

Original article

Surgical treatment of hip fractures

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ABSTRACT. *Objective:* evaluate the experience acquired in the surgical management of hip fractures. *Material and methods:* retrospective study of 206 patients undergoing surgical treatment of hip fracture from June 2005 to June 2007. Besides the demographic variables, the following variables were recorded: Fracture classification, interval between the occurrence of the fracture and its surgical treatment, physical status according to the American Society of Anesthesiology classification, preoperative comorbid conditions, type of implant used, approach used if a prosthesis was used, operative time, prophylaxis with antibiotics and for thromboembolic events, complications during the postoperative period and during a 24-month follow-up period. A descriptive statistical analysis was carried out. *Results:* fifty patients were males and 156 females, mean age was 80 years (50-99 years). The most frequent types of fractures were the intertrochanteric fracture (130 patients) and the displaced intracapsular fracture (38 patients). The most frequent surgical procedures were the placement of a compression ring and plate (133 patients) and hemiarthroplasty (49 patients). Ten patients had various postoperative complications. Two patients died during the follow-up period (24 months). *Conclusions:* fixation was performed in young patients with undisplaced fractures and in all patients with an impacted and stable subcapital fracture. Arthroplasty was preferred in patients with a displaced fracture.

RESUMEN. *Objetivo:* Evaluar la experiencia adquirida en el manejo quirúrgico de la fractura de cadera. *Material y métodos:* Estudio retrospectivo con 206 pacientes en quienes se efectuó tratamiento quirúrgico de fractura de cadera entre Junio de 2005 a Junio de 2007. Adicionalmente de las variables demográficas se registraron: Clasificación de la fractura, intervalo entre la fractura y su tratamiento quirúrgico, estado físico según la clasificación de la Sociedad Norteamericana de Anestesiólogos, comorbilidades preoperatorias, tipo de implante utilizado, vía de abordaje en caso de colocación de prótesis, duración del procedimiento quirúrgico, profilaxis con antibióticos y para eventos tromboembólicos, complicaciones en el postoperatorio y durante un período de seguimiento por 24 meses. Se realizó análisis estadístico descriptivo. *Resultados:* Cincuenta pacientes fueron del sexo masculino y 156 del femenino, la edad promedio fue 80 años (50-99 años). Los tipos más frecuentes de fractura fueron la intertrocanterica (130 pacientes) y la intracapsular desplazada (38 pacientes). Los procedimientos quirúrgicos más frecuentes fueron la colocación de tornillo de compresión y placa (133 pacientes) y hemiartróplastia (49 pacientes). Diez pacientes presentaron diversas complicaciones postoperatorias. Fallecieron dos pacientes durante el período de seguimiento (24 meses). *Conclusiones:* Se realiza fijación en pacientes jóvenes con fractura no desplazada y en todo paciente con fractura subcapital impactada y esta-

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Key words: hip fracture, fixation, arthroplasty, postoperative complications.

ble. En pacientes con fractura desplazada se prefiere realizar artroplastía.

Palabras clave: fractura de cadera, fijación, artroplastía, complicaciones postoperatorias.

Introduction

A very important increase in the incidence of hip fracture was reported in Western countries during the past three decades.¹ This trend will continue due to the increased proportion of elderly individuals resulting from a greater life expectancy, and due to the impact in the known risk factors for this fracture, particularly in individuals over age 80.²

In 1990 there were approximately 1.3 million hip fractures all over the world. Projections estimate that such figure will double by 2025 and will go up to as much as 6.3 million fractures by 2050. Of these, approximately half will be intracapsular and will occur in individuals around 80 years of age, 15% of whom will be females.³

In Mexico, the available morbidity figures published by the Ministry of Health reported 71,771 hospital discharges due to femur fracture from 2002 to 2007, and 47.2% of them occurred in individuals 65 or older (69.5% were women).⁴

In most cases, hip fractures should be managed surgically with the exception of critically ill patients or when the fracture is impacted and is considered as stable.⁵ Treatment varies according to the type of fracture and the patient's age.⁶

Most authors consider performing fixation for the treatment of femur neck fractures that occur in young patients and of undisplaced fractures (*Figure 1*).⁷ However, there is still controversy around the treatment of displaced fractures (*Figure 2*) due to the risk of femur head necrosis and pseudoarthrosis, especially in elderly patients.^{7,8}

Hip hemiarthroplasty is frequently used in elderly patients with femur neck fracture, whether as a primary surgery in the case of displaced fractures or as a secondary procedure after failure of internal fixation.^{9,10} Moreover, there is also controversy concerning the optimal surgical approach for hemiarthroplasty procedures.¹¹

It's a fact that this type of fracture is significantly associated with considerable morbidity and mortality rates, especially in elderly patients. The former results from the combination of several factors that include trauma, the major surgery itself, and concomitant medical conditions.¹²

The purpose of this paper is to review and evaluate the experience acquired in the surgical management of hip fractures during the past four years.

Material and methods

This observational, retrospective, cross-sectional study reviewed the medical records of all patients who un-

derwent surgery due to hip fracture from June 2005 to June 2007. Before starting the study, the Hospital Review Board approved this retrospective study and granted a waiver of informed consent. The study was conducted observing the United States Health Insurance Portability and Accountability Act.¹³

The inclusion criteria were as follows: available complete medical record, 50 years of age and over, having undergone



Figure 1. Plain X-ray showing a stable basicervical fracture.



Figure 2. Plain X-ray showing a displaced basicervical fracture.

surgical treatment for hip fracture, ability to walk without assistance prior to the fracture, and clinical evidence of an intact cognitive status.

Patients with pathologic fractures and with a previous condition of the hip or acetabulum and those living in resting homes were excluded.

Applying these selection criteria, a total of 206 patients were identified and constituted the sample. The following variables of each patient were analyzed: Age, gender, fracture classification (intertrochanteric or femur neck fractures), interval between the occurrence of the fracture and its surgical treatment, physical status according to the American Society of Anesthesiology classification,¹⁴ preoperative comorbid conditions, type of implant used, approach used if a prosthesis was used, operative time, prophylaxis with antibiotics and for thromboembolic events, as well as complications during the immediate postoperative period and during a 24-month follow-up period at the outpatient service.

Data analysis was done using descriptive statistics.

Results

The review included a total of 206 patients, 75% of whom were females (156/206) and 24% males (50/206). The patient age range was 50-99 years, with a mean of 80 years. It should be noted that 86% of the patients (179/206) were 70 years old or older.

Hip fracture occurred on the right side in 111/206 patients (53%) and on the left side in 95/206 patients (46%). Patient distribution according to the time elapsed between the occurrence of the fracture and surgical treatment is shown in *chart 3*. Concerning the classification of the American Society of Anesthesiology, 20% of patients (42/206) were considered as physical status I; 60% of patients (125/206) as physical status II; 14% (30/206) as physical status III, and 4% (9/206) as physical status IV. In the preoperative assessment, 5/206 patients had decompensated heart failure, 14/206 patients had severe chronic obstructive pulmonary disease, and 20/206 had decompensated type II diabetes mellitus. The operative time ranged between 30 and 180 minutes, with a mean of 116. The intertrochanteric fracture (2 fragments) was the most frequent type of fracture representing 63% of cases (130/206), followed by the displaced intracapsular fracture, which accounted for 18% (38/206), as summarized in *table I*. A compression screw and a DHS and DHHS plate were used in 64% of cases (133/206), and hemiarthroplasty was performed in 23% (49/206) (*See Table II*). Of the latter, 6/206 patients underwent unipolar hemiarthroplasty and 43/206 bipolar hemiarthroplasty. In the case of unipolar hemiarthroplasty, a posterolateral approach was used in 4/6 patients (66%) and a lateral approach in 2/6 patients (33%). In bipolar hemiarthroplasty, a posterolateral approach was used in 35/43 patients (81%) and a lateral approach in 8/43 patients (18%). In the hemiarthroplasty procedures, uncemented fixation was used in 44/49 patients and cemented fixation in 5/49 patients. All patients

received antibiotic prophylaxis; in 10/206 patients a double regimen plus enoxaparin was used.

During the immediate postoperative period, 8/206 patients (3%) had cognitive dysfunction, which subsided spontaneously. On the other hand, 1/206 patients had complications resulting from blood dyscrasia and 1/206 patients had surgical wound infection. During the follow-up period revision surgery was performed in 4/206 patients (*Table III*). There were 2/206 deaths, one patient due to pneumonia and respiratory failure and the other one due to complications of diabetes mellitus.

Discussion

In the past two decades, the mean age of patients with hip fracture has increased from 75 to 80 years. Individuals in this age group are considered as particularly vulnerable for this type of fractures due to various factors that include being more prone to falls, visual acuity impairment, psychotropic medications, and osteoporosis, among others.¹⁵

This study found that in 4% (9/206) of patients, more than 48 hours elapsed between the time of the fracture and the surgical treatment. Concerning this, some authors say that a delay of more than 2 days between the occurrence of the fracture and the surgical treatment is significantly asso-

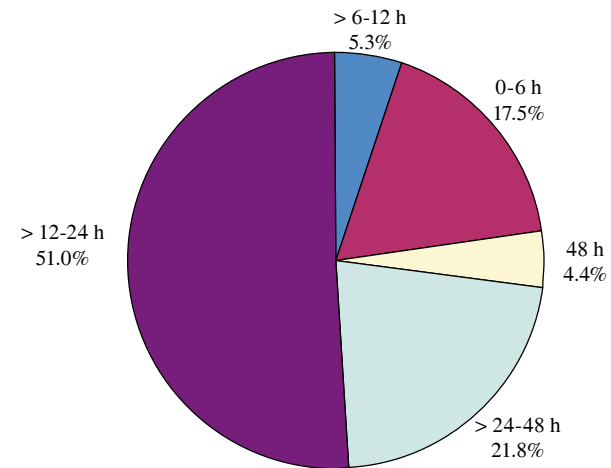


Chart 1. Interval between the time of fracture and surgical treatment.

Table 1. Patient distribution according to the fracture type.

Fracture type	Number of patients	Percentage (%)
Intertrochanteric fracture- 2 fragments	130	63.10
Displaced intracapsular fracture	38	18.44
Undisplaced intracapsular fracture	20	9.70
Multifragmented intertrochanteric fracture	9	4.36
Subtrochanteric fracture	5	2.42
Basicervical fracture	4	1.98
Total	206	100

ciated with a high short-term mortality rate.¹² Even though the proportion of our patients is similar to the one reported by several series, one should be especially careful and delay surgery only in high risk patients and for the shortest possible time while they achieve preoperative stabilization. One should also emphasize to physicians in charge of prehospital care the importance of timely referral.

In a prospective study, Roche et al. reported the perioperative complications and the 30-day mortality rate of



Figure 3. X-ray showing a hip fracture treated surgically with a gliding DHS nail plate.

Table 2. Patient distribution according to surgical treatment.

Type of surgery	Number of patients	%
Hemiarthroplasia bipolar	43	20.87
Compression screw and plate (DHS y DHHS types)	133	64.56
Bipolar hemiarthroplasty	43	20.87
Long intramedullary nail with distal fixation	9	4.36
Total arthroplasty	8	3.88
Unipolar hemiarthroplasty	6	2.91
Two screws or nails	4	1.94
Short intramedullary nail with distal fixation	2	0.97
30-hole LCP plate	1	0.57
Total	206	100.00

2,448 patients who underwent surgery for hip fracture; 41% of them had no preoperative comorbid conditions and in the remaining patients the most frequent entities were cardiovascular disease (24%), obstructive pulmonary disease (14%), and cerebrovascular disease (13%).¹² According to the preoperative assessment, 2% (5/206) of our patients had cardiovascular disease and 6% (14/206) had chronic obstructive pulmonary disease. Additionally, 9% of the patients (20/206) were found to have decompensated type II diabetes mellitus. Of them, 2/206 patients had moderate kidney failure. It has been shown that the preoperative comorbid conditions are significantly correlated with mortality; that is why in elderly patients with femur neck fracture and any comorbid conditions we prefer to perform bipolar hemiarthroplasty to promote early patient mobilization.^{12,16}

In this case series intertrochanteric fractures were the most frequent type, followed by displaced intracapsular fractures. Concerning the latter, Roche et al. found a 57% frequency of intracapsular and 43% of extracapsular fractures.¹² On the other hand, Gjertsen et al. reported that the intertrochanteric fracture was the most frequent one (30%).^{1,10}

Most authors recommend performing fixation in young patients and in those with undisplaced fractures. However, there is still controversy concerning the optimum treatment of displaced intracapsular fractures in elderly patients.⁷ Rogmark et al. reported that the result of hemiarthroplasty was better than internal fixation as the treatment of displaced fractures in elderly patients.⁶ Among our patients, 23% (49/206) of them underwent hemiarthroplasty due to a displaced intracapsular fracture.

In a recent study, Keating et al. concluded that total arthroplasty (*Figure 5*) provided a better functional outcome as treatment for hip fractures.⁸ In this study, eight total arthroplasties were performed based on the individual functional demand especially due to the presence of acetabular arthrosis.

Based on our experience, we think that the DHS and DHHS systems provide the best fixation for undisplaced extracapsular fractures, in agreement with what Yih-Shiunn et al. have pointed out; that is why it was the most frequent surgical procedure.⁷

In a retrospective study, Merrer et al. reported a 5% complication rate resulting from surgical wound infection in patients who underwent surgery for a femur neck fracture.¹⁷ However, in our series only one patient had this complication.

Table 3. Revision surgery.

Patient	Type of primary surgery	Reason for the revision	Type of treatment
1	Compression screw and plate	Fixation failure	Implant Removal/Hemiarthroplasty
2	Long intramedullary nail with distal fixation	Fracture around the implant	UFN centromedullary nail with anchoring and open reduction with a long LCP plate
3	Unipolar hemiarthroplasty	Periprosthetic fracture	Implant Removal/Hemiarthroplasty
4	Long intramedullary nail with distal fixation	Fracture around the implant	New fixation

In this study the most frequent complication was cognitive dysfunction or postoperative delirium, usually related with electrolytic disorders occurring in the immediate postoperative period, something that happens especially in elderly patients.¹²

During the follow-up period, one patient had fixation failure and three patients reported a second fall which led to periprosthetic fracture; these were the patients who required a revision procedure.



Figure 4. X-ray showing a total hip arthroplasty.



Figura 5. Imagen radiográfica axial que muestra fractura subcapital tratada con tornillos canulados.

By means of conclusion, a weakness of this study is that it is retrospective and is subject to the known biases of this type of studies. However, the experience reported herein allows pointing out that in every young patient with an undisplaced hip fracture, as well as in patients of any age with a subcapital fracture that is impacted and considered to be stable, osteosynthesis with fluted screws is the recommended procedure (*Figure 6*). In patients of any age with an intracapsular displaced fractures a bipolar hemiarthroplasty is indicated. We preferably use uncemented implants with/without hydroxyapatite. We use cemented implants preferably in elderly females when the cortico-diaphyseal index is indicative of poor bone quality. In patients with an extracapsular fracture we prefer fixation with a nail and DHS or DHHS plate and, in exceptional cases, when early mobilization of the patient is needed, a non-standard prosthesis with calcar replacement is considered.

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