Orthopedic & Muscular System: Current Research

Leung, Orthopedic Muscul Sys 2014, S2:006
DOI: 10.4172/2161-0533.S2-006

Review Article Open Access

Osteoporosis and the Orthopedist

Ping-Chung Leung[1,2*]

[1]*Department of Orthopaedics & Traumatology, The Chinese University of Hong Kong, HKSAR, Hong Kong*

[2]*Jockey Club Centre for Osteoporosis Care & Control, The Chinese University of Hong Kong, HKSAR, Hong Kong*

[*]**Corresponding author:** PC Leung, The Chinese University of Hong Kong, Hong Kong, Tel: 852- 2252-8868; Fax: (852) 2632 5441; E-mail: pingcleung@cuhk.edu.hk

Received date: Mar 12, 2014; **Accepted date:** Apr 17, 2014; **Published date:** Apr 23, 2014

Abstract

Orthopaedic surgeons are serving more and more elderly people suffering from bone fractures and spinal fractures, many of which are suffering from osteoporosis. They are aware of the special precautions to be taken while dealing with the soft bones, they need to be fully informed about the pathology of osteoporosis, the treatment, the complications and the safe practice.

As more reports about jaw necrosis and odd fractures are appearing in relation to long term treatment using bisphosphonates, orthopaedists should objectively evaluate the individual cases to give comprehensive recommendations.

Keywords: Osteoporosis; bisphosphonates; odd fractures

Introduction

Increasing human longevity in affluent communities is an exciting development. However longevity is complicated with physiological deteriorations in tissues and organs. Weakening of the bones has already developed into a major public health problem because of the increasing incidence of fractures, affecting the hip and spine [1]. Hip fractures demand a system of institutional treatment while spinal involvements constitute the most common cause of back pain among the elderlies [2].

Is Osteoporosis affecting the Quality of Life of People Involved?

The aging individual might not be aware of osteoporosis until fracture complications occur. When the apparently normal aging process abruptly turns into a disastrous mishap with the occurrence of fracture, the orthopaedic surgeon becomes directly involved. The rising incidence of hip fractures is often related to osteoporosis. A large number of patients with low back pain among the elderlies is caused by or related to osteoporotic compression of the vertebral bodies [3].

A review of the studies done on the quality of life (QoL) in relation to osteoporosis has clearly shown that when fracture occurs in an osteoporotic person, the deteriorations in the physical components of QoL are obvious. When no fracture complication is associated, special co-existing factors would contribute towards the changes in QoL [4]. The contributing factors include history of fracture, loss of height and presence of spinal deformities, all of which are apparently, directly or indirectly, related to fractures. For the osteoporosis without fracture, there is no evidence of QoL changes.

With the clear indications that osteoporotic fractures would lead to a serious decline of the QoL, analyzing the factors that would help with the prevention of fractures would be of real value. In other words, the determinants leading to fracture would need to be analyzed and subsequently advisable responses worked out.

Adachi in Canada, after studying 1129 post-menopausal women with a mean age of 67 years (SD 11.9 years), extensively discussed the determinants related to fractures and poor QoL. Regular exercise and higher educational levels are supportive of the maintenance of QoL. Adverse factors include a family history of falls, fractures and surgery, smoking, and cardiovascular problems. A variety of medications also negatively affect osteoporotic fractures [4].

Low back pain by itself is the most common musculo-skeletal complaint among all ages, so that para-menopausal women might not consider it significant unless they experience sudden exacerbation which might indicate a fresh vertebral fracture. In fact, it needs to be stressed that deteriorating bone density initiates micro fractures and slow but gradual collapse of the vertebral bodies are responsible for more obvious affections of back pain [5]. Timely intervention in such situations could be useful for prevention of sudden deteriorations.

One classical presentation of osteoporotic vertebral collapse is the sudden massive collapse of one vertebral body. The acute onset of disabling back pain results in immediate hospitalization and confinement to bed for days, if not weeks. The attending clinicians will face an immediate dilemma: mobilization is essential for prevention of pneumonia and yet only bed rest would secure a pain free rescue.

How is Osteoporosis Being Treated?

Anti-resorptive therapies with bisphosphonates, calcitonins, hormonal treatment, or raloxifene have been used to reduce the risk of osteoporotic vertebral, hip, and other non-vertebral fractures; to maintain or improve bone mass; and to suppress excessive bone turnover. Clinical studies show that bisphosphonate therapy provides the rapid onset and effective therapy for osteoporotic patients at high risk of fracture [6].

Bisphosphonates are analogues of pyrophosphate and exhibit marked effects on bone metabolism. The bisphosphonates' characteristic phosphorous – carbon – phosphorous bond (P-C-P) renders the class resistant to hydrolysis by phosphatases and enables these molecules to bind tightly to calcified bone matrix. They are very effective inhibitors of osteoclastic bone resorption and have been used clinically in Paget's disease of bone, osteoporosis, and hypercalcemia of malignancy and bone metastases. Zoledronic acid is a representative of a third generation bisphosphonate and is the most potent bisphosphonate in development. Zoledronic acid is about two to three orders of magnitude more potent than pamidronate, and about an order of magnitude more potent than alendronate, risedronate and ibandronate.

Data show that 4 mg iv slow injection once a year resulting in a clinically relevant and statistically significant increase in bone mass at the spine, hip, and distal radius at 6 (earliest time point assessed), 9, and 12 months [7].

On the other hand, strontium ranelate has been shown to increase biochemical bone formation markers (in in-vivo animal models and in osteoporotic post-menopausal women involved in clinical trials) and to decrease bone resorption markers (in pharmacological studies and in clinical trials), demonstrating its property to rebalance the bone turnover in favour of bone formation.

The dual effect of strontium ranelate is not only observed at the bone markers level as these effects are also evidenced by histomorphometry evaluation performed in bone samples obtained in pharmacological studies and in clinical trials, but the mechanism of the dual activity of strontium ranelate is still under investigation [8,9].

Studies of longer term use of zoledronic acid (up to 6 years), and alendronate (up to 10 years) have shown that in women who discontinue after 3-5 years of use, some benefits, including reduced bone loss and reduction in vertebral fractures, are retained. Retention of benefits after risedronate are probably less than with alendronate and there are no data for ibandronate. However, recent concerns about a possible association of bisphosphonates, particularly with long term use, with osteonecrosis of the jaw, esophageal cancer and atypical femur fractures have led patients and clinicians to try to limit duration of use. It is therefore important to provide long term data which can guide clinical decision-making about benefits against risks and the optimal duration of long term bisphosphonate use [10].

An extension study of annual zolendronate to 9 years showed little difference between patients who continued on active treatment for 9 years compared to those who continued for 6 years and then discontinued for 3 more. The data support the long term bony safety for bisphosphonates. The recommendation could be an intermittent administration of the drug every 3-6 years [11,12].

How Serious are the Complications Related to Bisphosphonate Treatment?

Reports on the occurrence of jaw necrosis after high doses of bisphonates for the treatment of bone metastasis in cancer patients have been plenty and trust worthy. The benefits however, might out-weigh the risks [13]. Reports on the complications of odd fractures appear conflicting. In 2011, a report from Sweden giving a nation-wide study on 12,777 women 55 years of age and over who sustained a fracture of the femur in 2008 is of particular value to reveal the truth. 59 cases of atypical femoral fractures were found. 78% of those patients compared with 10% of the controls had received bisphosphonates. The duration of use influenced the risk. After drug withdrawal, the risk diminished by 70% per year since the last use. This population based nationwide study could be reassuring for patients who receive bisphosphonates. Although the prevalence of atypical fractures in relation to bisphosphonate use does exist, the absolute risk appears small [14].

A Practical Attitude of the Orthopedists towards Osteoporosis

Laboratory tests have collected sufficient valid data on the mechanisms of bone metabolism, very effective means of slowing down bone resorption, and some means on the boostering of bone formation. Clinical studies have shown higher incidence of fractures among those with low bone densities (BMD) and that BMD can be elevated with effective pharmaceutical agents. It is also known that elderly patients suffer from higher morbidities and mortalities if they become victims of bone fracture. The aging people's fear against fractures therefore readily becomes transferred to a fear against Osteoporosis and declining BMD. The enthusiasm on active treatment against Osteoporosis could thus be readily understood.

It must be realized that Osteoporosis is not a disease by itself. Osteoporosis is a natural physiological process related to aging unless the bony density decline is caused by a separate pathology. The risks leading to fractures are plenty including flailty, visual defects, balance problems, nutritional deficiencies, medications etc. Exaggerations on only one risky area and ruthlessly starting effective (drastic) treatment could be harmful. Adverse effects of long term drug treatment often become obvious only after years of consumption. With regard to the apparently safe dual action Strontium therapy, the European Medicines Agency made a recommendation in 2014 that Strontium must not be used in patients with known history of cardiovascular diseases [15]. Although the risks of the prolonged use of bisphosphonates appear relatively acceptable, the risks are still real. A more intelligent planning on the prevention of deterioration of BMD, rather than a rapid up-lifting of BMD data, therefore, needs to be recommended. On the other hand, the extreme high-risk cases, e.g. those already sustained one low energy fracture, need to be protected.

References

1. [No authors listed] (2000) Osteoporosis prevention, diagnosis, and therapy. NIH Consens Statement 17: 1-45.
2. Cranney A, Welch V, Wells G, Adachi J, Shea B, et al. (2001) Discrimination of changes in osteoporosis outcomes. J Rheumatol 28: 413-421.
3. Roland M, Morris R (1983) A study of the natural history of low-back pain. Part II: development of guidelines for trials of treatment in primary care. Spine (Phila Pa 1976) 8: 145-150.
4. Papaioannou A, Kennedy CC, Ioannidis G, Brown JP, Pathak A, et al. (2006) Determinants of health-related quality of life in women with vertebral fractures. Osteoporos Int 17: 355-363.
5. Tosteson AN, Hammond CS (2002) Quality-of-life assessment in osteoporosis: health-status and preference-based measures. Pharmacoeconomics 20: 289-303.
6. Bone HG, Downs RW Jr, Tucci JR, Harris ST, Weinstein RS, et al. (1997) Dose-response relationships for alendronate treatment in osteoporotic elderly women. Alendronate Elderly Osteoporosis Study Centers. J Clin Endocrinol Metab 82: 265-274.

7. Black DM, Delmas PD, Eastell R, Reid IR, Boonen S, et al. (2007) Once-yearly zoledronic acid for treatment of postmenopausal osteoporosis. N Engl J Med 356: 1809-1822.
8. Ammann P, Shen V, Robin B, Mauras Y, Bonjour JP, et al. (2004) Strontium ranelate improves bone resistance by increasing bone mass and improving architecture in intact female rats. J Bone Miner Res 19: 2012-2020.
9. Arlot ME, Burt-Pichat B, Roux JP, Portero N, Meunier PJ (2005) The Effects of Strontium Ranelate on Bone Remodeling and Bone Safety Assessed by Histomorphometry in Patients with Postmenopausal Osteoporosis. J Bone Miner Res 20(Suppl1): 1084
10. Cummings SR, Black DM, Thompson DE, Applegate WB, Barrett-Connor E, et al. (1998) Effect of alendronate on risk of fracture in women with low bone density but without vertebral fractures: results from the Fracture Intervention Trial. JAMA 280: 2077-2082.
11. Black D, Kelly M, Genant HK, Leung PC (2010) Bisphiosphonate and Fractures of Subtrochantesic or diaphyseal femur N Eng J Med 10:1056.
12. Black DM, Reid IR, Boonen S, Bucci-Rechtweg C, Cauley JA, et al. (2012) The effect of 3 versus 6 years of zoledronic acid treatment of osteoporosis: a randomized extension to the HORIZON-Pivotal Fracture Trial (PFT). J Bone Miner Res 27: 243-254.
13. Black DM, Reid IR, Cauley JA, Leung PC et al Effect of 6 versus 9 years of Zoledronic acid Treatment in Osteoporosis – Second extension of HOIZON – Pivotal Fracture Trial. JAMA 2014 (under review).
14. Schilcher J, Michaëlsson K, Aspenberg P (2011) Bisphosphonate use and atypical fractures of the femoral shaft. N Engl J Med 364: 1728-1737.
15. European Medicines Agency (EMA) 2014 Recommendation on Strontium ranelate

This article was originally published in a special issue, entitled: **"Joint Replacement: Treatment of Arthritic Disease"**, Edited by Moschos A. Papadopoulos, Aristotle University of Thessaloniki, Greece