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Reduction of Osteoporosis in Cancer Patients who are Receiving Aromatase Inhibitor Treatment

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A Review of Literature

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PERMISSION

Title: Reduction of Osteoporosis in Cancer Patients receiving Aromatase Inhibitor Treatment

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Abstract

The prevalence of osteoporosis has become a public health concern particularly among postmenopausal women. The number of postmenopausal women that are experiencing low bone mineral density (BMD) and have progressed to osteoporosis is increasing annually. Aromatase Inhibitors play an important role in the treatment of postmenopausal women with hormone receptor positive breast cancer. However, studies indicate that postmenopausal women with breast cancer who are receiving adjuvant Aromatase Inhibitor (AI) have an accelerated risk of developing osteoporosis and osteoporotic fractures. BMD is the current gold standard method of assessment of osteoporosis and prediction of future fracture risk and the decrease in BMD is a risk factor for fracture. The dual energy x-ray absorptiometry (DXA) of the lumbar spine and hip is the most common method of BMD assessment. Several reviews and guidelines have presented management and treatment strategies for adverse events during AI therapy. Some guidelines have recommended that postmenopausal women with cancer receiving an AI therapy should have their bone health monitored for fracture risk. These include having a baseline risk factor assessment for all patients, BMD measurement and ensuring adequate calcium and vitamin D intake and lifestyle modification. This review examines the ways to reduce the prevalence of osteoporosis among postmenopausal women with breast cancer receiving aromatase inhibitor therapy as part of their treatment regimen.

Keywords: aromatase inhibitor, osteoporosis, bone mineral density, fracture, lifestyle

Background

The National Osteoporosis Foundation (NOF) (2014), reports that osteoporosis carries high incidence of mortality and morbidity. Current epidemiological studies show that over 75 million people in Europe, Japan, and the United States are affected by osteoporosis (Dunphy, Winland–Brown, Porter, & Thomas, 2011). In the United States alone, about 12 million adults above the age of 50 years suffer Osteoporosis (U.S. Preventive Services Task Force, 2011). Osteoporosis is a progressive skeletal disorder characterized by low bone mineral density (BMD) and increased risk of fragility fractures (Willson, Nelson, Newbold, Nelson, & LaEleur, 2015). It is a silent disease that usually does not show any symptoms but only becomes obvious when one suffers a bone fracture. The factors that contribute and accelerate the development of osteoporosis include cigarette smoking, inadequate calcium and vitamin D intake, and reduced rates of physical activities (Garlow, et al., 2009). In women, estrogen depletion has been associated with osteoporosis by inhibiting osteoclastogenesis, inducing osteoclast apoptosis, and decreasing the erosive activity of osteoclasts (Lash, Nichloson, Velez, Harrison, & McCort, 2009).

Most postmenopausal women will suffer bone mass depletion within the first ten years after the onset of menopause. This leads to increase risk of fracture commonly found in the vertebrae, hip, and distal radius (Eastell, Adams, Coleman, Howell, & Hannon, 2008; Becker, Kilgore, & Morrisey, 2010). However, postmenopausal women with chronic illnesses such as breast cancer, suffer additional and accelerated risks of getting osteoporosis, due to adjuvant hormonal therapy received during treatment (Reid, et al. 2008). Though there are many approved adjuvant hormonal therapies or treatment for breast cancer, Tamoxifen and Aromatase Inhibitors (AIs) are the two agents most commonly used. Aromatase inhibitors are preferable because they reduce the recurrence of breast cancer (Cheung, Heisey, & Srighanthan, 2013). However, the use

of this treatment in postmenopausal women decreases BMD, resulting in a more rapid progression of osteoporosis. Additionally, long-term inadequate dietary calcium and vitamin D has shown to be deleterious to skeletal mass. Lifestyle habits such as cigarette smoking also reduce circulating estrogen levels as well as having a toxic effect on osteoblasts. Other evidence shows that a sedentary lifestyle contributes to developing osteopenia and loss of BMD in postmenopausal women (Dunphy et al., 2011).

NOF (2014) reports that with time osteoporosis patients usually undergo reduced quality of life, disability, and sometimes death. As these result in many physical, economic, and social costs to both patients and their families, there is a need for further efforts to curb the onslaught of this disease. This research review seeks to discuss the ways to reduce the prevalence of osteoporosis among postmenopausal women with breast cancer receiving aromatase inhibitor therapy as part of their treatment regimen. The review will also discuss other risk factors associated with increased bone loss such as low dietary calcium and vitamin D intake, smoking, and lack of physical activities. In addition, screening tools to assess the bone mineral density, fracture risk, and other prophylactic measures will be discussed.

Case Report

Mrs. MH, a 63 years old Caucasian woman, who presented for a post-hospital follow-up after right total hip arthroplasty. Mrs. MH presented to the emergency room six months ago with a day history of right hip pain after falling in the bathtub and landing on her right hip (was brought in by her son-in-law). She complained of having a severe pain in her right hip and upper thigh that prevented her from getting up after her fall with no obvious trauma to her head. Oxymorphone hydrochloride (Numophan) was given to relieve her pain and she was taken to the radiology department for x-ray of her right leg and hip. The x-ray report showed a complete

comminuted intertrochanteric fracture of the right hip and she subsequently underwent total hip arthroplasty.

On presentation today, she denies fever, chills, shortness of breath, chest pain, palpitations or light- headedness. The pain in her right hip is dull and she rates it as 3/10 which is well controlled by Tylenol. She is not taking calcium, vitamin D supplement, or regularly dairy. She lives a sedentary lifestyle and has a history of 30 pack-years of cigarette smoking.

Past Medical and Surgical History

1. Hypertension
2. Breast Cancer Stage II
3 Total Right Hip Replacement in 2014
4 Right breast lumpectomy in 2011

Allergies: No known allergies

Medications:

Lisinopril (Zestril) 10 mg once daily,

Arimidex 1 mg tablet PO once daily

Tylenol 1000mg 1-3 times/daily PO as needed for pain

Screening: She had a negative mammography result last fall.

Family History: No family history provided

Social History: She is a widow with three grown children, she smokes ½ - 1 pack of cigarettes a day and has smoked for the past 50 years, and rarely uses alcohol. She does not engage in any physical exercise. She retired from crystal sugar factory.

Review of Systems

Constitutional: Denied fever or unintentional weight loss.

Respiratory: Denied shortness of breath, coughing or wheezing.

Cardiovascular: Denied chest pain or palpitations.

Musculoskeletal: Denied joint pain, muscle pain or weakness. She admits to having mild pain in the right hip, rated pain 3/10. She can ambulate with the use of a cane.

Neurologic: Denied loss of sensation, numbness or tingling.

Physical Exam

Vital signs: BP 144/85, HR 82, T 98.1, R14

General: Mrs. MH is a 63-year-old Caucasian female, well developed and in no distress. She was well groomed, cooperative, and had a pleasant appearance.

HEENT: Head - Normocephalic, atraumatic.

Cardiovascular: S1 and S2 noted. Regular heart rate and rhythm with no murmurs, gallops, or clicks.

Respirations: Lungs sounds are clear. No wheezing or rales noted.

Musculoskeletal: Surgical scar on the lateral right hip appeared healed with no ecchymosis, erythema, or warmth to touch. Full range of motion is intact to upper and lower extremities other than expected, decrease post-operative range of motion to right hip. No edema or change in color in her right extremity when compared to the left. Mild tenderness on both internal and external rotation of right hip is noted.

Neurologic: lower extremity strength, tone and reflexes intact.

Diagnostic tests

1. DEXA scan: -2.1 which is consistent with Osteoporosis and high risk for fracture.
2. CBC, Creatinine Clearance, calcium, phosphorus were all within normal level, while vitamin D was low level

Assessment

Osteoporosis, osteomalacia, and osteonecrosis secondary to stage II breast cancer

Plan

1. Alendronate (Fosamax) 70 mg weekly by mouth
2. Calcium 1200 units Once daily by mouth
3. Vitamin D 1000 mg once daily by mouth
4. Discussed the side effects of bisphosphonate that include esophagitis. Explained the importance of taking the medication with a full glass of water, and to stay in an upright position immediately after taking the medication.
5. Discussed smoking cessation and provided information on smoking cessation services delivered by North Dakota Quitline
6. Discussed importance of muscle strengthening exercises like swimming (Dunphy, et al., 2011).
7. Will follow-up in 2 to 4 weeks to assess her response to medication.

Literature Review

A review of literature was completed to examine factors affecting osteoporosis in cases such as the one above, seeking to provide information on how these factors can be mitigated and managed, backed by the current information in existing literature. Relevant factors included lifestyle, lack of calcium and vitamin D supplementation, and use of AI without the use of antiresorptive therapy or monitoring of bone health. American Society of Clinical Oncology, among others recommended guidelines for postmenopausal women with cancer receiving an AI therapy include bone health monitoring for osteoporosis and fracture risk (Dhesy-Thind et al., 2012). This can be accomplished by obtaining a baseline risk factor assessment for all patients as

well as a BMD measurement, and ensuring that there are adequate calcium and vitamin D intake and lifestyle modifications for optimal bone health (Younus & Kligman, 2010; National Comprehensive Cancer Network, 2011; Dent, Gaspo, Kissener & Pritchard, 2011). The American Society of Clinical Oncology guidelines recommended obtaining a baseline BMD before the initiation of AIs as well as annual screening (Hillner, Ingle, Chlebowski et al., 2003).

Inadequate Calcium, Vitamin D deficiency, and Bone Loss

According to Labronici et al. (2013), vitamin D, and calcium supplements aid in the prevention of bone loss in reducing bone renewal and the number of non-vertebral fractures. According to Zhu and Prince (2015), older people tend to have both low calcium intake and vitamin D deficiency. Consequently, it is recommended that postmenopausal women who are at increased risk for hip fracture should take calcium in combination with vitamin D to prevent bone loss and fracture. Observational studies revealed there is increased the risk of bone loss and fracture when calcium intake is below 700–800 mg/day (Zhu & Prince, 2014). A recent large cohort study conducted by Warensjo, et al (2011), also showed that women in the lowest quartile of calcium intake (<751 mg/day) had an increased risk of osteoporosis and hip fracture. (Prentice et al., 2013). Women's Health Initiative (WHI) in their study observed a 38% reduction in hip fracture among those who were taking calcium or vitamin D supplements at baseline or adhering to the calcium (1000 mg/day) and vitamin D (400 IU/day) supplementation (Prentice, et al., 2013).

Vitamin D (VD) helps to stimulate absorption of dietary calcium, and play a major role in regulating bone turnover and muscle function (Holick, 2007). It also maximizes the response of patients to antiresorptive therapy (Labronici et al., 2013). However, there is an extreme prevalence of VD deficiency in the general population worldwide (Holick and Chen, 2008). In the

US, the prevalence of vitamin D deficiency in adults is particularly significant among minority groups (Forrest & Stuhldreher, 2011). The prevalence rate of vitamin D deficiency was 41.6%, with the highest rate seen in blacks (82.1%), and followed by Hispanics (69.2%). Studies have shown low VD status to be associated with low bone mass and fracture (Sadat-Ali et al., 2011; Captina, Carsote, Caragheorgheopol, Poiana, & Berteanu, (2014).

Vitamin D deficiency can result from either nutritional deficiency or from limited sun exposure (Labronici et al., 2012). The major dietary sources of VD include egg yolk, liver, fatty fish, fish oils, and fortified dairy products. Synthesis of Vitamin D in the skin is through exposure to ultraviolet light of wavelength 290–315 nm. The ability to synthesize vitamin D in the skin due to exposure to sunlight decreases with ageing thus, getting adequate VD will depends heavily on increasing dietary intake in this population (Labronici et al., 2012).

Conversely, some epidemiological studies have yielded conflicting results when they evaluated the association between circulating 25-hyroxyvitamine D levels and bone density in older people. (Kuchuk, Pluijm, van Schoor, Looman, Smith, & Lips, 2009). The heterogeneity of the results may be partially explained by ethnicity differences of the population, differing age group as well as the fact that the studies focused on different regions of the human body. In postmenopausal women, loss of bone density has been linked to subclinical vitamin D deficiency. According to Labronici et al. (2012), this is considered a risk factor for fracture due to the high susceptibility of this population to falls and inappropriate neuromuscular response.

With this significant tendency in postmenopausal women with breast cancer who are receiving AI, several guidelines have recommended regarding bone health in order to monitor for osteoporosis and fracture. These include ensuring that there are adequate calcium and Vitamin D intake (Hadji, et al. 2011; Dent, Gaspo, Kissener & Pritchard, 2011).

Lifestyle and bone loss

Physical activity. Exercise is very important in increasing bone mineral density. According to Dunphy et al. 2011, engaging in regular exercises has shown to help maintain BMD. They also reported that a sedentary lifestyle increases susceptibility to osteoporosis. There is a growing evidence that the loss of BMD found in postmenopausal women can be prevented by engaging in muscle strength training (Kilbreath, et al., 2011). In their review, strength exercise was shown to be an effective way of improving and maintaining bone mass in postmenopausal women (Gomez-Cabello, et al. 2012). They suggested that achieving the best results with strength training requires a high–loading intensity training of three sessions per week and two to three sets per session.

According to Kilbreath, et al. (2011), high-impact exercise in combination with vitamin D and calcium supplementation in postmenopausal women retards bone resorption. They reported that this intervention has been to prevent or minimize the loss of bone density linked with menopause, thereby stopping the progression to osteoporosis. Furthermore, in healthy postmenopausal women, the effect of exercises on BMD can be improved by hormone replacement therapy (HRT) (Kilbreath et al., 2011). However, for women with estrogen positive breast cancer in whom HRT is contraindicated, the use of exercise in combination with Vitamin D and calcium has shown to serve as an alternative choice of primary prevention (Kilbreath et al., 2011). Nonetheless, the effects of these interventions on drug-induced osteoporosis, remains unknown

Smoking. Cigarette smoking has been a known risk factor for osteoporosis for more than 20 years (Zhu & Prince, 2015). The mechanism of action is mainly through the reduction in the circulating estrogen levels as well as its deleterious effects on osteoblasts (Dunphy et al., 2011).

Mrs. MH smokes half to a pack of cigarette and has a history of 30 pack-years of cigarette smoking. According Ruan and Mueck (2015), women who smoke have shown diminished effect of endogenous estrogen, although it is difficult to predict the activity of estrogen in smokers since it works through different mechanisms. It is a well-known fact that natural menopause occurs early in women who smoke, and this shows the correlation with endogenous estradiol metabolism (Ruan & Mueck, 2015).

Studies have shown reduced BMD in late adolescence boys and girls who started smoking early (Eleftheriou, et al. 2013; Lucas, Fraga, Ramos, & Barros, 2012). In older adults, meta-analyses have shown cigarette smoking to be related to reduced bone mass, increased bone loss and increased risk of fracture (Zhu & Prince, 2015). Furthermore, a large body of evidence has reported the relationship between smoking and a higher incidence of postmenopausal osteoporosis. Studies have revealed there is a reduction in bone density and an increased risk of fracture by as much as five times increased risk of fracture in this population (Ruan & Mueck, 2015).

Smokers tend to have a low body weight compared to non-smokers, however, adjusting for body weight in some studies did not account for the negative association between smoking and low bone mass or increased fracture risk (Zhu & Prince, 2015). According to Ruan and Mueck (2015) there is a positive clinical correlation for reduced effect of endogenous estrogen in women smokers. The most conspicuous is the reduced incidence of endometrial carcinoma, which may be as high as fifty percent(Zhu, et al., 2008). There is also a reduced incidence of endometriosis and breast tenderness in smokers further indicating decreased endogenous estrogenic activity (Ruan & Mueck, 2015). Although these are apparent positive effects associated with reduced estrogen activity in women smokers, the associated risk far outweighs

any possible benefits. Older people who smoke tend to have a higher risk of fall which increases the risk of fracture (Zhu & Prince, 2014). In the analysis of published studies, it was found that smoking increased the cumulative risk of hip fracture by approximately 50% in postmenopausal women (Hadji et al., 2008). Studies have shown smoking cessation to improve the BMD and reduce fracture risk (Callreus, McGuigan, & Akesson, 2013).

Breast cancer treatment

There are approximately 75% of breast cancers that are positive for the estrogen receptor, progesterone receptor or both (Kibreath, et al., 2011). Several hormonal agents are approved for the treatment of breast cancer: Aromatase Inhibitor (AI) and selective estrogen receptor modulators SERMs such as Tamoxifen, an estrogen receptor (ER) antagonists. Traditionally, Tamoxifen has been considered the standard of adjuvant hormone therapy for postmenopausal women with early stage hormone receptor positive breast cancer (Cella, & Fallowfield, 2008), while Aromatase inhibitor is an adjuvant hormonal therapy for postmenopausal women with hormone-sensitive early breast cancer (Eastell, et al., 2008). However, AIs have shown increased efficacy, improved survival, and improved tolerability when compared to Tamoxifen, thereby becoming the standard of care in postmenopausal women (Lonning, 2011) (Hadji, Body, Aapro, Brufsky, 2008).They are reported to decrease the recurrence rate of breast cancer and this occurs regardless of when treatment was initiated, and regardless of whether the agent was used initially as monotherapy or started much later in the disease course (Dowsett, et al., 2010).

There are two classes of Aromatase inhibitors available: nonsteroidal (anastrozole and letrozole) and steroidal (exemestane). Both classes of AIs rapidly suppress the circulating estrogen and increase bone loss (Hadji, 2009). The circulating estrogen plays an important part in maintaining bone remodeling through stimulating bone growth and inhibiting bone resorption

(Cella, & Fallowfield, 2008). AIs reduce circulating estrogen, which result in decreased bone remodeling and consequent bone loss. In postmenopausal women who are already at risk of osteoporosis, there may be an increased progression to osteoporosis due to the reduction in BMD from the use of AIs (Cella, & Fallowfield, 2008).

Hadji (2009) found that AI therapy can suppress up to 99% of circulating estrogen in as little as six weeks of initiation. Although the rate of bone loss is rapid at initiation, the severity of bone loss continues to increase during the entire duration of AI treatment (Hadji, 2009). From the report of several studies, AIs have the potential to cause a deleterious effect on the skeletal health of postmenopausal women receiving these medications (Eastell, et al., 2008). In a study conducted by Cheung et al., (2012), anastrozole was found to reduce BMD at the lumbar spine or total hip in healthy postmenopausal women. In an ATAC trial, the decrease in BMD with the use of anastrozole was 6.1% at the lumbar spine and 7.2 % total hip. Studies from large adjuvant trials have shown that women receiving AIs have significantly decreased BMD and higher fracture when compared with women on tamoxifen (Sestak et al., 2014; Eastell, et al., 2008). However, a significant increase in BMD was found with tamoxifen in some studies (Eastell, et al., 2008). According to Sestak et al., (2014), it is difficult to determine the true effect of aromatase inhibitors on BMD when compared with tamoxifen since most of the studies investigating the effect of AIs on bone density were done on postmenopausal women with early breast cancer receiving tamoxifen.

Bone mineral density monitoring

The guidelines for postmenopausal women with breast cancer receiving AI therapy recommends bone health monitoring for osteoporosis and fracture risk (Dhesy-Thind et al., 2012). The American Society of Clinical Oncology published guidelines which recommended obtaining

a baseline BMD before the initiation of AIs, and conducting annual screening or monitoring especially for women with BMD T-score greater than -2.5 (Hillner, Ingle, Chlebowski et al, 2003). In the case, no monitoring of BMD was not indicated, and the patient has not had a DEXA scan or bone density scan. According to Spangler, Yu, Loggers, and Boudreau (2013), postmenopausal women with breast cancer who are on AIs require regular monitoring of BMD to prevent bone loss. However, results from studies have indicated that a large proportion of this population is not receiving BMD screening as recommended (Spangler, Yu, Loggers, & Boudreau, 2013).

BMD measurement by densitometry is the current gold standard method of assessment or diagnostic test for diagnosing either osteopenia or osteoporosis (Dunphy, et al., 2011). This measurement has several technologies available including dual-energy x-ray absorptiometry (DXA or DEXA), single energy x-ray (SXA) among others. However, DXA or DEXA is the gold standard and most widely used method for documenting osteoporosis of the proximal femur and lumbar spine. Although other methods are considered accurate, DEXA is the most precise when reproduced in both short and long term studies, thereby making it an excellent method for monitoring response to intervention over time (Dunphy, et al.,2011). BMD measurement is reported using the calculated Z-score and T-score; both are used in determining how one individual compares to a reference population. The T-score has a more clinical relevant value when BMD is reported and is used to confirm the presence of osteoporosis as well as to determine the fracture risk (Dunphy et al. 2011).

Different guidelines provide varying recommendations on the interval between BMD screenings. The National Comprehensive Cancer Network recommended BMD screening by DEXA scan at baseline and periodic follow-up to evaluate risk of fracture, though they did not

specify any clear interval of screening (Papaioannou, et al., 2010). The current Osteoporosis Canada systemic review focused on preventing fracture due to fragility rather than treating low BMD (Papaioannou, Morin, Cheung, et al., 2010). They recommend using DXA scan along with an annual measurement of height and assessment of the presence of vertebral fractures including the history of fall within the last year and also repeat BMD measurement to reassess risk of bone loss every 1 to 3 years. Medicare pays for BMD screening every two years but may pay for more frequent screening if medically necessary (Center for Medicare & Medicaid Services, 2015)

Furthermore, Eastell, et al. (2008) suggested the need to examine the effect of AI therapy on BMD in postmenopausal women that are treated for breast cancer and determine those at risk of becoming osteoporotic during treatment before making the clinical decision to use this medication. In their analysis, none of the postmenopausal women receiving AI treatment with normal BMD at baseline became osteoporotic (Eastell, et al. 2008). They recommended that those without pre-existing osteopenia do not require further monitoring or preventive strategies. However, those who did have pre-existing osteopenia or other risk factors including age, smoking or family history should have regular monitoring of BMD done.

Use of preventive bisphosphonate therapy

The American Society of Clinical Oncology (ASCO) published guidelines and used BMD as an indicator of the need for antiresorptive/pharmacologic therapy. Antiresorptive therapy is used to slow bone loss by inhibiting the function of osteoclasts (Lim, Sian Yik, Bolster, & Marcy, 2015). There are several antiresorptive therapies used, and the main ones include bisphosphonates (such as Alendronate), Zoledronic acid; denosumab; and selective estrogen receptor modulators. Bisphosphonates are the most commonly prescribed antiresorptive medications and remain the

first-line treatment for osteoporosis and are either administered as oral or intravenous therapy (Lim, Sian Yik; Bolster, Marcy, 2015).

In their study, Hadji et al. (2008) reported that oral or intravenous bisphosphonate have shown to be effective for preventing bone loss associated with postmenopausal osteoporosis and with breast cancer treatment- associated bone loss. Bisphosphonate absorbed into the mineralized surface of bone and are internalized by osteoclasts, interfering with biochemical processes involved in bone resorption. They also induce apoptosis of osteoclasts (XU, Gou, Wang, et al., 2013). They are embedded in bone and thus, unlike other osteoporosis therapy, studies have shown that after a certain treatment period with bisphosphonate, most of the benefits with regard to bone mineral density (BMD) and fracture outcomes were maintained even after treatment cessation (Black, et al., 2012).

In the most current guideline from American Society of Clinical Oncology, bisphosphonate was recommended as the treatment of patients with breast cancer receiving AI therapy that have a BMD T-score of -2.5 or below (Hadji, Hartenfels, Kyvernitakis, Hars, Baumann & Kalder, 2012; Papaioannou, et al. 2010). However, the timing at which to initiate antiresorptive therapy in women with breast cancer who are receiving AIs is an area that requires extensive research. Several guidelines and algorithms have been used to determine when to initiate antiresorptive treatment. Some algorithm use the fracture risk or factors associated with fractures in addition to T-Score and this have resulted in higher percentage of patient recommended for antiresorptive treatment compared to others that used only T-scores (Hadji et al., 2012). Even in instances where cutoff of T-score decreased to -2.0, there was a low, consistent agreement for antiresorptive treatment in postmenopausal women with breast cancer.

According to Cheung, Heisey and Srighanthan (2013), all women with T-scores less than -2.0 or at least two of the following risk factors: T-score less than -1.5, age more than 65 years, low BMI (<20 kg/m2), family history of hip fracture, personal history of fragility fracture after age 50, oral corticosteroid use for more than 6 months, and smoking – should receive bisphosphonate therapy. They recommended the monitoring of BMD every two years, and bisphosphonate treatment to be initiated and continued for at least two years and also throughout duration of administering the aromatase inhibitor therapy. In instances where BMD decreases after 1–2 years on oral bisphosphonate therapy, they recommend considering a switch to intravenous bisphosphonate therapy. They suggested monitoring every 1–2 years for a change in risk status and BMD for those with T-scores -2.0 or higher and no additional risk factors. In addition, there are serious long-term effects for using of bisphosphonate which must be considered, including osteonecrosis of the jaw.

Learning points

To conclude, research shows that most postmenopausal women are more susceptible to developing osteoporosis due to estrogen depletion and erosive osteoclast activity. Those with breast cancer who are receiving aromatase inhibitors have an additional risk. In addition to adequate calcium and vitamin D and lifestyle modifications for optimal bone health, all women starting aromatase inhibitors should have a baseline BMD assessment. Health care providers need to pay close attention when treating this population to reduce the prevalence of osteoporosis that can affect their quality of life. It is of essence to educate providers as well as patients on the following points;

- Breast cancer treatments increase osteoporosis and fractures

- Aromatase inhibitors, especially the nonsteroidal aromatase inhibitors, adversely affect bone. Postmenopausal women on aromatase inhibitors should have bone density measurements every 1-2 years
- Bisphosphonate therapy can counteract aromatase inhibitor-induced bone loss in postmenopausal women with breast cancer
- Postmenopausal women with breast cancer who are receiving aromatase inhibitor should ensure there is adequate calcium and Vitamin D intake
- Lifestyle modifications such as smoking cessation improve the BMD and reduce fracture risk. Also, engaging in muscle strength training can help prevent the loss of BMD found in postmenopausal women

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