INTERNAL FIXATION WITH HANSSON TWIN HOOK FOR TROCHANTERIC FRACTURES

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INTERNAL FIXATION WITH HANSSON TWIN HOOK FOR TROCHANTERIC FRACTURES (Abstract): Hansson Twin Hook was recently developed as an alternative to the classical Dynamic Hip Screw. In the present study we aimed at presenting our results obtained by using the HTH in the treatment of trochanteric fractures. **Materials and methods:** Over a 2-year interval, 55 patients with trochanteric fractures were treated by reduction and internal fixation using HTH system. According to the AO fracture classification, we recorded 21 cases of 31.A1 fractures and 34 cases of 31.A2 fractures. **Results:** Clinical assessment at 3 months postoperatively using Merle D'Aubignier scale showed very good results in 41 (82%) patients, good in 7 (14%) patients and poor in 2 (4%) patients (two patients presented fixation failure). In these 2 patients, surgical reintervention was performed -implant removal and its replacement with a Dynamic Condylar Screw with good results at 3 months follow-up. **Conclusions:** Osteosynthesis with Hansson Twin Hook is a good choice in trochanteric fractures. Since it is a new developed implant, more studies are necessary for clinical validation of its value. **Keywords:** TWIN HOOK, TROCHANTERIC FRACTURES, ROTATIONAL STABILITY.

The results of internal fixation in proximal femoral fractures are disappointing in the elderly. Many studies showed a high reintervention rate associated with functional impairment and an increased morbidity of 35 % to 48% (1, 2). Dynamic hip screw (DHS) and short Gamma nail systems are commonly used for internal fixation of trochanteric fractures with favorable clinical outcomes (3). However, 1 to 4% of fractures fixed with DHS and 6-8% of those fixed with short Gamma nail require reintervention for “cut-out” (2).

The Hansson Twin Hook system (HTH) was developed as an alternative to the lag screw in combination with a dynamic plate. It consists of a side-plate combined with a sliding screw from which two apical hooks are deployed in opposite directions - anterior and posterior.

Before clinical use, comparative biomechanical studies of the new Twin Hook system and DHS systems - that rely on lag screw and are now considered “golden standard” in the treatment of trochanteric fractures - were conducted. Both the load
test and angulation and torsion tests revealed that to achieve the same deformation more force is needed for HTH system. These studies recommend HTH system as being biomechanically superior to conventional threaded screw implants. After receiving approval for clinical use, the first study that described its results appeared in 2000 (1); since then, only few studies were published on this topic (4, 5, 6, 7).

In the present study we aimed at presenting our results obtained by using the HTH in the treatment of trochanteric fractures.

**MATERIALS AND METHODS**

Over a 2-years interval, 55 patients with trochanteric fractures were treated by reduction and internal fixation using HTH system. Age-group distribution showed that most patients (n=20) were in the seventh decade of life (36.3%); mean age was 76 years (range 64-85 years), there was a predominance of female patients (female to male ratio = 36/19) and most patients were from rural areas. According to the AO fracture classification, we recorded 21 (38.2%) cases of 31.A1 fractures (stable trochanteric fractures) and 34 (61.8%) cases of 31.A2 fractures (unstable trochanteric fractures).

Close reduction was performed with the patient positioned on fracture table in all but 6 (10.9%) cases which required open reduction. The femoral head diameter was measured on preoperative X-rays. Incision length, surgery duration, cephalic screw length and femoral plate length were recorded. On anteroposterior and lateral postoperative X-rays, the adequacy of cephalic implant placement was assessed using the quadrants of Baumgaertner and the “tip-apex” distance was measured (8).

Postoperatively, patients were kept in bed for one day, the next day could sit at bedside and the third day resumed walking with the aid of a walker (partial weight-bearing). Patients were assessed clinically and radiographically immediately postoperatively and at 3 months, 6 months, and 1 year. Clinical outcome was assessed using Merle D’Aubignier score.

**RESULTS**

In our patients the size of femoral head was 42 to 62 mm, with an average of 44.4 mm in women (ranges 42 to 48 mm) and 55.8 mm in men (ranges 52 to 62 mm). The average surgery time was 36 minutes (range 26 to 48 minutes), and average incision length 6 cm (range 4 to 8 cm). The average length of the cephalic implant was 85 mm. Plates with three bicortical screws were used in 41 cases and with 4 bicortical screws in 14 cases (fig. 1).

On anteroposterior and lateral postoperative X-rays, the cephalic implant was in quadrant 5 (quadrants of Baumgaertner) in all cases but one; “tip-apex” distance had an average of 24.3 mm. The one case in which the implant was placed in the inferior quadrant had a tip-apex distance of 39.7 mm (fig. 2), significantly bigger than the average of all others.

Lateral X-ray view was used in all cases for measuring the distance between the tip of the hook and the joint, both in the anterior and in the posterior direction. There were no cases in which the hook penetrated the joint after expansion; the average distance between the tip of the hook and the joint was 9 mm, with a minimal distance of 2 mm.

At the 3-months postoperative follow up, radiological consolidation of fracture
site was seen in all but 2 (3.63%), patients one presenting femoral variation with a tendency for cephalic implant cut-out (fig. 3), and the other one cephalic implant cut-out, these two cases requiring surgical reintervention. Clinical assessment at 3 months postoperatively for 50 (90.9%) patients using Merle D'Aubignier scale showed very good results in 41 (82%) patients, good in 7 (14%) patients and poor in 2 (4%) patients (the 2 patients with fixation failure). In these 2 (3.63%) patients, surgical reintervention was performed - HTH removal and its replacement with a DCS, with good results at 3 months follow-up.

Fig. 1. Internal fixation with Hansson Twin Hook in a trochanteric fracture. Correct positioning of the implant. Preoperative X-ray (A), antero-posterior postoperative X-ray (B), lateral postoperative X-ray (C).
Fig. 2. Internal fixation with Hansson Twin Hook in a trochanteric fracture. Inferior positioning of the implant with a tip-apex distance of 39.7 mm; antero-posterior postoperative X-ray (A), lateral postoperative X-ray (B).

Fig 3. Fixation failure in a 71-year-old patient at 3 months after surgery.

One year after surgery, 37 (67.2%) patients were available for follow-up. For those, the results were very good in 13 (35.1%) patients, good in 20 (54%) patients and poor in 4 (10.9%) patients. In most patients, the results of clinical assessments were not influenced by implant placement - except the two “fixation failure” cases and
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fracture type, but rather by general health status and number of associated comorbidities.

DISCUSSION

Osteosynthesis with HTH in trochanteric fractures has recently been proposed and therefore there are very few studies in the literature on the subject. Most studies on this new implant took place in Scandinavian countries where Hansson Hook is traditionally used in femoral neck fractures.

Olsson et al. (5) conducted in 2000 a retrospective study on 102 patients with hip fractures surgically treated using the HTH compared to a classic DHS compression system and Medoff plate (MSP). Technical errors in HTH system insertion occurred intraoperatively in 7 cases, but overall, postoperative failures were equally distributed between the 2 groups. They concluded that HTH system gives adequate fixation comparable to that produced by DHS and MSP. Also in 2000, Olsson (4) conducted a clinical and biomechanical study on 342 trochanteric fractures comparing the resistance and stability of HTH with MSP. He found an enhanced stress resistance with the use of MPS than DHS in intertrochanteric fractures, and comparable stability with the use of MSP and Gamma system in sub trochanteric fractures; in addition, HTH provides enhanced migration resistance under both axial and torsional loading. In 2002, Olsson et al. (6) published another biomechanical study conducted this time in artificial bone comparing HTH and DHS systems; they found that the two implants gave similar fixation in terms of resistance but the degree of impaction at fracture site was superior with HTH.

In 2008, Hagino et al. (9), compared the results obtained by using HTH and DHS systems in terms of technical accuracy: HTH was used in 17 patients, being inserted into the center of femoral with an average tip - apex distance of 22.3 mm; DHS was used in 202 patients with an average tip - apex distance of 14.6 mm. No device failure or cut-out was found. They concluded that using HTH system requires more surgical skill than using DHS, because failure to insert the screw into the center of the femoral head may cause intraarticular perforation by the hooks.

In 2008, Olséen et al. (10) compared the fixation stability of HTH reported by 55 surgeons in 157 elderly patients with trochanteric fractures, 83 % of which were unstable. They found technical intraoperative errors in 7 cases, HTH had not been placed centrally in the femoral head, of these only two presenting fixation failures at the 2-year follow-up; they concluded that HTH system is easy to use, gives adequate fixation in the bone of elderly osteoporotic patients with trochanteric fracture and has a low failure rate.

Roerdink (11) published his study in 2009, starting from the assumption that intracapsular fractures are frequently accompanied by pseudarthrosis and aseptic necrosis of the femoral head performed a comparative biomechanical study in synthetic bone to compare DHS, HTH and dynamic locking blade plate (DLBP). He concluded that HTH system gives a stable fixation with a minimum amount of replaced bone, is a dynamic implant, and its angular and rotational stability is 2 times higher than that of DHS.

CONCLUSIONS

The results of our research have shown that osteosynthesis with Hansson Twin
Hook (HTH) gives a superior biomechanical stability compared to DHS systems and the shorter skin incision results in earlier mobilization, less bleeding and esthetic benefits. HTH is rotationally stable, thus being the ideal implant in basic cervical fractures characterized by an increased tendency to rotate.

In most patients one-year follow-up demonstrated good and very good outcomes. HTH allows less disruption to cancellous bone than conventional DHS systems, thus favoring stability; insertion of cephalic implant is atraumatic, fact of importance in preventing aseptic necrosis of the femoral head. Insertion technique is easy and does not require long-term training especially in surgeons familiar with DHS-type systems; in osteoporotic patients’ caution is recommend in using HTH because being less bulky there is a higher risk of articular penetration.

REFERENCES