

After the Fall: The ABCs of Fracture Prevention

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A wrist fracture is associated with an increased risk of another fracture and should prompt investigation for osteoporosis in both men and women. If the fracture was caused by low trauma (a fall from a standing height or less), a bone density test should be ordered. If the T score is <-1.5 , pharmacological treatment with a bisphosphonate and calcium (1,500 mg/d) and vitamin D₃ (≥ 800 IU/d) is recommended. Management should also include balance, posture, and muscle-strengthening exercises and walking, as well as a review of fall-prevention strategies.

Key words: wrist fracture, osteoporosis, diagnosis, treatment, exercise, falls

Introduction

A wrist fracture is a sentinel event that should trigger an investigation for osteoporosis, a condition characterized by bone fragility.¹ Osteoporosis often first presents itself with a fragility fracture, which typically occurs after a fall from a standing height or lower and usually involves the wrist, hip, or spine. Fifty percent of patients who sustain one fracture will have another fracture.² Wrist fractures are particularly important because they are associated with a twofold increase in the risk of subsequent fractures, and they usually precede a vertebral or hip fracture by 10–15 years, the latter of which is associated with more deaths, disability, and medical costs than all other osteoporotic fractures combined.^{3–8} In addition, a high percentage of postmenopausal women who have sustained a wrist fracture have osteoporosis, confirmed on bone density testing with dual energy x-ray absorptiometry (DEXA) scanning.⁹

Despite effective pharmacological treatments, the majority of individuals both within Canada and internationally who experience a fragility fracture are underinvestigated and undertreated.^{10,11} Other effective measures such as strength and balance training, lifestyle, and home

safety modifications that can reduce the risk of falls and fractures^{12,13} are underused.¹⁴ Thus, an important opportunity for intervention after a wrist fracture, to diminish hip fracture risk, is missed in these high-risk individuals.

Family physicians are responsible for osteoporosis management in postfracture care patients, but they face many barriers. For example, they have commented that they have limited time during visits, that “they treat more than just osteoporosis,” that “in reality, osteoporosis is a complex issue,” and that “it is hard to keep up with the current literature.”¹⁵ In a survey of Ontario hospitals,¹⁶ we noted that family physicians do not routinely receive notification from the emergency department if their patient has a fracture, the issue of osteoporosis is not mentioned to the majority of patients, and there is a lack of awareness regarding the connection between fragility fractures and osteoporosis among health care professionals in fracture clinics and emergency departments.

Preventing Subsequent Fractures

There are a number of things that primary care physicians can do to prevent a subsequent fracture (Figure 1). These are

organized as the ABCs of fracture prevention and are discussed below.

Ascertain If a Low-Trauma or Fragility Fracture

If a patient has experienced a wrist fracture as a result of tripping and falling, slipping on ice, falling out of bed, or losing his or her balance, or describes the incident as a “hard” fall, and if the patient is over the age of 40 years, this fracture is a low-trauma fracture (caused by a force that would be insufficient to fracture normal bone). It may indicate low bone density, and this patient should be investigated for osteoporosis—this applies to both men and women, who are at increased risk following a fragility fracture after 40 years of age.¹⁷

Bone Mineral Density Testing in Determining Future Fracture Risk

Patients who have had a fracture are at a higher risk for a future fracture. Bone mineral density (BMD), in combination with age, sex, fracture history, and glucocorticoid use, can be used to classify patients into three fracture risk categories to determine a 10-year absolute fracture risk: low ($<10\%$), moderate (10–20%), and high ($>20\%$).¹⁸ All patients with a wrist fracture are classified in the moderate or high category because a previous fracture or systemic glucocorticoid therapy of >3 months automatically moves individuals to the next highest fracture risk category.

To determine whether patients' BMD is being maintained or is improving, repeat DEXA testing should be performed every 1–5 years for patients with moderate risk and every 5–10 years for patients with low risk.¹⁸ These recommendations were developed by a multidisciplinary working group under the auspices of the Scientific Advisory Council of the Osteoporosis Society of Canada and the Canadian Association of Radiologists. Patients should have BMD measurements taken on the same DEXA machine because there is considerable variation between machines.¹⁷ Due to precision errors in DEXA equipment, a follow-up BMD that shows an absolute decrease of $<3\%$, 4% , or 6% at the lumbar

spine (L2–L4), total hip, and femoral neck, respectively, compared with the previous BMD, indicates that BMD is being maintained. It is important to note that little or no measurable change in BMD does not necessarily imply treatment failure.

Calcium and Vitamin D

After a fracture, the adult recommended daily intake for calcium is 1,500 mg and for vitamin D₃ is 800 IU.^{19,20} Adequate intakes of calcium and vitamin D through diet or supplements are an essential component of preventive therapy and an important adjunct to osteoporosis treatment.^{1,19} Vitamin D is important for the absorption of calcium and in maintaining muscle strength and reducing falls.²¹ Vitamin D deficiency is defined by most experts as a 25-hydroxyvitamin D level of <50 nmol/L and insufficiency as 52–72 nmol/L.²¹ One of the simplest ways to correct vitamin D deficiency is to have the patient take 1,000 IU/d of vitamin D₃. Strategies such as having patients take 100,000 IU of vitamin D₃ once every 3 months have been shown to be effective in maintaining 25-hydroxyvitamin D levels at 20 ng/mL or higher and are also effective in reducing the risk of fracture.²² It is important to let patients know that the body can only

Table 1: Interventions for Patients with a Wrist Fracture

Patient with a wrist fracture + age >50 years
Order BMD test
↓
If BMD T score < −1.5
↓
Initiate first-line medication: alendronate or risedronate, calcium (1,500 mg/d) and vitamin D ₃ (≥800 IU/d), exercise, and fall prevention
BMD = bone mineral density

absorb about 500 mg of calcium at one time,¹⁹ so they should avoid taking calcium supplements with calcium-rich foods if the total amount exceeds 500 mg.

Patients taking bisphosphonates should also be taking calcium and vitamin D₃. Since calcium limits the absorption of bisphosphonates, patients should be advised to avoid taking calcium <2 hours before or after they take their bisphosphonate. The body needs vitamin D to help absorb calcium, but since there are few dietary sources of vitamin D, patients should take vitamin D₃ supplements. It is best to take them with meals because of their improved absorption in the presence of fat.

Drug Treatment

Pharmacological intervention is recommended for women and men aged 50 years and older with wrist or other low-trauma fractures and a BMD T score <−1.5^{19,20} (Table 1). Note that osteoporosis is defined by a T score ≤−2.5, but since a wrist fracture additionally increases the risk of future fracture independent of BMD, a lower T score threshold for pharmacological intervention is recommended for patients with a fracture.

Effective pharmacotherapy with bisphosphonates can reduce the fracture risk by up to 50%.²³ First-line treatment with alendronate or risedronate should be considered to decrease vertebral, non-vertebral, and hip fractures, and treat-

Table 2: The Most Common Bisphosphonates for Fracture Prevention*

Drug	Dosage	Instructions	Contraindications and Side Effects
First line	Alendronate	70 mg tablet taken weekly	Take first thing in the morning with a full glass of water 60 minutes before food, beverages, or other medications and supplements. Stay in upright position for at least 30 minutes. Contraindications: renal failure (glomerular filtration rate <30 mL/min), history of allergy to bisphosphonate Side effects: usually limited to gastrointestinal intolerance
	Risedronate	35 mg tablet taken weekly	
Second line	Etidronate	400 mg tablet per day	First 14 days, take one tablet daily with a full glass of water 60 minutes before or after food. Next 76 days, take one blue pill daily with food.

*Calcium (1,500 mg/d) and vitamin D₃ (cholecalciferol 800 IU/d) is recommended as adjunct therapy to bisphosphonates, but patients should avoid taking calcium <2 hours before or after taking bisphosphonate.

Key Points: ABCs of Fracture Prevention

Ascertain if a low-trauma or fragility fracture: (1) A low-trauma fracture is the result of a force that would be insufficient to fracture normal bone (e.g., fall from a standing height) and may indicate low bone density. (2) Common sites are the wrist, hip, spine, and shoulder.

Bone mineral density test: (1) Determine if the patient has low bone density (T score < -1.5) (2) The lower the BMD, the higher the risk of future fracture. (3) Patients who have had a wrist fracture are at moderate risk of a future fracture, regardless of their BMD.

Calcium and vitamin D: (1) The daily recommended intakes from diet and supplements are calcium (1,500 mg) and vitamin D₃ (≥ 800 IU). (2) Patients should be advised to avoid taking calcium supplements with calcium-rich foods if the total calcium exceeds 500 mg at one time. (3) Vitamin D is important for the absorption of calcium and in maintaining muscle strength and reducing falls.

Drug treatment: (1) For patients who have had a fracture, if the BMD T score is < -1.5 , first-line treatment with alendronate or risedronate plus calcium (1,500 mg/d) and vitamin D₃ (≥ 800 IU/d) is recommended. (2) Little or no measurable change in BMD does not imply treatment failure.

Exercise prescription: (1) Patients should start a walking program that progresses until they can walk 20–30 min/d, 3 to 5 times a week, at a moderate pace. (2) A program of muscle strengthening, balance, and posture is beneficial for increasing bone density and decreasing falls. (3) Patients with osteoporosis should be advised to avoid lifting heavy objects, prolonged bending over, exercises that twist or rotate the spine, toe touches, reaching above shoulder level, and sit-ups.

Fall prevention: (1) A multifaceted assessment and interventions targeting risk factors (more than four medications, poor vision, balance and gait problems, and home hazards) are recommended. (2) Vitamin D levels should be determined and a supplement recommended if there is vitamin D insufficiency or deficiency.

ment with etidronate can be considered for decreasing vertebral fractures¹⁹ (Table 2). Treatment with raloxifene can be considered for decreasing vertebral fractures in women. It is most commonly prescribed to women who have failed or experienced intractable side effects or have a contraindication for alendronate or risedronate. If a patient is already assigned to treatment for osteoporosis and then fractures a wrist, a review of how the patient is taking the medications is appropriate, along with consideration of switching to a first-line treatment if the patient is not already on it.

Recently, Health Canada approved zoledronic acid (5 mg infusion) for the treatment of postmenopausal osteoporosis to reduce the incidence of hip, vertebral, and nonvertebral fractures. This is a once-yearly 15-minute intravenous infusion. The approval was based on data

from a double-blind, placebo-controlled, randomized trial (N = 7,736; mean age, 73 years) showing that once-yearly treatment with zoledronic acid along with the recommended daily intakes of calcium and vitamin D decreased the risk for vertebral fractures by 70% and the risk for hip fractures by 41%.²⁴ The most commonly reported adverse events were fever, muscle pain, flu-like symptoms, headache, and bone pain that generally resolved within 3 days and decreased in incidence with subsequent doses. This new drug may be an option for anyone

who is intolerant, unable to take the oral osteoporosis medications, or is looking for a more efficacious agent due to severe disease.

Despite evidence supporting antifracture efficacy of bisphosphonates in particular, about 50% of patients fail to comply or persist with treatment within 1 year.²⁵ Inadequate compliance and persistence with prescribed medication regimens is a major concern for osteoporosis treatment as it has been associated with higher fracture rates, increased morbidity and mortality, and excess cost.²⁵ A number of factors that may affect adherence include comorbidity, beliefs about the effectiveness of the medication or the severity of condition, improper drug administration, a complicated treatment program, pill burden, a lack of education received, inadequate monitoring of therapy, and expense associated with treatment.²⁶

Exercise Prescription

After a fracture, management should include balance, posture, muscle strengthening, and walking exercises. Individuals with osteoporosis should be advised to avoid lifting heavy objects, prolonged bending over, exercises that twist or rotate the spine, toe touches, reaching above shoulder level, and sit-ups. Patients can be prescribed a walking program that progresses until they can walk 20–30 min/d, 3 to 5 times per week at a moderate pace. A referral to a rehabilitation specialist for a program of muscle strengthening, balance, and posture is beneficial to increasing bone density and decreasing falls.²⁷

Fall Prevention

Fall prevention is an important component in preventing future fractures. This is particularly true for older adults for

Clinical Pearls

Ask all your patients age 50 years and older if they have had a recent fracture and whether it was caused by a fall from a standing height or less. If yes, order a bone density test and if the T-score is < -1.5 , treatment with a bisphosphonate and calcium and vitamin D is recommended.

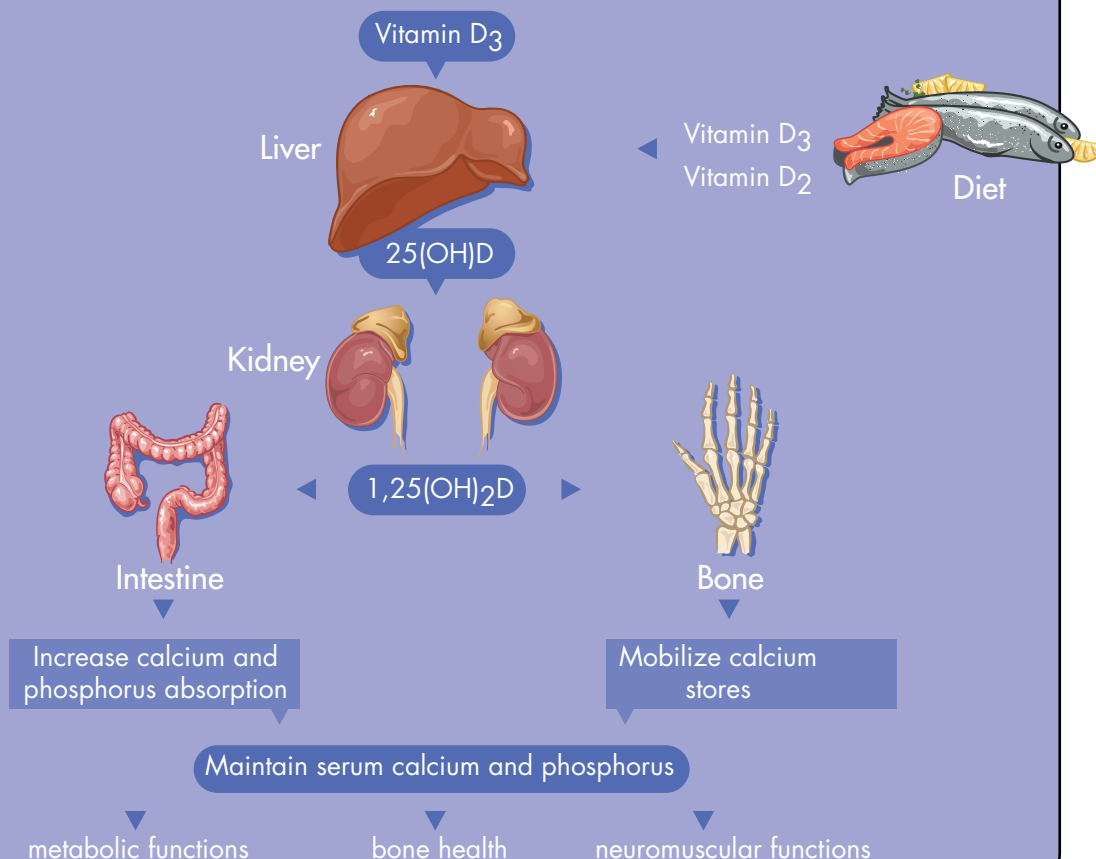
Figure 1:
Wrist Fractures and Prevention

Wrist fractures A wrist fracture is a sentinel event that should trigger an investigation for osteoporosis, a condition characterized by bone fragility. Wrist fractures are particularly important because they are associated with a twofold increase in the risk of subsequent fractures, and they usually precede a vertebral or hip fracture by 10–15 years.



Calcium and Vitamin D

After a fracture, the adult recommended daily intake for calcium is 1,500 mg and for vitamin D3 is 800 IU. Adequate intakes of calcium and vitamin D through diet or supplements are an essential component of preventive therapy and an important adjunct to osteoporosis treatment. Vitamin D is important for the absorption of calcium and in maintaining muscle strength and reducing falls.



whom non-BMD related determinants of fracture risk may be an important contributor. In a well-designed randomized controlled trial evaluating risedronate, in the group of women with osteoporosis (those 70–79 years old), the incidence of hip fracture among those assigned to risedronate was significantly reduced whereas in the group of women selected primarily on the basis of nonskeletal risk factors (those at least 80 years of age), the risk of hip fracture did not decrease.²⁸ This highlights the need to investigate and address non-BMD related determinants of fracture risk. Physicians should review medications as patients taking more than 4 medications are at an increased risk for falls.²⁹ Physicians should also recommend that patients have their vision assessed if it has not been checked in past 2 years as poor contrast, decreased depth perception, cataracts, and visual acuity <20/60 contribute to falls.²⁹ Vitamin D levels should be checked because vitamin D deficiency causes muscle weakness.²¹ It is important for physicians to ask patients about the number of falls they have had in the past year and how they occurred. For patients with recurrent falls, referral to a rehabilitation therapist or falls clinic for more in-depth and home safety assessments should be considered.

Conclusion

With recent advances in knowledge and availability of medications, secondary prevention of fractures is no longer a black box. A wrist fracture is a sentinel event that should trigger investigation for osteoporosis in both men and women. If the fracture was caused by low trauma (a fall from a standing height or less), a bone density test should be ordered. If the T score is <−1.5, pharmacological treatment with a bisphosphonate and calcium (1,500 mg/d) and vitamin D₃ (≥800 IU/d) is recommended. Management should also include balance, posture, and muscle-strengthening exercises and walking, as well as a review of fall-prevention strategies.



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