Trochanteric fractures in older patients: hip prosthetic surgery may be an alternative treatment to internal fixation?

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DOI:10.12920/jopola.2022.01

Abstract

Purpose. Internal fixation is the gold standard for the surgical treatment of trochanteric fractures in the older patients. However, in selected cases (presence of arthrosis, particularly displaced fracture, poor bone quality due to osteoporosis) some orthopedic surgeons prefer to perform a hip prostheses rather than an internal fixation. The main purpose of this work is to assess the risk of death 30 days after the trochanteric fracture by type of surgery and Charlson index, adjusted by gender and age >65 years.
Materials and Methods. From 2009 to 2017, in Tuscany region (Italy), 27707 patients with age ≥ 65 and trochanteric fracture were observed (data provided by Tuscany Regional Health Agency). Of these, 26984 patients (97,4%) had internal fixation surgery, the remaining 723 patients (2,6%) hip prosthetic surgery. Charlson Comorbit Index (CCI) was used to establish the degree of preoperative comorbidity.
Conclusions. The relative risk of death at 30 day in patients treated with hip prostheses is significantly higher than internal fixation surgery when CCI was equal to or greater than 2 (RR 1.69 *p*=0.06).
Prosthetic surgery in older patients with trochanteric fractures could be first surgical solution in patients selected for age (<75 years), presence of comorbidity (CCI = 0 or < 1) and for fracture type (31A2 or 31A3, Arbeitsgemeinschaft für Osteosynthesefragen/ Orthopaedic Trauma Association (AO/OTA) classification).

Key words: Charlson comorbidity index, trochanteric fracture, mortality.

Riassunto

Obbiettivo. La fissazione interna è il gold standard per il trattamento chirurgico delle fratture trocanteriche nei pazienti più anziani. Tuttavia, in casi selezionati (presenza di artrosi, fratture scomposte, scarsa qualità ossea dovuta all'osteoporosi) alcuni chirurghi preferiscono eseguire protesi dell'anca piuttosto che una fissazione interna.
Lo scopo di questo lavoro è valutare il rischio di morte a trenta giorni dalla frattura trocanterica per tipo di intervento chirurgico e indice di Charlson, adeguato per genere ed età > 65 anni.
Materiali e metodi. Dal 2009 al 2017, nella regione Toscana (Italia), sono stati monitorati 27707 pazienti con età ≥ 65 e frattura trocanterica (dati forniti dalla Toscana Regional Health Agency). Di questi 26984 pazienti (97,4%) sono stati sottoposti ad intervento di fissazione interna, i restanti 723 pazienti (2,6%) ad intervento di protesi d'anca. L'indice di comorbidità di Charlson (CCI) è stato utilizzato per stabilire il grado di comorbidità preoperatoria.
Conclusione. Il rischio relativo di morte a 30 giorni nei pazienti trattati con protesi dell'anca è significativamente più alto rispetto alla chirurgia di fissazione interna quando il CCI era uguale o maggiore di 2 (RR 1,69 *p*= 0,06).
La chirurgia protesica nei pazienti più anziani con fratture trocanteriche potrebbe essere la prima soluzione chirurgica in pazienti selezionati per età (<75 anni), presenza di comorbidità (CCI = 0 o <1) e per il tipo di frattura (31A2 o 31A3, Classificazione AO/OTA).

Parole chiave: Indice di Comorbidità di Charlson, frattura trocanterica, mortalità.

Introduction

The proximal femur fractures in the elderly patients (age > 65 years) are the result of an accidental fall or low-energy trauma usually associated with osteoporosis[1, 2] and other general medical conditions that may be caused by it (functional insufficiency of the lower limbs, Parkinson's disease and visual impairment)[3, 7]. It is well known that this event increases the risk of mortality[8, 9] as well as having a negative impact on the quality of life. According to the Italian Society of Orthopedics and Traumatology (SIOT) recommendations[10], the surgery should be performed within 24-48 hours of arrival at the hospital trying to identify and immediately treat any correct comorbidity (anemia, clotting deficiency, hypovolemia, electrolyte imbalance, diabetes decompensation, uncompensated heart failure, corrected heart arrhythmia or past ischemia, acute respiratory infection, aggravation

of chronic respiratory diseases), so that surgery is not delayed. The surgical internal fixation (intramedullary nail or plate and screws) represent the gold standard treatment as reported by the SIOT recommendations. However, as reported by the SIOT recommendations, there is no significant statistical evidence in the literature of reduced mortality in patients treated within 48 hours of arrival at the hospital, but a statistical trend that surgery within 48 hours could reduce the risk of mortality[10]. However, hip prosthesis may be an alternative treatment to internal fixation as reported in literature[11]. A retrospective study of 27707 older patients (age> 65 years), with trochanteric fractures, observed in Tuscany region (Italy) from 2009 to 2017 is presented (data provided by Tuscany Regional Health Agency) to evaluate if hip prosthetic surgery may be an alternative treatment to internal fixation. The main aim of the work is to assess the risk of death 30 days after the trochanteric fracture by type of surgery (internal fixation vs hip prosthetic surgery) and Charlson index, adjusted by gender and age >65 years.

Materials and Methods

From 2009 to 2017, 57412 patients were observed in the Tuscany region (Italy) for a proximal femur fracture (data provided by Tuscany Regional Health Agency from medical records). The study excluded femur neck fractures, patients treated conservatively, patients under the age of 65. Finally 27707 patients were considered. 26984 patients (97,4%) performed internal fixation (Fig. 1), the remaining 723 patients (2,6%) hip prostheses (Fig 2). In all patients the CCI[12, 13] has been calculated post hospitalization from medical records to establish the pre-operative comorbidity degree. CCI is a measure of the patients' co-morbidities, it was calculated on the diagnoses reported in the two years preceding hospitalizations for trochanteric fracture.

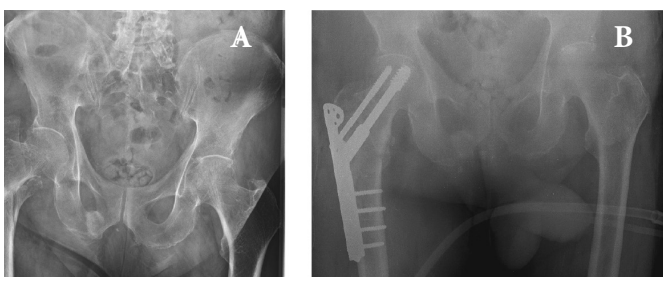


Figure 1
78-year-old man with trochanteric fracture (A). Internal fixation surgery by Dynamic Hip Screw (DHS) plate, antirotational screw and shield (B).

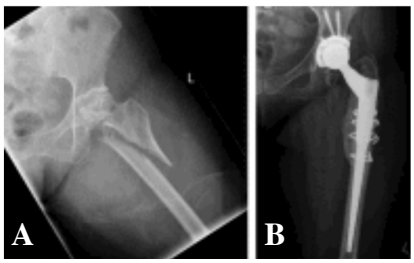


Figure 2
75-year-old woman with trochanteric fracture and hip osteoarthritis (A). Hip prosthesis with minimal internal fixation by metal circles (B).

Statistic analysis

The database was reported in excell format. A multivariate logistic regression was used for statistical analysis to assess the risk of death 30 days after the trochanteric fracture by type of surgery and CCI, adjusted by gender and age >65 years.

Results

The results of statistical analysis show that the relative risk of death in patients with surgical trochanteric fracture is higher in males (Risk Ratio = 2.1 with p <0.001), increases with age and with CCI (Risk Ratio is 2.67 with CCI equal to 2 or more versus CCI equal to 0 with p <0.001). The relative risk of death in surgical trochanteric fracture patients is insignificantly higher in patients treated with hip prosthesis (Risk Ratio 1.33 with p = 0.06). The relative risk of death in patients with surgical trochanteric fracture is significantly higher in patients treated with hip prostheses with CCI equal or greater than 2 (Risk Ratio 1.69 with p = 0.06). Mortality in prostheses is higher in more severe patients. (Table 1, 2, 3, 4) (Graphic 1).

Discussion

Usually trochanteric fractures are treated by internal fixation (Fig.1). However, fracture instability patterns, such as posteromedial cortex comminution, thin lateral wall thickness, subtrochanteric extension, and reverse obliquity but also severe comminution and osteoporosis, make fracture reduction more difficult and thus bear the risk of implant mispositioning, which ultimately increases the risk of implant failure[8, 9]. Furthermore, when arthrosis is associated to trochanteric fracture some sur-

Tables

Table 1: Multivariate regression model.

m30	Risk Ratio	*p*>z	(95% Conf.	Interval)
M vs F	2,06051	0,000	1,870255	2,371576
age	1,074186	0,000	1,064222	1,084243
CCI				
1 vs 0	1,601414	0,000	1,370991	1,870565
2 or >2 vs 0	2,67617	0,000	2,348663	3,049345
prostheses vs internal fixation	1,339731	0,065	0,9818571	1,828046
–cons	4,91E-05	0,000	2,16E-05	0,000112

Table 2: In patients with CCI equal to 0 the Risk Ratio Prosthesis vs internal fixation is equal to 1.02

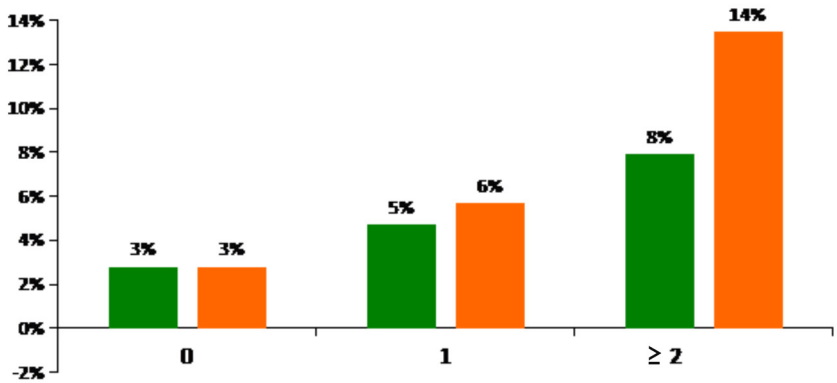
m30	Risk Ratio	Std Err.	z	*p*>z	(95% Conf.	Interval)
M vs F	2,545547	0,2283145	10,42	0	2,135184	3,034777
age	1,082494	0,007548	11,37	0	1,067801	1,09739
prosthesis vs internal fixation	1,022269	0,2897115	0,08	0,938	0,5865897	1,781542
_cons	2,36E-05	1,46E-05	17,28	0	7,06E-06	7,91E-05

Table 3: In patients with CCI equal to 1 the Risk Ratio Prosthesis vs internal fixation is equal to 1.21 (Not significant).

		EIM				
m30	Risk Ratio	Std Err.	z	*p*>z	(95% Conf.	Interval)
M vs F	1,866616	0,25886852	4,5	0	1,422628	2,44917
age	1,094176	0,0124573	7,91	0	1,07003	1,118866
prosthesis vs internal fixation	1,213764	0,4875286	0,48	0,63	0,5523758	2,667065
_cons	1,64E-05	1,65E-05	10,89	0	2,25E-06	0,0001189

Table 4: In patients with CCI equal to or greater than 2 the Risk Ratio Prosthesis vs synthesis is equal to 1.69 significant

m30	Risk Ratio	Std Err.	z	*p*>z	(95% Conf.	Interval)
M vs F	1,783818	0,1770191	5,83	0	1,468523	2,166808
age	1,052962	0,0083567	6,5	0	1,03671	1,069469
prosthesis vs internal fixation	1,697749	0,3675262	2,45	0,014	1,110726	2,595018
_cons	0,0007932	0,0005475	10,34	0	0,000205	0,0030685



Graphic: Risk of death 30 days after trochanteric fracture by type of surgery and CCI, adjusted for sex and age, years 2009-2017, age> 65

geons prefer to perform a hip prostheses than an internal fixation.[13] (Fig. 2) In any cases, the main objective in the elderly patient with a proximal femur fracture is to be able to mobilize as early as possible to avoid prolonged appearances with all associated negative consequences (bedsores, infections, muscle hypotrophy and impaired or delayed functional recovery). The surgical technique for hip prosthetic on trocantheric fracture, involves, the necessity to perform a reduction of the fracture with a minimal internal fixation (metal circles usually) and subsequently the implantation of the hip prosthesis. This surgical procedure results in increased intra-operative blood loss and longer surgical times with consequence of increased intra- and post-operative commorbidities. The rationale of this choice is to perform a single surgical approach rather than two surgical approaches (internal fixation before as first surgery and than with a second surgery removal of internal fixation implant and hip prostheses substitution).

The proposed study reveals that mortality at 30 days from the surgery is strongly conditioned, as well as by surgical choice, especially by comorbidities (assessed using the CCI) presented by patients. Charlson's CCI or Comorbidity Index was first developed in 1987 by Dr Mary E. Charlson in order to classify comorbidities that could alter the risk of mortality. The CCI was assessed for its ability to predict the risk of co-morbidity death in a cohort of 685 breast cancer patients at Yake New Haven Hospital between 1962 and 1969[11]. In our study, by convention, the CCI value of 0 indicates no comorbidities, 1 only one comorbidity, 2 or more indicates the presence of various comorbidities.

This study reveals that the presence of comorbidity (evaluated using the CCI) is a determining factor on the success of the surgery at 30 days. In fact, patients with CCI equal to or greater than 2 have a statistically significant risk of death at 30 days compared to patients of the same age group undergoing internal fixation surgery.

Therefore, is most important the selection of the patient before establishing the most appropriate surgery. Actually, there are no guidelines that define the role of the prosthesis in the treatment of trochanteric fractures in older patients.

Tiago Martinho et al.[13] report a narrative review of indication and outcomes about intertrocanteric fractures in older patients. Compared with intramedullary nails (IMN), hip hemiarthroplasty (HA) has a better early functional outcome and lower rates of surgical complications as well as reoperations. HA has a better functional outcome in the early postoperative period. The possibility of immediate full weight-bearing undoubtedly contributes to this result[14]. However, the increase in function is fast as soon as the patient can move without restriction, and the results are similar to HA from 6 to 12 months postoperatively.

The most reported complications of IMN are cut-out or protrusion of the lag screw, fixation failure, malunion, and nonunion. The most common complications of HA include dislocation or leg length discrepancy. The infection rate is similar for both treatment methods[14].

Finally the mortality rate in the longer term tend to favor IMN, even though the results are inconsistent, and a statistically significant difference cannot always be obtained. Ucpunar et al.[14] observed an increase in overall morbidity three months postoperatively in patients treated with HA, those with an American Society of Anesthesiologists (ASA) score 3 or 4, and with a lower level of independence in activities of daily living before the injury. In our series the conclusion are similar to literature[13]. In fact the surgical choice of HA rather than internal fixation involves long-term benefits but at 30 days after surgery a higher mortality rate in patients with comorbidities associated (CCI = or > 2).

Conclusions

Actually, IM is the gold standard for the treatment of trochanteric fracture in older patients. However, the choice HA may be an alternative surgical strategy and mainly depends on surgeon's preferences and fracture characteristics. In fact there are not guidelines about the best surgical strategy in older patients with trochanteric fractures.

However, about the data reported in our series, compared with data from literature, HA in elderly patients with trochanteric fractures could be solution in selected cases for age (<75 years), present comorbidity (CCI = 0 or < 1) and fracture type (31A2 or 31A3, AO/OTA classification).

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