Osteoporosis treatment following a low trauma wrist fracture presenting to the Accident and Emergency Department from 2011 to 2015

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Summary

Objective. **The aim of this study was to determine the treatment given to patients following a low trauma wrist fracture presenting to an Accident and Emergency (A&E) Department at a tertiary private hospital in Malaysia.**
Methods. **The records of patients over the age of 50 attending A&E Department from 2011-2015 with a diagnosis of Colles'/distal radius/wrist fracture were obtained. Information was extracted for those with a low trauma fracture. Data was analysed using IBM SPSS Statistics version 22.0 for Windows.**
Results. **191 patients presented with a wrist fracture for the years 2011-2015. 57 of these were due to accidents which left 134 (70.2%) low trauma wrist fractures for analysis. The mean age of the patients was 61.75 ± 10.23 [standard deviation (SD)] years. There were 87 (64.9%) females, and 90 (67.2%) were of Chinese ethnicity. Following the index low trauma wrist fracture, 16/134 (11.9%) were given anti-osteoporotic medication. Of those given treatment, 11/16 (68.8%) were given calcium/vitamin D/activated vitamin D and only 5/16 (31.2%) were given active anti-osteoporotic treatment. The median duration of prescribed treatment was one month. There was no significant difference in demographic factors between patients who were treated and not treated with anti-osteoporosis medication.**
Conclusions. **Currently, treatment for osteoporosis following low trauma wrist fractures in Malaysia is inadequate with only 11.9% receiving treatment, and in those who are treated, the median duration of treatment was only one month. This represents a missed opportunity for the prevention of future fractures.**

KEY WORDS: Colles' fracture; osteoporosis; treatment; Malaysia.

Introduction

Osteoporosis is defined as a skeletal disorder characterised by compromised bone strength and bone quality predisposing a person to an increased risk of fracture (1). Typical osteoporotic fractures occur at the wrist, spine and hip. Following an osteoporotic fracture, there is a significantly increased risk of future fracture compared with individuals without a prior fracture (2). Wrist fracture is the most common fragility fracture in perimenopausal and young postmenopausal women (3) and thus tends to be the earliest osteoporotic fracture sustained by an individual (4). Following an osteoporotic wrist fracture, there is approximately a two-fold increase in the risk of subsequent fracture (2), especially in the first 7 years (3).
Despite it being well-established that all drug treatments licensed for osteoporosis are effective at preventing fragility fractures (5), particularly as secondary prevention (after sustaining a low trauma fracture). A review article looking at osteoporotic fractures in Asia suggests that less than 10-20% of patients who sustain an osteoporotic fracture are tested or treated for osteoporosis (6). A systematic review looking at interventions after a fragility fracture estimated that approximately 22% of patients had medication initiated within the first 6 months of their fracture (7). Following an osteoporotic hip fracture requiring hospitalisation, the rate of starting anti-osteoporotic treatment on discharge varied depending on the study from 6% (8) to 39% (9), which means that generally 50% or more of patients are not treated. With regards to low trauma/osteoporotic wrist fractures, there have been fewer studies, but the number of patients treated remains in the minority. Earlier studies from North America showed that 27.5% of patients in Boston, United States of America (USA) were started on treatment within the first 6 months (10), 18% of patients in Minnesota, USA, remained on treatment after 1 year (11), and 38% of patients were on either hormone replacement therapy or a bisphosphonate in Edmonton, Cana-

da (12) after a wrist fracture. More recent studies from Europe showed that 18.4% of French patients received anti-osteoporosis medication after their wrist fracture (13) and in 2012, 8.8% of patients in Norway were on medication 1 year after their wrist fracture (14). There have been very few studies in Asian populations. Two studies, both from Japan, found that 8.2% (15) and 13.4% (16) of patients were given anti-osteoporosis medication after their wrist fracture. Thus, to increase the information in the Asian population, this study was done to determine the treatment given to patients following a low trauma wrist fracture presenting to an Accident and Emergency (A&E) Department at a tertiary private hospital in Malaysia.

Methods

This was a retrospective study based on medical chart review at a single centre in Malaysia. The names of patients over the age of 50 years attending the A&E Department from 1st January 2011-31st December 2015 (5 years) with a diagnosis of Colles'/distal radius/wrist fracture were obtained from the A&E Department attendance books. Their medical charts were obtained and manually searched for demographic data, past medical history and information on treatment. The data was anonymised after extraction with the specific identifiers for each individual (name, date of birth, medical record number) deleted from the database used for analysis.
Ethical approval was obtained from the Independent Ethics Committee Sime Darby Healthcare (ref. no: 201603.1) and from the Ethics Committee for Research involving Human Subjects of Universiti Putra Malaysia (JKEUPM) [FPSK (EXP16-Medic)U037].

Statistical analysis

Statistical calculations were performed using the statistical software package, IBM SPSS Statistics Version 22.0 for Windows (IBM Corp., Armonk, NY). Results were expressed as mean and standard deviation (SD) for normally distributed continuous variables. Association between qualitative variables were determined by Chi-square test, Fisher's exact test and one-way ANOVA as appropriate. In all statistical analyses, a p-value of < 0.05 was considered to be statistically significant.

Results

There were 191 patients who presented with a wrist fracture for the years 2011-2015. Fifty-seven of these were due to accidents which left 134 (70.2%) low trauma wrist fractures for analysis. The mean age of the patients was 61.75 ± 10.23 years. There were 87 (64.9%) female and 47 (35.1%) male patients. There were 23 (17.2%) Malay, 90 (67.2%) Chinese, 17 (12.7%) Indian patients with 4 (3.0%) other race/missing data. The mean body mass index (BMI) was 25.27 ± 4.43 kg/m^2.
Five patients had a previous low trauma fracture, but only 2 had treatment; 1 was given calcium only and the other intravenous (IV) zoledronate. Following the index low trauma wrist fracture, 16/134 (11.9%) were given treatment. Table 1 shows the different treatments prescribed. Of those given treatment, 11/16 (68.8%) were given calcium/vitamin D/activated vitamin D and just 5/16 (31.2%) were given active anti-osteoporotic treatment. Overall, this meant that only a very small minority of patients, 3.7% (5/134), received pharmacological treatment after their wrist fracture. This was despite a follow-up appointment given to 106 (79.1%) of the patients with 22 (16.4%) not having a follow-up appointment and 6 (4.5%) missing data. For the patients who were treated, 14 were prescribed treatment for 1 month, 1 was prescribed treatment for 4 months and 1 had subcutaneous denosumab, which has a duration of action of 6 months. Therefore, overall, the median duration of treatment was 1 month.
There was no significant difference in demographic factors or medical history between patients who were treated and not treated with anti-osteoporosis medication (Table 2). Table 3 shows the number of patients who were treated, compared to those who were not, between 2011-2015. There was no significant difference in the proportion of patients treated when all the years (2011-2015) were compared (Chi-square test $p = 0.216$).

Table 1 - Treatment given after index low trauma wrist fracture (all years 2011-2015).

Treatment	Number of patients (% of those treated n=16)
Calcium	4 (25.0%)
Calcium + vitamin D	5 (31.25%)
Vitamin D	1 (6.25%)
Calcitriol / alfacalcidol	1 (6.25%)
Bisphosphonate	2 (12.5%)
Denosumab	1 (6.25%)
Calcium + bisphosphonate	1 (6.25%)
Calcium + vitamin D + bisphosphonate	1 (6.25%)
None	115

Data missing for 3 patients

Table 2 - Association between demographic factors and low trauma wrist fracture patients who were treated and not treated using anti-osteoporosis medication.

	Treated for osteoporosis	Not treated for osteoporosis	*p*-value
Age (years)	62.31 ± 10.05	61.63 ± 10.42	0.807 [a]
BMI (kg/m^2) (n=31)	25.60 ± 6.16	25.21 ± 4.34	0.864 [a]
Gender (n-131)			0.418 [b]
Female	12 (9.2%)	73 (55.7%)	
Male	4 (3.1%)	42 (32.1%)	
Race (n=130)			0.421 [c]
Malay	5 (3.8%)	18 (13.8%)	
Chinese	10 (7.7%)	79 (60.8%)	
Indian	1 (0.77%)	15 (11.5%)	
Other	0	2 (1.5%)	
Follow-up appointment (n=128)			0.303 [b]
Yes	15 (11.7%)	91 (71.1%)	
No	1 (0.8%)	21 (16.4%)	

BMI = Body mass index
Values for Age and BMI are given as mean ± standard deviation
[a] One-way ANOVA
[b] Fisher's exact test
[c] Pearson Chi-square test

Table 3 - Number of patients treated and not treated for osteoporosis in 2011-2015.

	Treated for osteoporosis	Not treated for osteoporosis
2011 (n=23)	4 (17.4%)	19 (82.6%)
2012 (n=34)	2 (5.9%)	32 (94.1%)
2013 (n=26)	1 (3.8%)	25 (96.2%)
2014 (n=30)	5 (16.7%)	25 (83.3%)
2015 (n=18)	4 (2.2%)	14 (77.8%)

Missing data = 3
Pearson Chi-square p = 0.216

Discussion

This study was conducted at a private hospital with 393 beds in an urban area. The hospital has a busy A&E Department and would be the main hospital for anyone seeking private medical care in the area. Looking at studies from single centres such as ours, studies from USA by Cuddihy et al. (11) and Rozental et al. (10) showed that 18% and 27.5% of patients were given treatment after their wrist fracture. A single centre study from Canada by Khan et al. (12) showed a higher rate of treatment, 38%, following a wrist fracture. In a study from Japan from 4 hospitals in Hokkaido Prefecture, 8.2% patients received treatment after their distal radial fracture (15). Thus, our study's result of 11.9% of low trauma wrist fracture patients receiving treatment is similar to the Japanese study, but lower than that reported from North America. The other Asian study was from Japan where the practice of 155 orthopaedic surgeons were surveyed and found that 13.4% prescribed treatment for osteoporosis after a distal radial fracture (16). However, this study may not be representative of all orthopaedic surgeons as the Japanese Orthopaedic Association has more than 24,000 members as of 1st April 2016 (17).

Studies looking at databases generally have found smaller numbers of patients given treatment after a wrist fracture. Erny et al. (13) looked at a health insurance database from France and showed that overall, 18.4% of patients were treated, 13.4% received treatment at the time of fracture, and a further 6.8% received medication at an average of 3.8 months later. In contrast, our study showed that if patients

were not treated at the time of fracture, they were not likely to get medication, as no patient was started on medication during their follow-up visit, and only 1 out of the 16 patients in our study had their medication extended during their follow-up visit. Thus, education for post-osteoporotic wrist fracture care should include both the importance of starting treatment immediately after the fracture as well as continuing treatment over the long-term.

It remains disappointing that treatment rates for osteoporotic fractures have not improved over the years. Following a low trauma wrist fracture our study, showed varying percentages of treatment, ranging from 2.2% in 2015 to 17.4% in 2011; however, as numbers were small, there was no significant difference among the different years. This is similar to a study from a fracture registry in Norway: Nord-Trøndelag (2 hospitals) region together with the Norwegian Prescription database; the study found that treatment rates during the first year after a forearm fracture between the years of 2005 to 2012 were very similar and not significantly different (14). The rate of treatment varied from 10.4% in 2005 to 8.8% in 2012, with a high of 16.3% in 2006 and a low of 7.6% in 2008.

The majority of those who received treatment, 68.8% (11/16), received calcium/calcium and vitamin D/activated vitamin D (calcitriol/alfacalcidol). Although calcium and vitamin D have been shown in meta-analyses to have a "modest" reduction in fracture risk (18), it is more commonly used as an adjunctive treatment to the licensed anti-osteoporosis medication, rather than on its own (19). Activated vitamin D has been consistently shown to reduce spinal fractures but the evidence that it helps in non-vertebral fractures is less robust (20). Therefore, it is disappointing that the majority of the patients did not receive effective anti-osteoporosis medication. In a study from the United Kingdom of 175 patients who had a distal radial fracture, 22% were given calcium and vitamin D and 9% were prescribed a bisphosphonate after their fracture (21). In the study by Iba et al. (15) from Japan, which included all patients with osteoporotic fractures (hip, distal radius and proximal humerus), 20% of patients were on vitamin D3, 9.1% on bisphosphonates and 10.9% on both vitamin D and bisphosphonate. Unfortunately, Iba et al. (15) included calcium supplements (together with vitamin K and calcitonin) under "other", but it would still seem that the majority of patients was prescribed non-bisphosphonate medications after their fractures. Both these studies mirror our study in that more patients were given calcium and vitamin D supplements rather than licensed anti-osteoporosis medication.

Both the International Osteoporosis Foundation (22) and the American Society of Bone Mineral Research (23) recommend a coordinator-based model of care known as a Fracture Liaison Service (FLS) as the model of choice to be adopted by all hospitals and outpatient facilities that are treating fragility fracture patients for prevention of secondary fractures following the first fracture. With regards to treatment after a wrist fracture, Majumdar et al. showed that having a nurse case manager to directly contact patients regarding osteoporosis diagnosis and treatment compared to more generic patient and physician education, led to more patients being treated with bisphosphonates in the case-managed group (43%) compared to the education only group (12%) (relative risk 3.6, 95% confidence intervals 1.1-11.5, p = 0.019) (24). Overall, FLS programmes have been shown to be cost-effective and cost-saving for the secondary prevention of such fractures (25). This study's results add to the evidence supporting the need to establish a FLS programme to increase the treatment rate following an osteoporotic wrist fracture.

There are some weaknesses in this study, which may limit the interpretation of the results. Firstly, the numbers are small as it was a single centre review. Because of the anticipated small numbers, we studied 5 consecutive years and found that the numbers were consistently similar throughout the duration of the study; thus the information should be representative of our centre. In addition, as there are very few data from Asian countries, we feel that these results are relevant in documenting poor follow-up after a low trauma wrist fracture. Another possible source of bias was that the study was a retrospective case note review, which meant that there were missing items of information. However, for the parameters that we analysed, there were only a few missing data items in each section. Finally, a large proportion of our subjects were from the Chinese ethnic group, which is likely due to the fact that hospital is situated in an urban area that has more ethnic Chinese residents. Thus, these results may not be generalisable to the rest of the Malaysian population that has an ethnic Malay majority.

In conclusion, currently, treatment for osteoporosis following low trauma wrist fractures in Malaysia is inadequate with only 11.9% receiving some treatment. Of those receiving treatment after their fracture, just 31.2% were given active anti-osteoporotic therapy, that is, only 3.7% of those sustaining a low trauma wrist fracture received pharmacological treatment. Furthermore, in those who are treated, the median duration of treatment was only 1 month. This represents a missed opportunity for the prevention of future fractures.

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Conflict of interest

All the Authors have no conflicts of interest to declare.

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