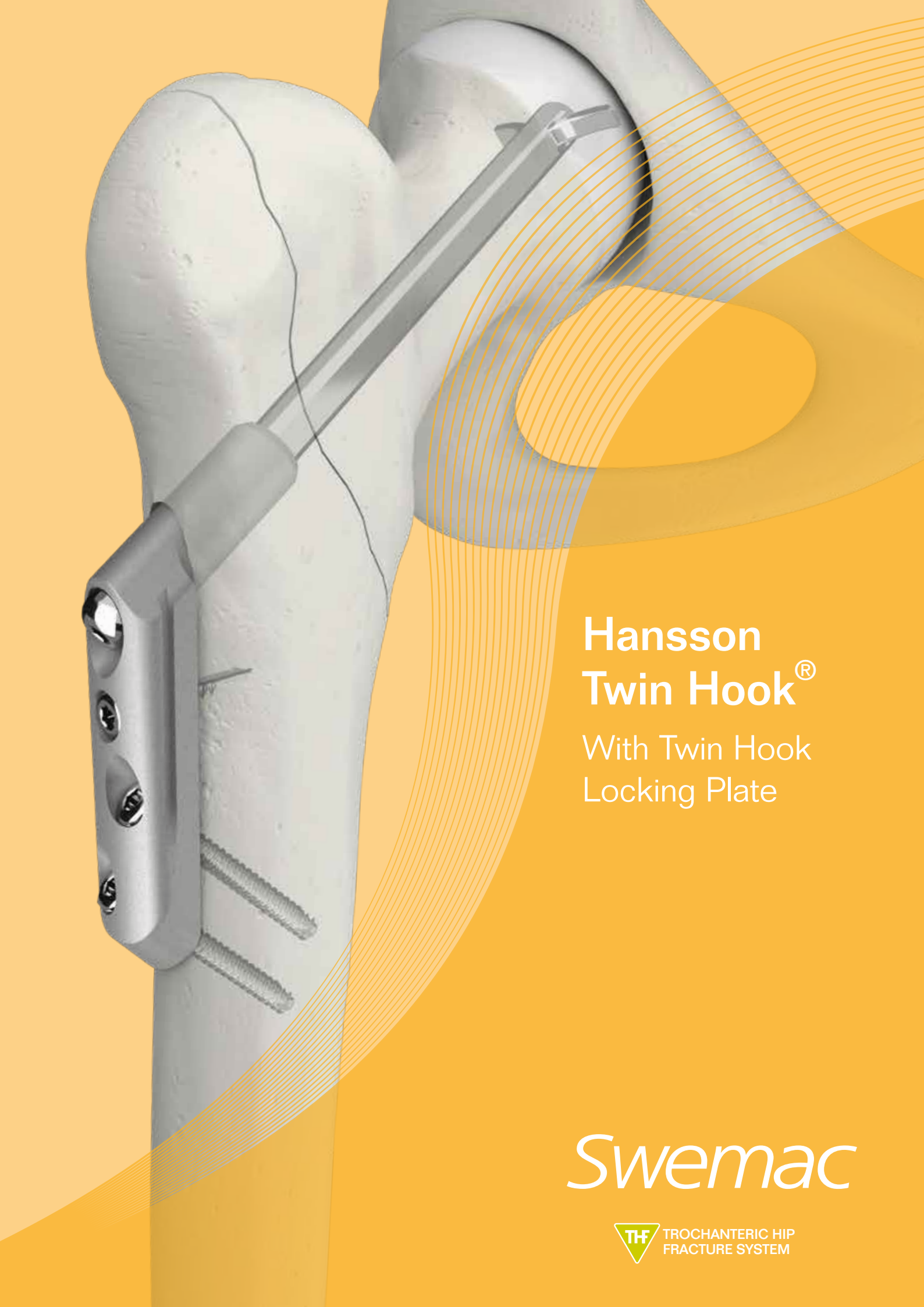


Hansson Twin Hook®

With Twin Hook Locking Plate

Swemac

TROCHANTERIC HIP FRACTURE SYSTEM

Hansson Twin Hook®

With Twin Hook Locking Plate

The Hansson Twin Hook is a proven fixation device for the treatment of femoral neck and trochanteric hip fractures. The implant features two hooks which are deployed to achieve purchase in both the cancellous and subchondral bone of the femoral head. The development of the Hansson Twin Hook was based on the long and successful experience with the Hansson Pin system and superior fixation has been demonstrated compared to a traditional compression hip screw.

The Hansson Twin Hook Locking Plate is an anatomical locking hip plate designed exclusively for use in combination with the Hansson Twin Hook. Together they provide **strong, stable fixation** and allow for **minimal surgical trauma** during implantation.

Hook Pin Fixation

More than **350 000 patients** treated with the Hansson Twin Hook, Hansson Pin or Hansson Pinloc Systems.

More than **280 scientific publications** and **10 Ph.D. theses** published on Hansson hook pin fixation technology.

Strong, stable fixation

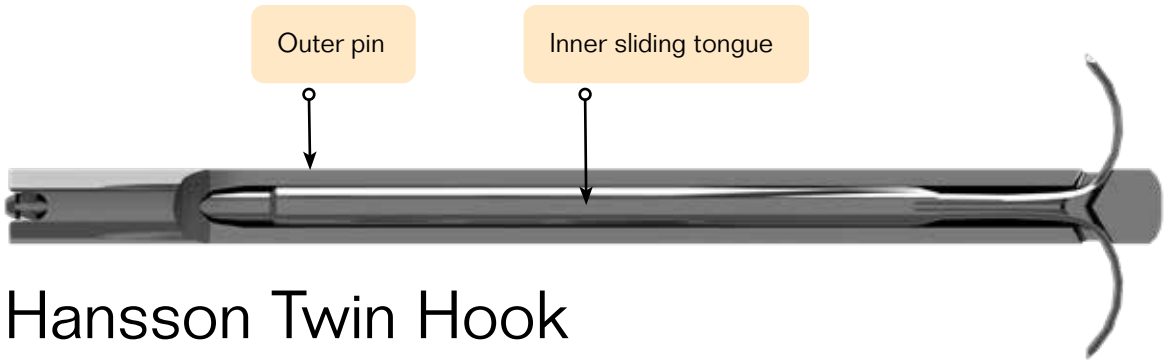
- Enhanced rotational stability
- Reduced risk of femoral head penetration
- Unique hip plate with oblique locking screws
- Dynamic lateral support plate

Minimal surgical trauma

- Reduced operative exposure
- No rotational forces during insertion
- Less damage to cancellous bone
- Percutaneous removal procedure

Product overview

The Hansson Twin Hook and the Twin Hook Locking Plate are both part of the Swemac Trochanteric Hip Fracture System (THF) and require the THF instrument platform for implantation. All implants are made from stainless steel.



Hansson Twin Hook

The Hansson Twin Hook consists of two parts; an inner sliding tongue and an outer pin. The outer pin is 8.9 mm in diameter. Length options from 70-135 mm are available in 5 mm increments. Fixation in the femoral head is achieved by pushing the inner sliding tongue out through the proximal windows. The hooks are 4.6 mm wide and extend out approximately 11 mm on each side of the outer pin when fully deployed. The Hansson Twin Hook can be used in combination with the Twin Hook Locking Plate, Swemac Hip Plate or the Medoff Sliding Plate.

Compression Screw

The Compression Screw has 3 functions; Firstly, to keep the plate aligned with the femoral shaft. Secondly, to prevent the plate and Twin Hook from separating and thirdly, to compress the fracture.

Unicortical Screw

A 28 mm self-drilling/self-tapping Unicortical Screw (Ø4.5 mm) is used for fixation and compression in the most proximal hole in the Twin Hook Locking Plate. The Unicortical Screw is also used for fixation of the Lateral Support Plate.

Locking Cortical Screws

Obliquely angled Ø5.1 mm self-tapping Locking Cortical Screws are used for fixation. Length options from 28-68 mm are available in 4 mm increments.

Lateral Support Plate

The Lateral Support Plates are available in two sizes; a standard 2-hole plate and a short 1-hole plate. The holes in the Lateral Support Plate will accept either Ø4.5 mm Unicortical Screws or Ø5.1 mm Locking Cortical Screws.

The Lateral Support Plate has two additional Ø3.0 mm holes for cerclage wire fixation.

Twin Hook Locking Plate

The Twin Hook Locking Plates are available with a plate barrel angle of 130°, 135° or 140°. A 3-hole (length 64 mm) or 4-hole (length 81 mm) option is offered for each. All plates have tracks for the Lateral Support Plate.

Strong, stable fixation

Fixation failure is the most common complication in the treatment of hip fractures. The Hansson Twin Hook has been developed to achieve strong, stable fixation and overcome the strength reduction in cancellous bone caused by osteoporosis.

Enhanced rotational stability with reduced risk of cut-out

The Hansson Twin Hook provides 200-300% more rotational resistance than a compression hip screw (Fig.4).

Subchondral bone contact

The hooks are positioned anteriorly and posteriorly in the femoral head and the total span of the two is 31mm. The hooks achieve purchase in both the cancellous and subchondral cortical bone and thus provide excellent support against varus and dorsal angulation (Fig.1).

Figure 1. The hooks will be in contact with both cancellous and subchondral bone in the femoral head.

Full bone and implant surface contact

The smooth profile of the Hansson Twin Hook has full bone and implant surface contact along its entire length which enhances resistance against varus and dorsal angulation (Fig. 2 and 3) (Ref. 1).

Figure 2. Hansson Twin Hook (Full contact)

Figure 3. Compression hip screw (Point contact)

Torque deformation test

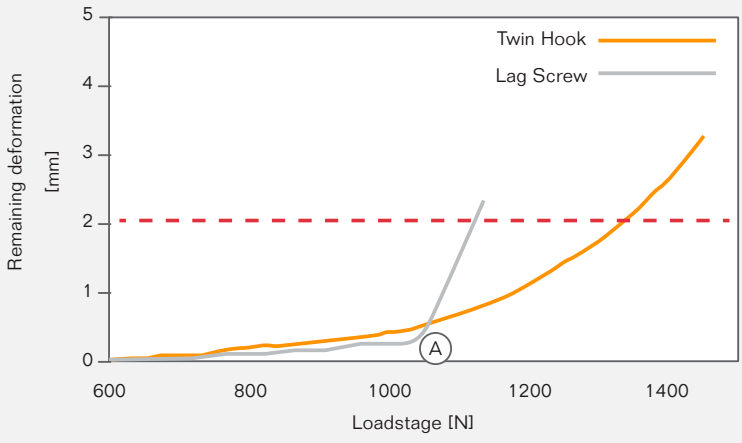
Figure 4. Torque deformation graph showing a comparison of the torsional loading of a Hansson Twin Hook and a compression hip screw during 40° clockwise and 40° counter-clockwise rotation (Ref. 2).

The Hansson Twin Hook provides 200-300% more rotational resistance in femoral heads than a compression hip screw. Rotational stability of the Hansson Twin Hook in the plate barrel is ensured through bilateral flattening of the shaft to match the inside of the hip plate barrel.

The Hansson Twin Hook maintains full torsional resistance after compression, making this a more forgiving and durable fixation than the compression hip screw.

Cut-out behaviour under cyclic loading

Figure 5. When the bone at the screw thread failed, the stability of the Lag Screw-construct decreased significantly and a distinct yield point could be observed (point A). Thus it seems that the Twin Hook is a more "forgiving" implant (Ref. 1).



"The Twin Hook provides a significantly higher cut-out resistance under cyclic loading compared to a Lag Screw."

(Ref. 1)

Reduced risk of femoral head penetration

Gradual bending of the hooks

Even if the outer pin of the Hansson Twin Hook advances into the femoral head, the hooks will gradually bend instead of stripping the bone. This makes the Hansson Twin Hook a more forgiving and durable implant compared to a compression hip screw.

Loading and deformation tests using cadaver femoral heads and artificial cancellous bone have shown that the Hansson Twin Hook behaves differently compared to the compression hip screw (Ref. 2). In case of impaired sliding between the Twin Hook and the plate/barrel, the compressive forces are transmitted to the fixation of the Hansson Twin Hook in the femoral head rather than to the fracture.

30% larger frontal area

The frontal area of the Hansson Twin Hook is 30% larger than a compression hip screw providing an increased surface area to prevent penetration (Fig. 6-7).

Figure 6. The frontal area of the Hansson Twin Hook is 164.4 mm^2.

Figure 7. The frontal area of a compression hip screw is 126.0 mm^2.

Load and deformation test

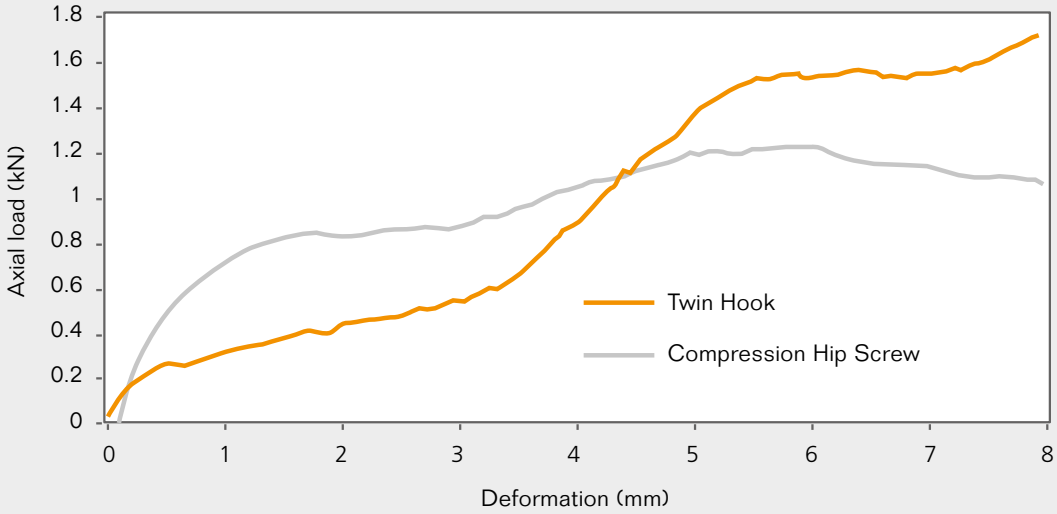


Figure 8. Load-deformation graph in axial loading of a compression hip screw and a Hansson Twin Hook during 8 mm deformation (Ref. 2).

The Hansson Twin Hook showed superior resistance in comparison to the compression hip screw in the important area close to, or in, the subchondral bone (in cadaver femoral heads) (Ref. 2).

The compression hip screw lost fixation after 1 mm of deformation and was no longer able to provide any torsional resistance.

Note: The frontal area of the current version of the Hansson Twin Hook is 25% larger than the one used in this test.

Impaction of bone

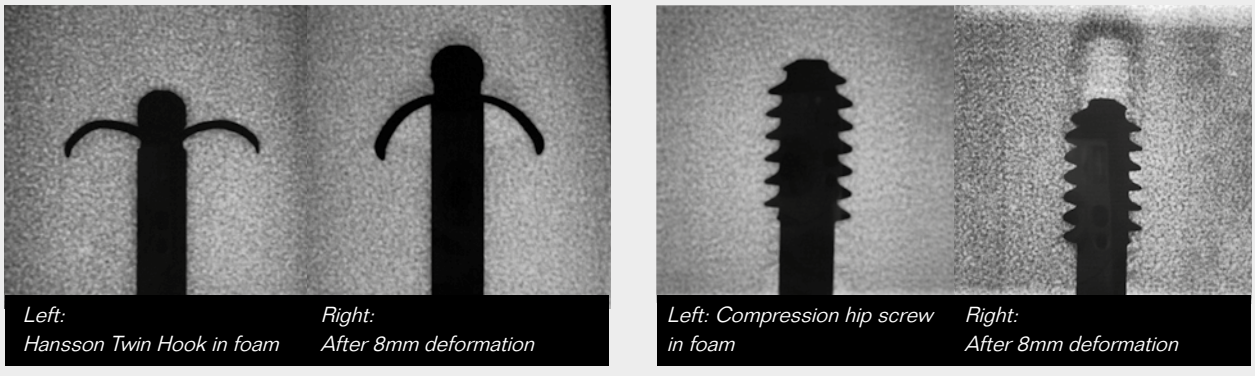


Figure 9. X-rays showing test specimens during load-deformation tests in axial loading of a Hansson Twin Hook and a compression hip screw in 160 kg/m^3 foam.

Hansson Twin Hook – maintains fixation

The Hansson Twin Hook maintains full torsional resistance after compression, making this a more forgiving and durable fixation than the compression hip screw.

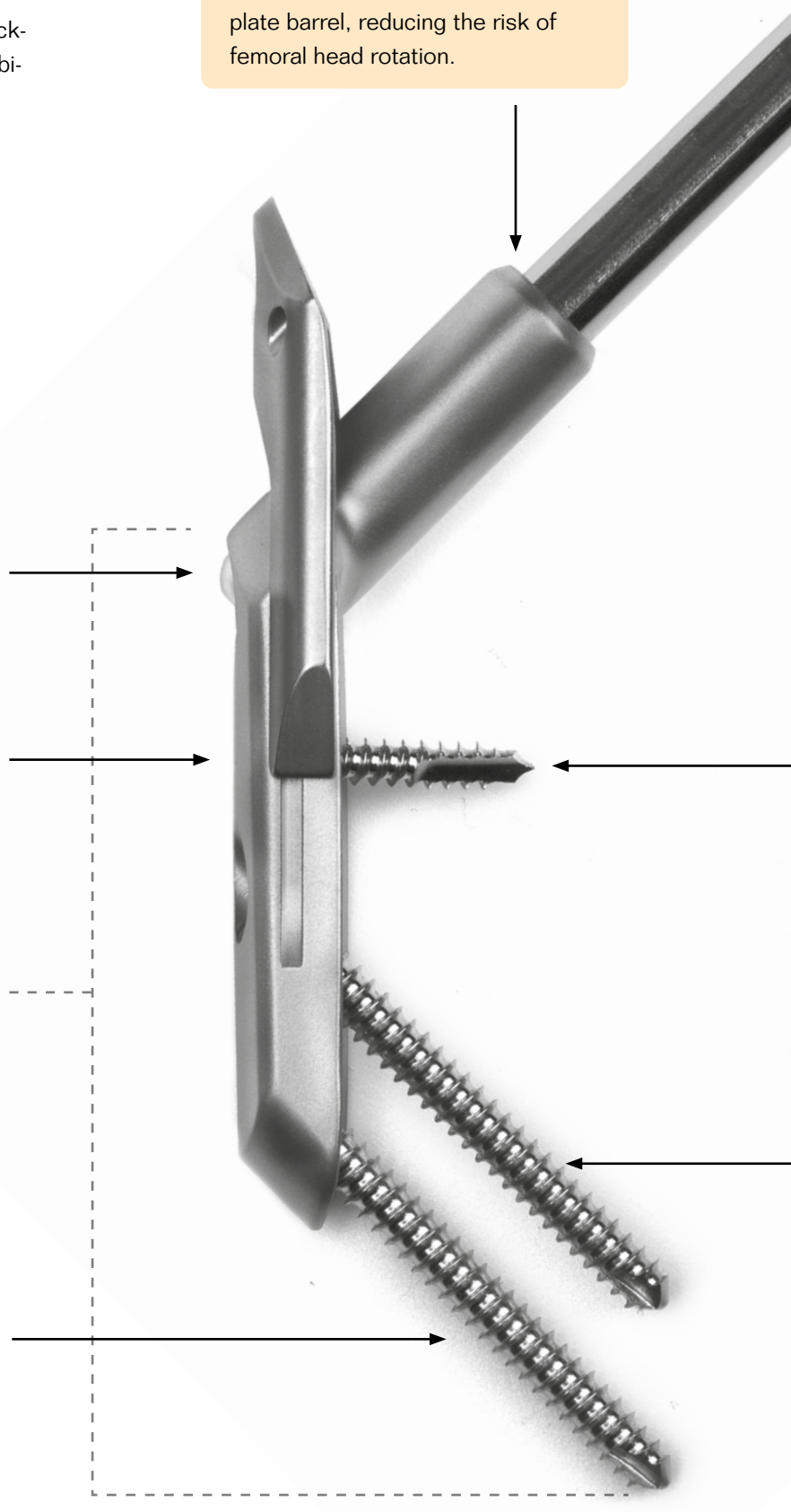
Compression hip screw – loses fixation

The compression hip screw loses fixation after compresssion due to stripping of the bone.

Unique hip plate with oblique locking screws

The Twin Hook Locking Plate is an anatomical locking hip plate designed exclusively for use in combination with the Hansson Twin Hook implant.

Keyed plate barrel
The Twin Hook cannot rotate in the plate barrel, reducing the risk of femoral head rotation.



Spherical head
The Compression Screw has a spherical head in order to minimise soft tissure irritation.

Plate compression hole
Allows compression of the plate to the lateral femoral cortex.

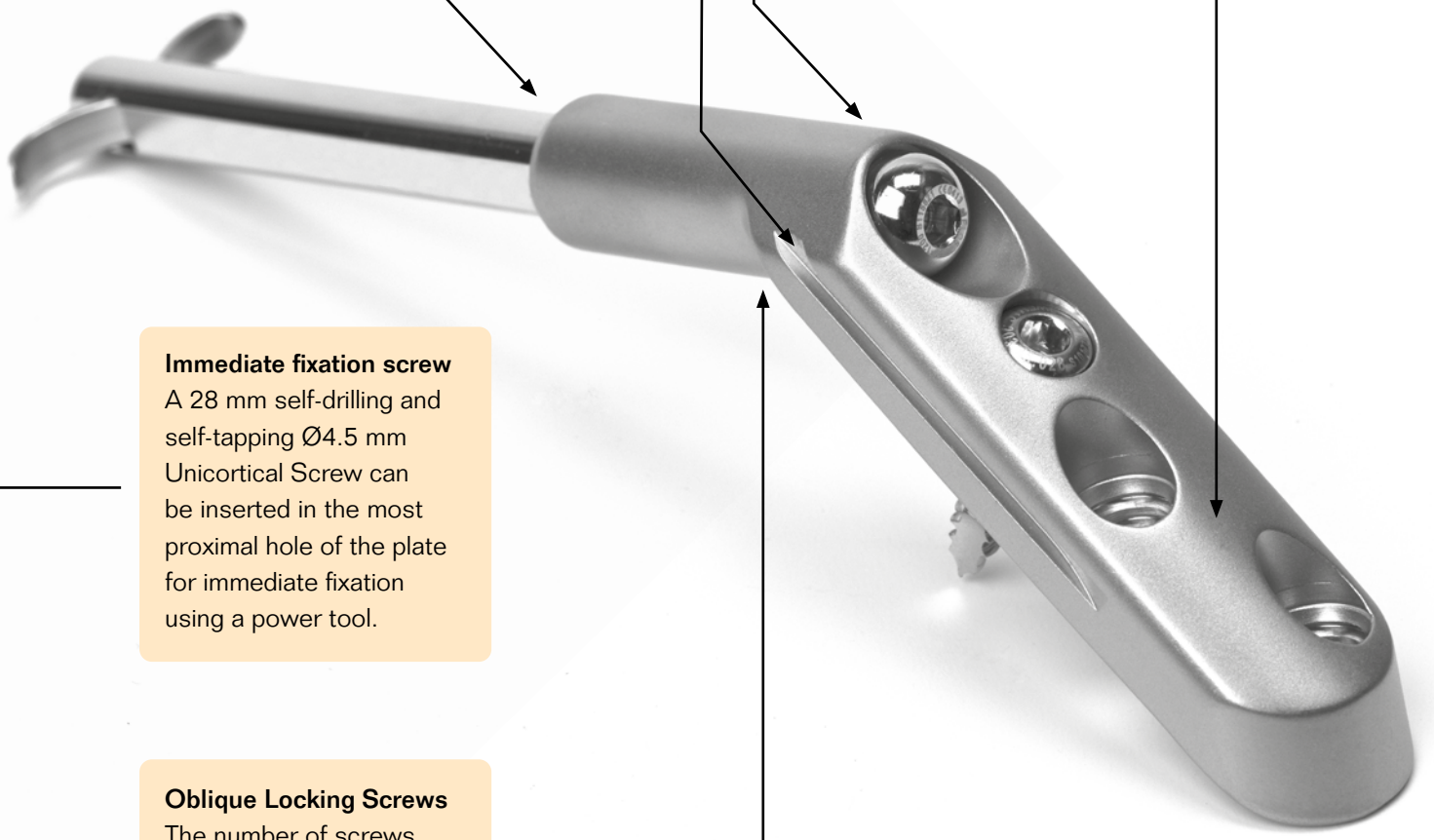
Reduced plate length
The length of a 3-hole Twin Hook Locking Plate (64 mm) is biomechanically equivalent to a 4-hole standard compression hip screw plate (96 mm) (Ref. 3). The oblique Locking Screws serves as an elongated part of the plate, transmitting the weight bearing forces over a longer distance along the femoral shaft.

Reduced risk of peri-implant fractures
Locking plates do not compress the bone or periosteum which is the case for standard non-locking plates. This reduces the risk of impaired blood supply and the subsequent decrease in cortical bone thickness that can lead to weakening and peri-implant fractures (Ref. 4)

Large chamfer
The plate barrell has a large chamfer to facilitate plate insertion.

Plate tracks
The anterior and posterior tracks allow for the Swemac Lateral Support Plate to be mounted on to the Twin Hook Locking Plate.

Smooth and curved outer profile
The Twin Hook Locking Plate has a smooth curved outer profile to minimise soft tissue irritation.



Immediate fixation screw
A 28 mm self-drilling and self-tapping Ø4.5 mm Unicortical Screw can be inserted in the most proximal hole of the plate for immediate fixation using a power tool.

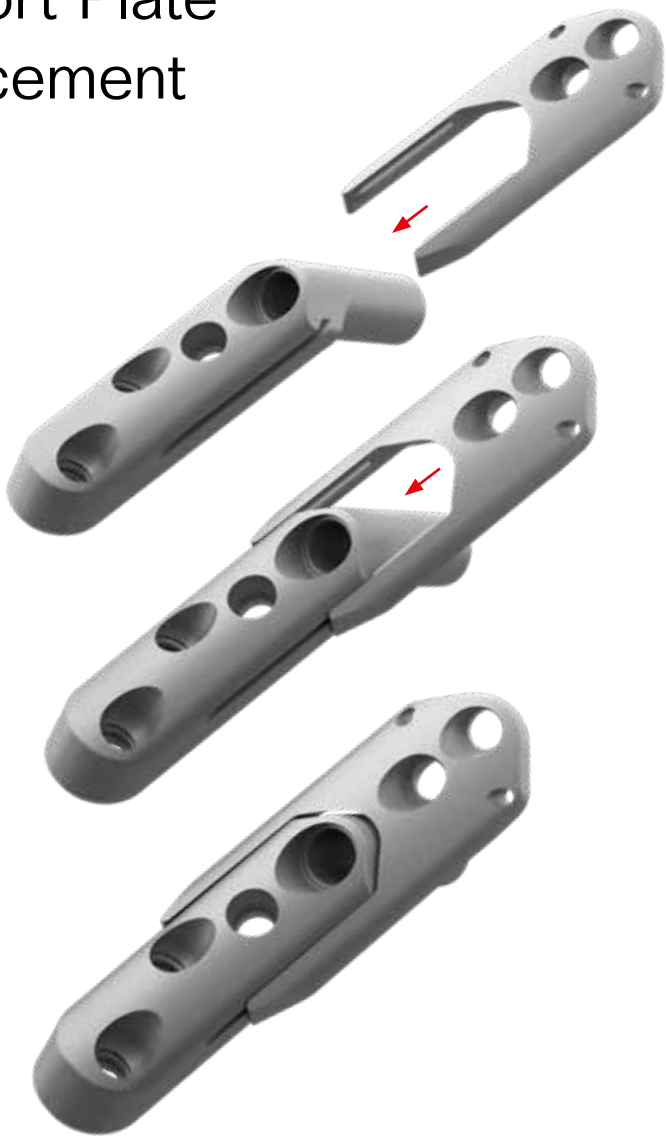
Oblique Locking Screws
The number of screws is reduced compared to a standard compression hip screw system. The Ø5.1 mm Locking Cortical Screws placed obliquely have 50% larger cortical contact than Ø4.5 mm Cortical Bone Screws placed at a 90° angle.

Mechanically strong plate
Mechanical testing has demonstrated the high strength of the Swemac Hip Plate and plate breakage has not been reported clinically (Ref. 5 & Ref. 6).

Built-in periosteal elevator
The distal part of the plate can be used as a periosteal elevator to lift the muscle from the bone, reducing soft tissue dissection.

Dynamic Lateral Support Plate prevents medial displacement

The Swemac Lateral Support Plate prevents medial displacement of the femoral shaft relative to the neck and head.



Minimal invasive

The Lateral Support Plate is implanted at the same time as the Twin Hook Locking Plate. The incision for the Twin Hook Locking Plate is slightly more proximal than for a standard compression hip screw system, allowing the Lateral Support Plate to be inserted without extending the skin incision much further.

Adjustable

The Lateral Support Plate allows the surgeon to adjust the position depending on the distance between the plate barrel and the greater trochanter. This distance will vary depending on the plate angle.

Allows compression

Contrary to trochanter stabilising plates, the Lateral Support Plate will allow compression between the fractured lateral cortex and the femoral shaft by a sliding mechanism.

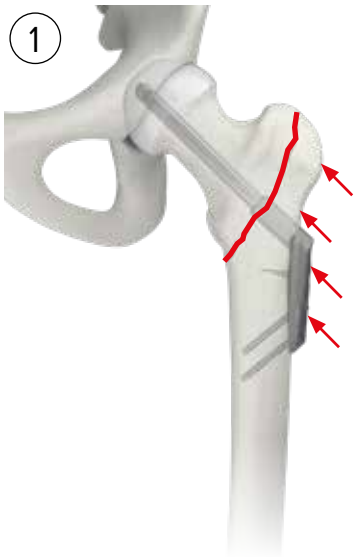
Low profile

The Lateral Support Plate has been designed to minimise soft tissue irritation and has an anatomical curvature templating the greater trochanter.

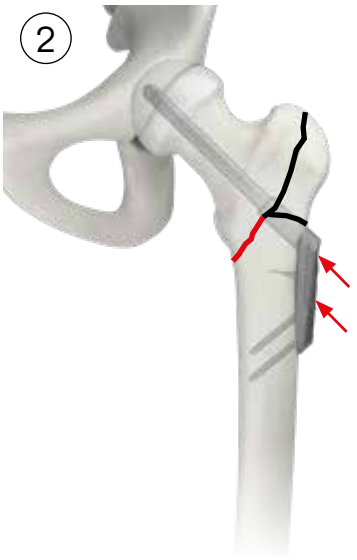
"A 7-fold increase in the risk of failure if medialization at more than one third occurred."

Parker, M. (1996)
Trochanteric hip fractures Fixation failure commoner with femoral medialization, a comparison of 101 cases
Acta Orthopaedica Scandinavica, 67 (4) p329-332
(Ref. 7)

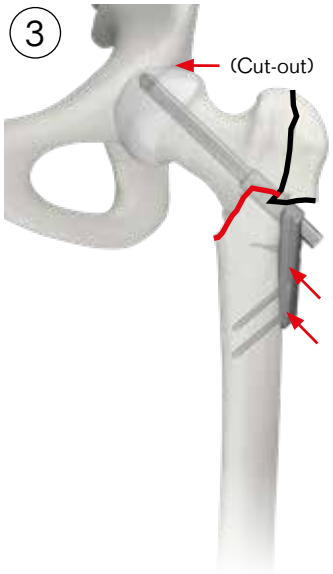
Biomechanics of the Lateral Support Plate



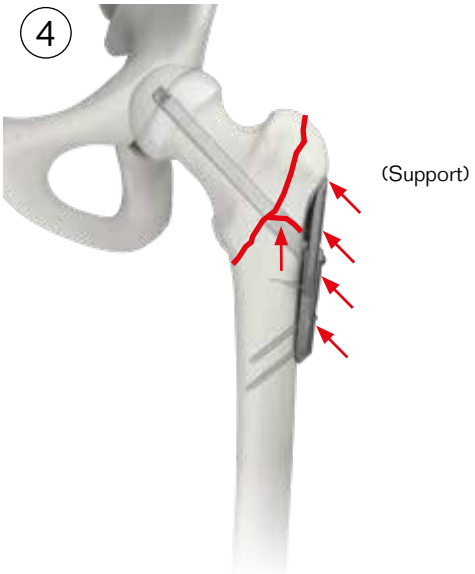
Two part stable trochanteric fracture
The fracture-line is perpendicular to the axis of the femoral neck. When the lateral cortex is intact, the distal and proximal fragment has a stable contact surface under compression. This is an ideal situation for a standard compression hip screw system.
The fixation is **LOAD-SHARING** in the axis of the femoral neck. Medial displacement is prevented.



Three part unstable trochanteric fracture
When the lateral cortex is fractured, the distal and proximal fragment has an unstable contact surface under compression. Shear forces tend to cause sliding of the fracture fragments.



When the greater trochanter is split, the implant becomes **LOAD-BEARING**. The implant is submitted to high forces and the risk of medial displacement and "cut-out" is high.



The Lateral Support Plate will support the lateral cortex under compression, recreating a stable contact surface between the distal and proximal fragment. The fixation is **LOAD-SHARING** in the axis of the femoral neck. Medial displacement is prevented.

Minimal surgical trauma

The Hansson Twin Hook and Twin Hook Locking Plate have both been designed to minimise surgical trauma and simplify the operative procedure.

Reduced operative exposure

The complete surgical procedure can be carried out through a 40-60 mm skin incision depending on the selected plate length. In comparison, the incision for a standard compression hip screw system would need to be approximately 3-4 times longer (Fig 10).

There are six reasons why the Hansson Twin Hook in combination with the Twin Hook Locking Plate can reduce the operative exposure compared to a standard compression hip screw system.

1. The Twin Hook Locking Plate can be inserted prior to the insertion of the Hansson Twin Hook.
2. The Hansson Twin Hook can be inserted through the barrel of the plate.
3. The length of the plate is reduced. The oblique placement of the Ø5.1 mm Locking Cortical Screws made it possible to reduce the length of 3-hole Twin Hook Locking Plate to 64 mm. An equivalent 4-hole standard compression hip screw plate is 96 mm in length.
4. The number of screws is reduced compared to a standard compression hip screw system. The Ø5.1 mm Locking Cortical Screws placed obliquely have 50% larger cortical contact than Ø4.5 mm Cortical Bone Screws placed at a 90° angle.
5. The distal part of the plate can be used as a periosteal elevator to lift the muscle from the bone, reducing soft tissue dissection.
6. The incision is slightly more proximal than for a standard compression hip screw system. This allows the Lateral Support Plate to be inserted without extending the skin incision much further.

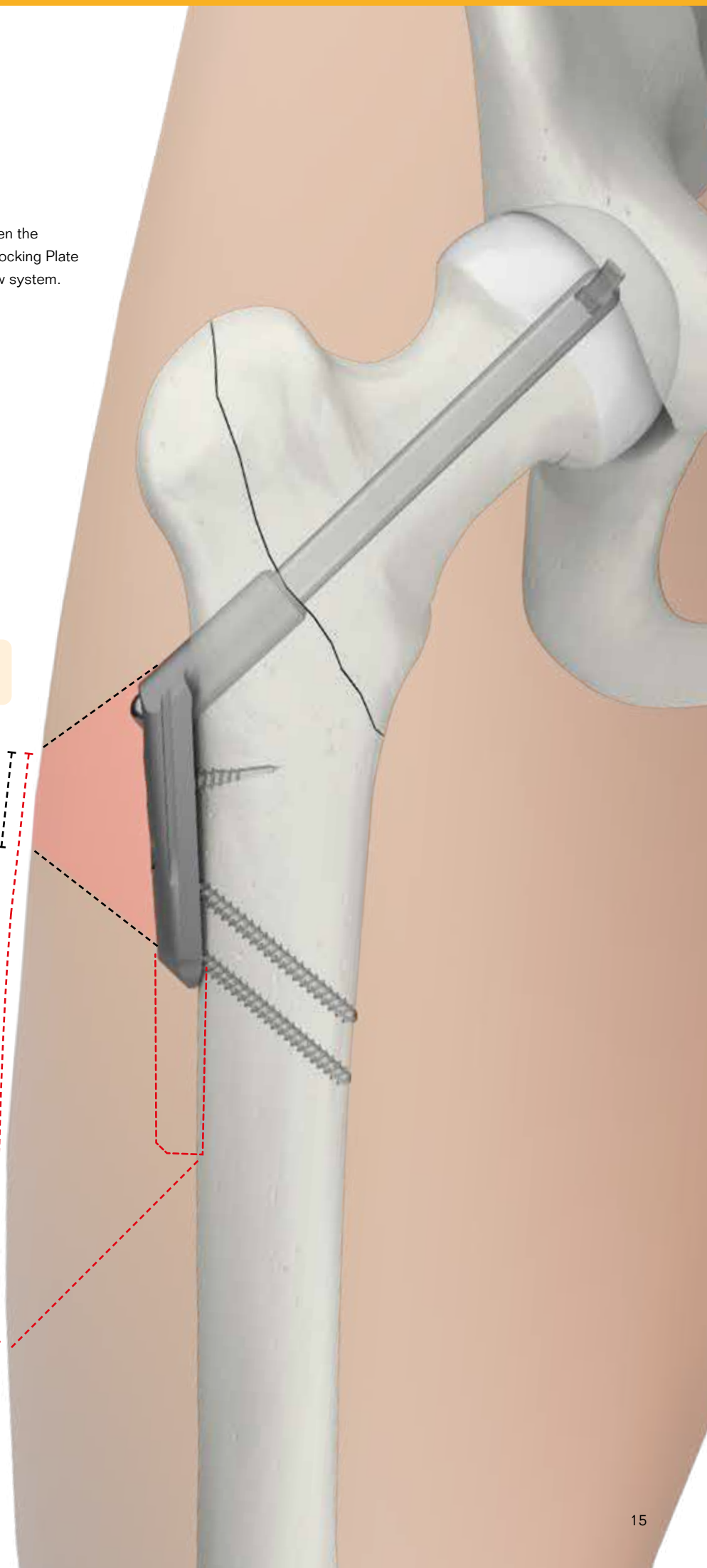
A minimal operative exposure can offer the following potential benefits (Ref. 8):

- Shorter operating time
- Reduced bleeding
- Reduced need for blood transfusion
- Reduced risk of infection
- Smaller surgical scar and increased patient satisfaction

"The Hansson Twin Hook was used in 100 trochanteric hip fractures. The mean length of skin incision was 45 mm."

Kinugasa, K. (2007)
Treatment with Hansson Twin Hook System for Trochanteric Hip fractures of the femur.
Fracture, Japanese Society for Fracture Repair, 29 (2)
(English translation is available on file at Swemac)
(Ref. 8)

Figure 10. Incision comparison between the Hansson Twin Hook with Twin Hook Locking Plate and a standard compression hip screw system.

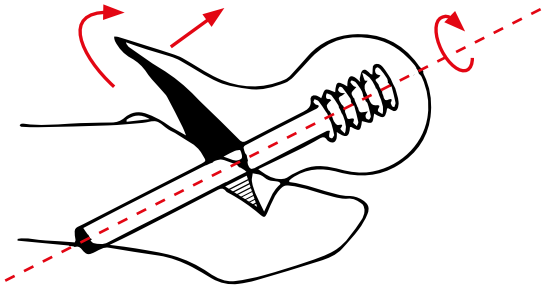


The Twin Hook Locking Plate only requires a 40-60 mm skin incision.

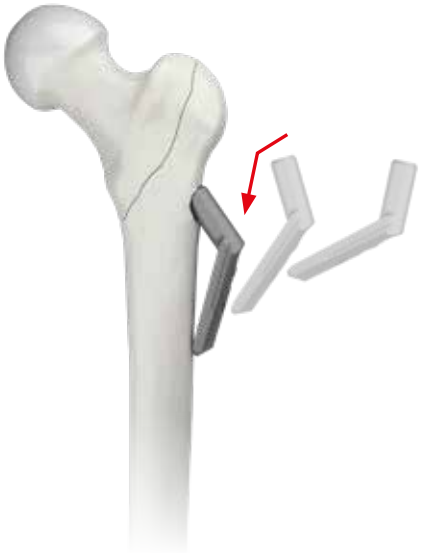
The incision for a standard compression hip screw system is approximately 3-4 times longer.
This is because the plate barrel has to be introduced over the lag screw which must be inserted first. This is in contrast to the Twin Hook Locking Plate which can be inserted before the Hansson Twin Hook.

No rotational forces during insertion

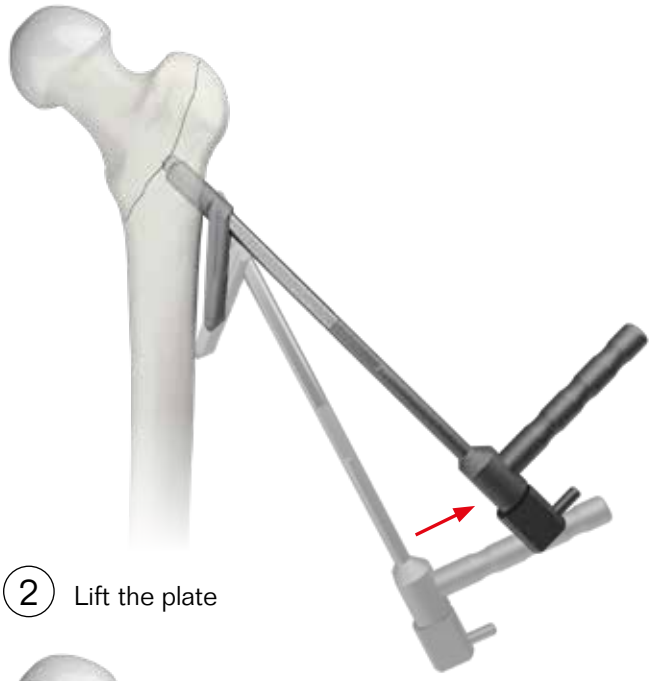
The smooth profile of the implant allows the Hansson Twin Hook to slide into place without twisting or hammering. This subsequently minimises the risk of displacement and greatly improves the chance of preserving femoral head vitality.



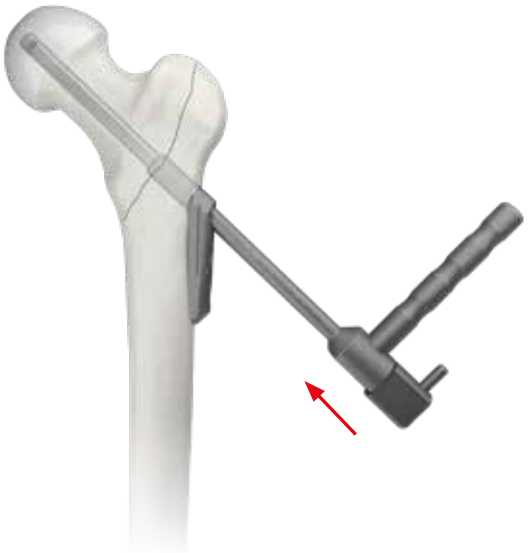
When inserting a compression hip screw there is a high risk of fracture dislocation.



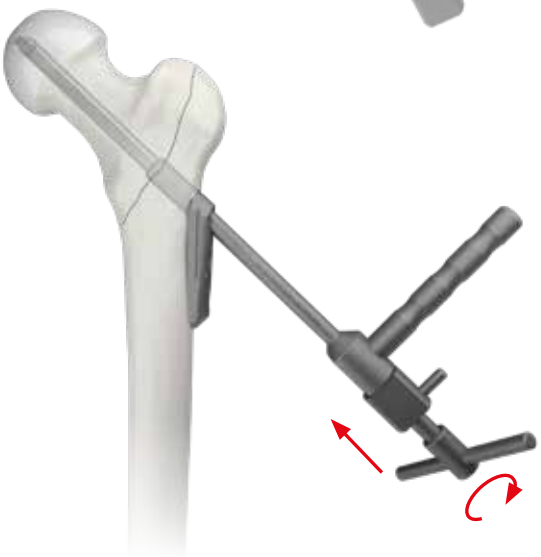
1 Introduce the plate



2 Lift the plate



3 Slide the Hansson Twin Hook into place



4 Check implant alignment and deploy the hooks

Less damage to cancellous bone

When using the Hansson Twin Hook the damage to cancellous bone is approximately 50% less compared to a compression hip screw.

The damage to cancellous bone when using the Hansson Twin Hook: 62 mm^2

The damage to cancellous bone when using a compression hip screw: 126.7 mm^2

Percutaneous removal procedure

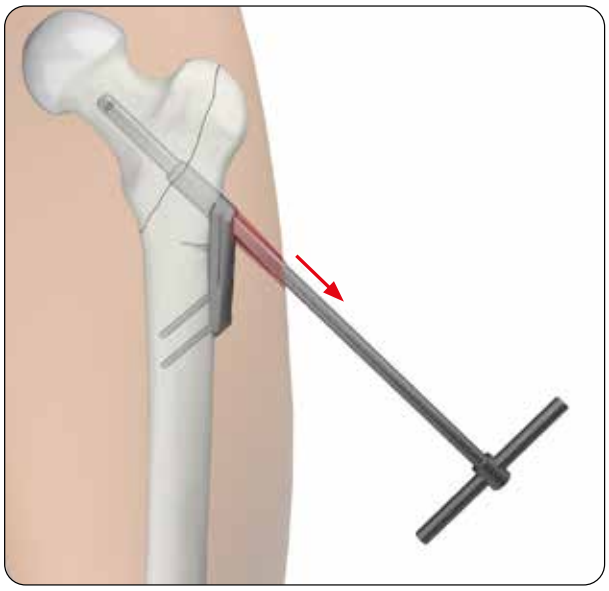


Figure 11. Should the need arise for implant removal, the Hansson Twin Hook is extracted with the Hansson Twin Hook Extractor.

The Hansson Twin Hook can be removed through a 10 mm skin incision without the need to remove the plate (Fig 11). This operation can be performed under local anaesthesia. Percutaneous removal can be advantageous in the case of femoral head penetration or if the patient suffers from soft tissue irritation after fracture healing caused by the distal end of the Hansson Twin Hook protruding into the soft tissue (Ref. 9).

In the case that a Hansson Twin Hook is removed because of femoral head penetration, it is possible to insert a new shorter Hansson Twin Hook percutaneously without removal of the plate.

Innovative instrumentation

Radiolucent Multi Angle Guide in PEEK

Correct placement of the Guide Wire is one of the most important steps in the surgical procedure. The Multi Angle Guide (Fig. 14) allows the surgeon to place the rigid 3.2 mm Guide Wire more accurately in the femoral head (Fig. 12-13). The Guide Wire can be seen under image intensification in both anteroposterior (AP) and lateral views ensuring a correct placement of the Guide Wire.

The curvature of the handle reduces the skin incision by 20 mm compared to a straight handle.

The Multi Angle Guide allows the Guide Wire to be placed at 130°, 135° and 140°.

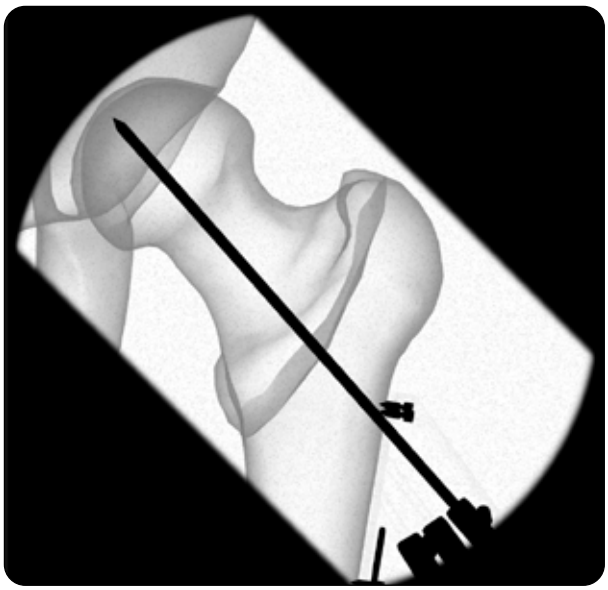


Figure 12. AP view

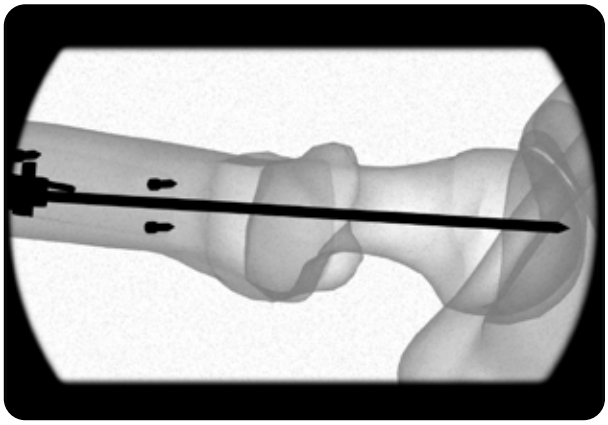


Figure 13. Lateral view

Figure 14. The Multi Angle Guide

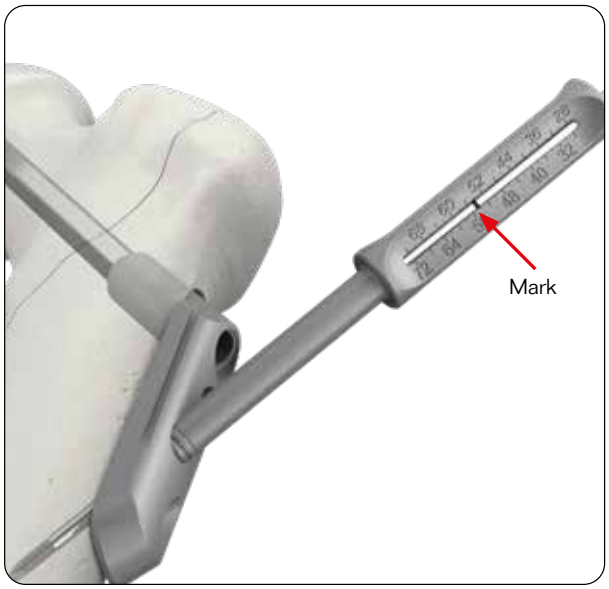


Figure 15.

Drill Sleeve with direct length measurement

The Ø4.5 mm Drill includes a mark which allows the required length of the Ø5.1 mm Locking Cortical Screws to be read directly from the Drill Sleeve scale.

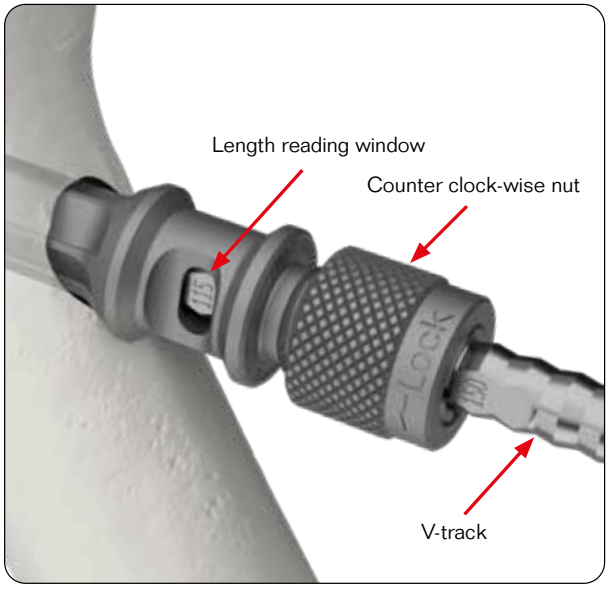


Figure 16.

Safe Step Reamer

The length reading window reduces the risk of misreading the adjusted length on the Step Reamer.

The Step Reamer is locked by turning the nut counter-clockwise. This will prevent the nut from becoming loose when the Step Reamer is turning.

The Drill of the Step Reamer has a V-track to prevent the Drill from unlocking.

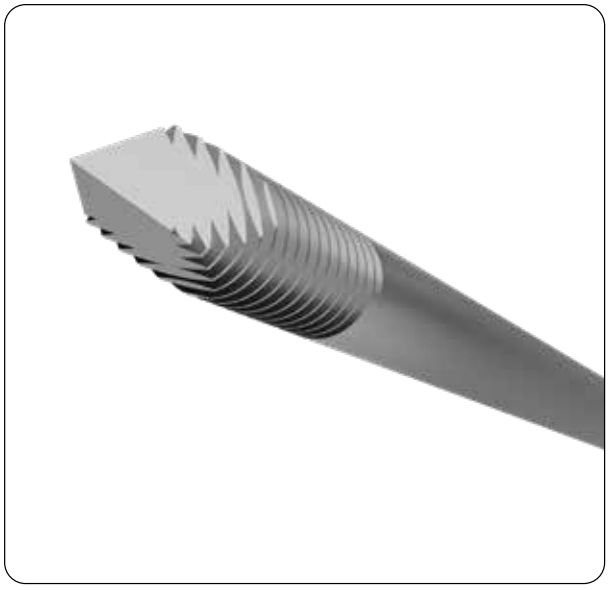


Figure 17.

Rigid Ø3.2 mm Guide Wire

The rigid Ø3.2 mm Guide Wire ensures a straight, precise and safe placement. The threaded tip guarantees a secure seating in the subcondral bone.

Most compression hip screw systems use a Ø2.5 mm Guide Wire. The Ø3.2 mm Guide Wire is 2.1 x stiffer than a Ø2.5 mm Guide Wire.

Case 1: Pauwels Type III fracture




Preoperative

Postoperative

Case 2: Basal neck fracture




Preoperative

Postoperative

Case 3: 2-part trochanteric fracture




Preoperative

Postoperative

Case 4: 4-part trochanteric fracture




Preoperative

Postoperative

Results

Extensive research has been carried out using the Hansson Twin Hook. Two Ph.D. theses and more than 60 scientific publications have been published including the two featured below.

Kinugasa, K. (2007)
Treatment with Hansson Twin Hook System for Trochanteric Hip fractures of the femur.
Fracture, Japanese Society for Fracture Repair, 29 (2)
(English translation is available on file at Swemac)
(Ref. 8)

Key points:

- Prospective study
- 100 consecutive patients with trochanteric fractures
- 65 cases of A1, 32 cases of A2 and 3 cases of A3
- Mean age of the patients was 84.6 years of age (67-102)
- 4+ months follow up period
- Average skin incision 4.5 cm
- Blood loss during surgery was 50 ml or less in 90 cases and 100 ml or less in 10 cases.
- 0 failures of fixation occurred

Olséen, P. Jonsson, B. Ceder, L. Besjakov, J. Olsson, O. Sernbo, I. & Lunsjö, K. (2008)
The Hansson Twin Hook is adequate for fixation of trochanteric fractures: 2 fixation failures in a series of 157 prospectively followed patients
Acta Orthopaedica, 79 (5) p602-608
(Ref. 6)

Key points:

- Prospective bicentric study
- 55 different surgeons performed the operations
- 157 consecutive patients with trochanteric fractures
- 83% of the fractures were unstable
- Mean age of the patients was 83 years of age (43-98)
- 2 year follow-up
- 2 failures of fixation occurred during the 2-year follow up period

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3. **Biomechanical testing of the Twin Hook Locking Plate**
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4. **Jewell, D. Gheduzzi S. Mitchell, M. & Miles, A. (2008)**
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   Injury, Int. J. Care Injured, 39 p209-212
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   Data on file at Swemac. Available on request.
6. **Olséen, P. Jonsson, B. Ceder, L. Besjakov, J. Olsson, O. Sernbo, I. & Lunsjö, K. (2008)**
   The Hansson Twin Hook is adequate for fixation of trochanteric fractures: 2 fixation failures in a series of 157 prospectively followed patients
   Acta Orthopaedica, 79 (5) p602-608
7. **Parker, M. (1996)**
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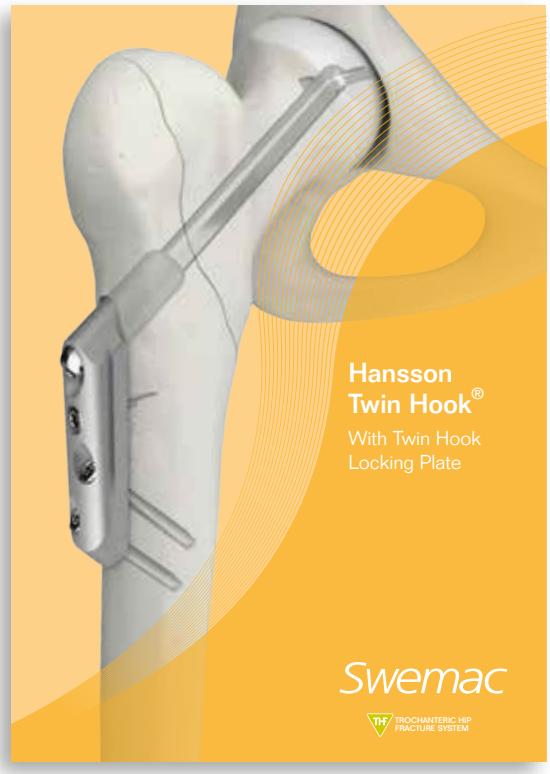
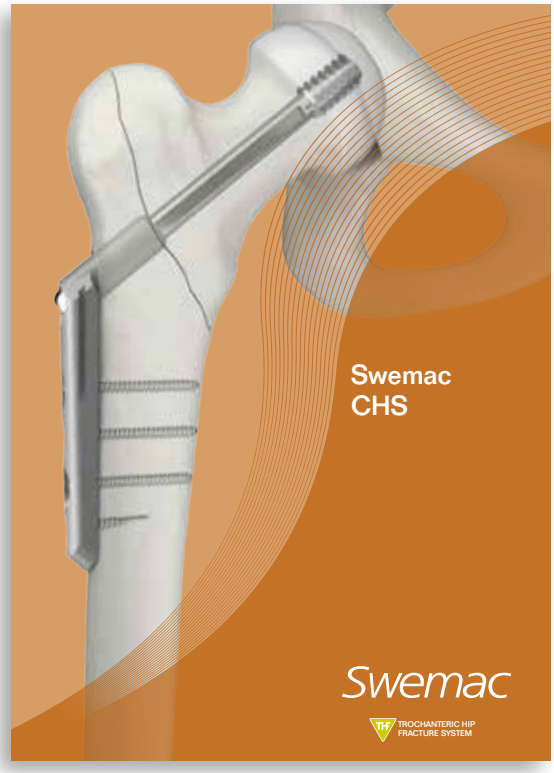
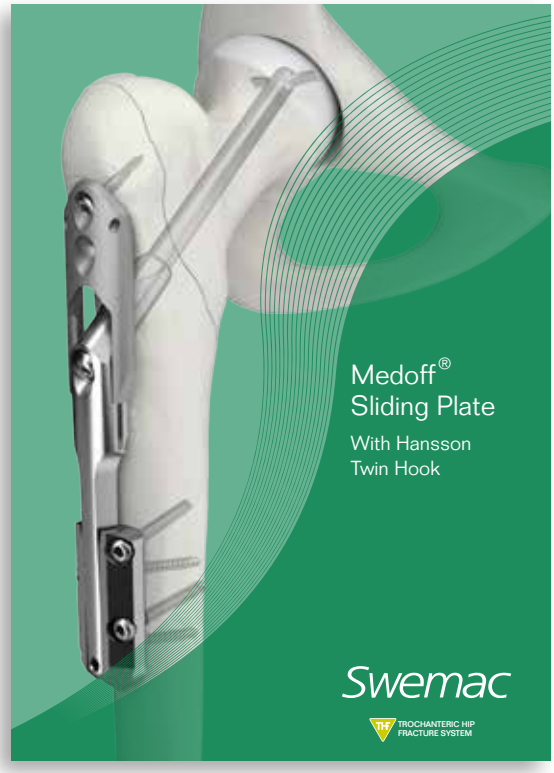
   Acta Orthopaedica Scandinavica, 67 (4) p329-332
8. **Kinugasa, K. (2007)**
   Treatment with Hansson Twin Hook System for Trochanteric Hip fractures of the femur.
   Fracture, Japanese Society for Fracture Repair, 29 (2)
   (English translation is available on file at Swemac)
9. **Paulsson, J. Stig, J. & Olsson, O. (2017)**
   Comparison and analysis of reoperations in two different treatment protocols for trochanteric hip fractures – postoperative technical complications with dynamic hip screw, intramedullary nail and Medoff sliding plate
   BMC Musculoskeletal Disorders, 18 (1) 364

The Swemac THF System

The following products are part of the Swemac Trochanteric Hip Fracture System (THF) and are implanted using the THF instrument platform.

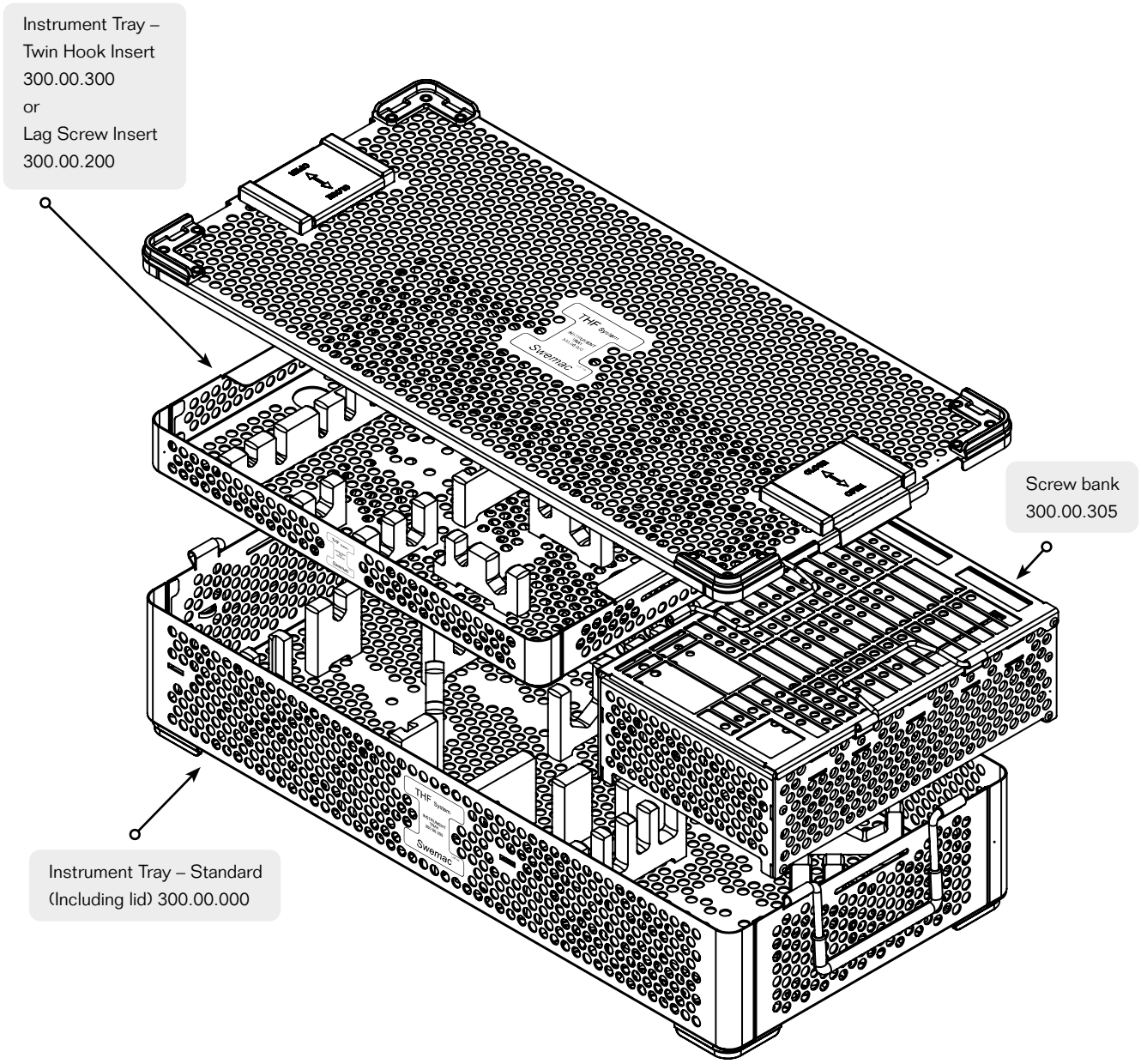






Swemac THF Instrument Platform

The Swemac THF system features a modular instrument tray which can be configured specifically to surgeon product preferences.



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TROCHANTERIC HIP FRACTURE SYSTEM

IFU

For the latest version of this Instruction For Use. Please visit:
download.swemac.com/Swemac-THF-System

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Swemac Trochanteric Hip Fracture System

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