FUNCTIONAL EVOLUTION OF PROXIMAL FEMORAL END FRACTURES

MURILO ANTÔNIO ROCHA, HELDER WILLIAM AZER, VALDÊNIA DAS GRAÇAS NASCIMENTO

ABSTRACT

Objectives: To assess the functional capacity evolution and the physiologic score in patients with proximal femoral end fractures, as well as to compare the final results of the treatment provided to the several pre-fracture variables. Materials and Methods: A prospective study with patients over 40 years old diagnosed with proximal femoral fracture. The patients were submitted to a pre-established protocol and followed up on an outpatient basis for a period of one year. Results: 68 patients were assessed (27 men and 41 women), with a mean age of 75,84 years. 83,82% were submitted to surgical treatment. The early mean physiologic score was 17,16 points (17,58 points for patients submitted to surgical treatment and 9,27 points for those not submitted to surgical treatment). The mortality rate found after one year of fracture was 36,76%. The free ambulation ability was achieved by 32,56%. 25,58% of the cases whose mean early physiologic score was lower compared to the overall mean score couldn't ambulate after one year of follow up. 27,90% of the patients who were previously independent, required family care and/or social service. Conclusion: the initial physiologic score was the most important influencing factor in the final result.

Keywords: *Femur. Femoral fractures. Aged.*

Citation: *Rocha MA, Azer HW, Nascimento VG. Functional evolution of proximal femoral end fractures. Acta Ortop Bras. [online]. 2009; 17(1):17-21. Available from URL: http://www.scielo.br/aob.*

INTRODUCTION

Proximal femoral fractures are associated to a high morbidity and mortality rate[1,2], affecting aged people. They are associated to a reasonable functional disability, reduced independence, quality of life and, particularly, to a reduced life expectation.[3-5] Osteoporosis is a risk factor related to this kind of fracture.[6]

Fractures of the femoral proximal end in an aged population is a public health problem throughout the world.[7,8] In addition to a high mortality rate, these patients require intensive healthcare and functional rehabilitation for long periods.[2] For 2050, the World Health Organization estimates an annual incidence of 6.26 million fractures.[9]

The treatment of choice for most of the fractures is surgery, except for cases in which the patient presents with comorbidities contraindicating surgery, mandatorily leading to a conservative treatment. The latter is also indicated in some incomplete fractures or without deviation. The purpose of treatment is to prevent functional disability progression and to restore function on the limb to pre-fracture levels.

The authors intend to assess the evolution of functional capacity and physiologic score in patients with femoral proximal end fractures, as well as to compare the final results of the implemented treatment with the several pre-fracture variables.

MATERIALS AND METHODS

This was a prospective study conducted at Hospital de Clínicas of the Federal University of Triângulo Mineiro, including patients with femoral proximal end fractures between December 2005 and May 2006. The inclusion criteria were: patients with proximal femur fractures either associated to other orthopaedic injuries or not, and at least 40 years old. The exclusion criteria were: patients with pathological fractures and/or femoral shaft fractures.

At hospital admission, plain anteroposterior and lateral X-ray images were taken, and the fractures were classified according to Tronzo[10] for transtrochanteric fractures, to Garden[11,12] for femoral neck fractures, and to Russell and Taylor[13] for subtrochanteric fractures. Also, the physiological status was assessed by applying a protocol suggested by Robinson et al.[14], which assessed pre-trauma status such as mobility, home conditions, patient's cognition, quality of bone trabeculate and associated comorbidities, with maximum joint score of 26 points, and minimum of 4 points.

Hip bone trabeculate was assessed according to the index proposed by Singh et al.[15], which regards levels 6, 5 and 4 as physiological, and 3,2 and 1 as pathological.

The patients were followed up on an outpatient basis at week 2, and months 1, 3, 6 and year 1 after hospital discharge, at which times pain and ambulation were assessed according to the scale by Sikorski and Barrington[16], and, again, home conditions were reviewed.

Score evolution was assessed by using variance analysis (ANOVA, significance level 5%), at hospital admission, and 15 days, 1, 3, 6 and 12 months after fracture. In order to assess the association of qualitative variables, the Chi-squared test was employed.

RESULTS

From December 2005 to May 2006 (6 months), 75 patients were admitted at Hospital das Clínicas of the Federal University of Triângulo Mineiro, diagnosed with femoral proximal end fracture. Seven patients lost follow-up, leaving 68 subjects included in our evaluation. There were 27 men and 41 women, with mean age of 75.84 years (range: 43 – 100), Fifty transtrochanteric fractures were found, most of these were Tronzo III (31), 17 femoral neck fractures, most of these were Garden III (11) and a Russell-Taylor type-IIB subtrochanteric fracture. (Table 1) Left femur was involved

All authors state no potential conflict of interest concerning this article

Department of Surgery – Discipline of Orthopaedics and Traumatology, Federal University of Triângulo Mineiro, Uberaba, MG

Correspondences to: Valdênia das Graças Nascimento – Disciplina de Ortopedia e Traumatologia da UFTM – Avenida Getúlio Guaritá, s/nº – Hospital Escola – Bairro Abadia – Uberaba, MG, Brasil. CEP 38025-440. Email: vallfmtm@yahoo.com.br / ortopedia_fmtm@mednet.com.br

Received in 07/27/07 approved in 09/10/07

Table 1 – *Epidemiological profile of patients with femoral proximal end fractures.*

Nr.	Gender	Age	Score at baseline	Final score	Classification	Nr. of comorbidities	Death
1	F	70	18.5	18.5	Garden III	2	No
2	M	69	17	16	Tronzo III	2	No
3	M	67	24.5	24.5	Tronzo III	0	No
4	F	72	22	21	Tronzo III	2	No
5	F	88	15	13	Tronzo III	3	No
6	F	80	18	16	Tronzo II	2	No
7	F	82	16.5	11.5	Tronzo III	3	No
8	M	51	25.5	25.5	Tronzo III	0	No
9	F	74	19	18	Tronzo III	3	No
10	F	76	23.5	22.5	Tronzo IV	0	No
11	F	87	13.5	9.5	Tronzo III	3	No
12	F	47	20.5	20.5	Garden III	0	No
13	F	83	19.5	17.5	Tronzo II	1	No
14	M	54	18	15	Garden III	1	No
15	F	82	19.5	14.5	Tronzo III	2	No
16	M	69	20	16	Garden III	1	No
17	F	89	17.5	16.5	Tronzo III	1	No
18	M	83	17	14	Tronzo III	2	No
19	F	98	16.5	13.5	Tronzo III	1	No
20	F	69	18.5	18.5	Tronzo II	2	No
21	M	64	15	12	Garden II	4	No
22	F	66	20.5	20.5	Garden I	1	No
23	F	75	16	15	Tronzo IV	2	No
24	M	85	17	14	Tronzo III	2	No
25	F	71	21.5	18.5	Garden III	2	No
26	M	54	13	13	Tronzo III	1	No
27	F	80	12	8	Tronzo III	2	No
28	F	81	12	11	Garden I	1	No
29	F	79	20.5	20.5	Tronzo III	2	No
30	F	79	16.5	16.5	Garden III	2	No
31	M	57	21.5	20.5	II-B Russell-Taylor	0	No
32	F	85	17	17	Tronzo II	1	No
33	F	60	21.5	21.5	Garden III	0	No
34	F	88	17.5	13.5	Tronzo III	1	No
35	M	62	18	18	Tronzo III	1	No
36	F	67	12	10	Garden III	1	No
37	F	60	17	16	Tronzo III	1	No
38	M	62	18.5	15.5	Tronzo IV	1	No
39	F	89	13	10	Tronzo III	2	No
40	M	43	15	11	Tronzo III	1	No
41	M	75	14.5	9.5	Tronzo III	2	No
42	M	86	17	16	Tronzo II	1	No
43	M	70	15.5	11.5	Tronzo IV	3	No
44	M	84	18.5	-	Tronzo IV	2	Yes
45	M	82	16.5	-	Tronzo III	2	Yes
46	F	89	15	-	Tronzo III	3	Yes
47	F	90	12	-	Tronzo III	3	Yes
48	M	85	19.5	-	Garden III	2	Yes
49	M	91	14	-	Tronzo II	2	Yes
50	F	70	22.5	-	Garden II	1	Yes
51	F	92	21.5	-	Tronzo II	0	Yes
52	F	100	13.5	-	Tronzo II	2	Yes
53	M	84	18.5	-	Garden II	2	Yes
54	M	57	18	-	Tronzo II	0	Yes
55	M	57	15	-	Tronzo II	0	Yes
56	F	89	15	-	Tronzo IV	3	Yes
57	M	82	18.5	-	Garden I	5	Yes
58	F	69	17	-	Tronzo IV	1	Yes
59	F	88	15	-	Tronzo III	1	Yes
60	F	89	13.5	-	Tronzo II	1	Yes
61	F	54	13	-	Tronzo III	4	Yes
62	F	83	17	-	Garden III	2	Yes
63	F	80	20	-	Tronzo III	0	Yes
64	M	84	12	-	Tronzo III	2	Yes
65	F	97	14	-	Tronzo IV	0	Yes
66	F	63	17	-	Garden I	2	Yes
67	M	94	13	-	Tronzo III	1	Yes
68	M	76	15.5	-	Tronzo III	2	Yes

in 35 patients, while the right limb was fractured in 33 cases. The prevailing mechanism of trauma was simple falls, which occurred in 58 cases, followed by high falls (6) and car accidents (4).
The average time elapsed from admission to surgery was 5.33 days (minimum: 1 day; maximum: 14 days), while the average time between surgery and hospital discharge was 2.79 days (minimum: 1 day; maximum: 14 days), totaling a mean hospitalization time of 8.12 days.
Surgical treatment was indicated to 57 patients (83.82%). Eleven patients (16.18%) could not be operated due to their clinical status. For transtrochanteric and subtrochanteric fractures, osteosynthesis with dynamic hip screws (DHS), and, for those femoral neck fractures, partial Thompson-type osteosynthesis was provided. Six patients (8.82%) have had prior partial arthroplasty of contralateral femur. Seven presented with other associated orthopaedic injuries, including the transcondylar humeral fracture, proximal humeral fracture, femoral shaft fracture, bilateral ulnar fracture, radius fracture, finger proximal phalangeal fracture, and tibial and fibular shaft fracture.
The mean physiologic score at baseline was 17.16 points. Patients submitted to conservative treatment showed a mean physiological score at hospital admission of 9.27 points, while in the operated ones, this score was 17.58 points.
Mortality rate in the group of operated patients was 7.01%, with this percentage increasing to 63.63% when the group in which surgery was not possible was considered.
Men and women showed a similar mortality rate, with no statistically significant difference ($p > 0.05$) in both groups.
The recovery of free or crutch-supported ambulation ability was statistically superior ($p < 0.05$) in patients with physiological scores higher or equal to the overall average.

FOLLOW-UP AFTER ONE YEAR

The survivors group after one year of fracture was constituted of 43 patients (16 men and 27 women) with mean age of 72.74 years (range: 43- 98). Surgical treatment was provided to 39 patients and conservative treatment was indicated to 4.
At mobility review – the first item of pre-fracture protocol – 37 patients (86.05%) ambulated freely, and six (13.95%) required crutches to walk.
Concerning the assessment of home conditions – the second item of pre-fracture protocol – 32 patients (74.42%) were regarded as independent to perform daily life activities, 8 (18.60%) required family members' or social service's assistance to perform daily life activities, 2 (4.65%) have been previously admitted in institutions, and one (2.33%) required special nursing care.
On the third item of the pre-fracture protocol, which assessed bone trabeculate at hip X-ray imaging, we found an average of 2.53 points (range: 1 - 6), consistent with pathological bone involvement, characteristic of osteoporosis.
Mean cognition, assessed on the fourth item of the pre-fracture protocol, was 2.60 points (range: 0 – 5 points).
In the evaluation of the last pre-fracture protocol, 6 patients (13.95%) had no comorbidities, 15 (34.89%) had an associated disease, and 22 (51.16%) had two or more comorbidities
The group of patients presenting with no comorbidities at hospital admission showed a mean physiological score of 22.83 points. All of them recovered the ability to ambulate and to use public transportation. Those with associated diseases showed a mean physiological score at hospital admission of 16.81 points, similar to patients with two or more comorbidities, whose physiological score at baseline was 16.95 points.
Concerning the first item of the outpatient follow-up protocol, absence of pain and/ or presence of moderate/occasional pain were found in 35 cases (81.39%) up to the first month after fracture. Improvement from the 3rd month on was found in three cases, in other three cases after 6 months of fracture, and only two patients reported persistence of continuous and strong pain after one year of follow-up, regularly requiring pain relief medication.
When assessing mobility after hospital discharge – the second item on the outpatient follow-up protocol, 14 patients (32.56%) recovered the ability to walk without assistance and to take public transportation after one year – mean physiologic score of 19.43 points at baseline. Sixteen (37.21%) required the use of crutches to ambulate – mean physiologic score of 18.15 points at baseline. Two patients (4.65%) recovered the ability to walk at home without crutches, however, they could not use public transportation – mean physiologic score of 16.75 points at baseline. Finally, 11 patients (25.58%) were not able to ambulate after one year of fracture – mean physiologic score of 15.09 points at baseline. (Table 2)

Table 2 – *Final result of the ability to ambulate after outpatient follow-up of one year after fracture.*

Ambulation in one year of follow-up after fracture		
Ambulation ability	**Number of cases**	**Mean physiologic score at baseline**
Ability to ambulate without assistance and to take public transportation	14	19.43
Ambulation with crutches, out of home	16	18.15
Ambulation without crutches, at home	2	16.75
Wheelchair /in bed	11	15.09

Still during outpatient follow-up, home conditions were again reassessed, according to table 3. Twenty patients (46.51%) recovered home independence – mean physiologic score of 19.75 points at baseline. Twelve patients (27.90%), who were previously independent, started to require family members' and/or social service's assistance – mean physiologic score of 17.21 points at baseline. Eight patients who depended on family members (mean physiologic score of 14.87 points at baseline), two patients living in nursing homes (mean physiologic score of 14.25 points at baseline), and one patient previously dependent on nursing care (mean physiologic score of 13 points at baseline) remained with the same status after hospital discharge.

Table 3 – *Home conditions after outpatient follow-up of one year after fracture.*

Home conditions one year after fracture		
Home conditions	**Number of cases**	**Mean physiologic score at baseline**
Home independence	20	19.45
Part-time care of family members and/or social service (previously independent)	12	17.21
Part-time care of family members and/or social service	8	14.84
At nursing homes	2	14.25
Nursing care	1	13.00

On the group of survivors submitted to conservative treatment, half of them remained unable to ambulate, and half recovered the ability to ambulate without requiring the use of crutches and to use public transportation after one year of fracture.
Patients younger than 75.84 years (55.81%) presented, at hospital admission, a mean physiologic score of 18.46 points, while those above this average (44.19%) had a value of 16.79 points.
The mean physiologic score of survivors at baseline was 17.72 points, in an average of 15.75 points for operated patients and 17.92 points for those treated conservatively. The mean final physiologic score of patients with an initial score higher or equal to the overall

average (17.16 points) was 1.41 point below that of admission (6.99% loss in mean initial value). Patients presenting a lower mean physiologic score at baseline had a mean final score 2.38 points below (15.72%) to the initial mean value for this group (a reduction of 15.72% of the initial mean value), as shown on figure 1.
As shown by table 4, a statistically significant difference ($p < 0.05$) was found in the evolution of mean physiologic score on the group of patients above the overall average and in those below the overall average, assessed at hospital admission, 15 days, 1 month, 3 months, 6 months and one year after fracture.

Table 4 – *Variance analysis (ANOVA, significance level = 5%), showing a significant difference on the evolution of physiologic scores of patients with values above the overall average and in those below the overall average.*

Variance analysis of mean average physiologic scores					
Source of variability	**Sum of square**	**Degrees of freedom**	**Mean square**	**F statistic**	**p-value**
Between	26,333	3	8,778	3,511	0,229542
Within	5,000	2	2,500		
Total	31,333	5			

DEATHS

Twenty five deaths were reported (36.76%) during the first year after fracture (11 men and 14 women), with mean age of 81.16 years (range: 54-100), most of these (48%) occurring in the first month, seven cases (28%) in the first quarter, five (20%) in the first year-half, and only one death (4%) nine months after fracture. Eighteen patients (72%) were submitted to surgical treatment, but, in seven, surgery could not be performed (28%). The mean physiologic score at baseline was 16.20 points . No statistically significant difference was found ($p > 0.05$) on mortality rate for male and female gender.
Four patients (16%) had associated diseases, and the vast majority (64%) had two or more diseases. Five cases (20%) had no comorbidities at hospital admission. All patients not submitted to surgery had two or more associated diseases. Prevalent causes of death were: Pulmonary thromboembolism (7), cardiorrespiratory failure (5), multiple organ failure (5), septic shock (4), pneumonia (3), and stroke (1). Mortality rate among patients presenting only one associated disease was not statistically different ($p > 0.05$) from patients having two or more comorbidities.
One patient had another simple fall after eight months, resulting in contralateral femoral neck fracture and death one month after hospital discharge.

DISCUSSION

Epidemiological studies addressing femoral proximal end fractures in Brazil are scarce. The incidence of this kind of fracture increases after the fifth decade of life, particularly in women, due to higher degrees of osteoporosis. The socioeconomical impact of fractures on hip region is very strong, leading to increased morbidity and mortality rates. This study evidenced a prevalence of femoral fractures in women (60.29%) and aged people (75.84 years), consistently with literature[17-19] Rocha et al.[18] found, in a retrospective study on proximal femoral fractures, a mean age of 68.5 years. Female gender showed higher mean ages compared to male gender, with values of 76.912 years for the first group, and 65.69 years for the second one.
There aren't enough studies in literature to prove the correlation between fracture trace and other variables. Transtrochanteric fractures were prevalent in our study, as well as in the study by Rocha et al.[18], however, other studies show no significant difference between the kind of fracture and higher incidence on males or females.[17]
Many factors, not assessed in this study, are involved in simple falls; this kind of trauma remains as the major cause of femoral fractures, totaling 85.30% of the total mechanisms of trauma studied.
The presence of comorbidities was an important factor for therapeutic approach, time of hospital stay, for prognosis and change on quality of life. There was prevalence of high systemic blood pressure (39), heart diseases (18), diabetes mellitus (10), stroke (10), Chagas disease (7), COPD (7) and Alzheimer (7). Survivors without comorbidities had a better prognosis than those with one or more associated diseases, since, in the first group, all subjects recovered the ability to ambulate freely and to live independently in their homes.

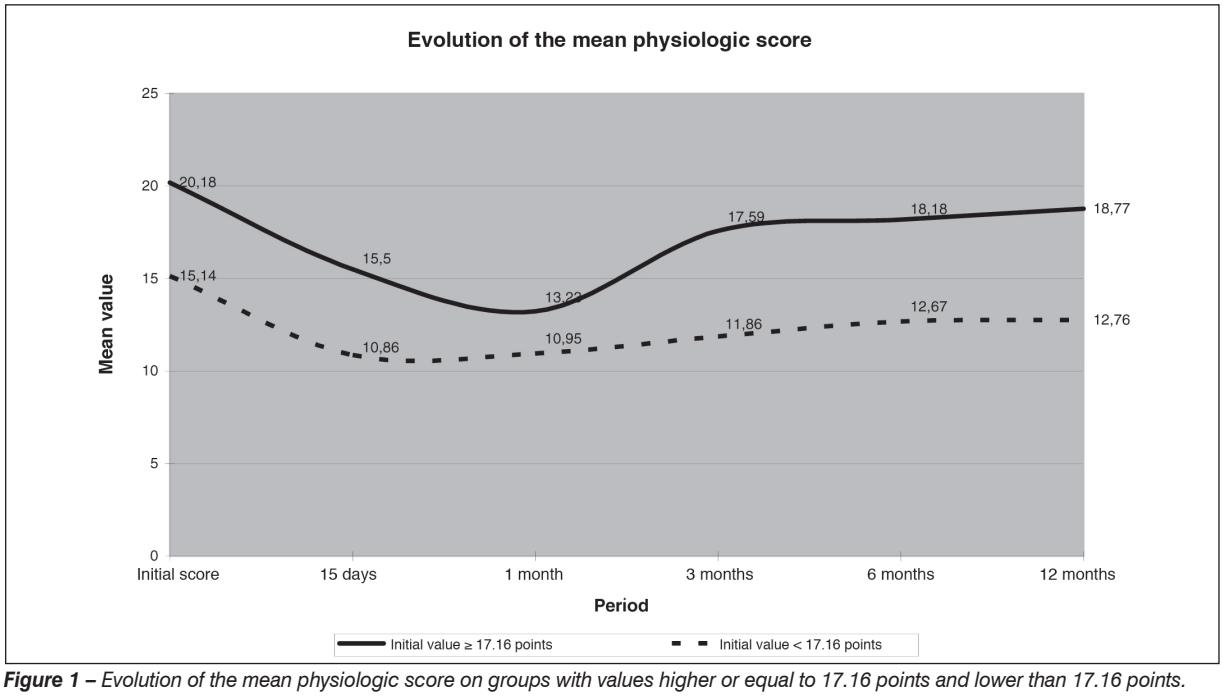

Figure 1 – *Evolution of the mean physiologic score on groups with values higher or equal to 17.16 points and lower than 17.16 points.*

Over half of the patients (52.94%) had one or more associated diseases, and the mortality rate found for this specific group was 41.66%, while in the group having only one comorbidity, this rate was reduced to 23.80%, although this difference was not statistically significant. Mortality within the group of patients with two or more associated diseases was not significantly higher than in those with up to one comorbidity ($p > 0.05$). Van Balen et al.[21] report that 67% of the patients showed two or more associated diseases to femoral fracture, and mortality rates range from 4% for patients with one associated disease, 15% in those with two associated diseases, 26% in those with three, and 47% when four or more concomitant diseases are found.

Mortality rate ranges from 14 to 36% according to some authors[22-24]. Cunha et al.[25] report a rate of 25%. Our study reported a mortality rate of 36.76%, particularly in older patients. The number of deaths after femoral fracture is higher during the first few months after trauma, and reduces over time [26-28], as also evidenced in our study, in which mortality rates were much higher during the first month after trauma, being progressively reduced on subsequent months.

Parker et al.[29] found no evidences in literature stating that the surgical treatment of proximal femoral fractures is correlated to a lower mortality rate when compared to patients conservatively treated; however, our study evidenced a 9-fold increase on mortality rate in the group submitted to conservative treatment as compared to the group submitted to surgical treatment. Obviously, the clinical status of non-operated patients is worse, but surgical treatment provides a better opportunity for functional recovery and improvement of quality of life.

The period between hospital admission and surgical treatment seems not to negatively influence patients' prognosis, since time periods were similar in those with best and worst prognosis. Cunha et al.[25] found a period of 4.1 days between hospitalization and surgery.

Approximately one third of the patients who were previously independent now require family members' and/or social service's care. This study also found that 32.56% of the patients recovered their previous ability to walk without assistance, and 25.58% became unable to ambulate. Recent studies show that 17% of the elderly patients with proximal femoral fracture accomplished the ability of performing daily life activities 4 months after fracture, and only 43% regained their previous ability to ambulate.[21]

The physiologic score was an important prognostic predictor. The mean value at baseline found for operated patients was, approximately, twice as big as for non-operated patients. This study also showed that the mean final physiologic score is reduced both the lower and the higher the initial value. The recovery of home independence and the ability to ambulate were evidenced most frequently in patients with better initial physiologic scores. The mean physiologic score at baseline among patients who passed away was always inferior to the ones found in survivors. The recovery of the ability to walk, either freely or with the aid of crutches, was stronger in patients with physiologic scores above the overall average, who remained on wheelchairs and/ or in bed.

CONCLUSION

Mortality rate after femoral proximal end fractures is higher in the first few months after trauma, showing a decrease during subsequent months.

The higher the physiologic score at baseline, the strongest the functional recovery.

The lower the value at baseline, the stronger the reduction of the final physiologic score.

The key influencing factor for final outcome was the physiologic score at baseline.

REFERENCES

1. Grimes JP, Gregory PM, Noveck H, Butler MS, Carson JL. The effects of time-to-surgery on mortality and morbidity in patients following hip fracture. Am J Med. 2002;112:702-9.
2. Hannan EL, Magaziner J, Wang JJ, Eastwood EA, Silberzweig SB, Gilbert M et al.. Mortality and locomotion 6 months after hospitalization for hip fracture: risk factors and risk-adjusted hospital outcomes. JAMA. 2001;285:2736-42.
3. Kannus P, Parkkari J, Sievanen H, Heinonen A, Vuori I, Järvinen M. Epidemiology of hip fractures. Bone. 1996;18(1 Suppl.):57S-63S.
4. Melton LJ. Hip fractures: a worldwide problem today and tomorrow. Bone. 1993;14:1-8.
5. Richmond J, Aharonoff GB, Zuckerman JD, Koval KJ. Mortality risk after hip fracture. J Orthop Trauma. 2003;17:53-6.
6. Cummings SR. Are patients with hip fracture more osteoporotic? Am J Med. 1985;78:487-93.
7. Kannus P, Niemi S, Parkkari J, Palvanen M, Vuori I, Järvinen M. Hip fractures in Finland between 1970 and 1997 and predictions for the future. Lancet. 1999;353:802-5.
8. Kannus P, Parkkari J, Niemi S, Pasanen M, Palvanen M, Järvinen M et al. Prevention of hip fracture in elderly people with use of a hip protector. N Engl J Med. 2000;343:1506-13.
9. World Health Organization. Prevention and management of osteoporosis, EB11413, 2004.
10. Tronzo RG. Symposium on fractures of the hip. Special considerations in management. Orthop Clin North Am. 1974;5:571-83.
11. Garden RS. Stability and union in subcapital fractures of the femur. J Bone Joint Surg Br. 1964;46:630-47.
12. Garden RS. Malreduction and avascular necrosis in subcapital fractures of the femur. J Bone Joint Surg Br. 1971;53:183-97.
13. Russell TA, Taylor JC. Fraturas subtrocanterianas do femur. In: Browner BD, Jupiter JB, Levine AM, Trafton PG. Traumatismos do sistema musculo-esquelético. 2a ed. São Paulo: Manole; 2000. p.1883-925.
14. Robinson CM, Saran D, Annan LH. Intracapsular hip fractures – results of management adopting a treatment protocol. Clin Orthop Relat Res. 1994;302:83-91.
15. Singh M, Nagreth AR, Maini PS. Changes in trabecular pattern of upper end of the femur as an index of osteoporosis. J Bone Joint Surg Am. 1970;52:457-567.
16. Sikorski JM, Barrington R. Internal fixation vs. hemiarthroplasty for displaced subcapital fracture in the femur: a prospective randomized study. J Bone Joint Surg Br. 1981;63:357.
17. Ramalho AC, Lazaretti-Castro M, Hauache O, Vieira JG, Takata E, Cafalli F et al. Osteoporotic fractures of proximal femur: clinical and epidemiological features in a population of the city of São Paulo. Sao Paulo Med J. 2001;119:48-53.
18. Rocha MA, Carvalho WS, Zanqueta C, Lemos SC. Estudo epidemiológico retrospectivo das fraturas do fêmur proximal tratados no Hospital Escola da Faculdade de Medicina do Triângulo Mineiro. Rev Bras Ortop. 2001; 36:.311-6.
19. Berend ME, Smith A, Meding JB, Ritter MA, Lynch T, Davis K. Long-term outcome and risk factors of proximal femoral fracture in uncemented and cemented total hip arthroplasty in 2551 hips. J Arthroplasty. 2006; 21(6 Suppl 2):53-9.
20. Pinheiro RS, Travassos C, Gamerman D. Desigualdade no tratamento à fratura proximal de fêmur no Rio de Janeiro. Rev Bras Epidemiol. 2006;9:374-83.
21. Van Balen R, Steyerberg EW, Polder JJ, Ribbers TL, Habbema JD, Cools HJ. Hip fracture in elderly patients: outcomes for function, quality of life, and type of residence. Clin Orthop Relat Res. 2001;390:232-43.
22. Kenzora JE, McCarthy RE, Lowell JD, Sledge CB. Hip fracture mortality. Relation to age, treatment, preoperative illness, time of surgery, and complications. Clin Orthop Relat Res. 1984;186:45-56.
23. Sexson SB, Lehner JT. Factors affecting hip fracture mortality. J Orthop Trauma. 1987;1:298-305.
24. Ions GK, Stevens J. Prediction of survival in patients with femoral neck fractures. J Bone Joint Surg Br. 1987;69:384-7.
25. Cunha U, Veado MAC. Proximal femoral fracture in the aged: functional independence and one-year mortality. Rev Bras Ortop. 2006;41:195-9.
26. Melton LJ 3rd, Therneau TM, Larson DR. Long-term trends in hip fracture prevalence: the influence of hip fracture incidence and survival. Osteoporos Int. 1998;8:68-74.
27. Schroder HM, Erlandsen M. Age and sex as determinants of mortality after hip fracture: 3,895 patients followed for 2.5–18.5 years. J Orthop Trauma. 1993;7:525-31.
28. White BL, Fisher WD, Laurin CA. Rate of mortality for elderly patients after fracture of the hip in the 1980's. J Bone Joint Surg Am. 1987;69:1335-40.
29. Parker MJ, Handoll HH, Bhargara A. Conservative versus operative treatment for hip fractures. Cochrane Database Syst Rev. 4:CD000337, 2000.