

Retrospective Comparison of Surgical Techniques for Hip Fractures

Kalça kırıklarında cerrahi yöntemlerin retrospektif olarak karşılaştırılması

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ABSTRACT

Objective: To compare the postoperative effects of different surgical techniques used during bipolar hemiarthroplasty (HA) for hip fractures.

Material and Method: The study included 151 patients (67 males, 84 females) who presented to our Orthopedics and Traumatology Clinic between January 2016 and December 2021 and who underwent HA with a Direct Lateral (DL) approach (n: 48) or Posterolateral (PL) approach (n: 103) for hip fracture were included in the study. Patients' postoperative 90-day mortality, wound site infection, bedsore, presence of fracture, varus/valgus angle on postoperative anteroposterior (AP) radiograph, operative time, mobilization status within the first 3 days and the number of people during surgery were evaluated retrospectively.

Results: While 44 patients treated with the DL approach had neutral and 4 patients had valgus alignment, none of them had varus alignment. In the PL approach, neutral alignment was observed in 79 patients, valgus alignment in 2 patients, and varus alignment in 22 patients. It was determined that there was a significant difference between the two approaches in the proportions of prostheses placed with both neutral and varus alignment ($p<0.001$).

Conclusions: Among the approaches used during HA application, it was observed that the PL approach caused more varus femoral stem alignment problems than the DL approach. In addition to increasing the risk of femoral collapse, this may cause worse functional outcomes.

Keywords: Hip Fractures, Posterolateral, Direct lateral, Hardinge, Bipolar hip hemiarthroplasty, Hip hemiarthroplasty

ÖZET

Amaç: Kalça kırıkları nedeniyle bipolar hemiarthroplasti (HA) uygulaması sırasında kullanılan farklı cerrahi yöntemlerin postoperatif etkilerini karşılaştırmak.

Gereç ve Yöntem: Ocak 2016 ve Aralık 2021 tarihleri arasında Ortopedi ve Travmatoloji Kliniğimize başvuran kalça kırığı nedeniyle Direkt Lateral (DL) yaklaşımla (n: 48) veya Posterolateral (PL) yaklaşımla (n: 103) HA uygulanan 151 hasta (67 erkek, 84 kadın) çalışmaya dahil edildi. Hastaların ameliyat süresi, postoperatif anteroposterior grafide varus-valgus açısı, periprotetik kırık ve dislokasyon varlığı, yara yeri enfeksiyonu, cerrahi alanda hematoma, postoperatif 90 günlük mortalitesi ve ilk 3 gün içerisinde mobilize olup olmadığı retrospektif değerlendirildi.

Sonuçlar: DL yaklaşımla tedavi edilen 44 hastada nötral, 4 hastada valgus dizilimi mevcutken, varus dizilimi hiçbir hastada görülmemiştir. PL yaklaşımda ise 79 hastada nötral, 2 hastada valgus ve 22 hastada varus diziliminin olduğu gözlemlenmiştir. İki yaklaşım arasında hem nötral hem de varus dizilimi ile yerleştirilen protez oranlarında anlamlı düzeyde farklılık gösterdiği saptanmıştır ($p<0,001$).

Çıkarımlar: HA uygulaması sırasında kullanılan yaklaşımlar arasında PL yaklaşımın DL yaklaşıma göre daha fazla varus femoral stem dizilim sorunu oluşturduğu görülmüştür. Bu durum femoral çökme riskini artırmasının yanında daha kötü fonksiyonel sonuçlara sebep olabilir.

Anahtar Kelimeler: Kalça kırıkları, Posterolateral, Direkt lateral, Hardinge, Bipolar kalça protezi, Kalça artroplastisi

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INTRODUCTION

Hip fracture is one of the most common fractures among the elderly population and is frequently encountered in the clinic due to the increase in the elderly population (1). Although internal fixation is preferred for these fractures, total hip arthroplasty (THA) or bipolar hemiarthroplasty (HA) have become the most common options for the management of displaced femoral neck and intertrochanteric fractures in the geriatric age group (2,3). HA is especially preferred in osteoporotic patients over 70 years of age or in patients with low physical activity (2).

When compared to THA, it is believed that HA is technically easier to apply, has a shorter operative time, is associated with less blood loss, and is cost-effective. The major disadvantage of HA is the risk of acetabular erosion, a complication resulting in pain and functional impairment (3).

One of the two main techniques used during HA for hip fractures is the posterolateral (PL) approach, and the other is the direct lateral (DL) approach. There are advantages and disadvantages between these two approaches. Therefore, the postoperative effects of the surgical approach on the patient are also variable (4).

This study aimed to investigate the effects of PL and DL approaches on postoperative mobility, and morbidity in femoral duodenal fracture and femoral intertrochanteric fracture patients treated with HA.

MATERIAL AND METHOD

This study was conducted with the approval of the Non-Interventional Clinical Research Ethics Committee of the Kutahya Health Sciences University dated February 9, 2021, and numbered 2020/02-02.

Patients who presented to the Orthopedics and Traumatology Clinic of Kutahya Health Sciences University, Evliya Celebi Training, and Research Hospital between January 2016 and December 2021 and underwent HA due to hip fracture were screened. The study included 151 patients aged 55 years and older without degenerative joint disease, who underwent only primary bipolar HA and who could mobilize

without support before the injury. The data of patients were retrospectively analyzed. The patients were treated, depending on the preference of the on-call orthopedic surgeon using the DL (n:48) or PL (n:103) approach with a cementless standard type square section Hydroxyapatite coated femoral stem prosthesis. (TCK-10 Hip Prosthesis -Uncemented- Hydroxyapatite Coated, Tıpmed, İzmir, Turkey)

The operation time of the patients, the angle between the femoral anatomical axis and the femoral stem axis in the postoperative anteroposterior hip direct graphy, varus-valgus angles, periprosthetic fracture status, presence of dislocation, presence of wound infection or hematoma, postoperative 90-day mortality and whether they were mobilized in the first three days were examined.

Statistical Analysis

Mean, standard deviation, median, lowest, highest, frequency, and ratio values were used in the descriptive statistics of the data. The distribution of variables was measured with the Kolmogorov-Smirnov test. Paired-sample t-test, and Wilcoxon test were used to analyze dependent quantitative data. Statistical analysis was performed using IBM SPSS version 22.0 software (IBM Corp., Armonk, NY, USA). P value of <0.05 was considered statistically significant.

RESULTS

The analysis of the data of 151 patients (67 males, 44.4% and 84 females, 55.6%) with a mean age of 79.9 (range, 53-97) years revealed 90 right (59.6%) and 61 (40.4%) left hip fractures. Forty-eight patients

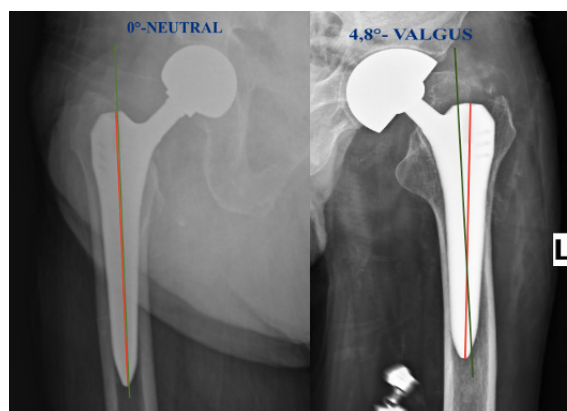


Figure 1.

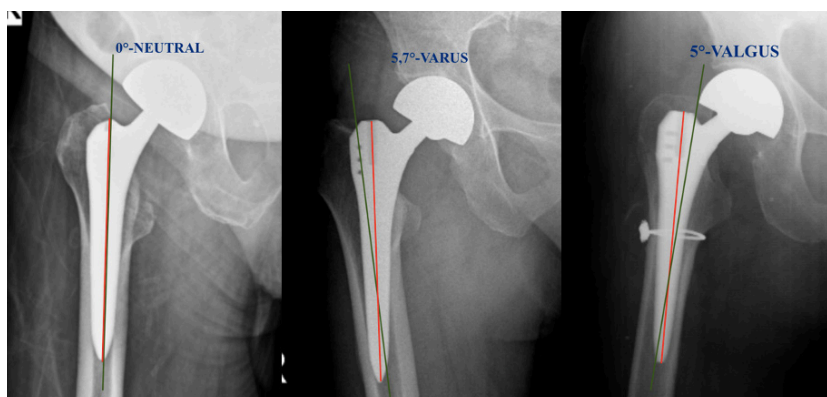


Figure 2.

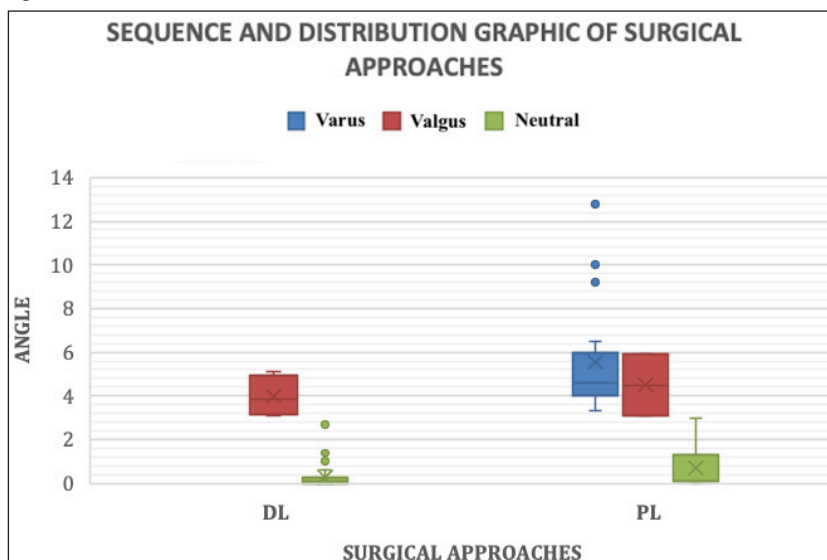


Figure 3.

(31.8%) were treated with the DL approach, and 103 patients (68.2%) with the PL approach.

While examining the prosthetic alignment, angles less than 3° degrees were considered neutral. Of the patients with the DL approach, 44 had a neutral alignment, and four had a valgus alignment, while none of the patients had varus alignment (Figure 1). Of the patients with the PL approach, 79 had a neutral alignment, 2 had a valgus alignment, and 22 had a varus alignment (Figure 2). There was a significant difference between the two approaches in terms of prosthetic alignment rates with both neutral and varus alignment ($p < 0.001$). The sequence distribution graphic of the surgical approaches is shown in Figure 3.

While the mean operative time was 79.4 (range, 60-95) minutes for the DL approach, it was 80.1 (range,

55-118) minutes for the PL approach. There was no significant difference between the approaches in terms of operative time.

The analysis of the complications showed ten periprosthetic fractures (20.8%) for the DL approach and 18 periprosthetic fractures (21.1%) for the PL approach. There was no significant difference between the approaches regarding periprosthetic fracture ($p = 0.621$). In addition, dislocation was observed in 1 patient treated with the DL approach (2.08%), while it was observed in 5 patients treated with the PL approach (4.85%). However, the difference between the approaches regarding dislocation was insignificant ($p = 0.417$). Moreover, the analysis of the relationship between periprosthetic fracture and dislocation rates and prosthetic alignment revealed no significant difference ($p = 0.041$ and $p = 0.067$, respectively). In addition, wound site infection was ob-

served in 2 (4.1%) patients in the DL approach and in 3 (2.9%) patients in the PL approach. There was no significant difference between the approaches in terms of wound infection ($p=0.691$). Findings of hematoma in the surgical field were seen in 1 (2.08%) patient in the DL approach and in 4 (3.88%) patients in the PL approach. There was no significant difference between the approaches in terms of surgical site hematoma finding ($p=0.568$). When the 90-day mortality was examined, it was seen that 11 (22.9%) patients died in the DL approach and 27 (26.2%) patients in the PL approach. There was no significant difference between approaches regarding 90-day mortality ($p=0.666$).

As a functional result, when the first three days of mobilization were examined, it was observed that 14 (29.16%) patients were mobilized in the DL approach and 22 (21.35%) patients in the PL approach. Extremity patients and those with periprosthetic fractures were considered immobilized. No significant difference was found between the approaches in terms of mobilization ($p=0.249$).

DISCUSSION

This retrospective study, including elderly patients who underwent HA for femoral neck fracture and intertrochanteric fracture, demonstrated that the PL approach may result in an increase in prosthetic alignment problems compared to the DL approach. In their study, Gema et al. showed a significant relationship between femoral stem alignment and femoral stem collapse and postoperative low functional outcomes. They reported that neutral alignment had a protective effect against femoral stem collapse with better functional outcomes. Moreover, they showed that varus alignment had the highest femoral stem collapse with the worst outcomes (5). Our study revealed that neutral alignment was significantly higher for the DL approach, while varus alignment was significantly higher for the PL approach. This shows that femoral stem complications may be less common, and functional outcomes may be better in HA procedures performed with the DL approach for hip fractures.

Proper intraoperative placement of the femoral stem is essential for periprosthetic fracture. The change in the femoral stem alignment increases the offset and extends the lever arm. This may increase the tension and stress on the medial side of the proximal femur and the area at the distal end of the stem, increasing the likelihood of intraoperative and postoperative periprosthetic fractures (6). Despite the higher rate of periprosthetic fractures for the PL approach compared to the DL approach in our study, there was no significant difference between the two approaches.

Preventing complications and repeat surgeries in the patient group who underwent HA for hip fracture is extremely important in terms of morbidity and mortality. Numerous studies report no significant difference between the DL approach and PL approach used for hip arthroplasty in terms of functional outcomes and postoperative complications (7,8). However, Enocson et al. reported the PL approach as the most important risk factor that increases dislocation despite the appropriate reconstruction of soft tissue structures to prevent HA dislocation with this approach (9). In addition, Sköldenberg et al. showed a significant decrease in prosthetic dislocation rates when they used the PL approach instead of the DL approach (10). There is a consensus in the literature that the PL approach has a higher risk for major reoperation. One of the most important reasons for this is that recurrent dislocations create a higher reoperation rate (11). Our study showed no significant difference between the two approaches, although the number of dislocations was higher for the PL approach than the DL approach.

In their study, Biber et al. retrospectively analyzed 704 patients and reported that the DL approach was more prone to hematoma formation requiring surgical intervention (12). Keene and Parker reported a higher risk of thrombosis for the PL approach, attributing the reason to greater trauma to the femoral vein caused by the PL approach (13). Our study revealed no significant difference between the two incisions in terms of the incidence of postoperative hematoma and the incidence of thrombosis. Postoperative hematoma formation can be reduced by an approach without traumatizing soft tissues and meticulous hemostasis; however, this would be reflected in operative time.

In their study, Macedo et al. reported that the PL approach resulted in shorter operative time, with less bleeding and less requirement for transfusion (14). Figueroa et al. reported that compared with the PL approach, the DL approach had a shorter operative time and caused less blood loss in patients treated with HA for femoral neck fracture (15). In our study, it was observed that there was no difference between the DL approach and the PL approach in terms of operation time.

Aggarwal et al. retrospectively analyzed 3574 patients who underwent primary elective total hip arthroplasty and reported a higher rate of infection for the posterior approach compared to the DL approach in this study, comparing five different types of incisions (16). Purcell et al. compared the anterior incision with the posterior incision in obese patients and reported more wound site problems for the anterior incision, which they attributed to the close proximity of the incision site to the abdominal pannus (17). Some authors in the literature have argued that the infection rate may be higher due to the proximity of the posterior approach to the perineum (13, 18). On the other hand, our study showed no significant difference between the two groups regarding wound site infection and wound site problems.

In a retrospective study of 409,906 hip prostheses in England and Wales between April 2003 and December 2011, Hunt et al. argued that among the incisions, the posterior approach could reduce the first 90-day mortality after hip replacement (19). A retrospective study by Mohamed et al. examining 171 patients and comparing the DL and posterior approach reported that six patients in the posterior approach group and 9 patients in the DL approach group died in the 1-year period (20). In our study, the effects of approaches on 90-day mortality were found to be similar.

Two randomized controlled trials compare functional outcomes between the DL and PL approach in hip fracture patients. A study by Sikorski and Barrington compared 114 patients who underwent HA with the DL or PL approach showed that the PL approach had better functional results (21).

In another study conducted with 216 patients treated with HA after hip fracture, the standard DL or PL approach was applied to the patients by a single surgeon, and it was shown that there was no significant difference between the two approaches in terms of functionality (22). In our study, it was observed that there was no difference between DL and PL approaches in terms of mobilization in the first three days.

The limitations of our study are that the sample size is partially small, the study is single-center, the DL approach used in hip fracture surgery, and the PL approach are preferred by the on-duty surgeon, so the patients are not randomized, and the follow-up period is relatively short.

As a result, varus femoral stem alignment in HA application increases the risk of femoral collapse and may be associated with worse functional outcomes. Among the approaches used during surgery, it was observed that the PL approach caused more varus femoral stem alignment problems than the DL approach. This situation may cause a serious increase in morbidity, limitation of mobilization, and the need for secondary surgery.

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