Injury, Int. J. Care Injured 50 (2019) 1347–1352

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

Outcome of non-surgical treatment of proximal femur fractures in the fragile elderly population

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ARTICLE INFO

Article history:
Accepted 21 May 2019

Keywords:
Fragility hip fracture
Femoral neck fracture
One-year survival
Charlson's co-morbidity index
Non-operative treatment

ABSTRACT

Introduction: With the aging of the population the rate of fragility hip fractures increases. While medical recommendations are for hasten surgical treatment, for some older patients burdened with severe comorbidities, this might be risky.
Aims: To compare the outcomes of patients treated non-surgically to those of the most fragile patients treated surgically.
Patients and methods: A retrospective cohort study, of individuals aged ≥65 years who presented with fragility hip fractures between 01.01.2011-30.06.2016, to a primary trauma center. Patients treated surgically were stratified according to their age-adjusted Charlsons' comorbidity index (ACCI) score. Patients in the upper third of ACCI score, representing the more fragile population, were compared to patients treated non-surgically.
Results: 847 patients presented with fragility fractures. 94 (11%) were treated non-surgically and 753 (89%) underwent surgery. Medical reasons were the leading cause for non-surgical treatment (61.7%). Surgically-treated patients were stratified according to their ACCI and 114 patients with ACCI > 9 were chosen for comparison. While both groups were comparable in terms of age, the non-surgical treatment group had more female patients (p. = 0.026) and a smaller proportion of independent walkers ($p < 0.001$). The ACCI was higher for the surgical treatment group ($p < 0.001$). In-hospital mortality was similar (14.9% and 18.1% for the operative and non-surgical groups respectively, P. = 0.575). However, one-year mortality was significantly higher for the non-surgical group (48.2% vs. 67.0%, P. = 0.005). The rates of in-hospital complications and 1-year readmissions were similar.
Conclusions: Operative treatment for fragility hip fracture reduces long-term mortality rates even in the more fragile patients, compared to non-surgical treatment.

Introduction

Hip fractures are now the second leading cause for hospitalization in the elderly, with a projected estimation of 500,000 surgeries annually in the USA by 2050 [1,2]. They are related to increased morbidity and mortality and decreased quality of life, both in the peri-operative period and through the following year [3–5]. While these fractures represent only 14% of geriatric fractures, they account for 72% of fracture-related costs, with an estimated expense of $40,000 per patient in the first year following treatment [2,6].

While early surgical treatment is considered the gold standard for most patients [7], over the last 2 decades few authors have tried to determine the outcomes of patients who were treated non-surgically, with traction, bed rest or early mobilization. Results differed between authors. Some found mortality to be higher in the non-surgical treatment group [5,8–11], while others did not reach the same result [3,12–14]. The reported post-treatment morbidity also differed between papers, and so did the described changes in mobility.

The specific criteria for non-surgical treatment for proximal hip fractures differed between studies but most authors stated a significant burden of comorbidities and concern regarding peri-operative high mortality risk to be the main indicators for non-surgical treatment [5,8,9,12–14]. However, there are no

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https://doi.org/10.1016/j.injury.2019.05.022
0020-1383/

recommendations regarding who not to operate upon. In our medical center we tend to operate all patients presenting with fragility hip fractures, unless they seem to be too fragile, or in a few cases present late (several weeks following the fracture) or decline surgery (the vast minority of patients). The present study compared patients who were operated under the heaviest burden of co-morbidities, as presented by the age adjusted Charlson's comorbidity index [15,16], to all other patients who were treated non-surgically, to evaluate who of all patients benefit from surgery.

Patients and methods

Data collection

Following approval by the institutional review board, data was retrieved from the medical records of consecutive patients, 65 years old and older, who presented with proximal femoral fracture (31A1, 31A2, 31A3, 31B1, 31B2 and 31B3) [17] to our medical center between 01.01.2011 and 30.06.2016 and were treated either surgically or in a non-surgical manner. Patients operated for pathological fractures were excluded. Demographic data was collected, along with hospitalization aspects such as length of stay (LOS), time to surgery, blood loss, in hospital complications and laboratory values at presentation (hemoglobin, platelets, creatinine and INR {international normalized ratio}). Finally, we gathered information regarding re-admissions (to our hospital and other hospitals in the country, via a shared electronic medical system), orthopedic complications and mortality in the first year following surgery.

Surgical therapy included closed reduction, open reduction or hemiarthroplasty. Non-surgical treatment included immediate physiotherapy for limb mobilization while supine and early sitting in a chair. Early walking was encouraged, according to the patients' previous mobility statue and pain levels.

Study design

Patients treated surgically were stratified according to their age adjusted Charlsons' comorbidity index (ACCI) score. Patients in the upper third of ACCI score, which we believe represent the more fragile population were compared to patients treated in a non-surgical manner.

Outcome measurements

The primary outcome was mortality, either within hospital or during the first post-operative year. Secondary outcomes were in-hospital complications, LOS and readmission rates within the postoperative year.

Statistical analysis

Continuous variables are presented as mean and standard deviation (SD). Quantitative and ordinal variables will be presented as absolute and relative frequencies. The Fisher's exact test was used for categorical variables, and the Student's *t*-test for numeric variables. Kaplan-Meier survival curves were used to demonstrate survival. All reported p-values will be two-tailed. Statistical significance will be defined as $p < 0.05$.

Results

Sample characteristics

During the study period, 847 patients, ages 84.9 ± 7.5 years have presented with fragility hip fractures. Ninety-four (11%) were treated non-surgically and 753 (89%) underwent surgery. the average ACCI for the entire operated group was 6.4 ± 2.1, range 3-14.

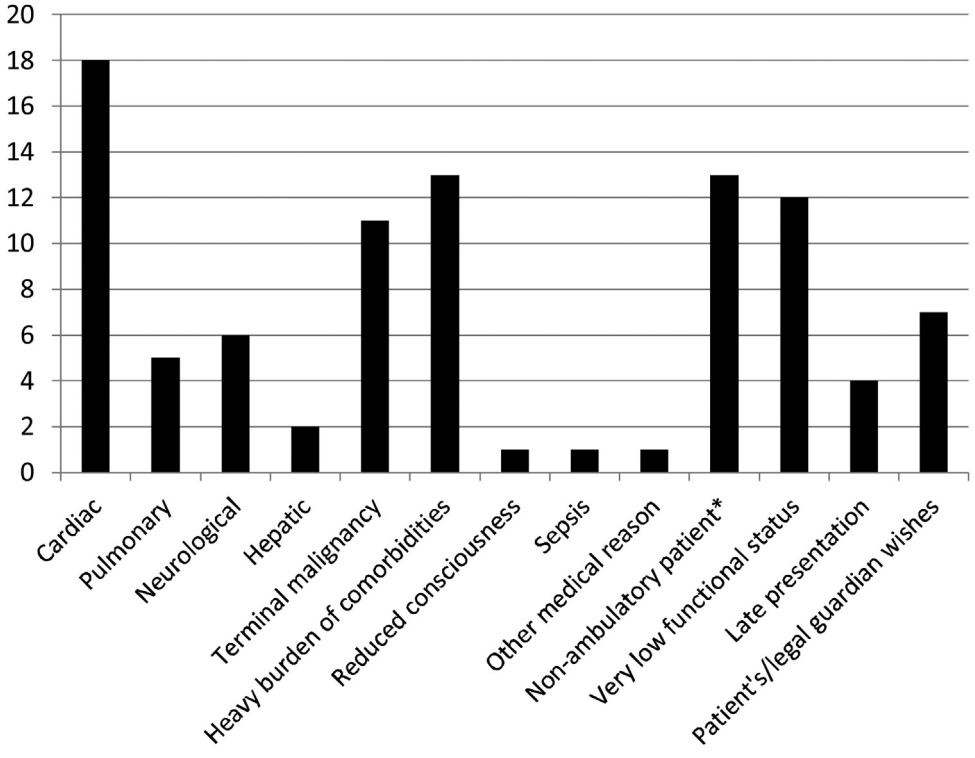

Fig. 1. Cause for non-surgical treatment.

Medical considerations were the leading cause for non-surgical treatment (61.7%). Other causes were non-ambulatory statue (patients who are dependent upon others for all ambulation and do not assist even in position changes from bed to chair etc.) (13.8%), very low functional status (12.8%), patient's or legal guardian wish for non-surgical treatment (7.4%) and late presentation, 2–3 weeks following the fracture (4.3%) (Fig. 1).

Surgically treated patients were stratified according to their ACCI score, 3–5 (307 patients), 6–8 (332 patients) and 9 and above (114 patients; 45, 31, 23, 8, 6 and 1 patient for ACCI scores of 9, 10, 11, 12, 13 and 14 respectably). The latest group was chosen for comparison. Average time for surgery was 34.0 ± 31.1 h, and 99 patients (86.8%) were operated upon within 48 h from admission. Nine patients (60%) were delayed due to medical reasons, 5 due to anticoagulant treatment (33.3%) and the last patient (6.7%) was not fasted when called upon to the operating room (Fig. 2).

Both groups were comparable in terms of age, yet the non-surgical treatment group consisted of a larger proportion of female patients (60.6% vs. 44.7% for the other group, p. = 0.026). Mobility was worse for this group, as a greater portion of patients were dependent in their walking ($p < 0.001$). Most patients from both study groups were admitted to medical wards (internal medicine and geriatrics), yet this was more prominent in the non-surgical group (p. = 0.006). The ACCI was higher for the surgical treatment group, representing a higher estimated risk for 1-year mortality (10.2 ± 1.2 vs. 8.8 ± 2.9, $p < 0.001$) (Table 1).

Mortality

In hospital mortality was similar between groups (14.9% and 18.1% for the operative and non-surgical treatment groups respectably, P. = 0.575). However, one-year mortality rates were significantly higher for the non-surgical group (48.2% vs. 67.0% for the operative and non-surgical treatment groups respectably, P. = 0.005) (Fig. 3). Causes of one-year mortality, when available, did not differ, with infectious diseases being in most common cause for mortality in both groups, followed by reasons related to malignancies (Table 2).

Complications

The rate of in-hospital complications was similar between groups, 0.96 ± 1.1 for the operative treatment group and 1.3 ± 1.7 for the other group (p. = 0130). When comparing the rates of each specific complication, only the presence of decubitus ulcers differed between groups, and was over 5 times higher for the non-surgical group (p. = 0.003) (Table 2).

Recurrent hospitalizations

The rate of readmissions in the post fracture year was similar, 1.4 ± 2.0 and 1.1 ± 1.2 readmissions for the operative and non-surgical treatment groups respectably (p. = 0.160). However, causes for readmissions differed between groups, as operated patients were admitted more frequently to orthopedics (11.0% of readmissions specifically related to the fragility fracture surgery, mainly due to surgical site infection) (Table 3).

Discussion

The decision not to operate on fragility hip fracture patients has serious implications upon the patients, as they result in reduced mobility and increased pain levels. However, occasionally physicians believe that for some patients' surgical intervention might be a burden too heavy to endure due to medical comorbidities or that surgery should be avoided due to the patients' general condition which also affected function and mobility status. Therefore, we compared the outcomes of patients who were treated non-surgically with the outcomes of a more fragile group of patients, as presented by the ACCI, who were operated upon, to deduce whether some patients would not benefit from surgical treatment. We found significantly higher rates of long-term mortality within the non-surgical treated group.

Few studies have presented the outcomes of non-surgical treatment for fragility hip fracture patients, yet criteria for non-surgical treatment were lacking, and groups were small [3,5,8–10,13,14]. In our cohort non-surgical treatment was applied mostly to two groups of patients, those who were deemed by the medical and anesthesiology specialists to be medically too frail for surgery, a statement not based upon an objective medical scale, and those who were believed to benefit less from surgery as they were non-ambulatory and/or with very low functioning levels. Mental status was not a criterion for surgery, and dementia rates were similar between groups. For the comparison, hoping to establish a criterion which could aid in the choice of treatment, we have implemented the ACCI. Jain et al. have demonstrated that higher Charlson's comorbidity index is associated with increased

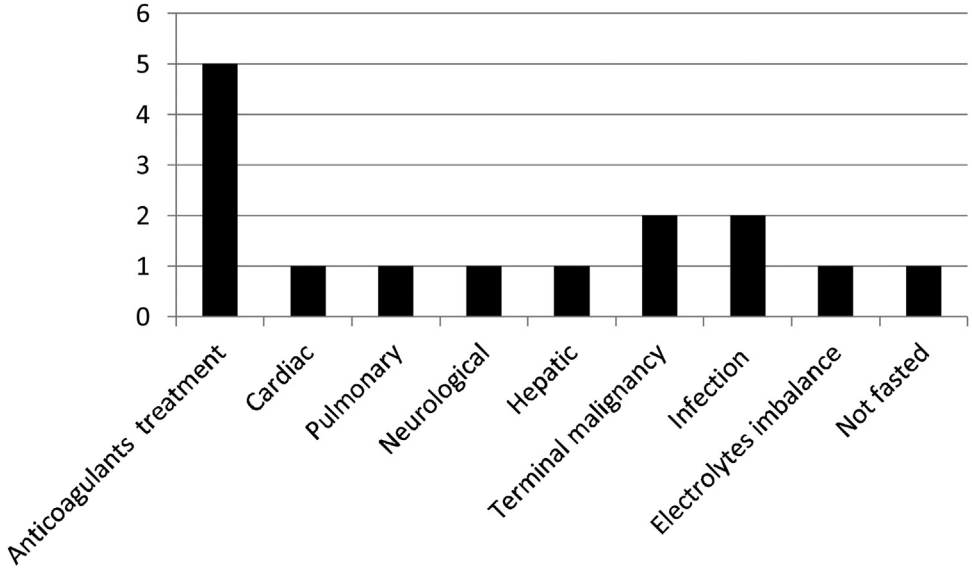

Fig. 2. Reasons for surgical delay beyond.48 h.

Table 1
Patients demographics.

		Surgical treatment (n = 114)	Non-surgical Treatment (n = 94)	p. value
Age (years), average (SD)		84.8 (7.1)	85 (8.0)	0.836
Gender, n(%)	Male	63 (55.3)	37 (39.4)	0.026
	Female	51 (44.7)	57 (60.6)	
Living arrangement, n(%)*	Home	66 (58.4)	43 (46.2)	0.173
	Home with a professional care giver	28 (24.8)	33 (35.5)	
	Nursing home	19 (16.8)	17 (18.3)	
Walking ability, n(%)**	Independent walking	45 (42.9)	20 (22.0)	<0.001
	Walks with caregiver assistance	0 (0)	3 (3.3)	
	Cane	23 (21.9)	11 (12.1)	
	Walker	34 (32.4)	41 (45.1)	
	Wheel chair	3 (2.9)	16 (17.6)	
Age adjusted Charlson's co-morbidity index, average (SD)		10.2 (1.2)	8.8 (2.9)	<0.001
Dementia, n(%)		35 (30.7)	32 (34.0)	0.656
CHADS2 score, average (SD)		3.8 (1.3)	3.5 (1.3)	0.471
Hospitalization Department	Orthopedics	55 (48.2)	27 (28.7)	0.006
	Medicine	58 (50.9)	64 (68.1)	
	Other	1 (0.9)	3 (3.2)	
Laboratory in admission, average (SD)	Hemoglobin (gr/dl)	11.4 (1.7)	11.5 (1.8)	0.931
	Platelets (K/micl)	215 .1 (81.7)	223.3 (86.8)	0.490
	Creatinine (mg/dL)	1.5 (0.9)	1.3 (0.8)	0.074
	INR	1.2 (0.6)	1.5 (0.8)	0.008

INR- international normalized ratio.
* Data was unavailable for one patient from each group.
** Data was unavailable for nine patients from the operated group and for 3 patients from the non-surgical treatment group.

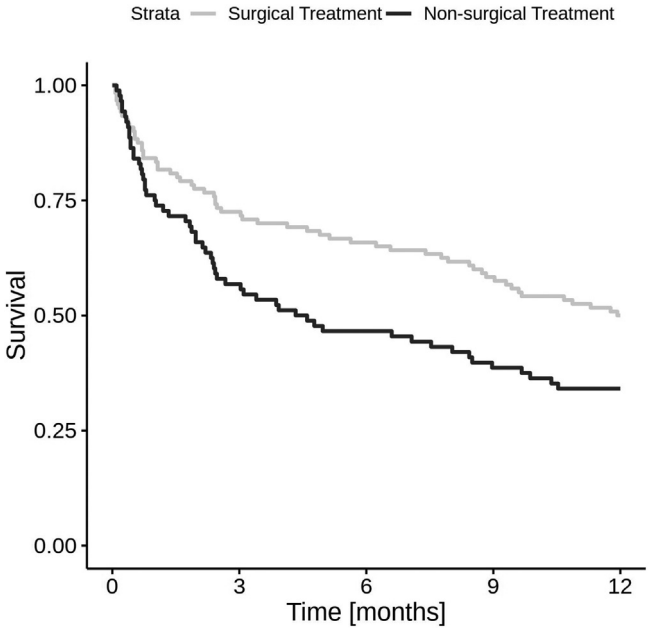

Fig. 3. 1-year survival.

mortality rates both in operatively and non-surgically treated patients with fragility hip fractures [18]. Interestingly, patients who were operated upon were found to have significantly higher ACCI. However, notably INR levels were higher for the non-surgical group, regardless of warfarin treatment rates, which might imply an underlaying fragility.

While short term mortality (within hospital and in the first month following the fracture) did not differ between groups, one-year mortality was higher for the non-surgical treatment group with odds ratio of 2.2 (CI 1.2–3.8, p. = 0.007). These results are supported by some who reported increased one year mortality for non-surgically treated patients, with mortality rates of 45%–50% [5,11], while others did not find a significant different in one-year mortality [13,14,18], yet their non-operative groups were small (22–38 patients). Notably, our one-year mortality rates for operated patients were higher than others due to the bias in patient selection, as only the sickest patients were included. As for short term mortality, in-hospital mortality was not reported by others, but one-month mortality was also found to be similar between treatment groups by some [3,13,14] and to be higher for the non-surgical group by others [5,8,9]. Notably, in the study by Ooi et al. who reported no difference in short- and long-term mortality outcomes, surgery was performed with in 5.7 ± 4.4 days from admission, which might have worsened the outcomes.

In-hospital complications did not differ between groups, except for a higher incidence of decubitus ulcers in the non-surgical treatment group. In the elderly population, blood supply to the skin decreases and skin layers and subcutaneous fat layer becomes thinner increasing the risk for pressure sores in patients with prolonged bed rest [19]. As the surgical treatment for fragility hip fracture is intended for early mobilization, it is not surprising that the operated group will have less decubitus ulcers. Also, patients from the non-surgical treatment group were also less mobile to begin with.

Recurrent hospitalization is an additional parameter which can help to estimate post fracture medical wellbeing. We did not find one group to return to the hospital at higher rates than the other, with 62–63% of patients from both groups returning to the hospital within the first year following fracture. Most patients were admitted for infectious diseases, which were also the main cause for mortality. Other hospitalizations were mainly to exacerbations of known medical conditions (congestive heart failure, rapid atrial fibrillation, renal failure etc.). Ten patients were hospitalized due to surgical complications (15 hospitalization), a rate which is similar to those of operated patients with the lower ACCI which were excluded from the study (34 patients, 39 hospitalizations, p. = 0.070).

This study presents several limitations, first due to the retrospective nature of data collection some data was not available for analysis. Second, the decision process which led to the treatment finally chosen was not based upon objective criteria. However, that was the leading force behind this study, as it is unethical to randomly allocate patients to non-surgical treatment

Table 2
Results.

		Surgical treatment (n = 114)	Non-surgical Treatment (n = 94)	p. value
Mortality, n(%)	In hospital	17 (14.9)	17 (18.1)	0.575
	1-months	17 (14.9)	24 (25.5)	0.079
	3- months	30 (26.3)	41 (43.6)	0.012
	1-year	55 (48.2)	63 (67.0)	0.005
Cause of death, n(%)*	Cardiac	2 (5.7)	8 (18.6)	0.373
	Cerebrovascular	2 (5.7)	2 (4.7)	
	Infectious	19 (54.3)	20 (46.5)	
	Malignancy	6 (17.1)	15 (34.9)	
	Other	6 (17.1)	8 (18.6)	
Length of stay (days), average (SD)		10.9 (7.4)	11 (7.5)	0.965
In hospital complications, average (SD)		0.96 (1.1)	1.3 (1.7)	0.130
In hospital complications	Myocardial infraction	3 (2.6)	2 (2.1)	1
	Atrial fibrillation	8 (7.0)	3 (3.2)	0.352
	Pulmonary congestion	7 (6.1)	11 (11.7)	0.215
	Cerebrovascular event	3 (2.6)	3 (2.2)	1
	Delirium	18 (15.8)	14 (14.9)	1
	Urinary retention	12 (10.5)	14 (14.9)	0.402
	Urinary tract infection	10 (8.8)	6 (6.4)	0.607
	Pneumonia	8 (8.7)	12 (12.8)	0.237
	COPD exacerbation	1 (0.9)	4 (4.3)	0.178
	Decubitus ulcer	3 (2.6)	13 (13.8)	0.003
	Systemic inflammatory response syndrome	5 (4.4)	7 (7.4)	0.384
	Acute renal failure	20 (17.5)	15 (85.3)	0.707
	Gastrointestinal bleeding	6 (5.3)	9 (9.6)	0.286
	Deep vein thrombosis	0 (0)	1 (1.1)	0.452
	Pulmonary emboli	0 (0)	1 (1.1)	0.452
	Other	5 (4.4)	9 (9.6)	0.169

COPD, chronic obstructive pulmonary disease.
* Cause of death was unknown for 20 patients from the surgical group and for 10 patients from the non-surgical treatment group.

Table 3
Recurrent hospitalizations within the post-fracture year*.

		Surgical treatment (n = 120)	Non-surgical Treatment (n = 83)	p. value
Recurrent hospitalizations within the postoperative year, average (SD)		1.4 (2.0)	1.1 (1.2)	0.160
Causes for recurrent hospitalizations, n(%)	Medical	36 (26.5)	20 (24.4)	0.006
	Infectious	49 (36.0)	42 (51.3)	
	Surgical	14 (10.3)	7 (8.5)	
	Orthopedic	23 (16.9)	2 (2.4)	
	Other	14 (10.3)	11 (13.4)	

Medical reasons included conditions such as myocardial infraction, pulmonary congestion, atrial fibrillation, acute renal failure, cerebrovascular events, laboratory anomalies etc. Surgical causes included mainly gastroenteritis, cholecystitis and gastrointestinal bleeding. Infections included pneumonia, urinary tract infection, cellulitis, pressure sores and sepsis. Orthopedic reasons were mainly related to the index surgery.
* n refers to the patients who survived the index hospitalization. There could be more than one reason for a hospitalization.

for fragility hip fracture treatment in light of supporting evidence in the medical literature for hasten surgical treatment and as most studies do not address the outcomes of the patients who were not operated. Third, we do not possess information regarding the functional outcomes of the patients, and specifically how many of them have returned to walk. Finally, while the vast majority of our patients are dismissed to a rehabilitation facility, we do not know how many of those who were living independently before the fall were able to return home.

Conclusion

Operative treatment for fragility hip fracture patients was found to reduce long term mortality rates even in the more fragile patients in comparison to non-surgical treatment aimed for early mobilization. However, the question whether operative treatment is appropriate for all patients, with regards to quality of life, poses an ethical dilemma which should be addressed in an individualized manner.

Funding

None.

Conflictof interests

All authors declare no conflict of interests.

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