PERIMENOPAUSAL WRIST FRACTURE — AN OPPORTUNITY FOR PREVENTION AND MANAGEMENT OF OSTEOPOROSIS

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Objective. Review of Medscheme's administrative databases to study the relationship between hip fracture and previous wrist fracture in peri- and postmenopausal women.

Design. Retrospective analysis of 1995 - 1998 data for women aged 50 and above hospitalised for management of wrist fracture. Those identified were subjected to further review to establish rates of osteoporosis and/or hip fracture. Osteoporosis and/or hip fracture rates were also determined for a control population.

Main outcome measures. Osteoporosis investigation and management rates in controls v. subjects who had experienced a previous wrist fracture.

Results. A total of 701 subjects was admitted to hospital for management of a wrist fracture between 1995 and 1998, and compared with 1 385 similarly aged controls. Diagnosis of osteoporosis and admission for hip fracture were more common in women who had experienced a previous wrist fracture (relative risk (RR) 1.55; 95% confidence interval (CI) 1.19 - 2.03 for osteoporosis, and RR 3.32; 95% CI 1.16 - 9.69 for hip fracture). Of 10 hip fractures which occurred in the wrist fracture group, 9 were in women not diagnosed as having, or treated for, osteoporosis.

Conclusion. While women with a history of wrist fracture are more likely than controls to be tested and treated for osteoporosis, it nevertheless appears that insufficient attention is being paid to this premonitory event.

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Postmenopausal osteoporosis is a global problem with significant morbidity, mortality and cost implications. Increased longevity is contributing to the prevalence of osteoporosis, while monitoring and pharmacological developments, e.g. densitometry, bisphosphonates and synthetic oestrogen receptor modulators, are impacting on the cost of the disease.

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The Internet abounds with information for consumers and professionals, citing disturbing statistics. For example, the US National Institutes of Health Resource Centre website[1] states that osteoporosis is a major public health risk for 28 million Americans, 80% of whom are women. Ten million already have osteoporosis and 18 million more have low bone mass. Fifty per cent of women over 50 years of age will have an osteoporosis-related fracture in their lifetime. Treating such fractures costs the US health care system more than $38 million per day, or $14 billion per annum.[1]

While the popular Internet statistics are sobering, they are not usually referenced or backed up directly by specific studies. In this regard Ballard *et al.*[2] reviewed dual-energy X-ray absorptiometry (DEXA) data on 823 women in their 60s from three general practices in the UK. Osteopenia was found in 49% and osteoporosis in 24%. Smeets-Goevaers *et al.*[3] studied 5 896 Dutch perimenopausal women between 46 and 54 years of age and showed that the progression from premenopause to menopause was associated with an increase in osteoporosis prevalence from 0.4% to 12.7%. Their data showed further that osteopenia increased from 14.5% to 42.8% over the same time period. It is noteworthy that these results were obtained in a population in which 24% of the women were using oestrogen preparations which would have positively influenced the results. Looker *et al.*[4] presented prevalence data in 1997 which are in accordance with the above. Their data showed a 17 - 18% prevalence of osteoporosis at the hip in women over 50 years of age.

In terms of cost, which included hospital, nursing home, outpatient and home care services, the American osteoporosis (mainly fracture-related) burden was found to be US $12.9 billion in 1997.[5] This amount was 2.5 times the expenditure on breast and gynaecological cancers found in this study, which utilised national health care survey and discharge data. Dolan and Torgerson[6] estimated the total cost of treating osteoporotic fractures in the UK. Their research covered primary care, hospitalisation and social care, with the total annual cost amounting to £727 million.

As stated by authors of the above prevalence and cost reports, osteoporosis is preventable, and every effort should be made to diagnose and treat appropriately.[1-5] Strategies for the prevention of osteoporosis are directed at maximising peak bone mass by means of calcium and vitamin D intake, exercise and maintenance of normal menstrual cycles from youth through adulthood.[7] Avoidance of tobacco and alcohol is also important in maintenance of bone mass, as is awareness of the adverse effects of chronic diseases and their treatments.[8] Counteracting age-related bone loss that occurs after 45 - 50 years of age is critical, particularly in women at specific risk for osteoporosis. In this regard oestrogen, oestrogen analogues and the non-hormonal bisphosphonates are usually prescribed.[9]

While all postmenopausal women will lose bone mass, not all will develop osteoporosis. Health care providers should therefore develop reliable and appropriate methods for screening patients to determine their risk and need for a bone density test.[10] In determining such risk, clinical guidelines usually include 'covert' signs (such as loss of height due to vertebral fracture), and also history of overt previous fracture, especially after minor trauma. However, the experience of the authors of this paper is that the underlying problem is often ignored even after something as significant as hip fracture, and in approximately 50% of such cases involving elderly women it is the case managers involved in Medscheme's managed care programmes who have to ask the attending doctor to initiate the osteoporosis assessment.

Whereas secondary osteoporosis prevention after hip fracture in an elderly woman is very much a case of shutting the stable door after the horse has bolted, initiation of osteoporosis assessment after previous perimenopausal 'minor' fracture would appear to be appropriate. To this end we interrogated the company's databases for a relationship between hip fracture and previous wrist fracture in peri- and postmenopausal women.

Subjects and methods

Medscheme provides administration and managed care services for a number of medical schemes, which together cover some 2 million lives. Claims data are captured into various databases that are available for review.

In this study we extracted data on women who were aged 50 years or older in 1995 and who were admitted to hospital for reduction of a wrist fracture and application of a plaster cast between 1995 and 1998. The diagnosis of the fracture and application of the cast were obtained from claims data that reflected the specific Medical Association of South Africa tariff codes used during the study years (0391: reduction of radius/ulna under general anaesthesia, 0392: open reduction, 0887: application of plaster cast). The dataset only included hospitalised cases admitted for fracture reduction because the radiology and plaster cast codes used for ambulatory cases are not specific for wrist fracture. Furthermore, in the absence of a diagnostic coding system, it is not possible in ambulatory cases to extract diagnostic information from electronically-archived medical practitioner claims.

All women identified as having undergone reduction of a wrist fracture were re-entered into a search for subsequent admission to hospital in 1998 for treatment of a hip fracture. This group was also reviewed for claims for densitometry (code 3604) and/or treatment of osteoporosis. The latter data were obtained from the chronic medication programme database, which accurately records and reflects diagnostic and drug detail.

In order to assess whether osteoporosis and/or hip fracture

were more prevalent in women with a previous wrist fracture than in the general population of peri- and postmenopausal women, we used a control group. This control group comprised women over 50 years of age from a major medical scheme. Subjects with a wrist fracture as defined above were removed from the control sample before analysis. The incidence of hip fractures in 1998 was determined for the controls, as well as the densitometry rate and treatment for osteoporosis.

RESULTS

The Medscheme database review yielded 701 subjects over 50 years of age with a history of wrist fracture requiring reduction between 1995 and 1998. The control group comprised 1 385 women over 50 years of age according to 1998 membership data for the selected major medical scheme (30 000 covered lives). Table I compares the two groups and demonstrates that subjects in the wrist fracture group were slightly older than those in the control group, were more likely to have been tested for and diagnosed as having osteoporosis, and were more predisposed to hip fracture. Relative risk and 95% confidence intervals (CIs) for osteoporosis and hip fracture in the wrist fracture group were 1.55 (1.19 - 2.03) and 3.32 (1.16 - 9.69) respectively when compared with the control population. Both of these values are significant ($P < 0.001$ and < 0.01, respectively). Of the 10 hip fractures that occurred in the wrist fracture group, 9 were in women not diagnosed as having, or treated for, osteoporosis.

Table I. Comparison of control and study groups

	Controls ($N = 1\,385$)	Wrist fracture ($N = 701$)	Significance (P-value)
Age (yrs) (mean ± SD)	60.4 ± 14.1	66.3 ± 10.1	< 0.001
Record of densitometry test (%)	110 (7.4)	90 (12.8)	< 0.001
Confirmed diagnosis of osteoporosis (%)	176 (12.7)	153 (21.8)	< 0.001
Admitted with hip fracture in 1998 (%)	7 (0.5)	10 (1.4)	0.03

Review of the medications prescribed for diagnosed osteoporosis in the two groups showed similar rates of hormone replacement and bisphosphonate use, but vitamin D and calcium were prescribed more frequently in the wrist fracture group, while 'other' medications (mainly anti-inflammatory and analgesic preparations) were more common among controls (Table II).

Table II. Medication prescribed for subjects diagnosed with osteoporosis

	Controls ($N = 176$)	Wrist fractures ($N = 153$)
Bisphosphonates (%)	11 (6.3)	13 (8.5)
HRT* (%)	99 (56.3)	84 (56.2)
Vitamin D and calcium (%)	32 (18.2)	53 (34.6)‡
Other† (%)	34 (19.3)	0‡

HRT = hormone replacement therapy.
† Mainly anti-inflammatory and analgesic preparations.
‡ $P < 0.005$.

DISCUSSION

Singer *et al.*[11] have shown that wrist fractures represent one of three peaks of 'fracture distribution' in humans. The first peak is seen in young adult males and is mainly trauma-related, the second involves elderly patients of both genders, while the third involves women from 40 years of age onwards.[11] They conclude that 'osteoporotic' fractures become evident in women earlier than expected, and that they are not entirely a postmenopausal phenomenon.

The effect of a previous fracture on the risk of later fracture was studied by Gunnes *et al.*[12] In their analysis of 29 802 postal responses they found that previous ankle fracture increased the risk of subsequent hip fracture to 1.6 (95% CI 1.1 - 2.1), and to 3.5 (95% CI 2.4 - 5.0) for a previous humeral fracture, and concluded that it seems possible to select women for evaluation and intervention against osteoporosis by using information on previous fragility fractures. Tuppurainen *et al.*[13] have demonstrated that previous low-energy fracture (mostly of the wrist) is associated with significantly lower lumbar and femoral bone mineral density than is found in non-fracture cases. Honkanen *et al.*[14] supported this in a subsequent study that related age of low-energy wrist fracture to peak bone mineral density, i.e. early premenopausal fracture is an indicator of low peak bone mineral density.

Two studies have demonstrated the significant relationship between wrist fracture and family history of wrist fracture, and also lower bone mineral density of the spine and hip in previous fracture cases with a family history.[15,16] In the study by Earnshaw and colleagues[17] in the UK, the association between Colles' fracture and subsequent hip fracture was confirmed in that osteoporosis of the hip was detected in 42% of cases with a history of wrist fracture, and bone mineral density in those over 65 years was found to be significantly lower than in age-matched controls.

The present study indicates that osteoporosis is indeed recognised as a postmenopausal problem in South Africa. Subjects with a history of wrist fracture are more likely to be tested than controls, and are almost twice as likely to be

diagnosed as osteoporotic. It would nevertheless appear that the condition is underdiagnosed in both our control and wrist fracture subjects. The 12.7% prevalence in the controls is less than the figure of 17 - 18% quoted by Looker *et al.*,[4] and the 21.8% osteoporosis prevalence in the wrist fracture group is lower than would be expected from the studies cited above.[12,17] The fact that patients with a previous wrist fracture are at major risk is borne out by the significantly higher rate of hip fractures when compared with controls, and the fact that management is inadequate is borne out by the finding that only 1 of 10 subjects with a hip fracture had been diagnosed as osteoporotic before the fracture.

The selection of medications for treatment of osteoporosis in the wrist fracture group might also suggest that the premonitory event is not being taken seriously enough. It is of particular concern that 34.6% of those diagnosed as osteoporotic were only receiving vitamin D and calcium as treatment, and the use of bisphosphonates in only 8.5% is lower than might be expected.[18]

The world is waking up to the importance of postmenopausal osteoporosis and South Africa has joined the ranks, as indicated by the inclusion of hormone replacement therapy in the recently published national list of Prescribed Minimum Benefits.[19] However, as stated in various guidelines and by authors of the studies cited in this report, while every effort should be made to maximise peak bone mass in all women (by means of calcium and vitamin D intake, exercise, maintenance of normal menstrual cycles premenopausally, and avoidance of alcohol and tobacco), drug therapy should be targeted at those at particular risk for osteoporosis.

The present study suggests that osteoporosis is currently underdiagnosed in both the general postmenopausal population and in the group with a history of perimenopausal wrist fracture. This latter group is at high risk of subsequent hip fracture, and all parties involved in the management of perimenopausal wrist fracture should accept responsibility for alerting the patient and the health care system to the need for an osteoporosis assessment. Most postmenopausal women who are currently assessed for osteoporosis are managed by general practitioners or gynaecologists. Neither of these disciplines would typically be involved in management of a wrist fracture, and it is therefore the casualty officers, radiologists, anaesthetists and orthopeadic surgeons who should pass the information on to the patient and her doctor. Perhaps there is also a role for medical schemes, which could communicate with perimenopausal members who have submitted claims for management of a wrist fracture, recommending that unless they have already been assessed they should see their GP, gynaecologist or other primary care provider for evaluation of bone status.

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References

1. Osteoporosis: overview. National Institutes of Health Osteoporosis and Related Bone Diseases. National Resource Centre. **www.healthfinder.gov**
2. Ballard PA, Purdie DW, Langton CM, *et al.* Prevalence of osteoporosis and related risks in UK women in the seventh decade: osteoporosis case finding by clinical referral criteria or predictive model. *Osteoporos Int* 1998; **8:** 535-539.
3. Smeets-Goevaers CG, Lesusink GL, Papapoulos SE, *et al.* The prevalence of low bone mineral density in Dutch perimenopausal women: The Eindhoven Perimenopausal Osteoporosis Study. *Osteoporos Int* 1998; **8:** 404-409.
4. Looker AC, Orwoll ES, Johnston CC, *et al.* Prevalence of low femoral bone density in older US adults from NHANES III. *J Bone Miner Res* 1997; **12:** 1761-1768.
5. Hoerger TJ, Downs KE, Lakshmanan MC, *et al.* Healthcare use among US women aged 45 and older: total costs and costs for selected postmenopausal health risks. *Journal of Women's Health and Gender-Based Medicine* 1999; **8:** 1077-1089.
6. Dolan P, Torgerson DJ. The cost of treating osteoporotic fractures in the United Kingdom female population. *Osteoporos Int* 1998; **8:** 611-617.
7. Lane JM, Nydick M. Osteoporosis: current modes of prevention and treatment. *J Am Acad Orthop Surg* 1999; **7:** 19-31.
8. Kulak CA, Bilezikian JP. Osteoporosis: preventive strategies. *Int J Fertil Womens Med* 1998; **43:** 56-64.
9. Renfro J, Brown JB. Understanding and preventing osteoporosis. *Journal of the American Association of Occupational Health Nurses* 1998; **46:** 181-191.
10. National Osteoporosis Foundation. *Physician's Guide to Prevention and Treatment of Osteoporosis*. Washington, DC: NOP, 2000.
11. Singer BR, McLauchlan GJ, Robinson CM, Christie J. Epidemiology of fractures in 15 000 adults: the influence of age and gender. *J Bone Joint Surg Br* 1998; **80:** 243-248.
12. Gunnes M, Mellstrom D, Johnell O. How well can a previous fracture indicate a new fracture? A questionnaire study of 29 802 postmenopausal women. *Acta Orthop Scand* 1998; **69:** 508-512.
13. Tuppurainen M, Kroger M, Honkanen R, *et al.* Risks of perimenopausal fractures — a prospective population-based study. *Acta Obstet Gynecol Scand* 1995; **74:** 624-628.
14. Honkanen R, Tuppurainen M, Kroger M, Alhava E, Puntila E. Associations of early premenopausal fractures with subsequent fractures vary by sites and mechanisms of fractures. *Calcif Tissue Int* 1997; **60:** 327-331.
15. Fox KM, Cummings SR, Powell-Threets K, Stone K. Family history and risk of osteoporosis fracture. Study of Osteoporosis Fractures Research Group. *Osteoporos Int* 1998; **8:** 557-562.
16. Keen RW, Hart DJ, Arden NK, Doyle DV, Spektor TD. Family history of appendicular fracture and risk of osteoporosis: a population-based study. *Osteoporos Int* 1999; **10:** 161-166.
17. Earnshaw SA, Cawte SA, Worley A, Hosking DJ. Colles' fracture of the wrist as an indicator of underlying osteoporosis in postmenopausal women: a prospective study of bone mineral density and bone turnover rate. *Osteoporos Int* 1998; **8:** 53-60.
18. Ensrud KE, Black DM, Palermo L, *et al.* Treatment with alendronate prevents fractures in women at highest risk: results from the Fracture Intervention Trial. *Arch Intern Med* 1997; **157:** 2617-2624.
19. Department of Health. *Regulations Under the Medical Schemes Act, 1998* (Act No 131 of 1998). Pretoria: Government Printer, 1999.

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