stryker

Osteosynthesis

Hansson™ Pin System
Pediatrics

Operative Technique

• Slipped Capital Femoral Epiphysis

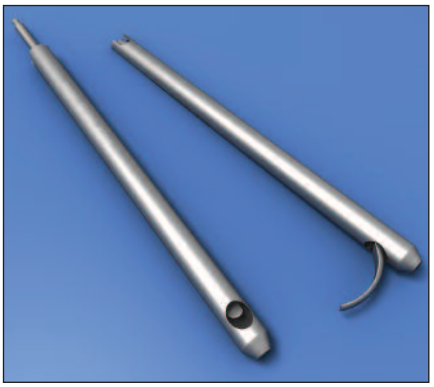
Contents

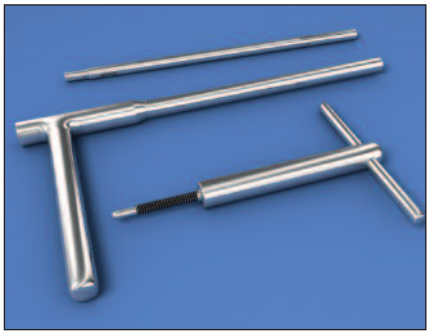
Introduction

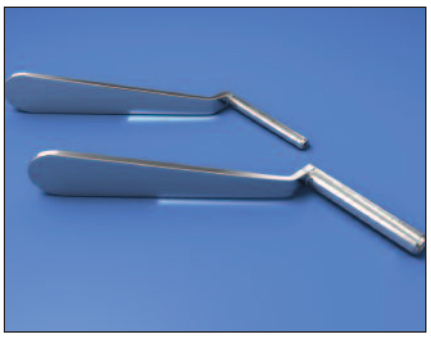
The Hansson™ Pin system, designed by Professor Lars Ingvar Hansson at the University of Lund in Sweden, was developed based on research concerning the effects of implants on the blood supply to the femoral head.

Specifically developed for the treatment of slipped capital femoral epiphysis, the Hansson Pin system has been designed to minimise surgical trauma to the patient and offer secure, stable fixation with reduced risk of healing complications for all grades of fracture.

Twenty years of successful clinical studies have been carried out to enhance the Hansson™ Pin System to its current form.
This work is summarized in 6 theses and more than 70 published articles.







Rationale

The methodology involves a cylindrical pin inserted in a drill hole which attaches to the femoral head via a hook, providing strong, stable fixation through a simple and precise procedure.
The drill hole and pin run at right angles to the growth zone and are, depending on the degree of slipping, relatively centrally located in the femoral neck and head.
The pin is 10-20mm longer than the drill hole to allow continued growth in the length of the femoral neck.
Slips of up to 60° can be stabilised by osteosynthesis.

Relative Indications & Contraindications

Indications

Slipped Capital Femoral Epiphysis

Adult Femoral Neck Fractures

Contraindications

Due to a lack of any supportive clinical experience, the Hansson Pin is not recommended for use with paediatric hip fractures.

Relative Contraindications

The physician's education, training and professional judgement must be relied upon to choose the most appropriate device and treatment.
Conditions presenting an increased risk of implant failure include:

- Any active or suspected latent infection or marked local inflammation in or about the affected area.
- Compromised vascularity that would inhibit adequate blood supply to the fracture or the operative site.
- Bone stock compromised by disease, infection or prior implantation that can not provide adequate support and/or fixation of the devices.
- Material sensitivity, documented or suspected.
- Obesity. An obese patient can produce loads on the implant that can lead to failure of the fixation of the device or to failure of the device itself.
- Patients having inadequate tissue coverage over the operative site.
- Implant utilization that would interfere with anatomical structures or physiological performance.
- Any mental or neuromuscular disorder which would create an unacceptable risk of fixation failure or complications in postoperative care.
- Other medical or surgical conditions which would preclude the potential benefit of surgery.

Detailed information is included in the instructions for use being provided with each implant.

See package insert for a complete list of potential adverse effects and contraindications. The surgeon must discuss all relevant risks, including the service life of the device and the need for postoperative protection of the implant with the child's parents, when necessary.

Features & Benefits

Preventing diastasis and further displacement of the epiphysis

The risk of further intraoperative displacement of the femoral head is reduced by drilling a channel for the Hansson Pin with the femoral head fixed with kirschner wires. The smooth outer pin allows the surgeon to gently push the implant through the channel, reducing the risk of diastasis between the femoral neck and the head.[1]

Lasting stable fixation

The hook resists loosening of the fixation to the femoral head as the longitudinal growth of the femoral neck retracts the pin in the channel thereby stabilizing the femoral head. Loosening of the implant is potentially reduced because of resorption and growth of the femoral neck under normal conditions.[1]

Reducing the risk of unequal bone length

The continued growth of the femoral neck in cases with Slipped Capital Femoral Epiphysis is an indication of undisturbed intra- and postoperative vascularization, as the nutrition for the proliferating cells of the growth plate is provided by the epiphysial vessels. By preserving the blood supply, the Hansson Pin System reduces the risk of unequal bone length.[1]

Easy extraction

The risk of the pin being trapped in the bone is reduced as the pin surface is smooth. The hook is easily withdrawn back into the body of the pin, which can then be removed.[1]

Slipped Capital Femoral Epiphysis

Frontal view

Lateral view

Operative Technique

Fig. 1 – Position Patient; C-Arm in A/P View

Fig. 2 – Position Patient; C-Arm in L/M View

Step 1 - Patient Positioning

Correct positioning of the patient on the fracture table is essential for avoiding problems and complications during surgery (Fig. 1).

Place the patient in supine position on the fracture table.

Healthy side: Position the leg on the healthy side with the hip in flexion and slight abduction so that the C-arm can be adjusted intra-operatively for both the anterior/posterior and the lateral/medial views. This is necessary to obtain a true lateral view of the femoral neck and head (Fig. 2). The purpose of this view is to avoid the penetration of the end of the pin through the surface of the femoral head.

Furthermore, again for avoiding pin penetration, the surface of the femoral head must be seen continuously when moving the C–arm from the horizontal position to the vertical position.

Slipped side: Position the hip in full extension with neutral position between abduction and adduction.

Step 2 - Reduction

Apply the surgical boot to the foot.

Mild traction is applied for the sole purpose of maintaining the leg in the horizontal plane. Additional support under the thigh may be necessary.

Rotate the foot internally by 30 - 60° and fix in position. This is so that the femoral neck is parallel to the radiation beam in the lateral view (Fig. 3).

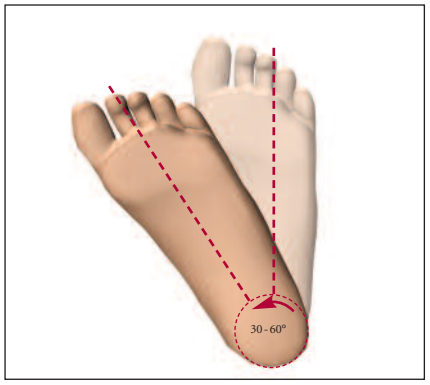


Fig. 3 – Internal Rotation of the Hip

Stable (Chronic) Slips
Eighty to ninety percent of slips are stable (or chronic).
Stable slips are always pinned in situ. Any attempt to perform a closed reduction on a chronic slip may lead to avascular necrosis.

Gradual bone remodelling has taken place as a response to the insidious slipping of the femur away from the femoral head. (Fig. 4) This is the body's natural attempt to adapt the geometry of the proximal femur in order to maintain a functional hip joint. The remodelling is therefore ossified and reduction is not possible.

The stable slip is pinned with the intention of preventing further slippage, as well as preventing the possibility of acute-on-chronic traumatic changes, which could be devastating for the vascularization of the femoral head.

The surgical treatment of a stable slip can therefore be planned in advance but must be considered urgent.

Unstable (Acute) Slips
Unstable slips (where the event is recent, the child cannot weight-bear and the threat of avascular necrosis of the femoral head is an immediate danger) must be pinned without delay from the moment of the patient's arrival in the clinic.

This is an emergency situation.

Some chronic remodelling may be noted on X-ray and again, this ossified modification of the hip joint cannot be reduced in surgery.

The acute or unstable portion of the slip is treated with closed reduction by internal rotation and then pinned. The chronic portion is left as it is.

Fig. 4 – Bone Remodelling

Operative Technique

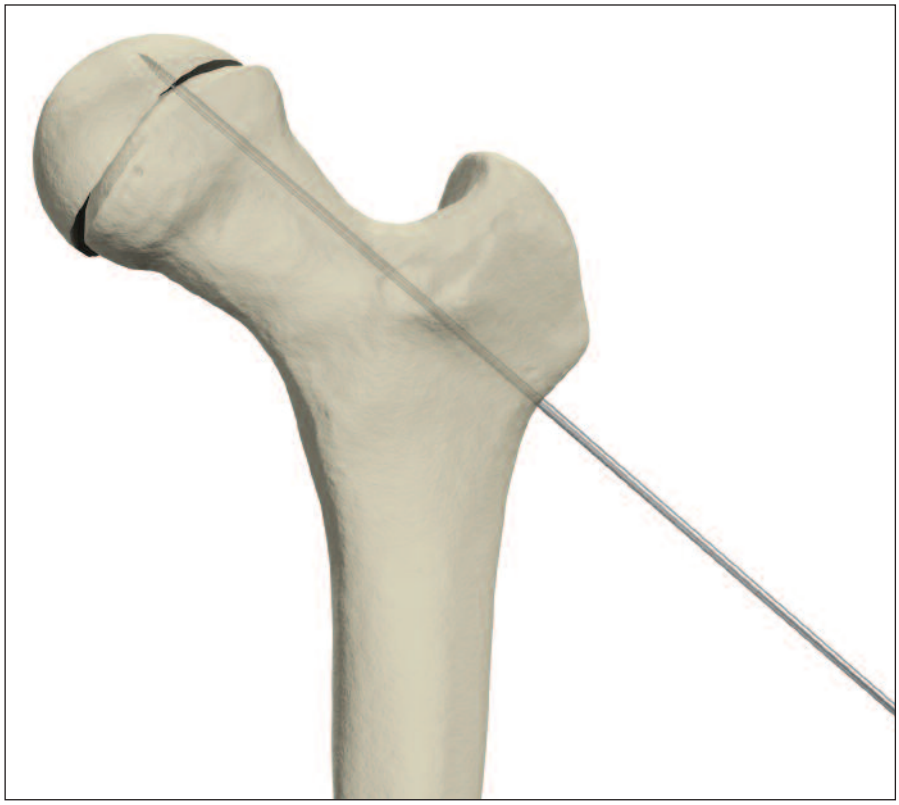


Fig. 5

Step 3 – Stabilization Guide Wire Insertion

When treating unstable (acute) slips
a Guide Wire may be used.
Using biplanar floroscopy, it is inserted percutaneously in the trochanteric region into the femoral neck and head for intraoperative stabilization. (Fig. 5).

Operative Technique

Step 4 – Determining the Incision Point and Implant Position

Slipping of the femoral head occurs in a true posterior direction. The Hansson Pin must be positioned in the central part of the femoral head.

To achieve this, the pin must be inserted anterior-laterally in the greater trochanter and then directed posteriorly (Fig. 6).

A prerequisite for being able to correctly position the Hansson Pin is to insert a Ø2.4mm Guide Wire prior to drilling.

Guide Wire Insertion Point – Anterior / Posterior View:
Position a Guide Wire on the skin of the anterior aspect of the thigh. Verify by anterior/posterior fluoroscopy that the Guide Wire is in the correct position in the central part of the femoral neck and head (Fig. 7). Mark the position of the Guide Wire on the anterior surface of the thigh.

Lateral / Medial View:
Now position the Guide Wire over the skin on the lateral aspect of the thigh. Verify by lateral/medial fluoroscopy that the Guide Wire has been positioned to enter posteriorly towards the central part of the femoral head (Fig. 8) Mark the position of the Guide Wire on the lateral aspect of the thigh.

The intersection of these two lines at the anterior-lateral aspect of the thigh at the level of the lesser trochanter represents the optimal point for percutaneous insertion of the Guide Wire (Fig. 9).

Fig. 6 – Final Implant Position to Achieve

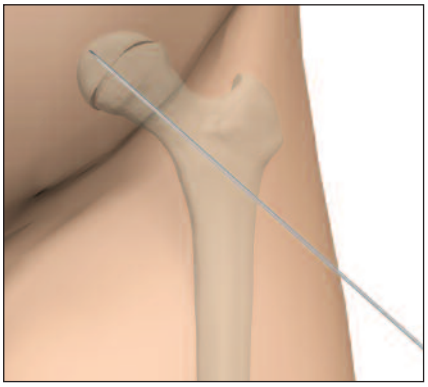


Fig. 7 – A/P X-Ray of Guide Wire over skin

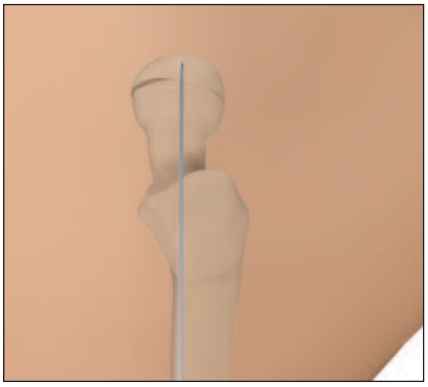


Fig. 8 – L/M X-Ray of Guide Wire over skin

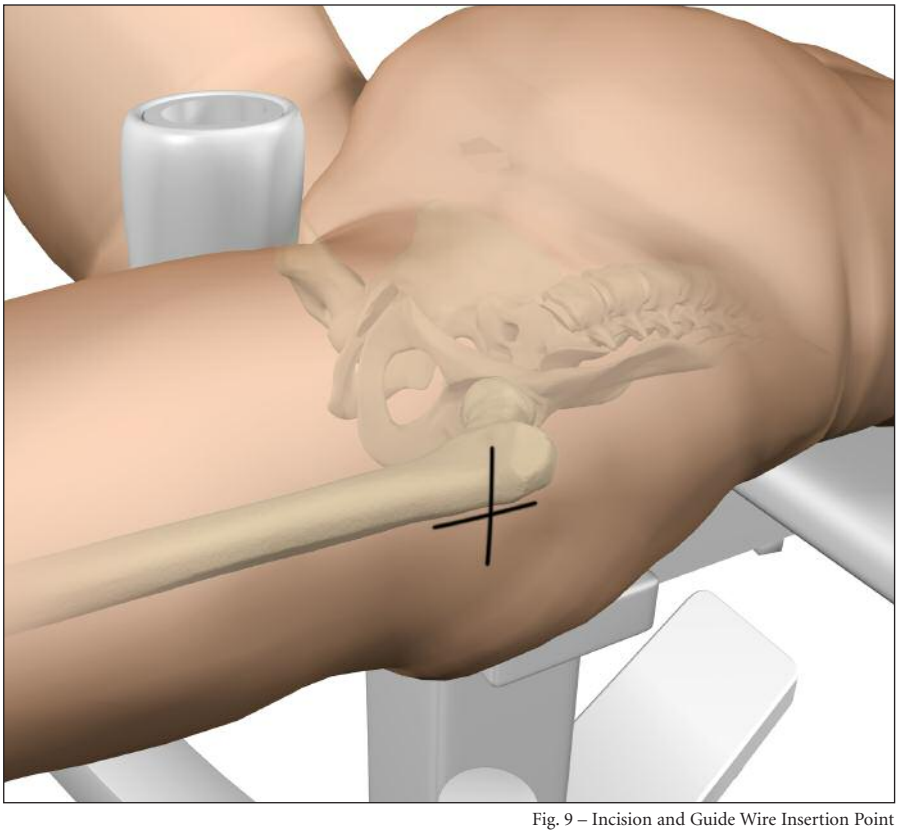


Fig. 9 – Incision and Guide Wire Insertion Point

Operative Technique

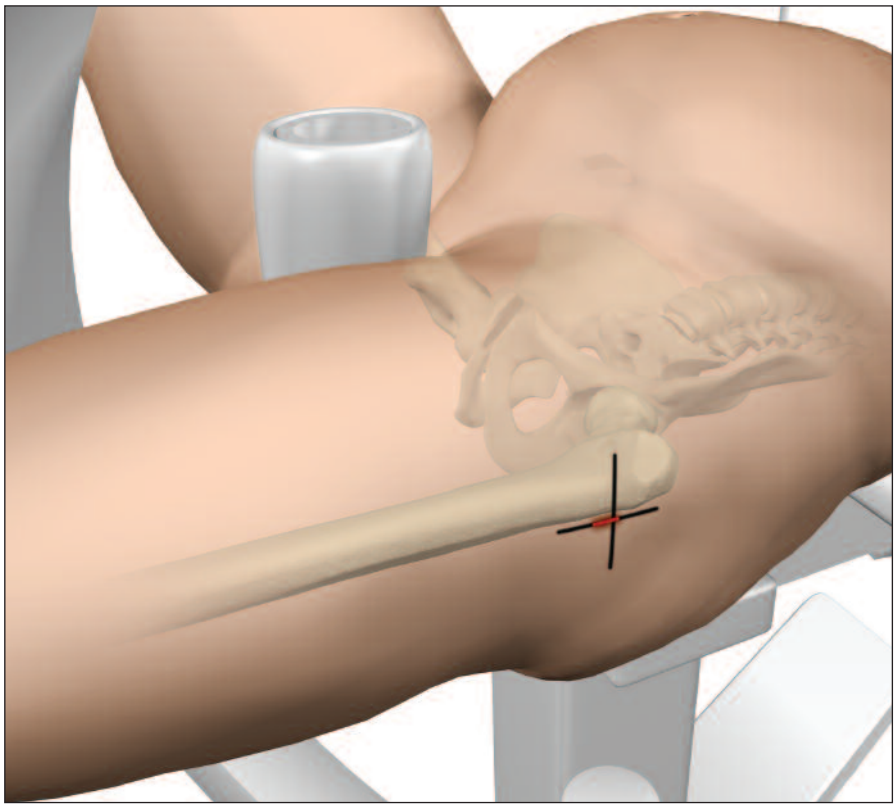


Fig. 10 – Skin Incision

Step 5 – Skin Incision and Guide Wire Insertion

Make a 20mm incision at the site where the two lines on the thigh intersect. The insertion point on the anterior-lateral face of the proximal femur is identified at the level of the lesser trochanter (Fig. 10).

If harder cortical bone is anticipated (such as with a child being treated with chemotherapy), the surgeon may prefer to pre-drill the cortex with the optional drill.

Insert the Guide Wire over the Guide Wire Bush and Drill Sleeve. Using a power drill, begin insertion from the anterio-lateral cortex, crossing the epiphysis and targeting the center of the femoral head. According to the severity of the slip, the guide wire will be in an oblique position in the femoral neck.
Use frequent biplanar fluoroscopic control to verify the alignment of the Guide Wire in both the anterior/posterior and lateral/medial plane.

This is to ensure that the centre of the femoral head will be reached.

If the direction of the Guide Wire appears to deviate from the centre of the femoral head, stop the procedure, remove the Guide Wire, and recommence until correct positioning of the Guide Wire is obtained (Fig. 11). Advance to within 5mm of the subchondral bone to anticipate the necessary space for the hook to be extruded.

Remove the Guide Wire Bush.

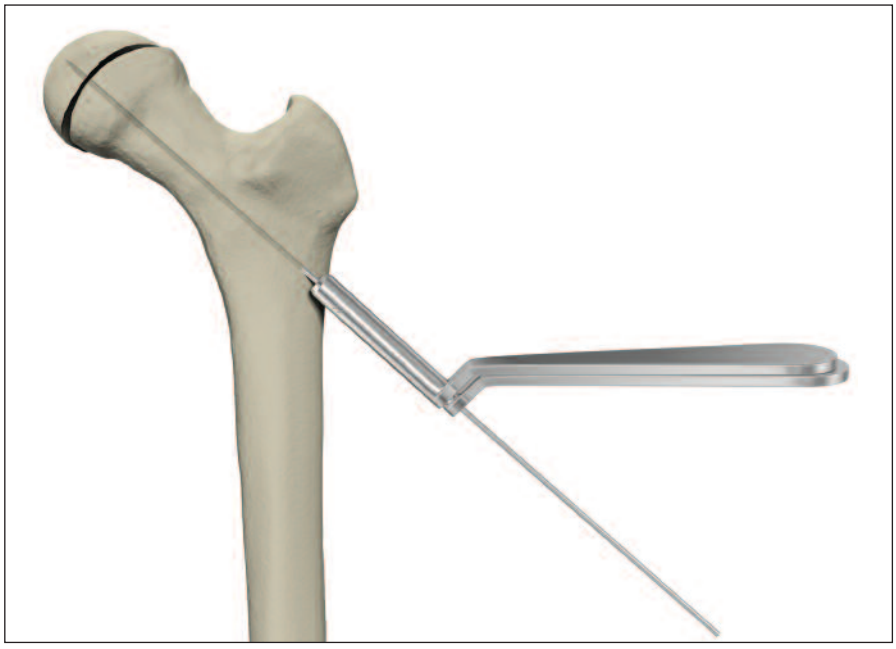


Fig. 11 – Guide Wire Insertion

Final Implant Position to Achieve

Operative Technique

Step 6 – Drilling and Measurement

Insert the Cannulated Drill over the Drill Sleeve and the Guide Wire. The Drill Sleeve is pressed against the lateral cortex of the femur and the drill is advanced towards the centre of the femoral head (Fig. 12).

Use frequent fluoroscopy while drilling to avoid medial migration and penetration of the Guide Wire through the joint surface of the femoral head.

If medial migration is detected, remove the Cannulated Drill and clean the bone debris from the cannulation.

Reinsert the Cannulated Drill over the Guide Wire and Drill Sleeve and advance to within 5mm of subchondral bone. **Leave the Drill Sleeve in place.**

Read the measurement shown on the drill at the level of the lateral aspect of the Drill Sleeve (See zoom of Fig. 12). Choose a Hansson Pin which is about 15 to 20mm more than the measurement shown. This is to allow the femoral neck to continue its growth along the pin and to ease pin removal once the physis has closed and growth has completed.

According to the amount of subcutaneous tissue which covers the Greater Trochanter, a longer pin protruding from the patient's lateral cortex may not be tolerated.

Therefore the amount of pin which may protrude is limited. In this case, a smaller pin is used and a future operation to replace the pin with a longer one may be necessary.

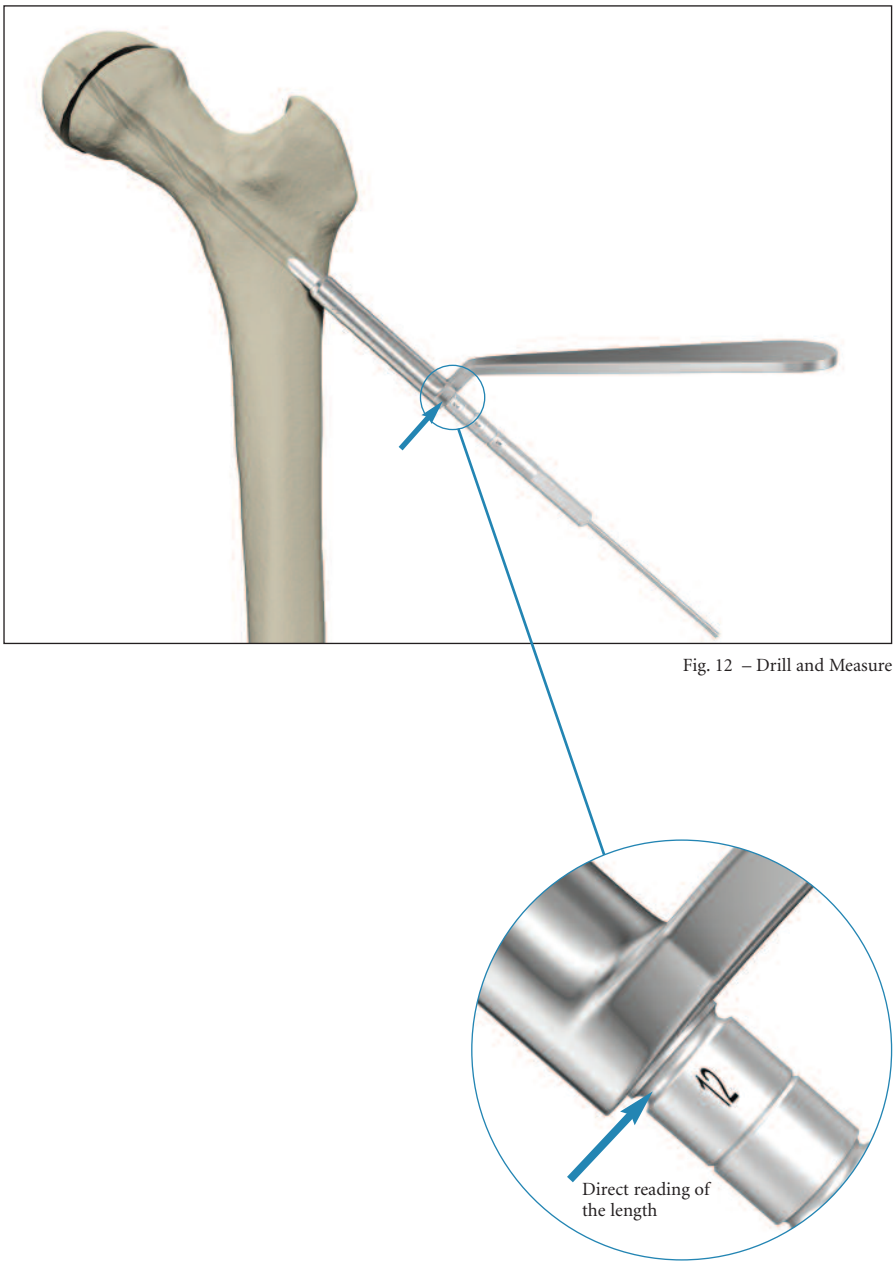


Fig. 12 – Drill and Measure

Operative Technique

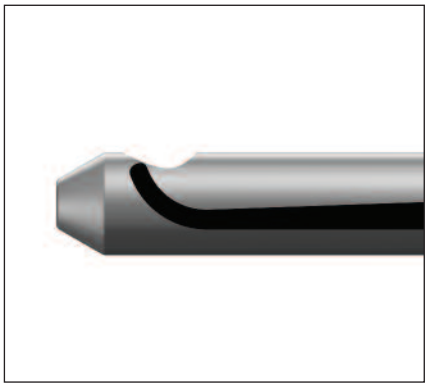


Fig.13

Step 7 – Instrument-to-Pin Assembly

Verify that the inner pin is completely withdrawn in the window of the outer body and in correct position (Fig. 13).

Pass the Inner Introducer through the Outer Introducer and screw it into the Hansson Pin (Fig. 14). There are unequal tabs on the Outer Introducer which correspond with slots in the pin; the tabs and slots should securely mate when the Introducer Assembly is screwed onto the Hansson Pin.

The handles of the Inner and Outer Introducers need not be aligned.

Hansson Pin Outer Introducer Inner Introducer

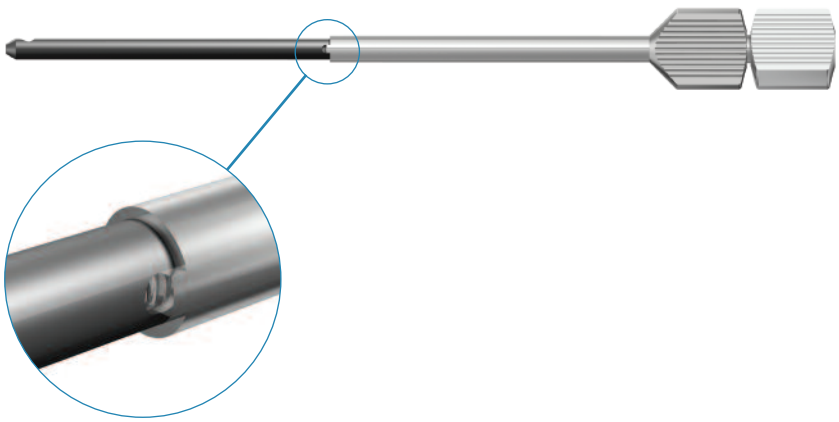


Fig. 14

Operative Technique

Step 8 – Insertion of the Hansson Pin and Activation of the Hook

Insert the Hansson Pin with the Introducer Assembly into the femoral channel which has been pre-drilled. Ensure that the pin is fully inserted. Use fluoroscopy to verify the position of the Hansson Pin. (Fig 15).

There is an etched line on the handle of the Outer Introducer which indicates the Inner Pin's point of exit. Verify that this guide line is in alignment with the femoral shaft. (Fig. 16). Thus the hook will be extruded in the superior direction as demonstrated in figure 17.

Insert the tip of the Introducer Handle through the hole in the Inner Introducer.

Maintain both the Outer and Inner Introducers in position.

Turn the Introducer Handle clockwise whilst gently pushing medially on the introducer assembly. Continue turning the Introducer Handle to completely deploy the hook using biplanar fluoroscopy. A mechanical stop is provided by the Inner Introducer (Fig. 17).

Fig. 15 – Insert Hansson Pin into channel

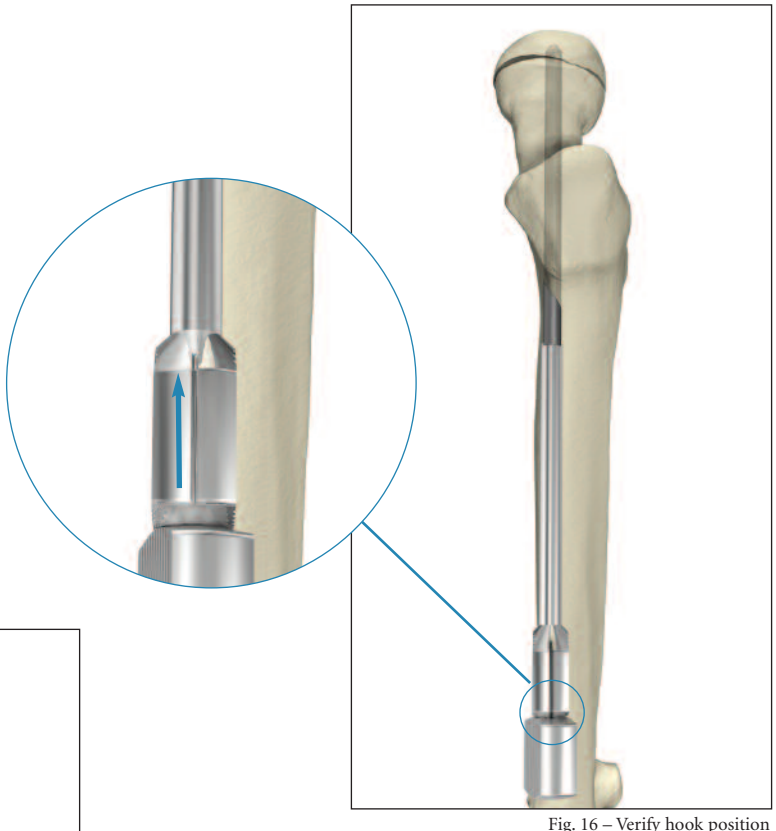


Fig. 16 – Verify hook position

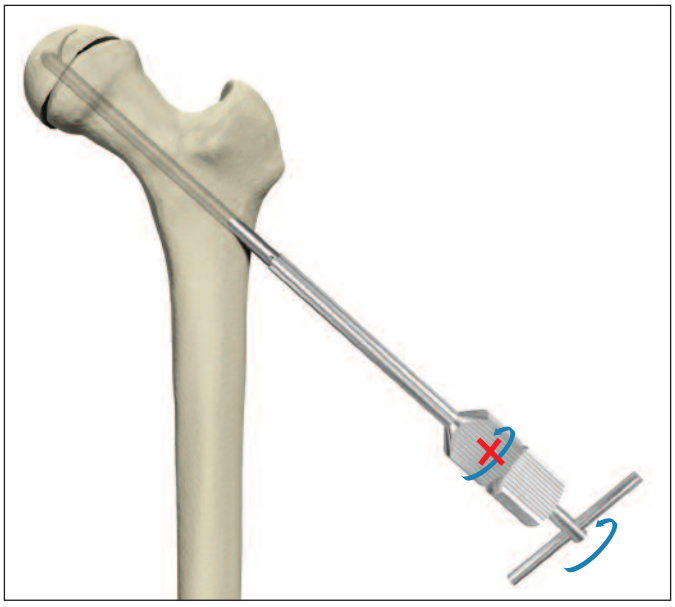


Fig. 17 – Activate hook

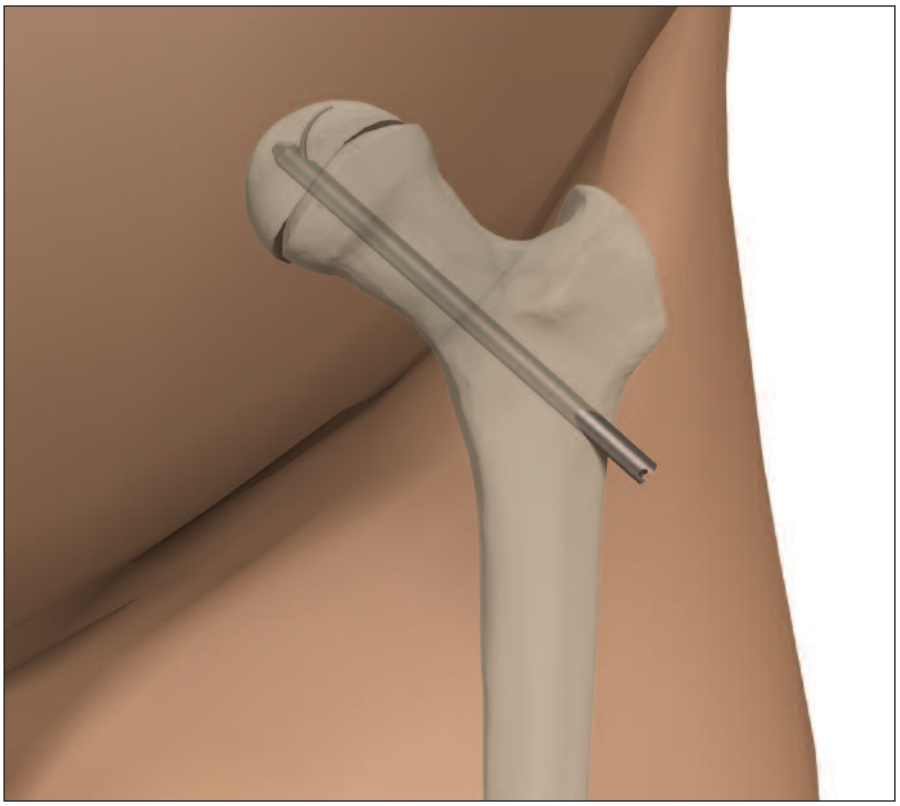
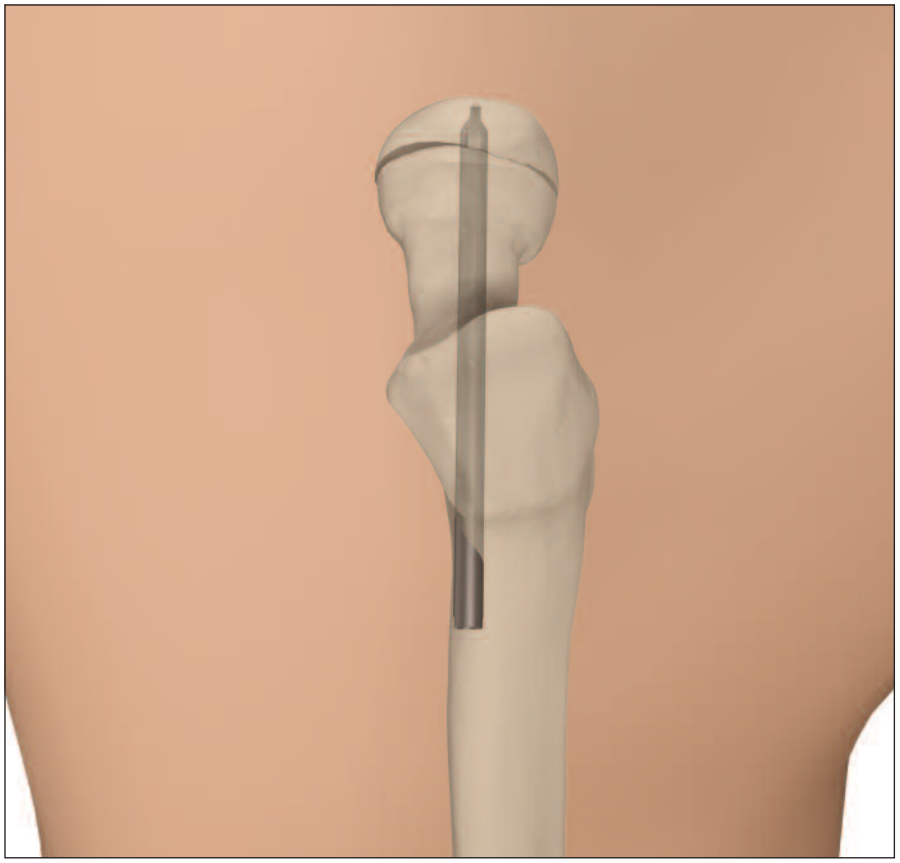


Fig.18

Step 9 – Instrument Removal

Maintain the Outer Introducer in position. Unscrew and then remove the Introducer Handle followed by the Inner Introducer and the Outer Introducer (Fig.18). Close the wound.



Postoperative Regime

Stable Slip:

The patient is allowed to start walking using crutches and partial weight bearing on the operated side the first day after surgery.
Usually the patient can be discharged from the ward one to two days after surgery when he or she is capable of walking with crutches.
Full weight bearing is possible after one week.

Unstable Slip:

The patient is allowed to start walking using crutches and partial weight bearing on the operated side the first day after surgery.
Full weight bearing on the operated leg is not allowed until after six weeks.

Bilateral Slips:

Periodic X-Ray images should be taken of both hips to facilitate early detection of contralateral slips.

Follow Up Examination – Stable and Unstable:

A six-week post-op follow up medical and radiological examination is recommended.

When assessing the follow-up X-ray, the surgeon must look for:

- Reliable anchorage of the hook in the femoral head.
- Protrusion of the end of the pin through the lateral cortex of the thigh.

The most accurate angle to view the protrusion of the pin is the lateral position, due to the insertion angle.

If the X-rays are satisfactory, then walking is permitted.

Repeat X-rays are necessary every 6 months until the physes have closed.

Postoperative Activities - Stable and Unstable:

Surgeons should instruct parents regarding appropriate and restricted activities during the treatment in order to prevent placing excessive stress on the implants which may lead to fixation or implant failure and accompanying clinical problems.

Surgeons should also instruct parents to report any unusual changes of the operative site to his/her physician.

The physician should closely monitor the patient if a change at the site has been detected.

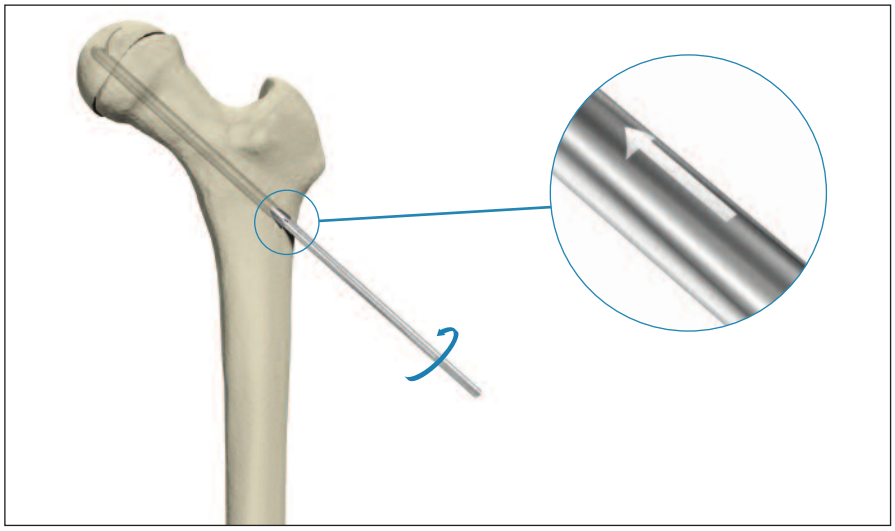


Fig. 18 – Engage Inner Extractor with Inner Pin

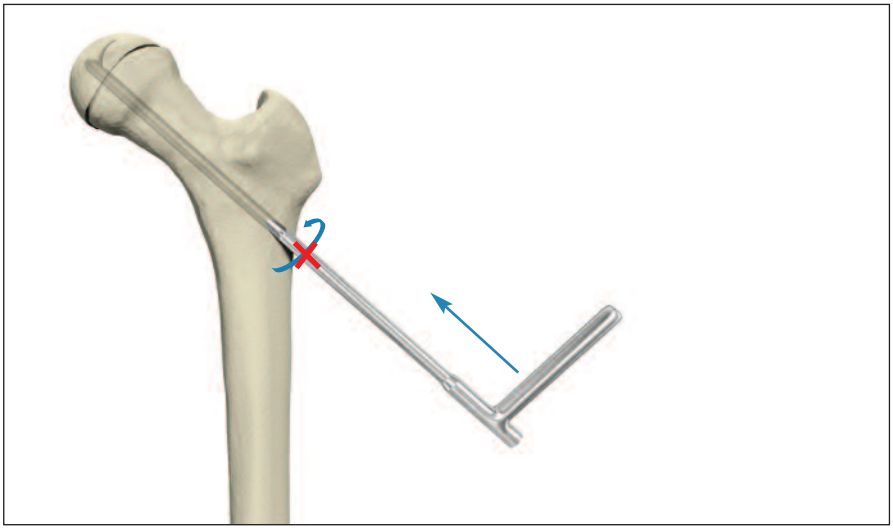


Fig. 19 – Key Outer Extractor over Inner Extractor

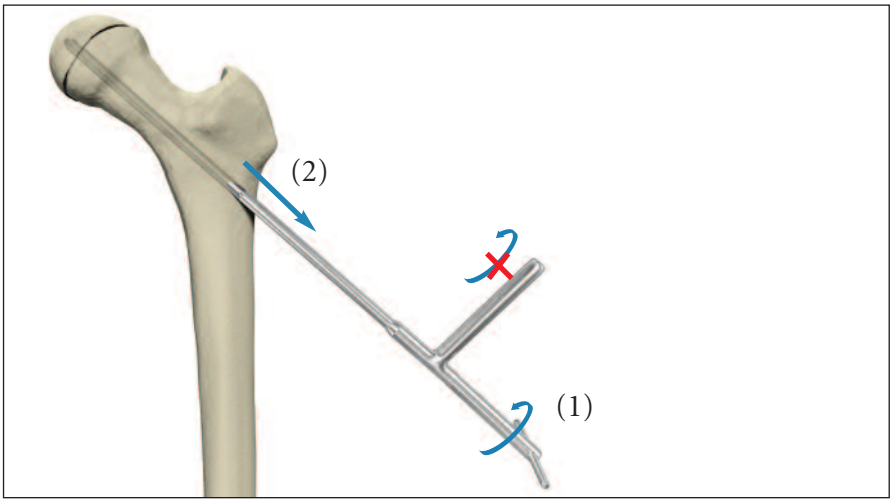


Fig. 20 – Insert and turn Extractor Handle

Pin Removal

Step 1

The arrowed end of the Inner Extractor is engaged with the inner pin's thread and rotated clockwise until it stops (Fig. 18).

Step 2

The Outer Extractor is slid over the Inner Extractor until it is in contact with the outer pin (Fig. 19).

Note: If the Outer Extractor is not in contact with the outer body of the Hansson Pin, rotate the Outer Extractor **only until it engages the flat sides of the Inner Extractor** and push the handle gently until it touches the tip of the outer body.
It is important not to exert any rotation on the Outer Extractor when the instrument is keyed by the flat sides of the Inner Extractor.

Step 3

Maintain the Outer Extractor in place.
Insert the threaded tip of the Extractor Handle into the Outer Extractor and turn it clockwise to engage the threaded part of the Inner Extractor
Do not rotate the Outer Extractor.
See step (1) in figure 20.

Continue to turn the Extractor Handle until a mechanical stop is felt.
This completely withdraws the hook into the outer pin.
Check under image intensification that the hook is fully retracted prior to pulling back the implant.
Once the hook is fully retracted, remove the implant along with the extraction instruments.
See step (2) in figure 20.

In case the hook is removed on its own, leaving behind the outer pin, the outer pin is removed by assembling the Inner and Outer Introducers and removing the outer pin from the bone.

Ordering Information — Implants

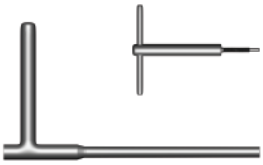
HANSSON PINS

Stainless Steel REF	Pin Length mm	Titanium REF
394070S	70mm	694070S
394075S	75mm	694075S
394080S	80mm	694080S
394085S	85mm	694085S
394090S	90mm	694090S
394095S	95mm	694095S
394100S	100mm	694100S
394105S	105mm	694105S
394110S	110mm	694110S
394115S	115mm	694115S
394120S	120mm	694120S
394125S	125mm	694125S
394130S	130mm	694130S
394135 *	135mm	694135*
394140 *	140mm	694140*

Special Order

Note: Sterile Only / * Special Order Non-Sterile

Ordering Information — Instruments

	REF	Description
	704501	Short Cannulated Drill Ø 6.7mm x 246mm with Jacobs fitting
	704510	Protective Measuring Sleeve
	704511	Guide-wire Bush
	704515	Outer Introducer
	704516	Inner Introducer
	704517	Introducer Handle
	704527	Extractor Handle
	704528	Outer Extractor
	704529	Inner Extractor
	704505S	Threaded Guide-wire Ø 2.4mm x 300mm (Single Use - Sterile Packed)
	901704	Sterilisation Tray for Instruments (Lid and Insert)

Optional Instrument

702448	Drill Bit Ø 1.4mm x 150mm (single use).

References

References:

1. Hansson L.I. (1982): Osteosynthesis with the Hook-Pin in Slipped Capital Femoral Epiphysis. Acta Orthop. Scand. 53: 87-96

2. Slipped Capital Femoral Epiphysis
Journal of Pediatric Orthopaedics. 26(3):286-290, May/June 2006.
Lehmann, Charles L. BS *; Arons, Raymond R. PhD +; Loder, Randall T. MD ++; Vitale, Michael G. MD, MPH +[S]

3. Bone Growth After Fixing Slipped Femoral Epiphysis: Brief Report
J Bone Joint Surg (Br) 1988 ;70-B : 846-6.
Hägglund, Gunnar ; Bylander, Birger ; Hansson, Lars Ingvar ; Selvik, Göran.

4. Radiographic Assessment of Coxarthrosis Following Slipped Capital Femoral Epipysis, A 32-year follow-up study of 51 hips.
Acta Radiologica 34 (1993) Fasc. 2
Hansson, G.; Jerre, R.; Sanders, S.M.; Wallin, J.

5. The Contralateral Hip in Patients Primarily Treated for Unilateral Slipped Upper Femoral Epiphysis, a long-term follow-up of 61 hips
J Bone Joint Surgery (Br) 1994; 76-B:563-7.
Jerre, Ragnar; Billing, Lars; Hansson, Göran; Wallin, Jan

6. Long-term Results After Nailing in situ of Slipped Upper Femoral Epiphysis
A 30-year follow-up of 59 hips.
The Journal of Bone and Joint Surgery (Br) 1998;80-B:70-7
Hansson, G; Billing, B.; Högstedt, B.; Jerre, R.; Wallin, J.

7. Prophylactic Pinning of the Contralateral Hip in Slipped Capital Femoral Epiphysis
Evaluation of Long-Term Outcome for the Contralateral Hip with Use of Decision Analysis
Journal of Bone and Joint Surgery, Inc. 2002
W. Randall Schultz, MD, MS, James N. Weinstein, DO, MS, Stuart L. Weinstein, MD and Brian G. Smith, MD

8. The Epidemiology of Slipped Capital Femoral Epiphysis: An Update
Paper No: 050 Presented at the American Academy of Orthopaedic Surgeons 2005 Annual Meeting, Washington, DC – February 23, 2005
Michael G Vitale, MD; Charles Lehmann BS; Randall T Loder, MD

9. Osteosynthesis with the Hook-Pin in Slipped Capital Femoral Epiphysis, Hansson, L.I. (1982):
Acta Orthop. Scand. 53: 87-96

10. Vitality of the Slipped Capital Femoral Epiphysis. Preoperative evaluation by tetracycline labeling.
Hagglund, G., Hansson, L.I. and Ordeberg G. (1985).

Thesis:

1. Physiolysis of the Hip. Epidemiology, natural history and long time results after closed treatment.
Gunnar Ordeberg, 1986.

2. Physiolysis of the Hip. Epidemiology, etiology and therapy.
Gunnar Hägglund, 1986.

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