HEMIARTHROPLASTY IN THE TREATMENT FRACTURES OF THE FEMORAL NECK

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ABSTRACT

Objective: To epidemiologically and clinically evaluate patients with displaced femoral neck fractures that were surgically treated with cemented hip hemiarthroplasty. Methods: All patients with displaced femoral neck fractures (Garden III and IV) who underwent cemented hip hemiarthroplasty using a unipolar prosthesis (Thompson), by means of a posterolateral access between June 2005 and September 2008 were retrospectively evaluated. Results: Seventy patients were initially evaluated. Their mean age was 83.1 years. The patients were predominantly female (84.3%). Thirty-six patients were monitored as outpatients for periods ranging from 10 to 48 months (mean of 26.5 months). Fifteen patients were lost to follow-up. Nineteen patients died, and the mortality rate within the first year was 25.4%. Patients classified as ASA III had a mortality rate of 25.7% and ASA II patients, a rate of 12.1%. Two patients had symptomatic deep vein thrombosis; one patient had an operative wound infection; and none of the patients presented hip dislocation. Most of the patients did not experience pain. Twelve patients (33%) showed deterioration of their walking ability. Conclusion: There were no cases of hip dislocation. Patients classified as ASA III had a higher mortality rate than did patients with ASA I or II. There was a worsening of walking ability in 33% of the patients. No revision due to loosening or pain was needed for any patient. Thirty patients did not present any pain (83.3%), four presented moderate pain (11.1%) and two presented intense pain (5.5%).

Keywords – Femoral neck fractures; Elderly person; Hip arthroplasty

INTRODUCTION

Fractures of the femoral neck are intracapsular and typically occur with bimodal age distribution, with the majority in the elderly population[1]. The treatment options include non-surgical approaches, percutaneous fixation, open reduction with internal fixation and partial or total hip arthroplasty[1].

Decisions on how to treat femoral neck fractures are usually based on two factors. The first factor is the patient’s clinical condition, which includes age, activity level and comorbidities. The second factor is the type of fracture and, more specifically, whether it is displaced or not. Physiologically elderly patients with dislocated femoral neck fractures who present low demand have been treated with partial Thompson prostheses.

This study had the aim of undertaking an epidemiological and clinical assessment on patients with displaced femoral neck fractures who underwent surgical treatment consisting of cemented partial hip arthroplasty with a unipolar Thompson prosthesis.

SAMPLE AND METHODS

All the patients with a dislocated femoral neck fracture (Garden III and IV) who underwent cemented partial hip arthroplasty with a unipolar Thompson prosthesis...
prosthesis by means of a posterolateral hip access route were evaluated. These patients were all operated in the Department of Orthopedics and Traumatology, School of Medical Sciences, Santa Casa de Misericórdia de São Paulo, between June 2005 and September 2008.

On admission to the hospital, the patients were radiographed in anteroposterior view of the pelvis and lateral view of the hip, and their fractures were classified in accordance with Garden. After radiography and clinical assessments, a protocol drawn up by the Hip Group of the Department of Orthopedics and Traumatology, School of Medical Sciences, Santa Casa de Misericórdia de São Paulo, was filled out.

Seventy patients with a displaced femoral neck fracture were admitted, and all of them underwent surgical treatment consisting of cemented partial hip arthroplasty with a Thompson prosthesis, by means of a posterolateral access route.

With regard to the operative technique, the patient is positioned in lateral decubitus. Moore’s posterolateral access route is used; the femoral head and neck are resected; the femoral canal is milled; the femoral canal is closed off using a bone plug; the unipolar Thompson prosthesis is cemented in, with 10 to 15° of anteversion; the stability of the hip is tested with the leg flexed with internal rotation and adduction, and extended with external rotation; and the posterior capsule is sutured and, when possible, the short external rotator muscles are reinserted using transosseous stitches with Ethibond thread.

Mechanical prophylaxis for deep vein thrombosis was used during the immediate postoperative period, with motor physiotherapy and early mobilization for the patient. No prophylactic medication was administered.

In assessing the patients’ capacity to walk, they were classified into four groups: community walkers (patients with the capacity to walk inside and outside of their homes, possibly needing a walking aid); home walkers (patients with the capacity to walk only inside their homes, generally requiring a walking aid); non-functional walkers (patients who only walked during the physiotherapy sessions); and non-walkers (without the capacity to walk).

For pain measurement, the Sikorski and Barrington scale was used. This was used because it was easy to apply and could be answered both by the patient and by the accompanying person, given that many of the patients presented notable cognitive abnormalities and were incapable of answering certain questions and quantifying their pain. This scale assesses the presence of pain and whether there is a need for analgesics and the frequency of their use (Box 1).

All the patients were referred to the Hip Group’s outpatient clinic for periodic follow-up, at which anteroposterior radiographs of the pelvis were obtained. The outpatient follow-up protocol drawn up by the Group was filled out. Among the various factors analyzed, the presence of infection (seen clinically and in laboratory tests), deep vein thrombosis and prosthesis dislocation were assessed.

RESULTS

Among the 70 patients, 59 were female (84.3%) and 11 were male (15.7%). The right side was affected in 37 patients (52.9%). The mean age was 83.1 years, with a range from 58 to 99 years. In the American Society of Anesthesiology (ASA) classification, two patients were ASA I (2.86%), 33 were ASA II (47.14%) and 35 were ASA III (50%). None of the patients were classified as ASA IV or V. All the femoral neck fractures were displaced: 20 (28.6%) were Garden grade III and 50 (71.4%) were grade IV. All the patients presented low-energy trauma caused by falls to the ground from their own height.

The mean time that elapsed between hospital admission and the surgical procedure was 7.86 days, with a range from less than 24 hours to 40 days.

Out of the 70 patients initially admitted, 15 were lost from the follow-up and 19 died. Thirty-six patients were followed up as outpatients. The length of follow-up ranged from 10 to 48 months, with a mean of 26.5 months.

Among the 19 deaths, 14 (25.4%) occurred during the first year after the surgical procedure: eight during the first three months, four in the second and two in the third.
One of the patients who died presented deep vein thrombosis on the eighth postoperative day. This patient had presented an episode of deep vein thrombosis one year before the surgical procedure and was still using Marevan®, which was suspended for the surgical procedure. The patient died in the fifth postoperative month.

One patient died during the surgical procedure. After cementation of the femoral canal, this patient presented hypotension and cardiorespiratory arrest, and did not respond to resuscitation procedures.

The causes of the other 17 deaths were not directly related to the surgical procedure. None of these patients presented infection of the operative wound, symptoms of deep vein thrombosis or hip dislocation.

Among the 36 patients who were followed up as outpatients, none of them presented hip dislocation.

One patient presented acute infection at the operative site and underwent surgical cleaning and antibiotic therapy without success. Resection arthroplasty (Girdlestone) was required, 10 months after the initial surgical procedure.

One patient presented clinical signs of deep vein thrombosis during the outpatient follow-up. This patient underwent Doppler ultrasonography on the affected leg, which demonstrated deep vein thrombosis. Treatment with oral anticoagulant was administered, with follow-up jointly with the vascular surgery service.

None of the patients presented any need for surgical revision due to pain or loosening of the prosthesis.

Evaluation of the ASA classification in relation to the length of hospitalization up to the time of the surgery showed that the ASA III patients required a longer time to achieve clinical compensation (Table 1).

Table 1 – Relationship between ASA classification and the time that elapsed between admission and surgery

| ASA I   | 3.5 days (1 to 7 days) |
|---------|-----------------------|
| ASA II  | 6.6 days (1 to 17 days) |
| ASA III | 9.3 days (less than 24h to 40 days) |

In relation to preoperative walking capacity, the patients were classified thus: 25 community walkers, 10 home walkers and one non-walker. At the end of the follow-up period of this study, it was observed that 24 patients (66%) maintained the same walking capacity. Among the patients who presented a declining pattern, two home walkers became non-walkers, seven community walkers became home walkers, and three community walkers became non-walkers. There were no cases of improvement of walking capacity.

In the patients’ pain assessments, 30 of them said that they did not have any pain, four said that they had moderate pain but did not need analgesics, and two said that they had intense pain and required analgesics occasionally. None of them reported intense pain that regularly required analgesics (Table 2).

Table 2 – Sikorski and Barrington(5) pain scale

| Grade 1 | Absence of pain | 30 | 83.3% |
|---------|-----------------|----|-------|
| Grade 2 | Occasional moderate pain, not requiring analgesics | 4 | 11.1% |
| Grade 3 | Occasional or constant intense pain, occasionally requiring analgesics | 2 | 5.6% |
| Grade 4 | Constant intense pain, regularly requiring analgesics | 0 | 0 |
|         |                  | 36 | 100%  |

DISCUSSION

In a study conducted in the city of São Paulo, among patients with femoral neck fractures who underwent partial hip arthroplasty, Chikude et al(6) observed that females predominated (80%) with a mean age of 83 years (ranging from 70 to 95 years). The present study confirmed these data, with a prevalence of females of 84.3% and a mean age of 83.1 years.

The radiographic classification most used for femoral neck fractures is the Garden system. However, studies have shown that the intra and inter-observer variation using this classification is high. The Garden classification is used to divide the fractures into non-dislocated (Garden I and II) and dislocated (Garden III and IV)(7-9). The patients who underwent partial arthroplasty were the ones who presented dislocated fractures.

The American Society of Anesthesiology has a system for classifying anesthesia risks. In this system, grade I indicates healthy patients; grade II, mild systemic disease, without functional limitation; grade III, moderate systemic disease, with functional limitation; grade IV, severe systemic disease that represents a constant risk to life; and grade V, moribund patient with the prospect of death within 24 hours, with or without surgery(10). White et al(11) considered that the
ASA classification was the best predictor of mortality for hip fracture patients. In their study, patients classified as grade I or II presented a mortality rate after one year of 8%, while patients with grade III or IV presented a rate of 49%. In the present study, out of the 35 patients classified as ASA III, nine (25.7%) died during the first year after the surgical procedure. There were 33 patients with ASA II, and four (12.1%) died during the first year.

The prostheses used in partial arthroplasty can be placed in two groups: bipolar or unipolar. In the literature, there is a big debate on the advantages and disadvantages of each group. Several studies analyzing the two groups concluded that the results were similar with regard to wear on the acetabulum, functional results (capacity to walk and carry out activities of daily living), duration of the operation, blood loss, wound infection, quality of life, hip pain and mortality. On the other hand, the cost of unipolar prostheses is around 25% of the cost of bipolar prostheses. In the present study, all the patients underwent partial arthroplasty using a unipolar prosthesis (Thompson).

Partial arthroplasties can also be divided into another two groups: cemented or non-cemented. Studies have shown that cemented partial arthroplasty presents lower incidence of residual pain and periprosthetic fracturing, better mobility, greater independence from walking aids, better return to activities of daily living and a lower rate of acetabular erosion. The arguments in favor of the non-cemented procedure are the lower cost, shorted duration of the operation, lower blood loss and lower clinical complication rate relating to nonuse of cement. Other studies have shown that there is no difference in relation to clinical complications and the mortality rate, between patients using cemented and non-cemented prostheses. In the present study, guided by the majority of the literature, all the partial arthroplasties were cemented.

Lennox and McLaughlan observed that cemented partial arthroplasty presented higher transoperative mortality but greater patient satisfaction, in relation to the non-cemented procedure. The long-term mortality rate and the complication rate were similar between the two groups. In the present study, it was observed that there was one death during the operation, just after cementation of the femoral canal.

The mortality rate among elderly patients with femoral neck fractures within the first year after the event is high, with reported rates of between 18% and 30% among patients without acute comorbidities. Many studies have shown that certain factors increase the mortality rate, and prominent among these are male sex, advanced age, uncontrolled systemic diseases, institutionalization, psychiatric diseases, delay in performing the surgical procedure and postoperative complications.

Many studies have shown that delay in performing the surgical procedure is one of the main factors correlated with a higher mortality rate. However, there is no defined threshold time. Patients firstly have to be assessed to ascertain whether they present any acute medical comorbidity, for example: heart failure, anemia, cardiac arrhythmia, hydreolectrolytic disorders, pneumonia and coagulation disorders, among others. For patients without acute comorbidities, clinical studies have indicated that surgery should be performed within the first 24-48h, and not more than four days after the trauma, with the aim of diminishing the risks of complications. On the other hand, patients with femoral neck fractures and acute medical comorbidities are veritable challenges for the medical team. These patients present a high risk of mortality, with rates of 17% within 30 days and 43% within one year. In general, surgery should take place when the patient’s conditions are suitable for the procedure. Nevertheless, this is a difficult decision that has to be made on an individual basis and should involve the anesthetist, general clinician and surgeon. For such patients, there is no ideal time for the surgical procedure, but delaying the surgery is associated with increased mortality.

In contrast, Kenzora et al stated that delay in carrying out the operation was associated with a decreased mortality rate. They reported a rate of 28% for healthy patients (those who had not more than three comorbidities) who underwent the surgical procedure on the day of admission, and a rate of 4% for those who underwent the procedure between the second and fifth day after admission. They concluded that all the patients who presented femoral neck fractures required one or two days to recover from the acute physiological abnormalities induced by the fracture. However, certain criticisms of this study can be made. The study group was heterogenous and ranged
from patients without cognitive abnormalities who could walk to institutionalized non-walkers with dementia, which may have obscured the impact of the delay in surgery on the survival of patients who were relatively healthy before the fracture\textsuperscript{(27)}.

In a retrospective study, Sexson and Lehner\textsuperscript{(23)} observed that patients who had no more than two comorbidities presented a high mortality rate over the first year (15%) when the surgery was postponed by more than 24 hours, in relation to patients who underwent surgery within the first 24 hours (3%). In contrast, the patients who had three or more comorbidities had a mortality rate over the first year that was lower when the surgery was postponed (22%), in relation to patients who surgery was not postponed (33%).

In the present study, the mean time that elapsed between hospital admission and the surgical procedure was 7.86 days. Only eight patients were operated within the first 48 hours after admission: one case of ASA I, four of ASA II and three of ASA III. All three of the ASA III patients and the ASA I patient died during the postoperative period. Three of the ASA II patients were followed up and no deaths were observed among these patients. One of the ASA II patients was lost from the follow-up. There was a need to postpone the surgical procedure in the great majority of the cases, so that the patients would achieve clinical compensation. Joint assessments by the medical team (orthopedist, general clinician and anesthesiologist) were always made.

The access route for partial hip arthroplasty has been a controversial matter in the literature. Studies have shown that the access route has effects on the incidence of dislocation and infection and on the duration of the operation and blood loss. The routes most used are anterolateral and posterolateral\textsuperscript{(1)}. Studies have reported that the posterolateral access route is associated with a higher rate of hip dislocation, presenting rates of up to 16.3%, compared with a rate of 3.3% using an anterolateral access route. Because of these high rates, many studies have suggested that the posterolateral access route should be abandoned in cases of partial hip arthroplasty\textsuperscript{(28,29)}, given that hip dislocation is now considered in the literature to be a veritable catastrophe, with mean mortality rates reported to be between 50% and 65%, and reaching a staggering rate of 73% after six months\textsuperscript{(30-33)}. However, other studies have demonstrated that there is no difference in dislocation rates after partial hip arthroplasty, in relation to whether the access route is posterolateral or anterolateral\textsuperscript{(5,34)}. Ko et al\textsuperscript{(35)} recommended that the joint capsule should be repaired and the short external rotator muscles should be reinserted using the posterior access route, since they did not find any cases of hip dislocation after partial hip arthroplasty with this repair and a rate of 1.9% when posterior repair was not performed. In the present study, the access route used was posterolateral, and the short external rotator muscles were repaired when possible. No cases of hip dislocation were observed.

The rate of deep vein thrombosis is high with the posterior access route, with reported rates of up to 6.5% \textsuperscript{(8)}. Moreover, the rate of subclinical deep vein thrombosis is certainly much higher \textsuperscript{(8)}. In the present study, the deep vein thrombosis rate was 3.6%. Mechanical prophylaxis was used, with early mobilization (active and passive) and motor physiotherapy. Among the two patients who presented clinical signs of deep vein thrombosis, one of them had a previous history of deep vein thrombosis and was still undergoing treatment with Marevan\textsuperscript{®}. This patient progressed to death. The other patient did not have any history of deep vein thrombosis or any risk factors, and evolved satisfactorily through clinical treatment with oral anticoagulants.

The rate of deep infection among elderly patients undergoing partial hip arthroplasty with a unipolar prosthesis, using the posterior access route, has been described as ranging from 1.5%\textsuperscript{(33)} to 4%\textsuperscript{(5)}. In the present study, this rate was 1.8%. The patient involved underwent surgical cleaning and intravenous antibiotic therapy, without therapeutic success, and the clinical condition persisted. This patient then underwent resection arthroplasty on the infected hip, which led to curing of the infectious condition.

The pain levels after the surgery were not intense in most of our cases and did not limit the individuals in their activities. Vilas Boas Junior et al\textsuperscript{(36)} evaluated patients with femoral neck fractures who had undergone surgical treatment with hemiarthroplasty or internal fixation, and observed that 6.45% of the patients complained of constant intense pain and required administration of analgesics, while 93.55% of the patients did not have any pain or only had occasional mild pain. In the present stu-
dy, two patients (5.55%) presented intense pain and occasionally required analgesics, while 94.45% did not present any pain or only had moderate pain, and did not require analgesics.

One of the main objectives of the surgical procedure is to enable patients to return to at least the walking level that they presented before the fracture. In the literature, the rate of recovery of walking capacity among such patients has ranged from 41% to 97%. This variation was probably due to lack of standardization of the methods for assessing patients’ walking abilities. Miller reported that 22% of the patients lost the capacity to walk. Patients who were active and independent before the trauma are the ones who present the lowest rates of functional limitation after the surgery. The factors that correlate best with poor functional results are muscle debilitation and balance difficulties among patients. Cunha and Veado analyzed patients with proximal femoral fractures and observed that one third of the patients presented some degree of functional dependence. We observed that 12 patients (33%) presented declines in their walking patterns. The most significant decline was seen among the community walkers, since 11 patients (44% of the community walkers) presented worsening, such that seven of them became home walkers and four became non-walkers. Only one home walker presented worsening, becoming a non-walker.

Because of the short follow-up and large loss of patients, either because they could not be found or because they had died (around 50%), it was not possible to make an adequate assessment of the cemented Thompson prosthesis.

**CONCLUSION**

Females predominated. All the patients had suffered low-energy trauma.

The mean time that elapsed between admission and the surgical procedure was 7.86 days.

A high postoperative mortality rate was found, consisting of 25.4% over the first year. The patients classified as ASA III had a higher mortality rate than those with ASA I and II.

No cases of dislocation were observed. Worsening of walking capacity was observed in 33% of the cases.

There was no need for revision due to loosening or pain, for any of the patients.

Thirty patients did not present any pain (83.3%), while four presented moderate pain (11.1%) and two presented intense pain (5.5%).

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