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Epidemiology outcomes of proximal humerus fractures in Saudi Arabia

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ABSTRACT

Background: Proximal humerus fractures (PHF) are osteoporotic fractures that affect women over 70 years of age. Like fractures of the femoral neck they have become a public health concern. As the population ages there is an increase in the number of people in poor general condition with an increased risk of falls on fragile bones. The incidence of these fractures has increased by 15% per year.

Methods: All patients managed for PHF in Saudi Arabia in the past year were included in this prospective study (prospective cohort study; level 2). Three hundred and twenty-five patients were included with 329 fractures.

Results: There was a ratio of two women to one man. At the final follow-up 50 patients had died (15%) and 25 patients were lost to follow-up. The mean age was 70 years old. There were two types of risk factors. The first was fragile bones, and the second was patient specific risk of falls. The severity of the fracture increased with the age of the population. Hospitalization was necessary in 43% of the cases in our study. Surgical management was necessary in 21%. This lack of relationship between the percentage of displaced fractures (58%) and the percentage of surgically treated fractures is a sign of the difficulties of managing this population, which is usually in poor general condition.

Conclusion: Proximal humerus fractures (PHF) is frequent and its prevalence is increasing. The ageing population is the cause, resulting in a population that is in poor general condition with an increased risk of falling on increasingly fragile bone. Measures must be taken in this growing population to prevent the risk factors of PHF because management of these fractures may become another source of dependency in the elderly population.

Keywords: Epidemiology; Fracture; Proximal humerus; Prevalence; Osteoporosis

INTRODUCTION

Proximal humerus fractures (PHF) are the seventh most frequent fracture in adults and the third in patients over 65 following wrist and femoral neck fractures. They represent 5.7% of diagnosed fractures. This is mainly an osteoporotic fracture and its prevalence increases as one moves north in Europe. There is a linear increase in the incidence of this entity after the age of 40. Like fractures of the femoral neck, PHF have become a public health. The ageing population means there is an increase in the number of people poor general condition with a greater risk of falling on weak bones. This regular increase in the prevalence of osteoporotic fractures results in higher medical costs (hospitalization, treatment, convalescence. . .) and can result in loss of autonomy. The management of these fractures will be a real challenge for future healthcare policies in the upcoming years. ***Kannus et al.*** [(1,2)] studied PHF between 1970 and 1998 in patients over the age of 60 admitted to hospitals in Finland. The number of patients went from 208 fractures in 1970 to 1105 in 1998 or increased by 15% per year. In 28 years and if the ageing of the population is taken into account, this fracture has increased by 166% in women and 250% in men. These fractures will probably become more difficult to treat due to delayed union, an increase in the number of complications and in the rate of pseudarthrosis. ***Palaven et al.*** [(3)] estimated that the number of shoulder fractures would increase three fold in the next 30 years. ***Court-Brown and Caesar*** [(4)] talk about a revolution in the management of fractures because trauma centers were created in the developed countries between 1970-1980 to manage trauma secondary to high-energy traumas, which mainly affect young men. At present, the prevalence of that type of trauma is decreasing while traumas on osteoporotic bone are increasing. The latter are managed differently because the short and long-term aims are different. ***Lind T et al.*** [(5)] noted that in 730 fractures, 29% of the patients needed to be hospitalized; 75% of these were over 60 and only 21% underwent surgery, which represents 583 hospital days per year for a Danish city of 250,000 inhabitants. The aims of the present study were to define the epidemiology of this population presenting a PHF and evaluate the severity of the fracture and its therapeutic management in relation to different subgroups in this population.

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PATIENTS AND METHODS

All the patients managed in the emergency unit of different University Hospitals in Saudi Arabia between July 2016 and December 2017 for PHF was included in this prospective study. The initial evaluation included double oblique AP view X-rays of the shoulder and a Lamy view while MRI was requested for more complex fractures. These different imaging techniques were visualized digitally. Initial management of each patient was noted in the medical file (number of days of hospitalization, period of the trauma, surgical procedures, and type of immobilization). Each fracture was classified twice by three senior surgeons at 3-month intervals based on the Neer classification[6]. The most frequent response was taken for each fracture. All of the patients were seen for postoperative follow-up in an out- patient consultation at 3 weeks, 6 weeks and 3 months. All patients were contacted by telephone at 10 months of follow-up. They responded to a medical questionnaire concerning: risk factors (osteoporosis, history of falling, low level of physical activity, hip fracture in the mother, trouble walking, pain in the lower limbs, trouble seeing, trouble hearing, alcoholism, tobacco use), comorbidities (diabetes, epilepsy, depression, dementia, Parkinson's disease, others), the causes of the fracture, medical history in the fractured shoulder, associated traumas, the patient's notion of his/her own general condition on a three point scale (good, average, poor) and the MOS SF12 quality of life score [7]. All of these data were noted on an excel table. This was a prospective cohort study (level 2).

RESULTS

Three hundred and twenty-five patients were included with 329 fractures. The population included 224 women (69%) including three with bilateral fractures and 101 men (31%) one with a bilateral fracture, for a ratio of two-women/one man. PHF was associated with another fracture in 34 cases. PHF represented 0.4% of adult emergency room consultations at Saudi Arabia (70,000 consultations per year). On a national level, there are 15,500,000 visits to the emergency room per year and an estimated 65,000-isolated PHF per year in Saudi. At the final follow-up, 50 patients had died (15%) and 25 patients were lost to follow-up. Initial data included the entire study population, while at the final follow-up questionnaires were sent to 250 patients with 253 fractures (185 women and 65 men). The mean age was 70 (16-97). The fractured shoulder was on the right side 156 times and on the left side 173 times. The fracture affects the dominant side in 48% of cases. Analysis of the distribution of fractures throughout the year showed that most of these fractures occurred during the ''cold'' season with 60% between December and May. Figs. 1 and 2 show that there is a peak in the prevalence of fractures in patients in their eighties and this is only observed in women. The causes of fracture are summarized in Table 1. In men, 55% of the fractures were due to a simple fall and 45% to a high-energy kinetic trauma. In women, the cause was a simple fall in 82% of the cases. The cause of fracture was a high energy trauma in young patients and low energy trauma in older patients, which can be remarked as of the age of 60 because in 56% of cases it was due to a fall from standing height and this percentage regularly increased until it reached 100% at the age of 100. The risk factors and comorbidities are summarized respectively in Tables 2 and 3. The patients felt that they were in good general condition in 154 cases (62%), average in 66 cases and poor in 30 cases. The objective measurement of the general condition of this population based on the MOS SF12 quality of life scale showed a mean 41 for the physical score and 53 for the psychological score (the normal score is 50 for each). There was a history of shoulder injury in 10 patients (4%), (three fractures, two dislocations, five rotator cuff tears, one arthritis and two anti-inflammatory injections). Fig. 3 shows the distribution of the different fractures according to the Neer classification. Forty-two percent of the fractures were NEER type 1; these are considered to be slightly or not displaced. Fifty-nine percent of the fractures were displaced. The type of fracture varied depending upon the age group. Under the age of 40, 41% were slightly or not displaced (Neer type 1), the rest were two part fractures (Neer type 3, 4 or 6). Following this, fracture displacement worsened. In the 41—70 year old age group, the percentage of Neer type 1 fractures was similar (43%) but three or four part fractures are found and represent 16% of all fractures. In the 71—100 year old age group, the percentage of type 1 Neer fractures was only 33% and the percentage of three or four part fractures was 19%; this is also the only age group with six patients with articular fractures of the humeral head. Fractures were managed by conservative treatment in 79% of the cases (256 patients) and surgery in 21% (69 patients).

Surgical treatment included internal fixation in 57 cases (53 intramedullary nails and four ORIF with screws in the greater/lesser tuberosity) and 12 shoulder arthroplasties (four anatomical replacements and eight reverse total shoulder replacements). Hospitalization was necessary in 43% of the patients (139 patients). Therapeutic management varied depending upon the type of fracture. Surgery was performed in three Neer type 1 fractures. Two presented with a diaphyseal fracture of the humerus associated with the PHF, while the third presented with a bilateral fracture, and it was decided to stabilize both shoulder fractures for the patient's comfort. Neer type 3 fractures (surgical neck fracture) were treated surgically in 39% of cases, Neer type 8 fractures (surgical neck fractures and the greater tuberosity) in 41% of the cases and Neer type 12 (four part fractures) in 45% of cases. The other types of fractures were rarely operated on (Table 4). Thirty-seven percent of the patients (125) who presented with displaced PHF were not operated on. Conservative treatment was indicated because of the patient's poor general condition and the risk of anesthesia. This population was a mean of 78 years old, older than the overall population, and in poorer general condition (22% had died at 10 months, 14% had dementia, 20% had comorbidities, 26% had difficulty walking). At the final follow-up our questionnaire was filled out by 88 of these patients (27 had died, eight were lost to follow-up, two had severe dementia). From a subjective point of view 52% (46) of these patients considered themselves to be in good general condition 36% (32) in average condition and 11% (10) in poor condition. Objectively the mean SF 12 physical score was 39 and the mean SF 12 psychological score was 53. The results of these two scores were similar to those in the overall study population.

Table (1): Number of patients according to the cause of the fracture.

Cause of fracture	Total	Men	Women
Falling from standing height	189	37	152
Road accident	34	18	16
Violent fall	17	7	10
Aggression	9	3	6
Suicide attempt	1	0	1

Table (2): Risk factors for fracture.

Risk factors for fracture	Number of patients	%
Osteoporosis	85	34
History of falling	82	33
Limited physical activity	75	30
History of femoral neck fracture in mother	31	12
Trouble walking	62	25
Pain in the lower limbs	47	19
Trouble seeing	66	26
Trouble hearing	41	16
Alcoholism	37	15
Tobacco use	71	28

Table (3): Comorbidities.

Comorbidities	Number of patients	%
Diabetes	26	10
Epilepsy	7	3
Depression	53	21
Dementia	26	10
Parkinson's disease	4	1.6
Psychosis	8	3
Cardiopathy	21	8
HTA	10	4
History of stroke	8	3

Table (4): Percentage of patients who underwent surgery for PHF in relation to the Neer classification of fracture.

Neer	Number of shoulders	Surgery	%
I	136	3	2
III	102	40	39
IV	3	0	0
VI	33	4	12
VII	1	1	100
VIII	27	11	45
IX	1	0	0
XII	20	9	45
XV	6	2	33

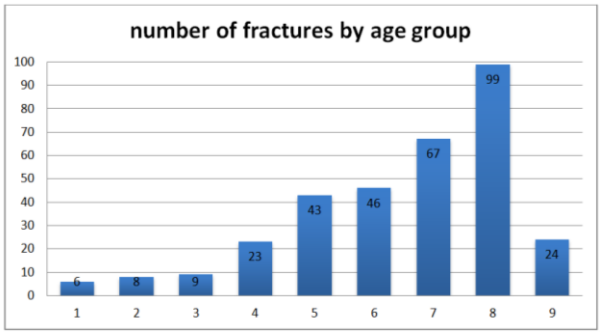

Figure (1): Number of fractures according to age group.

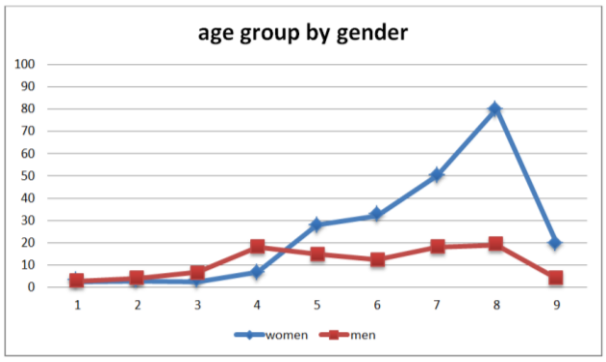

Figure (2): Age group in relation to gender.

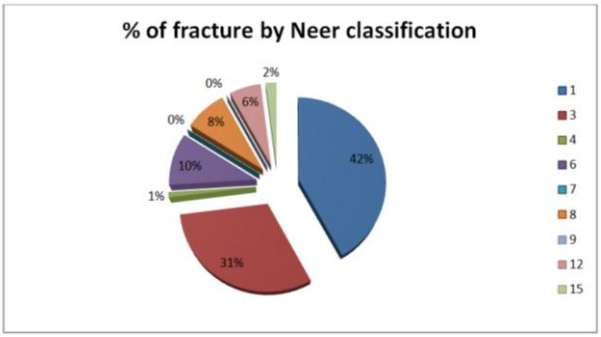

Figure (3): Distribution of fractures according to the Neer classification.

DISCUSSION

Like the studies by ***Kannus et al.*** [1] and *Court-Brown et al.* [4,8], this epidemiological study showed that most PHF were osteoporotic fractures in women over the age of 70. The risk of fracture begins to increase linearly in women in their fifties [9,10]. The prevalence of PHF increases as the population ages. There are two main types of risk factors for osteoporotic fractures, in particular for PHF. The first risk is fragile bones and the second is the risk of falling. The more fragile the bones are the more severe the fracture is [8]. *Nguyen et al.* [11] found that osteoporotic vertebral compression fractures with loss of height, which is one of the most typical signs of existing osteoporosis, were a predictive factor for these fractures. Ethnicity is also a risk factor of fragile bones [12,13] . The prospective EPOS [9] study showed that in osteoporotic fractures, PHF were more frequent in women in northern Europe with an incidence of 5.2/1000/year, while in the rest of Europe it was 1.3—1.9/1000/year. In men the incidence was comparable in the different European regions with figures between 0.4 and 1.2/1000/year. One or several risk factors of falling were found in more than half of our population: 33% had a history of falling and 30% had low level of physical activity which could indicate worsening of the patient's general condition which was identified as a risk factor for PHF by ***Kelsey et al.*** [14]**.** Difficulty seeing was identified in 26% of patients. Difficulty walking and pain in the lower limbs was identified respectively in 25 and 19% of the cases. Cardiovascular diseases were found in 16% of cases, but their frequency in the general population made it difficult to confirm that this increases the risk of PHF, although in the elderly this is probably the cause of attacks, which result in falls. Diseases, which increase the risk of PHF, are diabetes, epilepsy, depression and dementia. In our study, 10.4% of patients were diabetics (1 and 2 combined) while this figure is 3.8% in the general Saudi population. In our study 21% of patients were depressive. ***Lind T et al.*** [5] found an increase in these fractures in the winter, which we also observed usually in the middle of the day, but cannot confirm statistically. Although alcohol or tobacco consumption was not considered to be a risk factor by ***Chu et al.*** [12] they were present in 15 and 28% of our cases respectively. The patient's general condition is an equally important risk factor because an autonomous person in good condition will be less apt to fall and his/her bones will be less fragile. In a 5-year prospective study (1027 PHF), ***Court-Brown et al.*** [8] found that this population was in poorer general condition than the population presenting with wrist fractures, but in better general condition than the population presenting with hip fractures. Only 10% were in an institution when the fracture occurred. Measures taken to limit these risk factors and the lifestyle in certain areas of the world can reduce the prevalence of PHF. In a study performed between 1970 and 1995 and published in 2008 in a population that was 80 or older, ***Kannus et al.*** [15]**,** showed that the number of

fractures increased from 88 to 304/per 100,000 women. However the number of fractures has stabilized since 1995 suggesting that this population was in better health, that preventive measures have been taken, and that management of osteoporotic bone has improved. ***Hagino et al.*** [(10)] found that the traditional Japanese way of life decreased the risk of falling, and therefore reduced the prevalence of these fractures. The prospective study EPIDOS [(16)] in osteoporotic fractures of the shoulder showed that a patient with osteoporosis with falling risk factors has a greater risk of fracture than a patient without osteoporosis or falling risk factors. On the other hand, s/he has the same risks as a patient without osteoporosis with high falling risks. The severity of the fracture increases as the population ages. In his article in 1970, **Neer** [(17)] reported type 1 fractures (not or slightly displaced - less than one centimeter of displacement and an angle of less than 45°) in 85% of the population. On the other hand in a prospective 5-year study (1027 FESH) in 2001, ***Court-Brown et al.*** [(8)] found Neer type 1 fractures in 49%, two part fractures in 37%, three parts in 9% and four parts in 4%. We identified Neer type I fractures in 42% of the patients in our study in 2010 in 329 fractures. The percentage of non-displaced fractures has decreased by 50% in 40 years. This increase in the number of displaced fractures suggests that there is theoretically a greater need for surgical management and a risk of poorer functional outcome. However, compared to the results by **Neer** [(17)] in which approximately 15% of FEUH were considered to be displaced, and thus require surgical management, the percentage of surgically treated fractures in our study (21%) was similar to that in the **Neer** study. This lack of relationship between the percentage of displaced fractures (58%) and the percentage of fractures that were surgically treated (21%) is a sign of the difficulties of man- aging this population. The technical difficulties associated with fixation material that is not always adapted to mediocre bone quality and the general condition of patients who are usually extremely elderly with multiple comorbidities, are the main reasons for this low percentage of surgeries. At 10 months of follow-up the level of satisfaction in this specific population is similar to that in the overall study population, but no firm conclusions can be drawn due after such a short amount of time.

CONCLUSION

PHF is now usually an osteoporotic fracture in women over the age of 70. It is frequent and its prevalence is increasing. The ageing population is the cause, resulting in a population that is in poor general condition with an increased risk of falling on increasingly fragile bone. PHF are displaced in 50% of the cases, requiring hospitalization in at least one out of two cases while surgery was performed in one out of five. Measures must be taken in this growing population to prevent the risk factors of PHF because management of these fractures may become another source of dependency in the elderly population.

CONFLICTS OF INTEREST

There are no conflicts of interest.

REFERENCES

1. **Kannus P, Palvanen M, Niemi S, Parkkari J, Järvinen M, Vuori I (2000):** Osteoporotic fractures of the proximal humerus in elderly Finnish persons: sharp increase in 1970-1998 and alarming projections for the new millennium. Acta Orthop Scand., 71(5): 465-70.
2. **Kannus P, Palvanen M, Niemi S, Parkkari J, Järvinen M, Vuori I (1996):** Increasing number and incidence of osteoporotic fractures of the proximal humerus in elderly people. BMJ., 313(7064): 1051-2.
3. **Palvanen M, Kannus P, Niemi S, Parkkari J (2006):** Update in the epidemiology of proximal humeral fractures. Clin Orthop Relat Res., 442: 87-92.
4. **Court-Brown CM, Caesar B (2006):** Epidemiology of adult fractures: a review. Injury, 37(8): 691-7.
5. **Lind T, Kroner K, Jensen J (1989):** The epidemiology of fractures of the proximal humerus. Arch Orthop Trauma Surg., 108(5): 285-7.
6. **Neer II CS (1970):** Displaced proximal humeral fractures. Classification and evaluation. J Bone Joint Surg Am., 52(6): 1077-89.
7. **Ware JE, Kosinski M, Keller SD (1996):** A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. Med Care, 34(3): 220-33.

8. **Court-Brown CM, Garg A, McQueen MM (2001):** The epidemiology of proximal humeral fractures. Acta Orthop Scand., 72(4): 365-71.

9. **Kristiansen B, Barfod G, Bredesen J, Erin-Madsen J, Grum B, Horsnaes MW *et al.* (1987):** Epidemiology of proximal humeral fractures. Acta Orthop Scand., 58(1): 75-7.

10. **Hagino H, Yamamoto K, Ohshiro H, Nakamura T, Kishimoto H, Nose T (1999):** Changing incidence of hip, distal radius, and proximal humerus fractures in Tottori Prefecture, Japan. Bone, 24(3): 265-70.

11. **Nguyen TV, Center JR, Sambrook PN, Eisman JA (2001):** Risk factors for proximal humerus, forearm, and wrist fractures in elderly men and women: the Dubbo Osteoporosis Epidemiology Study. Sydney, Australia: Bone and Mineral Research Program, American Journal of Epidemiology, 153(6): 587-595.

12. **Chu SP, Kelsey JL, Keegan TH, Sternfeld B, Prill M, Quesenberry CP *et al.* (2004):** Risk factors for proximal humerus fracture. Am J Epidemiol., 160(4):360-7.

13. **Chapurlat R (2007):** Épidémiologie des fractures de l'extrémité supérieure de l'humérus: l'épaule est une autre cible de l'ostéoporose. Lett Rhumatol., 333:15-7.

14. **Kelsey JL, Browner WS, Seeley DG, Nevitt MC (1992):** Cummings SR. Risk factors for fractures of the distal forearm and proximal humerus. The Study of Osteoporotic Fractures Research Group. Am J Epidemiol., 135(5): 477-89.

15. **Kannus P, Palvanen M, Niemi S, Sievänen H, Parkkari J (2009):** Rate of proximal humeral fractures in older Finnish women between 1970 and 2007. Bone, 44(4): 656-9.

16. **Lee SH, Dargent-Molina P, Bréart G (2002):** EPIDOS Group. Risk factors for fractures of the proximal humerus: results from the EPI- DOS prospective study. Épidemiologie de l'Ostéoporose Study. J Bone Miner Res., 17(5): 817-25.

17. **Neer II CS (1970):** Displaced proximal humeral fractures: part 1. Classification and evaluation. JBJS Am., 52: 1077-89.