



# Treatment of intertrochanteric femur fractures in elderly patients: internal fixation or hemiarthroplasty

## *Yaşlılarda intertrokanterik femur kırıklarının tedavisi: Internal tespit mi, hemiarthroplasti mi?*

Hayrettin KESMEZACAR, Tahir OGUT, M. Gokhan BILGILI, Selim GOKAY, Yüksel TENKECIOGLU

*Istanbul University, Cerrahpaşa Faculty of Medicine Department of Orthopaedics and Traumatology*

**Amaç:** Yaşlı hastalardaki intertrokanterik femur kırıklarında internal tespit mi, yoksa ideal tedavi yöntemi olmasa da, hemiarthroplasti mi yapılması gerektiği konusu tartışmalıdır. Endoprotezin avantajı hastayı bir an önce ayağa kaldırmak, internal tespitin avantajı ise kalça eklemine koruyarak protezin getireceği risklerden kaçınmaktır. Çalışmamızda iki uygulamanın erken dönem sonuçları karşılaştırıldı.

**Çalışma planı:** Femur intertrokanterik kırığı nedeniyle ameliyat edilen ve takiplerde ulaşılabilen 81 hasta çalışmaya alındı. Internal tespit uygulanan 38 hastanın (ort. yaş 77.7; dağılım 65-99) 25'inin, hemiarthroplasti uygulanan 43 hastanın (ort. yaş 80; dağılım 67-97) 22'sinin sağ olduğu saptandı. İki grup ameliyat öncesi özellikler, ameliyattan sonra harekete başlama zamanı, komplikasyon ve ölüm oranı, Barthel Günlük Yaşam Aktivite İndeksi'ne göre değerlendirilen günlük yaşam aktiviteleri açısından karşılaştırıldı. Ortalama takip süresi internal tespit grubunda 22.7 ay (dağılım 6-39 ay), hemiarthroplasti grubunda 22.3 ay (dağılım 7-39 ay) idi.

**Sonuçlar:** Internal tespit yapılanların %34.2'sinin ameliyat sonrası ortalama 13 ay (1-36 ay), endoprotez yapılan hastaların ise %48.8'inin ortalama 6 ay (1-24 ay) sonra ölmüş oldukları saptandı. İki grup arasında yatak içinde hareket, ayağa kalkma, desteksiz tam yük verme, komplikasyonlar, günlük yaşam aktiviteleri açısından anlamlı farklılık bulunmadı. Ancak, hemiarthroplasti yapılan olgular, çift destek ile tam yük vererek daha kısa sürede yürüyebilmişlerdi ( $p<0.05$ ).

**Çıkarımlar:** Erken dönem takiplerde, hemiarthroplastinin internal tespite göre anlamlı bir üstünlüğü bulunmamış; ayrıca, protez grubunda ameliyat sonrası yaşam süresi daha kısa, ölüm oranı daha yüksek bulunmuştur. Bu nedenle, bu kırıkların tedavisinde öncelikle internal tespit düşünmek daha doğru olacaktır.

**Anahtar sözcükler:** Yaşlılık; artroplasti, replasman, kalça; kırık fiksasyonu, internal; kalça kırığı/cerrahi/radyografi; kalça eklemi; kalça protezi; osteoporoz/komplikasyon.

**Objectives:** There is no consensus as to whether internal fixation or hemiarthroplasty is more appropriate for the treatment of intertrochanteric femur fractures in elderly patients. While the latter offers early mobilization, internal fixation preserves the hip joint and avoids long-term complications associated with the prosthesis. This retrospective study aimed to compare the early results of these treatment modalities.

**Methods:** The study included 81 patients who were available for follow-up after surgery for intertrochanteric femur fractures. Of 38 patients (mean age 77.7 years; range 65 to 99 years) treated with internal fixation, 25 were alive; of 43 patients (mean age 80 years; range 67 to 97 years) treated with hemiarthroplasty, 22 were alive at the last follow-ups. The two groups were compared with regard to perioperative characteristics, mobilization time, complications, mortality, and daily activities according to the Barthel Activities of Daily Living Index. The mean follow-up was 22.7 months (range 6 to 39 months) in internal fixation, and 22.3 months (range 7 to 39 months) in hemiarthroplasty groups.

**Results:** Subsequent to the operation, mortality occurred in 34.2% after a mean of 13 months (range 1 to 36 months) and in 48.8% after a mean of six months (range 1 to 24 months) in patients treated with internal fixation and endoprosthesis, respectively. There were no significant differences with respect to mobilization in bed, standing, weight bearing without support, complications, and daily activity scores. The only significant difference in favor of hemiarthroplasty was that full weight bearing with two crutches took a shorter time ( $p<0.05$ ).

**Conclusion:** Short-term results suggest that hemiarthroplasty is not an advantageous alternative to internal fixation; moreover, its postoperative survival is shorter and mortality rate is higher. Osteosynthesis seems to be the first choice in the treatment of elderly patients with intertrochanteric femur fractures.

**Key words:** Aged; arthroplasty, replacement, hip; fracture fixation, internal; hip fractures/surgery/radiography; hip joint/surgery; hip prosthesis; osteoporosis/complications.

Intertrochanteric femur fracture is one of the most important health problems amongst the elder population, which orthopaedic surgeons encounter. Appropriate treatment method is rather controversial because of the poor quality of bone mass, accompanying systemic disorders and discordancy of these patients.<sup>[1-3]</sup> Rigid internal fixation and early mobilization are the points of the treatment.<sup>[1,4,5]</sup> Trochanteric plate fixation, intramedullary nailing, methylmethacrylate or absorbable ceramic application and proximal femoral osteotomies are the recently used treatment modalities. But these options are not commonly accepted, because of the inadequate stabilization, shortening of the leg and abductor weakness after treatment.<sup>[5-7]</sup> Another treatment option is endoprosthesis application aiming early mobilization with weight bearing although it isn't the ideal treatment option. There is still controversy about the appropriate treatment option.

In this study, the patients treated with endoprosthesis or internal fixation, were compared according to the mobilization time, quality of life and survival respectively.

## Patients and method

97 Patients, ages 65 years and above, were treated due to intertrochanteric femur fracture, between March 1999 and December 2002 (70 women, 27 men; mean age 79,7; Range 65-100; 53 endoprosthesis, 44 internal fixation). 81 of them (83 %) whose clinical data were sufficient, were participated in the study and studied into two groups. 25 of 38 patients in the internal fixation group (group 1) and 22 of 43 patients in the endoprosthesis group (group 2) were alive. The demographic data and treatment methods of these two groups were demonstrated in Table 1. The two groups were compared to the preoperative data; the time between injury and operation, hospitalization time; mobilization in bed, standing and walking times with two crutches, full weight bearing time and complications accordingly. The ratio of the death patients, their times of death and daily living activity of alive patients were also investigated. Daily living activities were evaluated according to the Barthel Activities of Daily Living Index<sup>[8]</sup> (Table 2).

**Table 1.** The features of the patients whom internal fixation and hemiarthroplasty was applied.

	Group 1 - Internal Fixation (n=38) (Mean age 77.7; range 65-99)		Group 2 – Hemiarthroplasty (n=43) (Mean age 80; range 67-97)	
	Number	Percentage	Number	Percentage
Treatment method				
Smith Petersen-McLaughlin Plate	28	73.7	–	
95° wedge plate	6	15.8	–	
Richard's screw	2	5.3	–	
Jewett plate	2	5.3	–	
Leinbach	–		41	95.4
Thompson	–		2	4.7
Types of fracture (Evans <sup>6</sup> )				
Tip 1a	7	18.4	3	7.0
Tip 1b	8	21.1	12	27.9
Tip 1c	15	39.5	22	51.2
Tip 1d	1	2.6	6	14.0
Tip 2	7	18.4	–	
Cardiologic, metabolic, neurologic or respiratory problem				
None	9	23.7	11	25.6
One	22	57.9	22	51.5
Two	4	10.5	7	16.3
Three	3	7.9	3	7.0
<i>Total</i>	38	100.0	43	100.0

**Table 2.** Barthel Activities of Daily Living Index <sup>[8]</sup>

Activity	Point	Feature
Bowel activity	0	Incontinence (or lacsative needed for defecation)
	1	Can't hold once a week
	2	Continence
Bladder	0	Incontinence, continuous catheterization and help needed
	1	Can't hold once in 24 hours
	2	Continence
Personal care	0	Needs help for care
	1	Independent
Toilet use	0	Dependent
	1	Needs partial help
	2	Independent
Feeding	0	Dependent
	1	Needs help for cutting or spreading butter
	2	Independent
Transfer (bed to chair and back)	0	Disable to do, imbalance while sitting
	1	Able to sit, but needs one or two guys
	2	Needs physically or verbal help
	3	Independent
Movement	0	Inactive
	1	Dependent to the wheelchair
	2	Needs physically or verbal help
	3	Independent (Can sit with the help of a stick)
Wearing clothes	0	Dependent
	1	Need help but able to do some
	2	Independent (button, zip, string vs)
Stairs	0	Disable to climb
	1	Needs verbal, physically help or stick
	2	Independent
Bath	0	Dependent
	1	Independent

The patients who died on the postoperative in the first month were evaluated only according to the daily life activity score. 17 of the 47 patients, still alive, were evaluated with control graphies (11 internal fixations, 6 hemiarthroplasty). The information of the patients; who were not able to come to the hospital for control and who were dead; was asked by telephone (Either from themselves or their relatives). Possible complications like nonunion, loss of reduction and implant migration in group one and prosthesis loosening and dislocation in group two were evaluated with radiographic examination. The mean follow-up

time of the alive patients was 22.7 month (Range 6-39 month) in group one and 22.3 month (Range 7-39 month) in group two.

We used Mann-Whitney U-test for statistical assessments; p<0.05 was accepted as statistically significant.

### Results

13 patients, treated with internal fixation, (34.2%; 4 men, 7 women) died at meanly 13 months (1-36 months) and 21 patients, treated with endo-prosthesis, (48.8%; 6 men, 15 women) died at meanly 6 months (1-24 months) after the operation

**Table 3.** Death ratio, mobilization time and complications of two groups

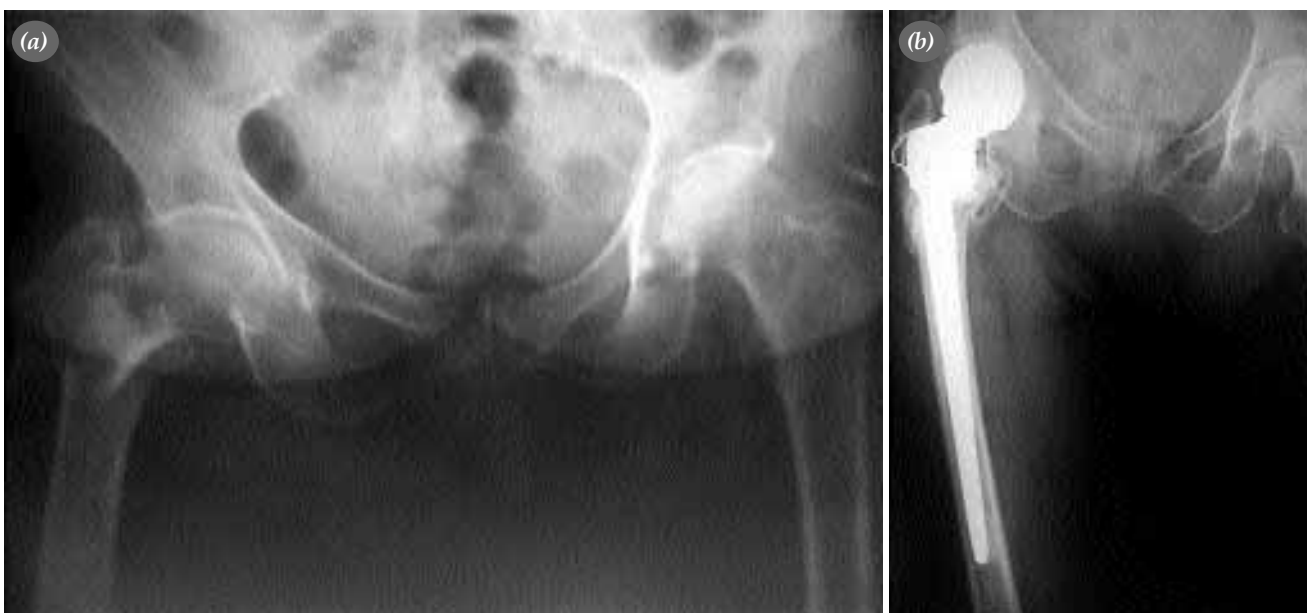
	Group 1 Internal fixation (n=38)	Group 2 Hemiarthroplasty (n=43)
Meanly follow-up time (month)	22.7 (6-39)	22.3 (7-39)
Number of the patients died	13 (%34.2)	21 (%48.8)
Meanly death time (month)	13 (1-36)	6 (1-24)
Mobilization in bed (day)	2.5	2.9
Standing up (day)	4.6	5.5
Two crutches (day)	28.8 gün*	6.0*
One crutch (day)	97	90
Full weight bearing without crutches	6.8	4
Complications		
Sacral decubitis ulcer	3	–
Pseudoarthrosis + infection	1	–
Pseudoarthrosis	1	–
Implant migration	1	–
Aseptic loosening	–	1
Dislocation of the prosthesis	–	1

\*: $p < 0.05$ 

( $p > 0.05$ ). In group one, 3 of the patients died on the first month, 3 of them died at an interval of 1-6 months and 7 of them died at an interval of 6-24 months after the operation. In group 2, the number of the dead patients at the same time intervals were 8, 5 and 8 respectively. Pulmonary embolism signs

were seen in 4 patients who died in the hemiarthroplasty group.

Total hospitalization time was meanly 17.2 days and postoperative hospitalization time was meanly 9.1 days in the internal fixation group and was 21.2 and 11.3 days in hemiarthroplasty group respective-



**Figure 1.** (a) Preoperative pelvis graphy of an 81 years old woman with right intertrochanteric femur fracture. (b) The control graphy of the same patient after 16 months.

ly. Postoperative follow-up time in the intensive care unit of 23 patients in group one was meanly 1.4 day while it was meanly 3.9 days for the 19 patients in group two (Figure 1).

Mobilization in bed and stand up times were similar for both groups but we observed that the time of walking with two crutches and full weight bearing without crutches was shorter in group two than group one (Figure 2, 3). There weren't any statistically significant differences in these times between two groups, except walking with two crutches (Table 3).

Although the number of the patients who were evaluated by radiographic examination was too few (%36), in internal fixation group, we determined pseudoarthrosis and infection in one patient and only pseudoarthrosis in another patient as a complication. There was also sacral decubitus ulcer at the same patient and it healed spontaneously (Table 3). One patient in hemiarthroplasty group underwent total hip replacement surgery due to aseptic loosening.

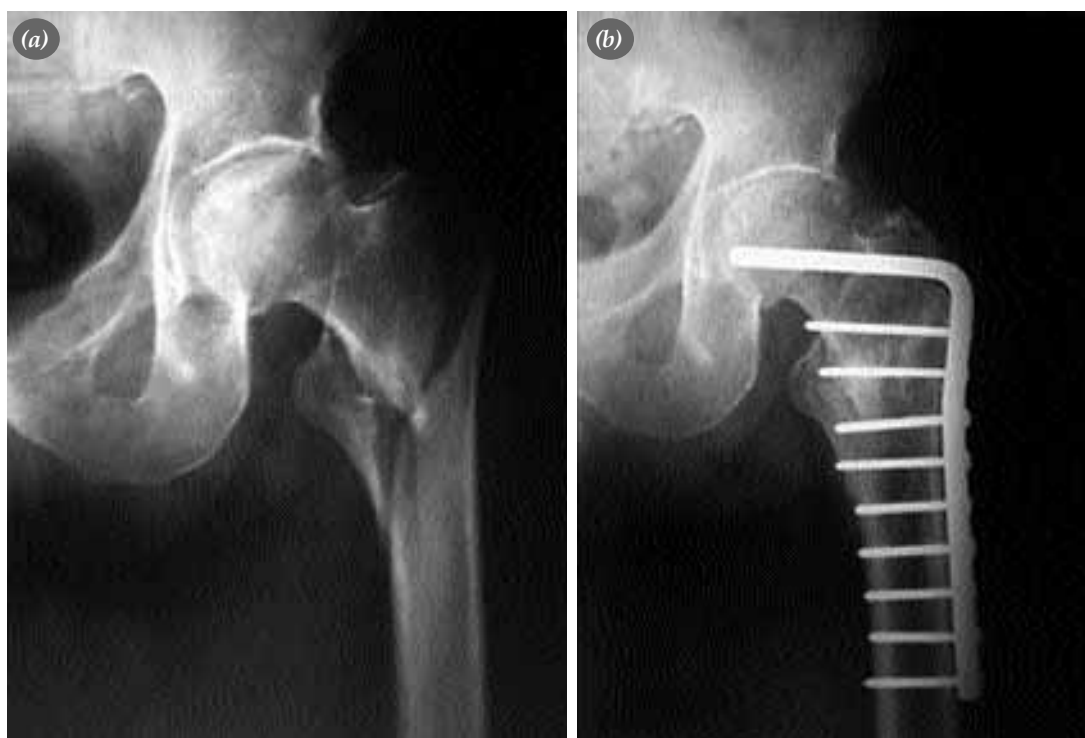
Barthel Activities of Daily Living Indexes were 16 and 15.7 in group one and group two, respective-

ly ( $p>0.05$ ). Two patients in both groups were bedridden.

## Discussion

The purpose of the treatment of hip fractures seen in elder population is to prevent the probable complications by providing early mobilization and to help the patients in returning to their daily activities. In spite endoprosthesis surgery is an accepted method in the treatment of femoral neck fractures, there is still controversy for the treatment of intertrochanteric unstable fractures. The purpose of the internal fixation is to preserve the hip joint and to prevent complications related to prosthesis surgery. Although it isn't a treatment option, the advantage of the endoprosthesis surgery in the treatment of certain intertrochanteric femur fractures is to provide early mobilization and to prevent the systemic complications due to immobilization.

The complication rate of the intertrochanteric fractures treated with sliding hip screws was reported as %38.6 by Wolfgang et al.<sup>[9]</sup> Sarmiento<sup>[10]</sup> reported that the patients who had



**Figure 2.** (a) Preoperative graphy of an 84 years old male patient with fragmented fracture. (b) After 22 months, union is seen on the postoperative graphy of the fracture, treated with 95° plate. Patient has returned to his normal life.

intertrochanteric fracture were allowed mobilization at the second week after treated with internal fixation, there wasn't any nonunion problem by means of valgization osteotomy. Laros and Moore<sup>[11]</sup> reported that most of the complications occurred due to unstable fractures and medial displacement osteotomy didn't affect complication rate. The most important causes for complications were fragmentation of most fractures, insufficient fixation of the osteoporotic bone and discordancy of the patients to the postoperative rehabilitation.<sup>[12]</sup>

It was reported that the mobilization time was shorter, and complication rate was lower in the hemiarthroplasty cases compared to internal fixation.<sup>[13,14]</sup> They also reported a success rate of 90% in hemiarthroplasty cases<sup>[13,14]</sup> where reported success rates were lower in our country. The success rate of Leinbach bipolar prosthesis surgery was reported as 80% and 68.4% by Rodop et al.<sup>[15]</sup> and Akman et al.<sup>[1]</sup> respectively. The follow-up time was shorter than two years in both of the studies.

There are seldom studies which compare both techniques. Stappaerts et al.<sup>[16]</sup> evaluated 90 old

patients who were treated with compressive hip screw or Vandeputte prosthesis for unstable trochanteric hip fractures. They didn't determine any significant difference between two groups according to operation time, wound infection, and death frequency. More blood transfusion was required in the arthroplasty group. Mechanical disability was determined as 26% in the osteosynthesis group. As a result, they reported that compressive hip screw was a favorable implant but arthroplasty might be used for the treatment of unstable, multi-fragment fractures of old osteoporotic patients.<sup>[16]</sup>

Haentjens et al.<sup>[12]</sup> operated 79 patients using AO/ASIF plate or Muller bipolar type endoprosthesis. They didn't determine any significant difference between two groups according to operation time, amount of bleeding, hospitalization time, death frequency, and preoperative internal diseases but they observed that rehabilitation was easier and faster and decubitus ulcer and pneumonia were seen less in the arthroplasty group.

Although it was a common opinion that hemi-



**Figure 3.** (a) Preoperative, (b) postoperative follow-up graphs of a 68 years old male patient whom was treated by Jewett plate fixation.

arthroplasty allows early mobilization, we found out in our study that early mobilization was related to the patient's general health situation and it was independent of surgical technique. We didn't determine any significant differences between internal fixation and hemiarthroplasty groups according to the postoperative complications, mobilization time, hip functions, and quality of life. We also observed that decreased quality of life and probable complications were due to the systemic problems which were commonly seen in these age.

The results about death frequencies differ in the literature. The death frequency was reported as 14-34% in patients operated with osteosynthesis.<sup>[9,10,12,17]</sup> It was also reported that 13-30% of the patients died in the two years after surgery.<sup>[1,12,15,18]</sup> We observed higher death frequencies in our cases. Although it wasn't statistically significant, death frequency was higher and mean postoperative survival time was shorter in hemiarthroplasty group. We thought that these had to be related to surgery features although there was not any statistically significant difference between two groups according to systemic diseases. Patient and leg position, and surgery time were the considerable differences between two groups. Also, bone cement was used during the arthroplasty procedure, as a result the risk of microembolia thought to be higher in arthroplasty group.

The comparison of the two groups thought to be made as much as objectively, because of that the type of the surgery in our patients was decided according to the surgeon's choice and it was independent of fracture type and patient's general situation. After our study, we recommend to preserve the hip joint in the treatment of the intertrochanteric fracture except the situations like high physiological age, short life expectation, and existence of osteoporotic, multifragment, unstable fractures.

We didn't determine any significant advantage of the hemiarthroplasty to the internal fixation procedure at early follow-up. It is certain that the principal objective is to prevent the possible complications by early mobilization and to help the patient returning to their daily life. Intertrochanteric fracture of elderly must be treated with

considering the age of the patient, mental status, bone quality, and type of the fracture. Furthermore, there is no study about mid and long time results of the hemiarthroplasty procedure in the literature. Because of that, our opinion about the treatment of intertrochanteric femur fractures is first of all to use the internal fixation procedure and we recommend hemiarthroplasty for only carefully selected patients.

## References

1. Akman Ş, Şen C, Aşık M, Akpınar S, Gedik HK. İntertrochanterik femur kırıklarında Leinbach protezi uygulamalarımız. *Ulusal Travma Dergisi* 1999;5:208-12.
2. Roder F, Schwab M, Aleker T, Morike K, Thon KP, Klotz U. Proximal femur fracture in older patients-rehabilitation and clinical outcome. *Age Ageing* 2003;32:74-80.
3. Sarmiento A, Williams EM. The unstable intertrochanteric fracture: treatment with a valgus osteotomy and I-beam nail-plate. A preliminary report of one hundred cases. *J Bone Joint Surg [Am]* 1970;52:1309-18.
4. Miller K, Atzenhofer K, Gerber G, Reichel M. Risk prediction in operatively treated fractures of the hip. *Clin Orthop Relat Res* 1993;(293):148-52.
5. Şen C, Akman Ş, Boynuk B, Aşık M, Tözün R. 70 yaş üzerindeki femur boyun kırıklı hastalarda düz saplı (straight stem) parsiyel protez uygulamalarımız. *Ulusal Travma Dergisi* 2000;6:160-5.
6. DeLee JC. Fractures and dislocations of the hip. In: Rockwood CA Jr, Green DP, Bucholz RW, Heckman JD, editors. *Rockwood and Green's fractures in adults*. Vol. 2, 4th ed. Philadelphia: Lippincott-Raven; 1996. p. 1659-825.
7. Eastwood EA, Magaziner J, Wang J, Silberzweig SB, Hannan EL, Strauss E, et al. Patients with hip fracture: subgroups and their outcomes. *J Am Geriatr Soc* 2002;50:1240-9.
8. Mahoney FI, Barthel DW. Functional evaluation: The Barthel Index. *Md State Med J* 1965;14:61-5.
9. Wolfgang GL, Bryant MH, O'Neill JP. Treatment of intertrochanteric fracture of the femur using sliding screw plate fixation. *Clin Orthop Relat Res* 1982;(163):148-58.
10. Sarmiento A. Unstable intertrochanteric fractures of the femur. *Clin Orthop Relat Res* 1973;(92):77-85.
11. Laros GS, Moore JF. Complications of fixation in intertrochanteric fractures. *Clin Orthop Relat Res* 1974;(101):110-9.
12. Haentjens P, Casteleyn PP, De Boeck H, Handelberg F, Opdecam P. Treatment of unstable intertrochanteric and subtrochanteric fractures in elderly patients. Primary bipolar arthroplasty compared with internal fixation. *J Bone Joint Surg [Am]* 1989;71:1214-25.
13. Rosenfeld RT, Schwartz DR, Alter AH. Leinbach prosthesis in intertrochanteric fractures. *J Bone Joint Surg [Am]* 1973;55:420-6.
14. Stern MB, Angerman A. Comminuted intertrochanteric fractures treated with a Leinbach prosthesis. *Clin Orthop Relat Res* 1987;(218):75-80.
15. Rodop O, Kiral A, Kaplan H, Akmaz I. Primary bipolar hemiprosthesis for unstable intertrochanteric fractures. *Int Orthop* 2002;26:233-7.

16. Stappaerts KH, Deldycke J, Broos PL, Staes FF, Rommens PM, Claes P. Treatment of unstable peritrochanteric fractures in elderly patients with a compression hip screw or with the Vandeputte (VDP) endoprosthesis: a prospective randomized study. *J Orthop Trauma* 1995;9:292-7.
17. Sernbo I, Johnell O, Gentz CF, Nilsson JA. Unstable intertrochanteric fractures of the hip. Treatment with Ender pins compared with a compression hip-screw. *J Bone Joint Surg [Am]* 1988;70:1297-303.
18. Green S, Moore T, Proano F. Bipolar prosthetic replacement for the management of unstable intertrochanteric hip fractures in the elderly. *Clin Orthop Relat Res* 1987;224:169-77.