Comparison Between Cephalomedullary Device And Dynamic Hip Screw In The Management Of Stable Intertrochanteric Fractures

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ABSTRACT

Objective: To evaluate and compare the clinical and radiological outcomes of patients with stable intertrochanteric fractures treated with proximal femoral nail vs. dynamic hip screw.MSixty patients with stable intertrochanteric fractures, aged over 18 years, were randomly divided into the proximal femoral nail and dynamic hip screw groups. Dynamic hip screw with a three-hole side-plate and an anti-rotation screw were used, as well as a modified ultra-short proximal femoral nail for the smaller Asian population. The intra-operative, early and late complications were recorded, and the functional outcome of each group was assessed using the Harris HiResulIn the dynamic hip screw group, the one-month mean Harris Hip Score was slightly lower than that of the proximal femoral nail group. However, at the three- and six-month monthly follow-ups, the dynamic hip screw group presented higher mean scores than the proximal femoral nail group; at the one-year follow-up, both the groups attaConclusiProximal femoral nail provides a significantly shorter surgery with a smaller incision that leads to less wound-related complications. However, the incidence of technical errors was significantly higher in proximal femoral nail when compared with dynamic hip screw as it is a technically more demanding surgery that leads to more implant failures and the consequent re-opeKeywords: Bone nails, Bone screws, Fracture fixation, intramedullary/instrumentation, Hip Treatment of stable intertrochanteric fractures of the femur with proximal femoral nail versus dynamic hip screw: a comparative study.

Background: The frequency of Intertrochanteric fractures increased because of increased life span and increased road traffic accidents. Intramedullary (cephalomedullary device) and extramedullary(dynamic hip screw)fixations are the two initial choices for management of intertrochanteric fractures.

Aim: To assess the postoperative results of femur stable intertrochanteric fractures managed using cephalomedullary device or dynamic hip screw.

Methods: Our prospective, observational and randomized investigation included 112 patients, aged 63-79 yr, of both sexes and with femur stable intertrochanteric fractures. Patients were grouped according to type of management used into the cephalomedullary device group (GI, n=57) and dynamic hip screw group (GII, n=55) at Royal Rehabilitation Center, Amman, JORDAN, during the period June 2016- June 2018. Reduction was performed using Closed or indirect methods. Follow up intervals were achieved at 14days after surgery, then at 60,120 and 240 days for the first year and then once per year. The postoperative profile, including early with late complications and function (using the Harris Hip Score) was followed up.

The data was evaluated statistically using student's t-test. P-value was considered statistically significant if it was less than 0.05.

Results: 14 days postoperatively, the median Harris Hip Score was better in group II than that of group I(not statistically significant). At the postoperative 60 and 120 days intervals, group II had more median scores than group I. At the postoperative 240days interval, both groups experienced comparable scores.

Conclusion: Cephalomedullary device caused remarkably less non-significant incision-induced hazards, but there were more non-significant prosthesis failures and re-surgery.

Keywords: femur stable intertrochanteric fractures; cephalomedullary ; hip screw; postoperative profile: hazards, functionality.

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Introduction

The frequency of Intertrochanteric fractures increased because of increased life span and increased road traffic accidents. Intertrochanteric fractures are approximately 50% of the hip (proximal femoral) fractures in old people (1).

In 2015, a prospective cohort of 743 patients found that most of patients (60%) were labeled as stable trochanteric and only 40% as unstable trochanteric or subtrochanteric fractures (2). Others showed that the AO/OTA type 31-A1 and 31-A2 fractures, which are stable, were most frequent (78%)(2). Stable fracture has an intact posteromedial cortex and unstable fracture has comminution of the posteromedial cortex.

Evans classified intertrochanteric fractures into:

Type I: Fracture line extends upwards and outwards from the lesser trochanter (stable).

Type I fractures can be subdivided as:

Type Ia: Undisplaced two-fragment fracture.

Type Ib: Displaced two-fragment fracture.

Type Ic: Three-fragment fracture without posterolateral support, due to displacement of greater trochanter fragment.

Type Id: Three-fragment fracture without medial support, due to displaced lesser trochanter or femoral arch fragment .

Type Ie: Four-fragment fracture without postero-lateral and medial support (combination of Type III and Type IV)

Type II: Fracture line extends downwards and outwards from the lesser trochanter (reversed obliquity/unstable).

These fractures are unstable and have a tendency to drift medially.As fracture occurs via the cancellous bone which has excellent blood supply, malunion is inevitable. Management aims to regain the pre-insult condition with early movement by internal fixation to increase comfort and reduce complications. Fractures of the proximal femur and hip are frequent causes of complications in old patients.

Intramedullary and extramedullary fixations are the two initial choices for management of intertrochanteric fractures. The dynamic hip screw, frequently used in extramedullary fixation, is now the corner stone prosthesis in management of stable fractures. The proximal femoral nail was introduced in 1997 for management of trochanteric fractures. Proximal Femur Nailing fixation causes more biomechanical stability by decreasing the distance between hip joint and implant (3). Proximal femoral nail is frequently used in the intramedullary fixation. PFN was added for management of intertrochanteric fractures to avoid prosthesis-acquired hazards and enhance the operative management of unstable intertrochanteric fractures .It attains more angular and rotational stability with less prosthesis-induced hazards (3).PFN maintains rotational stability with a remarkable decrease in distal stress and an increase in total stability.

The goal of our investigation was to assess the postoperative profile of stable Intertrochanteric fractures managed using a proximal femoral nail compared to dynamic hip screw.

Methods

This is a prospective,observational and randomized investigation that enrolled 112 patients of femur stable Intertrochanteric fractures ,aged 63-79 yrs of both sexes managed at Royal Rehabilitation Center, Amman, JORDAN, during the period June 2016- June 2018,
after obtaining written consent from all patients and approval from the local ethical and research board review committee of the Royal medical services. Patients with pathological or complicated fractures were ruled out from the investigation. Patients were operated upon as soon as possible. Dynamic hip screw was used in group II (n=55) and cephalomedullary device was used in group I (n=57). Reduction was performed using closed or indirect methods.

After surgery, all patients were scheduled for comparable rehabilitation program. Follow up intervals were achieved at 14 days after surgery, then at 60,120 and 240 days for the first year and then once per year. Based on the AO fracture classification system, type A1 is stable and type A3 (reverse obliquity fractures) is unstable. A2-1 fractures are stable whereas A2-2 and A2-3 fractures are unstable.

Postoperative early and late complications were registered for both groups. Postoperative Functionality was evaluated using Harris hip Scores(4).
Statistics Data was evaluated statistically using student's *t*-test using the IBM SPSS Statistics 21.0 program (IBM SPSS Statistics for Windows, version 21.0, Armonk, NY: IBM Corp.) and the SAS 9.3 program.. P-value was considered statistically significant if it was less than 0.05. Categorical variables were studied by the Pearson Chi-square test.

Results

Median length of surgical wound was significantly less in group I ($P < 0.01$). Mean bleeding was significantly more in group II ($P < 0.01$). Table I. The time of prosthesis fixation was comparable in both groups. Time needed for wound closure was significantly more in group II.

Table I: Patients demographics.

		GII(DHS)	**GI(PFN)**
NO		55	57
Age(yrs) median (range)		66.4 (65–79)	64.2 (63–75)
Gender (no)	**M**	35	30
	F	20	27
Duration between fracture and surgery(days) median		6.8	6.4
Length of surgical wound (cm) median		8.7	5.6
Bleeding (ml) Median		0.5 L	0.25 L

Lengthened drainage and superficial infections were more frequent but not significant in group II (TableII). Frequency of loss of reduction, prosthesis failure and re-surgery was more in group I (Table II) (P>0.05). Median shortening was comparable in both groups. In group II, at the first 14 days postoperative interval, the median Harrison hip score was less than that of group I (P > 0.05) (Table III). At postoperative 60 and 120 days intervals, group II patients experienced more median scores than group I (P < 0.01).At postoperative 240 days interval, both groups had comparable scores (P value > 0.05).

Table II. Postoperative complications.

		GII(DHS)	GI(PFN)	P value
EARLY				
	lengthened drainage	4(7.2%)	1(1.7%)	>0.05
	Superficial infection	2(3.6%)	1(1.7%)	>0.05
LATE				
	Loss of reduction	2(3.6%)	3(5.2%)	>0.05
	Prosthesis failure	2(3.6%)	4(7.1%)	>0.05
	Re- surgery	1(1.8%)	4(7.1%)	>0.05
	Shortening(median)	0.63 cm	0.61 cm	>0.05

Table III: Postoperative function using the Harris hip score.

Post.op.period	GII(DHS)	GI(PFN)	P value
14 days	36.9	38.2	>0.05
60 days	65.5	59.7	<0.05
120 days	90.8	84.3	<0.05
240 days	96.3	96.1	>0.05

Discussion

Regarding the management of intertrochanteric fractures, dynamic hip screw is the corner stone of fixation mainly for the stable ones. The proximal femoral nail was intended to bypass prosthesis induced hazards of dynamic hip screw for unstable intertrochanteric fractures. The proximal femoral nail intramedullary prosthesis avoids the medialization of the shaft (5). Proximal femoral nail gives the benefits of better biomechanical power, less period of operation and less invasive operation. However,it has an increased frequency of prosthesis induced complications and re-surgery (5). A previous study found that proximal femoral nail is number one for management of intertrochanteric fractures with less incidence of fixation failure, bleeding and hospital admission (5). Proximal femoral nail was better than dynamic hip screw for intertrochanteric fractures with a less frequency of reopening and fixation failures; Proximal femoral nail experienced less frequency of major hazards (incision infection and thromboembolism); Proximal femoral nail might decrease the surgical bleeding , duration of surgery, fluoroscopy exposure and admission(3).

In our study, the median length of surgical incision was less in the proximal femoral nail group, as in (6,7). Time needed for wound closure was significantly more in dynamic hip screw group because of bigger incision and larger dissection as in proximal femoral nail, as in (8,9). Early complications were superficial infections and lengthened discharge from wound in dynamic hip screw group. These were because of the bigger incision and larger dissection in dynamic hip screw group. Late complications were increased frequency of loss of reduction, prosthesis failure and re-surgery in proximal femoral nail group, as in (10). Prosthesis failure was recorded in six patients (two in dynamic hip screw group and four patients in proximal femoral nail group). Loss of reduction included varus collapse in five of patients of prosthesis failure (two in dynamic hip screw group, three in proximal femoral nail group). Five patients had to be re-operated and in one patient (proximal femoral nail), screws were removed. Final median shortening was similar in both groups. In our investigation all patients were of stable intertrochanteric fractures which were reduced during surgery and dynamic hip screw did not cause any shortening. Primarily, functional scores were less in the dynamic hip screw group, but at 60 and 120 days intervals, the dynamic hip screw patients looked better than the proximal femoral nail group because of reduced range of abduction in proximal femoral nail group in comparison to dynamic hip screw patients. At 240 days interval, the scores in both groups were comparable, because of the reaquiring of abductor strength. Comparable final results may be produced by the dynamic hip screw and proximal femoral nail (11). It is important to discuss other factors in the device selection including price, fracture types and familiarity. Price of intramedullary nailing is more than dynamic hip screw. For stable fractures, extramedullary or intramedullary fixations might attain a safe and efficient option. For the unstable fractures, intramedullary prosthesis has less fracture acquired hazards and failures (3). Proximal femoral nail is inserted by less invasive technique, permitting reduction of soft tissue dissection with decreasing operative insult and bleeding. Surgical duration, bleeding during surgery and length of surgical wound are remarkably less. The limitations of our investigation included the small number of cases and the limited follow-up period.

Conclusion

Proximal femoral nail produced a significantly shorter operation with a smaller incision and less wound induced complications. The proximal femoral nail and the dynamic hip screw have comparable final functionality postoperative results. In stable intertrochanteric fractures, the proximal femoral nail has no better effect than the dynamic hip screw regarding the final shortening.

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