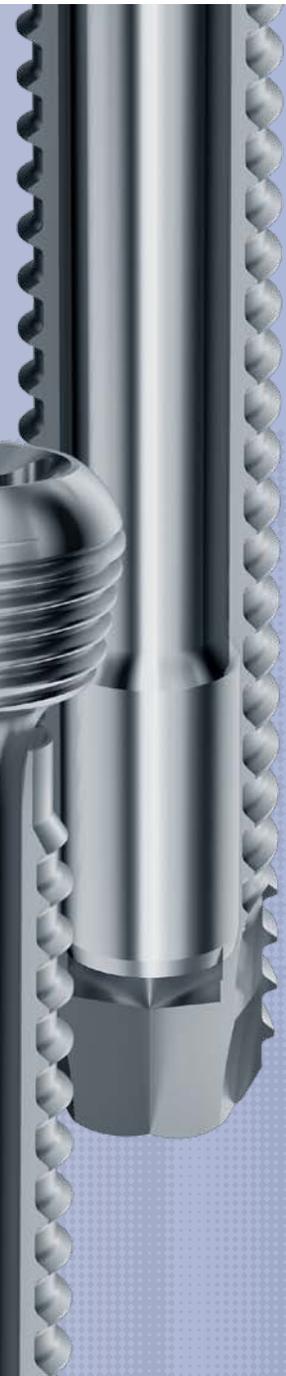
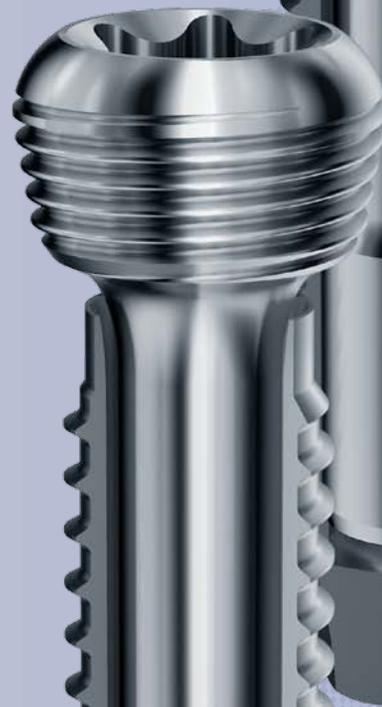


**TK System**

Innovations

1 | 2012



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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.

## EDITORIAL

Dear reader,

TK's quest to obtain evidence of improvement for our innovations and procedures for the surgical community continues. TK has a long-standing cooperation with AO CID, currently running a number of clinical studies (twelve just in trauma), plus a full pipeline in the planning phase. In spine, a rigorous evaluation of clinical outcomes one year after first approval is in place. Our latest approach includes "Mini registries" to evaluate clinical experience, much needed in the early phase of a new technique to demonstrate its benefits or be aware of any downsides. This "historical AO approach" has been adapted to current regulatory needs, but serves as an important motor of optimization. We are also evaluating new ways to automatically generate healing related data, and look forward to "smart implants" to collect data intrinsically. In biomechanical testing, we are focussing on standardization to better compare published data, with our first project on the humerus.

In our lead article, we discuss how much elasticity/flexibility is advantageous for effective bone healing, and when the stiffness of locking plate constructs should be reduced. Data is presented from biomechanical and animal tests, and the first clinical experiences of plate osteosynthesis with the Dynamic Locking Screw (DLS). We are certain the DLS reduces stiffness within locking plate constructs but must still determine when this is most beneficial. Tests into the reduction of screw cut-out in osteoporotic bone, and the usefulness of the "damping effect", are ongoing.

In trauma, the Variable Angle LCP Elbow Set consists of pre-contoured plates with a lower profile. A 180 degree plate for parallel plating allows treatment of distal humerus fractures by placing screws from lateral to medial through the trochlea. The LCP Ulna Osteotomy System allows accurate oblique or transverse osteotomy cuts and restoration of bone alignment. It consists of plates and instruments with prede-

finied shortening lengths. The Tibia Nail System now includes instruments to insert the nail with the leg in extension through the suprapatellar pouch, while protecting cartilage and soft tissues.

In CME, the Strut Plate is the third and newest design for the subcondylar plate family, for fractures of the condylar process. It presents an alternative to double plating, with improved strength and stability to the fracture reduction. Also, the new 1.3 mm Pediatric Curvilinear Distractor treats infants needing mandibular lengthening for airway improvement.

In spine, the USS Fracture MIS allows a minimally invasive surgical technique for fracture management according to AO principles, and encompasses Schanz screws and clamps for routine clinical conditions of the posterior thoracolumbar spine. The Prodisc-C Vivo is the next evolution of the cervical total disc replacement, and maintains the biomechanical and radiographic features of Prodisc-C. It offers primary fixation with spikes and anatomical implant design with a convex cranial endplate, as well as a two-step surgical technique of trial placement and insertion.

Our portrait piece this issue features Yves Aklin from Chur, a surgeon rapidly becoming an outstanding orthopedic trauma leader in Switzerland and the AO. He is involved in many AO clinical trials and we encourage you to follow his example and share your talents with us.

Once again we stress that none of the articles substitutes for AO's surgical techniques or teaching tools. You can obtain more information on these and our other devices from AO or the official technical guidelines. Please do not hesitate to contact us at any time.

Yours faithfully,



*T. Pohlemann*  
Tim Pohlemann  
AOTK (Trauma)



*Edward Ellis III*  
Edward Ellis III  
AOTK (CMF)



*Robert McGuire*  
Robert McGuire  
AOSpine TK

Stefan Döbele, Thomas Freude, Röbi Frigg, Dankward Höntzsch, Michael Plecko, Brigitte von Rechenberg, Henning Richter, Ulrich Stöckle

## DYNAMIC LOCKING SCREW (DLS)



Fig 1a–b  
Simple spiral fracture of the distal tibia AO 43-A1.1.  
Preoperative and postoperative.



Fig 1c–d  
At 3 and 11 months follow-up.

### Background—clinical problem

The new Dynamic Locking Screw (DLS) was developed to address the problem of delayed bone healing mainly seen in distal tibia and distal femur fractures. The standard treatment for dia-/metaphyseal fractures of long bones is fixation with anatomical locking compression plates using the MIPO and bridge plate technique [1, 2]. The basic principle of this technique is indirect reduction and bridging the fracture zone, with the benefit of keeping the surrounding soft tissue unaffected. This relative stability leads to indirect bone healing, with callus formation to bridge the unstable area. Several studies have shown that greater stiffness of the osteosynthesis (eg, in locking compression plates), might suppress callus formation. The stiffness should be in a range that enables adequate fracture motion [3–5]. In a retrospective study of 51 distal tibia fractures, Horn et al reported an 18% delay in bone healing [6]. The characteristic x-ray sign for each case with delayed bone healing was callus formation on the transcortex (opposite of the plate) and less or no callus on the ciscortex (near the plate).

### Mechanical environment of a fracture—asymmetrical fracture motion

The reduction of a fracture by MIPO technique, especially in simple fractures of long bones, can be challenging. The restoration is performed under fluoroscopic control without the possibility of direct manipulation of the fracture zone. The main problem seems to be an asymmetrical motion of the main fragments caused by the bending of the plate. The rigidity of the construct leads to more motion with better callus formation on the transcortex [1, 5, 7] (Fig 1), whereas at the plate side (ciscortex) there is less motion and nearly no callus formation.

The development of the Dynamic Locking Screw (DLS) was initiated to permit a more homogenous distribution of the motion along the fracture gap. This way, a more homogenous, symmetrical callus formation is intended.



Fig 2a–b  
Dynamic Locking Screw (DLS).

### Design and benefits of the DLS

The DLS represents a new generation of locking screws that allows the surgeon to control the rigidity of plating constructs.

#### Pin-sleeve design

The DLS system is based on the proven advantages of standard locking screws by eliminating tension on the bone and compression between plate and bone, while simultaneously retaining circulation and protecting the periosteum from potential damage. The DLS pin-sleeve design is a technical breakthrough that combines locking technology with dynamic motion; the threaded sleeve anchors the DLS in the bone while the pin locks the DLS with its standardized threaded head into Synthes locking plates (Fig 2). The interplay between the sleeve and the pin determines the amount of motion induced in the fracture gap, a particularly beneficial feature when bridging is the chosen method of fracture treatment.

#### Material

The new material of the DLS system also brings invaluable benefits. Cobalt chromium molybdenum alloy (CoCrMo) ensures the mechanical stability of DLS, while encouraging less on-growth and facilitating screw removal, similar to stainless steel screws. The DLS is fully compatible with all of Synthes' titanium and stainless steel locking plates, which enables the system to complement well-established surgical techniques.

#### Features and Benefits

The new DLS has a range of benefits including:

- DLS constructs increase plate-side fracture motion (Fig 3)
- Pin-sleeve design allows the surgeon to adjust construct rigidity
- Motion is contained within the screw, which therefore does not change the plate-screw or screw-bone interface
- Compatible with LCP and VA-LCP systems
- Can be used with stainless steel or titanium plates (produced using CoCrMo)
- StarDrive Recess for better torque transmission
- Rounded tip minimizes soft irritation.

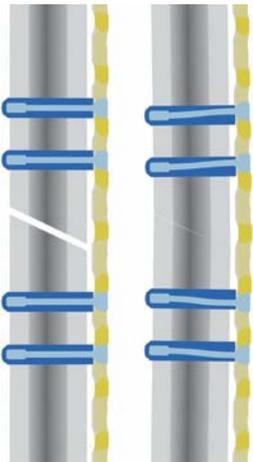


Fig 3  
DLS constructs increase plate-side fracture motion; osteosynthesis with and without axial load.

The DLS is available in two sizes, the small fragment screw (3.7 mm) and the large fragment screw (5.0 mm). Small fragment screws allow 0.2 mm of additional motion in all directions between pin and sleeve of the screw, and large fragment screws allow for an additional motion of 0.35 mm.

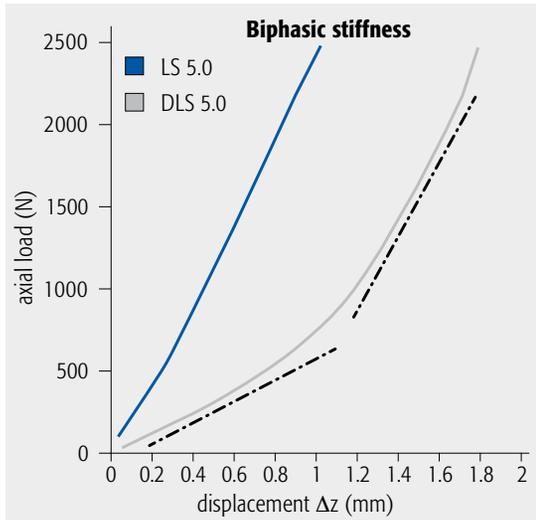


Fig 4  
DLS constructs show a biphasic stiffness distribution with an initial stiffness and a secondary stiffness.

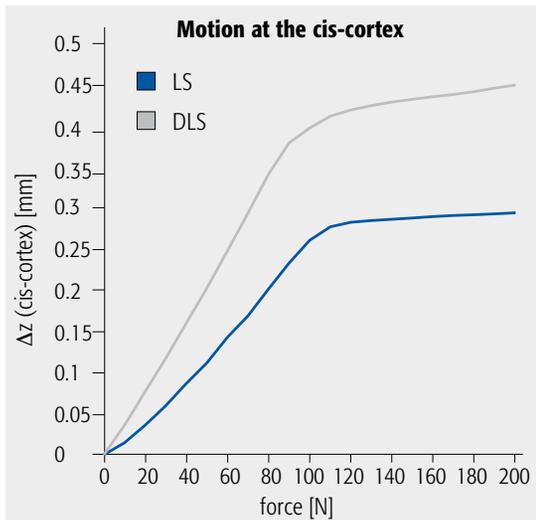


Fig 5  
Increased interfragmentary motion at the cis cortex using the DLS versus standard locking screws (LS).

### Biomechanical data

The goal of the biomechanical test series was to clarify if the DLS changes the stiffness of the locking plate construct and allows for a more homogenous axial movement of the fragments over the fracture gap. The setup contained four simplified fracture models:

- a: Rigid transverse fracture
- b: Flexible bridged transverse fracture
- c: Oblique fracture
- d: Spiral fracture.

An axial load and a bending moment were applied. The fracture motion was detected in all six degrees of freedom with an optical motion analysis system (PONTOS 5M). The axial stiffness and bending stiffness were calculated. In an additional test, the pressure distribution along the fracture gap was monitored.

The biomechanical test series could show the following characteristics of the DLS:

1. Biphasic axial stiffness distribution with an initial stiffness and a secondary stiffness (Fig 4)
2. Significant reduction of axial stiffness (no change in bending stiffness)
3. Significant increase of interfragmentary motion at ciscortex
4. Homogeneous pressure distribution along the fracture gap (Fig 5)
5. Near symmetrical fracture motion.

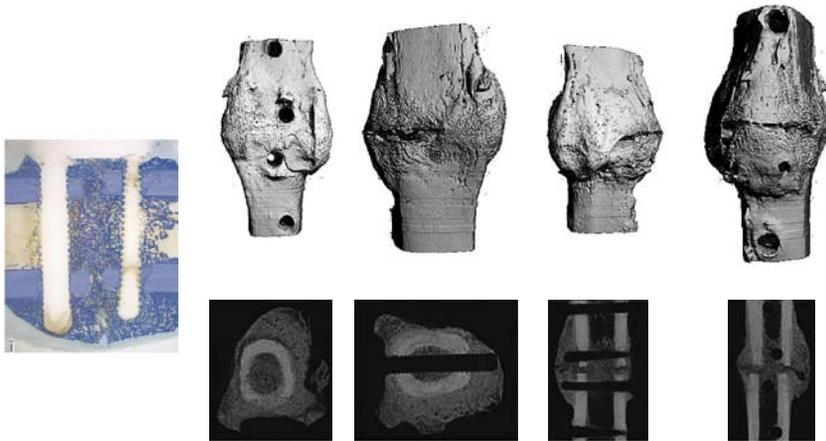


Fig 6  
Volumes of interest (VOI), especially at the ciscortex, observed significantly larger callus areas.

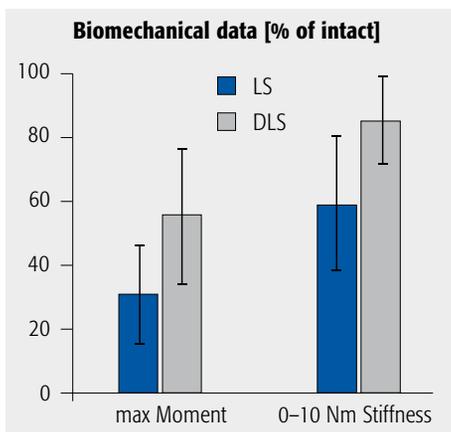


Fig 7  
The DLS showed significantly higher mean values for torsional stiffness ( $p=0.027$ ) and the failure test ( $p=0.021$ ) compared to the standard locking screw (LS).

### Animal studies

The biomechanical results could be underlined by several animal studies. Using a standardized transverse osteotomy, with a 3 mm gap, on sheep tibiae, a more homogeneous callus distribution was seen on  $\mu$ -CT scans after six weeks in the group with the DLS. These radiological results predicted a symmetrical fracture motion in cases using the dynamic system (DLS) in contrast to conventional locking screws. Several volumes of interest (VOI), especially at the ciscortex, observed significantly larger callus areas when compared to the standard locking screw (Fig 6). Furthermore, biomechanical tests including torsional stiffness and torsion to failure were carried out in the animal study. The DLS showed significantly higher mean values for torsional stiffness ( $p=0.027$ ) and the failure test ( $p=0.021$ ) compared to the standard locking screw (Fig 7).

### Clinical experience

The clinical use of the 3.7 mm DLS small fragment screw started in November 2009 within a limited multicenter-study, in which six clinical centers participated (Munich, Berlin, Chur, Wien, Graz, Luzern). In this clinical study, the indication for the DLS was limited to simple dia-/metaphyseal tibial fractures and proximal humerus fractures. The goal was to gather clinical experience with the DLS and to evaluate the influence of the dynamic system on bone healing. It was postulated that the use of the DLS could decrease the rate of delayed unions because of the more homogenous fracture motion and a uniform distribution of callus.



Fig 8a  
Distal femur fracture treated  
with DLS proximal and distal.

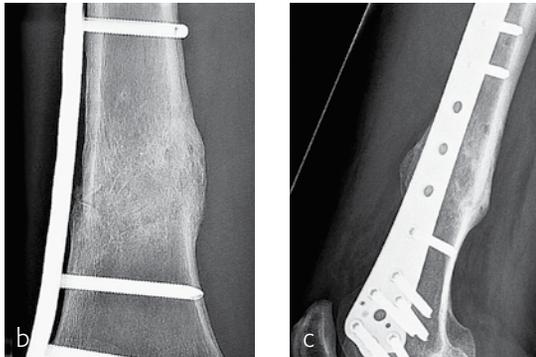


Fig 8b–c  
Follow up shows homogeneous callus distribution.

In 2012, the first clinical experiences were gathered with the 5.0 mm DLS, in the context of distal femur fractures (Fig 8).

Since the introduction of the DLS, more than 100 distal tibial fractures, more than 100 humerus fractures, and more than 50 distal femur fractures have been treated with the system. The first evaluations with the 3.7 mm and the 5.0 mm DLS are encouraging. There were no complications with the insertion. Handling was rated as very good by the surgeons and especially in simple distal tibia fractures there was no apparent delayed healing.

The experiences at the proximal humerus were also very promising. The blunt screw tip showed to be beneficial and the larger diameter as well as the dynamic moment of the DLS had a positive effect on the screw anchorage in the humeral head and might reduce the rate of cutting out of the screws in osteoporotic bone.

### Conclusion

The DLS is an improvement of angular stable plate osteosynthesis. The advantages of the angular stability are not only preserved, but even supplemented by a dynamic element that leads to homogenous fracture movement and to a uniform callus distribution. The surgeon has the opportunity to influence the rigidity of an osteosynthesis through the DLS. Nevertheless, the principles of fracture treatment remain valid and have to be respected.

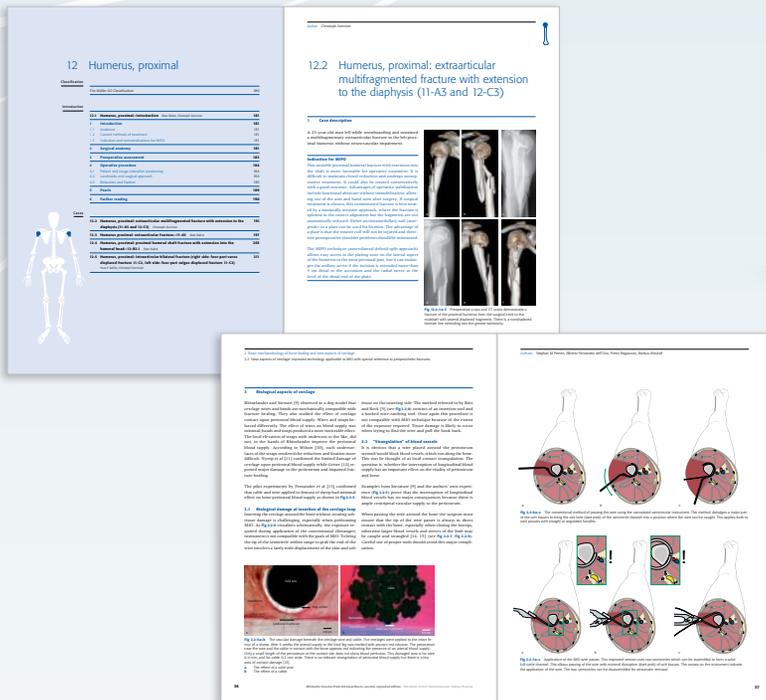
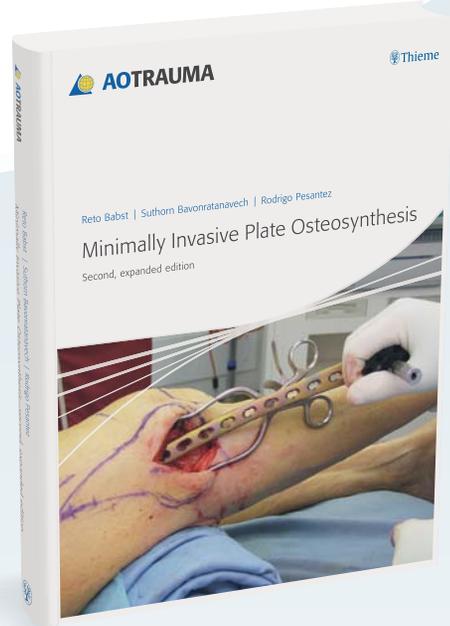
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Reto Babst | Suthorn Bavonratavech | Rodrigo Pesantez

# Minimally Invasive Plate Osteosynthesis

## Second, expanded edition



Number of pages: **784**  
 Number of figures and illustrations: **2,600**  
 Number of cases: **52**  
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Purchasing: **This book is available from Thieme.**  
[www.thieme.com](http://www.thieme.com)

This textbook offers a comprehensive view of all aspects of minimally invasive plate osteosynthesis (MIPO). The second expanded edition includes the expert knowledge of AO surgeons from all around the world. It not only provides basic concepts and the latest clinical and basic scientific research, but guides the interested surgeon through the crucial steps of MIPO application in the different anatomical regions.

Enhanced by clear photographs, x-rays, MRIs, CT scans, and detailed illustrations, the book comprises two sections:

- Section 1 "Principles"—covers the principles of MIPO surgery as well as education in MIPO
- Section 2 "Cases"—encompasses all anatomical regions. For each region there is a comprehensive introduction covering general aspects of MIPO techniques regarding indications, preoperative planning, and positioning, before indirect and direct reduction and fixation techniques are presented. Case examples then allow the reader to follow each procedure in a thorough, step-by-step manner.

Additional chapters on pediatric and fragility fractures, special indications, and implant removal conclude this second section.

The main concept behind the MIPO technique is to deal with soft tissue and bone in a way that does not add additional trauma to the fracture site. The bone must be accessed through soft-tissue windows away from the fracture site. Direct reduction maneuvers, if needed, should be executed to leave only small "footprints" at the fracture area and reduce disturbance of fracture healing.

*"This comprehensive guide to MIPO is essential for every surgeon intending to undertake or improve his/her MIPO technique and careful soft-tissue handling."*  
*Stephan M Perren, Prof Dr med DSc (hc), Surgeon FMH*

Doug Campbell, Juan González del Pino, Tom Fischer, Martin Hessmann, Ladislav Nagy, Stefaan Nijs, Fabio Suarez, Norbert Südkamp, Yuan-Kun Tu

## TRAUMA, UPPER EXTREMITY



Fig 1  
The modular MultiLoc Humeral Nailing System, consisting of a short and (new) long nail with multiple locking options covering a wide application range to address simple and complex fractures.

### MultiLoc Humeral Nailing System

In 2011, the MultiLoc Proximal Humeral Nail (PHN) was launched, which was designed in an effort to improve nailing osteosynthesis stability and thus expand the indications for nailing at the proximal humerus (see also corresponding article in the TK Innovation Magazine 2/2011). The nail is “Xmas tree” in design, with the innovative screw-in-screw technology that improves fixation in osteoporotic bone. The modular implant configuration allows for the treatment of both simple and complex fractures.

Recently, a long version of the MultiLoc nail was developed in order to treat such issues as fractures of the humeral diaphysis, fractures of the proximal humerus with diaphyseal extension, as well as combined fractures of the proximal humerus and the humeral diaphysis. This longer version nail, which is available in 7.0 mm and 8.5 mm diameters and in lengths from 180 mm to 315 mm, completes the MultiLoc Humeral Nailing System (Fig 1) creating a single comprehensive system for all fractures amenable for nailing.

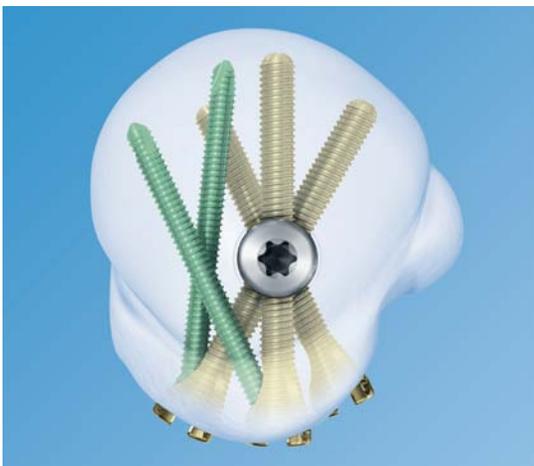


Fig 2  
Optional secondary 3.5 mm locking screws can be placed through the MultiLoc screws (screw-in-screw) for improved fixation in osteoporotic bone. The additional screws provide a large support area without increasing the entry area.



The straight nail design, with its corresponding central insertion point, improves anchorage in the strong subchondral bone at this location, and potentially avoids insertion through the fracture site in typical 3-part fractures, while preserving the hypovascular supraspinatus footprint. Due to its straight design, the implant can only be used in an antegrade manner. The proximal locking concept of the new long nail is similar to the existing MultiLoc PHN, and comprises the innovative screw-in-screw technology (Fig 2) that permits a more specific treatment of proximal humerus fractures. Either an ascending screw to support the medial calcar region or a compression screw for the compression of transverse or short oblique fractures (Fig 3) can be inserted in the long nail. The latter allows bicortical compression, which is an easy-to-handle feature improving rotational stability in transverse and short oblique fractures. The instrumentation comprises color coding for easy assembly, while self-holding mechanisms facilitate handling of sleeves and screwdrivers. Flippable aiming arms for left and right nail instrumentation help to reduce inventory and costs.

The three distal locking screws, which are placed freehand, are located in two different planes to reduce implant toggling, and increase stability of the osteosynthesis. The locking planes are situated in anatomical anteroposterior and lateral oblique direction at 25 degrees to each other. Due to the three-dimensional distal locking features, which offer the option to insert ASLS screws, distal diaphyseal fractures can also be addressed with antegrade nailing.

In comparison to previous implants, the MultiLoc nail offers clear advantages for stable fixation, especially of complex fractures like combined proximal and diaphyseal fractures and proximal humeral fractures extending into the diaphysis. Based on surgeon opinions, the compression option could also be advantageous in the management of nonunions and situations with delayed fracture healing.

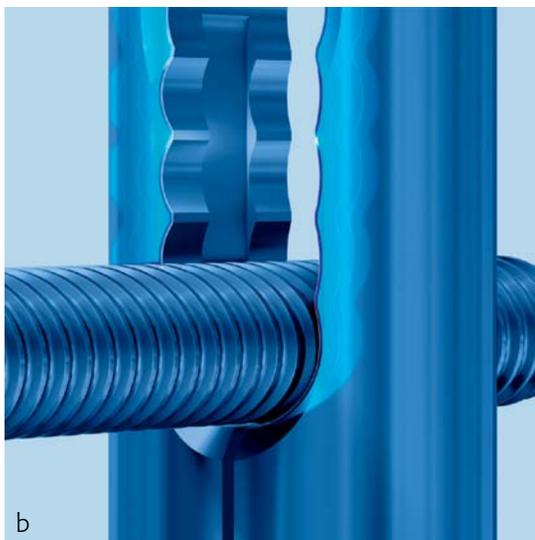


Fig 3a–b

The novel compression feature of the long MultiLoc Humeral Nail (a) allows to close a transverse or short oblique fracture gap of up to 8 mm. The oblong hole design (b) holds compression temporarily until proximal locking is performed. The nail must be over-inserted by at least the same amount of interfragmentary travel that is anticipated, because, as compression is applied, the nail will back out at the insertion site.

Case provided by Stefaan Nijs, Leuven, Belgium

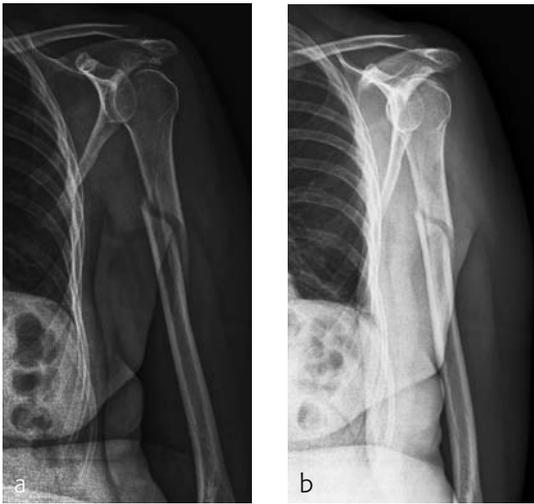


Fig 1a–b  
Preoperative AP and lateral views.

**Case 1: AO 12C1 fracture following fall**

A 54-year-old woman, and otherwise healthy patient, fell during her holidays and sustained an AO 12C1 fracture. There was no major soft tissue trauma. Other lesions: avulsion at the 5th metatarsal base, and concussion.

Surgery took place on day 9 after the accident. The patient left the hospital the day after surgery.



Fig 2a–b  
Six weeks postoperatively AP and lateral views.

Case provided by Markus Wambacher,  
Innsbruck, Austria



Fig 1a–b  
AP (a) and axial view (b) of a two-level humerus fracture (proximal three-part fracture, distal AO 12-A3).

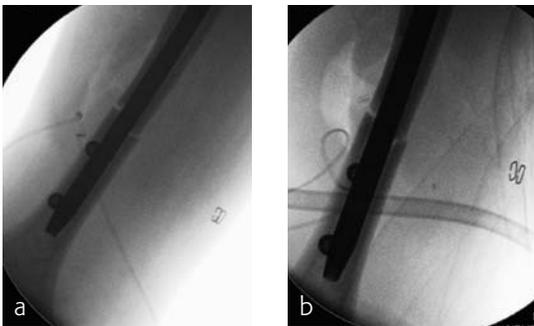


Fig 2a–b  
a Intraoperative x-ray of the distal fracture displaying a remaining gap.  
b Intraoperative x-ray of the distal fracture after compression: gap closed at ulnar, remaining gap on radial side due to small defect.

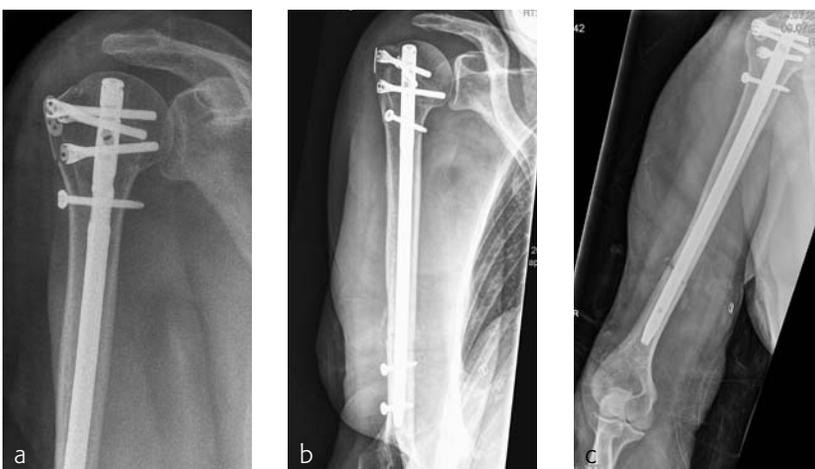


Fig 3a–c  
a–b AP postoperative x-rays.  
c Axial postoperative x-ray.

### Case 2: Staircase fall

Following a fall downstairs, a 70-year-old woman sustained a head injury with intracerebral and subdural haematoma, as well as a complex fracture of the right humerus, representing a minimal displaced proximal and an oblique fracture in the distal part of the humerus (Fig 1).

After neurosurgical intervention, surgery of the humerus was planned 10 days after the index trauma. The patient was still at the neurological intensive care unit and a preoperative clinical examination of the patient, regarding radial nerve palsy, was not possible. Therefore, a surgical revision with exploration of the radial nerve and an osteosynthesis of the humerus using a long MultiLoc Humeral Nail was indicated.

The patient was operated on in beach chair position. For the exploration of the radial nerve, a limited anterolateral approach was used. The nerve was mobilized and retracted laterally. An anterolateral approach to the proximal humerus was performed. The supraspinatus showed a small acute rupture without retraction. The supraspinatus tendon was split to get access to the insertion area on the humeral head. A 270 mm long MultiLock Humeral Nail of 8.5 mm diameter was inserted under visual and x-ray control to the desired endpoint. Reduction of both the proximal and the distal humerus fracture was anatomical. In the lateral view there was a small gap, and it was decided to apply compression after distal locking (Fig 2). Proximally, three MultiLoc screws were inserted and a 2 mm end cap was placed. Finally, the supraspinatus rupture was reconstructed with transosseous sutures and secured with an augmentation plate. The posterior greater tuberosity fracture was secured with Fiber Wire to the MultiLoc screws. Fig 3 illustrates the definitive fixation.

Postoperatively, no sling was used because the patient stayed in medically induced coma.



Fig 1  
VA-LCP Elbow Plating System.

Case provided by Norbert Südkamp,  
Freiburg, Germany

### Case: Elbow surgery

A 94-year-old man underwent surgery on his left elbow, using the VA-LCP Elbow Plating System. Plaster was used for soft tissue healing. The following images show intraoperative x-rays (Fig 2).

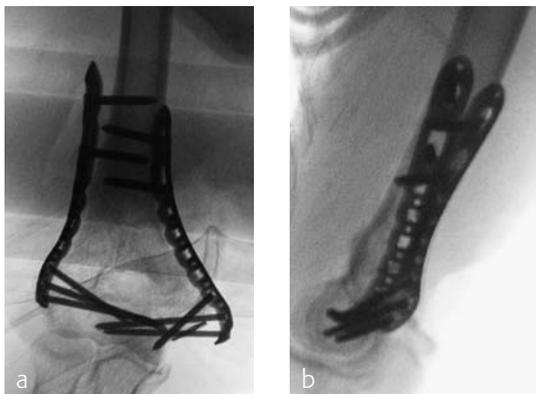


Fig 2a–b  
Intraoperative images.

### VA-LCP Elbow Plating System

The treatment of complex and/or intra-articular fractures of the elbow, when combined with poor bone quality, is a clinical challenge with a high rate of unsatisfactory results (loss of reduction, non-unions and impaired function). Significant stiffness, pain, and deformity can follow treatment of the fractures in both adults and adolescents. Prolonged immobilization usually leads to these clinical complications, as also can occur with traction. In order to overcome this, stable reduction and fixation of fractures is required so that active motion can be started early to produce the best possible results.

Founded upon the established AO principles, and based on the first generation elbow plates, the new Variable Angle LCP Elbow Plating System (Fig 1) reduces the risk of soft tissue irritation, taking into account the poor soft tissue coverage of the elbow, by improving the plate profile, optimizing the anatomical plate contours, and enabling the screw heads to sit flush in the plate hole. The variable angle locking technology combines the simplicity of the established LCP screw insertion technique with the possibility of adapting screw angulations. Safety is enhanced during screw insertion by offering optimized redefined screw angles while allowing  $\pm 15^\circ$  off-axis angulation, if needed.

Responding to the specifics of proximal ulna fractures, the system recognizes the particular biomechanical requirements of each fracture type, offering specific implants with optimized shapes and screw configurations. The multiple distal humerus plate configurations that are provided, including parallel and perpendicular plating, address surgeon plating preferences, offering a portfolio to treat a vast array of elbow fractures.

An optimized metaphyseal plate profile, together with rounded edges and an improved anatomical plate fit, minimize the prominence of the construct without compromising stability. The 2.7 mm Variable Angle Locking Screw and a newly developed 2.7 mm Low-Profile Metaphyseal Compression Screw, an alternative to a cortex screw (non-locking) with low-profile head, assure a minimal screw-head prominence. The predefined screw angles are optimized for common fracture patterns for average anatomy. Where needed, undercuts in the metaphyseal part and recon notches enable adaptation to the plate axis to the bone-shaft axis.

The VA-LCP Elbow Plating System offers three main double-plating configurations for the distal humerus: Perpendicular; perpendicular with lateral support, and Parallel. In response to the specifics of the proximal ulna, the new system offers the Proximal Olecranon Plate, the Olecranon Plate, and the Proximal Ulna Plate, extra-articular.



Fig 1  
LCP Ulna Osteotomy 2.7 system.



Fig 2  
The 6-hole and 8-hole plates.

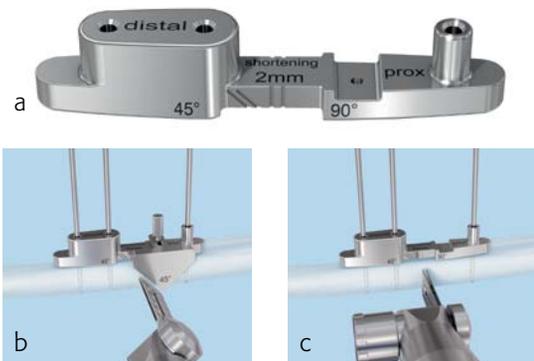


Fig 3a–c  
a Drill template.  
b–c Allows for oblique or transverse cutting.



Fig 4  
Saw guide for oblique cuts.



Fig 5  
Saw blades for transverse and oblique cuts and 2 mm shortening.

### LCP Ulna Osteotomy 2.7 System

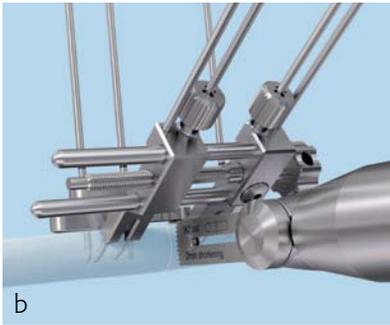
Ulna impaction syndrome (or ulnocarpal abutment syndrome) is a degenerative condition related to excessive load bearing across the ulnar aspect of the wrist, which results in chronic impingement of the ulnar head against TFCC, lunate and triquetrum. This chronic impingement further results in wrist pain, swelling, limited range of motion, and diminished grip strength. In most cases, a positive ulna variance causes this ulnocarpal impaction syndrome. Distal radius fractures with radius collapse are also a common problem with a secondary painful positive ulna variance. Depending on stage and patient symptomatology, the treatment includes an ulna shortening osteotomy. However, the common complications in ulna osteotomies are hardware irritations as well as delayed union or nonunions.

If ulna osteotomies are performed with standard plates and screws, the precise performance of parallel cuts is not always easy, nor is achieving the correct alignment of the bone parts cut. Some ulna osteotomy systems that help the surgeon to perform precise parallel cuts, as well as the correct alignment of the bone, are already available. But those systems utilize a long plate and a big cutting jig that is mounted onto the plate, with both needing a relatively large incision. As there is not much soft tissue around the ulna, the protruding plate sometimes disturbs the patient.

The LCP Ulna Osteotomy 2.7 system (Fig 1) is ideal for shortening osteotomies of the ulna. It allows accurate oblique or transverse osteotomy cuts and correct restoration of bone alignment, and uses a smooth and low profile plate design that minimizes hardware irritation. The system consists of plates in two sizes (short plate 6-hole, and long plate 8-hole) (Fig 2), five drill templates (Fig 3) with predefined shortening lengths (2.0 mm/2.5 mm/3.0 mm/4.0 mm/5.0 mm) for transverse or oblique cuts, a saw guide for oblique 45° cuts (Fig 4), 2.0 mm K-wire with drill tip, five parallel saw blades for transverse cuts, and five parallel saw blades for oblique (45°) cuts (Fig 5).

The system can be used in different osteotomy techniques:

- Technique for 2–5 mm shortening: AO type
- Technique > 5 mm shortening: Freehand
- Saw blades (Powertools)
- Jig (Compression/Distractor Instrument).



It is important to understand the concept of the system: First of all, either a transverse or oblique osteotomy has to be selected. Screw holes for the plate need to be drilled at the right place before the osteotomy is done. A special tool helps get a precise parallel osteotomy cut, but the instrument will only work on a flat surface. A bent or curved bone will require a larger incision. If the plate toggles, either the bone needs to be flattened or the plate should be positioned more proximally. For an oblique cut, a guide is used for marking the osteotomy and then removed. The correct usage of the jig is important for accurate shortening, and proper rotation alignment needs to be ensured. Sufficient interfragmentary compression (good friction of the whole osteotomy surface) is needed (Fig 6). In oblique osteotomies, the adequate length of the lag screw (screws should be used 1 mm longer than measured) is mandatory for a good compression. Depending on the bone quality, the type of patient (eg, very muscular persons may require an 8-hole plate instead of a 6-hole plate), and the amount of shortening, a sufficient number of bi-cortical locking screws has to be used. In patients with hard bone, it is advisable to use the dedicated tap.

In summary, the LCP Ulna Osteotomy 2.7 system leads to a lower complication rate, reduced non-union rate, and reduced postoperative pain, as it allows for a shorter incision, more precise cutting, better alignment, and minimizes hardware irritation, which greatly reduces the need for plate removal, if the correct surgical technique is followed.

Fig 6a–e

a–b Technique with Compression/Distraktion Instrument and Drill Template.

c–e Freehand technique.

Cases provided by Doug Campbell, Leeds, UK; Ladislav Nagy, Zurich, Switzerland; and Juan González del Pino, Madrid, Spain.

**Case 1: Distal radius fracture**

A 69-year-old female patient had suffered a right distal radius fracture one year earlier, and received conservative management. Symptoms included pain and impaired function about the wrist and forearm, with decreased forearm rotation. Painful DRUJ (DASH: 34, PWRE: 29).

The x-ray showed ulna variance of +3 mm (Fig 1). Normal sagittal and coronal alignment of the distal radius. Surgery was performed, with the amount of shortening being 4 mm. Transverse cut (Fig 2).

The outcome (Fig 3) included bone healing at 4 months, pain relief and improved forearm rotation at 2 months. Early osteotomy site remodeling: 6 months. Final remodeling: 12 months. Outcome at 1 year and 6 months: DASH: 11, PWRE: 13.



Fig 1a–b  
Preoperative images.

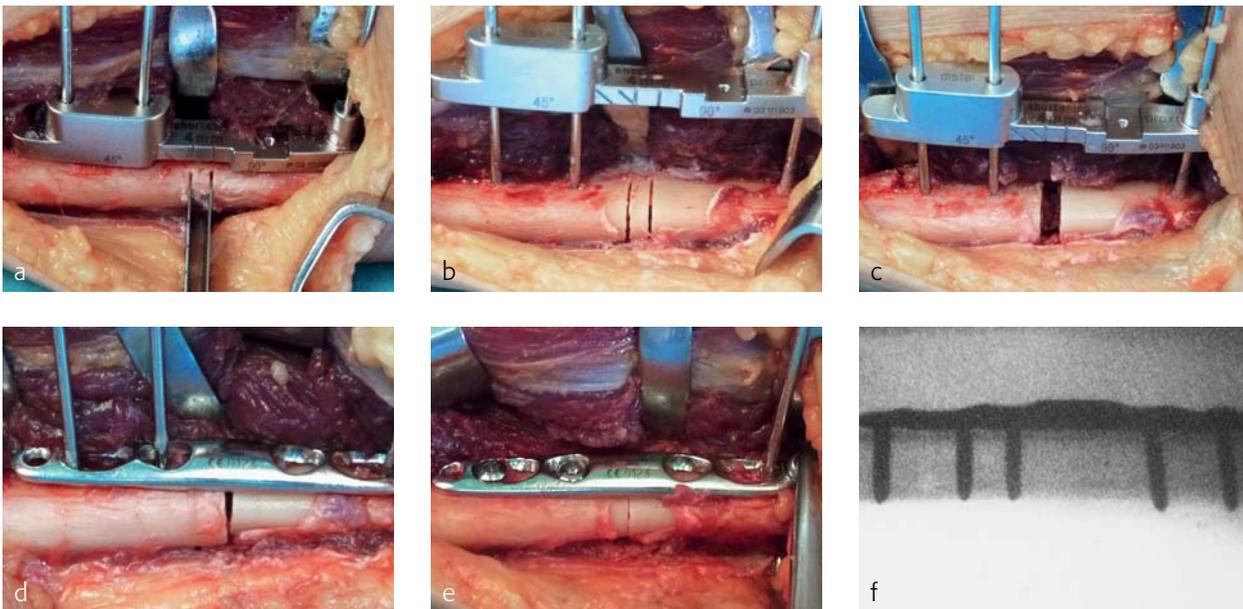


Fig 2a–f  
Intraoperative images of 4 mm shortening, transverse cut.



Fig 3 a–d  
Bone healing at 4 months (a–b) and bone remodeling at 12 months (c–d).

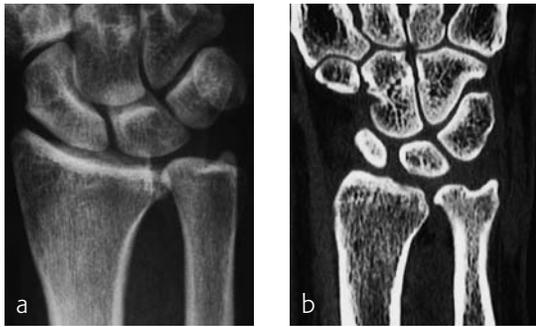


Fig 1a–b

**Case 2: Painful ulno-carpal abutment**

A 32-year-old man suffered torsional trauma about the right wrist, with TCFF rupture. A failed arthroscopic repair had taken place. Constitutional ulna plus. Symptoms included pain and impaired function about the wrist and forearm. Painful DRUJ (DASH: 22, PWRE: 21).

The x-ray showed ulna variance of +3 mm (Fig 1). Surgery was conducted with an amount of shortening of 4 mm, transverse cut.

Postoperative outcomes (Fig 2 and 3) included bone healing at 4 months, and pain relief at 1 month. Early osteotomy site remodeling: 7 months and final remodeling: 12 months. Outcome at 14 months: DASH: 9. PWRE: 5

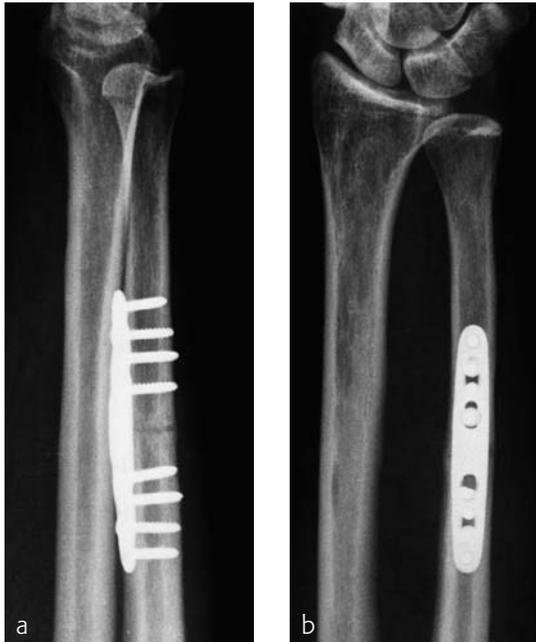


Fig 2a–b



Fig 3a–b



**Case 3: Oblique osteotomy**

A 48-year-old female nurse had a diagnosis of a degenerative central TFCC-rupture, with chronic ulnocarpal abutment.

The amount of correction required was 2.5 mm. The preoperative x-ray showed positive ulnar variance (Fig 1). Images from the operation and results at four months are shown (Fig 2 and Fig 3).

Fig 1

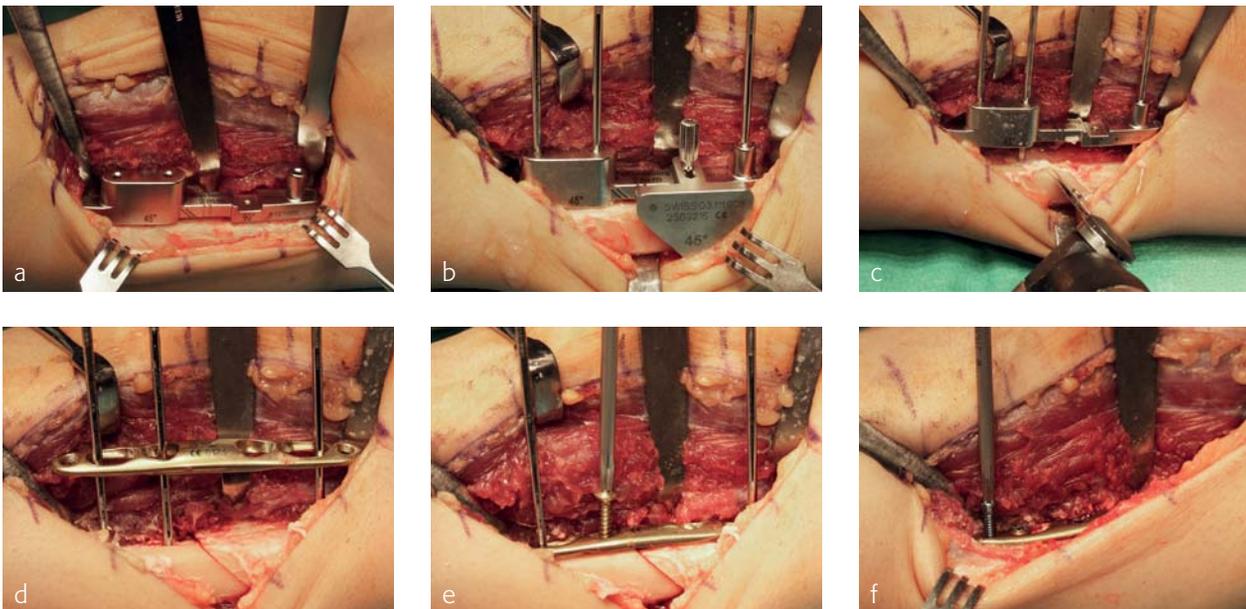


Fig 2a-f

Drill template introduced for shortening, drill holes prepared (bolts), and saw guide used for the oblique cut (45 degrees). Once the bone slice was removed, the saw guide was replaced with the proximal plate, and screwed in (lag screws and locking screws).



Fig 3a-d

a-b Postoperative x-ray.  
c-d Images of the healed osteotomy four months post-op.

Paulo Barbosa, Diarmuid De Faoite, Sabine Goldhahn, Takeshi Sawaguchi, Clifford Turen,  
PFNA Asia Multicenter Study Group

## TRAUMA, FEMUR



### TFN Set Screw

Some surgeons like the option of preventing sliding of the TFN helical blade or screw in certain situations, such as, reconstructive procedures, gun shot injuries, reverse obliquity fractures, and tumors. In order to prevent collapse of the head element, the TFN Set Screw (Fig 1a) was developed. Once the set screw is tightened with a torque limiting handle, the grooves on the underside of the TFN Set Screw engage with the helical blade or screw to prevent sliding. It is available in 3 angles (125°, 130° and 135°) in order to match the CCD angle of the nails, and is made of TAN (alloy).

If a surgeon wants to prevent sliding, the scrub technician has to remove the TFN locking mechanism from inside the nail, on the back table, and replace it with the pre-assembled TFN Set Screw. The surgeon must make a conscious decision to replace the locking mechanism with the TFN Set Screw, which helps ensure the surgeon does not unintentionally prevent sliding.

Self-retention between subcomponents of the TFN Set Screw allows for ease of insertion. After the head element is inserted, the surgeon will use a torque limiting handle to tighten the set screw and prevent collapse. If the surgeon changes his or her mind and wants to allow sliding, the tang is long enough that the set screw can be backed off to allow sliding, while still preventing rotation. If sliding is permitted, however, an end cap must be used in conjunction with the set screw.

It is important to note that the TFN Set Screw should only be used for fixation in fractures where sliding of the head element is not desired. The addition of the locking feature expands the utility of the TFN system. While it should only be used in select cases, the new locking feature offers an alternative fixation option for certain difficult and complex fractures.

Fig 1a–b  
The TFN Set Screw with long tang and grooves on the underside (a) allows the surgeon to lock the TFN head element to prevent sliding (b).



Fig 1  
The PFNA Asia.

## First AOTrauma Japan multicenter study completed: Treatment of unstable trochanteric fractures with the Proximal Femoral Nail Antirotation (PFNA) Asia

### Background information

Unstable trochanteric fractures, mainly due to osteoporosis, are a surgical challenge worldwide. However, significant regional variations are apparent in both the size and the characteristics of the problem. For example, it is known that East-Asians have different geometric proportions to Caucasians, resulting in complications due to a mismatch when using standard implants.

### The Proximal Femoral Nail Antirotation (PFNA) Asia

To help cope with the differences described above, an Asian version of the existing Proximal Femoral Nail Antirotation (PFNA) was developed and introduced into the market. The PFNA Asia (also known as PFNA II) (Fig 1) has a proximal diameter of 16.5 mm, Caput Collum Diaphyseal (CCD) angles of 125° or 130°, a range of lengths (short: 170 mm, 200 mm; long: 300 mm–420 mm) and distal diameters (9 mm–12 mm) with an adapted geometry, i.e., a flat lateral side, a straighter tip point, and medial-lateral bending of 5°.

### Study Rationale and Aims

While few previous studies have been conducted to compare the standard PFNA with other implants in the treatment of trochanteric fractures in Asians, no prospective study had focused on the effect of the PFNA Asia in the Asian population with respect to a detailed complication analysis.

The primary focus of the AOTrauma Japan multicenter case series study was safety, examined by assessing the 1-year local bone/fracture and implant/surgery complication rates in patients treated with the PFNA Asia. In addition, secondary outcomes focused on assessing function and quality of life-related patient outcomes, operative handling by the surgeon, potential mismatches between the femur and implant, anatomical restoration, and prognostic factors associated with the occurrence of complications.

### Study conduct

The clinical investigation was performed in 20 Japanese hospitals over a three year period. The study population was 176 patients aged 65 years and older with a radiologically-confirmed, unstable, closed trochanteric fracture, sustained seven days or less before primary fixation treatment with the PFNA Asia.

### Preliminary results and conclusion

Patient functional outcomes and health-related quality of life were similar between the pre-injury and final follow-up evaluations, and surgeons were highly satisfied with the implant and its handling. There is

also a large societal benefit to enabling patients of advanced age that have sustained an unstable trochanteric fracture to return to their pre-injury residential status.

The preliminary results from this study highlight the importance of having implants designed for older Asian patients available to surgeons in the region.

#### Further information

A manuscript on the study is currently in preparation. More information on the study methodology is available from [www.ClinicalTrials.gov](http://www.ClinicalTrials.gov) under the identifying number: NCT00873548.



PFNA Asia Multicenter Study Group at the study closure meeting in Tokyo.



Fig 2  
The PFNA range.

#### Features of the Proximal Femoral Nail Antirotation (PFNA) Asia

The Proximal Femoral Nail Antirotation (PFNA), with its helical blade concept, is a state-of-the-art treatment method for proximal femoral fractures, providing rotational and angular stability with one single element (Fig 2). The intramedullary nail acts as an internal splint that controls but does not prevent micromovements of the bone fragments. The PFNA provides relative stability, leading to indirect healing through callus formation.

With the PFNA Asia, the proximal-lateral portion of the nail has been narrowed to prevent jamming with the lateral cortex, and to facilitate smooth insertion of the nail.

The bending point was shifted by 5 mm proximally, compared to the standard PFNA, also helping with smoother nail insertion (Fig 3). The valgus angle is 5° with PFNA Asia, compared to the standard PFNA 6°.

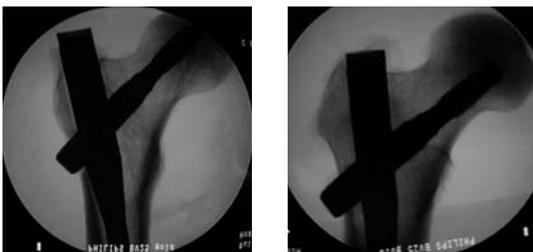


Fig 3a–b  
Representations of a fitted PFNA (a) and PFNA Asia (b).

Cases provided by Takeshi Sawaguchi,  
Toyama, Japan.

### Case 1: Woman with fall injury

A 78-year-old Japanese patient fell while at her home and sustained an AO 31-A2.1 injury (Fig 1a). She was operated on the next day and fixed with a PFNA Asia (size: extra small, angle 130 degrees, distal diameter: 9 mm, blade length 100 mm) (Fig 1b). Good reduction and stable fixation were obtained.

Full weight-bearing gait was allowed on the second postoperative day. There was an uneventful postoperative course, and good union was obtained at three months after surgery (Fig 1c).

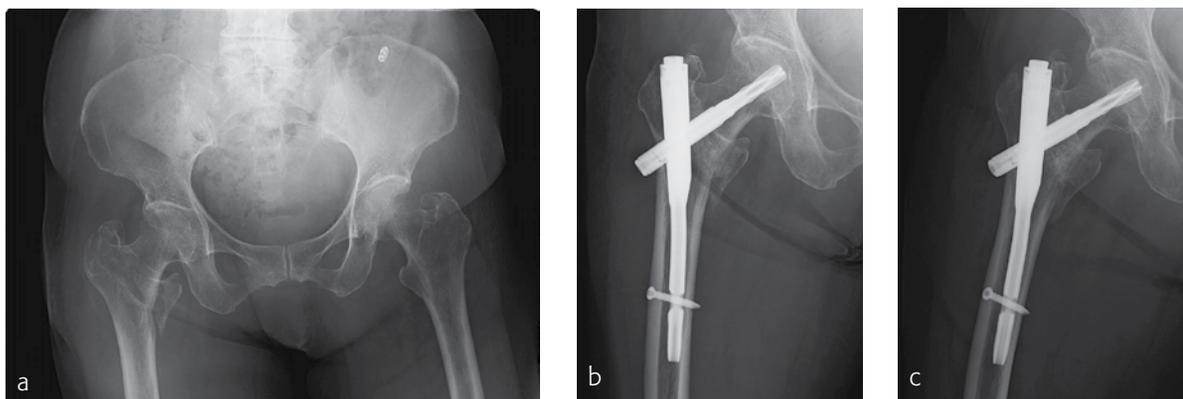


Fig 1a–b  
Preoperative (a) and postoperative (b) x-rays, and at 3 months (c).

### Case 2: Elderly patient with fall injury

An 85-year-old Japanese woman fell down at her home. She sustained an AO 31-A2.1 fracture. The images indicate various stages of the operation, using the PFNA Asia (Fig 2).

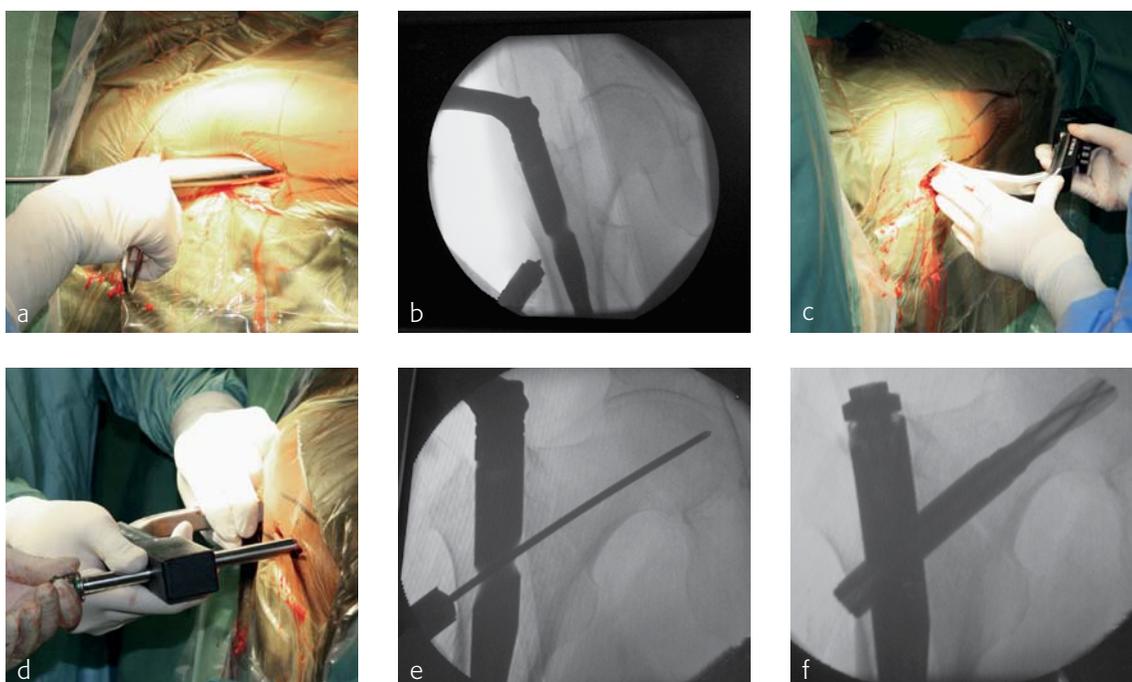


Fig 2a–f  
Surgeons performing the operation.

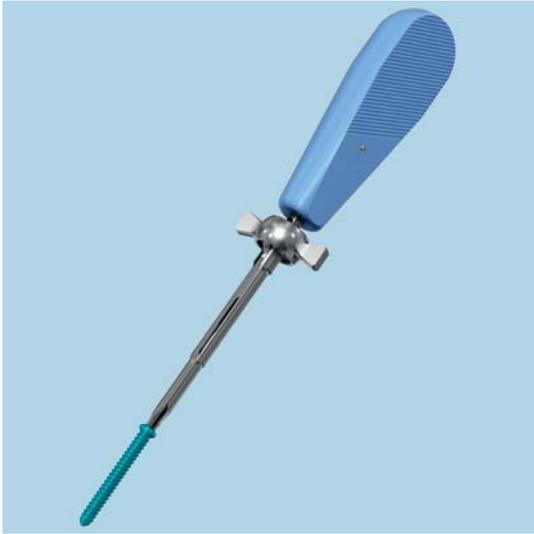


Fig 1  
The new Inter-lock Screwdriver T25/3.5 mm Hex, which allows locking the screwdriver tip into the screw recess by turning the nut with the wings.

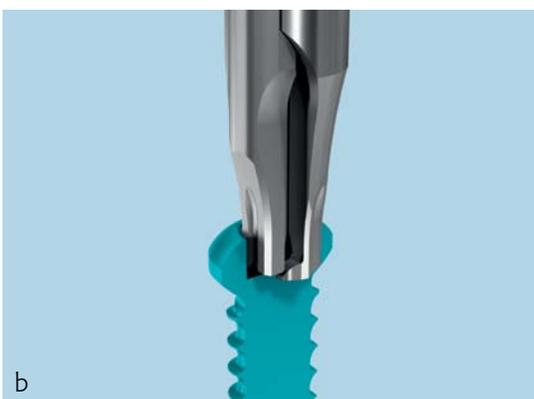
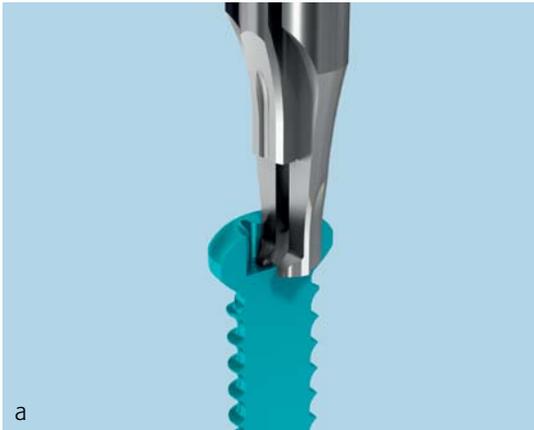


Fig 2a–b  
a Disengaged configuration of the locking mechanism.  
b Engaged.

### Inter-lock Screwdriver T25/3.5 mm Hex

An essential part of fracture fixation today is ensuring soft tissue protection, driving surgeons to use MIO techniques and small, stab incisions for screw insertion with either plates or nail implants. However, several difficulties have been reported, such as missing screws, disengagement of the screw from the screwdriver, improper direction of screw insertion, and other problems.

For the current T25 and 3.5 mm hex screwdrivers, an external holding sleeve is available to retain the screw, but there are certain disadvantages with the external holding sleeve, such as the difficulty in the handling procedure and the need for a larger incision for the proper insertion of the instrument.

In order to address these clinical challenges, a new self-holding screwdriver has been designed to facilitate screw insertion, especially through small incisions at areas with large amounts of soft tissue, and will greatly help avoid the risk of disengagement of the screw.

The tips of the new Inter-lock Screwdrivers (T25/3.5 mm Hex) lock into the recesses of existing Synthes screws with a StarDrive 25 or 3.5 mm hexagonal recess (see Fig 1). Wings were added to the nut for better grip when tightening the nut down while capturing the screw (Fig 2). After insertion of the screw, no force is required to release the screw from the tip of the screwdriver. The screwdrivers are available in two lengths: 330 mm and 224 mm.

This new screwdriver will improve the current screw insertion and removal procedures when compared to previously available screwdrivers, and will help to decrease the required OR time for these procedures.

Matthew Graves, Rami Mosheiff, Sean Nork, Christian Ryf

## TRAUMA, LOWER EXTREMITY



Fig 1  
Comparison of screw geometry of 3.5 mm Low Profile Cortical Screws and standard 3.5 mm cortex screws with Hex Drive (left) and StarDrive recess (right).



Fig 2  
Illustration of the difference in screw prominence when placing a 3.5 mm standard cortex screw (left) and a 3.5 mm Low Profile Cortical Screw (right).

### 3.5 mm Low Profile Cortical Screw

When plates and screws are chosen for fracture treatment, soft tissue and/or tendon irritation is a potential clinical problem. Screw head prominence can be especially problematic in subcutaneous locations such as the clavicle, the olecranon, or the tibia; or when tendons pass over the implant as observed in the distal radius.

To address this issue, a 3.5 mm Low Profile Cortical Screw has been developed, which is compatible with all Synthes 3.5 mm plates. Design changes in the new screw consist of alterations to the head height, screw head outer diameter, and geometry of the underside of the screw (Fig 1). These changes alter the location of the screw's gauge-line, allowing the 3.5 mm Low Profile Cortical Screw to be seated lower in a given plate hole (Fig 2). The new screws are available in both stainless steel and titanium and have a T15 StarDrive or Hex Drive recess.

Mechanical testing has shown that the 3.5 mm Low Profile Cortical Screw demonstrates failure torque, bending strength, and driving torque that are mechanically comparable to that of standard 3.5 mm cortex screws.

The 3.5 mm Low Profile Cortical Screw is intended for the fixation of fractures, osteotomies, and nonunions of the clavicle, scapula, humerus, olecranon, radius, ulna, pelvis, femur, tibia, fibula, and calcaneus.

The new screw is an additional treatment option for surgeons with concerns about soft tissue and/or tendon irritation when using plate and screw fixation. It also addresses the clinical need to prevent or minimize additional surgical procedures to remove implants that become too uncomfortable or pose a health risk for the patient.



Fig 1  
Trocar made out of PEEK, protection sleeve, handle for protection sleeve, and outer protection sleeve (from top to bottom in picture) for suprapatellar nail insertion.

### Suprapatellar Insertion Instruments

Extra-articular proximal tibial fractures (AO/type 41A) are fractures involving the proximal tibial segment between the tibial tuberosity and the metaphyseal-diaphyseal junction. These fractures make up 5% to 11% of all tibial fractures. A substantial part of these fractures is caused by high-energy trauma with considerable displacement and comminution.

Three factors have been recognized as causing malalignment in these fractures:

1. Muscle pull. Muscle pull on the proximal fragment of the fracture is applied mainly by the patellar tendon. When stressed, as in knee flexion, the anterior part of the proximal fragment is pulled, and thus an anterior angulation is created at the fracture site.
2. Nail configuration. The nail, originally designed for midshaft tibial fractures, has a curvature along its proximal third – the “Herzog bend”. This curvature is designed to enable the nail to enter the medullary canal without penetrating the knee joint. Due to this configuration of the tibial nail, both parts of the fracture site are subject to uneven forces. In addition, if the nail impacts the posterior cortex it can create a posterior translational force on the distal fragment. Henley and colleagues termed this phenomenon the wedge effect [1].
3. Surgical approach. The medial parapatellar surgical approach of nail insertion can create a slightly medial starting point and lateral entrance angle. As the nail straightens when it meets the lateral cortex, it pushes the proximal fragment into a varus position or the leg into a valgus position. An anterior insertion point causes a similar effect, but in the sagittal plane. The nail is directed down and posteriorly in order to enter the medullary canal. If the entrance angle doesn't match the offset, it creates an apex anterior angulation.

In the last couple of years, significant efforts have been made to change the configuration of the nail to allow accurate reduction and fixation of proximal tibia fractures. These efforts successfully resulted in the Expert Tibial Nail, which is ideal for fractures of this sort. On the other hand, experience shows that the nail itself cannot solve the entire problem without dealing with the other malalignment factors. The suprapatellar insertion technique is a new, innovative technique whose purpose is to neutralize these other factors.

A suprapatellar nail insertion technique will help to reduce the secondary deformities associated with the forces of the tendon pulling on the proximal segment of tibia fractures. The forces are decreased due to the leg being in extension when applying a suprapatellar nail insertion technique. In addition, the new technique, which allows for a high entry point, reduces the medial or lateral deviation of the nail. This new entry point minimizes the risk for angulation in the proximal fracture site during nail insertion.

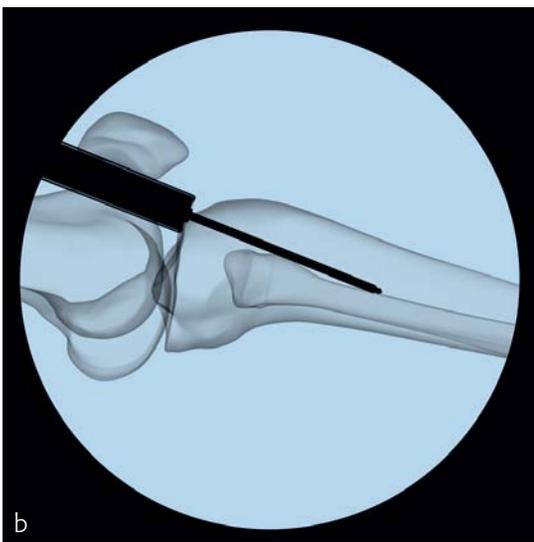
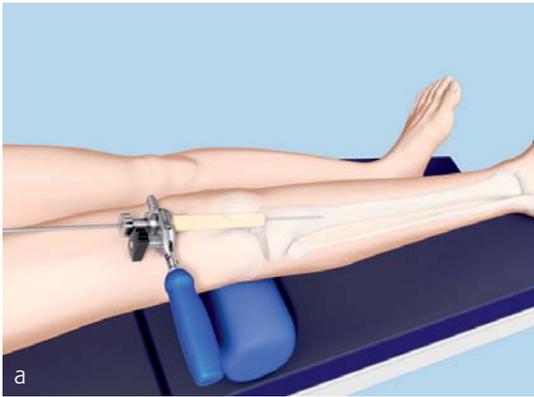
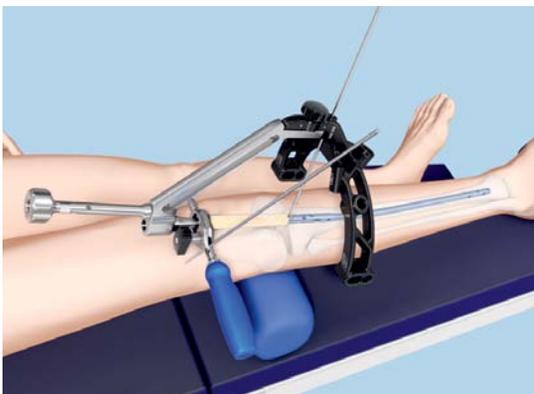


Fig 2a–b  
Insertion of the centering sleeve through the inner protection sleeve. Slight adjustment of the knee flexion will provide the ideal radiographic location for the starting point and insertion of a guide wire. Adjustments to the guide wire location can be “dialed-in” by rotating the multi-hole centering sleeve to place a second guide wire while the first guide wire remains in place.



In response to the advantages of a suprapatellar insertion technique, and the increasing clinical demand to perform such a procedure, the Suprapatellar Insertion Instruments have been developed. These instruments allow the insertion of the nail with the leg in extension through the suprapatellar pouch in a simple and intuitive way. The instruments comprise a soft and flexible outer protection sleeve made of santoprene (single-use, Fig 1) to protect the cartilage and soft tissues during the procedure, as well as a metal inner protection sleeve to encompass the cutting and reaming tools and protect the outer protection sleeve. Fig 2 illustrates the insertion of the guide wire after placement of the protection sleeve during the surgical procedure. In addition to the Suprapatellar Insertion Instruments, a new carbon fiber aiming arm has been developed and introduced into the tibial nailing systems (Fig 3).

Based on clinical experiences collected over a number of years, the semi-extended position provides multiple advantages for intramedullary rodding, including:

1. Elimination of sagittal plane deforming forces in proximal tibial fractures
2. Providing a more stable platform for reduction of tibia fractures
3. Eliminating the need to change the position of the leg for radiographs, thus decreasing radiation exposure and easing the work of the c-arm technician.

The Suprapatellar Insertion Instruments were designed to take advantage of this experience, while still providing in-line access to the coronal plane anatomic axis.

### References

- 1 Henley MB, Meier M, Tencer AF (1993) Influences of some design parameters on the biomechanics of the unreamed tibial intramedullary nail. *J Orthop Trauma*; 7(4): 311–319.

Fig 3  
Instrumentation with insertion handle and radio-lucent, carbon fiber aiming arm attached to the nail, which has been inserted through the outer protection sleeve.

### VA-LCP Proximal Tibial Plate 3.5 System

#### One plate for various tibia indications

Open reduction and internal fixation with plates and screws is considered to be today's gold standard method for treatment of proximal tibial fractures. A broad variety of plates is available for this anatomic area, with special features providing solutions to different clinical problems.

The VA-Locking Proximal Tibial Plate 3.5 (Fig 1) covers various indications with one (small fragment) implant, which had previously been restricted to different plate types (small and large fragment):

- The proximal row of 4 rafting screws ideally supports depression fractures of the tibial plateau
- The flexible neck area, together with the long-hole accepting compression screws, allows buttressing of split-type fractures
- In addition, the overall plate stability (same construct stability as a LCP 4.5/5.0 narrow plate in the shaft) allows for the treatment of complex metaphyseal, bicondylar and (associated) shaft fractures with small fragment screws, which have until now been restricted to large fragment plates.

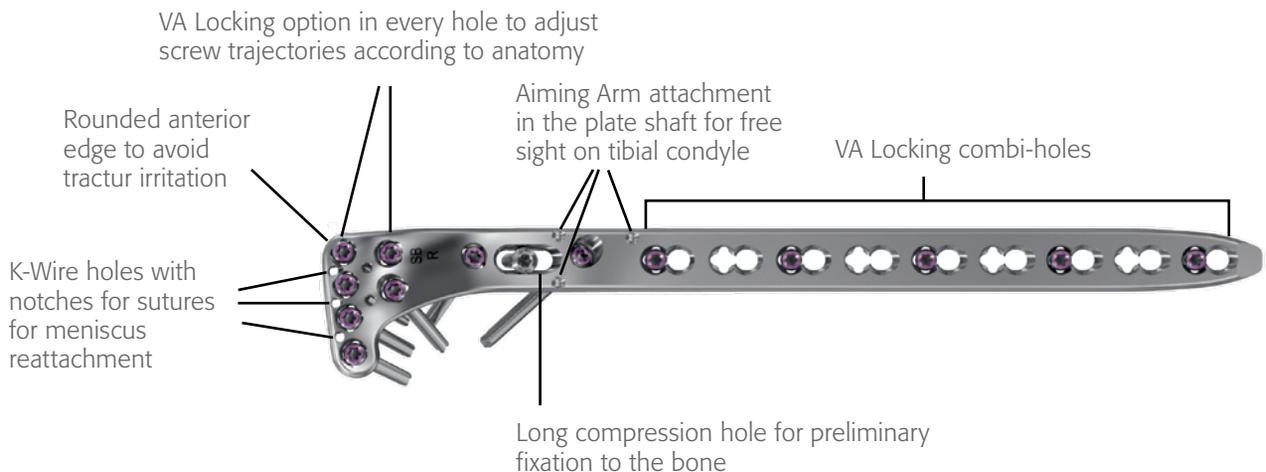


Fig 1  
Features of the VA-LCP Proximal Tibia Plate 3.5.  
The plate is currently available in stainless steel,  
in the lengths 4 to 14 holes (87mm–237mm).



Fig 2  
Small and large bend versions of the plate are available for optimal plate fit.



Fig 3  
The VA-LCP combi-holes in the plate shaft combine compression and VA locking capabilities.



Fig 4  
The aiming arm allows an easy to use instrumentation for straight forward assembly and improved handling.

### Caring about soft-tissue

Literature shows that the tibia is a highly variable bone. A good plate fit is essential as it supports a stable fracture fixation, improves screw-plate mechanics, prevents malreductions, and consequently avoids impingement of the overlying soft-tissue.

A CT scan study covering 170 bones was performed to define the ideal shape for the VA-LCP Proximal Tibial Plate. As a consequence of the findings of this study, two plate shapes were developed to cover these bone variances and achieve an optimal plate fit (Fig 2).

Suture-holes in the plate head facilitate meniscus reattachment, and the aiming arm makes a minimally-invasive percutaneous screw insertion possible.

### Variable Angle (VA) screw technology to adapt screw direction according to clinical need

The concept of fixed angle locking screws is both clinically proven and widely spread. But with the VA locking technology, with its screw variability of 15° in each direction (Fig 3), additional clinical problems can also be solved:

- Adapt the screw trajectory to varying tibial plateau inclinations, thereby avoiding joint penetration
- Adapt the screw trajectory to condyle size by distributing screws over the tibial plateau
- Capture the fracture fragments and target specific anatomic regions
- Anchor the screws in good quality bone
- Avoid collisions with other implants or prostheses
- All screw types of the small fragment set can be used in any plate hole (3.5 mm VA Locking Screws, 3.5 mm Cortex Screws, 4 mm Cancellous Bone Screws; in nominal angle also 3.7 mm Dynamic Locking Screws, and 3.5 mm Locking Screws).

### First clinical experiences with the VA-LCP Proximal Tibial Plate system

An aiming arm is available for minimally-invasive screw insertion, and is suitable for all plate types (right, left, small bend, large bend) (Fig 4). During the Market Preference Evaluation, users of the VA-LCP Proximal Tibial Plate rated the performance of the system in terms of plate fit, aiming arm design and handling, and simplicity of surgical technique as excellent in the majority of cases. Plate fitting, screw configurations, the screw variability, and the handling of screw insertion were also rated as being good in the majority of cases, all indicating that the VA-LCP Proximal Tibial Plate provides an effective proximal tibial fracture solution.

Case provided by Christian Ryf, Davos, Switzerland



Fig 1  
Preoperative CT image.



Fig 2a–b  
Preoperative images AP and lateral.



Fig 3a–b  
Postoperative images AP and lateral.

**Case: Hiking accident**

A 70-year-old female patient had an accident while hiking. Osteoporosis was preexisting but with asymptomatic moderate degenerative osteoarthritis of the knee with chondrocalcinosis of the lateral compartment (Fig 1 and Fig 2).

The area was functional soon after treatment (Fig 3), and the patient was able to experience weight bearing of 20 kg for the first 6 weeks. She was completely pain free after 6 weeks (Fig 4) with excellent muscular function and coordination, therefore unlimited weight bearing after the first follow-up was enabled.

**Conclusion**

While the Market Preference Evaluation of the new VA-LCP Proximal Tibial Plate 3.5 system outlined its needs, advantages and benefits, a highly sophisticated new plate and screw system is still no guarantee of a good result. The key steps in a successful treatment of a complex proximal tibia fracture remain the same, namely, the choice and careful performance of the adequate approaches and the attentive and anatomical reduction of the joint and the axes.

Clearly, an exact preoperative plan is also essential in order to fulfill all the biomechanical requirements. However, the new VA-LCP Proximal Tibial Plate 3.5 system offers a comprehensive variety of screw options, instruments, and plate features that support the surgeon to implement the above mentioned key steps, for a successful outcome.



Fig 4a–b  
Postoperative images at 6 weeks follow-up, showing AP and lateral.

## POWER TOOLS



Fig 1  
The new Colibri II.

### Colibri II: the Colibri system adapted to the latest technological standards

The Colibri II is a universal battery-driven power tool intended to be used for drilling, reaming, sawing, and K-wire setting on small bones. It addresses the entire range of trauma applications up to intra-medullary reaming.

The Colibri II offers the much appreciated balance and ergonomics of the Colibri while providing a new, more powerful and highly durable motor. In addition to the improved handpiece (Fig 1), the Colibri II offers a brand new 14.4V battery pack with Li-Ion technology.

The changes result in the following main advantages:

- Users benefit from increased power (+30%\*) and from higher reliability of the handpiece
- Thanks to the environmentally-friendly\*\* Li-Ion technology, the Colibri II offers a higher battery capacity (+140%\*) while the Li-Ion technology prevents the batteries from discharging during storage or from memory effect
- The flat battery casing provides more convenience to OR staff during surgery.

Importantly, the new Colibri II remains compatible with existing Colibri attachments and accessories. Moreover, the Colibri II battery pack is compatible with the existing Colibri handpiece, while the Colibri II handpiece is also compatible with the existing Colibri 12V and 14.4V battery packs.

\* Colibri II with lithium-ion (Li-Ion) battery compared to Colibri with 14.4 V Ni-Cd battery

\*\* As per Battery Directive 2006/66EC



Fig 1  
The Small Electric Drive, ideal for small bone surgery.

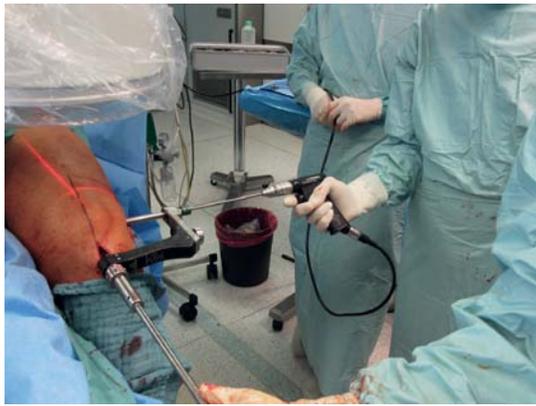


Fig 2  
The Small Electric Drive in action.

### Small Electric Drive: the new Power Tool of the Small Bone Portfolio

The Small Electric Drive is a new power tool designed to complete the Small Bone Power Tools portfolio. This compact and powerful handpiece (Fig 1) is optimal for use in general traumatology, especially for applications in fore-, hindfoot and hand surgery. Procedures such as ulna shortening, wrist surgery, hallux valgus correction or arthrodesis should be well performed with this new system.

A key benefit of the new system is the compatibility of the handpiece with existing consoles of the Electric Pen Drive, and with almost all attachments of the Colibri and new Colibri II. Users will therefore benefit from the synergies that exist within the Small Bone portfolio.

So far, the Small Electric Drive system has been much appreciated for its ergonomic and lightweight handpiece, which offers high working comfort with low hand fatigue. Its simple coupling and mode switch mechanisms are respectively known from the Colibri and Electric Pen Drive, and should therefore be easy to use. Being an electric-driven system, users will not face any battery constraints and will enjoy the endless power offered by the consoles.

Several attachments are available with the system for drilling, burring, reaming, screwing, sawing and K-wire setting to cover most applications of the small bone segment. Each attachment offers the optimal speed and torque for the corresponding procedure.

The pistol-shaped handpiece is an ideal complement to the existing portfolio. Not only does it offer a compact and ergonomic design but it is also user-friendly and versatile.



Fig 1  
Trauma Recon System.



Fig 2  
The new technology enhances performance, reduces vibration, and increases battery life.

### Trauma Recon System (TRS)—Recon Sagittal Saw

The TRS Recon Sagittal Saw is a dedicated handpiece, specifically designed for arthroplasty. Together with the TRS Modular handpiece, it is an optimal system for orthopedic applications and can also be used for heavy duty trauma (Fig 1).

Total joint replacement surgeries are often seen as “worst case” surgeries in terms of using a powered saw. As these surgeries normally include the longest sawing times under high load, the saw performance is very important. Nowadays, more attention is also being paid to working safety regulations, such as limiting noise and vibration levels to protect the OR staff as well as shortening the OR times to save money. Therefore, the target during the development of the TRS Recon Sagittal Saw was to develop a handpiece with good ergonomics, fast and precise saw cuts, as well as low noise levels and vibration.

The new dedicated TRS Recon Sagittal Saw handpiece offers:

- Time-saving knee and hip replacement surgery due to quick switch from the drill/ream to the saw handpiece
- Ergonomic design, allowing optimal tool balance for performance of precise cuts
- Low noise and vibration levels\*, which allow comfortable and precise sawing when carrying out long cuts under high loads.

The Trauma Recon System includes a power module, which is the core of the system. It includes the motor, electronic control unit, and a lithium-ion (Li-Ion) battery pack. The power module is unsterile and must be removed during reprocessing of the handpiece. However, the Trauma Recon System has significantly longer life-time expectancy, since the critical components are not exposed to stress from sterilization and cleaning processes.

Best of all, the Trauma Recon System uses new technology, which, in combination with lithium-Ion batteries, almost totally reduces the need to change batteries interoperatively, prevents self-discharge during storage, and shows no memory effect (Fig 2).

\* Based on external noise and vibration measurements

## AO Trauma

**TRANSFORMING AOTRAUMA EDUCATION!**

From text books and flip charts to overhead projectors, and then the transition into virtual elearning tools with webcasts, webinars, and more dynamic and interactive education delivery channels, AOTrauma is transforming its education portfolios in dramatic ways. And it's the growing complexity of their surgeons' and ORPs' clinical work, the diversity of clinical problems they face, and the need for “just-in-time” learning that are the catalysts for the creation and delivery of expansive education portfolios to meet the emerging needs of the AOT community.

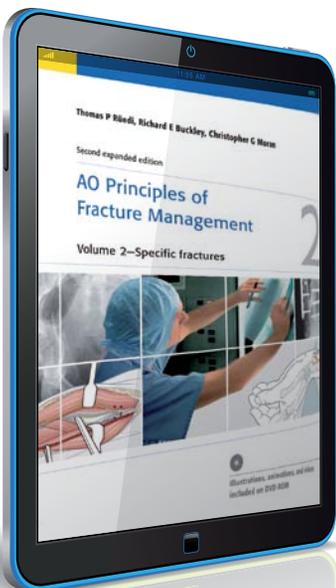
**Education is more than just a course**

For going on half of a century, surgeons and ORPs have looked to the AO as the leading provider of medical education, and to its traditional, formal courses as the very best means of improving practice through education. But over time, faced with fast-paced medical developments and mounting practice-based demands, there has been a growing awareness at AO that just offering courses is not enough. Today's surgeons and ORPs face a wide range of clinical problems. Their education needs have evolved as their practice and challenges have evolved. Education must be relevant and address the specific needs of each surgeon and ORP, when and where they need it.

So what does that mean for AOT education? AOT education has transformed from just face-to-face courses and fellowships to comprehensive education portfolios that include webinars and webcasts, online elearning modules, interactive videos, online discussion forums and ask the experts, shared communities of practice, blended courses, interactive digital books, masters level in-depth workshops and seminars, expansive case and video lecture libraries, internet based resources, and more. Of course our traditional face-to-face courses and fellowships will continue to be central educational activities in these new educational portfolios. This transforming of AOT education will allow surgeons and ORPs to take more control of their learning strategies, providing them the education and resources that are specifically relevant to them when they need them.

**Program development—a new approach**

So how do we go about the task of transforming AOT education? The key is focusing on the outcome: improved patient care; to do this we need backward planning to identify the specific competencies (abilities) surgeons and ORPs need to effectively address the patient problems they face. Competencies are deconstructed into the interaction of specific knowledge, skills, and attitudes. This backward planning process, led by surgeons and ORPs, is creating a whole new curriculum concept, which will lead to a new generation of learning activities and resources.





**“Development starts with understanding the clinical problems surgeons face; then creating the activities and resources that educate to the competencies—abilities, needed to effectively treat those problems”,** states Clint Miner, Global Education Manager AO Trauma.

### Blended learning equals more effective learning

A critical characteristic of the transformation of AOT Education is the leveraging of distributive elearning technologies. AOT, through the expertise of AO Education, is integrating the latest education techniques and tools into its education portfolios. For example, web conferencing and the combining of elearning with live events. Many of the course lecture elements can be delivered online. This reduces the amount of time spent in the face-to-face courses on lectures and increases the direct interaction with faculty in the practical exercises and small group discussions.

AOTrauma continues to add to the existing set of elearning modules. The development of elearning educational assets is supported by the newly formed eservices team, under the leadership of Michael Redies. “We are using different methodologies, ranging from a more standardized, product-oriented concept to one offering a highly motivational “serious game” approach,” says Pascal Schmidt, head of elearning. (A “serious game” uses the principles of game playing for achieving real learning objectives.) A prototype of this method is the Müller AO Classification of Fractures.

The AOT transformation initiative includes many other elearning assets. For example, an interactive video on radiation hazard that invites viewers to identify and thereby avoid future errors in the use of C-arm technology during surgery, is under development.

A large number of lectures are captured in video format and available online by AOTrauma members for self-directed learning. New innovations in book publishing include the upcoming release of ebooks (as part of clinical collections), additional smart phone applications, online discussion forums, and interactive online cases. The look and feel of AOTrauma education is being transformed in dramatic ways. AOT, supported by the expertise of AO Education, is creating extensive education portfolios that retain courses and fellowships as core educational assets, and integrates a myriad of new and exciting education activities and resources. The singular goal is to improve patient care by offering relevant, timely, education activities and resources that meet the specific needs of the AOTrauma community.



Fig 1  
AOTrauma webinar



Fig 2  
Instant access to images, cases and presentations through live, online education.

Brian Beale, Randy J Boudrieau, Kenneth Johnson, Michael Kowaleski, Alessandro Piras, Rico Vannini and Aldo Vezzoni

## VETERINARY



Fig 1  
The new Mini TPLO Jig facilitates the appropriate placement of the 2.0 mm, 2.4 mm, and 2.7 mm plates.

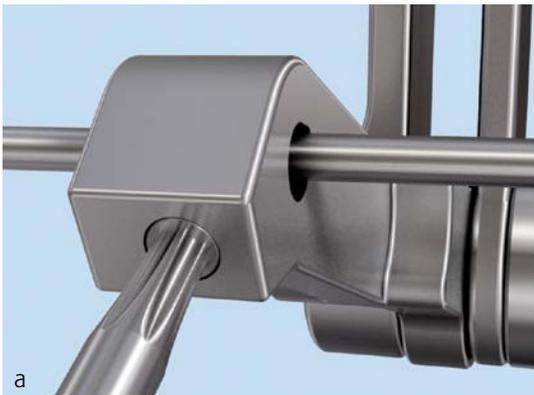


Fig 2a–b  
The jig pin screw of the new Mini TPLO Jig (a) is a great help to surgeons during sawing (b).

### New Mini Tibia Leveling Osteotomy (TPLO) Jig

“One size fits all” – this is not the case when it comes to orthopedic procedures in small animals. In fact, “size matters”! For this reason, the TPLO system has been expanded with the new Mini TPLO Jig, which is designed to be used with the 2.0 mm, 2.4 mm, and 2.7 mm TPLO Plates.

#### What is TPLO?

Cranial cruciate ligament tears are a common cause of lameness in the dog. Since the slope of the dog’s tibial plateau is much greater than their human counterpart, shear loads on the canine stifle are increased, and over time, this repetitive force can lead to chronic, progressive damage and rupture of the cranial cruciate ligament. The TPLO procedure dynamically stabilizes the knee by eliminating cranial tibial subluxation during the weight bearing phase of locomotion. Since the TPLO Plates are available in six different profiles (3.5 mm, 3.5 mm small stature, 3.5 mm broad, 2.7 mm, 2.4 mm, and 2.0 mm), this technique can now be applied in all sizes of dogs and even cats. The appropriate placement of these plates is facilitated by the use of a jig. Until recently, the TPLO Jig was available for the 3.5 mm, 3.5 mm small stature, and 3.5 mm broad TPLO Plates.

#### The new Mini TPLO Jig

The Mini TPLO Jig is designed specifically for the 2.0 mm, 2.4 mm, and 2.7 mm size TPLO cases and helps to maintain stability and limb alignment after the proximal tibial osteotomy (Fig 1). The jig can be used with any tibia leveling osteotomy plate, but was designed to be used with the new Synthes Mini TPLO Plates. The jig can be positioned with great versatility to best suit a broad range of patient anatomy and can also be used to provide similar functions when performing corrective osteotomy for treatment of angular limb deformity.

The Mini TPLO Jig features a 45 degree jig pin screw orientation for more access to plate head holes. Further, it attaches to the bone with K-wires of 1.6 mm to 2.5 mm diameter to accommodate the great variety of patient size. The jig arms can be angled as needed to position the jig pins optimally in the proximal and distal aspect of the tibia. During sawing, the surgeon will appreciate the vibration resistant hinge screw (Fig 2). Loss of hinge screws during the osteotomy procedure in the past has led to many a frustrated surgeon.



Fig 3  
The Mini TPLO Jig in use for an operation on a Bichon Frise (see case study below).

The jig is designed to allow ample room for the saw blade during a proximal tibial osteotomy (Fig 3). The jig arms can be positioned as needed to accommodate the individual patient. The jig is designed to accommodate jig pin diameters from 1.6 mm to 2.5 mm. Additionally, the jig can be easily disassembled for removal and cleaning.

“Size matters” – the new Mini TPLO Jig completes the TPLO implants and instruments range. Surgeons can now be prepared for all sizes and breeds of dogs and cats.

Case provided by Brian Beale, Houston, USA

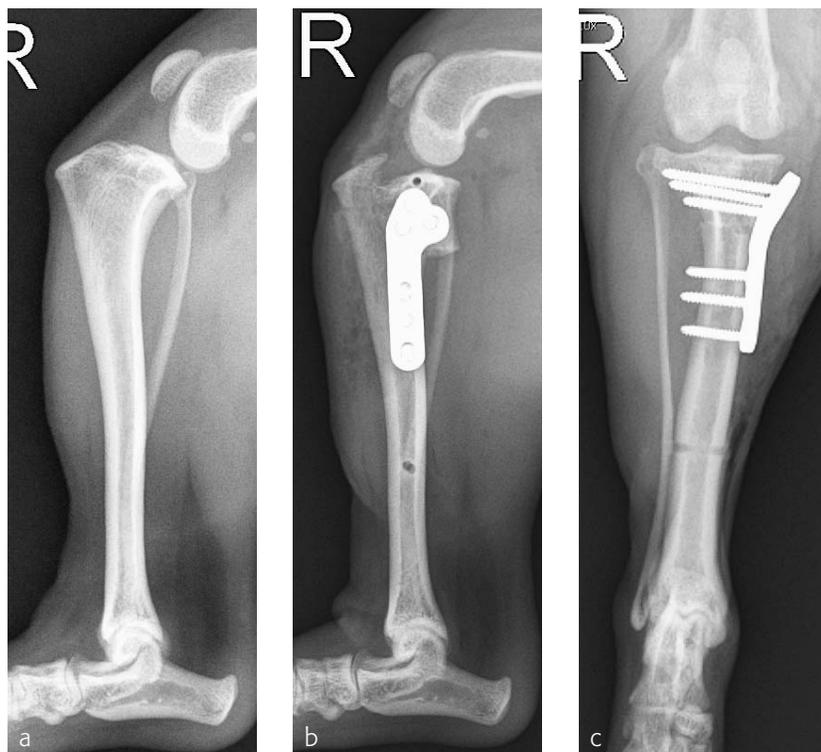


Fig 1a–c  
Pre and postoperative views of a 6.8 kg male neutered Bichon Frise treated with TPLO.

#### Case: Active dog becomes lame after running

A Bichon Frise became acutely non weightbearing lame following running, with a tear of the cranial cruciate ligament.

The preoperative tibial plateau angle was 36°. The jig pin diameter was 1.6 mm. A 10 mm TPLO saw blade was used to make the osteotomy while the jig was in place. A 2.0 mm Synthes TPLO Plate was applied with three 2.0 mm locking screws proximally and three 2.0 mm cortical screws distally (Fig 1).

Locking screws were the best option in the proximal tibial segment due to the small gap between the contoured plate and the bone. The postoperative TPA was 5°.

Carl-Peter Cornelius

## CRANIOMAXILLOFACIAL



Fig 1  
2.0 mm Fine Pitch Screw.



Fig 2a–b  
a 1.0 mm Thick, Adaption Plate 4 hole.  
b 1.0 mm Thick, Adaption Plate 6 hole.



Fig 3a–b  
a 2x2 hole 1.25 mm Thick, Tension Band.  
b 2x2 hole 1.0 mm Thick, Narrow Malleable Plate.

### MatrixMandible Line Extension

The main goal of the TK System is to identify and address existing clinical needs in the OR in order to foster development and innovation, as a means to improving patient outcomes and patient care. New concepts and solutions are an important aspect, and continuous evaluation and improvement of approved projects is essential. Different sources of surgeon feedback, such as MPE (market preference evaluation), expert symposia, user opinions in the field, etc, are used during and after development, and provide valuable information. The following line extensions to the matrix mandible system have been developed in response to this feedback.

### 2.0 mm Fine Pitch (Non-locking) Screw

On occasions, it is necessary to pre-drill into bone, but in some instances this can increase hole diameter and impact on screw performance in terms of stripping and pull-out resistance. In order to address this problem, the 2.0 mm Fine Pitch (Non-locking) Screw (Fig 1) has been developed. A reduction in pitch of 0.5 mm provides an improvement in screw/bone engagement and pull out retention, as against the existing 2.0 mm screw with 1.0 mm pitch, and also allows a shorter screw length design of 4 mm. The double lead allows for the same insertion speed as that for standard pitch screws.

### 1.0 mm Thick, Adaption Plate (4 and 6 Hole)

The 1.0 mm Thick, Adaption Plate is a shorter version of the existing 12 and 20 hole adaption plates. The bar in tension bands prevents the user from placing the screw too close to the fracture line, however, surgeon feedback indicated that 12 and 20 hole adaption plates were being used in a way where they were being cut into desired lengths. The fragmented plates were then used in different patients, which introduced challenging cost split. The new 4 and 6 hole adaption plates (Fig 2) provides a more effective solution, and can be used without the bar as an option in trauma sets, allowing hospital savings.

### 1.25 mm Thick, Tension Band

The 2x2 hole 1.25 mm Thick, Tension Band (Fig 3a) is a stronger option for trauma and orthognathic surgery (BSSO) than the existing 1.25 mm Thick, Crescent Plate. It is 2 mm shorter than the 2x2 hole 1.0 mm Thick, Narrow Malleable Plate (Fig 3b) that is currently found in the set. Both the 1.25 mm Thick, Tension Band and its bending template have been added to the matrix mandible system.



Fig 4a–d

- a The 7x23 hole 1.5 mm Thick, Angle Reconstruction Plate, left side.
- b 1.5 mm Thick, Double Angle Reconstruction Plate small.
- c 1.5 mm Thick, Double Angle Reconstruction Plate medium.
- d 1.5 mm Thick, Double Angle Reconstruction Plate large.

### 1.5 mm Thick, Reconstruction Plates

Mandible reconstruction is at times necessary as a result of trauma or from segmental resection defects due to, eg, tumors. The main goals here are to restore functionality in terms of support mastication and swallowing, muscle attachment, maintenance of airways, and to provide a bed for teeth. It is also important to bear in mind aesthetic factors, such as the maintenance of facial contours and soft tissue.

In primary mandibular reconstruction with vascularized bone graft, it is often necessary to use lower profile plates. The 7x23 hole 1.5 mm Thick, Reconstruction Plate, left (Fig 4a) and right angle versions, and double angle in small, medium and large sizes (Fig 4b-d) have all been designed to improve concealment beneath the skin and reduce dehiscence in the mandibular region. Additionally, they can be used clinically in cases of comminuted mandibular fractures.



Fig 5a–b

- a Articulating Plate Introducer complete instrument.
- b Articulating Plate Introducer tip.

### Articulating Plate Introducer

The Articulating Plate Introducer is a new version of an existing instrument that is only usable with dynamic compression plates (DCP) of the subcondylar/ramus fixation set. The tips provide versatility, since they are compatible with the matrix mandible 1.0 mm Thick, Straight Design and Subcondylar Plates, as well as 1.25 mm Thick, Non-DCP Plates. They are also interchangeable with the current instrument, so either the complete instrument (Fig 5a) or just the tips (Fig 5b), can be optionally available for trauma treatment in conjunction with the transbuccal set.

### The new Strut Plate for fractures of the base or neck of the mandibular condylar process

Management of fractures in the different subregions of the condylar process is still a controversial topic. The topography of these subregions is delineated in the updated AO CMF Classification (Fig 1). Dislocation and displacement of the condyle bearing fragment, subsequent to neck or base fracture or condylar head fragment, occur in a multitude of patterns. Moreover, the status of dentition, degree of dislocation, condition of the patient, concomitant fractures of the mandible, and bimaxillary or panfacial fractures are all decisive factors when choosing either open or closed fracture treatment.

Transfacial or transcutaneous surgical access to these anatomic zones is challenging due to the delicate location and presence of the marginal branch and the main stem of the facial nerve.

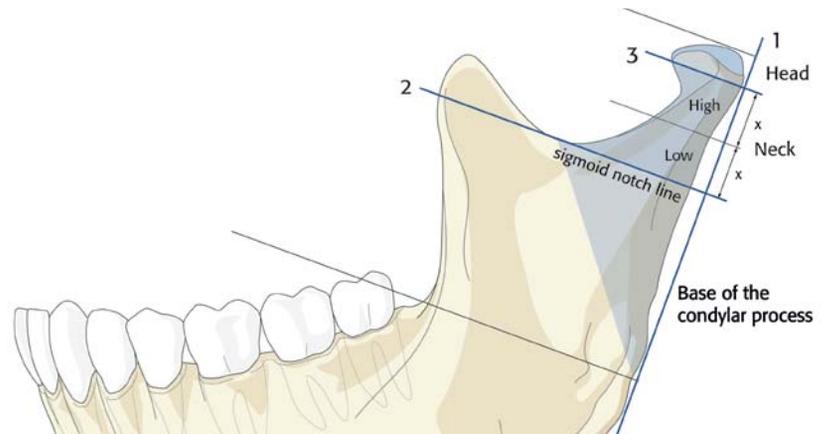


Fig 1  
Subregions of the condylar process.

The three subregions of condylar head, condylar neck, and base of the condylar process are identified using specific landmarks and reference lines:

- The posterior ramus line (base line) running along the posterior border of the ascending ramus
- The sigmoid notch line running through the deepest point of the sigmoid notch and perpendicular to the posterior ramus line
- The condylar head reference line running perpendicular to the posterior ramus line below the lateral pole of the condylar head. The height of the lateral pole is determined by the diameter of a circle (2-D) or a sphere (3-D), whose arc best fits with the upper lateral boundaries of the lateral pole.

Nonetheless, during the last decade, open reduction and internal fixation techniques have been increasingly applied in treatment concepts accompanied by the development of standardized surgical approaches, instrumentation and osteosynthesis hardware. To circumvent the facial nerve and its branches, an endoscopically-assisted transoral approach has been advocated. From a biomechanical standpoint, a



Fig 2  
Subcondylar Lambda Plate.



Fig 3  
Trapezoidal Plate.



Fig 4  
The new Strut Plate.



Fig 5  
Strut Plates (left and right plates).

two mini-plate fixation for fractures of the base of the condylar process or the condylar neck was considered necessary to secure enough stability, and regarded most handy in application via the external or transoral route.

Along these lines of refinement and innovation, in 2011 a family of specialized implants was developed with the idea of providing optimized, single-plate solutions with sufficient strength and ease of use for fracture configurations at the level of the condylar base or the condylar neck. These include:

- the Lambda Plate
- the Trapezoidal Plate.

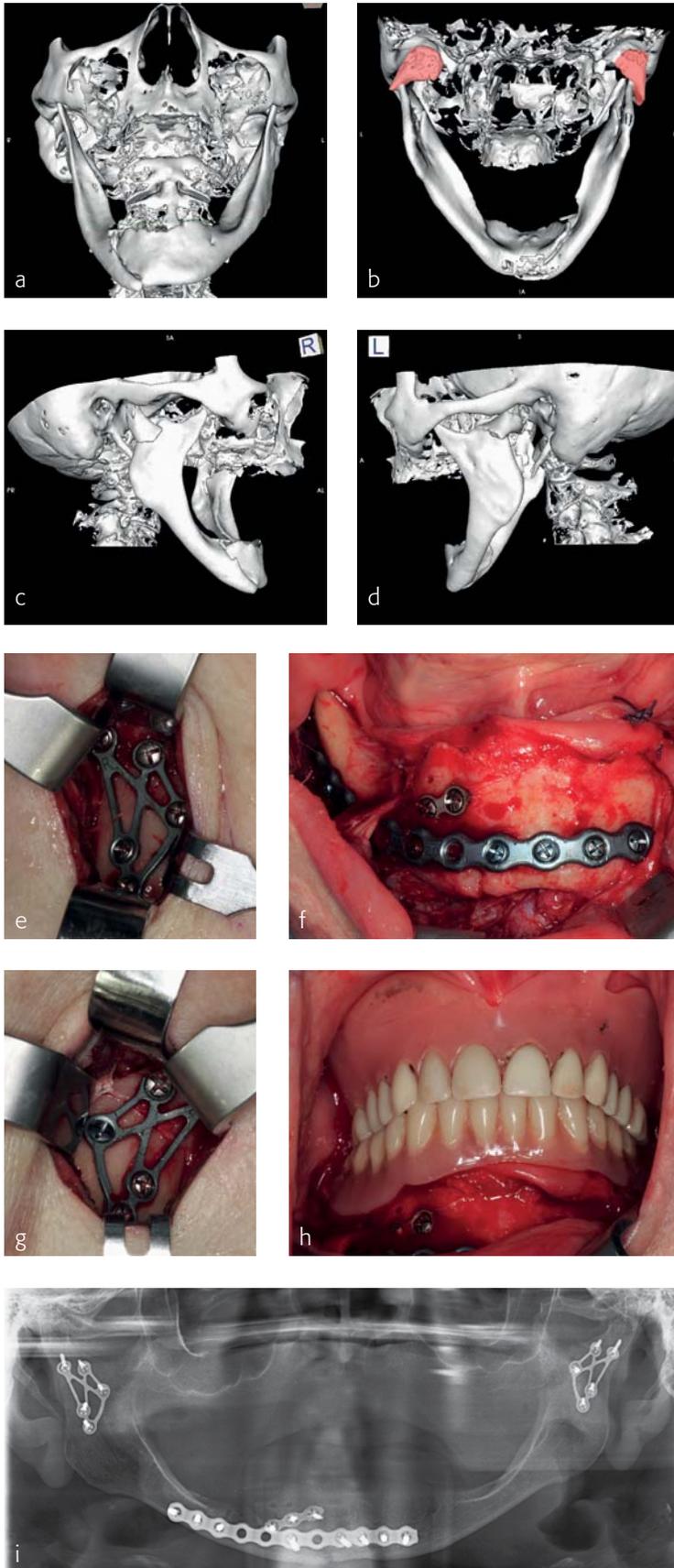
The Lambda Plate (Fig 2) is particularly suitable for fractures within the narrow-neck zone of the condylar process with its limited lateral bone surface. The linear upper fixation arm can be placed far cranially to extend over fracture lines even in the high neck. Though the plate may be applied within a wide vertical range down to the height of the mandibular foramen, it should not be overlapped by the anterior arm. The Lambda Plate comes in a left and right version. The converging midportion of the plate provides the required stability. The preferred surgical approach is external.

The Trapezoidal Plate (Fig 3) is designed in a grid shape with two parallel rods at the top and the base connecting two larger merging bars at the sides. The distance between the holes at the top determines the uppermost placement position of the plate. Usually this will correspond to the width of the lower neck. The trapezoidal plate is conically molded to match with the curved lateral surface of the transitional zone between the base of the condylar process and the neck. The plate is applicable in a large diagonal field spanning downwards below the level of the sigmoid notch. The plate allows for external or transoral surgical approaches.

The newest plate type is the Strut Plate (Fig 4), consisting of a criss-crossed framework of slender beams with an overall conical molding. This three-dimensional structure provides exceptional resistance to lateral bending stresses and supports the condylar process fragments most efficiently. The terrace like plate hole arrangement at the top of the plate facilitates a placement up into the midneck region, since it coincides with the natural backward angulation of the condylar process. The plate placement zone moves best parallel to the posterior border of the ascending ramus thus precluding any interference with the mandibular foramen or canal.

The Strut Plate comes in a left and right version (Fig 5) and is commonly applied via an external approach. A transoral use is conditional on the rare prerequisite that the condyle bearing fragment is stable upon reduction.

Case provided by Carl-Peter Cornelius, Munich, Germany



### Case: Mandible fracture

An 84-year-old female patient with a triple fracture in the edentulous atrophic mandible (Luhr Class II): displaced condylar based fractures bilaterally in combination with a fracture in the anterior body on the right. Prosthetic restoration with full dentures.

Fig 1a–i

- a Preoperative 3-D CT scans: Frontal view. Right anterior body fracture associated with slight widening of the mandibular arch.
- b Dorsal view. Shortening of both rami due to lateral override displacement and medial angulation of both condylar bearing fragments, partial medial dislocation out of the fossa of the right condylar head.
- c Right lateral view. Lateral override of posteriorly displaced condyle bearing fragment and decreased ramus height.
- d Left lateral view. Lateral override position and posteromedial angulation of condyle bearing fragment.
- e Intraoperative situation. Reduced condyle bearing fragments fixed with strut plates via retromandibular transparotid approaches.
- f Intraoperative situation, showing the mandible after fracture reduction and right paramedian plate osteosynthesis.
- g Intraoperative situation. Reduced condyle bearing fragments fixed with strut plates via retromandibular transparotid approaches.
- h Intraoperative situation. Reestablished occlusion, with full dentures in place.
- i Postoperative panoramic x-ray.



### 1.3mm Pediatric Curvilinear Distractor

The development of the 1.3 mm Pediatric Curvilinear Distractor (Fig 1) has been based on surgeon feedback from using the 2.0 mm system (Fig 2), since the latter was indicated for either adults or pediatric patients over one year of age. But it was found that the pediatric population under one year needed an equivalent device in order to address distraction cases for all patient ages.

The new 1.3 mm Pediatric Curvilinear Distractor system is an internal distraction osteogenesis device that gradually advances the mandible along a curved trajectory of distraction. As with the previously developed 2.0 mm Curvilinear Distractor, the 1.3 mm is indicated for correction of congenital deficiencies or posttraumatic defects on the mandibular body and ramus, where gradual bone distraction is required. This 1.3 mm pediatric version is intended for patients four years of age and younger.

This pediatric system is part of the curvilinear distractors family, which lengthens the mandible in both vertical and horizontal planes to close an existing open bite, or avoid creating one, secondarily to distraction.

In order to adapt the existing distractor's design to smaller anatomies of younger patients, it was necessary to reduce the overall size of the device in terms of profile (from 7.5 mm to 5.5 mm) and track width (from 4.25 mm to 3 mm). Other modifications include the footplate design, which changed to a mesh pattern to allow for the insert of more screws in a smaller area of bone, and the distractor acceptance of 1.3 mm diameter bone screws.



Fig 1a–b  
1.3 mm Pediatric Curvilinear Distractor.



Fig 2  
2.0 mm Curvilinear Distractor.



Fig 3a–b



Fig 4



Fig 5



Fig 6



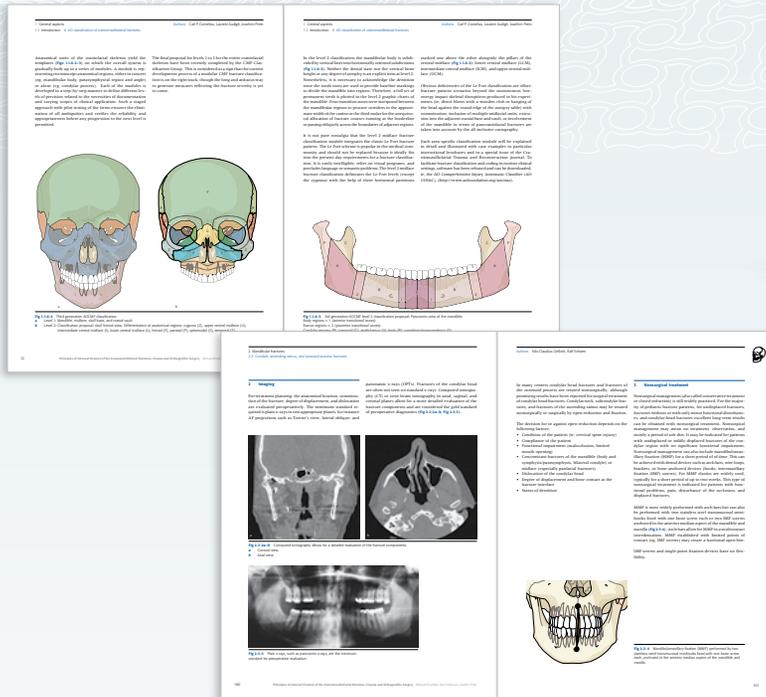
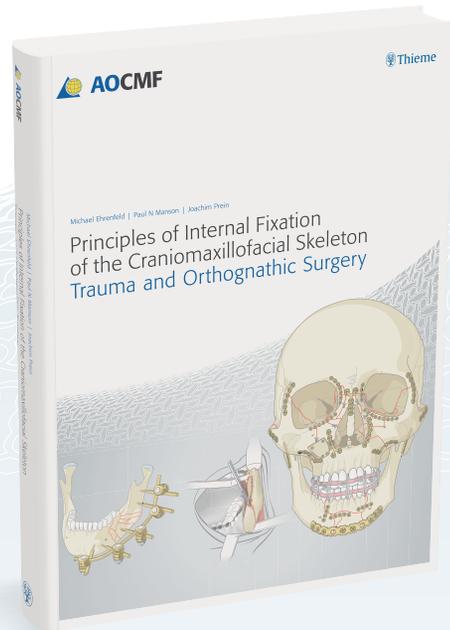
Fig 7

The device allows advancement of up to 35 mm, leaving the surgeon the option of cutting and crimping the track if less advancement is required. Existing tools, such as cutter (Fig 3a) and crimper (Fig 3b) were slightly modified to be able to work with both sized distractors: 2.0 mm and 1.3 mm. A functional stop is created by a track crimp to avoid undesired device disassembling (Fig 4). The distractor is made of titanium molybdenum, is for single use only, and has left and right assemblies available in different radii of curvature (30 mm, 40 mm, 50 mm, 70 mm, and 100 mm), as well as a straight version.

All distractors accept removable extension arms (Fig 5), which move the point of activation to a location that is easily accessible with the activation instrument (Fig 6). One full rotation of the activation instrument equals 1.0 mm of distraction per day (one half turn twice daily - Fig 7), which is recommended to prevent premature consolidation, and in young patients a rate of 1.5 to 2.0 mm per day could be considered.

Michael Ehrenfeld | Paul N Manson | Joachim Prein

# Principles of Internal Fixation of the Craniomaxillofacial Skeleton Trauma and Orthognathic Surgery



Number of pages: **395**  
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Purchasing: **This book is available from Thieme.**  
[www.thieme.com](http://www.thieme.com)

Traditionally, each specialty involved in craniomaxillofacial trauma and orthognathic surgery had its own areas of interest and expertise. This introductory textbook is different in that it presents the combined and focused expertise and competence of the different specialties on the entire craniofacial skeleton.

The principles described in this textbook represent the evolution of craniomaxillofacial buttress reconstruction over the last 60 years. In

addition to standard procedures, techniques representing recent surgical advances and new developments are introduced.

This textbook not only provides an overview on current concepts of craniomaxillofacial trauma care and orthognathic surgery, but also helps to understand the complexity of the craniofacial skeleton and its related soft tissues for an efficient and successful reconstruction of the face following trauma and congenital deformities.

Ziya Gokaslan, Roger Härtl, Raoul Heilbronner, Frank Kandziora, H Michael Mayer, Patricia Zadnik

## SPINE

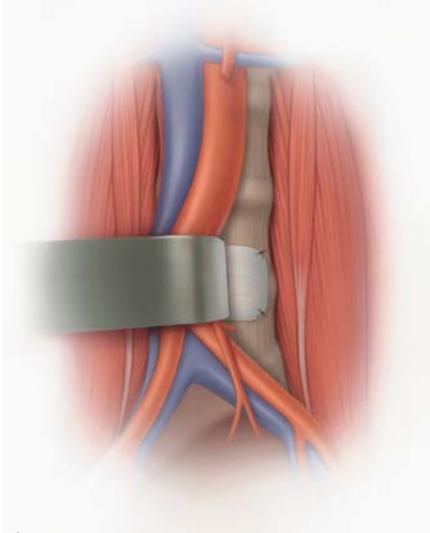


Fig 1  
Vessel guard placed between vasculature and anterior spine.



Fig 2  
The Scout Vessel Guard provides excellent handling characteristics.



Fig 3  
Packaged and provided hydrated for minimal OR prep time.

### Scout Vessel Guard

Anterior spine surgery has been evolving since its inception in the early 1900s. Many technique improvements have helped address the challenge of mobilizing the anterior abdominal muscles, peritoneal sac, and great vessels, which is necessary to access the disc space. Protecting these sensitive vessels still remains a major challenge for this approach, especially during surgical revisions.

The ability to protect sensitive vessels during a primary anterior spinal surgery is of utmost importance. It is particularly desirable to limit contact between these vessels and any implanted device and/or inflammatory graft materials. The Scout Vessel Guard has been designed with this very protection in mind. The guard is placed over the implanted materials, residing between the anterior spine and adjacent vessels, and provides improved protection to sensitive areas (Fig 1).

The Scout Vessel Guard is a permanent implant. In the event that a revision surgery of the anterior spine is needed, the guard will be present and is able to be clearly visualized and identified. The presence of the Scout Vessel Guard then also helps the surgeon locate important surgical landmarks during challenging cases.

The Scout Vessel Guard is made of Hydrogel, a water-swollen, cross-linked polymer structure that can be produced to achieve various geometries and ranges of material properties. This product was developed to provide exceptional handling characteristics, minimal pore size, maximal surface smoothness, and easy size customization of the one and two level footprints offered (Fig 2). The cryogenic hydrogel formulation used in the Scout Vessel Guard is approximately 75% water, with the balance being a novel blend of mostly polyvinyl alcohol (PVA) and a small amount of polyvinyl pyrrolidone (PVP). This hydrophilic material is packaged and provided hydrated, requiring minimal prep time in the OR (Fig 3).

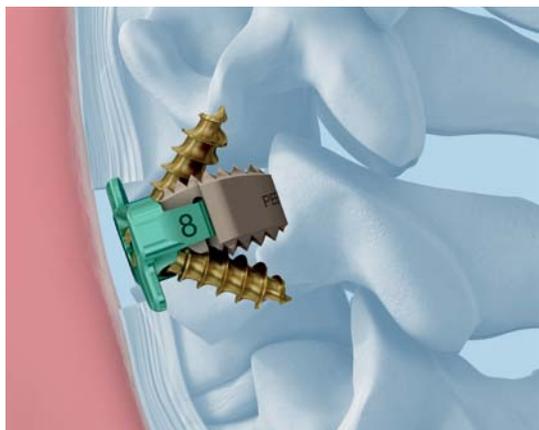


Fig 1  
Zero-P VA construct.



Fig 2  
Zero-P plate/spacer with four locking screws.



a



b

Fig 3a–b  
Anterior (a) and lateral (b) view of Zero-P VA plate/spacer with two variable angle screws.

### Zero-P VA

Cervical Degenerative Disc Disease (DDD) is a common pathology and part of the natural process of aging. When DDD becomes symptomatic or painful, it can cause several different symptoms, including neck pain, nerve root pathology (eg, numbness or pain in shoulders/arms), and spinal cord compression. If pain cannot be resolved by conservative treatment, surgery might become the only option. Some patients with persistent pain or neurological deficits need surgery to relieve the symptoms.

Today's standard surgical treatment is to fuse the vertebrae adjacent to the diseased disc. Studies show that anterior cervical plating helps increase fusions rates [1,2], however anterior cervical plating also has potential drawbacks, such as the prolongation of OR time, the potential for postoperative dysphagia, and/or heterotopic ossification (abnormal formation of bone over time) at adjacent spinal levels.

In 2008, a novel cervical fusion implant named Zero-P was introduced. The implant was designed to be fully contained within the excised disc space without protruding past the anterior wall of the vertebral body when implanted. The combination of the plate/spacer assembly with four rigid screws ensures that the construct provides similar stability [3] to traditional cervical plate and spacer constructs while offering a number of clinical advantages. These include:

- Prevention of soft-tissue irritation
- Minimization of adjacent level ossification
- Smaller incision sizes
- Facilitates surgeries where Zero-P is implanted adjacent to a previous fusion.

Zero-P VA (Fig 1) complements the original Zero-P (Fig 2) by offering an implant that is based on the same fundamentals but utilizes two semi-constrained screws with variable angle insertion (Fig 3) instead of four rigid screws as a means of fixation.

Zero-P VA is designed for surgeons' ease of use. It is a stand-alone plate/spacer fusion device for indications where the stability of a two screw semi-constrained fixation is sufficient.

For optimal adoption to the patient anatomy, Zero-P VA is available in various spacer shapes (convex, lordotic, parallel), two different footprint sizes and multiple height options (5–12 mm in 1 mm increments).

Zero-P VA follows a similar surgical technique to Zero-P. In a first step after discectomy and decompression, trial spacers are used to determine implant height, shape, and footprint size. Once the implant is inserted and correctly positioned, screw hole preparation is performed. For anatomically challenging situations, such as patients with short

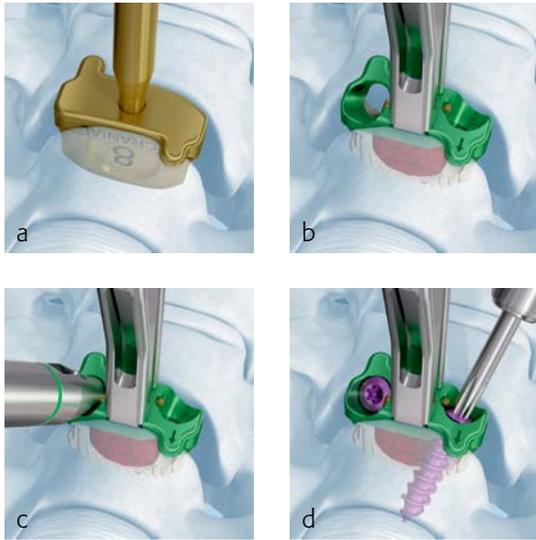


Fig 4a–d

Zero-P VA main technique steps:

- a Trialing
- b Spacer insertion
- c Screw hole preparation
- d Screw insertion

necks, angled instruments are available. Blocking of the screw happens automatically once the screw head passes the golden blocking pin built into the plate. This one-step blocking mechanism features audible, tactile and visual cues to confirm the screw is blocked upon insertion and ensures its secure retention (Fig 4).

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- 6 Azab W, Abdel-Razek M, Ali A, et al (2012) Outcome evaluation of a zero-profile implant for anterior cervical discectomy with fusion. *Turkish Neurosurgery*; 22(5):611–617.

Case provided by Raoul Heilbronner, St. Gallen, Switzerland

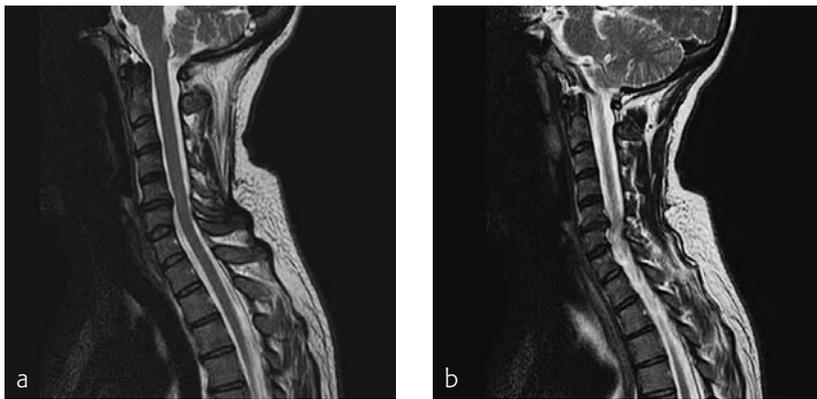


Fig 1a–b

Preoperative MRI shows a disc protusion (a) and spondylosis (b) at C5/6.



Fig 2

Postoperative x-ray one year after implantation of Zero-P VA.

## Case: Cervicobrachial pain syndrome

A 49-year-old woman complained of a persistent cervicobrachial pain syndrome on the right side, over a period of five years, which was refractory to all conservative treatments.

The conventional x-ray of the cervical spine showed a slightly pronounced degeneration with kyphosis of the segment C5/6, and preoperative MRI showed disc protusion (Fig 1).

After an uneventful surgical procedure (Fig 2) and recovery, the preoperative pain syndrome resolved completely.



Fig 1  
Prodisc-C Vivo with trapezoidal endplate design, convex cranial endplate, and spikes as a means of primary fixation.

### Prodisc-C Vivo

Many people experience neck, shoulder and/or arm pain in their lifetime due to disc abnormalities in the neck. Most of those with these kinds of symptoms do not require surgery; they can often improve with conservative treatment.

Those that continue to have significant pain may have symptomatic cervical disc disease, which is defined as neck or arm (radicular) pain and/or a functional/neurological deficit with at least one of the following conditions confirmed by imaging (CT, MRI, or x-rays):

- Herniated nucleus pulposus
- Spondylosis (defined by the presence of osteophytes)
- Loss of disc height.

The traditional approach to relieving such pain is a standard decompression and fusion at the symptomatic levels. While this technique has demonstrated good patient outcomes in terms of pain reduction, there may be other unintended consequences that result from altering the natural biomechanics of the cervical spine [1].

Cervical Total Disc Replacement (TDR) may provide the solution. Decompression and restoration of disc height can be achieved as normal to alleviate pain. In addition, the preservation of the preoperative range of motion and restoration of biomechanical stability may reduce the incidence of adjacent-segment degeneration [2].

The Prodisc-C Vivo (Fig 1) is the next evolution of the cervical TDR. Building on the success of the pre-existing Prodisc-C family, the new design keeps the features that have proved so clinically advantageous, while incorporating new features that reduce the required remodeling and simplify the overall technique.

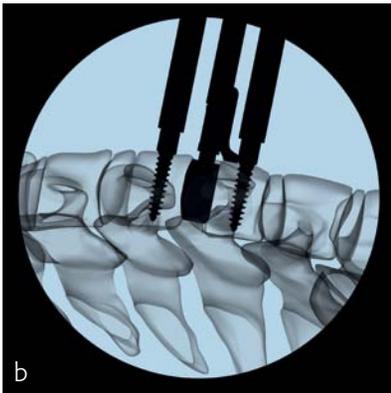
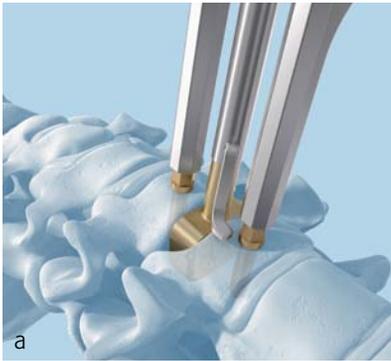


Fig 2a–b  
Trial to determine implant size.

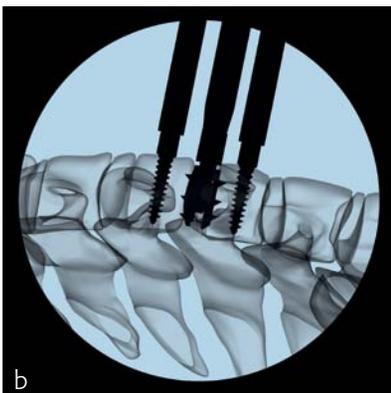
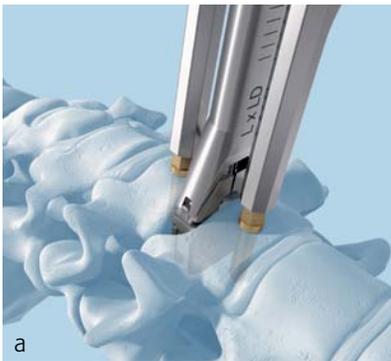


Fig 3a–b  
Implant insertion.

Prodisc-C Vivo maintains the following features at the core of the already successful Prodisc-C family of implants:

- Fixed center of rotation that resists shear forces and enables controlled motion
- Ball-and-socket articulation using the proven combination of CoCrMo/UHMWPE
- Titanium alloy endplates that reduce the MRI artefacts.

Additionally, Prodisc-C Vivo offers the following new benefits:

- Primary fixation with spikes
- Anatomical implant design with convex cranial endplate
- Simple surgical technique with two main steps, trialing (Fig 2) and implant insertion (Fig 3).

Because of the anatomical, keel-less design of the Prodisc-C Vivo, vertebral body preparation is not required, which simplifies the surgery and enables a less traumatic implantation. Furthermore, the endplates of the vertebral bodies generally do not require remodelling to accommodate the implant. This reduces OR time and leaves the bone intact, minimizing the potential risk of postoperative implant subsidence.

Again, because the endplates do not require remodelling the instrumentation of the Prodisc-C Vivo is done in two simple steps: trialing and implant insertion.

## References

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Case provided by H Michael Mayer, Graefelfing, Germany

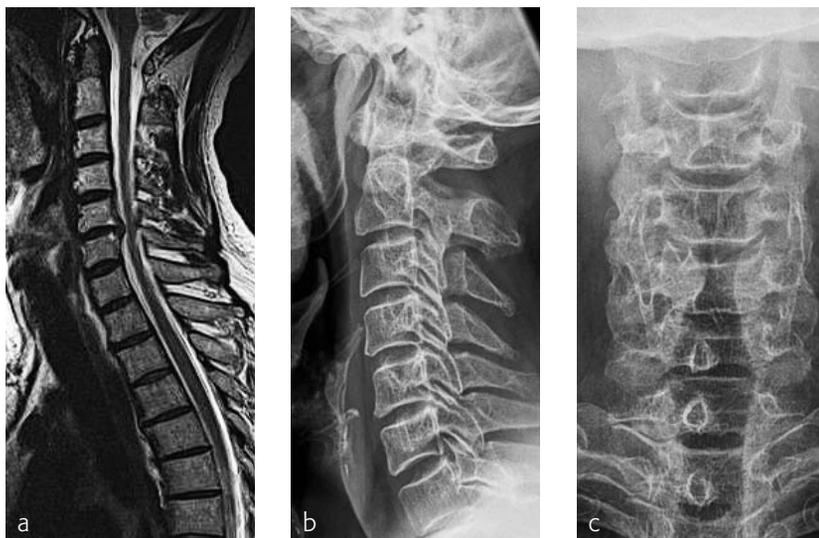


Fig 1a–c  
Preoperative images.



Fig 2a–d  
a–b: Postoperative images.  
c–d: Flexion-extension x-rays.

### Case: Man with neck and arm pain

A 50-yr-old man presented with a 4 month history of neck and arm pain on the right side. Repeated trials of conservative treatment, including image-guided injections, had not led to a significant relief of symptoms. Clinical examination showed a C6 radiculopathy on the right side with pain, hypoesthesia, and a slight biceps weakness.

The MRI (Fig 1a) showed a disk herniation C5/6 medial and paramedian right-sided. The preop x-rays (Fig 1b–c) showed a slight narrowing of the disc space at C5/6. The segment was still mobile.

A microsurgical discectomy, decompression and implantation of a Prodisc-C Vivo implant was performed (Fig 2a and b).

The early and 6 month outcome was excellent. The segment showed preserved mobility (Fig 2c extension and Fig 2d flexion). The patient returned to work after two weeks and returned to normal activities.



Fig 1  
USS Fracture MIS.

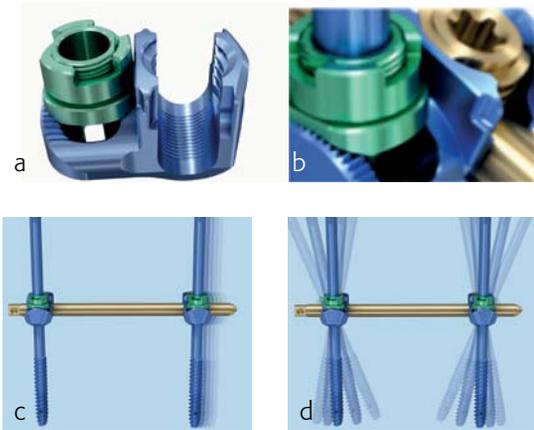


Fig 2a-d  
USS MIS Fracture clamp allowing for sagittal movement ( $\pm 20^\circ$ ).



Fig 3  
Perforated Schanz screws.

### USS Fracture MIS

Thoracolumbar fractures predominately result from motor vehicle accidents, work related injuries, and an increased incidence of fractures from the aging osteoporotic population. In many parts of the world, the golden standard of care for unstable spine fractures involves stabilization with a Schanz pedicle screw-clamp system (USS Fracture).

Over the years, the trend to minimize iatrogenic trauma during spine fracture surgery has been supported by the excellent clinical outcomes of patients and the development of minimally invasive stabilization systems. Yet, the currently available minimal invasive stabilization systems have, so far, not been dedicated to the treatment of spine fractures according to AO principles.

Until now surgeons often had to make compromises in the minimally invasive surgical treatment of spine fractures because the available systems allowed only very limited active kyphosis correction and distraction. Instead, most systems relied on an indirect correction of the deformity by positioning the patient on the operating table. Hence, they were only able to stabilize the correction, which was achieved by closed reduction.

With USS Fracture MIS (Fig 1), there is now the opportunity to bridge this gap and address the treatment of spine fractures in a minimally invasive way in accordance with acknowledged AO principles.

The USS Fracture MIS system makes the AO fracture treatment philosophy applicable for the first time in a minimally invasive way by enabling an active repositioning of fractures through an independent, nearly stepless correction of the deformity based on distraction and lordosis. USS Fracture MIS has a specialized clamp with two independent locking mechanisms (MIS fracture clamp), which allow for control of sagittal alignment ( $\pm 20^\circ$ ) (Fig 2) as well as height restoration. Together with the perforated Schanz screws (Fig 3), it delivers a unique solution for a broad range of indications.

The USS Fracture MIS system is appropriate for a range of clinical conditions including fractures, tumours, degenerative disc disease, post traumatic deformities, and spondylolisthesis of the posterior thoracolumbar spine.

Contra indications for USS Fracture MIS as a stand-alone are: fractures and tumours with severe anterior vertebral body destruction, where an additional anterior column reconstruction is required. Additionally it should not be used in severe osteoporosis without augmentation. However, in Europe, USS Fracture MIS Perforated complements USS Fracture MIS and addresses the growing population of osteoporotic patients requiring fracture procedures by offering perforated Schanz screws that allow additional cement augmentation.

Case provided by Frank Kandziora, Frankfurt, Germany

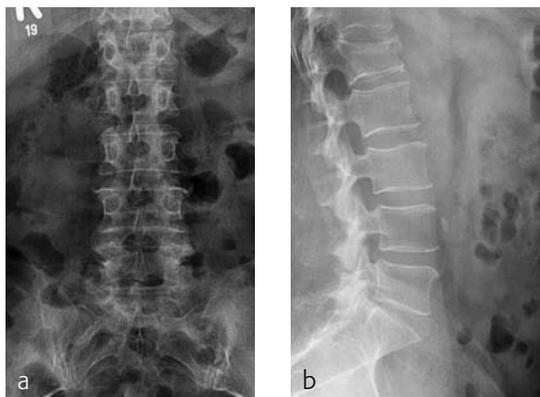


Fig 1a–b  
AP and lateral preoperative x-rays.

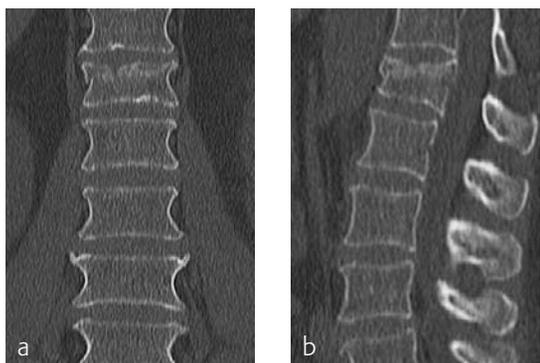


Fig 2a–b  
AP and lateral preoperative CT scans.

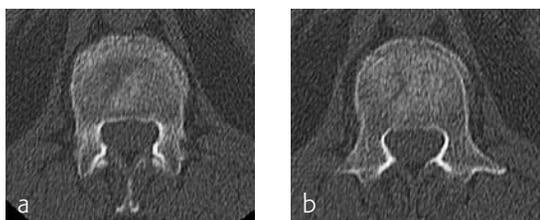


Fig 3a–b  
Coronal CT scans preoperative.



Fig 4a–b  
Lateral MRI pre-operative.

### Case: Minimally invasive fracture treatment for an incomplete burst fracture

A 50-year-old female patient fell down the stairs, suffering severe back pain. The initial examination showed pain at the thoracolumbar junction and no neurologic deficit.

#### Preoperative analysis

X-rays (Fig 1) and CT scans (Fig 2-3) were performed for preoperative analysis, definition of the fracture type, and surgical pre-op planning. The lateral x-ray and CT scans showed a typical wedge deformity of the fractured vertebral body (L1). The fracture included the cranial endplate as well as the anterior and posterior wall.

Additionally, a MRI scan was performed to analyze the integrity of the soft tissue in detail. The lateral MRI (Fig 4) clearly showed a ruptured intervertebral disc at the level T12/L1.

Based on the Magerl Classification [1], the final classification of the fracture concluded in AO Type A 3.1.1. This fracture type is also referred to as an unstable incomplete burst fracture including posterior wall involvement.

#### Surgical plan

The incomplete burst fracture associated with the destruction of the intervertebral disc resulted in the planning of a two staged approach. In a first immediate surgery, the unstable fracture was stabilized by posterior percutaneous fixation. In a second surgery, a cranial hemi-vertebrectomy was performed. Reconstruction was done using an autologous iliac crest bone graft and a plate to achieve a mono-segmental fusion.

#### First surgery Intraoperative

Based on the preoperative analysis and the surgical plan, the patient was positioned supine for the first surgery and the fracture was stabilized with a bridging construct (T12-L2) from posterior. Due to the ruptured disc, an anterior reconstruction of the spine was planned for a later stage surgery. The posterior stabilization was considered to be sufficient to bridge the fracture and time between both surgeries.



Fig 5 Independent correction of the sagittal profile by readjusting lordosis or kyphosis.

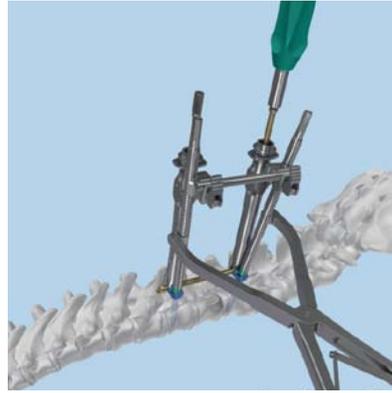


Fig 6 Independent distraction for stepless height readjustment of the fractured spine.

Using the USS Fracture MIS system for the initial stabilization allowed for a minimally invasive approach with intraoperative active reduction of the spinal fracture. The unique design of the fracture clamp allowed for independent correction of the sagittal alignment (Fig 5) as well as height readjustment (Fig 6).

For this patient, independent lordosis correction, height readjustment, and spinal stabilization were the primary goal of surgery. As percutaneous top-loading pedicle screw systems cannot provide independent correction of the flexion-compression deformity, the fracture clamps and Schanz screws of the USS Fracture MIS system were used to overcome this disadvantage (Fig 7 and Fig 8).

Due to the minimally invasive approach, the patient experienced less blood loss and muscle trauma compared to the traditional open approach.

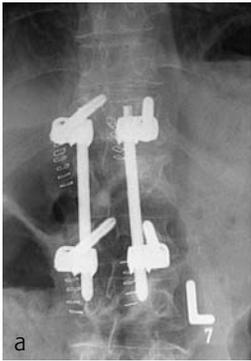


Fig 7a–b Final x-rays (AP and lateral) after the complete fracture reduction and posterior stabilization.

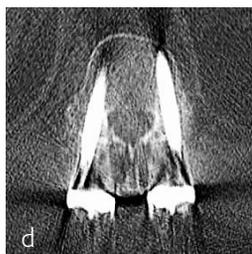
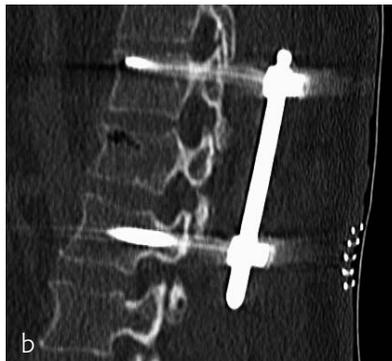
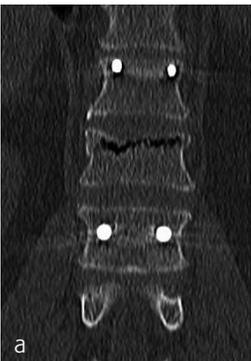


Fig 8a–d Final CT scans (AP, lateral and coronal) after the complete fracture reduction and posterior stabilization.



Fig 9  
Intraoperative thoracoscopic picture of Arcofix plate in position. Fan retractor on the upper part of the picture retracting the diaphragm.

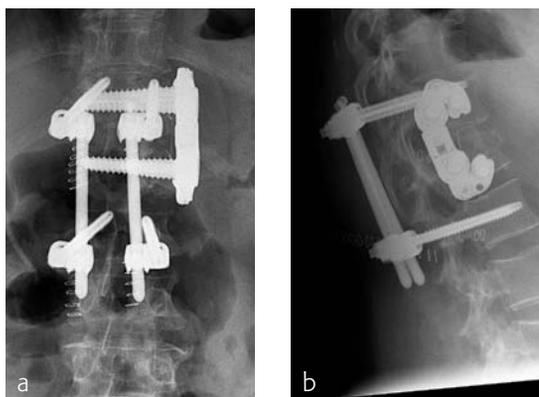


Fig 10a–b  
Final X-ray scans (AP and lateral) after the second surgery, reconstructing the anterior column with mono-segmental fusion.

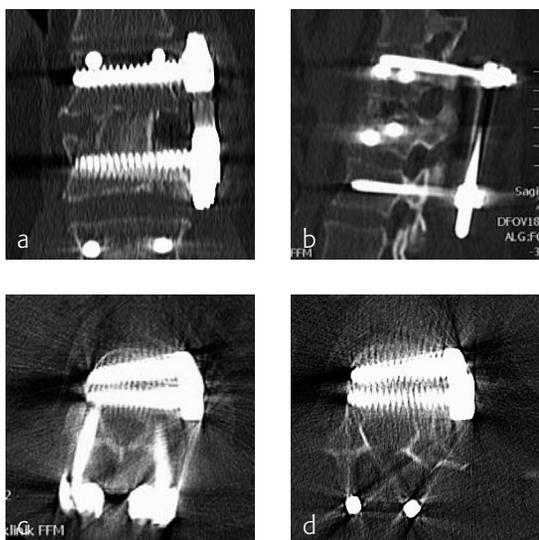


Fig 11a–d  
Follow up CT Scans (AP, lateral and coronal) after the second surgery.

### Second surgery for anterior column reconstruction

As a result of the ruptured disc and the fractured superior endplate, a hemivertebrectomy was performed and reconstruction was performed using an autologous iliac crest bone graft. To keep the graft in place and to allow for early posterior implant removal, an ArcoFix plate (Fig 9) was used, allowing for slight compression as well as final sagittal reconstruction (Fig 10).

The hemivertebrectomy and the placement of the bone graft and ArcoFix plate were performed applying thoracoscopically assisted surgical technique.

### Postoperative follow up

The minimally invasive approach with USS Fracture MIS allowed for this patient’s fast recovery, and supported earlier discharge (Fig 11). The patient was back home eight days after the second surgery.

### References

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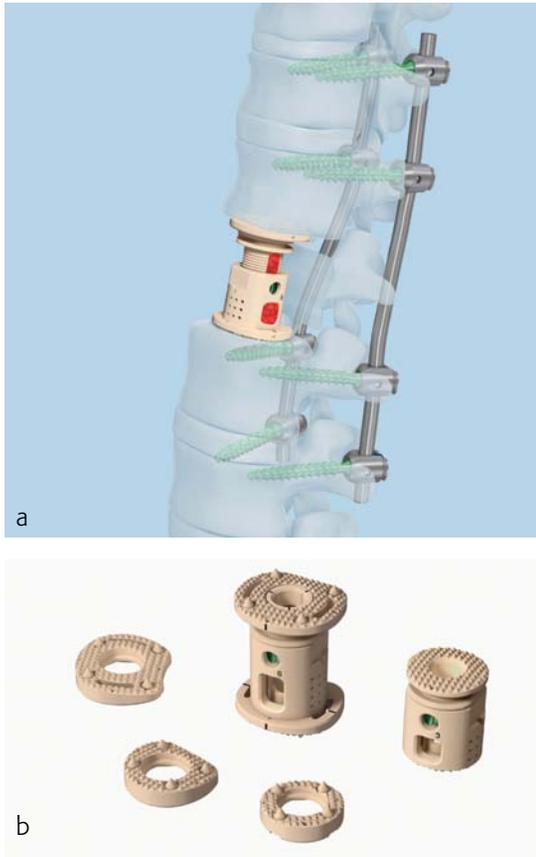


Fig 1a-b  
Vertebral Body Replacement implant.

### XRL Vertebral Body Replacement

The XRL Vertebral Body Replacement (VBR) implant (Fig 1) is intended for use in the thoracolumbar spine (T1-L5) to replace a collapsed, damaged, or unstable vertebral body due to tumor or trauma (ie, fracture).

The XRL VBR has been designed to provide anterior spinal column support, even in the absence of fusion for a prolonged period. Due to the fact that its biomechanical characteristics (eg, modulus of elasticity) sit between the cancellous and cortical bone, the XRL VBR aids in stress distribution and load sharing. The implant is intended to be used with Synthes' supplemental internal fixation systems (eg, USS, including MATRIX, Pangea, and TSLP).

The interior of the XRL VBR can be packed with bone (ie, autograft or allograft), and the PEEK implant's radiolucency gives surgeons the ability to assess tumor recurrence and fusion progress.

The implant encompasses modular endplates to accommodate multiple approach options. There are six endplate footprints that range from -10 to 20 degrees and construct heights that range from 22 to 145 mm, allowing the surgeon to customize the implant to better match patient anatomy.

An all-in-one spreader gives the surgeon the ability to insert, expand and lock implants all with one instrument.

Additionally, three solution options currently exist:

- Allograft
- Static VBRs in titanium and PEEK
- Expandable VBRs in titanium and PEEK.

However, use of the XRL VBR implant is contraindicated when there is active systemic infection, infection localized to the site of the proposed implantation, or when the patient has demonstrated allergy or foreign body sensitivity to any of the implant materials. Severe osteoporosis may also prevent adequate fixation, and therefore preclude the use of this or any other orthopaedic implant.

Conditions that place excessive stresses on bones and implants, such as severe obesity or degenerative diseases, are relative contraindications. The decision whether to use this device with patients with such conditions must be made by the physician, taking into account the risks versus the benefits to the patient.

Use of the implants is also relatively contraindicated in patients whose activity, mental capacity, mental illness, alcoholism, drug abuse, occupation, or lifestyle interferes with their ability to follow postoperative restrictions, potentially placing undue stress on the implant during bone healing, resulting in a higher risk of implant failure.

Case provided by Ziya L Gokaslan, Baltimore, USA

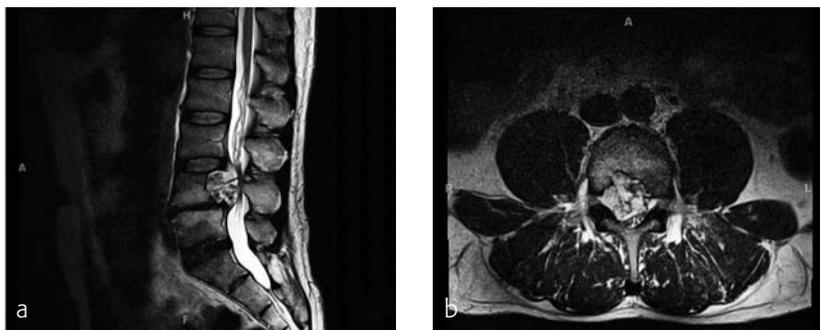


Fig 1a–b  
Preoperative T2 MRI.

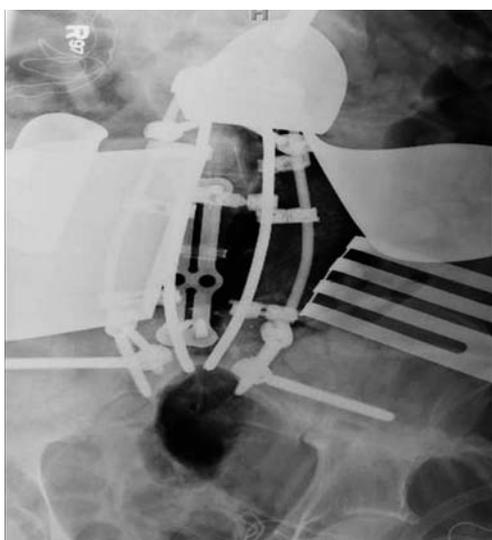


Fig 2  
Intraoperative image, stage two.

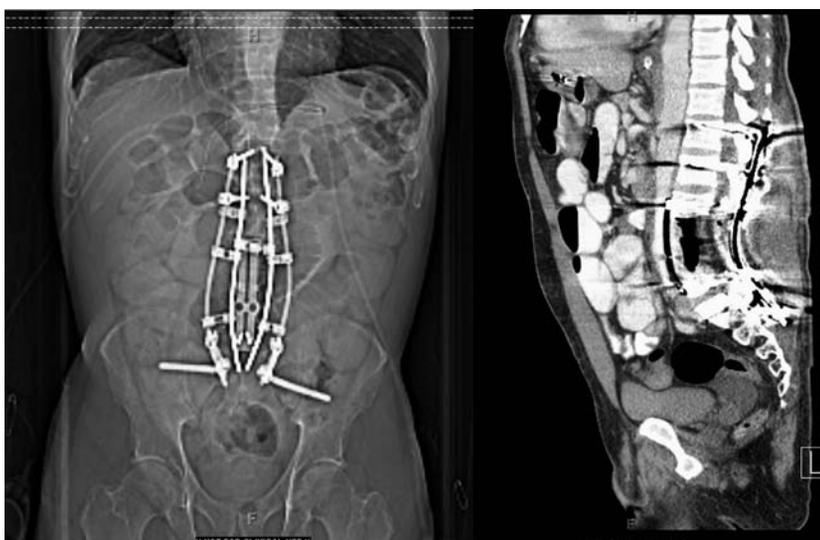


Fig 3  
Postoperative, stage two.

### Case: Posterior-anterior en bloc spondylectomy

A 46-year-old man presented to an emergency department complaining of an acutely worsening pain that radiated from his lower back and buttock region down his left leg.

The patient had a two-year history of similar pain, unresponsive to physical therapy. The patient also complained of constipation and walking difficulty. He denied smoking or drug/alcohol use. His past medical and surgical history were unremarkable. Family history was noncontributory.

The patient was admitted for evaluation, and on MRI, was found to have a lesion at the L4 vertebral body, extending into the epidural space and compressing the cauda equine (Fig1). The lesion was biopsied and found to be a chordoma, so he was transferred to the Neurosurgery department at Johns Hopkins Hospital for further management. His initial examination there was normal; motor strength 5/5 in all extremities, intact sensation, and reflexes present at 2+ throughout.

After discussing the risks of surgery, the patient consented to a staged posterior-anterior en bloc spondylectomy. The first stage involved a posterior lumbar pelvic exposure with dissection of the iliopsoas and lumbar plexus. Laminectomy of L3-L5 was performed, with instrumentation from L1 to the ilium bilaterally. Tomita saws were placed at the L3 and L5 disk space.

Stage two was a retroperitoneal exposure of L3-L5 with mobilization of the IVS, aorta, internal common iliac artery and veins, with en bloc resection of the tumor and partial L3 and L5 vertebrectomies (Fig 2). The vertebral body defect was reconstructed with the PEEK distractible cage (Fig 3), anterior plate, screws, and demineralized bone matrix. Final pathology revealed a true en bloc resection with negative margins.

The patient recovered well from surgery, but developed postoperative pneumonia and transient postoperative ileus. But at the time of discharge, the patient was ambulating well and was able to participate in active, inpatient rehabilitation.

AOSpine

## CELEBRATING 10 YEARS OF AOSPINE



Drs Wang and Vialle, looking forward to continued success at AOSpine.

In 2013, AOSpine will celebrate the 10th anniversary of its founding. With this in mind, AOSpine International's Chairperson, Dr Jeff Wang, and Past-Chairperson, Dr Luiz Vialle, reflect on the last 10 years and talk about the road ahead.

“Looking back, I believe John Webb successfully established the AOSpine brand and concept, immediately appealing to a wide range of target groups,” said Dr Luiz Vialle.

“Following this pilot project, our first AOSpine Chairperson, Max Aebi created regional and national structures to rapidly implement strategies at local levels. The second Chairperson, Michael Janssen transformed AOSpine into an outward looking, member-oriented, value generating spine entity. Since then, I have been working hard to establish, and enhance, the academic credibility of AOSpine.”

“Looking forward, I'm delighted that Dr Jeff Wang is the next Chairperson of AOSpine International. Jeff's leadership qualities will further realize the dream of AOSpine's founders and past Chairpersons, and so I am very enthusiastic about our future and genuinely excited about the opportunities that lie ahead,” Dr Vialle said.

In recent years, while Dr Vialle was Chairperson of AOSpine International (2009–2012), and Jeff Wang was Chairperson of AOSpine International Education (2008–2011), AOSpine saw some significant advances that included:

- The Global Spine Congresses in San Francisco (2009) and Barcelona (2011), which offered a unique academic platform to spine care professionals, with the aim to educate, stimulate debate, and advance knowledge in the field of spine care
- The World Forum for Spine Research events Montreal (2010) and Helsinki (2012), which shared new knowledge on basic, translational, and clinical research in the field of intervertebral disc and back/neck pain with clinicians and researchers from around the world
- The introduction of the AOSpine Curriculum, based on the competencies that enable spine surgeons to perform effectively across six areas of pathology in their practice setting, and to meet the standards of the profession
- The introduction of Knowledge Forums, where working groups led by key opinion leaders aim to generate knowledge and integrate the latest advances and outcomes of treatment and techniques into AOSpine's education program to assist surgeons in clinical decision-making related to prevention, diagnosis, treatment, and prognosis
- The introduction of the Global Spine Journal, an international peer-reviewed quarterly journal that includes scientific articles as well as original research, reviews, commentaries, editorials, technical reports, and case studies in all spine fields.

Incoming AOSpine Chairman, Dr Jeff Wang said he was deeply honored to be nominated and accepted by his peers for such an important position, and that he looked forward to building upon the work of his predecessor Luiz Vialle.

"My vision is for AOSpine to be recognized as the premier global academic spine society by setting the standard for education, research, and membership," Dr Wang said.

"I believe that we are on our way to building a most respected and active academic society, one that will interact on a worldwide basis. And I also believe that we should continue to build our global community and enhance our academic value through our outstanding courses, congresses, and publications."

"On a regional level, I will strive to make AOSpine relevant to each member across the globe by creating initiatives that allow our members to be involved and add value to our organization. I am very excited about this new opportunity and I greatly look forward to working with you all in building the future of AOSpine," Dr Wang said.

AOSpine looks forward to celebrating the 10th anniversary throughout 2013!

Tim Pohlemann

## AO AWARD

The award certificate reads:

**The AO Foundation awards this prize to Prof Dr Pietro Regazzoni, Lugano-Soragno, Switzerland for his exceptional role in the development of new treatment options in surgery, and his enduring innovative contributions to the AOTK System.**

### AO Recognition Award 2012—Pietro Regazzoni

Pietro Regazzoni, MD is the latest recipient of the prestigious AO Recognition Award.



Prof Dr Regazzoni (centre) receives his award from Tim Pohlemann and Norbert Haas.

The AO Recognition Award is the highest prize of the AO Foundation and is awarded for life-time achievement and presented to exceptional recipients, at infrequent intervals (see below for the list of previous award recipients). Prof Dr Regazzoni was presented his award at a special ceremony during the AO Trustees Meeting in Davos in June 2012.

Besides many other activities and achievements, Pietro Regazzoni is the promoter of the distal radius 3-column theory (together with Dr D Rikli). He has been passionate in improving the treatment of proximal femur fractures through intramedullary nailing and plating. Indeed, many of today's instruments for minimally invasive osteosynthesis have benefited from his expertise and creativity. He has been at the forefront of technology integration (computer-assisted surgery, pre-op planning, navigation etc.) since the early 1990s. And he has pursued, with modern tools as "Open Source" case documentation, the standards set by Maurice Müller to document our clinical outcomes, to learn from our mistakes, or to provide evidence of the advantages of one technique over another.



Pietro Regazzoni and his wife Francesca.

Dr Regazzoni joined the TK System as a member of the “large” AO Technical Commission (AOTK) under Stephan Perren in 1987. He served on the Long Bone TK from 1991 until 2005, first as a member, and from 1998, as Chairman. With the formation of the 3-pillar model of the TK System in 2005, he provided vital guidance to the newly formed TK Executive Board, helping to set common standards and preserving the innovative spirit of the TK System.

More recently, he has continued to dedicate himself to the AO cause, serving in numerous committees of the AO Foundation, such as the Board of Trustees, the Academic Council (AcC), and as Chairman of the AO Development Institute (ADI). He provides ongoing consultancy to the Minimally-invasive Osteosynthesis Expert Group.

Besides his contributions to the TK System, Pietro Regazzoni has been an exceptional teacher and host for almost a generation of trauma fellows at his clinic.

He is not only an outstanding innovator and teacher but also a multi-lingual ambassador for the AO Foundation. He is a charismatic person with an incredibly broad perspective, as well as a man of vast reading, talented in the arts, and last but not least, a passionate billiards player.

The AO Family owes a lot to Pietro Regazzoni and proudly awards its highest prize to him.

Former recipients of the AO Recognition Award:

- **Jeff Mast in 1992,**
- **Dankward Höntzsch in 1993,**
- **the AO Hand EG (Jesse Jupiter, Hill Hastings, Uli Büscher, Jürgen Brennwald) in 1995,**
- **John Thalgott in 1996,**
- **Röbi Frigg and Friedl Schläpfer in 2001,**
- **Stephan Perren in 2004,**
- **Ted Hansen jr in 2006,**
- **Jörg Auer in 2008,**
- **and Paul Pavlov in 2010.**

Christoph Sommer

## PORTRAIT: YVES PASCAL ACKLIN



Fig 1  
Yves explains the shoulder anatomy to a resident.



Fig 2  
Yves presenting technique and results of minimally invasive plate osteosynthesis proximal humerus, at an AO educational event in Vienna in 2012.

Yves Acklin is a trauma surgeon on his way to becoming a leader in orthopaedic trauma in Switzerland and the AO.

Born in 1976, he finished his initial medical schooling with a doctorate in Basel in 2002 (under EW Morscher). He trained in general surgery in Basel (under 2012 AO Recognition Award recipient Prof Dr Regazzoni) and in Chur (under Drs Leutenegger and Sommer). This study was temporarily interrupted by a two month period doing military surgery in a German field hospital in Kosovo. As a Major, he is still an active artillery officer in a mountain battalion of the Swiss Army.

Yves finished his surgical training in 2007, becoming an attending surgeon at the Trauma Unit, Kantonsspital Graubünden. He has specialized in trauma surgery over the last five years, and successfully passed the Swiss and European exams of trauma surgery, achieving the highest level grades. Recently, he was also conferred an additional doctorate (in scientific medicine) at the University of Lichtenstein with the topic "Treatment and Complications of Dislocation and Non-Dislocation Type Proximal Tibia Fractures".

Yves is especially interested in minimally invasive surgery, pelvic and acetabular fractures, and treatment of polytrauma patients. His main recent scientific activities, which include several peer reviewed publications, were on the topics of minimally invasive plate osteosynthesis in proximal humeral fractures, and treatment of proximal tibial fractures, injuries typically seen in winter sport accidents.

Besides being an excellent surgeon throughout the whole field of orthopaedic trauma surgery, Yves has for many years been an active teacher at national and international AO courses and seminars and has assisted at AO webinars and webcasts. He has been actively involved in many clinical trials for new AO techniques and devices, and has been a member of the Dynamic Locking Screw (DLS) User Group from its beginning in 2009.

In his rare spare time, Yves is a family man for his wife Stefanie, an attending pediatrician, and his three children.

Without doubt, Yves, with his enthusiasm and efficient working capacity, will become an inspiration to many, as he develops his own academic career through continued post doctorate study in the next few years, and in becoming a leading general and orthopaedic trauma surgeon in the near future.



Fig 3  
Yves with his wife Stefanie, and children Lorenz, Olivier, and Noélie.

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### **For further information please contact:**

AO Foundation  
TK System  
Clavadelstrasse 8  
CH-7270 Davos Platz  
Phone: +41 81 4142-471  
Fax: +41 81 4142-290  
aotk@aofoundation.org  
www.aofoundation.org/tk

### **Editors:**

Univ-Prof Dr Tim P Pohlemann  
Chairman of the TK System  
tim.pohlemann@uniklinikum-saarland.de

TK Office  
Philip Schreiterer (Trauma and Vet)  
philip.schreiterer@aofoundation.org  
Andrea Chierici (Spine)  
andrea.chierici@aofoundation.org  
Maria Velasco Rodriguez (CMF)  
maria.velasco@aofoundation.org

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