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Research Paper

The clinical and functional results of trochanter major fixation in elderly patients who underwent hip arthroplasty with unstable pertrochanteric fractures

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Abstract

Aim: To evaluate the effect on the clinical results of fixation methods of trochanter major fractures in patients with unstable pertrochanteric fractures who underwent hip arthroplasty.

Material and Method: Evaluation was made of 72 patients with an unstable pertrochanteric fracture who underwent hip arthroplasty with fixation of the trochanter major between 2011 and 2016. A tension band was applied to 34 patients and trochanteric grip plates and cables to were applied to 38 patients. Evaluation of the patients was made using the Parker Mobility Score and the Harris Hip Score.

Results: The mean age of the 72 patients who participated in the study was 84 (70-96), and the mean follow-up was 18 (6-30) months. An increase was seen in the mean clinical scores of the patients; 6 months postoperative Parker Mobility Score (7.0) and Harris Hip Score (78.9). Union in the trochanter major was determined in 58 patients. In 2 patients who received tension bands, breakage occurred in the tension wire and there was a dislocation of the Kirschner wires. In 2 patients where trochanteric grip and cable were used, there was cable breakage and dislocation of the plate, and osteolysis was determined in the trochanter major in 2 patients and superficial infections and persistent discharge were seen in 3 patients.

Conclusion: Fixation devices applied with different techniques are effective methods in the treatment of major fractures and contribute to early mobilization after hip arthroplasty. In weak patients, a grip plate may cause infection and persistent discharge related to skin irritation and there is a greater risk of osteolysis and trochanteric region pain developing compared with the application of tension band.

Keywords: Trochanter major, fixation, hip, fracture

INTRODUCTION

Treatment of unstable intertrochanteric fractures, which may occur with low-energy trauma in elderly patients with osteoporosis, are still controversial [1]. In older patients with unstable intertrochanteric fractures, it may not always be possible stable fixation to achieve early weight-bearing and mobilization [1,2]. Although fracture fixation with osteosynthesis is the most preferred method in intertrochanteric fractures, primary arthroplasty can be selected for older patients and those with multi-fragmented fractures or fractures where sufficient reduction cannot be obtained during fixation [2,3]. In some patients with advanced osteoporosis, even if appropriate fixation can be achieved, failure may develop. In elderly patients with unstable intertrochanteric fractures, stabilization of the trochanter major fracture with hip arthroplasty is helpful for the early union of the fracture and early mobilization [4]. If there is non-union of the fracture in patients with a trochanter major fracture who have undergone arthroplasty, pain in the trochanteric region, limping related to abductor muscle failure, and hip dislocation may be seen. Internal fixation of the trochanter major can be made with different methods. However, the superiority of one method over another has not been shown in the literature [5].

The aim of this study was to evaluate the clinical results and efficacy of fixation methods in patients with a trochanter major fracture who underwent hip arthroplasty where fixation was provided with a trochanteric grip device together with a cable or with a tension band.

MATERIALS AND METHODS

The study included 72 of 84 patients in 2011-2016 with unstable intertrochanteric fracture with concomitant trochanter major fracture. The study was retrospective. Four patients who died postoperatively and 8 patients who were followed up for less than 6 months were excluded from the study. The patients comprised 56 females and 16 males with a mean age of 84 years (range, 70-96 years). Bipolar hemiarthroplasty was performed in 62 patients [straight system (Tipsan, Turkey) $n=40$, and calcar stem (Tipmed, Turkey) $n=22$] and total arthroplasty (Tipsan, Turkey) in 10 patients. Cementless arthroplasty was preferred to prevent cement related complications (trochanter major nonunion, hypotension).

All patients underwent surgery in the lateral decubitus position with a modified Gibson incision. Hip arthroplasty was performed with a posterior approach. The fractures were classified using the AO/OTA classification system, according to which 28 patients were 31A2.2 and 44 were 31A2.3. In the 62 patients who underwent bipolar arthroplasty, trochanteric grips (Tipsan, Turkey) were used in 34 and tension bands in 28. In the tension band application, after placement of the femoral stem, 2 Kirschner (K)-wires were placed within the bone cortex or between the prosthesis and the bone (Fig. 1). In the 10 patients who underwent total arthroplasty, tension bands were used in six and trochanteric grips in 4 (Fig. 2 and 3). The grips were placed on the trochanter major and fixation was achieved with at least 2 cables (Fig. 3). Clinical evaluation was made using the Parker Mobility Score and the Harris Hip Score.

STATISTICAL ANALYSIS

Statistical analyses of the study data were made using SPSS 20 software (SPSS Inc, Chicago, IL, USA). The Student's independent samples t-test was used for parametric data and the Mann-Whitney U test and Fischer's exact test for non-parametric data. The results are shown as mean \pm standard deviation (SD) values. A value of $p < 0.05$ was accepted as statistically significant.

RESULTS

No statistically significant difference was determined between the two groups in respect of time to mobilization, time to bone union or operating time ($p > 0.05$). The mean operating time was 80 mins (range, 55-120 mins). The mean follow-up period was 18 months (range, 6-30

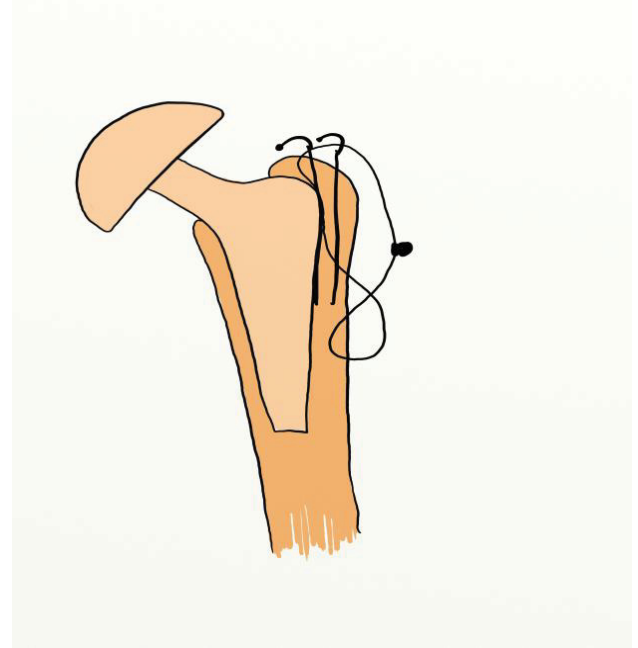


Fig. 1. Schematic image of the application of tension band

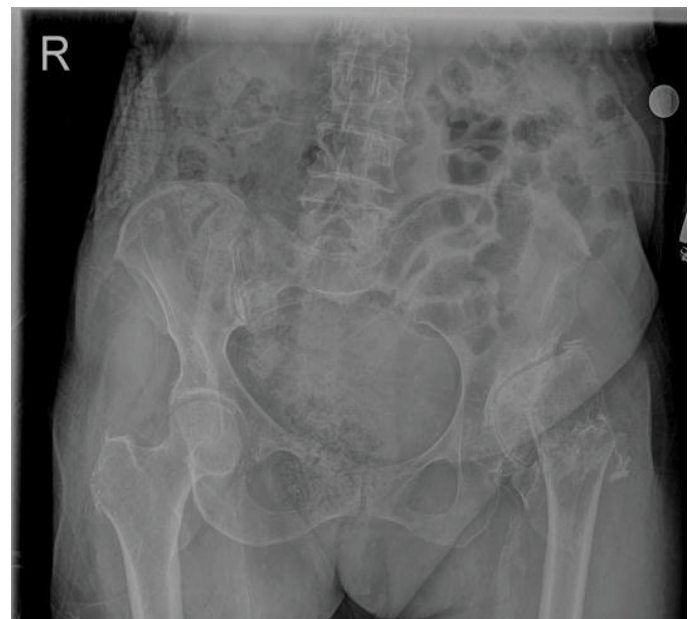


Fig. 2. Preoperative radiograph of unstable intertrochanteric fracture in a patient with coxarthrosis

months). All patients were mobilized on postoperative day 1. For 6 weeks, the patients were mobilized with a walker with weight-bearing as tolerated. At the end of 6 months, 48 of the 72 patients had returned to the preoperative level of daily activities. The Parker Mobility Score (0-9) was determined as a mean of 7.0 on average at 6 months postoperatively. At a mean 6 months postoperatively, the mean Harris Hip Score was determined as 78.9 (Table 1). Bone union in the trochanter was seen in 58 of the 72 patients at 6 months (Fig. 4 and 5). Non-union developed in 14 patients ($n=6$ tension band, $n=8$ grip plates).

In the total arthroplasty group, the clinical scores were better (Parker score 7.2 Harris score 81.1) because the patients treated with total arthroplasty were younger and more active ($p=0.436$).

Although there was no difference between the groups in terms of limping, more pain was detected in the trochanteric region in the trochanteric grip group of patients.

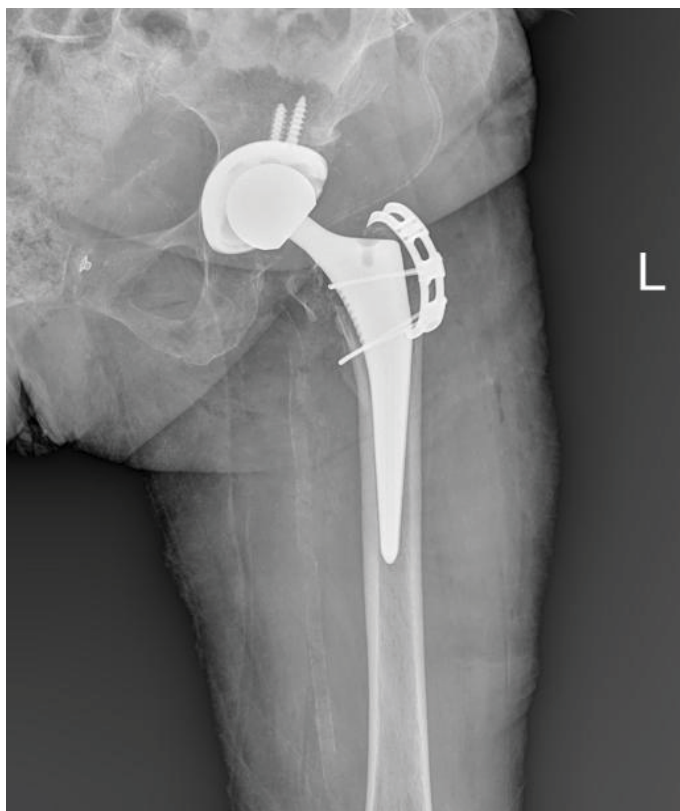


Fig. 3. Postoperative radiograph of total hip arthroplasty and trochanteric grip

Table 1. Pre- and postoperative clinical evaluation scores

	Preoperative	Postoperative
Parker mobility score	7.8	7
Harris hip score	-	78.95



Fig. 4. Unstable 31A2-2 type intertrochanteric hip fracture preoperative radiograph

Breakage of the tension wire and dislocation of the K-wires were seen in 2 patients in the group who received tension bands. In 1 patient, the wire was displaced subcutaneously and in another patient deep infection was seen which required removal of the prosthesis.

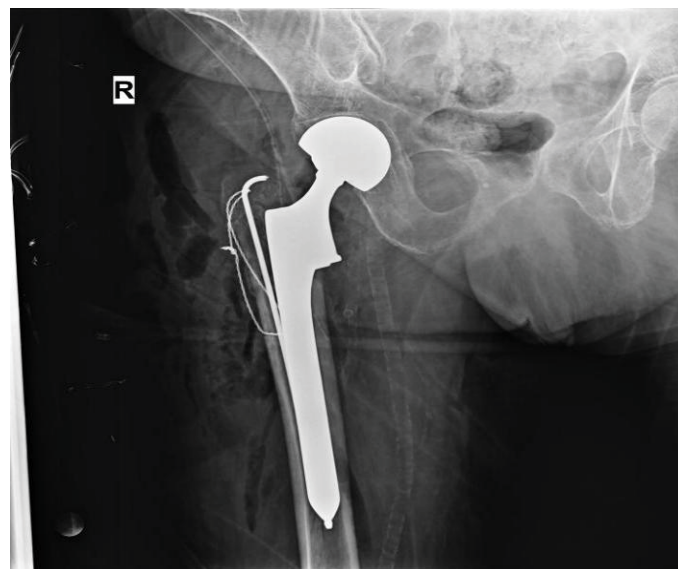


Fig. 5. Postoperative 6-month radiograph after hip arthroplasty and tension band

Table 2. Complications seen according to the trochanter major fixation methods following hip arthroplasty

	Tension band	Trochanteric grip plate
Superficial infection	-	3
Trochanteric osteolysis	-	2
Trochanteric region pain	-	2
Deep infection	1	-
Implant dislocation	3	2
Impingement	1	2

Table 3. Complications rates according to the fixation method: Trochanteric grip application compared with the tension band technique

			Fixation method		Total
			Tension band	Trochanteric grip	
Complication	Present	number	4	9	13
		% of total complications	30.80%	69.20%	100%
	Absent	number	30	29	59
		% of total complications	50.80%	49.20%	100%
Total		number	34	38	72
		% of total complications	47.20%	52.80%	100%

Table 4. Difference between the groups in respect of the Harris hip score

		n	Mean	Std. deviation	Std. error mean
Age	Tension	34	80.794	5.8712	1.0069
	Band grip	38	85.026	6.4115	1.0401
Harris	Tension	34	79.441	4.9555	0.8499
	Band grip	38	78.79	5.1892	0.8418

Osteolysis developed in the trochanter major in 2 patients who received trochanter grip group and in another 2 patients, plate dislocation was seen following cable breakage. In 3 patients, superficial infections were observed following skin irritation associated with grip pressure (Table 2). These 3 patients were frail with thin subcutaneous tissue and the trochanteric plate was later removed in 2 patients. Although no statistically significant difference was determined between the two groups with respect to the complication rates ($p=0.231$), approximately 2.5-fold more complications were seen in the group grip and cable (Table 3). No statistically significant difference was determined between the two different techniques in respect of the operating time, Harris Hip Scores (Table 4) and Parker Mobility Scores ($p>0.05$)^{*}.

DISCUSSION

In unstable intertrochanteric fractures seen together with osteoporosis in elderly patients, fixation difficulties and problems in early mobilization may be experienced. In patients where early mobilization cannot be achieved, increased rates of systemic complications are seen. Fixation is the first treatment to be selected in fractures in the trochanteric region. The use of primary prosthesis is limited in the treatment of these fractures [6], although it may be selected when accompanied by degenerative symptomatic hip arthritis or in multi-fragmented fractures in patients with low bone quality [3,6,7]. After the fixation of advanced osteoporotic unstable intertrochanteric fractures, it can be difficult to protect the reduction until union. There can be secondary displacement, non-union, failure, and poor results [8,9]. In the current study, arthroplasty was applied to patients with unstable intertrochanteric fracture and high risk of post-fixation failure.

An increased risk of trochanter major fracture has been shown in arthroplasty performed following PFN [10]. Due to these complications and fixation difficulties, some authors prefer primary hip replacement in these types of fractures [11-13]. In a study by Sidhu et al., satisfactory results were reported from primary arthroplasty in elderly patients with advanced osteoporosis [11]. Previous studies have reported complication rates of 5%-12% and failure at 5%-16% following fixation of unstable intertrochanteric fractures [14-16]. Full weight-bearing after primary fixation may be postponed as elderly patients may not be adherent with partial weight-bearing and thus mobilization can be delayed. This can cause pulmonary complications and other complications such as venous thrombosis, urinary tract infections, and pressure sores [17-20].

In a study by Schuster et al., It was reported that there is 97% union in the trochanter major with vertical and horizontal wires among the patients with trochanteric osteotomy and revision total hip arthroplasty [21]. In our study, non-union was seen in 14 patients among 72, which is 19%. The high rate of the union in Schutzer's study was attributed to trochanteric osteotomy being controlled and with low energy. According to us, the relatively low union rate of our study was due to our patients'being old, having low quality and osteoporotic bone structure.

While Ritter et al. identify 32% rate of cable failure in revision hip arthroplasty done by trochanteric fixation with trochanteric grip and cable, Koyama et al. identified 4 cable failure and 19 trochanteric non-union in 62 patients [22,23]. Whereas in another study by Grimsrud et

al. of 39 patients with an unstable intertrochanteric fracture, treatment with bipolar arthroplasty and cerclage cables were reported to be safe with low complication rates, early weight-bearing, and high satisfaction rates [24]. In the current study, the improvement was seen in the hip scores and early reliable mobilization results were obtained (Table 4).

In unstable intertrochanteric fractures, stable fixation of the trochanter major in the application of hip arthroplasty is a method that accelerates bone union and increases hip functions. Hamadouche et al. applied fixation with trochanteric plates and cables to displaced trochanter major fractures in patients who underwent total hip arthroplasty and reported that very good cortical contact and the union was obtained [25]. Among 21 patients who underwent arthroplasty and modified double tension bands, Kim et al. reported that revision with trochanteric plate was required in only 1 [26]. Baril et al. obtained high union rates and stable fixation of the trochanter with trochanteric plates and superelastic cables [27]. In the current study, stable fixation was obtained and an improvement was seen in hip scores with the use of hip arthroplasty with trochanteric grips and cables. The same efficacy was obtained in patients with tension bands and the hip scores were observed to increase at a similar rate. Although there was no superiority of the trochanteric devices over the tension bands, costs were greater and it was observed that in there could be skin irritation and persistent discharge in frail patients, and it could cause osteolysis and trochanteric region pain in some patients. It was concluded that because the tension band method could provide as much stable fixation as the trochanteric plate and increase the functional capacity of the patient, it could be a safe method.

CONCLUSION

Uncemented bipolar and total hip arthroplasty after unstable intertrochanteric fractures in elderly patients are successful methods with good results. Fixation of a trochanter major fracture is important for early mobilization and the function of the abductor muscle mechanism. Although both the trochanteric grip device and tension band techniques can be used safely for fixation and which help in early union and early mobilization, fewer complications were encountered in the tension band technique in the current study.

The limitations of this study are that the number of patients was low and the follow-up period was short. The study was retrospective. Sufficient standardization could not be achieved with total and partial arthroplasty. Which type of trochanter major fixation was performed after the arthroplasty was left to the surgeon's choice.

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