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Management of osteoporosis in elderly people

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Definition: Osteoporosis means reduced overall bone mineral density (BMD) and increased bone fragility which makes bones more prone for fractures. BMD can be measured by DEXA (Dual energy xray absorptiometry) scan while there is no objective test to measure bone fragility. Osteoporosis is broadly divided as primary and secondary. Primary osteoporosis is again divided into Type 1 or post menopausal osteoporosis and Type 2 or senile osteoporosis. Secondary osteoporosis is also known as Type III osteoporosis. Senile osteoporosis occurs in people beyond 70 years of age with the male to female ratio of 1:2. It is primarily related to ageing process, long standing poor calcium intake, reduced 1,25 (OH)D₃ formation in kidneys and relatively sedentary status. Both cortical as well as trabecular bones are affected in contrast to predominantly trabecular bone involvement in post menopausal osteoporosis. After the age of 65 years more than 80% of females have osteoporosis.

Epidemiology. Eighty percent of women above 65 years of age will have osteoporosis. It is estimated that 1 in 3 women and 1 in 5 men will suffer from osteoporotic fracture sooner or later. Risk of repeat vertebral fracture is 4 times high in a woman who sustains osteoporotic vertebral fracture once than in those who don't get it. About 10-20% of patients die within 1 year and 50% become permanently disabled after sustaining an osteoporotic hip fracture.

Diagnosis:

Bone Densitometry: Gold standard for diagnosis of osteoporosis is with DEXA scan.. Since the management of osteoporosis is a long term treatment requiring at least for 2-5 years, correct diagnosis is very important. Plain X-Rays underestimates the severity of osteoporosis. By the time changes of osteoporosis appear on plain radiographs at least 30% of bone mass is lost. Ultrasound based bone density measurement is good for screening purpose but should be followed by DEXA scan before starting specific medical therapy. As per WHO definition of osteoporosis, if DEXA scan shows 'T' score less than - 2.5, it is osteoporosis while if it is between -1.0 to -2.5 it is defined osteopenia.

‘T’ score more than – 1.0 is considered normal bone density. Bone turn over markers are good for monitoring the osteoporosis treatment but not for diagnosis.

Bone turnover markers: Bio chemical markers of bone turnover like urine free deoxypyridinoline, serum osteocalcin and serum bone specific alkaline phosphatase may be used in monitoring of osteoporosis treatment. They are how ever not used for diagnosis of osteoporosis and even in follow up they always don’t correlate with the response to pharmacological therapy (6).

Treatment: Each and every patient considered for osteoporosis treatment must under go battery of investigations like thyroid profile, renal and liver function tests, blood glucose test and haematological tests to rule our secondary cause of osteoporosis.

Calcium supplementation: Adequate calcium intake in tune of 1000-1500 mg of elemental calcium is must for every one receiving osteoposis treatment. . Following table gives idea about calcium content from common dietary sources (1-3). We must encourage the patient for adequate dietary calcium intake and over and above all patients of osteoporosis must receive additional calcium supplementation. Calcium carbonate is a fairly good form of calcium supplementation to prescribe because of easy availability and good bioavailability for elemental calcium (40-45%). Those who don’t tolerate calcium carbonate should receive calcium citrate for calcium supplementation.

Food Sources of Calcium	
Instant Oatmeal, 3/4 cup	163
2% Cottage Cheese, 1 cup	155
Broccoli, 1 stalk	150
Pizza, 1 slice	150
Milk, 1/2 cup	150
Buttermilk, 1/2 cup	150
Baked Custard, 1/2 cup	149
Pudding, 1/2 cup	146
Blackstrap Molasses, 1 T	137
Instant Nonfat Dry Milk, 2 T	105
Gruyere Cheese, 1 oz.	287
Mozzarella Cheese, 1 oz	207
Cheddar Cheese, 1 oz.	204
Yogurt, 1/2 cup	200
Macaroni & Cheese, 1/2 cup	200
7 ² Homemade Waffle, 1	179
Vanilla Ice Cream, 1 cup	176
Ice Milk, 1 cup	176
American Cheese, 1 oz	174
Ricotta Cheese, 1/4 cup	167

Vitamin D supplementation: As the age advances, skin cannot synthesize vitamin D as efficiently and the kidney is less able to convert vitamin D to its active hormone form. Vitamin D is important for adequate calcium absorption from gut, maintaining normal

calcium and phosphorus level and mineralization of bones. In contrary to common belief vitamin D deficiency, serum 25 (OH) D3 less than 25 ng/ml is very common in India in spite of adequate sun light. Many studies have reported that below this level of Vitamin D, PTH level starts rising. As per surveys conducted across the India approximately 50% of people are vitamin D deficient in spite of adequate sunlight every where. Pigmented skin interfering with ultra violet rays action, social customs and clothes depriving people of adequate sunlight, increased phytate contents in Indian 'roti' interfering with vitamin D absorption are the reasons quoted for increased vitamin D deficiency in India. Approximately 5-30 minutes of sun exposure between 10 AM and 3 PM at least twice a week to the face, arms, legs, or back with applying sun screen usually lead to sufficient vitamin D synthesis. Excess of UV radiation is carcinogenic to skin. Warnings about skin cancers from sunlight exposure in western countries may have increased risk for osteoporosis. People above 65 years of age must receive at least 800 IU of vitamin D daily.

Weight bearing exercise: Immobilization, bed ridden state leads to increased tendency for osteoporosis. Whenever possible patient should be encouraged for ambulatory life and weight bearing exercise.

Bisphosphonates: In established cases of osteoporosis only calcium and vitamin D supplementation are not sufficient to correct the osteoporosis. Bisphosphonates like Alandronate, Risedronate, Ibandronate and Zolendronic acid are available as daily, weekly, monthly and yearly once therapy respectively. in age groups of 50-65 especially when bone turnover markers levels are high. How ever in elderly people beyond 65 when there is mainly low bone turnover disease & osteoclastic resorption is minimum they don't help much.

Estrogens: Even though very potent anti resorptive agent especially in post menopausal women, due to its side effect profile and with availability of many other anti resorptive agents, they are no longer used for the treatment of osteoporosis.

Raloxifene: It belongs to a group called selective estrogen receptor modulators (SERMS). It prevents vertebral osteoporotic fracture in tune of 30-40%. It is available as 60 mg once/day oral tablets

Calcitonin: Daily treatment with 100 IU calcitonin (injections or through nasal spray) for initial period of 2-4 weeks is a potent anti resorptive agent useful in painful osteoporosis. How ever with availability of so many other anti resorptive agents use of calcitonin in treatment of osteoporosis has been marginalized.

Teriparatide: Parathyroid hormone is otherwise potent bone resorpting agent when given continuously. As seen in cases of primary hyperparathyroidism where PTH levels are persistently high. When given in pulses PTH acts as potent bone forming agent. PTH (1-34), is a recombinant DNA product which contains first 34 amino acids of total 84 amino acid structured human parathyroid hormone. Studies have shown that PTH acts on bone building cells called osteoblasts to stimulate new bone growth and improve bone density. It is given as 20 microgram subcutaneously daily for 18 months. Unlike agents already in use that prevent further bone loss (such as estrogen and bisphosphonate), synthetic PTH may have the potential to replace depleted bone stores.

Anabolic steroids: Even though used commonly, they have limited role in bone formation and they don't improve osteoporosis significantly.

Newer agents: Role of receptor activator of nuclear factor- κ B ligand (RANKL) in causing increased bone resorption is now well established. Successful clinical trials about once in 6 months subcutaneous therapy with Denosumab (human monoclonal antibody to RANKL) are recently published (4-5) and this agent awaits FDA approval for the treatment of osteoporosis. Vitamin D analogues are other group of agents which may be useful in preventing glucocorticoids induced osteoporosis.

Compounding factors while managing osteoporosis in elderly people: In elderly people there are several compounding factors apart from ageing process to cause increased risk of osteoporosis. Sedentary or bed ridden states will per se cause osteoporosis and it also deprives them of adequate sun exposure. Poor nutrition especially poor calcium and vitamin D makes them prone for osteoporosis. Smoking also aggravates tendency for osteoporosis. Age related androgen deficiency contributes to osteoporosis and should be treated on case to case basis. Concomitant drugs like glucocorticoids, over dosage of thyroxine, anti diabetic agents like pioglitazones etc. increase the risk of osteoporosis. Associated conditions like diabetes, hyperthyroidism and haematological malignancy will make their osteoporosis worse. One must search for undetected and undiagnosed ailments like vitamin D deficiency, primary, asymptomatic hyperparathyroidism and over corrected hypothyroidism while managing osteoporosis in elderly people.

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