use implant consisting of a powder and a liquid component. It can be mixed manually and does not require an additional mixing device. After mixing of chronOS Inject for 1 minute, the product needs to rest for 2 minutes. During this time, the crystallisation process starts and the product remains injectable for the next 3 minutes. Thereafter the brushite crystals start to entangle, providing chronOS Inject with sufficient stability. Manipulation during the setting reaction interferes with the crystallization process, resulting in a lower mechanical strength. Six minutes after injection and modelling of chronOS Inject, the primary treatment is completed. chronOS Inject hardens at body temperature, without an exothermal reaction. The hardening process requires a humid environment.

Indications

chronOS Inject fills bone defects of traumatic and iatrogenic origin and defects resulting from reconstruction. The use is indicated for the treatment of metaphyseal bone defects, eg, in the radius, tibia, calcaneus, humerus, femur, and metacarpals. Additionally, the filling of bone or resection defects after osteotomy or bone harvesting and the filling of cysts, benign tumours and posttraumatic bone defects also show good results. Fractures must be appropriately reduced prior to the application of chronOS Inject. In view of its limited mechanical properties, the use of internal fixation is an indispensable prerequisite for a successful therapy, especially in load-bearing applications.

Clinical experience

In total, more than 400 implantations have been performed. The safety as well as the operative handling by the performing surgeon and the final outcome were assessed in a prospective, multicenter AO CID study. The ongoing study includes 8 trauma units. So far, 95 patients were treated for 92 fractures and 3 reconstructions at the proximal humerus, distal radius, proximal and distal femur, proximal and distal tibia and calcaneus. The majority of patients had fractures at the distal radius ($n = 37$) and the proximal tibia ($n = 38$). The indications mainly included fresh metaphyseal fractures requiring a bone void filler in addition to stable fixation. Depending on the location, open reduction and stable internal fixation with plates, screws, K-wires and nails was performed, followed by filling the bone voids with chronOS Inject.

The results of the study indicate a very good success rate of the therapy, excellent handling characteristics and a very high overall satisfaction rate for both, patients and surgeons. At the visual analogue scale (VAS), a median of more than 90 points out of 100 was recorded at the 6 and 12 months follow-ups.

Indications for chronOS inject

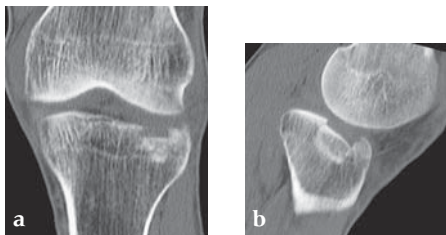
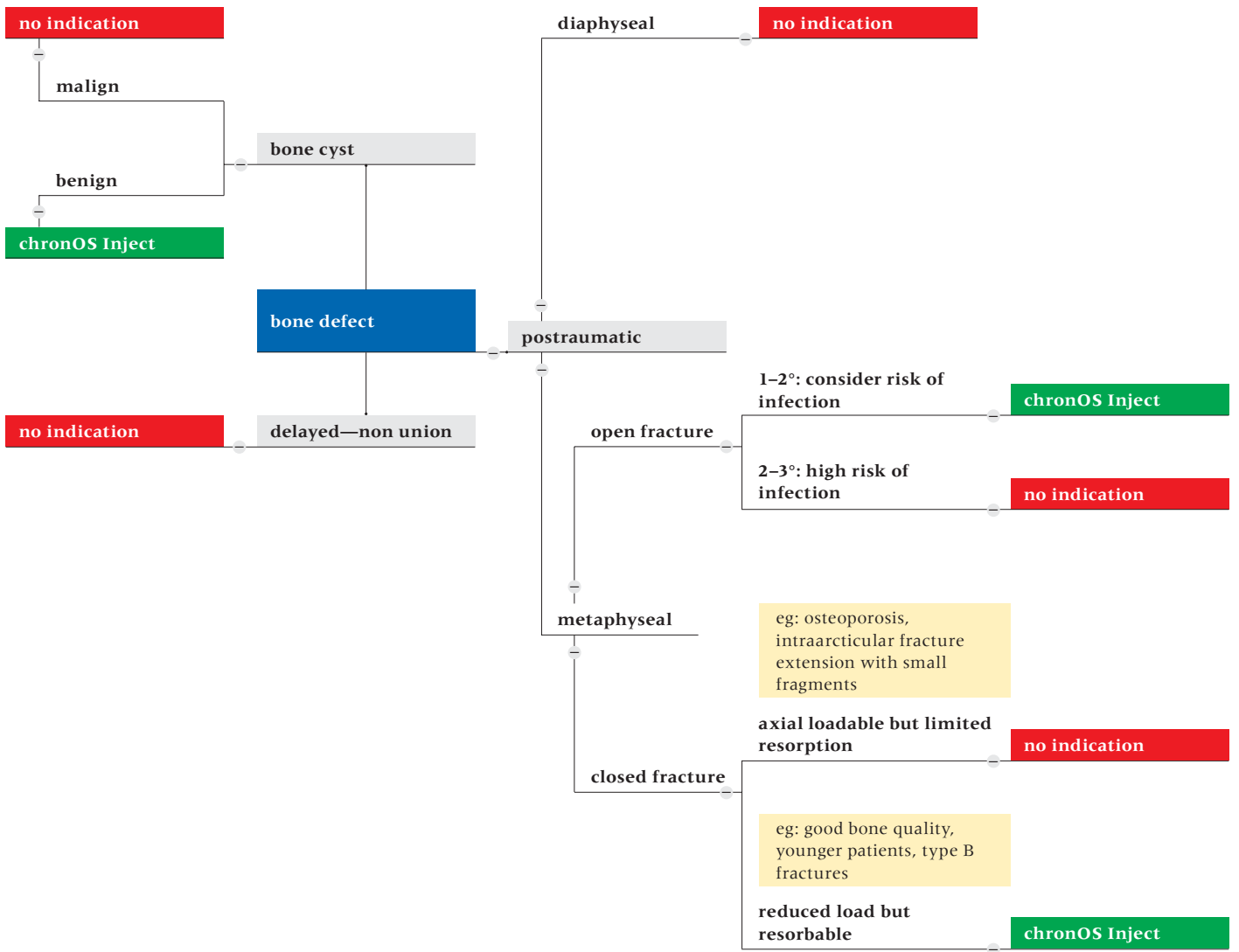


Fig 1a–b
Preoperative CT

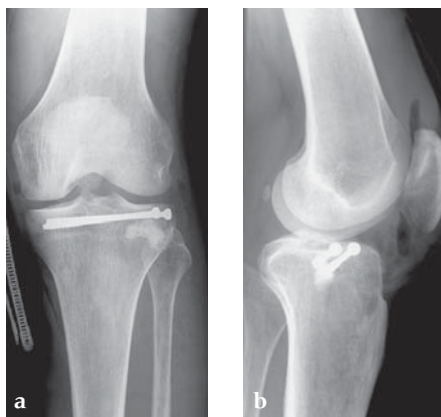


Fig 2a–b
X-rays postoperative arthroscopically assisted reduction, and percutaneous screw fixation

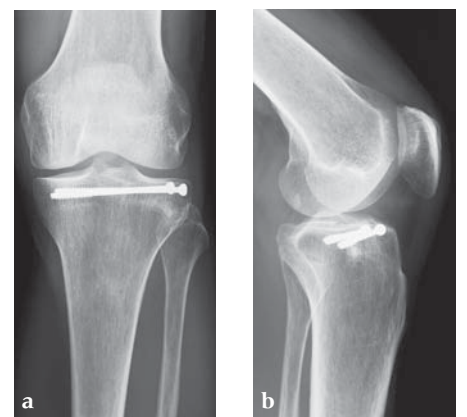


Fig 3a–b
X-rays 11 months after surgery

Dankward Höntzsch

NEW MINIMALLY INVASIVE OSTEOSYNTHESIS (MIO) PRODUCTS



Collinear Reduction Clamp: line extension

The Collinear Reduction Clamp (CRC) assists fracture reduction with a collinear sliding mechanism to apply minimally invasive techniques. Different attachment arms increase versatility and allow the surgeon to create an optimal reduction tool based on clinical need. The additional reduction attachments can easily be attached on the CRC by turning and pushing the attachments against the slider of the CRC.

The bone hook-shape arm is used for minimally invasive reduction of long bones. It tolerates higher forces than the Hohmann-shape arm. In combination with the reduction attachment, a three-point support for secure reduction can be achieved. The bone hook-shape arm is compatible with the large external fixator to maintain reduction.

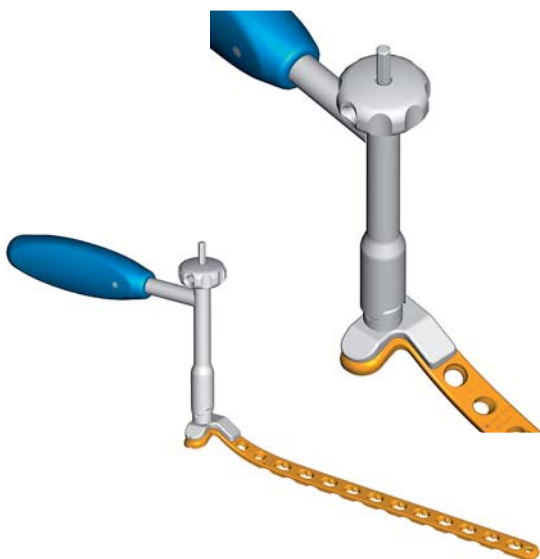
The LCP Reduction Attachment is designed for minimally invasive reduction with small and large LCP plates.

The Reduction Attachment is used for minimally invasive reduction of long bones with or without plate. It allows for centralized or orthogonal alignment. In combination with the bone hook-shape arm and the CRC, it enables a joystick-like reduction and fixation by the external fixation components.

The 2.6 mm K-wire with spade point tip, length 500 mm is used for temporary fixation in combination with the CRC. It can be used through the CRC and can be attached to a power tool.

Clamping Foot: anatomical plate holding device

MIO instruments are designed to facilitate reduction and to minimize devascularization of fracture fragments by minimizing soft-tissue stripping. To enable the use of the different existing MIO instruments for plate insertion with the variety of anatomically preshaped locking compression plates (LCP), Clamping Feet have been developed which function like “adaptors”. Clamping Feet are anatomical plate holding devices which are designed to help insert an anatomically shaped plate in a minimally invasive way. The Clamping Feet or holding shoes come in a right and left version. They are available for the left and right plates of the 2.7 mm and 3.5 mm LCP distal medial tibia, 3.5 mm LCP proximal tibia, 3.5, 4.5, and 5.0 mm LCP metaphyseal plate for distal tibia, and 4.5 mm LCP proximal tibia plate. It is planned to integrate a Clamping Foot for every plate with which percutaneous MIO insertion could be possible. A connection screw fixes the clamped-on plate to the plate holder.



Michael E Janssen

NEW SPINE PRODUCTS



ProDisc-L and ProDisc-C

Introduction

Back pain is a leading cause for physician visits, with approximately 60–80% of the US population experiencing episodes of acute low back pain at least once in their lives. While the majority of these patients improve with conservative care, a significant number become chronically debilitated and require surgical intervention. Historically, these patients are treated with fusion in lumbar spine or discectomy in cervical spine. Total disc replacement provides spine surgeons a proven alternative. Just like knee and hip arthroplasty, motion preservation of the spine is expected to make a significant impact on the surgical treatment of degenerative disc disease (DDD).

ProDisc

ProDisc was developed using the ball and socket concept successfully used in joint replacement implants for over 40 years. The ProDisc ball and socket implant design has been used clinically since 1990 and continues to demonstrate excellent long-term clinical results.

The ProDisc surgical technique, instrumentation, and implant function as a unified system. It provides a safe and reproducible implantation through a midline, mini open anterior approach. The implant is comprised of three implant components—two cobalt chrome alloy (CoCrMo) endplates, and an ultra-high molecular-weight polyethylene (UHMWPE) inlay. These materials have a long-term history of safe and effective use in joint replacement, which in the case of hips and knees is a much more demanding mechanical application.

ProDisc-L

Patients with degenerative disc disease (DDD) in lumbar spine are often treated with spinal fusion. While some patients do well after fusion, there are a significant number that do not find pain relief or go on to experience long-term degenerative changes from the rigid immobilization of their spine.

The ProDisc-L total disc replacement is indicated for spinal arthroplasty in skeletally mature patients with DDD at one level from L3-S1. DDD is defined as discogenic back pain with degeneration of the disc confirmed by patient history and radiographic studies. These DDD patients should have no more than grade 1 degenerative spondylolisthesis at the involved level. Patients receiving the ProDisc-L total disc replacement should have failed at least 6 months of conservative treatment prior to implantation of the ProDisc-L total disc replacement.

An FDA Investigation Device Exemption (IDE) clinical study with ProDisc-L was started in 2001 in the USA. The IDE study for single-level indications involved nearly 300 patients at 17 centers across the USA, comparing ProDisc-L to circumferential fusion. The study showed that ProDisc-L is a safe and reproducible procedure with a minimal learning curve. The patients were more satisfied with the ProDisc-L total disc replacement than fusion (81% satisfaction vs 69% for fusion). 94% of ProDisc-L patients had a normal range of motion at 24 months. ProDisc-L patients have significantly greater improvement in ODI scores than fusion patients (46% improvement over baseline vs 38% for fusion).



ProDisc-C

When conservative attempts fail to alleviate the pain and neurological deficits caused by degenerative disc disease, the most common treatment is surgical decompression of the affected nerves and spinal cord. Cervical decompression is most often accomplished via an anterior discectomy. Discectomy involves the surgical removal of soft disc herniations that press against the spinal cord or nerve roots. Most cervical discectomies are followed by the insertion of a bone graft into the space to fuse the adjacent vertebrae together. This is known as an anterior cervical discectomy and fusion (ACDF). ACDF is considered successful when the motion at a painful motion segment is stopped. However, stopping the motion at a vertebral segment changes the mechanics of the cervical spine (which is designed for motion and flexibility). This results in the transfer of the loads and stresses to the adjacent vertebral segments and often leads to the recurrence of neck and arm pain over time. Like ACDF, cervical total disc replacement (CTDR) is intended to reduce pain by allowing for the removal of the diseased disc while restoring disc height. The difference is that CTDR also attempts to replicate a normal physiologic range of motion without increasing the stress and strain on adjacent cervical segments.

The ProDisc-C total disc replacement provides the potential for motion in a single vertebral segment from C3-C7. The ProDisc-C provides for immediate fixation into the vertebral bodies through a midline keel that is orientated anterior-posterior. The bone contacting surfaces of the inferior and superior plates as well as both keels are titanium plasma spray coated to allow for long-term fixation by bony integration. Additionally, the implant is provided in a variety of sizes to allow the surgeon to accurately match the patient's anatomy.

In the US, the ProDisc-C recently completed the 2 year follow-up of a multicenter, prospective, randomized, controlled clinical trial. The purpose of the trial was to compare the safety and effectiveness of ProDisc-C to traditional spinal fusion surgery for the treatment of symptomatic degenerative disc disease in the C3-C7 cervical vertebral segments. Over 200 patients were randomized to ProDisc-C or ACDF surgery in a 1:1 ratio. 15 clinical sites were selected to assess the primary endpoints of the study which included key clinical outcomes such as the neck disability index (NDI), neurologic parameters, and removal or revision rates. The results of this study will be available soon.

44-years-old Firefighter—2 years of increased low back pain

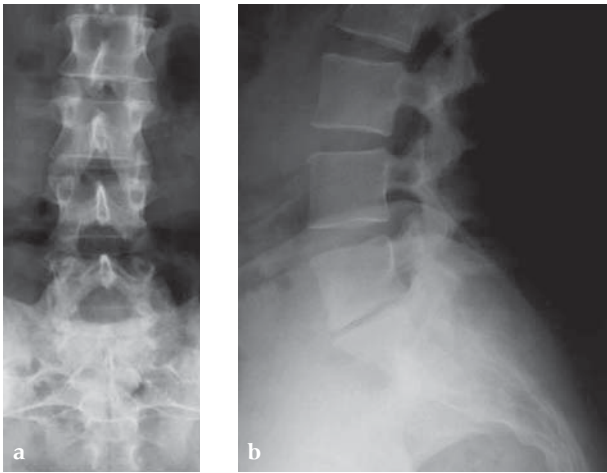


Fig 1a–b
Preoperative x-rays

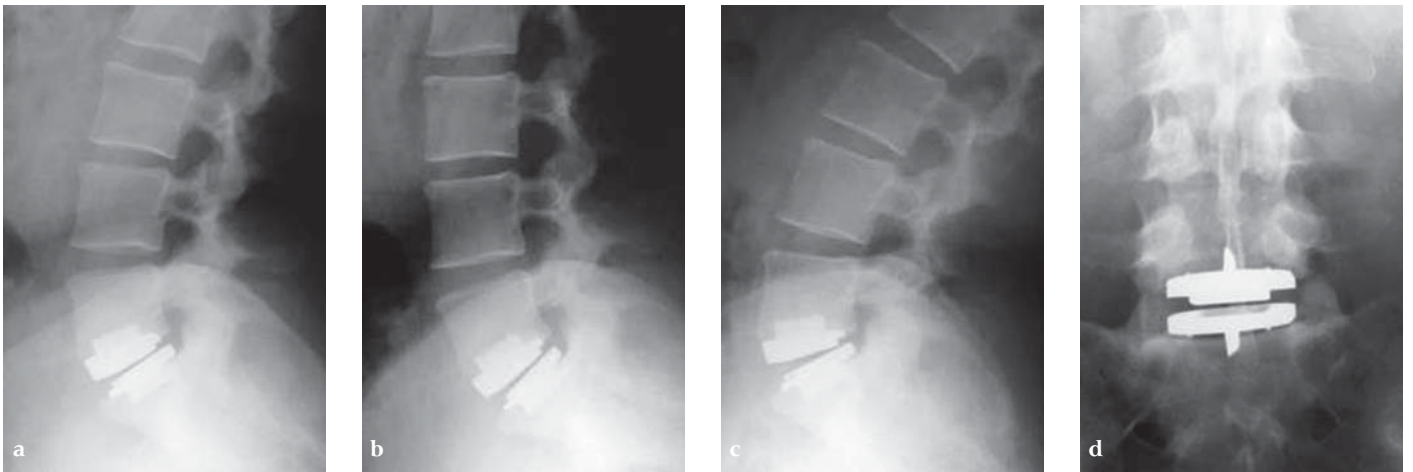


Fig 2a–d
X-rays of the patient at 1 year follow-up after L5/S1 TDR in:
a neutral position
b flexion
c extension
d AP

Edward Bradley Strong, Claas Albers

NEW CRANIOMAXILLOFACIAL (CMF) PRODUCTS

MatrixNEURO System

The new MatrixNEURO Plate and Screw System offers a complete line of screws, plates, meshes as well as new instrumentation designed for neurosurgical fixation. It is intended for use in selective trauma of the midface and craniofacial skeleton, craniofacial surgery, and reconstructive procedures. It can also be used for selective orthognatic surgery of the maxilla and chin. Its main strength revolves around its concept of improved self-drilling low profile neuro screws which can be used in a range of plate strengths.

Implants

In order to meet the need for low profile in neurosurgical applications broad MatrixNEURO Plates are 0.4 mm thick, which is significantly less than the currently existing low profile system. Still they provide maximum strength being comparable in bar stiffness. Full selections of titanium plates such as 2-hole and 4-hole dog bone, y-plate and box plate and burr hole covers are available (Fig 1).

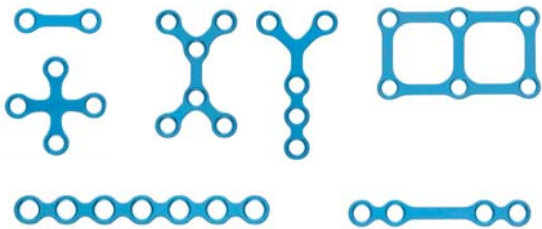


Fig 1

The MatrixNEURO Contourable Mesh is available in a variety of shapes and sizes to meet the needs of the individual patient. An addition to the malleable mesh another more rigid version is available. Both versions are 0.4 mm thick. The unique design allows screw placement through either side of the mesh. It is color-coded based on strength characteristic. Specialty shapes, such as Strut Mesh, Temporal Mesh, and the Mastoid Mesh are available as well (Fig 2).

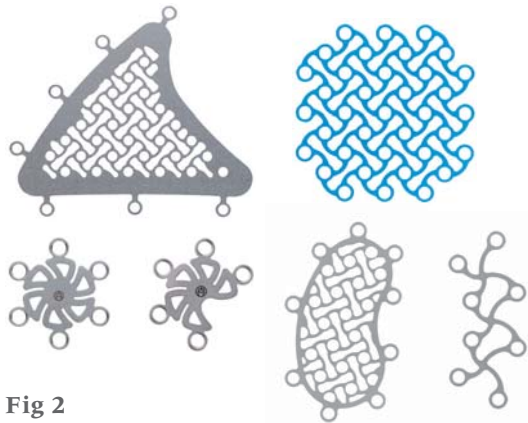


Fig 2

The MatrixNEURO Self-Drilling Screws have a unique thread design for rapid screw starting and significant lower insertion torque almost instantaneously starting with bone contact (Fig 3). They have a deep recess cross-drive for improved retention and resistance to com-out. The screws are available in 3 mm, 4 mm, and 5 mm lengths (1.55 mm in diameter—emergency screws in 1.85 mm are available). They provide a fast closure of bone flaps and rapid fixation of cranial fractures. The overall plate/screw profile of the MatrixNEURO System is 0.5 mm.



Fig 3



Fig 4

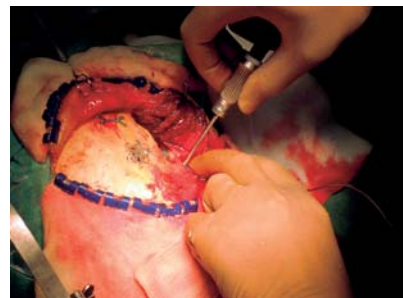
The MatrixNEURO System includes newly designed instrumentation such as screwdriver blades, mesh cutters, plate benders and plate holders (Fig 4). It is available with an especially designed modular graphic case, which is stackable, providing a flexible and convenient means of storage. Addressing the need for quick and easy access of instruments and implants the drawers feature an improved movement and the screw holding insert is made of metal instead of plastic (Fig 5).

The Matrix System

The MatrixNEURO Set is the first part of the new Matrix System, a new plating platform for internal fixation of the craniomaxillofacial skeleton—addressing neuro, craniofacial, mandibular, and orthognatic surgery. Its main characteristic feature is that all screws work with all plates within each Matrix System. Furthermore, only one blade is needed for all screws within each Matrix System. Along with a streamlined instrumentation the Matrix Systems offer significant consolidation of the sets combined with improved easy of use quality. The MatrixNEURO System will be followed by respective systems for mid-face and mandible with all systems being consistent in color-coding and case design.



Fig 5



Pictures of anatomy lab

Jörg Auer

NEW VETERINARY PRODUCTS



Tibia Plateau Leveling Osteotomy Plate 3.5 System (TPLO)

Cranial cruciate ligament (CCL) injuries are one of the most common canine orthopedic problems. Most CCL injuries are treated with the tibial plateau leveling osteotomy (TPLO).

The AO Veterinary TPLO system is indicated for osteotomies of the canine proximal tibia. It combines six new plates with a new basic instrumentation set. The six plates are precontoured to match the anatomy of the proximal tibia with a limited contact design. The plates are available in left and right configurations and feature locking head screw technology. The plates will have three different profiles, 2.7 mm, 3.5 mm, and 3.5 mm broad. The TPLO plates 3.5 will be used in approximately 85% of TPLO cases. Therefore, it was the first plate to be designed. The broad TPLO plates 2.7 and 3.5 will be introduced soon. The plates and screws are available in stainless steel. The TPLO utilizes either locking head, or compression screws, 2.7 mm and 3.5 mm locking head and 2.7 mm and 3.5 mm cortex, and 4.0 mm cancellous bone screws.

With the introduction of the TPLO system, AOVet is also introducing the concept of locked plating to the veterinary practitioners. Therefore, this system also includes a new veterinary basic instrumentation set that contains both standard and locking head screws. The compact design fits into the smaller sized autoclaves commonly used in veterinary clinics.



Tibia Plateau Leveling Osteotomy Plate System (TPLO)

2-years-old Labrador Retriever, 30 kg, female. Chronic lameness in both hind limbs, chronic bilateral cranial cruciate ligament tears, with subsequent stifle joint instability and degenerative joint disease. At that time, she was more clinically lame on the left hind limb, and a surgical correction was subsequently performed on this limb (Fig 1).

X-rays of the stifle joint revealed the degenerative joint changes and an effusion; the tibial plateau slope was 20°. In addition, the x-rays confirmed that there was a slight amount of tibial torsion that also was observed clinically, accounting for a slight internal rotation of the distal limb. Radiographically, this could be assessed by a 4 mm shift of the normal point of intersection of the medial aspect of the calcaneus with the deepest point of the talar sulcus (Fig 2).

The stifle joint was surgically explored. All remaining remnants of the torn cranial cruciate ligament were debrided; in addition, the caudal pole of the medial meniscus was torn/crushed, and a partial meniscectomy of the damaged portion was performed. A TPLO plate 3.5 was applied to stabilize the fracture. The plate was applied in a neutral fashion. Postoperative x-rays revealed a tibial plateau angle of 5°, and a correction of the torsion to 0 mm (Fig 3).

Follow-up x-rays at 8 weeks postoperatively revealed that the osteotomy had healed, and the dog was doing very well. The identical procedure was performed on the opposite stifle joint 2 months later. Healing was again obtained 8 weeks postoperatively (Fig 4).

Presently, the dog is about 1 year postoperatively and functioning very well (Fig 5).

Case provided by Randy Boudrieau, North Grafton

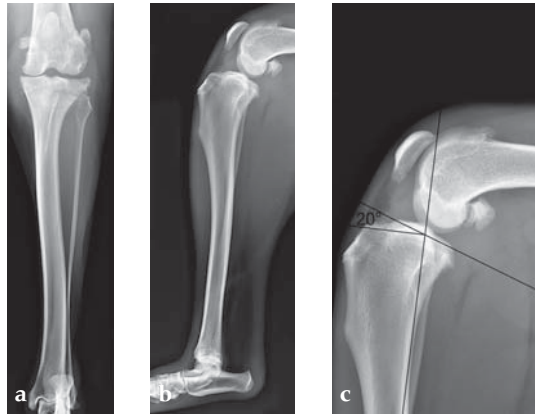


Fig 1a-c Craniocaudal preoperative x-rays; 4 mm of tibial torsion



Fig 2 Lateral preoperative x-rays; tibial plateau slope is 20°

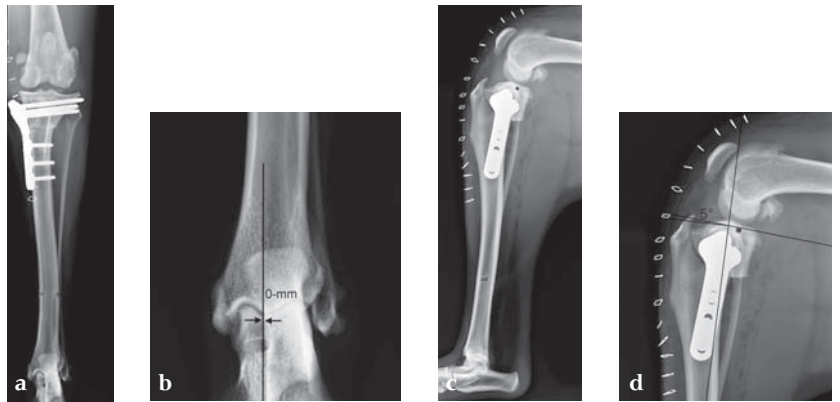


Fig 3a-d a-b Craniocaudal postoperative x-rays; 0 mm of tibial torsion c-d Lateral postoperative x-rays; tibial plateau slope is 5°

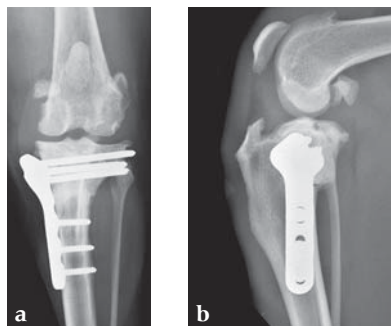


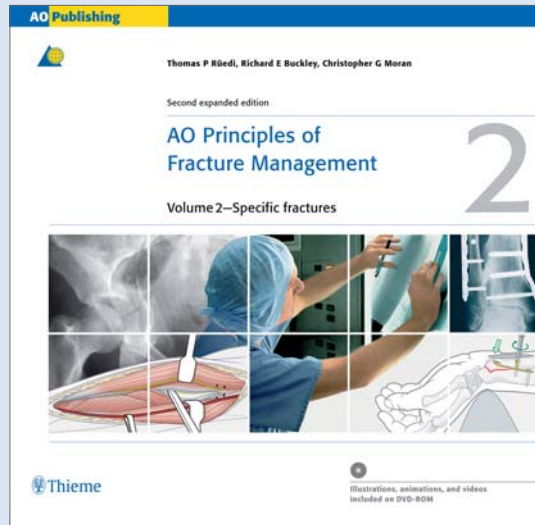
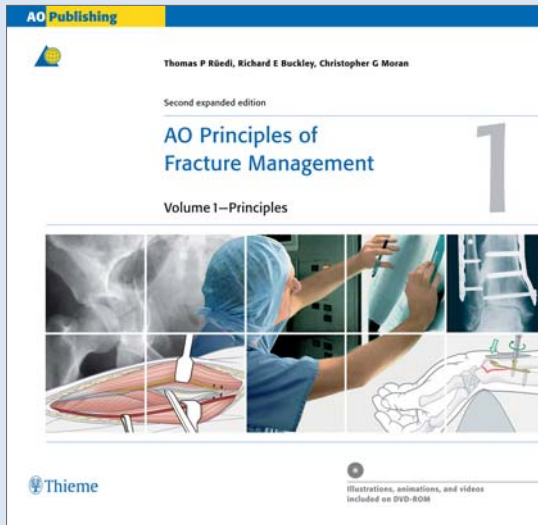
Fig 4a-b Follow-up x-rays at 8 weeks



Fig 5 1 year postoperatively

Sigrid Unterberg

NEWS FROM AO PUBLISHING



Just released

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Richard E Buckley,
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Volume 1 focuses on the basic knowledge and the principles of fracture management, eg, biomechanics, tools for preoperative planning, soft-tissue management, different methods of reduction and fixation, implants. Simultaneously, it addresses new issues pertaining to internal/external fixation, damage-control surgery, minimally invasive surgery, and biotechnology.

Volume 2 focuses on the management of specific fractures in different anatomical areas. For each of these areas there is a separate chapter discussing the assessment of injuries, surgical anatomy, preoperative planning, surgical treatment, and postoperative care, while pointing out pitfalls and complications. New fixation techniques and implants have particularly been taken into account.

Jan Ljungqvist, Melissa Wilhelmi

NEWS FROM AO CLINICAL INVESTIGATION & DOCUMENTATION (AOCID)



Fig 1a–b

a Standard LFN

b LFN with recon locking option

Expert Lateral Femoral Nail (LFN) study update

Intramedullary nailing is considered the method of choice in the treatment of femoral head and shaft fractures. Various nail implants are available for the management of these particular fractures. More recently, the lateral femoral nail (LFN) has been developed as part of the EXPERT nail family which offers an antegrade femoral nail with a unique anatomical bend for lateral entry point. The LFN is made with a different production technology, allowing for bending radii in two planes over portions of the nail. With an antecurvature of 1000 mm, LFN differs from other nails that have antecurvature characteristics of 1500 mm in the sagittal plane.

The LFN nail, with its two proximal locking options, (ie, retrograde (recon) and standard), is specifically indicated for the treatment of combined ipsilateral neck/shaft, subtrochanteric, and femoral shaft fractures with AO Classification 32-A, B, C and 31-B. With the recon locking option, two 6.5 mm screws can be inserted through the nail into the femoral neck and head. Alternatively, the LFN offers a standard proximal locking option with two 5.0 mm or 6.0 mm screws. Distal interlocking can be made by two static mediolateral, as well as one static oblique screw.

Due to advancements made with the LFN, AOCID has been conducting a prospective multicenter case-series that was initiated in August 2005, with the main objective of documenting all cases treated with this implant and evaluating intra-/postoperative complications associated with its use. Pain, fracture healing, reduction, functional outcome, and alignment were secondary parameters also monitored during the 12-week and 1-year follow-up periods.

17 study centers based in 11 different countries are participating in this prospective study. A total of 182 patients (130 male, 52 female) with femoral shaft fractures with or without femoral neck fractures have so far been recruited within a period of 17 months. The female patients are on average 20 years older than the male patients (32.2 male:51.8 female years), the general patient population is young (mean age:37.9 years) and consists mostly of fracture types 32-A3 and 32-B2, which have mainly resulted from traffic (ie, car/motorbike) accidents.

The LFN length and diameter most often used in this patient population is 360–420 mm and 9–10 mm, respectively, and the average operation time of 118 min with an associated average x-ray exposure time of 341 sec is required for implantation. Recon locking option was used in 39/182 patients. Reaming occurred in 54% of the cases although for 84 unreamed cases, a small proportion (n = 14) of the nails was implanted with resistance. The occurrence of iatrogenic fractures (n = 6) was an observed baseline complication. During both follow-up examinations, other adverse events including namely screw/bolt breakage (n = 2) and delayed union (n = 7) or malrotation of the femur (n = 2) occurred.

The definitive evaluation of the study is expected to take place after the final follow-up assessments in spring 2008. This will provide us with the final results in regards to fracture healing, reduction, axial alignment, complications, reoperations, and evaluation on handling of the LFN.

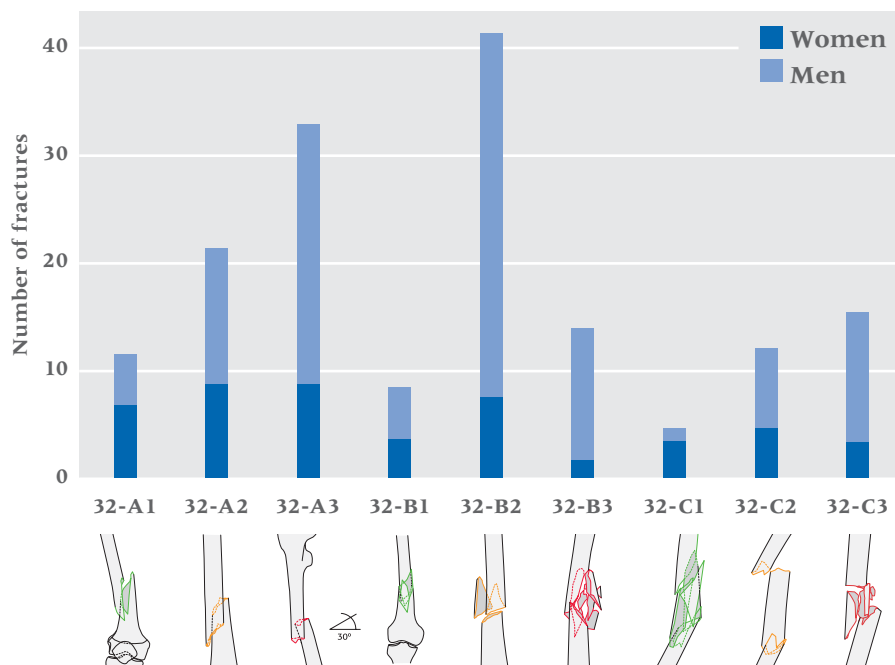


Fig 2
Fracture distribution over gender (Müller AO Classification)

For product information refer to page 14/15.

Karsten Schwieger, Chloe Ansari Moein, Oliver Bösl, Michiel Verhofstad

NEWS FROM THE AO RESEARCH INSTITUTE (ARI)

Lateral insertion points in antegrade femoral nailing and their influence on femoral bone strains

Objective

Insertion of rigid uniplane bent femoral nails through the piriform fossa has been reported to cause muscular and neurovascular complications. New nails were designed for more lateral entry points. However, these may result in more iatrogenic fractures. This study investigated if two differently bent nails with more lateral entry points induce higher cortical bone strains than a uniplane bent nail introduced through the piriform fossa.

Materials/methods

Three groups of eight cadaveric femurs were instrumented using following nail systems and entry points: cannulated femoral nail, piriform fossa (PF); antegrade femoral nail, trochanteric tip (TT); helical nail (prototype of the LFN), lateral of the trochanteric tip (LTT). During insertion the maximum principal bone strains were recorded at nine locations at the proximal femur and the diaphysis (Fig 1). The occurrence of iatrogenic fissures was documented.

Results

No differences in bone strains were found between the groups for the anatomical locations in the midshaft region and at the medial impingement point just below the lesser trochanter (Fig 2). Strains higher than those reported during walking, ie $> 1800 \mu\text{m}/\text{m}$, were only recorded around the entry point. Significant differences between groups were observed at locations lateral to the entry point and the anterior greater trochanter, with the highest strains after nailing through the trochanteric tip. The high strains and associated fissures were due to deviations of the actually achieved insertion point from the ideal insertion point as planned from x-rays. Such deviations occurred more often in the trochanteric tip group.

Conclusion

We conclude that nail introduction through entry points lateral to the piriform fossa does not induce higher bone strains distally and at the impingement site compared to the piriform fossa, when correspondingly designed nails are used and implanted in a correct way. For nails designed for an entry point at or lateral to the trochanteric tip, deviations of the actual insertion compared to the ideal insertion are associated with higher strains and sometimes fissures in the proximal area. However, the clinical relevance of these high proximal strains and fissures is unclear and subject to further investigation.

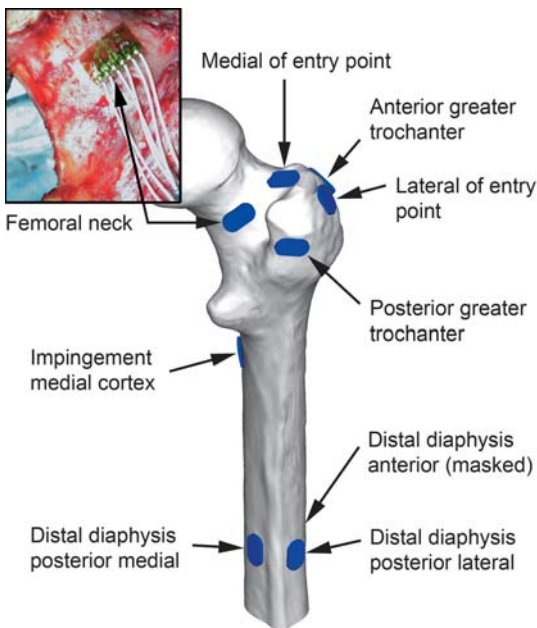


Fig 1
Illustration of the strain gauge locations. Example of a strain gauge bonded to the femoral neck.

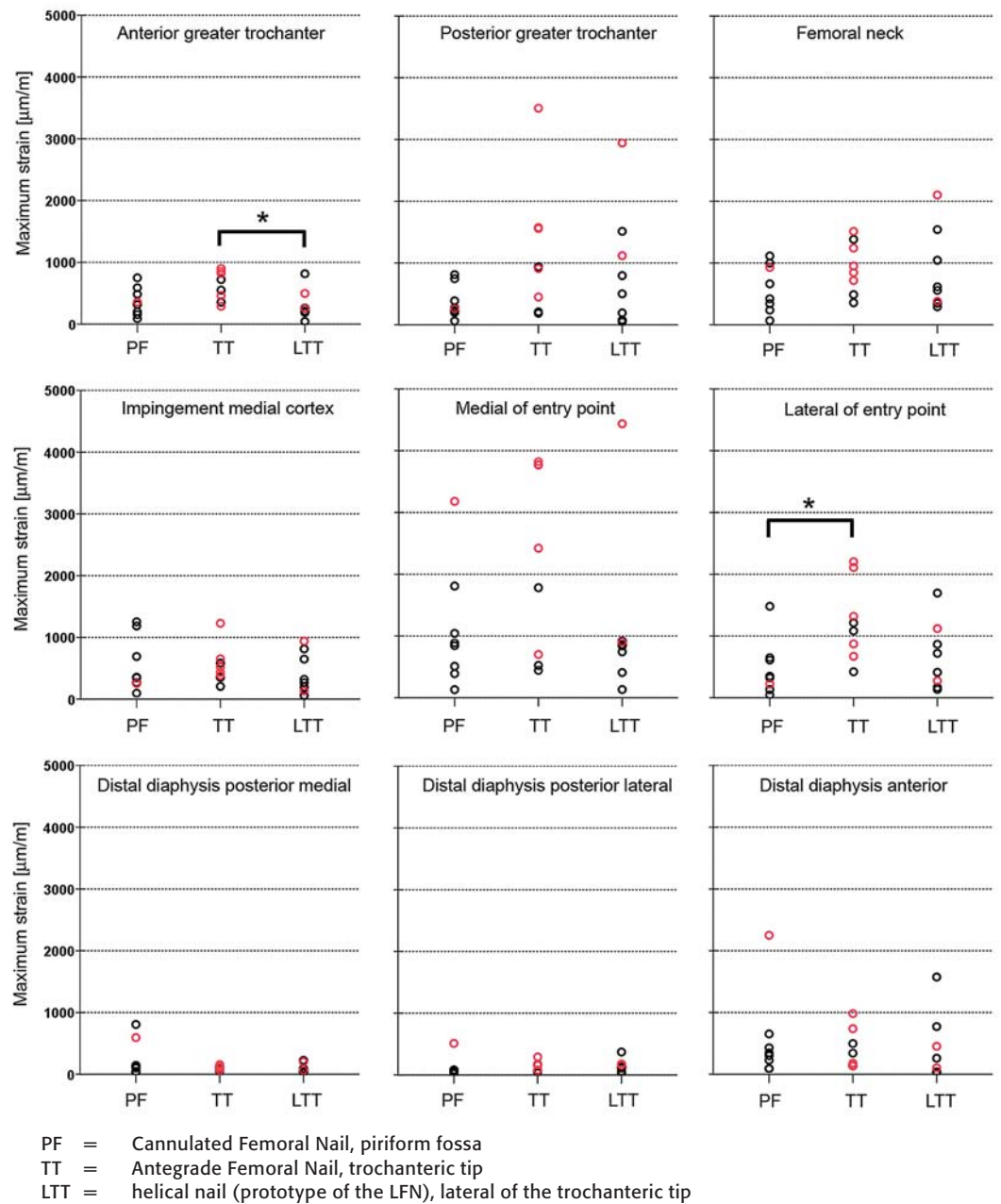


Fig 2

Maximum principal strains for all strain gauge locations depending on entry point group for nail insertions rated as precise (black) and imprecise (red). Significant differences between groups are indicated by stars.

For product information refer to page 14/15.

Nicola Rusca

NEWS FROM AO TEACHING VIDEOS

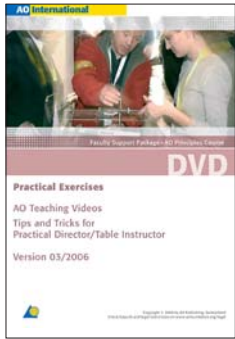


Fig 1



New Faculty Support Package

A new release of the Faculty Support Package for the Principles (Fig 1) and Advanced Course (Fig 2) is available.

The package contains all videos from the corresponding course, with navigation, and an additional booklet (80 pages Principles Course, and 51 pages Advanced Course).

The booklet includes information for the practical director and the table instructor concerning learning objectives, timetables and useful tips and tricks.

Four activities are identified for the successful running of an AO practical (Fig 3).



Fig 2



The practical director

Showing the video

The table instructor

Practical exercise

00110 Internal Fixation with Screws and Plates Providing Absolute Stability

Activities	Description	Minutes
	Introduction—review of learning objectives	0–5
	Screw technique with learning objectives which are: 1 Use of the screw as a position screw 2 The lag screw technique using a 4.5 cortical screw	5–8
	Position screw, Lag screw	8–13
	Discussion with table instructors regarding sequence of instruments used when a 4.5 cortical screw is used as a lag screw	13–18
	Practical exercise	18–38
	<p><i>Cancellous bone screw (note this part of the exercise is usually not possible due to difficulty in getting hold of the bone model. Course directors can decide whether or not to show the video as a demonstration only.</i></p> <p><i>Learning Objectives of this are:</i></p> <ol style="list-style-type: none"> To understand the use of a 6.5 cancellous screw as a lag screw To understand the principle that the thread must cross the fracture site 	

Fig 3

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00110	Christoph Sommer, Thomas P Rüedi Internal Fixation with Screws and Plates Providing Absolute Stability	20:57
00112	Christoph Sommer, Thomas P Rüedi The Principle of the Internal Fixator Using the Locking Compression Plate (LCP)	16:53
20203	Wolfgang Ertel The Cannulated Femoral Nail (CFN) and SynReam	14:46
00116	Dankward Höntzsch, Joseph Borrelli Jr Tibia–Shaft Fracture—Large External Fixator: Modular Frame	07:37
00118	Dankward Höntzsch, Joseph Borrelli Jr Tibia–Shaft Fracture—Large External Fixator: Uniplanar Double-rod Frame	07:55
00130	Matthias Hansen, Dankward Höntzsch Tibia Fractures—Intramedullary Nailing with the Expert Tibial Nail (with reaming)	19:16
00131	Matthias Hansen, Dankward Höntzsch Tibia Fractures—Intramedullary Nailing with the Expert Tibial Nail (without reaming)	18:06
DVD 2		
00113	Thomas P Rüedi Forearm Shaft Fracture, 22-C1 – 3.5 LCP (8 and 11 holes)	11:23
20142B	Thomas P Rüedi, Michael M Schüller Intraarticular Type C Fracture of the Distal Humerus	10:34
00121	Dankward Höntzsch, Joseph Borrelli Jr Small External Fixator: Wrist-spanning Frame	06:25
20156	Pietro Regazzoni Dynamic Hip Screw (DHS)	17:38
00104	Peter Messmer, Pietro Regazzoni The 7.3 mm Cannulated Screw: Femoral Neck Fracture	04:24
00108	Thomas P Rüedi, Dominik Heim Type C Malleolar Fracture	09:47
00122	Dankward Höntzsch, Joseph Borrelli Jr, Tim Pohlemann Pelvis—Pelvic Ring Instability - Large External Fixator: Stabilization of the Pelvic Ring	15:54
00125	Rogier K J Simmermacher, Christiaan van der Werken Femur–Trochanteric Fractures - Intramedullary Nailing with the Small PFNA	18:20
DVD video		
Language:	English	Standard: NTSC
Release:	August 2006	Regional code: No
Version:	03/2006	DVD type: 5
AO International 7270 Davos, Switzerland video@aofoundation.org www.aofoundation.org/video		T +41 81 414 24 01 F +41 81 414 22 87

Table of contents: Advances Course

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DVD 1		
20207	Christoph Sommer Locking Compression Plate (LCP): Percutaneous Plate Fixation of the Tibia and Fibula in a Distal Multifragmentary Fracture of the Lower Leg (MIPO technique)	19:50
20199	Michael Schütz Less Invasive Stabilisation System DF (LISS)	18:57
20190	Thomas P Rüedi, Christoph Sommer Bicondylar Fracture of the Tibial Plateau	11:58
24018	Kaj Klauw, Hans Zwipp Open Reduction and Internal Fixation of Comminuted Fractures of the Calcaneus	11:15
20211	Reto Babst, Andrew H Schmidt The Proximal Humerus Internal Locking System, PHILOS	15:46
20162B	Thomas P Rüedi, Michael M Schüller Intraarticular Type C Fracture of the Distal Humerus (foamed model)	12:30
20223	Norbert Südkamp LCP Distal Humerus Plate System	18:09
DVD video		
Language:	English	Standard: NTSC
Release:	October 2006	Regional code: No
Version:	2/2006	DVD type: 9
AO International 7270 Davos, Switzerland T +41 81 414 24 01 F +41 81 414 22 87 video@aofoundation.org www.aofoundation.org/video		

Please check the video news site for further information such as the video catalogue, examples of videos, and contacts. Go to www.aofoundation.org/video.

For further questions please contact nicola.rusca@aofoundation.org.

Chris van der Werken

PORTRAIT OF ROGIER SIMMERMACHER, MD



Rogier Simmermacher is one of those doctors who knew from a very early age that he wanted to become a doctor. At this early stage it also became apparent that he was not much of a spectator but somebody who preferred the “hands on approach” which is not surprising coming from a family of surgeons and butchers!

Born in 1957 in Heidelberg into a French-Italian-German-Dutch family, he started to operate on his toys, providing them with styro-foam organs. As a medical student he came to The Netherlands where he fell for the charms of an attractive Dutch blonde to who he later married, never to go back to Germany. To finance his studies at the University of Amsterdam he took a job as teacher in anatomy at the university and also taught at a school for physiotherapy, which formed the basis for his later educational activities. He then worked as an obstetric resident in South America for about 6 months, after which he was offered both a gynecological as well as a surgical training program. He decided to start his surgical training in Groningen, which he completed in 1994 in Zwolle.

In that period three aspects of his surgical life became quite clear: Firstly, his persistent interest in all fields of surgery (with the exception of vascular surgery), secondly his continuing motivation to improve treatment options in common and basic surgical problems, and thirdly his interest in teaching. During his training he finished his thesis on the treatment of large abdominal wall defects by modifying the then existing prosthetic material and by describing possible solutions for the future.

After his training it seemed that he finally would turn out to be a trauma surgeon. He spent his first 3 months as an AO fellow working with Bernd Claudi in Munich, followed by a 6-month trauma fellowship at Groote Schuur Hospital in Cape Town. Following his return to The Netherlands, he became a consultant general surgeon in a large Dutch teaching hospital where he continued to cover all fields of surgery. However, after becoming a consultant surgeon at the University Medical Center in Utrecht, he developed specific interests in thoraco-abdominal injuries and humeral fractures, but mainly in proximal femoral fractures.

His special interest in proximal femoral fractures has led to contributions in the development and clinical testing of the PFN and PFNA as well as producing AO Teaching Videos on the use of these implants. He participates in many AO educational activities. He is chairman of the AO Principles and Advanced Courses in The Netherlands and in Davos, as well as international faculty, participating in many overseas courses for the AO. He is a regular faculty member on the Tips for Trainers courses, and he also contributes to www.aosurgery and the AO Principles of Fracture Management.

In his “spare time”, he sits on the board of the European Hernia Society, not surprisingly, as the member responsible for education. He also travels to Africa to operate on groin herniae on a humanitarian basis. He is chairman of the Board of Governors at the private grammar school which his three children attend. Finally he still loves to use his hands and enjoys regularly cooking for his family and friends. It is no wonder that one of his publications is a chapter with his favorite recipe, in AO’s “Bone Appetite”!

Norbert P Haas

TK PRIZES 2006



N. Haas, J. Kellam and S. Hansen (left to right)



A. Staubli and N. Haas (left to right)

The AO Foundation awards an array of prizes each year to surgeons who have supported the AO in developing new treatments and methods.

2006 saw the rare presentation of an AO Innovation Award, which is presented by the AO Foundation's Board of Directors (AOVA) only upon special proposal of the TK-System team. The prize was given to Sigvard Hansen, head of the Hanson Foot and Ankle Institute at Harborview Medical Center, Seattle, USA. It recognizes his lifetime achievement and exceptional contribution to the development of new concepts, technologies, and treatment options in trauma, reconstructive, and orthopedic foot surgery. This prize has only been awarded three times in the past decade, which demonstrates the esteem with which Sigvard Hansen is held by his colleagues within the TK System.

The 2006 TK Recognition Award was presented to Alex Staubli for his numerous contributions to the conceptual enhancement in the field of osteotomies around the knee joint. Alex Staubli is the head of the orthopedic department in the Cantonal Hospital of Luzern, where he is a work colleague of the 1999 winner of this prize, Reto Babst. Their close working relationship is testimony to the synergy that can be achieved by trauma and orthopedics learning from one another.

Both men are to be congratulated upon their great achievements. Their prizes will act as a spur to other innovative surgeons who seek to improve patient care.

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