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Management of osteoporotic pertrochanteric fractures with external fixation in elderly patients

Osteoporotik yaşlı hastalarda pertrokanterik kırıkların eksternal fiksasyonla tedavisi

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Amaç: Bu çalışmada anestezi riski yüksek yaşlı hastalarda intertrokanterik kırıklar için eksternal fiksatörle osteosentezin sonuçları değerlendirildi.

Çalışma planı: İntertrokanterik kırığı olan, ASA 4 14 hastaya (5 erkek, 9 kadın; ort. yaş 75; dağılım 65-81), hafif sedasyonla kombine epidural anestezi altında, eksternal fiksatörle osteosentez ameliyatı yapıldı. AO/OTA sınıflamasına göre altı hastada A1.2, yedi hastada A2.2, bir hastada ise A3.1 tipi kırık vardı. Kırıkların tamamı kapalı kırıktı. Ameliyat öncesinde sağlam taraf kalçanın Singh indeksi ortalama 3.15 (dağılım 3-5) bulundu. On bir hastada AO tipi tübüler eksternal fiksatör, üç hastada ise unilateral eksternal fiksatör kullanıldı. Hastalar son kontrollerinde Parker-Palmer mobilite skoru ve Harris skoru ile değerlendirildi. Ortalama takip süresi 12 aydı (dağılım 9-17 ay).

Sonuçlar: Ortalama ameliyat süresi 37 dk (dağılım 25-44 dk), skopi kullanma süresi 1.5 dk (dağılım 1-2 dk), ortalama hastanede yatış süresi yedi gün (dağılım 5-15 gün) idi. Hiçbir hastada kan transfüzyonu gerekmedi. Tüm hastalarda ortalama 4.1 ayda (dağılım 3-5 ay) kaynama sağlandı. Ameliyat sonrası erken dönemde ortalama 133º (dağılım 127°-139°) ölçülen femur boyun-şaft açısı, son kontrollerde 132º (dağılım 126°-138°) bulundu. Beş hastada (%35.7) çivi dibi enfeksiyonu (derece I) görüldü. Hiçbir hastada distal fragmanın mediale deplasmanı, ekstremitede kısalık veya cihaz yetmezliği görülmedi. Üç hasta (%21.4) ameliyat sonrası ilk yıl içinde eşlik eden hastalıklar nedeniyle öldü. Son kontrollerdeki ortalama Harris skoru 61 (dağılım 45-80), Parker-Palmer mobilite skoru ise 6.6 (dağılım 5-8) bulundu.

Çıkarımlar: Yüksek anestezi riski taşıyan yaşlı hastalarda, pertrokanterik kırıkların tedavisinde eksternal fiksatörle osteosentez, ameliyat sırasındaki ve sonrası komplikasyonları azaltan hızlı ve minimal invaziv bir seçenektir.

Anahtar sözcükler: Kemik çivisi; eksternal fiksatör; femur kırığı; kırık tespiti; kalça kırığı/cerrahi; osteoporoz/komplikasyon.

Objectives: We evaluated the results of osteosynthesis with external fixation for intertrochanteric hip fractures in elderly patients with a high anesthesia risk.

Methods: Fourteen ASA 4 patients (5 men, 9 women; mean age 75 years; range 65 to 81 years) with intertrochanteric hip fractures were treated with a unilateral external fixator under epidural anesthesia combined with mild sedation. According to the AO/OTA classification, six fractures were A1.2, seven fractures were A2.2, and one fracture was A3.1. All were closed fractures. The mean preoperative Singh index of the contralateral hip was 3.1 (range 3 to 5). Eleven patients received an AO tubular external fixator, and three patients received a unilateral external fixator. Final evaluations were made using the Parker-Palmer mobility score and Harris hip score. The mean follow up was 12 months (range 9 to 17 months).

Results: The mean operation time was 37 min (range 25 to 44 min), the mean fluoroscopy time was 1.5 min (1 to 2 min), and the mean hospital stay was seven days (5 to 15 days). None of the patients required blood transfusion. Bone union was obtained in all the patients in a mean of 4.1 months (3 to 5 months). The mean femoral shaft-neck angles in the early postoperative period and at the latest follow-up were 133º (127º to 139º) and 132º (126º to 138º), respectively. Five patients (35.7%) developed grade I pin-tract infection. Medial displacement of the distal fragment, limb shortening, or fixator failure were not seen. Three patients (21.4%) died within the first postoperative year due to associated diseases. The mean final Harris hip score was 61 (range 45 to 80) and the mean Parker-Palmer mobility score was 6.6 (range 5 to 8).

Conclusion: Osteosynthesis with an external fixator in elderly patients with a high anesthesia risk is a fast, minimally invasive procedure in the treatment of pertrochanteric fractures, resulting in fewer pre- and postoperative complications.

Key words: Bone nails; external fixators; femoral fractures; fracture fixation; hip fractures/surgery; osteoporosis/complications.

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Osteoporotic hip fractures of the elderly patients are serious injuries with high costs, high morbidity and high mortality. Results of conservative management of geriatric fractures is not satisfactory due to the increased risk of cardiopulmonary complications related to immobilization; the mortality rate in the first postoperative year is reported as %18 to %30.[1] The goals of surgical tretment are to obtain anatomical reduction, to obtain stable fixation and to allow early rehabilitation.[2,3] Various surgical techniques and materials have been proposed. Open reduction and internal fixation of patients with pertrochanteric fractures and high ASA scores may result in increased risk of hemorrage and additional soft tissue trauma.[3-7] In these high risk group of patients, minimal invasive surgical techniques with less morbidity should be prefered.

Recently, external fixators with superior biomechanical properties using minimally invasive techniques have been developed.[8-12] In this study, results of patients with intertrochanteric fractures and high ASA risks who have been managed with external fixators are peresented.

Patients and methods

14 patients (5 male, 9 female; mean age 75; range 65-81) with intertrochanteric fractures were managed with closed reduction and external fixation between May 2005-January 2007. Six patients had A1.2 , seven patients had A2.2, and one patient had A3.1 type fractures according to AO/OTA classification (Figure 1). All fractures were closed fractures. According to the American Society of Anesthesiologists (ASA) scale, all patients were classified as ASA 4 preoperatively. Presence of senil dementia would interfere with compliance of the patient to the postoperative rehabilitation programme and thus was accepted as an exclusion criteria. The Singh index was evaluated preoperatively at the time of the procedure from the contralateral hip radiographs and average score was found to be 3.15 (range 3-5). Due to the high risk of general anaesthesia, all patients received a combined epidural anaesthesia with minimal sedation. The mean follow up of the patients were 12 months (range 9-17 months).

External fixators

In this study, two different types of external fixators were used. In eleven of the patients, the AO tubuler external fixators were used. This system consists of carbon rods with 11 mm diameter, connection aparatus and pin holders. Free sliding effect of pin holders on carbon rods enables the surgeon insertion of Schanz pins at different angles which obtains a multiplanar fixation.

In the remaining five patients, unilateral external fixators which had been previously designed for limb lengthening were used. Although this type of fixator was larger and heavier than the other type, it costed less and thus preferred in patients with no social insurance.

Surgical technique

Prior to fixation, the fractures were reduced under fluoroscopy, with the patient on a fracture table, to ensure a slightly valgus angulation. (Figure 2a,b) Excessive valgus angulation, varus angulation and unsatisfactory internal rotation were avoided. Using image intensifier, three Schanz screws of 6 mm diameter were inserted into the femoral head and implanted to a depth of 1cm below the femoral head surface in different planes and angles. The threaded parts of the Schanz screw should cross the fracture line. The quality of reduction and the position of the Schanz screws were checked in both planes using image intensifier. Both cortices of the femoral diaphysis were drilled with a low speed burr, and two

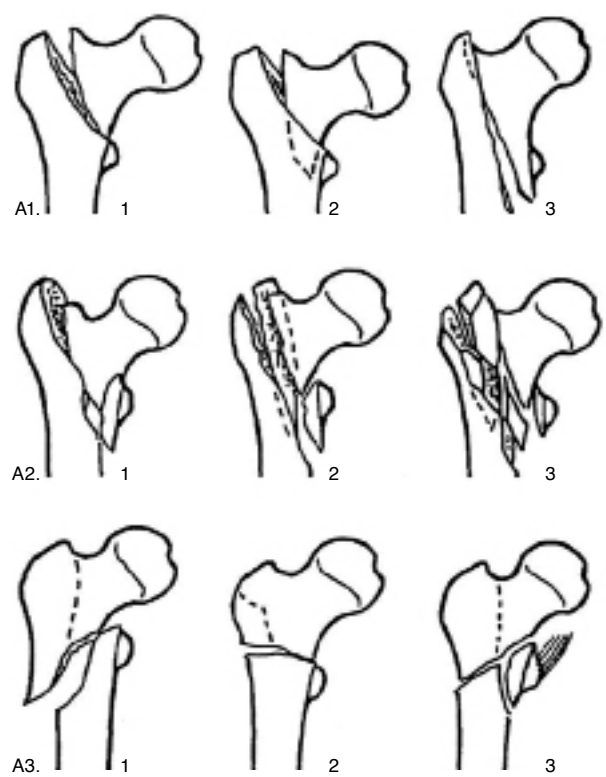

Figure 1. AO/OTA classification.

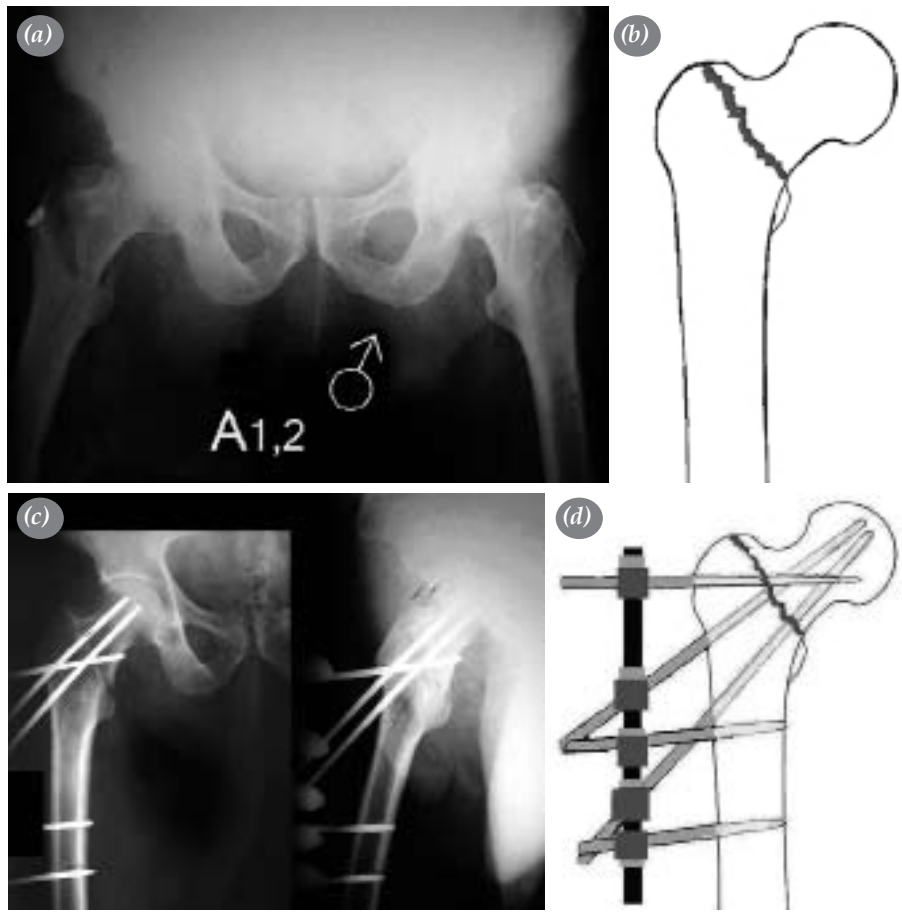

Figure 2. (a) Anteroposterior radiograph of a seventy-one year old man who sustained a A1.2 type intertrochanteric fracture as a result of a fall at home. **(b)** Schematic presentation of the fracture; **(c)** Postoperative anteroposterior and lateral radiographs of the same patient demonstrates good reduction; **(d)** Schematic presentation of the reduction and osteosynthesis with external fixator **(e)** anteroposterior and lateral radiographs 20 months after the procedure

Schanz screws of 6 mm diameter were inserted manually using a T-handle to a depth of two screw threads beyond the opposite bone cortex. After fracture reduction, the pin holders were tightened and the fixator was mounted. (Figure 2c,d) One dose of prophylactic first generation cephalosporin (1 g intramuscular) was administered preoperatively and postoperatively. Antithrombotic prophylaxis consisting of low-molecular-weight heparin (0.6 ml sc) was administered 12 hours preoperatively and continued once per day for 7 days postoperatively.

Postoperative radiographs were obtained in the first postoperative day and partial weightbearing with walkers were encouraged in compliant patients. After discharge, follow-up visits were scheduled at monthly intervals for six months. (Figure 2e) Partial weight bearing was gradually improved to full weight bearing and fixators were removed when complete bone healing was observed. To avoid pin-track complications, daily cleaning with betadine solution was performed.

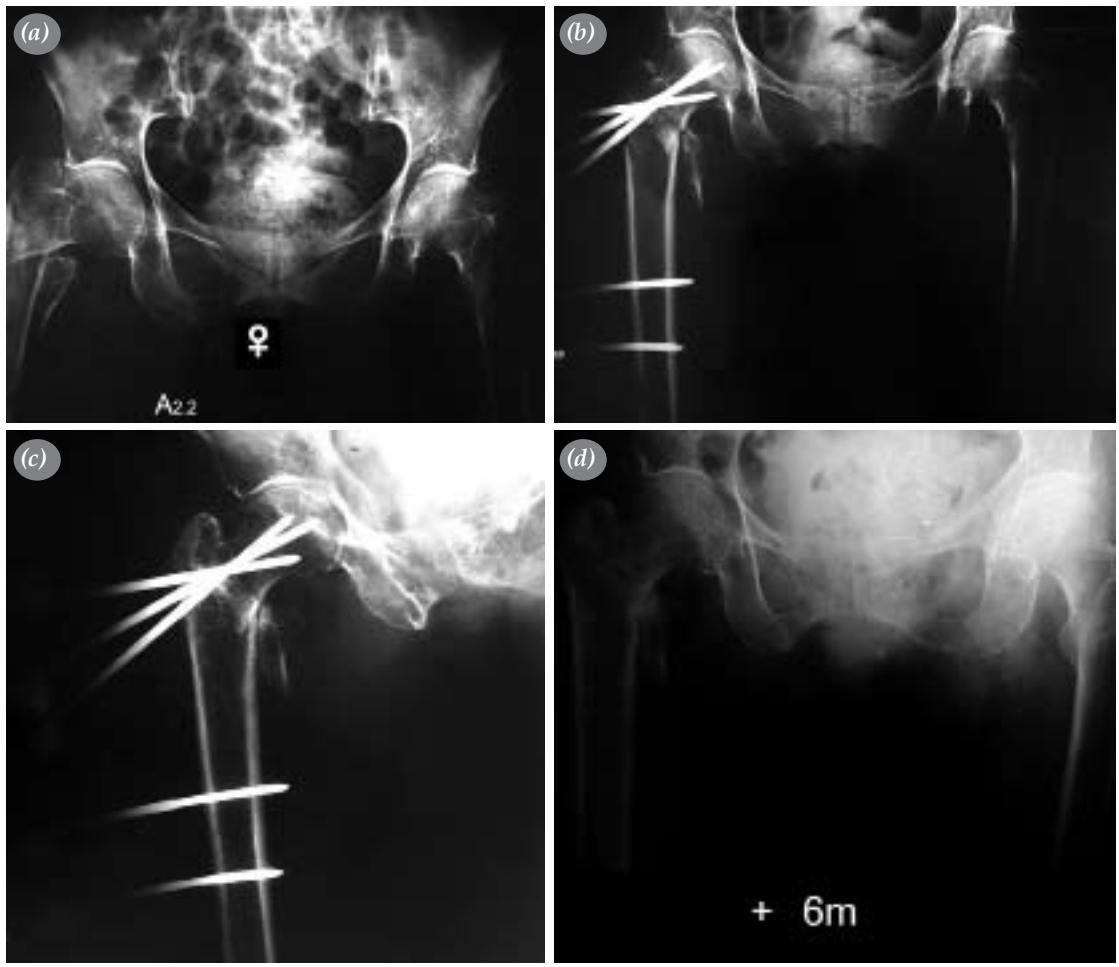

Figure 3. (a) Anteroposterior radiograph of a seventy-three year old woman who sustained a A2.2 type intertrochanteric fracture as a result of a fall at home. **(b)** Postoperative radiographs of the same patient shows satisfactory fracture reduction **(c)** anteroposterior radiograph 3 months after the operation **(d)** anteroposterior radiograph 6 months after the operation

Patient education for daily pin care was carried out during hospitalization period. At the last assessment , clinical results were assessed with the Parker-Palmer mortality score [13] and with the Harris hip score.[14] Parker-Palmer mortality score evaluates the patients on the basis of their ability to walk within their place of residence, their ability to walk outside, and their ability to go shopping. Each activity was assigned a score on the basis of its level of difficulty: 3 points indicated that the patient had no difficulty, 2 points indicated that the patient needed a cane or other aid, 1 point indicated that the patient needed help from another person, and 0 points indicated that the activity was impossible for the patient to perform.[13]

Results

The average intraoperative time was 37 min (range 25-44 min), the average fluoroscopy time was 1.5 min (range 1-2 min), the average hospitalisation period was 7 days (range 5-15 days); the average preoperative hospitalization period was four days (range 2-7 days) due to the pre-existing medical conditions. None of the patients needed intraoperative blood transfusion. All fractures healed in an average of 4.1 months (range 3-5 months).(Figure 3) The radiographs at the early postoperative period and at the last assessment revealed a mean neck-shaft angle of 133º (range 127°-139°) and 132º (range 126°-138°), respectively. Grade 1 pin track infections were observed in five patients (%35.7) which healed with daily wound dressing change.

Medial displacement of the distal fragment, shortening of the extremity, or implant failure were not observed in this series; secondary procedures related to serious postoperative complications was not necessary in this study. Postoperative mortality was

observed in three patients. One patient died of pre-existing heart failure in the intensive care unit at the 15th postoperative day. The other two patients died in the first postoperative 6 months after complete raidological healing was observed.

The average Harris score and the average Parker-Palmer score of the remaining 11 patients at the time of the most recent follow- up were 61 (range 45-80), and 6.6 (range 5-8), respectively.

Discussion

Mortality rates of hip fractures are higher than by other common severe diseases such as cancer of the stomach or the pancreas [15] Knowing the fact that the average life expectancy will be eighty-two years for women and seventy-four years for men by the year 2020, it is predictable that this type of fractures will be seen more often.[16]

Stability of fracture fixation is vital for bone healing and evaluation of bone quality is of primary concern.[17] Moroni et al believe that an ideal osteosynthesis technique and material for osteoporotic pertrochanteric fracture must obtain good stability and control fracture impaction.[18] Serious disadvantages such as postoperative varus collapse, limb shortening and medial displacement of the distal fragment have been reported with sliding hip screws which is one of the most widely used techniques for pertrochanteric fractures.[3-5] Proximal femoral nailing is another method wich can be used with minimal invasive surgery technique. Cutout of the lag screw, implant failure, pull out of the cortical screws have been reported in both techniques in %5-20 of unstable fractures.[3,6,7] Both methods of internal fixation methods may not be suitable in patients with high ASA scores. The incidence of mechanical problems common in external fixators have been reported to be less in both techniques.[6] This advantage of external fixators have been correlated with the tension band effect of laterally placed external fixator and/or the elasticity of the Schanz screws. [6] All fractures in this study had closed reduction and no loss of intraoperative reduction was observed in the follow up. The superior biomechanical stability achieved by multiplanar insertion of Schanz screws may be the main reason in preventing loss of anatomical reduction.

Recently, the rate of pin track infections have been reported %0-30 in several studies. [6,18,19] Five patients (%35.7) had low grade pi track infections which were not serious enough to have a negative impact on the results. Meticulous surgical technique during Schanz screw insertion and good patient education about pin care were thought to be responsible in decreasing the severity and rate of pin track infection. The surgical technique of external fixation in proximal hip fractures is relatively easy compared to sliding hip screw and proximal femoral nail.[20] It was first described in 1950's for pertrochanteric fractures but was later abandoned because of high complication rates.[21,22] External fixators enable the surgeon a wide range of freedom to implant the Schanz screws in different angles and numbers depending on the surgeon's preference and the width of yhe femoral neck.[8,20]

In external fixation of pertrochanteric fractures, the surgical time of is short, the intraoperative reuction achieved is stable and postoperative complications are few. In this study,both the surgical time and intraoperative fluoroscopy time were found to be short and the closed reduction of the fracture was easy. In conclusion, we think that external fixation, which is a minimally invasive technique with minimal blood loss, may be one of the wise solutions in ASA 4 risk patients with intertrochanteric fractures.

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