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The Epidemiological Analysis of Humeral Shaft Fractures in Kashmiri Population

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Abstract
A retrospective study of all humeral shaft fractures presenting to bone and joint hospital Srinagar, Kashmir a tertiary care hospital between January 2015 to January 2017 was undertaken. We studied 200 cases of fracture shaft of humerus. The fractures were defined by their AO morphology, position, the age and gender of the patient and the mechanism of injury. Open fractures were classified using the Gustilo system and soft-tissue injury, and closed fractures using the Tscherne system.
Results: *The fractures were classified as AO type A in 65.5%, type B in 25.5% and type C in 9.0%. Most (60%) occurred in the middle third of the diaphysis with around 30% in the proximal and 10% in the distal third. The severity of the fracture and soft-tissue injury was greater with increasing injury severity. Less than 10% of the fractures were open. There was a bimodal age distribution with a peak in the third decade as a result of moderate to severe injury in men and a larger peak in the seventh decade after a simple fall in women.*
Keywords: *Humerus, Kashmir, Retrospective, Epidemology.*

Introduction

Epidemiology related to humeral shaft fractures have not been extensively studied as those related to fractures occurring in other parts of the human skeleton, such as the peritrochanteric femur or the distal radius. Nevertheless, the available literature report that the general incidence of humeral shaft fractures remain in the area to 1% to 2% of all fractures occurring in the human body[1,2,3] and 14% of all fractures of the humerus. To obtaina true picture of epidemiology all the fractures occurring in a known area to a defined population must be studied. This information can then be used to plan preventive programs for safer environments to be possible, planning of treatment, to define priorities in training and to gain an understanding of orthopedic trauma. Our study was undertaken in an orthopedic hospital which serves a population of approximately 2000 000 people and is responsible for the inpatient and outpatient care of their injuries.

Materials and Methods

The work represents a retrospective study conducted for a period of two years between January 2013 and January 2015. All inpatients and outpatients aged 13 years or over with a humeral diaphyseal fracture were included in the survey. A

diaphyseal fracture was defined as one occurring between the superior border of the insertion of pectoralis major and the area above the supracondylar ridge. All the fractures were classified using the AO system[4]. We used the Tscherne[5] classification for closed fractures and the Gustilo system for open fractures[6,7]. They were also classified according to their location in the proximal, middle or distal thirds of the diaphysis. We recorded six basic causes of injury: falls from standing height, falls from a greater height, road-traffic injuries sustained as a pedestrian, other road traffic injuries, pathological fractures (usually metastatic) and miscellaneous injuries sustained in fights, from falling objects, sports or industrial accidents. All those patients about whom some data pertaining to above mentioned parameters were missing were excluded from our study. Results were then compared with existing literature regarding humeral shaft fractures.

Results

200 patients with unilateral fractures of the humeral shaft were analyzed; 123 were on the right and 77 on the left. There were 88 men and 112 women with a mean age of 50.3 years (15 to 84). Incidence of fractures sustained according to age and a comparison of the male-to-female proportions are given in Figure 1 and Table I. There is a bimodal distribution peaking in the third and seventh decades. Fractures occurring in patients aged over 50 years accounted for 60% of the total. The largest peak for males was in the third decade and for females in the seventh. Of the 74 patients aged under 50 years, 70% were men while 74% of the 126 aged over 50 years were women.

Fig. 1 Age and gender distribution of fractures of the humeral shaft in 200 patients

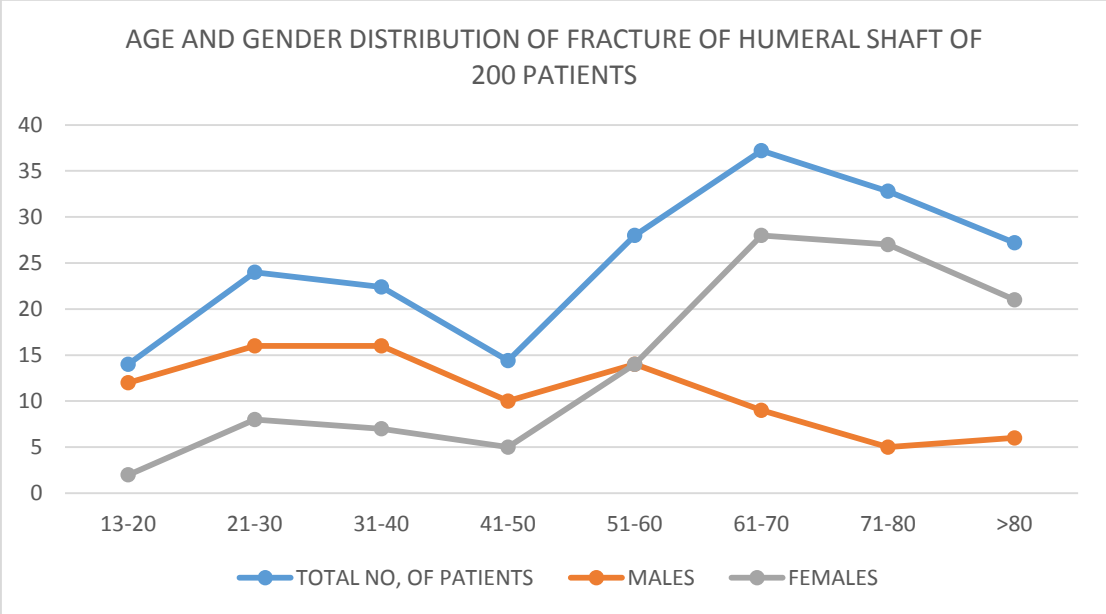

Table I. Distribution of 200 fractures of the humeral shaft into AO type and gender by decade

AGE (year)	No. of patients	%age	AO type			Women (%age)
			A	B	C	
11-20	14	7	5	5	1	16
21-30	24	12	12	10	1	35
31-40	22.4	11.2	12	6	2	32
41-50	14.4	7.2	12	2	3	35
51-60	28	14	20	8	2	50
61-70	37.2	18.6	25	8	5	76
71-80	32.8	16.4	24	6	2	85
>80	27.2	13.6	20	6	2	77

Table II. Distribution of the 200 humeral fractures into AO types

A (%)		B (%)		C (%)	
A1	30.2	B1	16.1	C1	5.1
A2	10.6	B2	8.5	C2	2.2
A3	24.7	B3	0.9	C3	1.7
TOTAL	65.5	TOTAL	25.5	TOTAL	9.0

Table III. Position and incidence of fractures in the humeral diaphysis

Position of Fracture	Incidence (%)
Proximal	28.2
Middle	60.2
Distal	11.6

Table IV. Open versus closed fractures

Open (%)	**Closed** (%)
6	94

Table VI. Distribution of Gustilo anderson[6,7] type open fractures compared with the average Age

Gustillo Anderson Type	Incidence	Average Age (Yr)
I	70	52
II	12	53.5
IIIa	90	52
IIIb	8	40

Table VII. Distribution of 235 closed humeral fractures according to the Tscherne classification[5] compared with average age

Tscherene Type	Incidence	Average Age(Yr)
C0	36.2	60.8
C1	50	48.9
C2	12.3	44.4
C3	1.5	41.3

Table VIII. Numbers of patients and their mechanism of injury type

Mechanism of injury	Incidence	Average age(yr)
Simple fall	60.2	66.3
Fall from height	6.3	43.7
RTA (pedestrian)	5.1	51.2
RTA (vehicular)	19.4	29.2
Pathological	2.9	55.4
Miscellaneous	6.1	44.9

Humeral shaft fractures were classified into different AO groups and analyzed. Table II shows that 65.5% were AO type A or simple fractures, 25.5% were type B or fractures with a wedge and 9.0% were type C with the more complex patterns. The A1 simple spiral fracture was the most common type (30.2%) followed by the A3 simple transverse and the B1 spiral wedge groups. The simple oblique A2 fractures were also quite common. Distribution according to the location of fracture revealed that Over 60% of fractures were in the middle third of the humeral diaphysis, 28.2% were in the proximal and 11.6% in the distal third (Table III).

Open fractures were mainly of the Gustilo type I (70%), with type-II (12%), type-IIIa (10%) and type-IIIb (8%) fractures being much less common (Table VI). Half of the type-I and all of the type-II and type-III fractures were associated with multiple injuries. The Gustilo type-IIIb fractures occurred in a younger age group than the other open fractures.

There were 188 closed fractures (94%) in patients with an average age of 48.85 years. These injuries were analysed using the Tscherne classification (Table VII). The commonest types were C1 (50.0%) and C0 (36.2%), the C2 (12.3%) and C3 (1.5%) fractures being much less common. Patients with C0 fractures had an average age of 60.8 years which decreased with increasing severity to 41.3 years for C3 fractures.

An analysis of the age distribution and incidence of fractures with their mechanism of injury is given in Table VIII. In male's highest incidence was in the second and third decades, a large proportion resulting from vehicular road-traffic accidents (RTA) and miscellaneous causes. During young age upto 50 years most of the fractures resulted from high energy trauma. From the sixth decade onwards over 75% of the fractures occurred in women and were due to simple falls. Regarding pathological fractures, they occurred with increasing frequency with increasing age. The high-energy fractures resulting from vehicular RTA was mainly spotted in younger population.

Discussion

Epidemiological studies concentrating on fractures of the humeral shaft in Kashmiri population using modern systems of classification

is very rare. Most of these fractures are simple injuries sustained by middle-aged to elderly patients who are likely to be osteoporotic. The 'J'-shaped curve described by Buhr and Cooke [7]which they called the 'post-wage-earning' fracture pattern conforms well to our pattern of age specific incidence. Our figures confirm their view that these fractures are the result of considerable violence in the young, but are predominantly osteoporotic in nature as in the elderly. This, should prompt us to review our methods of treatment for this injury. Open reduction and internal fixation with plating anosteoporotic bone is unreliable because of poor screw purchase and antegrade intramedullary nailing violates the rotator cuff which can cause considerable complications in elderly patients[8].we compared our results of epidemiological study with the existing literature. Mast et al, [9]in a retrospective study of 240 fractures of the humeral shaft, found that 60% occurred in the under-30-year age group, and that there was a fairly even distribution of injury within the shaft. This reflects a more violent environment as 17% of the fractures were the result of gunshot wounds, and illustrates the difficulty of interpreting epidemiological data from a selected population in a level-1 trauma centre. Rose et al[10] reviewed 586 humeral fractures of which 116 (20%) were of the shaft. They noted a bimodal distribution for the latter injuries with a peak in the under-30-year and over-30-year age groups. Nearly 70% of the fractures occurred in the former group, and were a result of severe trauma with just over half being sustained in men. These data also suggest a selected population.

Analysis of our series also shows a bimodal distribution of the fractures. The peaks are in the third and seventh decades. In the under- 50-year group, 70% of the fractures occurred in men and over two-thirds were the result of moderate to severe trauma. In our series, however, 60% occurred in the over- 50-year group with almost 80% resulting from simple falls; 73% were in women. In injuries to long bones in the lower limb there is a much higher incidence of fractures due to sport and RTA[11].Over 60% of fractures occurred in the middle segment of the shaft of the humerus and over 60% were AO type A. In general, an increasing severity of fracture as defined by the AO type was seen consequent to more violent injury, with 40% of fractures sustained by pedestrians in RTAs being AO type C. There were, however, a number of type-C fractures after simple falls in the elderly, perhaps due to the alteration of biomechanical properties seen in elderly bone[12,13,14]. There was a reasonable correlation between increasing soft-tissue injury by the Tscherne score, the increasing severity of AO fracture type and decreasing age. Less than 10% of the fractures were open, but there was good correlation between increasing AO type and Gustilo type.

Conclusion

We conclude that this is the largest reported study of epidemiology of humeral shaft fractures in adult population of Kashmir valley that we are aware of. This study will provide useful information for planning better treatment or prevention of these fractures in elderly[15]. Further research is needed for proper management of osteoporotic humeral shaft fractures in elderly population.

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