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Patient survival and surgical re-intervention predictors for intracapsular hip fractures☆

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ABSTRACT

Background: Choosing between total hip replacement (THR) and partial hip replacement (PHR) for patients with intracapsular hip fractures is often based on subjective factors. Predicting the survival of these patients and risk of surgical re-intervention is essential to select the most adequate implant.
Methods: We conducted a retrospective cohort study on mortality of patients over 70 years with intracapsular hip fractures who were treated between January 2010 and December 2013, with either PHR or THR. Patients' information was withdrawn from our local computerized database. The age-adjusted Charlson comorbidity index (ACCI) and American Society of Anesthesiologists (ASA) score were calculated for all patients. The patients were followed for 2 years after surgery. Survival and surgical re-intervention rates were compared between the two groups using a Multivariate Cox proportional hazard model.
Results: A total of 356 individuals were included in this study. At 2 years of follow-up, 221 (74.4%) of the patients with ACCI score ≤ 7 were still alive, in contrast to only 20 (29.0%) of those with ACCI score > 7. In addition, 201 (76.2%) of the patients with ASA score ≤ 3 were still alive after 2 years, compared to 30 (32.6%) of individuals with ASA >3. Patients with the ACCI score > 7, and ASA score > 3 had a significant increase in all-cause 2-year mortality (adjusted hazard ratio of 3.2, 95% CI 2.2–4.6; and 3.12, 95% CI 2.2–4.5, respectively). Patients with an ASA score > 3 had a quasi-significant increase in the re-intervention risk (adjusted hazard ratio 2.2, 95% CI 1.0–5.1). The sensitivity, specificity, positive predictive value and negative predictive values of ACCI in predicting 2-year mortality were 39.2%, 91.1%, 71%, and 74.4%, respectively. On the other hand, the sensitivity, specificity, positive predictive value and negative predictive values of ASA score in predicting 2-year mortality were 49.6%, 79.1%, 67.4%, and 76.1%, respectively.
Conclusions: Both ACCI and ASA scales were able to predict the 2-year survival of patients with intracapsular hip fractures. The ASA scale was also able to predict the risk of re-intervention in these patients.

Level of Clinical Evidence: 3

Background

Intracapsular hip fractures in elderly patients usually require treatment with joint replacement because of the high risk of femoral head necrosis and non-union in these patients [1], and the high rate of failure and poor functional outcome after internal fixation [2]. The established treatment of these injuries is either with total hip replacement (THR) or partial hip replacement (PHR), either uni- or bi-polar [3]. Each of these options has specific characteristics that make them more suitable for certain patients.

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For example, THR contrary to PHR is associated with lower surgical re-intervention rates, and possibly better functional results, but is more expensive, and has higher dislocation rates, surgical time and blood loss [3,4]. However, the use of PHR is often associated with groin pain as a result of acetabular erosion especially in active individuals [5]. This complication may appear within a year after surgery and progressively increases with time [5], and it is often associated with poor functional outcomes and higher surgical re-intervention rates [5]. Therefore, PHR is more suitable for patients with poor general health, while THR should be performed in the patients who are expected to live longer, more mobile with better general health [6,7].

In addition, some authors argue that THR is the treatment of choice for all patients above 60 years with intracapsular hip fractures, because PHR cannot restore neither the anatomical nor biomechanical features of the hip joint; and that PHR should be implanted only in patients with a limited life expectancy [8]. Accordingly, it is essential to carefully select the patients that will undergo PHR to reduce the risk of perioperative mortality and to avoid postoperative complications.

The decision of whether to choose one treatment option over the other is often based on the age and overall health of the patient [9]. However, there is no clear guidelines that would help taking this decision, and there is a lack of evidence in the literature providing information on the survival predictors of patients with intracapsular hip fractures [10,11]. For all the above reasons, it was hypothesized that the use of objective comorbidity scores to predict the mortality of patients with intracapsular hip fractures could be a useful tool to help choose between THA or PHR. Accordingly, the main objective of this study is to analyze the 2-year survival of patients with intracapsular hip fractures who underwent either PHR or THR by use of two validated comorbidity scales: the age-adjusted Charlson comorbidity index (ACCI) and American Society of Anesthesiologists (ASA) physical status classification system score. In addition, the 2-year surgical re-intervention rate of patients who underwent the joint replacement surgery will also be analyzed.

Methods

Patient selection and clinical features

A retrospective cohort study was conducted on patients over 70 years with intra-capsular hip fractures who were treated with either PHR or THR during the period between January 2010 and December 2013. Patients' records were withdrawn from the computerized database of the Orthopedic Surgery Department at Carlos Haya Hospital of Malaga. As there was no direct contact with patients, institutional ethical approval and patients' informed consent were not obtained. All the intracapsular proximal fractures that occurred within the study period were reviewed (i.e., femoral neck and subcapital fractures). Patients with pathological fractures (i.e., history of malignancy, Paget's disease, osteomalacia) and patients treated with cannulated screws were excluded from the study.

The following information was collected from our local computerized database: age, gender, fracture side, ACCI, ASA score, treatment type (THR or PHR), surgical re-intervention and mortality. Patients were followed until death or end of study (2 years of follow-up). ACCI scores were calculated by the method previously reported by Charlson et al., in which comorbid conditions are weighted and scored, with additional points added for age [12]. The ASA score were calculated following the method described by the American Society of Anesthesiologists [13]. Patients were grouped in two categories according to the ACCI (score: ≤ 7 or >7), and ASA (score: ≤ 3 and >3). These divisions were based on a preliminary analysis which showed that 2-year mortality rates were highest in individuals whose scores were above the selected cut-off points.

Table 1
Patient demographic and clinical features.

Parameter	THR (n = 65)	PHR (n = 291)	P value
Age, years	74.8 ± 0.4	84.6 ± 0.3	<0.01
Gender			
Male	13 (20)	84 (28.9)	0.17
Female	52 (80)	207 (71.1)	
Side			
Left	36 (55.4)	155 (53.3)	0.79
Right	29 (44.6)	136 (46.7)	
Cementation			
Cemented	1 (98.5)	291 (100)	<0.01
Non-cemented	64 (1.5)	0 (0)	
ACCI			
≤7	60 (92.3)	227 (78.0)	<0.01
>7	5 (7.7)	64 (22.0)	
ASA			
≤3	53 (81.5)	205 (72.2)	0.16
>3	12 (18.5)	79 (27.8)	
Surgical re-intervention	2 (3.1)	28 (9.6)	0.13
Survival at 2 years			
Alive	58 (89.2)	173 (59.5)	<0.01
Dead	7 (10.8)	118 (40.5)	

Data are presented as No. (%) or mean ± SD.
Abbreviations: THRtotal hip replacement; PHRpartial hip replacement; ACCI, Age-adjusted Charlson's comorbidity index; ASA, American Society of Anesthesiologists physical status classification system.

Treatment options

Patients who underwent THR were operated through a direct lateral approach, and were implanted a cemented or non-cemented stem (CORAIL Hip System, De Puy Synthes®) and a non-cemented acetabular component (PINNACLE Hip System, De Puy Synthes®) with a ceramic on polyethylene bearing. Patients who underwent PHR received a cemented straight femoral stem (Original M.E. Müller, Zimmer®) and a bipolar head (Modular Bipolar Femoral Head, Zimmer®) via a posterior approach. The selection of the treatment method depended mainly on the surgeon's experience and the age of the patient.

All the operated patients followed the same post-operative pain control and rehabilitation protocols. Peri-operative pain control consisted of a combination of oral analgesia and IV opioids as needed. Physiotherapy was initiated from the first day post-surgery, the use of two crutches or a Zimmer frame were recommended for the first 6 weeks after surgery depending on the baseline condition of the patient. Patients were discharged when they were medically stable, able to mobilize safely, and had an adequate pain control. Patients were reviewed in clinic at 4 weeks, 3 months, 6 months, 1 year, and 2 years after surgery.

Statistical analysis

Data were analyzed with SPSS 22.0 software (SPSS Inc, Chicago, IL, USA). Categorical variables were presented as absolute values and percentages. Means were presented with their corresponding standard deviation (SD). The normality of the continuous variables

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