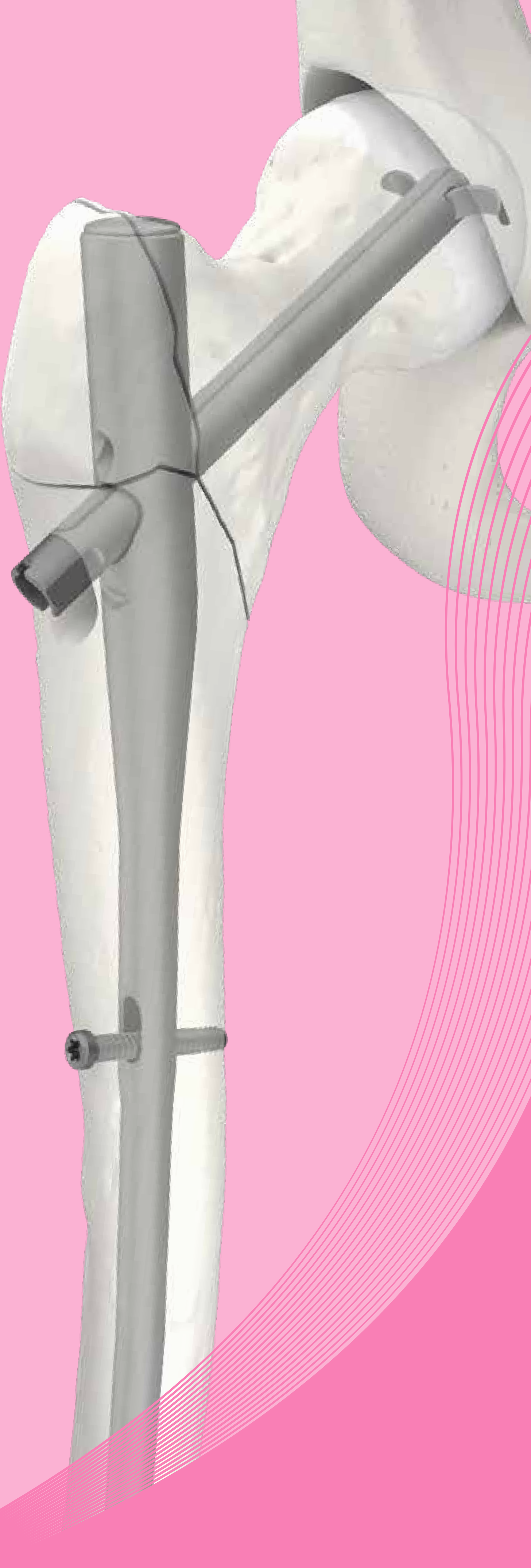


Hansson DC Nail System®

Swemac

Hansson DC Nail System®

The Hansson Dynamic Cephalomedullary (DC) Nail System is an intramedullary system designed to address trochanteric, subtrochanteric and combined trochanteric-subtrochanteric fractures. The system incorporates new technologies covered by seven patents.

The Hansson DC Nail System provides three different types of intramedullary Nails (Short, Superior Lock & Long) which can be combined with either the Hansson Twin Hook or a Lag Screw for fixation in the femoral head. Both are proven fixation methods when treating hip fractures.

The intramedullary Nails are available in different sizes to give the surgeon full flexibility in selecting the most appropriate implant combination based on the fracture pattern and patient anatomy. The instrumentation provided allows for a minimally invasive surgical procedure and the ability to incorporate axial dynamisation along the axis of the femoral shaft through the creation of a notch in the lateral femoral cortex.

Advanced Dynamisation

A new dynamic function – Advanced Dynamisation

Allows continuous compression along the axis of the femoral shaft through the creation of a notch in the lateral femoral cortex.

A new type of nail – Superior Lock Nail

Combines the surgical simplicity of a short nail with the advantages of a long nail.

Proven proximal fixation – Hansson Twin Hook®

Provides enhanced rotational stability. Requires no rotational force during insertion.

Lag Screw with a self-cutting compression thread

Designed to overcome the strength reduction in the cancellous bone caused by osteopaenia or osteoporosis.

Next generation instrumentation

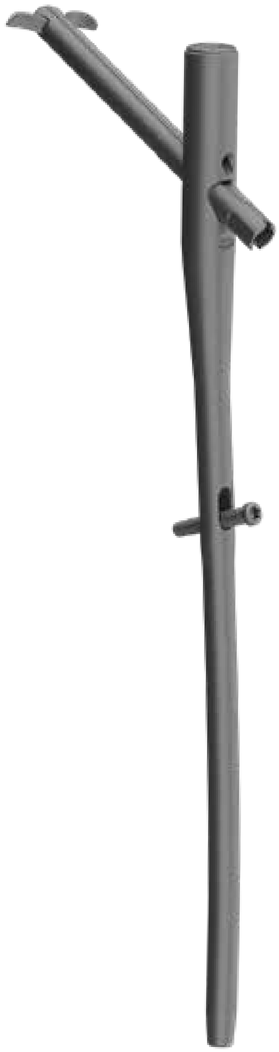
Includes innovative instrumentation designed to allow a safe and minimally invasive procedure with reduced soft tissue irritation.

Product overview

Hansson DC Nails

Short Nail

- Proximal diameter 15.9 mm
- Distal diameter 11 mm
- One length (180 mm)
- CCD angle 125° (*)
- Medial/Lateral (ML) bend 4°
- Universal left and right use



Superior Lock (SL) Nail

- Proximal diameter 15.9 mm
- Distal diameter 10 mm (tapers to 9.5 mm distal to the distal locking hole)
- Lengths 240-480 mm in 20 mm increments (left & right)
- CCD angle 125° (*)
- Medial/Lateral (ML) bend 4°
- Radius of curvature (ROC) 1250 mm
- 3° bend at distal tip
- Distal locking hole is located at the same level as the short Nail and is locked using the Targeting Device

Long Nail

- Proximal diameter 15.9 mm
- Distal diameter 11 mm
- Lengths 240-480 mm in 20 mm increments (left & right)
- CCD angle 125° (*)
- Medial/Lateral (ML) bend 4°
- Radius of curvature (ROC) 1450 mm
- 3° bend at distal tip
- Anteversion 15°

** At market introduction all Nails are only available with a CCD angle of 125°. However the instrumentation is designed for the future addition of 120° and 130° Nails.*

End Cap

End Caps are provided in four different sizes: +0 mm, +5 mm, +10 mm and +15 mm.

Pre-loaded Set Screw

All Hansson DC Nails are supplied with the Set Screw preassembled. The Nail and Set Screw are offered as one unit under one article number in sterile packaging,

Anti Rotation Wire hole

All Hansson DC Nails have an Anti Rotation Wire hole which allows the dedicated Anti Rotation Wire provided with the system to stabilise the femoral head when drilling and inserting the Lag Screw.

Locking Screws

Self-cutting and fully threaded Ø5 mm Locking Screws are offered in 2 mm increments from 26 to 70 mm and in 5 mm increments from 75 to 125 mm.

Hansson Twin Hook®

The Hansson Twin Hook has a diameter of 10.75 mm and offered in lengths from 75 to 130 mm in 5 mm increments.

Lag Screw

The Lag Screw has a diameter of 10.75 mm and offered in lengths from 70 to 130 mm in 5 mm increments.

A new dynamic function

Advanced Dynamisation

The Rate of Fixation Failure when using intramedullary nails in AO / OTA 31-A1 / A2 / A3 fractures is approximately 6-8%. 80% of these are caused by 'cut-out'. Other causes include non-union, femoral shaft fracture, implant fatigue, severe collapse and shortening. (Ref. 1)

Most of these complications are a result of the implant not being able to transfer the load to the bone. (Ref. 2)

Why are intramedullary nails unable to transfer load to the bone using the standard technique?

Dynamisation along the axis of the femoral neck (Fig.1:A) is prevented because the proximal part of the Nail (at the entry point) and the proximal fixation (Hansson Twin Hook / Lag Screw) are both situated in the proximal fracture fragment. (Ref. 3)

The distal end of the Hansson Twin Hook or Lag Screw is blocking dynamisation in the axis of the femoral shaft (Fig.1:B) even when the distal locking screw is placed in dynamic mode.

Advanced Dynamisation can transfer the load to the bone

Using the standard techniques, dynamisation in the red zone (see Fig.1) is not possible. However, all the Nails in the Hansson DC Nail System have the capability of providing axial dynamisation along the axis of the femoral shaft by creating a notch immediately below the entry hole for the Hansson Twin Hook or Lag Screw. This notch, created using dedicated instrumentation, allows the shaft fragment to slide cranially and compress a fracture in the red zone.

Continuous compression of a fracture permits load-sharing and may reduce the risk of fixation failure such as cut-out of the femoral head, non-union, femoral shaft fracture and implant fatique. (Ref. 4-13)

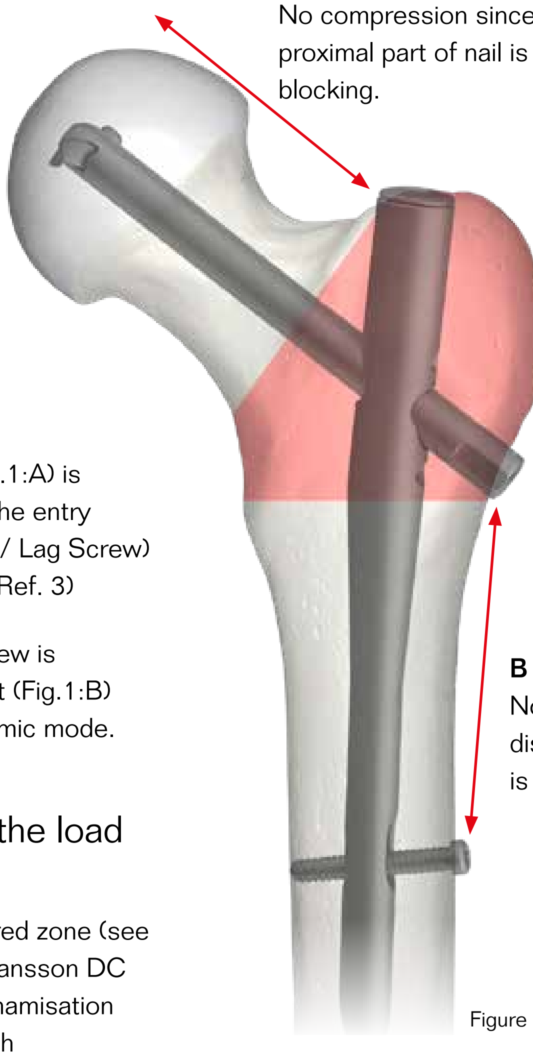
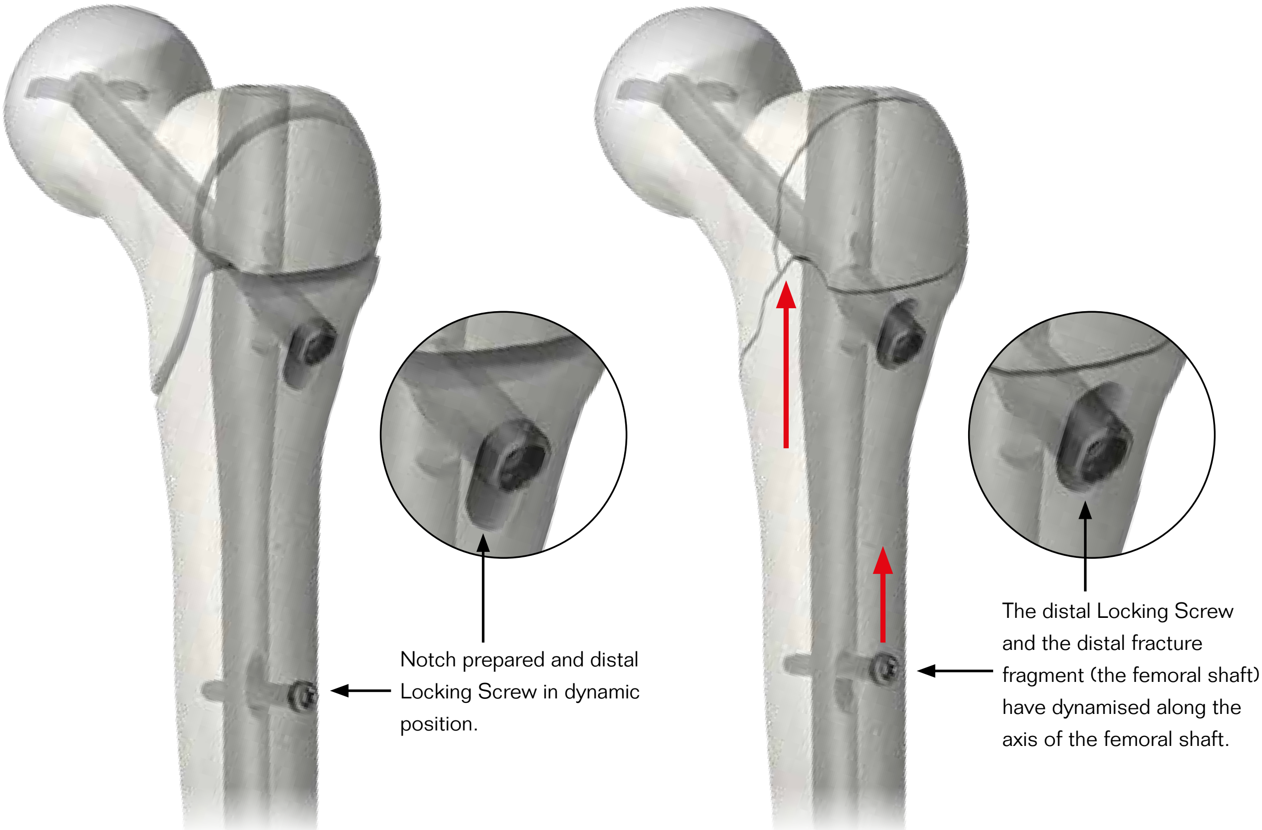


Figure 1

Creating the notch

In order for Advanced Dynamisation function to be achieved, a notch is prepared in the lateral femoral cortex immediately below the proximal fixation. Dedicated instrumentation to perform this extra step is provided in the Hansson DC Nail System.

Figure 2: A notch is created using dedicated instruments through the Targeting Device, without damaging the nail. X-ray images provided by Dr. Hamada, Kyushu Chuo Hospital, Japan.



Peri-operative:
Lateral cortex prepared with notch.

Post-operative:
Dynamisation of the fracture has occured after loading.

A new type of Nail

The patented Superior Lock (SL) Nail

The SL Nail has been developed to reduce the risk of peri-implant fractures, swing motion and to offer minimal surgical trauma.

Peri-implant fractures occur in 1.7% of patients when using a short nail for AO/OTA 31-A1 and A2 fractures (Ref. 14). This is due to an increased stress at the tip of the short nail compared to a long nail (Ref. 15-16).

Peri-implant fractures and swing motions have increased the use of long nails in trochanteric hip fractures.

The distal tip of the Short Nail is unable to prevent;

- a stress riser at the tip of the nail (Fig. 3).
- varus angulation if the intramedullary canal is too wide and the nail can shift on the distal locking screw (Fig. 4).
- sagittal swing motion in unstable trochanteric hip fractures with a large posterior lateral fragment* which allows the short nail to swing around the distal locking screw (resulting in collapse and shortening) (Fig. 5).

Figure 3: Stress risers at the tip of the Short Nail

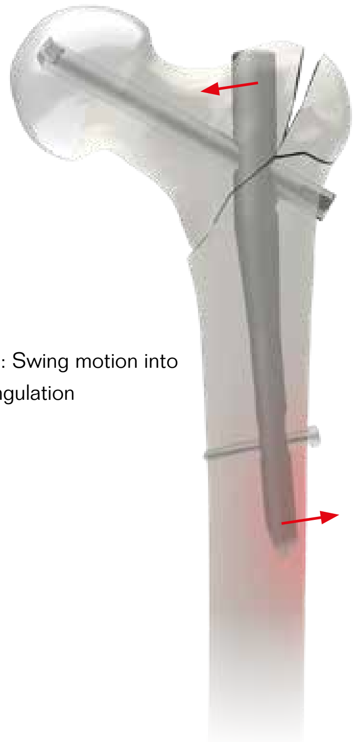


Figure 4: Swing motion into varus angulation

Reduced risk of peri-implant fractures and swing motion

In terms of stability, the SL Nail is comparable to a long nail (the SL Nail is a short nail with a tail). A long nail splints the entire length of the femoral shaft. The SL Nail combines the surgical simplicity of a short nail with the advantages of a long nail.

The length of the SL Nail provides a counterforce against swing motion similar to a long nail. The SL Nail is inserted to the same depth as a long nail and has contact with the cortical bone of the intramedullary canal in several places (Ref. 14).

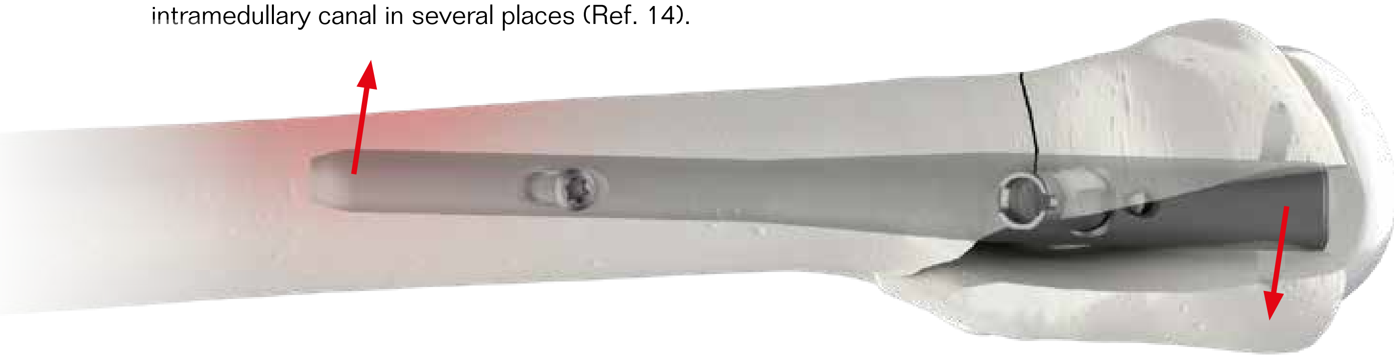
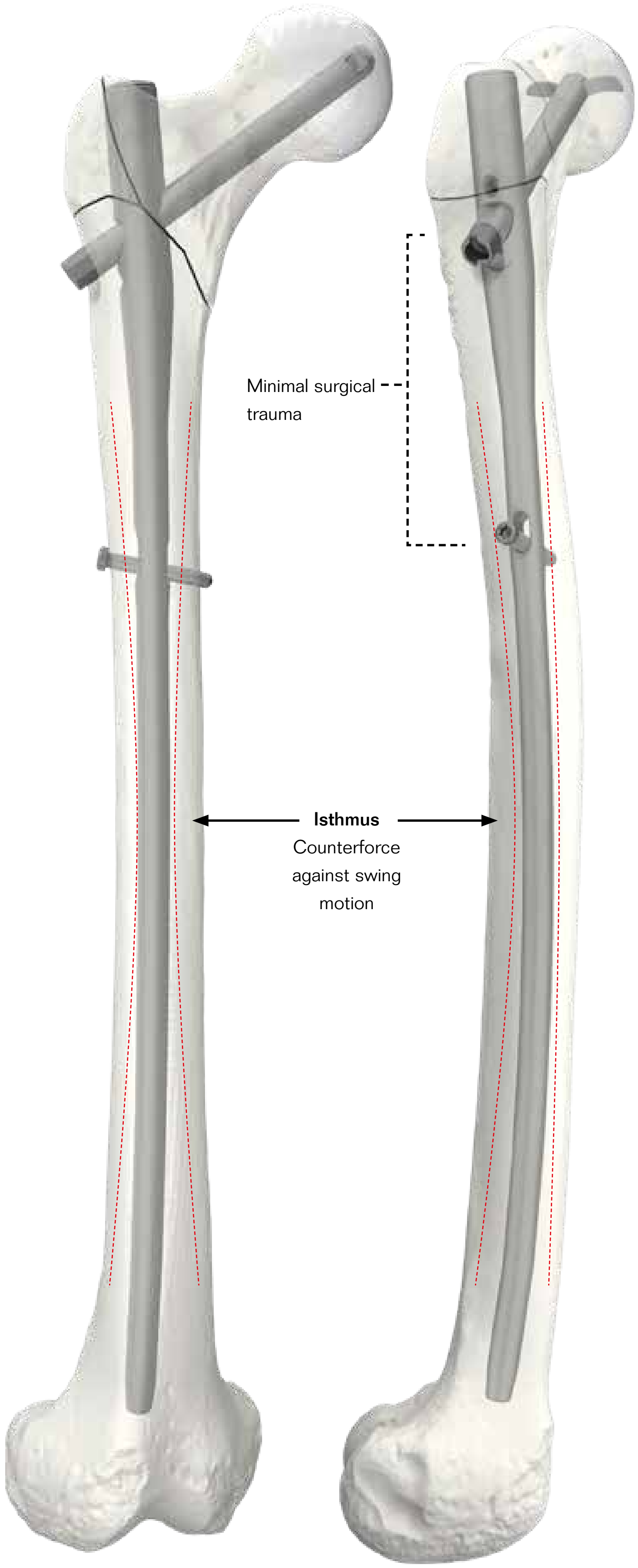


Figure 5: Sagittal swing motion

** Nakano (3D-CT) Classification 3B and 4 with Ikuta Classification Subtype P.*



Minimal surgical trauma

In terms of surgical trauma, the SL Nail is a effectively acting like a short nail and the distal screw can be inserted through the Targeting Device. A short nail offers minimal surgical trauma compared to a long nail (Ref. 17-23) and can;

- minimise the use of flexible reamers which subsequently reduces the risk of systemic inflammatory response syndrome.
- reduce surgical time by approximately 15-20 minutes.
- reduce fluoroscopy time.
- reduce the risk of infection.
- reduce blood loss and the need for blood transfusion.
- reduce postoperative pain.
- allow for early mobilisation.

Precise anatomical fit

All SL Nails have a RoC of 1250 mm (Long Nails 1450 mm) between the distal locking hole and 40 mm from their tip, where they bend 3° to avoid contact with the anterior cortex. This 40 mm section of the nail is the same on all nail lengths which, if included in the calculation of the RoC, gives a unique true RoC for each individual SL Nail length. This is designed to both improve the anatomical fit (Fig. 6) and ease insertion (Ref. 24-25).

Figure 6: The SL Nail is centered in the femoral shaft and the tip is angled away from the anterior cortex. CT Scan provided by Dr. Oroku Junpei, Kaisei General Hospital, Japan.

Proven proximal fixation

Hansson Twin Hook®

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.

Figure 7. The hooks will be in contact with both cancellous and subchondral bone in the femoral head.

Enhanced rotational stability

The Hansson Twin Hook provides 100-200% more rotational resistance than a lag screw (Ref. 26).

Subchondral bone contact

The hooks are positioned anteriorly and posteriorly in the femoral head and the total span of the two is 28-32 mm. The hooks achieve purchase in both the cancellous and subchondral cortical bone and thus provide excellent support against varus angulation and rotation around the femoral neck and head axis (Fig. 7).

CW = Clockwise
CCW = Counter-clockwise (anti-clockwise)

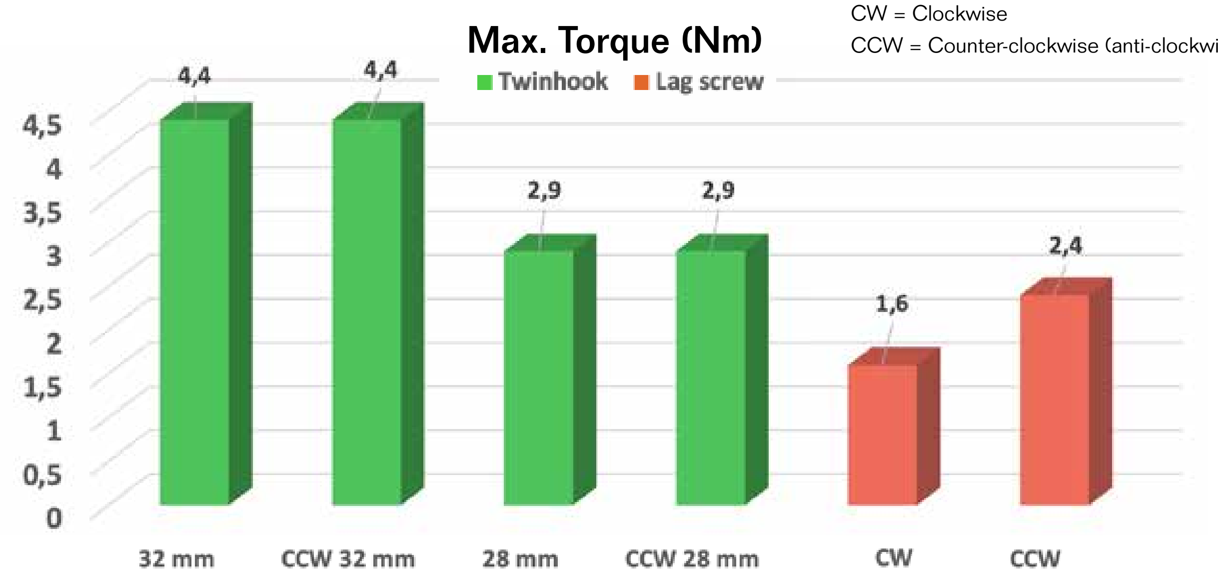


Figure 8: The graph is showing the difference in torque deformation between the Hansson Twin Hook and a lag screw. The test was executed by an ISO 17025 certified independent test laboratory, ENDOLAB GmbH. (Ref. 26)

Reduced risk of femoral head penetration

Figure 9.

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 (Fig. 9). This makes the Hansson Twin Hook a more forgiving and durable implant compared to a compression hip screw (Ref. 27-28).

131% larger frontal area

The frontal area of the Hansson Twin Hook is 131% larger (Fig. 10-11) than a compression hip screw providing an increased surface area to prevent penetration or loosening (Ref. 29-30).

Figure 10. The frontal area of the Hansson Twin Hook is 210 mm^2.

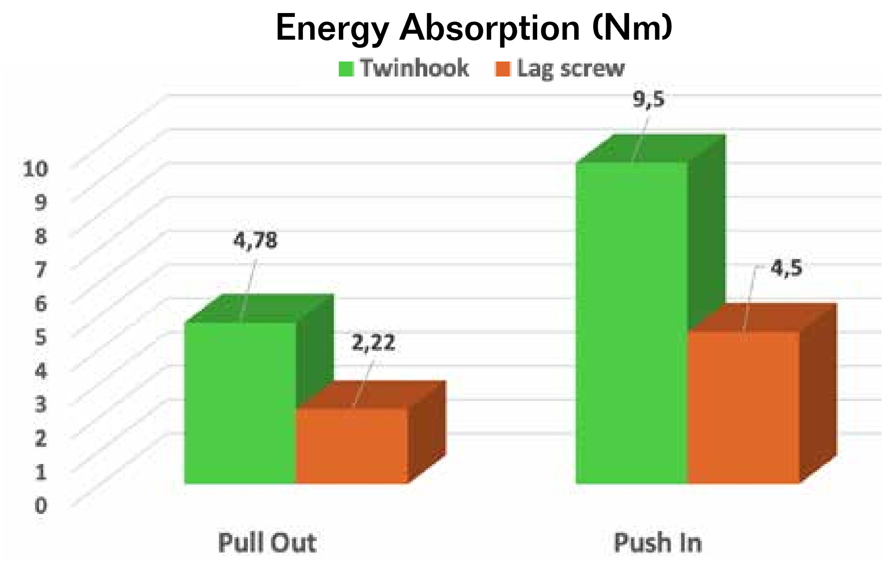


Figure 12. The graph is showing the difference in energy absorption between the Hansson Twin Hook and a lag screw. The test was executed by an ISO 17025 certified independent test laboratory, ENDOLAB GmbH. (Ref. 30)

Figure 11. The frontal area of a compression hip screw is 91 mm^2.

No rotational forces during insertion

When inserting a compression hip screw there is a high risk of fracture dislocation (Fig. 13).

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

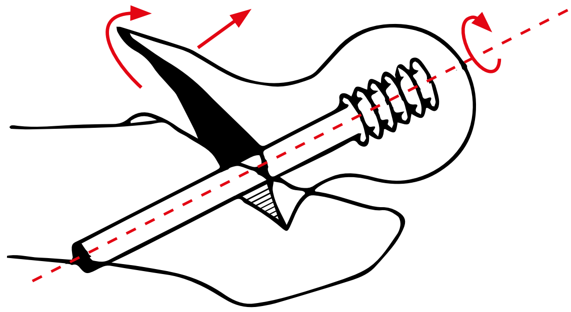
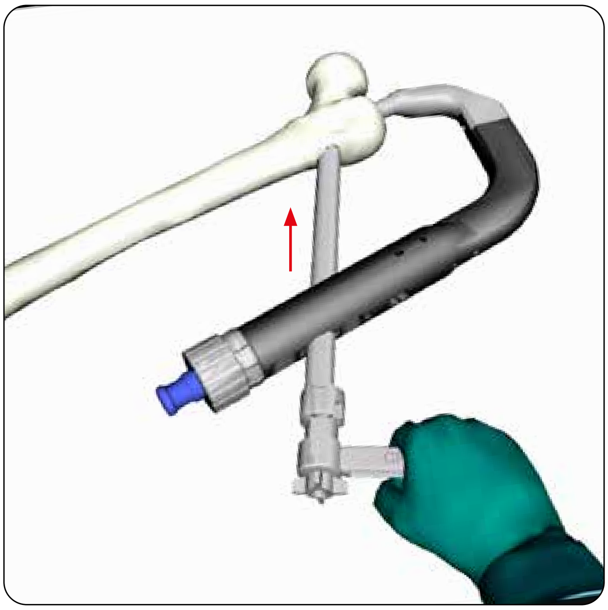
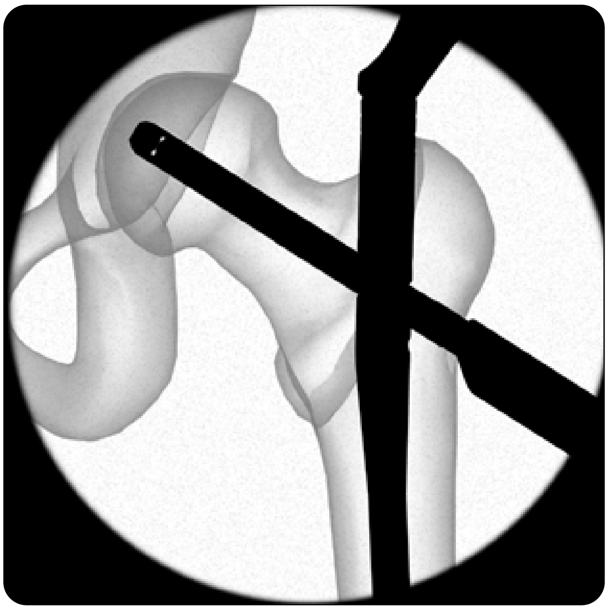


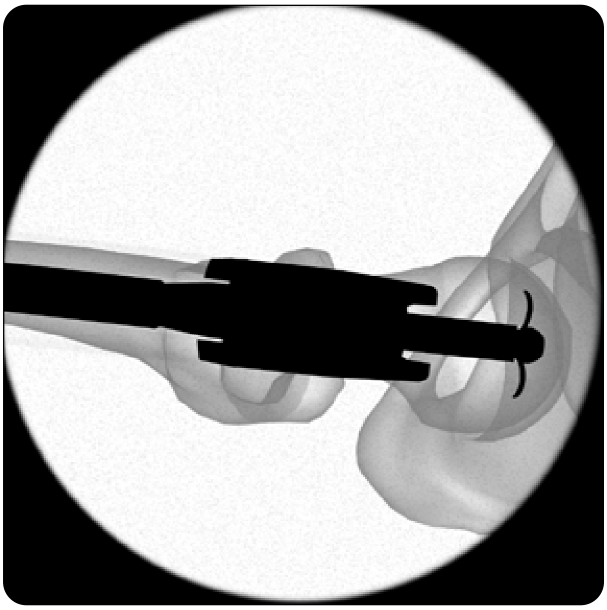
Figure 13.

The Hansson Twin Hook slides into position without twisting or hammering.





The hooks are deployed without any external forces.



Percutaneous removal procedure

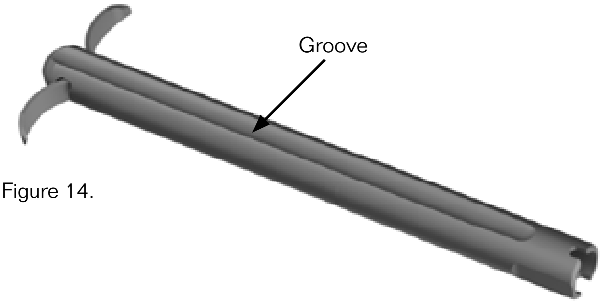
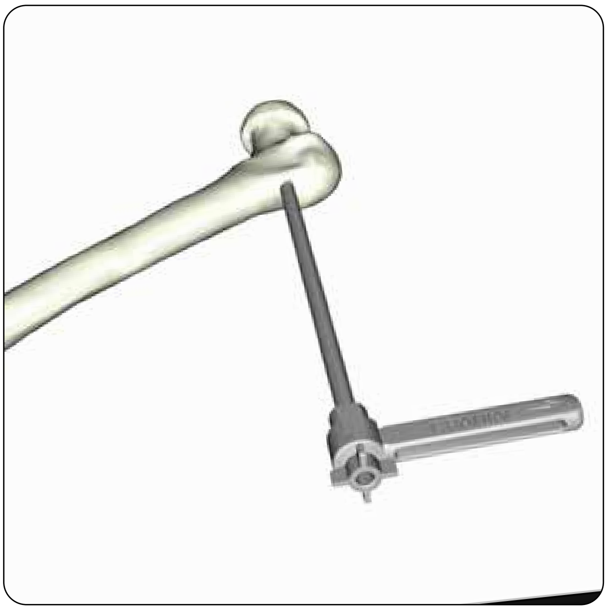
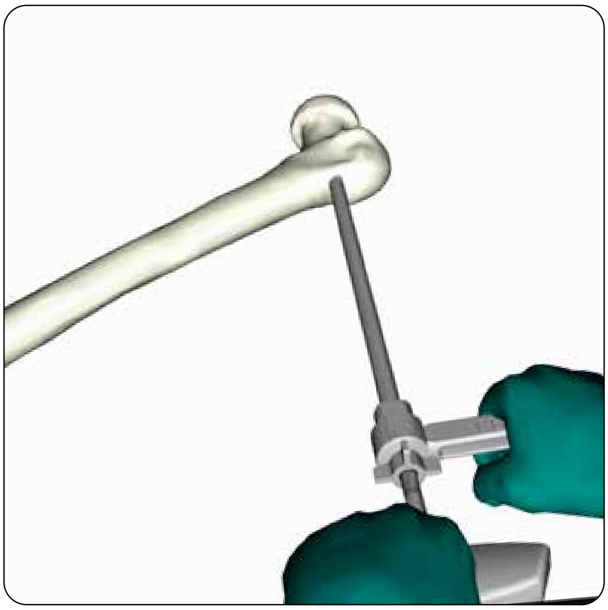


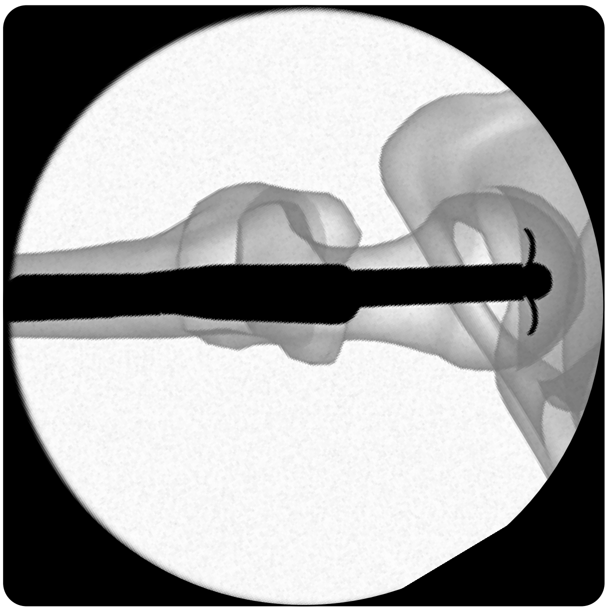
Figure 14.

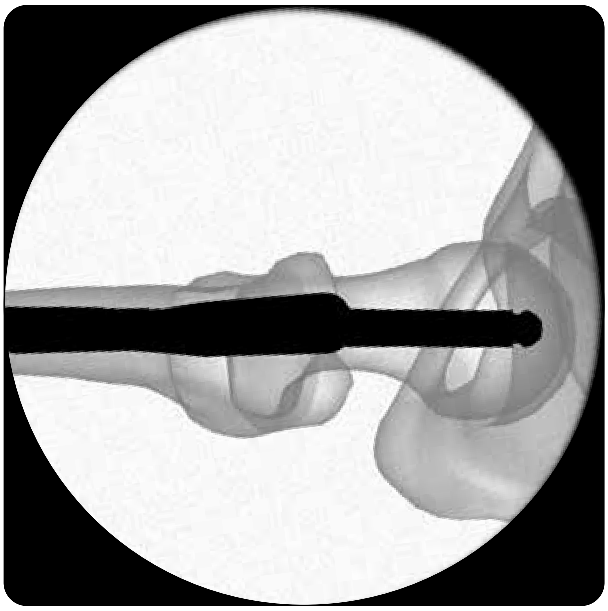
The Hansson Twin Hook can be removed using the introducer assembly through a 10 mm skin incision through the scar where the implant was previously introduced. There is no need to unscrew the set screw in order to remove the Hansson Twin Hook because the groove on the implant continues all the way to the tip (Fig. 14).

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.



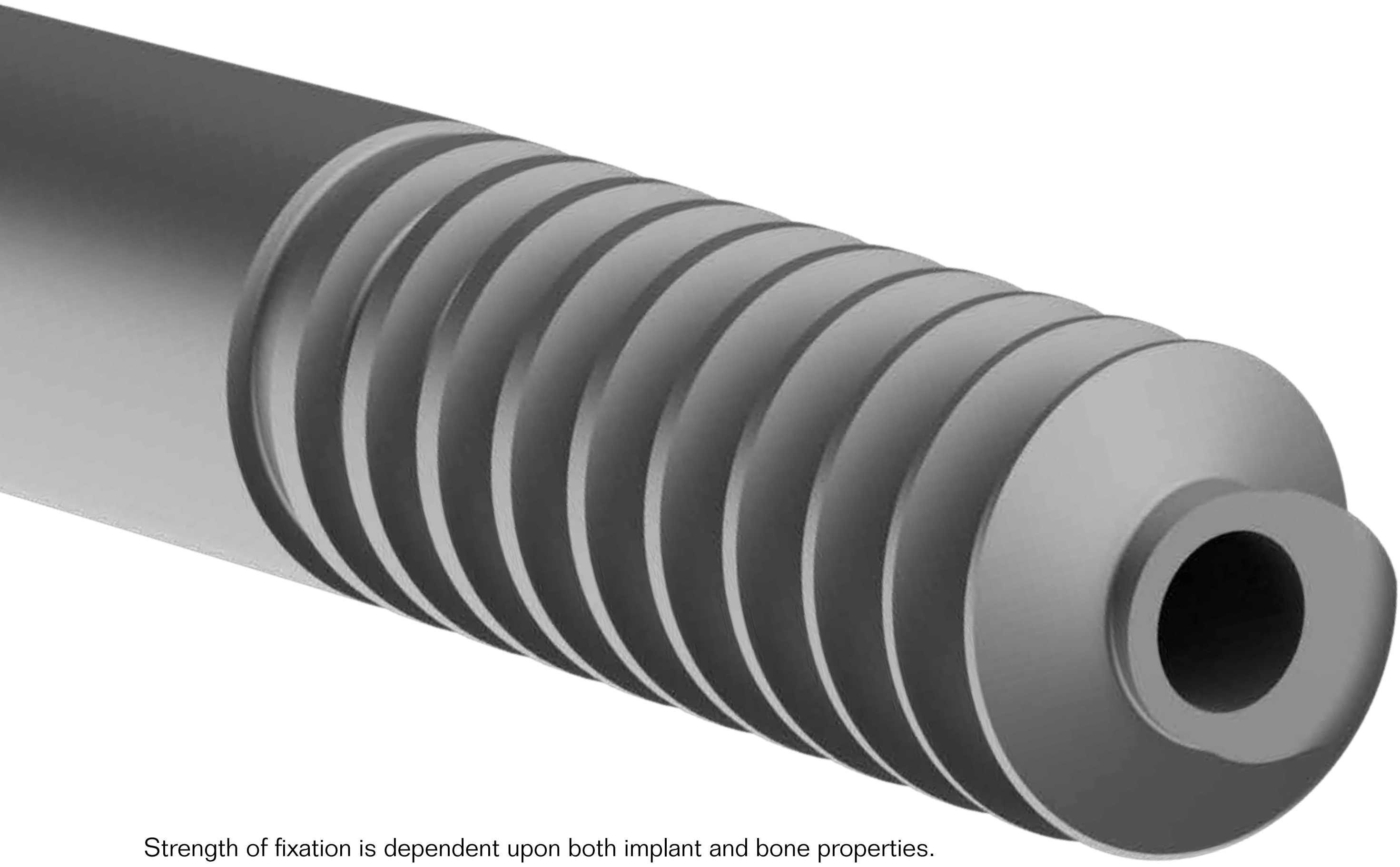






Hansson DC Nail Lag Screw

Fixation failure is the most common complication in the treatment of hip fractures. The patented Hansson DC Nail Lag Screw has been developed to optimise fixation in the femoral head, even in osteoporotic bone. This has been achieved by increasing the surface area of the thread and designing the implant to compress the cancellous bone in both the axial and radial directions during insertion (Ref. 31).



Strength of fixation is dependent upon both implant and bone properties. If too much bone trabeculae is removed, the interaction between bone and implant may be impaired (Ref. 32).

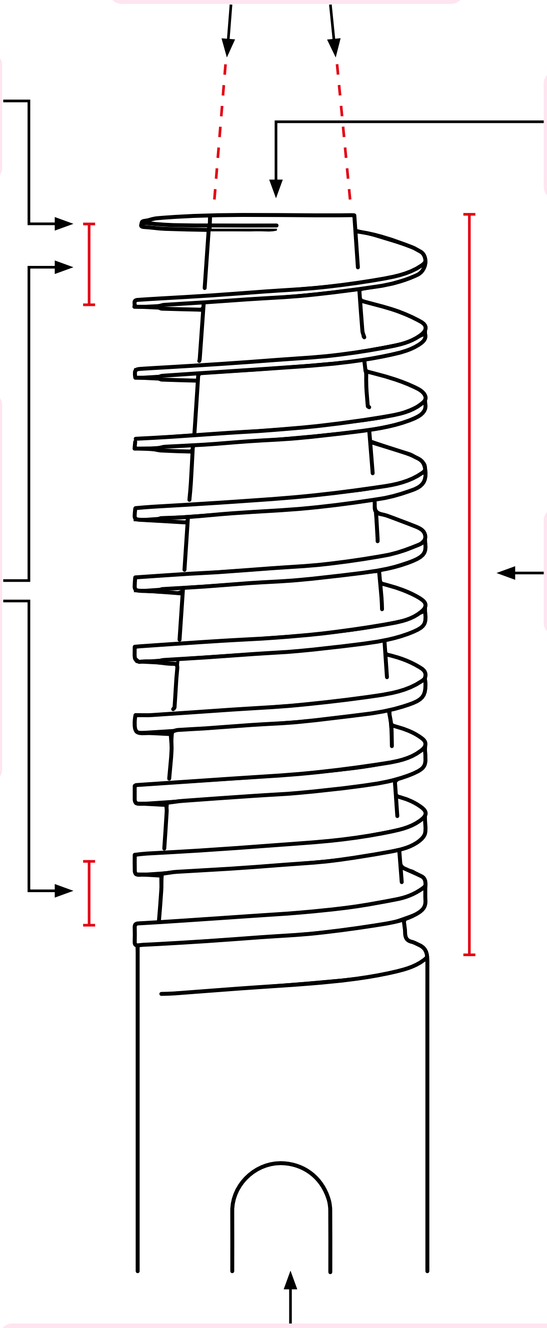
The special design of the conical Cannulated Drill and the Lag Screw have been developed to minimise the disruption of the bone trabeculae and thus improve the fixation.

The Hansson DC Nail Lag Screw has six unique features designed to improve the holding power in the femoral head.

The **conical core** increases the total surface area of the thread and compresses the bone in a radial direction.

The **knife-edged self-cutting** leading thread is designed to preserve bone.

The **blunt tip** lowers the risk of femoral head penetration.



The **compression thread** is created by having a gradually decreasing distance between the threads starting from the tip. The bone is compressed in an axial direction and prevents forward rotation when reaching its final position.

All the threads have a **consistent outer diameter** to increase the surface area.

The Set Screw can be introduced into **the groove** preventing the Lag Screw from rotating. This subsequently reduces the risks of femoral head rotation.

Other features and benefits

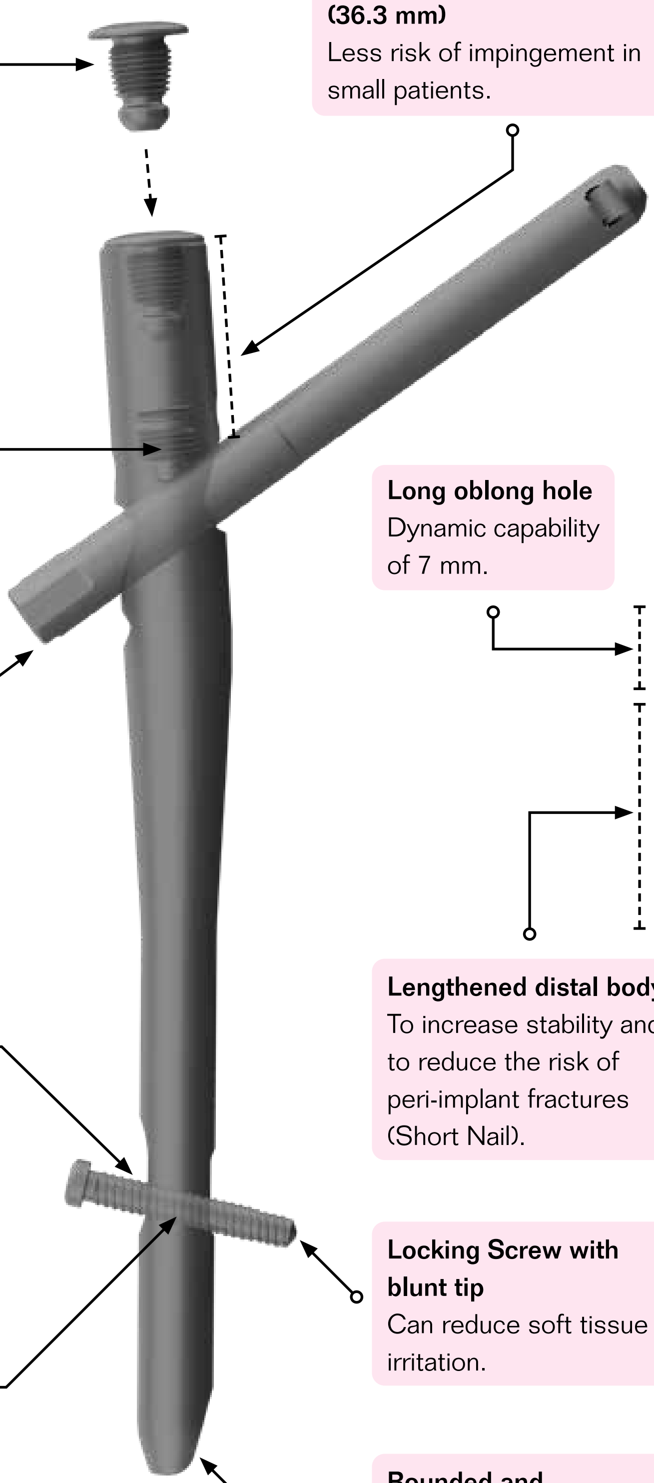
End Cap with bulb design and conical thread
Allows the surgeon to introduce the End Cap from an angle without cross threading.

Preassembled Set Screw
Reduces both surgical time and the risk of losing the Set Screw.

Rounded edges on Hansson Twin Hook and Lag Screw
Can reduce soft tissue irritation.

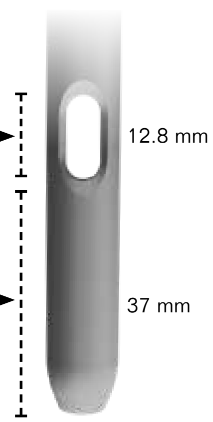
16.5 degree Locking Screw angle
Cortical screw holes on different levels can reduce the risk of peri-implant fractures and increase cortical bone fixation.

Locking Screw with a double lead helix thread
Twice as fast to insert and substantially stronger compared to a screw with a single lead thread.



Shortened proximal body (36.3 mm)
Less risk of impingement in small patients.

Long oblong hole
Dynamic capability of 7 mm.



Lengthened distal body
To increase stability and to reduce the risk of peri-implant fractures (Short Nail).

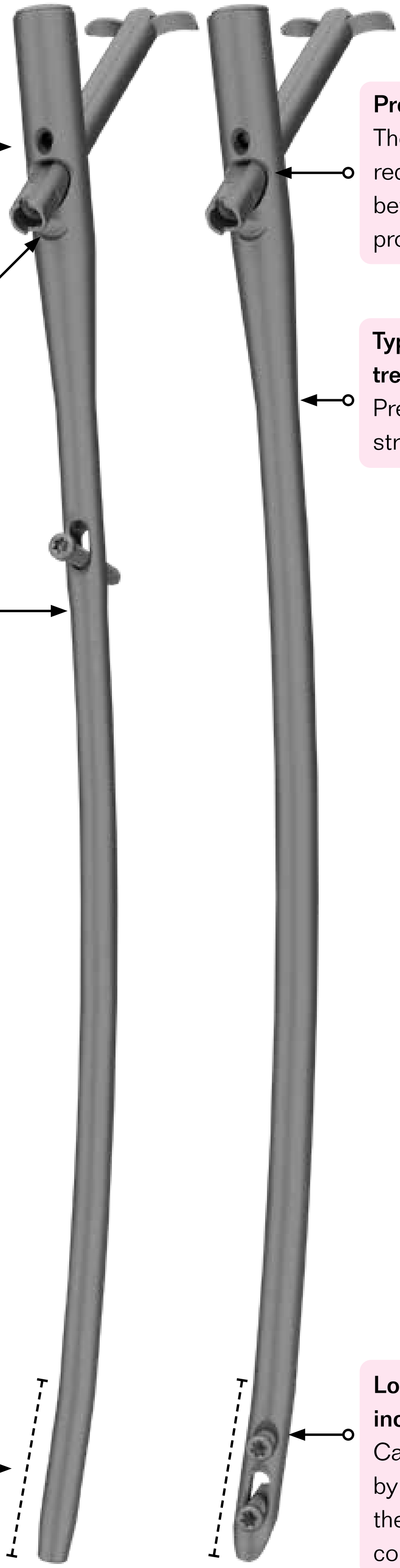
Locking Screw with blunt tip
Can reduce soft tissue irritation.

Rounded and chamfered distal nail tip
For easier nail insertion.

Anti Rotation Wire hole for Lag Screw
By inserting an Anti Rotation Wire through the nail, rotation of the femoral head fragment can be prevented when introducing a Lag Screw.

Mechanical stop for Milling Cutter
The mechanical stop ensures that the Nail is not damaged during the milling procedure.

The SL Nail has a 9.5 mm diameter from below the locking screw hole
Can reduce the need to use flexible reamers.



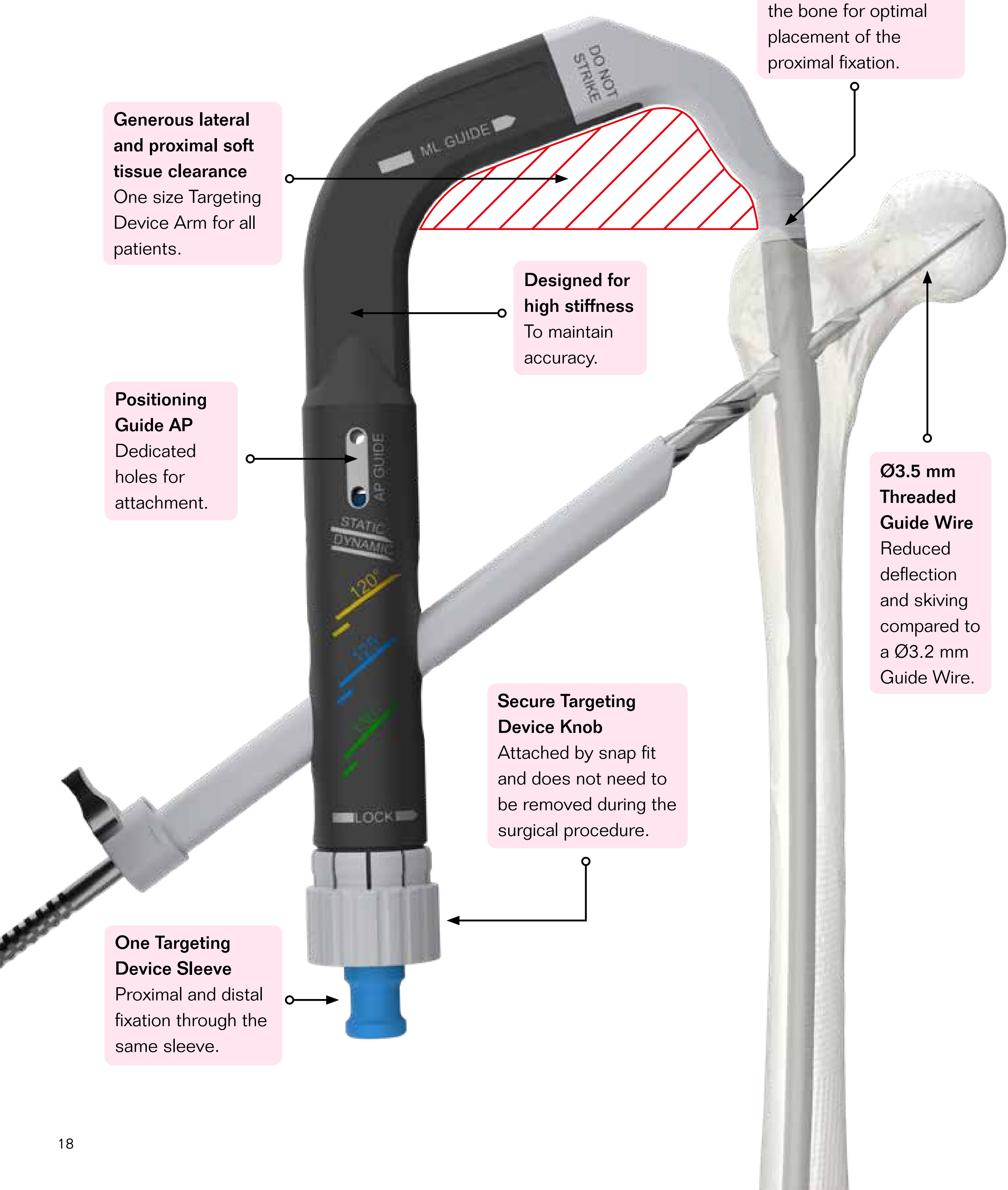
Proximal fixation hole
The unique wave design will reduce stress at the junction between the nail and the proximal fixation.

Type II anodized surface treatment
Prevents ongrowth of bone and strengthens the nail.

3 degree bend at the distal tip of the SL Nail
Can reduce the risk of nail penetration by moving the distal nail tip towards the centre of the intramedullary canal.

Locking Screws in 2 mm increments
Can reduce soft tissue irritation by optimising the length of the screw outside the medial cortex.

Next generation instrumentation



Slim post
The post has the same width as the Nail which permits a small incision and the ability to enter the bone for optimal placement of the proximal fixation.

Generous lateral and proximal soft tissue clearance
One size Targeting Device Arm for all patients.

Designed for high stiffness
To maintain accuracy.

Positioning Guide AP
Dedicated holes for attachment.

Ø3.5 mm Threaded Guide Wire
Reduced deflection and skiving compared to a Ø3.2 mm Guide Wire.

Secure Targeting Device Knob
Attached by snap fit and does not need to be removed during the surgical procedure.

One Targeting Device Sleeve
Proximal and distal fixation through the same sleeve.

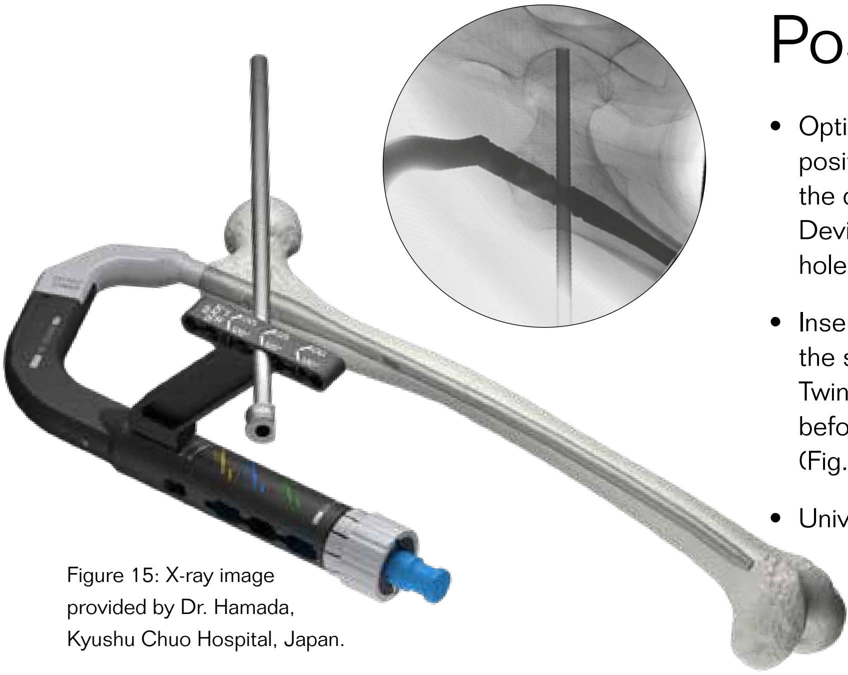


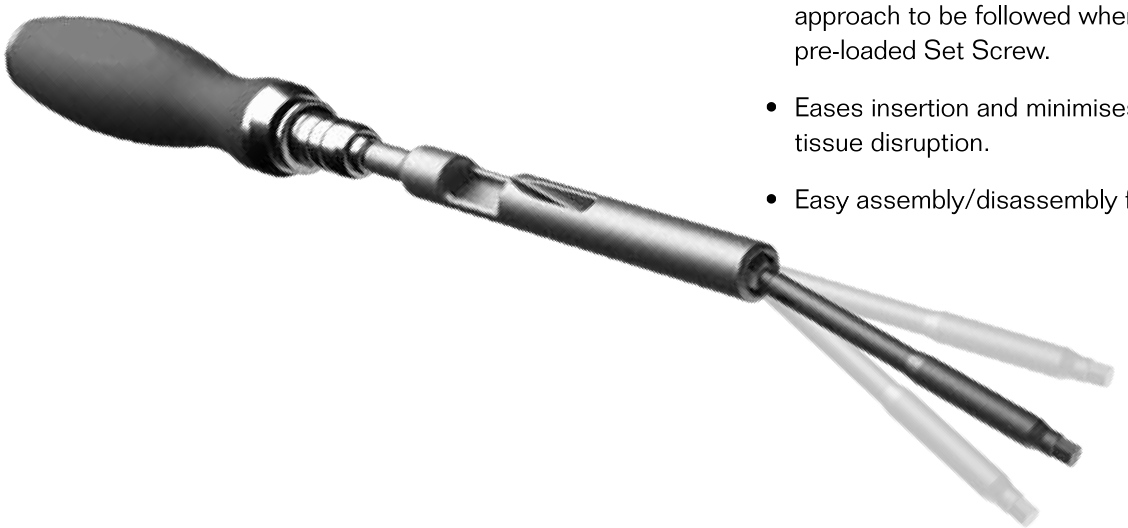
Figure 15: X-ray image provided by Dr. Hamada, Kyushu Chuo Hospital, Japan.

Positioning Guide AP

- Optional guide to assist in achieving optimal position of the Hansson Twin Hook/Lag Screw and the correct Nail depth. Attaches to the Targeting Device Arm by inserting its two pins into dedicated holes (see page 18).
- Insertion of the Positioning Guide AP - Tube allows the surgeon to visualise the position of the Hansson Twin Hook/Lag Screw under image intensification before insertion of the Threaded Guide Wire (Fig. 15).
- Universal use in left and right applications.

Guide Wire Driver - Handle

- Grasps the Ball Tip Guide Wire to ease insertion.
- Ergonomic single action self-retaining clamping mechanism.
- Easy assembly/disassembly for cleaning.



Flexible Screwdriver

- Allows the exact pathway of the surgical approach to be followed when tightening the pre-loaded Set Screw.
- Eases insertion and minimises additional soft tissue disruption.
- Easy assembly/disassembly for cleaning.

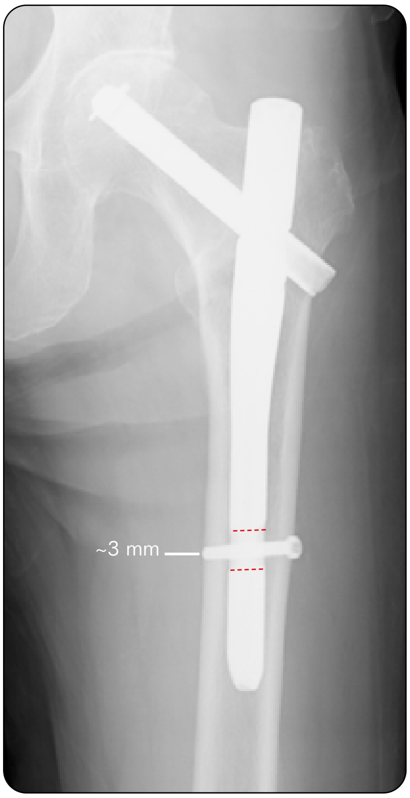
Case 1 - AO/OTA - 31A 1.2

76 year old female who sustained a 2-part trochanteric fracture.

Pre-operatively. 3D reconstruction anterior surface.

Pre-operatively. 3D reconstruction posterior surface.

Post-operatively. A Short Nail with Hansson Twin Hook was used. A notch has been created in the lateral cortex below the Hansson Twin Hook.



2 weeks post-operatively. ~3 mm of Advanced Dynamisation has occurred and the fracture gap is closed.

5 weeks post-operatively. ~4 mm of Advanced Dynamisation has occurred.

Case 2 - AO/OTA - 31A 2.1

85 year old female who sustained a 3-part trochanteric fracture.

Pre-operatively. 3D reconstruction anterior surface.

Pre-operatively. 3D reconstruction posterior surface.

Post-operatively. An SL-Nail with Hansson Twin Hook was used. An axial notch has been created in the lateral cortex below the Hansson Twin Hook.

2 weeks post-operatively. ~5 mm of Advanced Dynamisation has occurred and the fracture gap is closed.

7 weeks post-operatively. ~6 mm of Advanced Dynamisation has occurred.

Case reports provided by:
Dr. Oroku Junpei
Kaisei General Hospital, Japan

References

1. **Chitnis, A. S., Vanderkarr, M., Ruppenkamp, J., Lerner, J., Holy, C. E., & Sparks, C. (2019)**
Reoperations in intramedullary fixation of pertrochanteric hip fractures.
Journal of medical economics, 22(7), 706–712.

2. **Mahomed, N., Harrington, I., Kellam, J., Maistrelli, G., Hearn, T., & Vroemen, J. (1994)**
Biomechanical analysis of the Gamma nail and sliding hip screw.
Clinical orthopaedics and related research, (304), 280–288.

3. **Zhu, Y., Meili, S., Zhang, C., Luo, C., & Zeng, B. F. (2012)**
Is the lag screw sliding effective in the intramedullary nailing in A1 and A2 AO-OTA intertrochanteric fractures? A prospective study of Sliding and None-sliding lag screw in Gamma-III nail.
Scandinavian journal of trauma, resuscitation and emergency medicine, 20, 60.

4. **Biber, R., Bail, H. J., & Stedtfeld, H. W. (2013)**
Lateral cortical notching in specific cases of delayed unions or nonunions after intertrochanteric and reversed fractures.
Archives of orthopaedic and trauma surgery, 133(4), 495–501.

5. **Tinner, C., Beckmann, N. A., & Bastian, J. D. (2020)**
Lateral Cortical Notching in Revision of a Subtrochanteric Fracture Non-union with Breakage of a Cephalomedullary Nail.
Journal of orthopaedic case reports, 10(6), 5–8.

6. **Hiragami, K., & Ishii, J. (2018)**
Embedding the lateral end of the lag screw within the lateral wall in the repair of reverse obliquity intertrochanteric femur fracture.
The Journal of international medical research, 46(3), 1103–1108.

7. **Mahomed, M. N., Harrington, I. J., & Hearn, T. C. (2000)**
Biomechanical analysis of the Medoff sliding plate.
The Journal of trauma, 48(1), 93–100.

8. **Kummer, F. J., Olsson, O., Pearlman, C. A., Ceder, L., Larsson, S., & Koval, K. J. (1998)**
Intramedullary versus extramedullary fixation of subtrochanteric fractures. A biomechanical study.
Acta orthopaedica Scandinavica, 69(6), 580–584.

9. **Olsson, O., Kummer, F. J., Ceder, L., Koval, K. J., Larsson, S., & Zuckerman, J. D. (1998)**
The Medoff sliding plate and a standard sliding hip screw for unstable intertrochanteric fractures: a mechanical comparison in cadaver femurs.
Acta orthopaedica Scandinavica, 69(3), 266–272.

10. **Olsson, O., Ceder, L., Lunsjö, K., & Hauggaard, A. (1997)**
Biaxial dynamization in unstable intertrochanteric fractures. Good experience with a simplified Medoff sliding plate in 94 patients.
Acta orthopaedica Scandinavica, 68(4), 327–331.

11. **Watson, J. T., Moed, B. R., Cramer, K. E., & Karges, D. E. (1998)**
Comparison of the compression hip screw with the Medoff sliding plate for intertrochanteric fractures.
Clinical orthopaedics and related research, (348), 79–86.

12. **Ekström, W., Karlsson-Thur, C., Larsson, S., Ragnarsson, B., & Alberts, K. A. (2007)**
Functional outcome in treatment of unstable trochanteric and subtrochanteric fractures with the proximal femoral nail and the Medoff sliding plate.
Journal of orthopaedic trauma, 21(1), 18–25.

13. **Lunsjö, K., Ceder, L., Tidermark, J., Hamberg, P., Larsson, B. E., Ragnarsson, B., Knebel, R. W., Allvin, I., Hjalmars, K., Norberg, S., Fornander, P., Hauggaard, A., & Stigsson, L. (1999)**
Extramedullary fixation of 107 subtrochanteric fractures: a randomized multicenter trial of the Medoff sliding plate versus 3 other screw-plate systems.
Acta orthopaedica Scandinavica, 70(5), 459–466.

14. **Norris, R., Bhattacharjee, D., & Parker, M. J. (2012)**
Occurrence of secondary fracture around intramedullary nails used for trochanteric hip fractures: a systematic review of 13,568 patients.
Injury, 43(6), 706–711.

15. **Müller, F., Galler, M., Zellner, M., Bäuml, C., Marzouk, A., & Füchtmeier, B. (2016)**
Peri-implant femoral fractures: The risk is more than three times higher within PFN compared with DHS.
Injury, 47(10), 2189–2194.

16. **Halonen, L. M., Stenroos, A., Vasara, H., & Kosola, J. (2022)**
Peri-implant fracture: a rare complication after intramedullary fixation of trochanteric femoral fracture.
Archives of orthopaedic and trauma surgery, 142(12), 3715–3720.

17. **Pape, H. C., Giannoudis, P., & Krettek, C. (2002)**
The timing of fracture treatment in polytrauma patients: relevance of damage control orthopedic surgery.
American journal of surgery, 183(6), 622–629.

18. **Keel, M., & Trentz, O. (2005).**
Pathophysiology of polytrauma.
Injury, 36(6), 691–709.

19. **Hou, Z., Bowen, T. R., Irgit, K. S., Matzko, M. E., Andreychik, C. M., Horwitz, D. S., & Smith, W. R. (2013)**
Treatment of pertrochanteric fractures (OTA 31-A1 and A2): long versus short cephalomedullary nailing.
Journal of orthopaedic trauma, 27(6), 318–324.

20. **Boone, C., Carlberg, K. N., Koueiter, D. M., Baker, K. C., Sadowski, J., Wiater, P. J., Nowinski, G. P., & Grant, K. D. (2014)**
Short versus long intramedullary nails for treatment of intertrochanteric femur fractures (OTA 31-A1 and A2).
Journal of orthopaedic trauma, 28(5), e96–e100.

21. **Kanakaris, N. K., Tosounidis, T. H., & Giannoudis, P. V. (2015)**
Nailing intertrochanteric hip fractures: short versus long; locked versus nonlocked.
Journal of orthopaedic trauma, 29 Suppl 4, S10–S16.

22. **Dunn, J., Kusnezov, N., Bader, J., Waterman, B. R., Orr, J., & Belmont, P. J. (2016)**
Long versus short cephalomedullary nail for trochanteric femur fractures (OTA 31-A1, A2 and A3): a systematic review.
Journal of orthopaedics and traumatology : official journal of the Italian Society of Orthopaedics and Traumatology, 17(4), 361–367.

23. **Okcu, G., Ozkayin, N., Okta, C., Topcu, I., & Aktuglu, K. (2013)**
Which implant is better for treating reverse obliquity fractures of the proximal femur: a standard or long nail?
Clinical orthopaedics and related research, 471(9), 2768–2775.

24. **Maratt, J., Schilling, P. L., Holcombe, S., Dougherty, R., Murphy, R., Wang, S. C., & Goulet, J. A. (2014)**
Variation in the femoral bow: a novel high-throughput analysis of 3922 femurs on cross-sectional imaging.
Journal of orthopaedic trauma, 28(1), 6–9.

25. **Buford, W. L., Jr, Turnbow, B. J., Gugala, Z., & Lindsey, R. W. (2014)**
Three-dimensional computed tomography-based modeling of sagittal cadaveric femoral bowing and implications for intramedullary nailing.
Journal of orthopaedic trauma, 28(1), 10–16.

26. **Loferer, M. (2020)**
Torque deformation test between the Hansson Twin Hook and a compression hip screw.
Test Report Ref. 728_200710_120_900
Test Report Ref. 728_200710_120_901
Endolab Mechanical Engineering GmbH (Data on file)

27. **Olsson, O. Tanner, K. Ceder, L. & Ryd, L. (2002)**
A biomechanical study on fixation stability with twin hook or lag screw in artificial cancellous bone.
International orthopaedics, 26 (6) p349-55.

28. **Nonomiya, H. & Bauer, C. (2007)**
Omega™ Plus Ti Hansson™ Twin Hook: A Biomechanical Investigation.
Memorial Hospital, Department of Orthopaedics, Shizuoka, Japan, March 2007
Data on file at Swemac. Available on request.

29. **Öster, L. (2022)**
Twin Hook vs Lag Screw in respect of frontal area.
Technical document on file.

30. **Loferer, M. (2020)**
Energy absorption test between the Hansson Twin Hook and a compression hip screw.
Test Report Ref. 728_200710_120_900-part1
Test Report Ref. 728_200710_120_900-part2
Test Report Ref. 728_200710_120_901-part1
Test Report Ref. 728_200710_120_901-part2
Endolab Mechanical Engineering GmbH (Data on file)

31. **Eriksson, F. Mattsson, P. Larsson, S. (2000)**
The Effect of Implanting Design and Bone Density on Maximum Torque and Holding Power for Femoral Neck Fracture Devices
Annales chirurgiae et gynaecologiae 89 (2) p119-23

32. **Benterud, J. & Hoiseth, A. (1994)**
Implant / bone constructs in femoral neck osteotomy.
Archives of Orthopaedic and Trauma surgery, 113 (2) p97-100

IFU

For the latest version of this Instruction For Use. Please visit:
download.swemac.com/hansson-dynamic-cephalomedullary-nail-system

Swemac

Hansson Dynamic Cephalomedullary Nail System

Manufacturer: **Swemac Innovation AB** CE 0413
Cobolgatan 1 • SE-583 35 Linköping, Sweden
+46 13 37 40 30 • info@swemac.com
www.swemac.com

P151-28-1-20230118
Print date: 2023-01-18