

Telescoping, compaction, impaction and displacement in complex trochanteric fractures

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Introduction: To understand trochanteric fractures and plan a rationale treatment on the basis of a problem list, it is useful to describe the involvement of the constituent different elements and their relations.

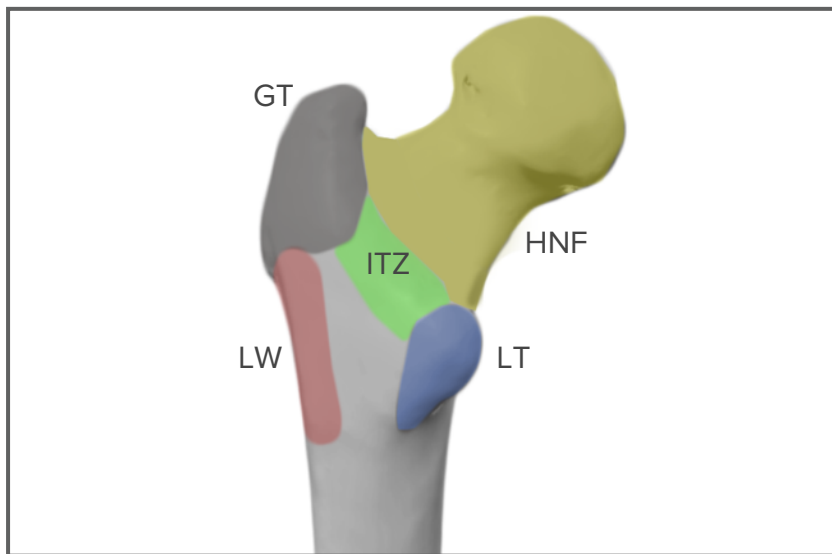


Fig. 1: Anatomical elements: Head-and-neck fragment (HNF), intertrochanteric zone (ITZ), greater trochanter (GT), lesser trochanter (LT), lateral wall (LW) and shaft/subtrochanteric zone.

Definitions

To describe and understand postoperative events in detail, we need a defined terminology.

Both, sliding hip screws and proximal femoral nails are implants made of two elements: one or two screw(s) which should guide the head-and-neck fragment and either a nail or a side-plate. The design allows a controlled movement in relation to each other, this is “**telescoping**” of the screw through the barrel of the plate or the hole of the nail. It therefore appeared to be obvious to call “**telescoping**” all different events where the screw glides laterally. **Unfortunately, such generic terms prevent a differentiated understanding.**

To understand what happens at the different interfaces:

- Lag screw and nail/barrel.
- HNF and surrounding structures (LT, GT, ITZ).
- Eventual fracture plains (LW and GT to surrounding structures).

Clinically we differentiate:

- Contact or impaction of HNF into metaphysis according to pattern of HNF.
- Lateral dislocation of GT/LW / primary or secondary or by implant placement).
- A combination of the two.

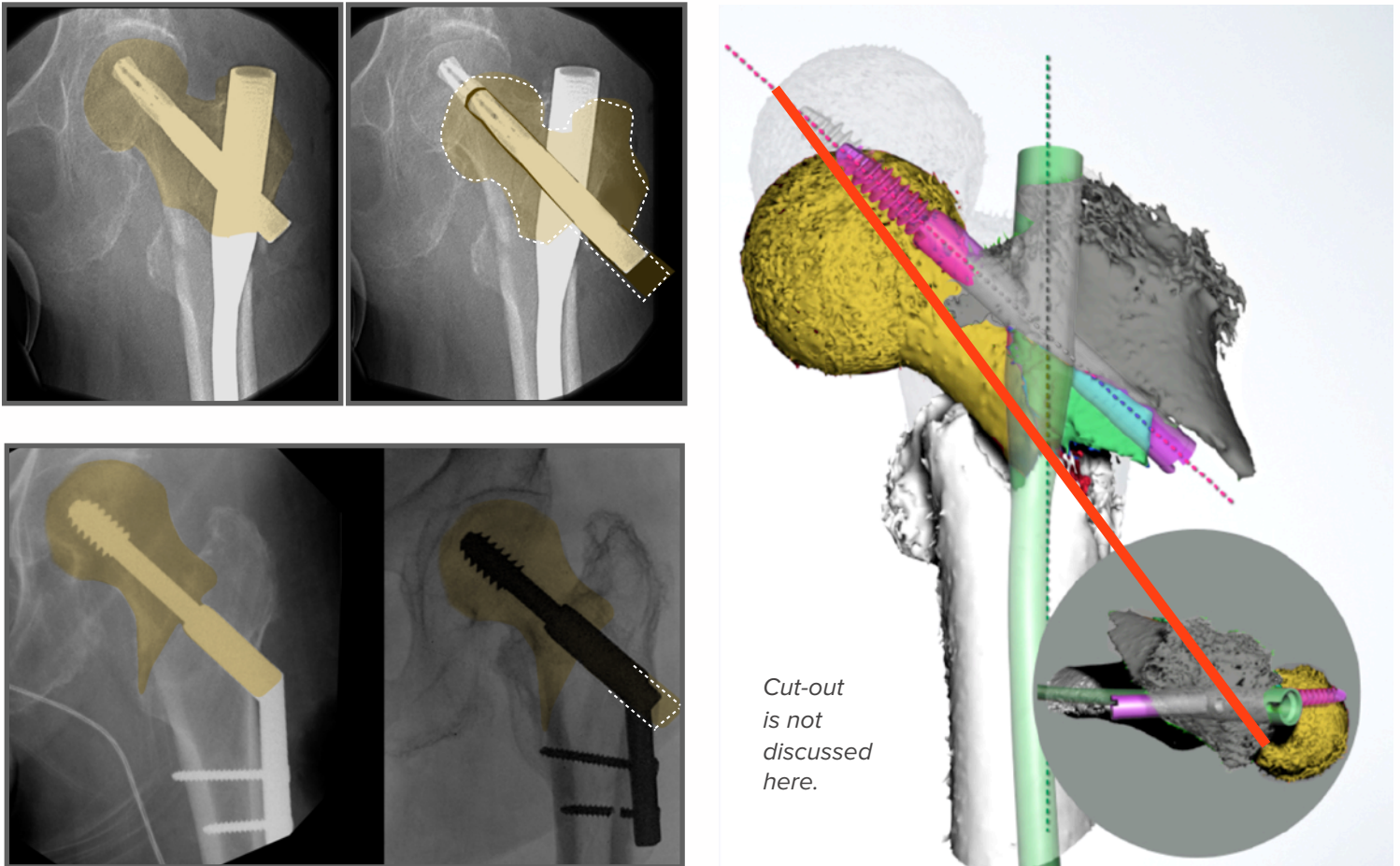


Fig. 2: Telescoping: Left: Telescoping = sliding of lag screw + HNF through hole of nail / barrel of DHS. Relation of screw / HNF remains constant. **Right:** migration of the screw in relation to the HNF (cut-out) (*will be discussed in later newsletter*).

If the screw is placed correctly and the bone quality is good, the screw position in the femoral head is usually maintained. Screw and HNF move together as a single unit. The amount of movement of this unit depends on the fracture pattern of the HNF and the surrounding elements. “HNF + screw” can move together laterally until they abut against a nail or a bony structure. The result of this movement is called “**compaction**”.

ICUC® app ID: 31-PS-146

Intra-op

13w

Overlapping images

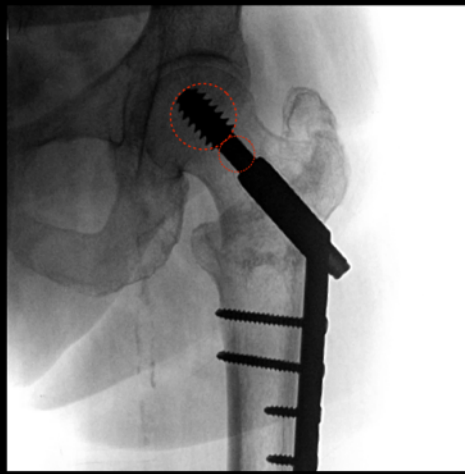
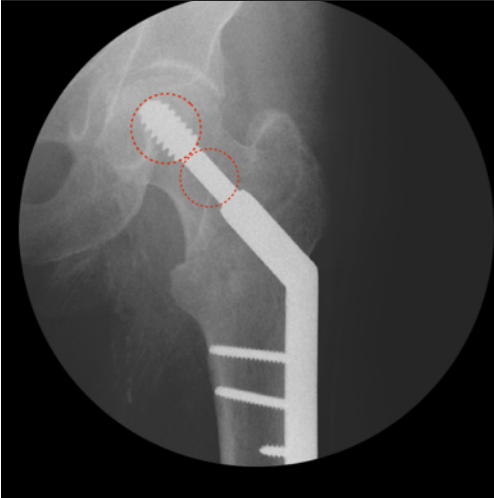


Fig. 3: Compaction / Impaction of the fragments and telescoping of the implant.

Left: fracture, reduced, remaining gap at 0 weeks. **Right and middle:** the fragments compact and reach stable contact through impaction. The HNF impacts against cancellous metaphyseal bone producing a small (acceptable) telescoping of a 6 mm of the lag screw within the barrel. Lateral wall intact. Position of lag screw within HNF unchanged. The gap disappears and the impaction zone (condensation zone i.e. entrenched, condensed bone), is visible radiologically) in the metaphysis.

ICUC® app ID: 31-PC-772

Intra-op

39w

Overlapping images

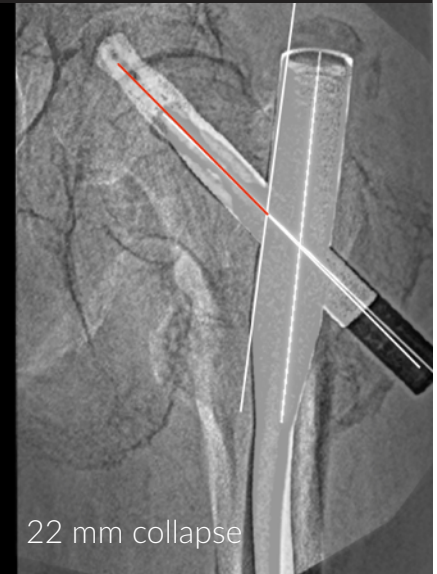
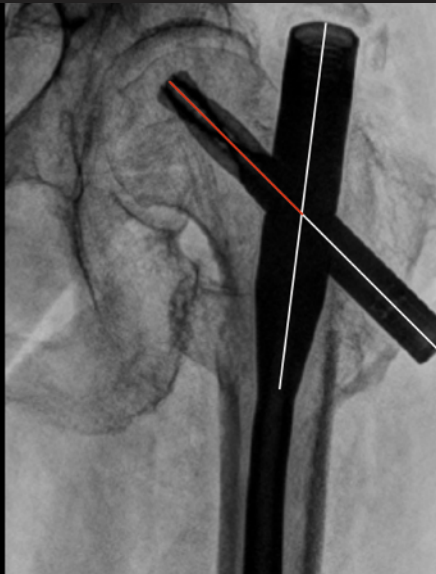


Fig. 4: Telescoping of implant and lateral displacement of GT+LW. The displacement of the LW+GT evident at 0 week. Main amount of implant telescoping already present. Between 0 and 39 weeks only slight increase of implant telescoping (22 mm).

ICUC® app ID: 3I-PC-563

Intra-op

86w

Overlapping images

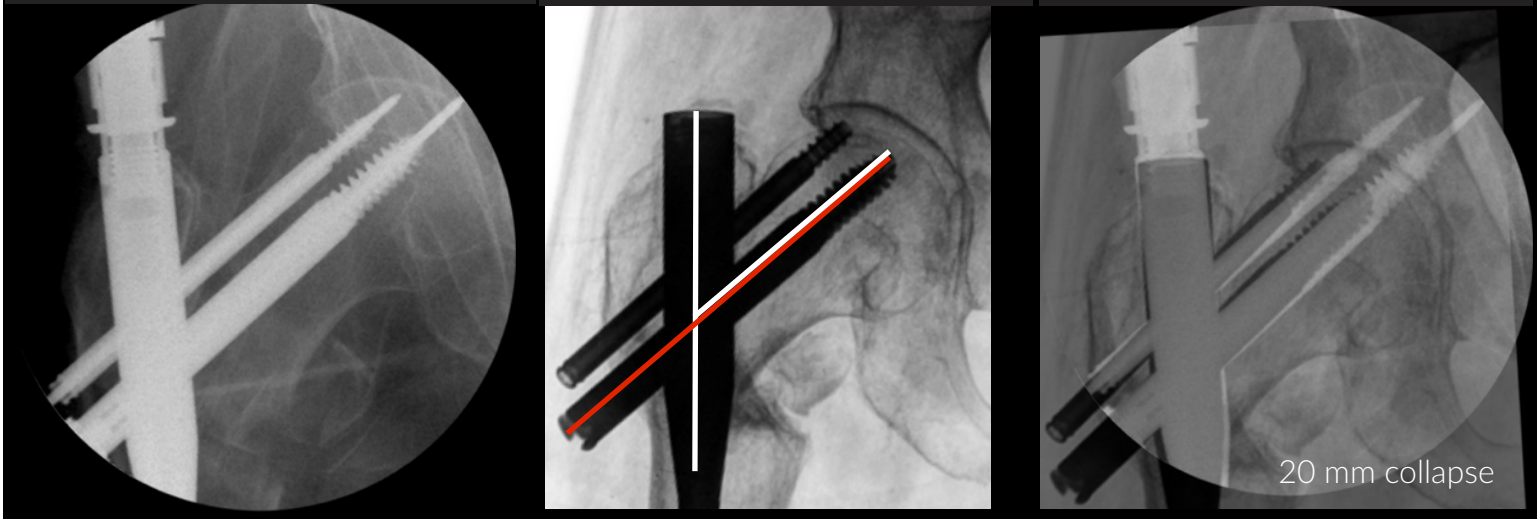


Fig. 5: Lateral displacement of LW+GT, metaphyseal compaction/impaction and implant telescoping.

A certain amount of displacement of the LW and GT along the screw axis evident at 0 weeks because of the lack of buttress. Slight implant telescoping. Between 0 and 87 weeks further implant telescoping due to metaphyseal impaction, because the movement of the isolated HNF and the two screws are only blocked when they abut against the nail.

The fracture healed despite the reduction in varus and suboptimal screw placement, showing that consolidation cannot be the only goal.

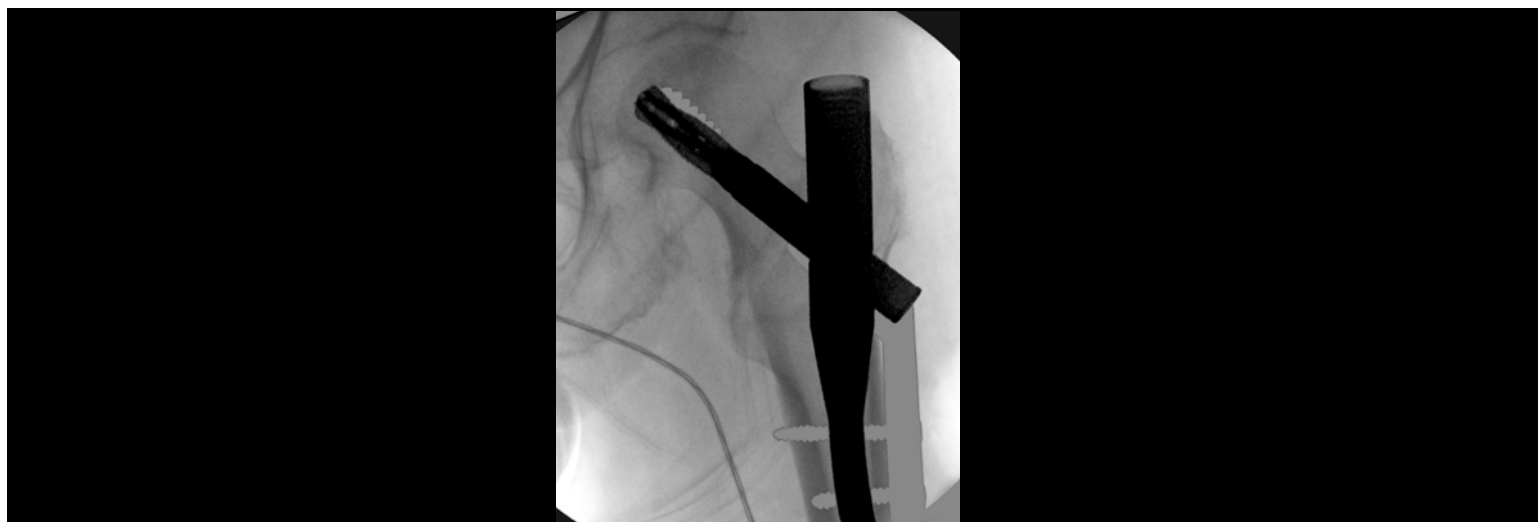
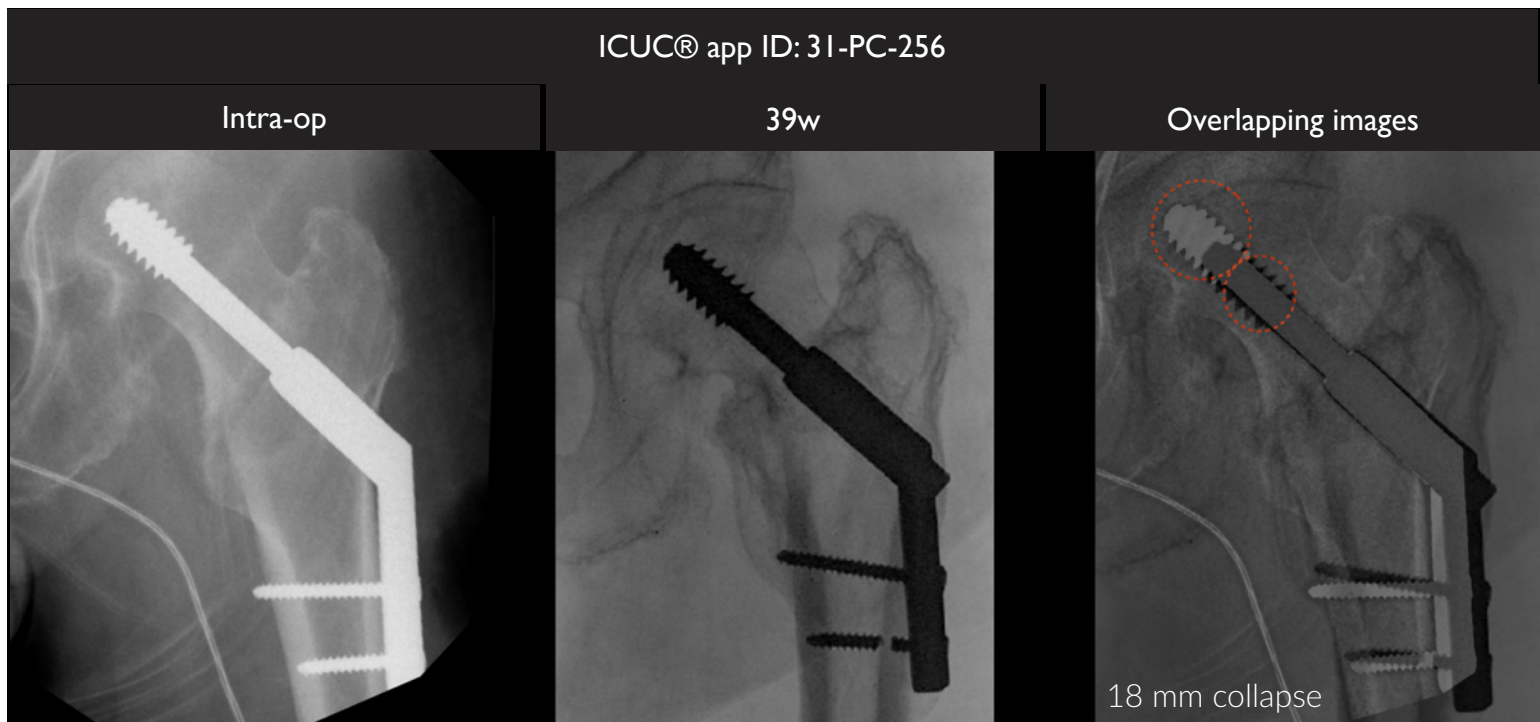


Fig. 6: ICUC® Case, app ID:31-PS-256.

Above: Important (18 mm) telescoping without fracture of LW. Broken greater trochanter, thin but unbroken lateral wall. Isolated head-and-neck fragment (HNF) which deeply impacts into intertrochanteric cancellous bone producing an important shortening.

Below: Fluoroscopy image on fracture table of case 256 (left image) with a superposed nail.

Open question: Would a nail have done better, because HNF would abut earlier against nail diminishing implant telescoping?

In conclusion:

Relative movements between implant parts and those between anatomical elements of the proximal femur require separate analysis for a differentiated understanding.

Excessive (≥ 20 mm) implant telescoping between lag screw and nail usually occurs only when the LW+GT are displaced laterally or when an extramedullary implant is used in cases of isolated HNF and comminution of the ITZ allowing excessive compaction/impaction.

For these cases intramedullary devices are considered advantageous as theoretically stop the movement at an earlier position even when we found at our database two cases: ICUC® app ID: 31-PC-294 and 31-PC-772, where we detected a collapse ≥ 20 mm.

Excessive telescoping allowed fracture consolidation in most of the cases. So we may think consolidation should not be the only goal.

FURTHER READINGS

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