Case Report

MALE OSTEOPOROSIS

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Osteoporosis is uncommon in males. All cases of osteoporosis in males need complete evaluation for secondary cause. We report a case of severe osteoporosis in 70 years old male. He presented with D8 anterior wedging with paraparesis. He was evaluated for the secondary causes. He was found to have hypogonadism and hypovitaminosis D along with senile osteoporosis. He was treated with Teriparatide. His paraparesis improved following treatment with bone forming agent.

Key words: Osteoporosis, Male osteoporosis, Hypogonadism, Hypovitaminosis D, Testosterone, Sex steroids

INTRODUCTION

Osteoporosis is one of the most important health problems in the aging population. Osteoporosis is defined as "Skeletal disorder characterized by compromised bone strength predisposing a person to an increased risk of fracture. Bone strength reflects the integration of two main features: bone density and bone quality" [1]. It has been thought that osteoporosis only affects females but the data suggests that males too are at risk of osteoporosis. Most of the males have secondary cause of Osteoporosis and establishing the root cause of osteoporosis in male patient is a diagnostic challenge. We report an interesting case of osteoporosis in male patient.

CASE

Seventy years old businessman, known case of Type II diabetes, essential hypertension and chronic airway obstructive disease presented with low backache for 2 months. Back pain was aggravated by changing posture. For last one week, the severity of pain was intolerable and movement of spine was totally restricted. This time he also noticed weakness of both lower limbs along with urinary retention. There was no obvious fall or trauma during this period. Routine radiograph revealed D8 wedging. He consulted Orthopedicain for the same and he was advised to undergo MRI of spine. Being obese, he could not enter the MRI gantry; hence his CT scan of Spine was done. CT scan confirmed anterior wedging of D8 and compression of spinal cord. He was treated conservative. His relatives were inquisitive about the cause of D8 wedging; hence he was brought to Endocrinologist for further evaluation.

He had no history of steroid abuse. He was a chronic smoker 2 packs/day for last 40 years. His dietary pattern was erratic. Daily calcium intake was approximately 400 mg/day. Exposure to sunlight was minimal. He denied answering queried about his sexual life. He youngest child is 40 years old at present.

Patient was subjected for neurosurgical consultation for neurological deficits in both lower limbs. Since, more than one week had elapsed following paraparesis, prognosis was poor hence, he was advised conservative treatment.

Differential diagnosis

List of secondary causes of Osteoporosis are mentioned in *Table* 1. We need to investigate to rule out above said disorders. However, in this case, there was high likely hood of following clinical possibilities.

Malignancy with secondaries in spine: The risk of lung malignancies is high in chronic smoker. Some of malignancies like small cell carcinoma can present with much of respiratory symptoms. They are known to metastasize in bone as well particularly, in skull and spine. It is also associated with PTH independent hypercalcemia. Secondly, at this age the other possibility of prostate malignancy and its secondaries in spine is common. Appropriate investigations are needed to rule out the respective etiology.

Multiple myeloma: Plasma cell disorders have their second peak after the age of 60 years. It presents with bone pain and fractures. Patients are anemic and have high ESR. Urine shown presence of Bence Jones protein and serum electrophoresis show M band. Radiographs show multiple punched out lesions.

Hyperparathyroidism: Hyperparathyrodism can present at any age with typical symptoms of bony pains, abdominal pain, depression, and recurrent renal stones. Radiographs are typical with feature like subperiosteal resorption, osteititis fibrosa cystica and diffuse osteopenia. Elevated serum calcium along with elevated serum parathormone confirms the diagnosis.

Involutional or nutritional osteoporosis: As thought earlier, that there is bone loss with increasing age. However, the recent data has shown that poor calcium intake is one of the important reasons for age related bone loss. However, after all other secondary causes have been ruled out, person can be diagnosed as 'Involutional' osteoporosis.

Investigations

Hb	15.2 g%	
TLC	9600/cumm	
DLC	78/15/4/3	
ESR:	40 mm/1st hr	
S creatinine:	1.0 mg/dL	
FBS	148 mg/dL	
PPBS	175 mg/dL	
HbAlc	8.2%	
S. calcium	9.0 mg/dL	
S. phosphorus	3.0 mg/dL	
S alkaline phosphate	121 IU/l	
S. albumin	3.4 g/dL	
S. globulin	3.1 g/dL	
Prostate specific antigen	1.4 ng/mL	(N: < 4 ng/mL)
S . testosterone	0.47 ng/mL	(N: 3 - 10.6 ng/mL)
S. prolactin	59.09 ng/mL	(N: 1-20 ng/mL)
S. FSH	3.2 mIU/m	
S. Immunoelectrophoresis	no M band seen	
25(OH) vitamin D	20 ng/mL	(N: 30-75 ng/mL)
S. PTH	102 pg/mL	(N: 10-72 pg/mL)
S.osteocalcin	1.41 ng/mL	(N: 3.1 - 13.7 ng/ml)
24 hr urinary calcium	80 mg/24 hrs	(N: 50-200 mg/24 hrs)
24 hr urinary cortisol	90 mcg/24 hrs	(N: < 100 mcg/24 hrs)
X-ray DL spine (AP & Lat)	Generalized osteopenia, Anterior wedging of D 8	
X-ray hands (AP)	Generalized osteopenia, no evidence of hyperparathyroidism	
X-ray skull (Lateral)	Normal, no sellar erosion	
X-ray chest	Normal except osteoporosis	
USG abdomen	Normal except GB stones	
Quantitative CT spine	T score 4.46 Z score 1.26	
CT brain	Normal pituitary, no sellar or suprasellar mass	

Final diagnosis

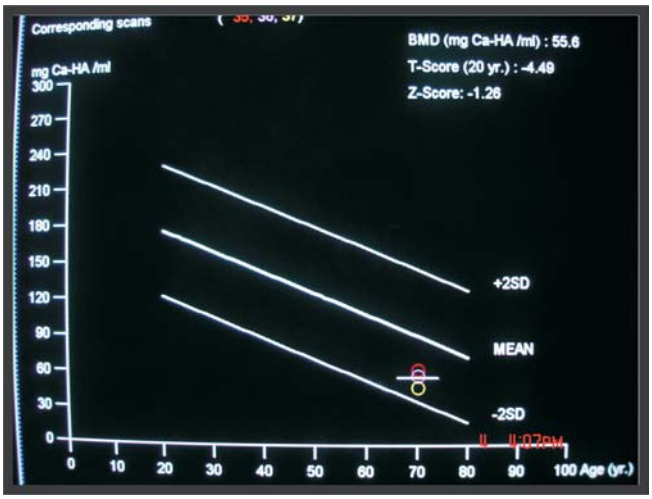
Type II Diabetes mellitus, Essential hypertension, Chronic obstructive airway disease.

Severe osteoporosis: Secondary osteoporosis due to Hypogonadism, Hypovitaminosis, Poor calcium in-take, Chronic smoking, Sedentary lifestyle.

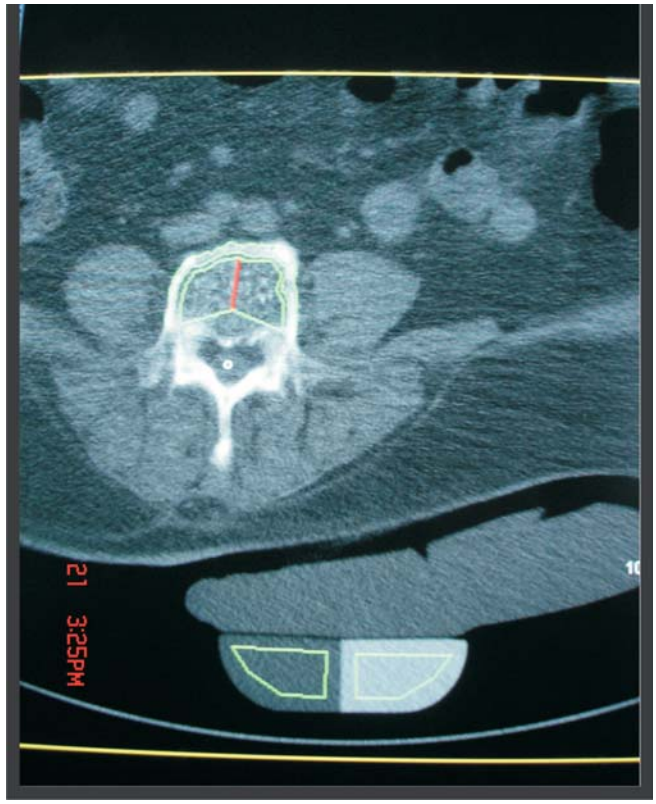
Treatment and Follow up: Patient was initiated on testosterone supplements. Since, he would have been hypogonad for long time, we initiated with smaller doses of 100 mg every 3 week which was increased to 250 mg every 3 week. His vitamin D status was treated with Injectable vitamin D 0.6 million IU deep intramuscular. In the view of severe osteoporosis, he was advised anabolic agent "Teriparatide" 20 mcg subcutaneous daily along with calcium and vitamin D supplements.

Patient responded very well to anti-osteoporotic treatment. His intensity of back pain reduced after 6-8

(*a*) CT scan at Apollo Hospital, Ahmedabad.



(*c*) Graph depicting BMD of patient on BMD curve.



(*b*) Image of lumbar spine used for quantitative CT scan for assessment of bone mineral density.

Fig. 1. qCT of spine, image and plotting.

weeks. Follow-up at 8 months after initiating therapy, he had no back pain. There was a remarkable improvement in neurological deficit. Power in both lower limbs improved and he had grade 3/4 power. He is continued on the same line of treatment and the next BMD assessment is due after 4 months.

DISCUSSION

Osteoporosis in men is now recognized as an increasingly important public health issue. Osteoporosis and osteoporosis related fractures once thought concern for postmenopausal or elderly females, but it is equally important problem in men as well. It is expected that 2 million American men have osteoporosis and another 12 million men are at risk for osteoporosis. One in four men over the age of 50 years is expected to have osteoporosis related fracture in their lifetime [2]. Since, we do not have statistics in India, but scenario not much different. Males have little lesser risk of osteoporosis as compared to females because of several differences in skeletal physiology. First of all, males accrete more calcium during their 2nd and 3rd decade of life and attain higher bone mass as compared to female counterparts. Secondly, the diameter of bone is larger; hence the strength of bone is also higher. Thirdly, males do not have sudden decrement in sex steroids like menopause in females; hence the rapid bone loss is avoided.

Osteoporosis in men very often occurs as a consequence of other disorders. One of the large studies have shown that 2/3rd of males with osteoporosis have secondary cause while only 1/3rd of cases are primary

Table 1: Risk factors for osteoporosis in men.

High-risk causes
History of non-traumatic fracture (hip, vertebrae, or wrist)
Osteopenia seen on plain radiograph
Glucocorticoid use of 5 mg or more per day for longer than six months
Hypogonadism (glucocorticoid-induced or following orchidectomy)
Hyperparathyroidism
Medium-risk causes
Anticonvulsant drug use (phenytoin or phenobarbital)
Excess alcohol consumption
Tobacco use
Rheumatoid or other inflammatory arthritis
Multiple myeloma or lymphoma
Hypothyroidism or hyperthyroidism
Conditions associated with increased risk of falling (nursing home residence, prior fall, gait disorder, dementia, or hemiparesis)
Family history of osteoporosis
Infrequent causes
Cushing's disease
Chronic liver or kidney disease
Low body mass index
Gastric resection

(idiopathic) osteoporosis [3]. Risk factors for osteoporosis in males are enumerated in Table 1. Of these, hypogonadism, alcohol abuse, glucocorticoid use and idiopathic hypercalciuria are common causes. Etiology of primary osteoporosis is mainly genetic. Testosterone levels progressively decline with aging [4]. These declining levels of testosterone is known to cause osteopenia and sarcopenia. Decline is not so much so to cause symptomatic hypogonadism, hence is it often neglected. Acquired profound hypogonadism is known to induce high bone turnover and accelerated bone loss. The role of testosterone in the regulation of bone metabolism is complex. Testosterone is aromatized to estrogen, which plays an important role in preservation of skeletal integrity. Though testosterone is the predominant hormone in males but role of estradiol is equally important in maintaining bone mass in males as well. In the recent cross sectional study, multivariate analysis has shown that free or bioavailable estradiol is a better predictor of BMD in elderly men than free or bioavailable testosterone [5]. Importance of estradiol is also compounded by cohort studies, which have shown that bioavailable estradiol is negatively associated with bone loss assessed prospectively and it is independent of bioavailable testosterone levels [6]. Bone turnover markers have been shown to rise moderately with ageing. Bone turnover marker correlates inversely with BMD. Estradiol has been shown to correlate with bone resorption markers negatively [7]. Data regarding testosterone level and fracture risk is limited. In case control study it has been shown that men presenting with hip fracture have higher prevalence of low testosterone levels [8]. Rancho Bernardo study has also shown lower estradiol level were associated with higher prevalence of vertebral fracture in elderly men [9]. The recent MrOS study have demonstrated that men who had bioavailable testosterone in the lowest quartile has 2.5 times increases risk of non-spine fracture compared with the highest quartile. Testosterone level was associated with risk of fracture independent of bone density [10]. Hence, bioavailable testosterone as well as bioavailable estradiol has shown a strong correlation with bone density, bone turnover and fracture risk. Hypogonadism subjects treated with testosterone supplement have shown changes in bone turnover marker and improvement in BMD [11].

Treatment of male osteoporosis is similar to that of female osteoporosis. Well balanced diet with good amount of calcium of approximately 1500 mg/day and vitamin D 800 IU/day is recommended. Smokers are advised to stop smoking and ethanol to be avoided by alcoholics. Aerobic as well as resistance exercise are recommended. Specific therapy for any identified secondary cause needs to be initiated. Testosterone replacement in hypogonad males has shown increment in spinal BMD by as much as 8% [11,12].

Bisphosphonates is as effective in males as in females. Males treated with 10 mg daily alendronate have shown improvement in lumbar spine BMD of 7.1% vs. baseline at the end of 2 years [13]. Another study has shown increment of 10% at lumbar spine at the end of 2 years [14]. Both studies have reported >50% risk reduction for new vertebral fracture. Residronate has also shown to have similar response in term of BMD increment and fracture risk reduction [15].

Teriparatide is the treatment of choice for patients with severe osteoporosis. Studied have shown increment in BMD of lumbar spine by 10% at the end of one year [16]. This improvement is significant and better than all other available agents. Teriparatide is a bone anabolic agent. It has been shown to increase osteoblast numbers and activity so as to increase bone remodeling rate. It has been shown to increase trabecular thickness and improve trabecular connectivity. It also increases cortical thickness and increase bone size as well.

SUMMARY

Declining sex steroid levels in aging males have adverse effect on skeletal integrity. Aromatization of testosterone to estradiol is a major component of the regulation of bone metabolism in elderly males. Hypogonad males should be treated appropriately with sex steroids. Measure to treat severe osteoporosis includes use of anabolic agent like teriparatide. Response of teriparatide in terms of BMD improvement and fracture risk reduction is better than other available drugs.

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