

Comparison of long-stemmed cementless hemiarthroplasty with proximal femur nail in unstable intertrochanteric femur fractures over 85 years of age

85 yaş üstü instabil intertrokanterik femur kırıklarında uzun stemli sementsiz hemiarthroplasti ile proksimal femur çivisinin karşılaştırılması

Mirza Zafer Dağtaş¹, Ömer Kays Ünal¹

¹ Maltepe University Medical Faculty Hospital,
Department of Orthopedics and Traumatology,
Istanbul, Turkey

ORCID ID of the author(s)

MZD: 0000-0001-6861-6555

ÖKÜ: 0000-0002-9445-1552

Corresponding author / Sorumlu yazar:

Mirza Zafer Dağtaş

Address / Adres: Bağlarbaşı mah. Feyzullah Cad.

Maltepe Üniversitesi Tıp Fakültesi Hastanesi

No:39 Maltepe İstanbul, Türkiye

E-mail: zaferdagtas@hotmail.com

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Abstract

Aim: The most appropriate treatment option for intertrochanteric femoral fractures is still controversial. While there are articles showing that proximal femoral nails are superior to partial prostheses, other studies claim that partial prostheses result in better patient outcomes. We aimed to compare long-stemmed cementless hemiarthroplasty (LFS-BPH) and proximal femur nail (PFN), which are the treatment options applied in unstable intertrochanteric hip fractures in patients over 85 years of age.

Methods: The records of 64 patients with unstable intertrochanteric femur fractures who were operated between May 2016 and December 2018 in the Orthopedics and Traumatology Clinic of Maltepe University Medical Faculty Hospital were evaluated. A retrospective cohort study was conducted and 42 patients who met the inclusion criteria were included in the study. The patients were divided into 2 groups as the proximal nail group and the prosthesis group, and evaluated in terms of total hospitalization time, operation time, amount of blood transfusion, time until the patient walked independently, postoperative complications, and Harris hip scores.

Results: There were statistically significant differences in favor of the PP group in terms of total length of stay, fully independent mobilization time, deep vein thrombosis and decubitus development in the postoperative period. There was no difference between LFS-BPH and PFN in terms of total hospitalization time, blood transfusion amount, and Harris hip scores in unstable intertrochanteric hip fractures occurring above 85 years of age.

Conclusion: LFS-BPH was superior to PFN in terms of operation time, early independent mobilization, reduction of deep vein thrombosis and decubitus development rate in the postoperative period.

Keywords: Intertrochanteric fractures, Intramedullary nailing, Hip prosthesis, Geriatric

Öz

Amaç: İntertrokanterik femur kırıkları için en uygun tedavi seçeneği halen tartışmalıdır. Proksimal femoral tırnakların parsiyel protezlerden üstün olduğunu gösteren makaleler varken, diğer çalışmalar kısmi protezlerin daha iyi hasta sonuçları verdiğini iddia etmektedir. Mayıs 2016 ile Aralık 2018 tarihleri arasında Maltepe Üniversitesi Tıp Fakültesi Hastanesi Ortopedi ve Travmatoloji Kliniğinde opere edilen 85 yaş üstü instabil intertrokanterik kalça kırığı vakalarında uygulanan tedavi seçeneklerinden uzun stemli sementsiz hemiarthroplasti (UFS-BPH) ile proksimal femur çivisinin (PFN) karşılaştırılması amaçlandı.

Yöntemler: 64 AO/OTA 31-A2.3 instabil intertrokanterik femur kırığı hastasının kayıtları retrospektif olarak değerlendirildi. Dahil edilme kriterlerine uyan 42 hasta çalışmaya alınıp 2 homojen gruba ayrıldı. Gruplar toplam yatış süresi, operasyon süresi, kan transfüzyon miktarı, hastanın tek başına bağımsız olarak yürütmesine kadar geçen süre, postoperatif dönemde gelişebilecek derin ven trombozu ve dekübitüs yara gelişimi ve Harris kalça skorları açısından değerlendirildi.

Bulgular: Gruplar arasında toplam yatış süresi, tam bağımsız mobilizasyon süresi ve postoperatif dönemde derin ven trombozu ve dekübitüs gelişimi açısından PP grubu lehine istatistiksel olarak anlamlı fark saptanmıştır. Yapılan çalışma sonucunda 85 yaş üstü instabil intertrokanterik kalça kırığı vakalarında toplam yatış süresi, kan transfüzyon miktarı ve Harris kalça skorları açısından UFS-BPH ile PFN arasında bir farka rastlanmadı.

Sonuç: Ameliyat süresi, erken bağımsız mobilizasyon ve postoperatif dönemde gelişebilecek derin ven trombozu ve dekübitüs yara gelişim oranının azaltılması açısından UFS-BPH nin PFN ne göre daha üstün olduğu görüldü.

Anahtar kelimeler: İntertrokanterik kırık, İntramedüller çivileme, Kalça protezleri, Geriatri

Introduction

Hip fracture surgery is one of the most common operations in orthopedic surgery [1–4]. The worldwide incidence of hip fractures is 2.3% per year [5]. Surgical indications for femoral neck fractures (CFF) are clearer than those for intertrochanteric femoral fractures (ITF) [6]. If the rate of fracture union is high in CFF, osteosynthesis is preferred, otherwise, arthroplasty is the procedure of choice [6]. However, ITFs have higher fracture union rates compared to CFFs. Despite this union rate, hemiarthroplasty is performed by many surgeons [7]. ITF surgery is still controversial, especially in older patients [8].

In order to contribute to the discussion about the indications for ITF surgery, we compared long femoral stemless bipolar hemiarthroplasty (LFS-BPH) and proximal femoral nail (PFN) outcomes in terms of total hospitalization time, operation time, amount of blood transfusion, time until the patient walks independently, postoperative complications and Harris hip scores.

Materials and methods

This retrospective cohort study was conducted in Maltepe University Hospital. There were 64 patients with unstable ITF who were operated between 2016 and 2019. Data were collected from hospital files, operating room, and polyclinic records.

Inclusion criteria included having unstable ITF and being over 85 years of age, coming to outpatient clinic controls in the first 6 postoperative months, and not having had a revision surgery due to implant failure or infection in the postoperative period.

The study was started with 42 patients who met the inclusion criteria. All patients were selected according to the AO classification, according to which 12 patients were A2.2, 8 patients were A2.3, 8 patients were A3.1, 6 patients were A3.2 and 8 patients were A3.3. Preoperative anesthesia evaluation was performed: According to the ASA (American Society of Anesthesiologists) classification, 37 patients included in the study were ASA4 and 5 patients were ASA3.

The patients were divided into 2 groups as those who underwent LFS-BPH and PFN. The groups were evaluated in terms of total hospitalization time, operation time, amount of blood transfusion, time until the patient walked independently, presence of deep vein thrombosis in the postoperative period, development of decubitus wounds, and Harris hip scores [8]. Deep vein thrombosis was evaluated with Doppler USG, decubitus ulcers were clinically diagnosed, and the hip scores of both groups were calculated using the Harris hip score at the 6th postoperative month.

Surgical technique

All patients who underwent PFN were placed supine on the traction table. Under fluoroscopy, traction, adduction, and internal rotation were applied gradually, and reduction was absolutely controlled in the anterior and lateral planes. PFN was adapted to the femoral medulla with fluoroscopy after raemerization over the K-wire. PFN was locked with 2 dynamic screws locking each other on the femoral neck and 1 dynamic

screw on the femur shaft (SMITH NEPHEW trigene intertan, Cordova, USA) (Figure 1).



Figure 1: Preoperative and postoperative radiographs of the patient in whom intramedullary nail was applied for intertrochanteric femur fracture

All patients in the UFS-BPH group were placed in lateral supine position. Following a 12 cm skin incision with a posterior hip approach, the subcutaneous tissues were incised and the short rotator muscles were cut with a sling suture. T incision was performed to the hip joint capsule. The fractured femoral neck was exposed, and the femoral capsule was opened. The fractured femoral head and neck were removed from the fracture line at the femoral neck. After the femoral medulla was prepared, an appropriately sized uncemented femoral stem was adapted to the femur medulla with a femoral bipolar head (T2, Tipsan, Izmir, Turkey) (Figure 2).



Figure 2: Preoperative and postoperative radiographs of the patient in whom intramedullary nail was applied for intertrochanteric femur fracture

All patients were put on anti-embolic stockings from the first day of hospitalization to the 30th postoperative day and anticoagulant prophylaxis was performed. On the 1st postoperative day, both groups of patients started in-bed exercise, on the 2nd day, patients were mobilized with help.

Statistical analysis

SPSS 25.0 program was used for analysis. Frequency analysis was performed for demographic data. For comparison, parametric data were analyzed with the Chi-square, Student t and ANOVA tests, while non-parametric data were analyzed with Mann Whitney U and Kruskal Wallis tests. *P*-value <0.05 was considered statistically significant.

Results

Among the patients participating in the study, there were 19 males and 23 females. The mean age of all patients was 89.6 (86-99) years. Mean follow-up time was 26.4 weeks (24-29

weeks). Twenty-three patients were in the UFS-BPH group and 19 were in the PFN group (Table 1).

UFS-BPH group was superior to the group with PFN in terms of total hospital stay, total operation time and independent mobilization time ($P=0.29$, $P=0.02$ and $P<0.001$, respectively). However, no difference was found in terms of the number of erythrocyte suspensions used during and after surgery, and the 6th Month Harris Hip Scores ($P=0.74$ and $P=0.65$, respectively) (Table 2).

When compared in terms of postoperative complications, the rate of decubitus ulcer in the UFS-BPH group was insignificantly lower than the group with PFN ($P=0.23$). The rate of DVT in the UFS-BPH group was significantly lower than the group with PFN ($P=0.03$) (Table 3).

Table 1: Distribution of demographic data by groups

Demographic Information	Groups		P-value
	LFS-BPH	PFN	
Number of patients (n)	23	19	
Average age (min.-max.)	88.7 (86-94)	90.6 (86-99)	0.16
Gender (F / M)	11/12	12/7	0.09
Average follow-up time (min.-max.)	24.6 (24-28)	27.1 (24-29)	0.89

LFS-BPH: Bipolar partial hemiarthroplasty with long femoral stems, PFN: Proximal femoral nail, min: Minimum, max: Maximum, F: Female, M: Male

Table 2: Comparison of independent variables according to the implants used

Independent variables, mean (SD)	LFS-BPH	PFN	P-value *
Average length of stay in hospital	5.39 (0.7)	4.58 (0.9)	0.29
Operation times (min)	60.9 (9.8)	106.3 (13.9)	0.02
Duration until independent mobilization	3 (1.2)	32.5 (6.9)	<0.001
Erythrocyte Suspension number	1.7 (0.68)	1.7 (0.65)	0.74
Harris Hip Scores	77.1 (9.1)	77.0 (9.2)	0.65

LFS-BPH: Bipolar partial hemiarthroplasty with long femoral stem, PFN: Proximal femoral nail, SD: standard deviation, min: minutes, * Independent Sample Test

Table 3: Distribution of postoperative complications by groups

Postoperative complications, mean (%*)	LFS-BPH	PFN	P-value §
DVT	3 (13%)	8 (42.1%)	0.03
Decubitus ulcer	4 (17.4%)	6 (31.6%)	0.23

LFS-BPH: Long femoral stem bipolar partial hemiarthroplasty, PFN: Proximal femoral nail, DVT: Deep vein thrombosis, * Percentage within implant groups, § Pearson Chi-Square Test

Discussion

In our study, it was observed that UFS-PBH was superior to PFN due to the shorter independent mobilization time, less postoperative complications such as deep vein thrombosis and decubitus wounds, and short operative time.

Hip fractures constitute an important public health problem in the world. They progress with high mortality in old age patient groups. Conservative treatment has a limited place; the main treatment for hip fractures is surgery [10]. ITFs are observed 3 times more than CFFs [11]. The surgical approach to CFFs has gained clarity in the literature [12], while surgical indication in ITFs is still controversial [13]. While many surgeons always prefer osteosynthesis in ITF, many surgical teams prefer hemiarthroplasty [14].

In the literature, there are comparative studies with different views for surgical indication in old age ITFs. In their meta-analysis in 2019, Bao et al. [15] examined 1067 patients and published results in favor of early weight-bearing and low-complication hemiarthroplasty, while surgical time, length of stay, blood loss and Harris scores were similar for hemiarthroplasty and PFN. In this study, both cemented and non-cemented hemiarthroplasty were performed and patients over 65 years of age were selected. Nie et al. [16] emphasized that PFN was superior to hemiarthroplasty due to its high Harris scores, low blood loss and short operation time in the meta-analysis of 1239 patients in 2017. In their series of 1239 patients, Nie et al. [16] reported no clear data about the time until independent

mobilization in patients with ITF. This meta-analysis was performed between 1980 and 2016 with patients over 60 years of age. The results are not similar, even with recent, very large series of patients. The retrospective selection of patients over the age of 85 years and the creation of two homogeneous groups were the highlights of our study.

In our study, we found that the surgical durations of our patients with UFS-BPH were considerably shorter than that of our patients with PFN. On the contrary to our study, Korkmaz et al. [17] found the duration of surgery to be shorter in the group with PFN. In the studies of Korkmaz et al, there is no clear data on whether the time for positioning the patient is added or not. The difference in our study is that the time elapsed until closed reduction is achieved in PFN surgery during the operation. In addition, the use of cementless stem shortens the operation time in LFS-BPH. Exposure to anesthesia is less in LFS-BPH surgery compared to PFN surgery. In the literature, it has been observed that the use of cementless stem decreases the operation time [18]. Li et al. [19] compiled 1577 hip hemiarthroplasty surgeries, and it was observed that the durations of non-cemented hemiarthroplasty were consistent with those in our study.

While there are authors in the literature claiming that blood loss is not related to surgical technique and is caused by fracture [19], there are publications that support the need for less transfusion in PFN compared to LFS-PBH [20]. In the meta-analysis of Bao et al. [15] the need for blood transfusion was less than that in PFN, but there was no difference in blood loss between these two groups during the entire hospitalization period. In our study, not only the preoperative needs of the patients were calculated, but the transfusions performed during the entire hospitalization period were examined as well. The transfusion needs of UFS-PBH and PFN patients were equal.

They found that the length of stay was equal in LFS-PBH and PFN in Nie et al.'s series of 1239 patients and Bao et al.'s series of 1067 patients [15,16]. On the other hand, Jian-Bin [21] reported that the length of stay in hemiarthroplasty was short. In our study, no significant difference was found between the two groups in terms of length of stay. Being over the age of 85 years and having advanced ASA scores were more effective on hospitalization periods.

In the series of Bao et al. [15], the incidence of deep vein thrombosis was higher in the group with PFN, while Jian-Bin Dong et al. [21] published equal results in both groups in their 2015 study. In our study, they found a significant difference in DVT between 2 groups. Although all patients with unstable ITF were given anticoagulant prophylaxis from the first day of hospitalization and anticoagulant maintenance and anti-embolic stockings were used for 30 days after discharge, deep vein thrombosis was more common in the group undergoing PFN surgery. Studies in the literature that show that prolonged immobilization increases deep vein thrombosis support our results [22].

In a meta-analysis of 8871 patients conducted in April 2020, Galivanche et al. [23] associated decubitus wounds with the patient's preoperative skin condition or any postoperative complications. According to this meta-analysis, the surgical technique was not important. In the study of Jian-Bin et al., they found that decubitus wounds were less in patients who

underwent PFN compared to hemiarthroplasty. In our study, although we encountered more decubitus ulcers in the PFN group, no statistical differences were found.

In the literature, it has been reported that patients who underwent hemiarthroplasty were mobilized earlier than those who underwent PFN [24]. While there are studies in which cemented hemiarthroplasty was performed and patients were mobilized early [25], some other studies regarding uncemented hemiarthroplasty have also been conducted [26]. Wang et al. [27] published a research about the need to load weight on the operated extremity for independent mobilization, due to atrophy and arthrosis in the upper extremities of geriatric patients. In our study, in accordance with the literature, it was observed that patients who underwent LFS-PBH were mobilized earlier than those in the PFN group.

In the study of Jian-Bin et al. [21], Harris scores were high in the group with hemiarthroplasty, while in a similar meta-analysis, Nie et al. [16] presented the Harris scores as high in the group with PFN. Although it was observed that Harris scores were high in PFN at the end of the 4th week, it was reported that they were equal in the 12th week [28]. Jonnes et al. [29] found no significant difference between the 3-month Harris results of PFN and LFS-PBD in their comparative study. In our study, when we compared the 6-month hip Harris scores of the LFS-PBH and PFN groups, no significant differences were found.

Limitations and strengths of the study

One of the limitations in our study was that age-related skeletal system problems and cognitive functions were ignored while calculating the time until the patient could walk independently. The other limitation was the lack of comparison with the pre-transfusion control group, as the need for transfusion of geriatric patients may be higher than the normal population.

The strength of our study was that all patients were over the age of 85 years and all fractures were unstable. In the literature, while a comparison has been made with a large case series over 60 and 65 years of age, regardless of the fracture type, there is no comparative study with patients with unstable fractures over 85 years of age.

Conclusion

In unstable intertrochanteric fractures over the age of 85 years, PFN and UFS-PBH surgery did not show superiority to each other in terms of hospital stay, amount of blood transfusion and Harris hip scores. LFS-PKD was superior to PFN due to shorter time until independent mobilization, fewer complications such as deep vein thrombosis and decubitus wounds in the postoperative period, and short operation time.

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