Secondary fracture prevention in spine surgery

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A B S T R A C T

A fragility fracture is associated with high likelihood of further fracture and the risk is reduced by quality improvement programs to provide osteoporotic care and rehabilitation. Unfortunately, these treatments are offered to less than 20% of patients who have fragility fractures. Multiple types of secondary fracture prevention programs are available and all have been shown to increase diagnostic testing and pharmacologic treatments in a cost-effective manner. The American Orthopaedic Association’s “Own the Bone” is one such comprehensive quality improvement program that provides leadership and offers patients access to preventive care. Spine surgeons should take the lead to make sure that patients with fragility spinal fractures receive secondary fracture prevention.

Introduction

Fragility fractures associated with osteoporosis are increasing as the population ages. The presence of an initial fragility fracture, especially of the hip and spine, also significantly increases the risk of secondary fractures. A goal of management is to make the initial fracture the last fragility fracture. Systematic approaches to this end have been called secondary fracture prevention; also called fracture liaison service (FLS). Secondary fracture prevention focuses on modifiable factors such as nutritional deficiencies, education, fall prevention, exercise, diagnostic testing, and pharmaceutical intervention when appropriate. Many scientific and regulatory bodies have recommended secondary fracture prevention, although compliance with these recommendations has been poor.1

Fragility fractures of the spine are the most common osteoporotic fracture. Management is usually non-operative and a majority of patients heal successfully. Traditionally, spine surgeons have expected the management of the concomitant osteoporosis to be done by the primary care physician. However, further assessment and treatment of the osteoporosis after fragility fractures occurs in less than 20% of cases and the unfortunate patient is at risk for further fractures.2 Secondary fracture prevention programs such as the American Orthopedic Association “Own the Bone” have been developed to address this treatment gap.3–5 The purpose of this manuscript is to review the recent epidemiology of osteoporotic spinal fractures, focusing on the risk of secondary fractures. Then discussion of the effectiveness of secondary fracture programs will be reviewed and an example program presented.

Epidemiology

Prevalence

Osteoporosis and low bone mass (osteopenia) are common conditions that are increasing as the population ages. Wright et al.6 reported that as of 2010, 10.3 million Americans over the age of 50 had osteoporosis and 43.4 million had low bone mass (osteopenia). This is expected to increase by 32% over...
the next two decades. Women were four times as likely to have osteoporosis as men. 7

Health care utilization

Over 2.1 million patients suffered fragility fractures in the United States in 2011, which was greater than the occurrence of breast cancer, myocardial infarction, and stroke combined. 8,9 Between 2000 and 2012 there were over 4.9 million hospitalizations in the United States as a result of fragility fractures. The estimated cost was $17 billion per year for the direct fracture care. 9 Over 245,000 admissions for vertebral fractures occurred. 10,11 However, clinical vertebral fractures are often treated without hospital admission. Emergency department (ED) visits accounted for over 1.2 million visits secondary to fragility fractures. 11

Vertebral fractures

Vertebral fractures are the most common fracture type related to metabolic bone disease. However, only one-third are clinically symptomatic while two-thirds are occult. Amin et al. 12 found that the incidence of vertebral fracture has increased by 20% from 1999 to 2010 while at the same time the incidence of hip and forearm fractures decreased.

The incidence of spine fractures increases with age and varies by gender with females having a 4–5 times higher chance. 13 There is a strong association with diminished bone mineral density (BMD) and vertebral fracture; for females the odds ratio per one standard deviation worsening of bone mineral density is 1.4–2.1 and for men is 1.8–2.6. 13

Mortality of fragility fracture

Mortality, debility and destitution are stark realities for many patients after hip fracture. 14 In a study of 43,000 hip fractures, Tajeu et al. 14 found that hip fracture had a 1-year incidence of 28.3% mortality which was 2.3 times greater than controls. Similarly, patients were four times more likely to require long-term nursing and over twice as likely to change to a poorer income status. Clinical osteoporotic spine fractures have similar poor outcomes.

Symptomatic vertebral fractures are associated with 2–8 times increased excess mortality. The highest risk is seen in the first 6 months after fracture but the association persists as long as 21 years. 15 The association is stronger in men than women. The initial mortality is posited to be from the fracture while later mortality from comorbid conditions. Edidne used the Medicare database and found that 1,2 and 4-year mortality after vertebral fracture was 22.4%, 32.7%, and 49.4%, respectively. 15 Similarly, also using Medicare claims, Lau et al. 16 reported the mortality after vertebral fracture was 46.1%, 68.1%, and 89.5% at 3, 5 and 8 years. After adjusting for comorbidities, the hazard ratio was 1.83, indicating that a vertebral fracture was associated with almost two times the risk of mortality.

Hasserez found that the severity of vertebral deformity (wedges) was associated with increased mortality risk. Further, two or more vertebral fractures increased the likelihood of secondary fragility fracture in the spine, as well as other locations. 17

Morbidity of fragility fracture

Clinical vertebral fractures are life changing events that can affect pain, function, social state, and overall quality of life. Initial pain after vertebral fracture is high, ranging from 7 to 8.5 on VAS, which is worse than seen in clinical trials for herniated disc, spondylolisthesis, and spinal stenosis. 18–20 Unfortunately, many patients do not recover and have significant chronic pain. Klazen et al. 21 reported that VAS pain scores at 6 and 12 months were 4.8 and 3.8. Similarly, Comstock et al. 22 reported VAS pain of 4.5 at 12 months after fracture. Physical function as measured by the Roland Morris questionnaire who is embedded as part of the fracture care team. The coordinator uses the fracture as a teaching moment to educate the patient and family, make recommendations in

Secondary fractures

A fragility fracture is a strong predictor of second fractures; spine and hip being stronger predictors than upper extremity fractures. Black reported a 5-fold increase in further vertebral fractures which increased if more than one fracture was present and when there was increased severity of the fracture. 23 Hodsman et al. 24 reported that at 5 and 10 years after vertebral fractures, secondary fractures occurred in 16.3% and 25.7% of patients, respectively. Other studies have shown increased secondary fracture incidence. In a meta-analysis, Anderson et al. 25 reported that 18% of patients with non-operatively treated vertebral fractures had secondary fractures within 12 months. In a meta-analysis, Kanis et al. 26,27 found a risk ratio for a new fracture to control of 1.8–2. They noted that the risk increased over predictive models using only BMD criteria and recommended that the threshold be lowered in the presence of an initial fragility fracture. Recently the recommendations to diagnose osteoporosis have changed to include low bone mass (T-score between −1.0 and −2.5) in conjunction with a hip or spine fracture. 28

Models of secondary fracture prevention

A comprehensive program to improve bone health and prevent falls forms the premise of secondary fracture prevention services. Ganda et al. 29 identified four models of secondary fracture prevention (Table 1). Type A is a comprehensive program that utilizes a fracture care liaison coordinator who is embedded as part of the fracture care team. The coordinator uses the fracture as a teaching moment to educate the patient and family, make recommendations in
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