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Elderly patients with maxillofacial trauma: the effect of an ageing population on a maxillofacial unit's workload

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Abstract

The purpose of this study was to identify the aetiology and management of facial fractures in patients over 60 years old and to identify potential trends in caseload to assist with planning of resources for maxillofacial services in the coming decades. We made a prospective study over 2 years (2009–2010), during which all injured patients referred to the oral and maxillofacial surgery unit at The Canberra Hospital, Australia were recruited. The patients were classified into two groups: less than 60 years old (younger group); or 60 years old or more (older group). Factors studied included sex, age, aetiology, site of fractures, severity scored using the Maxillofacial Injury Severity Score (MFISS), and management. Based on current trends, the expected workload was extrapolated. A total of 470 patients were recruited (younger: $n = 430$ and older: $n = 40$). Falls were the most common cause of fracture in the older group (85%) and the zygoma (40%) was the bone most commonly fractured. The mean (SD) MFISS for the older group was 3.8 (2.2) (17% of these maxillofacial injuries were operated on) and 6.0 (5.0) for the younger group (72% of these were operated on). In Australia, population trends suggest that older people as a proportion of the total population will rise from about 20% of 22 million to 26% of 30 million by 2034. As the older group increases there will be a corresponding increase in the number of older people who present with trauma to maxillofacial units. The overall maxillofacial surgical workload will probably not increase much because the injuries tend to be less severe and are less likely to require operation.

Keywords: Maxillofacial; Trauma; Elderly; Caseload; Aetiology

Introduction

With increasing life expectancy, the number of older people who will be treated by maxillofacial units will increase. Census data from the Australian Bureau of Statistics including the population pyramid for Australia show that for the past decade the proportion of people in the 15–60 years age group has remained stable, the percentage of people aged over 60 has risen (15.4–19%), and the number of people over 84 has roughly doubled.[1]

Trauma has a greater physical impact on the older age group because of their decreased physical reserves and age-related coexisting conditions including cardiovascular disease, poor eyesight, osteoporosis, reduced muscle mass, arthritis, and cognitive decline.[2] Specific organ system dysfunctions (such as ischaemic heart disease and dysrhythmias) and polypharmacy may also contribute.[3]

Despite the morbidity associated with facial trauma among older people, little has been written about it. In this study we aimed to identify the aetiology of facial fractures, their surgical management, and the patients' coexisting conditions, within the over-60 age group. We then compared the aetiology and surgical management with that of patients

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aged less than 60. In conclusion, we summarise the ramifications of an increasingly older population on the caseload of a maxillofacial unit.

Methods

We made a 2-year prospective observational study (2009–2010) of patients with maxillofacial trauma who presented to The Canberra Hospital (Australian Capital Territory, Australia). A total of 470 patients were seen during the period: 430 (91%) were less than 60 years old and 40 (9%) were 60 or older. In the younger group there were 66 women (15%) and 364 men (85%), and their ages ranged from 1 to 59 years, median 24 and mean (SD) age 27 (12). In the older group there were 26 women (65%) and 14 men (35%) whose ages ranged from 60 to 96 years, median 76 and mean (SD) 76 (11). We recorded social and clinical details about the patients, aetiology of the injury, type and severity of the facial fracture and other coexisting conditions.

The severity of facial fractures was assessed using the Maxillofacial Injury Severity Score (MFISS), described by Zhang et al.,[4] which combines the Abbreviated Injury Scale (AIS-90) standard for facial injury scale with a maxillofacial functional injury scale, where the three highest AIS-90 scores are multiplied by functional injury [MFISS = (A1 + A2 + A3) × (MO + LMO + FD)].

The Mandibular Injury Severity Scale (MISS) was used to quantify mandibular fractures,[5] and is the sum of type of fracture, anatomical site, occlusion, involvement of soft tissues, infection, and displacement (MISS = sum of F + L + O + S + I + D).

We used Student's *t*-test to compare the severity of the fractures between the two age groups, and their duration of stay in hospital. We used the chi square test and likelihood ratio to compare differences between the groups for the association between aetiology, age, and sex. Probabilities of less than 0.05 were accepted as significant.

The projected size and proportions of the two groups that were likely to be operated on during 2034 were calculated based on extrapolation of population distribution data from the Australian Bureau of Statistics.

Results

Aetiology

The most common cause of facial injuries among older people was falls, whereas among younger people it was interpersonal violence (Fig. 1). There was an association between sex and age group ($p < 0.001$), aetiology and age group ($p < 0.001$), and aetiology and sex ($p < 0.001$). The association between fall and assault, and sex and age group, showed that there was an association between sex and age group for falls ($p = 0.002$), but no association between them for assault ($p = 0.71$). Because sex and age group were associated for falls, we used further tests to investigate how sex varied within the age groups. The number of men outweighed the number of women in the younger group ($p = 0.04$) and the number of women outweighed the number of men in the older group ($p = 0.04$) for falls. Sixteen of the fall-related injuries in the older group (40%) resulted in multiple injuries (involving treatment by more than one surgical team) of which 4 were associated with intracranial and extracranial haemorrhages. There were 2 deaths after massive brain haemorrhage resulting from falls in this group, which were direct or indirect results of both physiological and mechanical causes such as polypharmacy, syncope, undiagnosed aortoventricular block, cognitive impairment, and tripping.

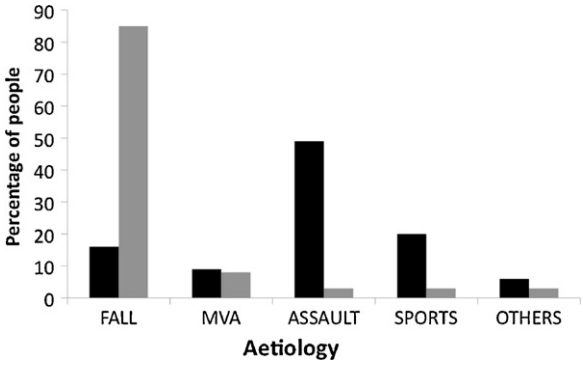

Fig. 1. Aetiology of maxillofacial fractures. Black bars = patients less than 60 years old, grey bars = patients aged 60 years or more.

Coexisting conditions and polypharmacy

In the older group, 35 patients had other medical conditions (88%) (Fig. 2). Musculoskeletal conditions included osteoporosis, which Werning et al. found were an independent risk factor for maxillofacial fractures.[6]

Multiple different definitions of polypharmacy have been reported.[7] We have used 5 or more drugs/day as our definition, which agrees with the definition used by Lai et al.[8] Polypharmacy may have contributed to the cause of the injury in 17 (43%) of the older patients and in only 12 (3%) of the

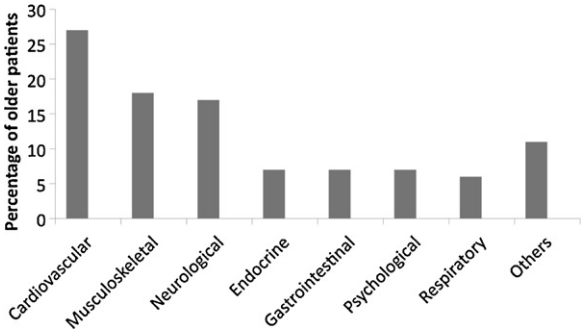

Fig. 2. Coexisting conditions in patients aged 60 years or more.

Table 1
Management of facial injuries or fractures. Data are number (%) of injuries, or number of injuries.

Type of facial injury or fracture	Younger group (<60 years) ($n = 516$)			Older group (60 years+) ($n = 47$)		
	Total no.	No operation	Operation	Total no.	No operation	Operation
Orbital complex	94	46 (49)	48 (51)	7	7	0
Nasal bone	40	16 (40)	24 (60)	9	7	2
Zygomatic complex	98	18 (18)	80 (82)	18	16	2
Maxilla	26	6 (23)	20 (77)	4	3	1
Mandible	141	14 (10)	127 (90)	5	2	3
Dentoalveolar complex injury	42	13 (31)	29 (69)	2	2	0
Laceration	70	27 (39)	43 (61)	2	2	0
Haemarthrosis of TMJ	5	100	0	0	NA	NA

TMJ, temporomandibular joint; NA, not applicable.

younger patients. The most common drug taken by the older patients was aspirin ($n = 11$, 28%), which confirms the results of the study by Wade et al.[9] Both older patients who died from intracranial bleeding were taking antiplatelet drugs. Eight of the older patients who presented after a fall (20%) were admitted from nursing homes or other care facilities.

Type of fracture

The facial fractures were classified according to anatomical site. Fractures of the zygoma or zygomaticomaxillary complex were the most common fractures among older people and, in contrast, the mandible was most common in the younger age group (Table 1). Older people sustained less severe fractures than younger ones. The mean (SD) MFISS score was 3.8 (2.2) ($n = 47$ injuries) for the older group and 6.0 (5.04) ($n = 516$ facial injuries) for the younger one. The mean (SD) MISS score for the older group was 7.0 (0.63) ($n = 6$ fractures) and for the younger ones 12.6 (6.9) ($n = 141$ fractures). These differences in scores between the two groups were significant ($p < 0.001$). We treated more maxillofacial injuries conservatively in the older group ($n = 33$, 83%) than in the younger group ($n = 120$, 28%).

Discussion

The aetiology of the fractures, sex distribution, and patterns of fracture differed significantly between the two groups. The facial fractures sustained by the older age group were less severe than those sustained by the younger group ($p < 0.001$) and were more likely to be managed conservatively.

Only 2 lacerations were recorded in the older age group, probably because patients with complex facial lacerations but no underlying fractures tended to be referred to the Plastic Surgical Unit instead of the Oral and Maxillofacial Surgical Unit. Our younger age group is similar to those described in other studies,[10,11] including one from the UK that reported that interpersonal violence accounted for 43% of facial trauma.[12]

Like other studies,[13–15] we found that falls were the leading cause of facial trauma among older people, that there was a disproportionate number of women in the older age group, and that there was a high incidence of zygomatic fractures. In contrast, a recent Malaysian study found that motor vehicle crashes and male sex were most commonly associated with facial trauma among their older people.[14] Mandibular fracture was most common in this group, but they did note that falls were the most common cause of fracture in patients over 75 years of age. These findings may be secondary to differences in lifestyle, as many Malaysians over the age of 60 are still working and drive long distances to work, and women make up only 36% of the workforce.[15,16]

An important finding in this investigation was that 17 (43%) patients who presented with maxillofacial injuries after falls were taking more than 5 drugs regularly. An association between polypharmacy and the increased risk of falling has been reported in other studies including Lai et al.[8]

Seventeen percent of the facial injuries in older people were operated (Fig. 3). Most of the fractures in the older age group were minimally displaced zygomatic fractures, which confirms a recent paper by Rehman and Edmondson[13] who treated only a quarter of their midface fractures surgically. However, the decision to operate is based on more confounding factors than just severity alone, and include the preferences of the surgeon, the patient, and the anaesthetist. Older patients also tend to place less focus on aesthetics and more focus on function than younger people.

Overall, older patients accounted for 8.5% of presentations and 2.4% (8 of 336) of all patients operated on. According to

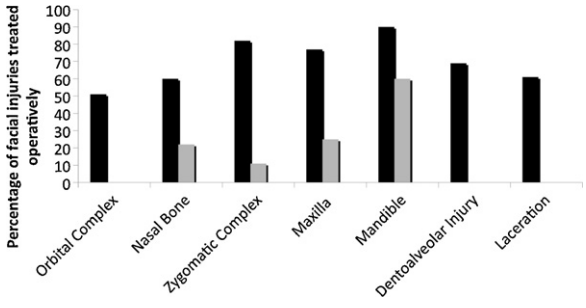

Fig. 3. Percentage of facial injuries managed operatively. Black bars = patients less than 60 years old, grey bars = patients aged 60 years or more.

Table 2
Current workload and that predicted for 2034.

	Current workload	Workload predicted for 2034
Facial injuries/fractures		
Younger (<60 years)	516	614
Older (60 years+)	47	85
Operations required		
Younger	328	390
Older	8	14

the data from the Australian Bureau of Statistics, it is expected that there will be a rise in the number of older people as a proportion of the total population in Australia from about 20% of 22 million to 26% of 30 million in 2034. The predicted rise in workload shown in Table 2 is perhaps an over-simplification, and it is difficult to predict accurately the number of patients from the older age group who will require operation in over 20 years' time. There are many confounders, including the fact that the patient's preference for operative rather than conservative management may vary from one older age group to another, and advances in research into treatment of facial trauma may mean that the options available in 2034 may be different from those available today (see Fig. 4).

The probable future increase in the number of older patients indicates that planning must ensure optimisation of patient care and implementation of appropriate services to ensure that inpatient stays do not increase appreciably. Consequently, as in orthopaedic units in Australia, it may be of benefit that this group of patients is assessed early during admission by a medical team to optimise the treatment of coexisting conditions, investigate the causes of injury, and review the number of drugs they are taking.[17,18]

Although the surgical workload is unlikely to increase drastically, the burden of care of older patients with maxillofacial injuries is most likely to be felt in an increase in the number of beds required, extended admissions, and the associated increase in hospital costs.[19]

Our mean (SD) duration of stay in the older age group was 4.4 (5.6) days and in the younger age group 3.7 (15.4) days, but the difference did not differ significantly ($p = 0.4$). Eight patients stayed in hospital for at least 20 days because they had other severe injuries including neurosurgical and orthopaedic injuries. These 8 patients were in the younger age group and if they are excluded then the mean (SD) length of stay in the younger age group becomes 2.5 (3.0) and there is a significant difference ($p = 0.02$).

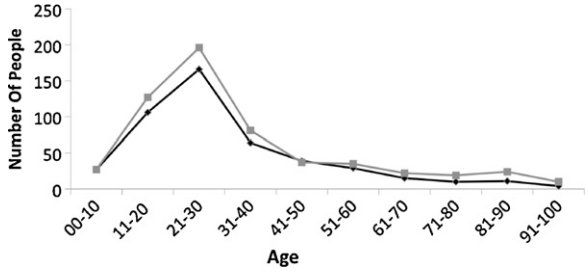

Fig. 4. Distribution of ages at the time of injuries in 2011 (black line), and as projected for 2034 (grey line).

Other studies conducted on falls and trauma among elderly people have shown that they are associated with long stays in hospital, and high mortality and morbidity. There are many reasons for associated complications, long stays in hospital, and related costs including hospital-acquired infections, poor wound healing, long-standing pain, functional impairment, disability, and the need for rehabilitation.[20] A study done in the USA reported that the 30-day in hospital mortality was 6%.[21] The associated cost in 2007 in the USA for trauma among elderly people was USD 4.4 billion (£2.8 billion) for Medicare inpatients alone. This does not include costs associated with rehabilitation and other costs after discharge from hospital. In a study done in New South Wales, Australia, trauma among the older population secondary to fall-related injuries alone was estimated to cost USD 580.6 million (£364.1 million).[22] Another study showed that the total number of hospital bed-days used for fall-related injuries among older people in NSW had increased from 267,360 in 1999 to 441,300 in 2008.[23] That study also showed an increase in 12% in the mean duration of hospital stay/incident case over this 10-year period. This further emphasises the workload placed on our hospitals by trauma-related injuries in the 60+ age group, and the need for early preventative measures.

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