ORIGINAL ARTICLE

Osteomalacia in Neurosurgical Practice - A Review of 32 Cases

MUMTAZ ALI, YASEEN KHAN, SHAMS
Shahid Ayub, Shah Jehan
Department of Neurosurgery, PGMI, LRH, Peshawar

ABSTRACT:

Objectives: *To assess the apparently neurosurgical presentation of patients suffering from osteomalacia which is potentially preventable and treatable metabolic disease, (mimicking discogenic disorder), osteomalacia.*

Study Duration: *January 2005 to December 2006, covering a period of two years in the department of Neurosurgery Lady Reading Hospital, Peshawar and Department of Medicine Hayatabad Medical Complex Peshawar.*

Study Design: *Descriptive observational study.*

Material & Method: *This is a review study of 32 cases of osteomalacia presenting as discogenic disorder, collected from the Neurosurgery OPD. A separate Performa, which outlined, age, sex, marital status, gestational history, educational status, main presenting complaints, history of exposure to sunlight in the domain of urban and rural set up. The duration of the symptoms, history of medical and surgical treatment and procedures was used. This was supplemented by appropriate hematological and biochemical profile namely hemoglobin concentration, ESR, serum calcium, phosphate and serum alkaline phosphates levels. A detailed note of the plain radiological findings mainly the looser zones and CT scan or MRI findings was also made to exclude the other diseases. All patients having biochemical profile and radiological evidence of osteomalacia were included. While patients having other orthopedic, neurosurgical and medical conditions not fulfilling this criteria were excluded. The available data was analyzed according to the set parameters and was later used for discussion and recommendation.*

Results: *Out of the total 32 (n=32) patients who presented with osteomalacia, 29 (90.62%) were female and 3 (9.37%) were male. The presenting age for both these ranged from 14 to 45 years with a mean age of 23 years. The educational status included 27 (84.37%) illiterate. 3 (9.37%) matriculate and Two (6.25%) Graduate. Twenty (62.5%) patients belonged to the rural set up and 12 (37.4%) patients presented from urban locations. Among the females (n=29) 7 (24.13%) were multiparae, 9 (31.03%) were non-multiparae and 5 (17.24%) were having no issues while 8 (27.58%) were unmarried. The average duration of symptoms was 3-9 months. Significant past surgical history included spinal surgery in 3 (9.37% and 2 (6.25%) patients underwent bone biopsy. The exposure to sunlight was adequate in 23 (71.87%) and it was inadequate in only 9 (28.12%) cases. The hematological values recorded included* ***hemoglobin*** *of less than 10gm% in 17(53.12%) cases with normal valves in 15 (46.87%) cases. The* ***ESR*** *was raised in 21 (65.62%) to levels above 30mm/1st hour and was less than 30mm/ 1st hour in 11 (34.37%) cases.* ***Serum calcium*** *was below normal in 23* ***(71.37%) cases*** *and normal in only 9* ***(28.12%) cases****.* ***Serum alkaline phosphates*** *values were very much reliable and raised above 3000-IU in only 18 cases (60.5%) and markedly raised in patients with fractures. The* ***plain x-ray*** *revealed Osteopenia in 9 cases (28.1%) only while* ***looser zones*** *were seen in 23 cases* ***(74.9%)****.*

Conclusion: *Depending upon our socioeconomic, literacy and health care delivery apparatus, strange observations can be made in very specialized field of health profession. Neurosurgery is no exception to it as a sizeable number of* ***chronic backache and bone pain syndrome*** *patients averaging 1.34 cases per month over the two years study has demonstrated the need for more primary health care delivery system as well as proper*

referral for the adequate and timely treatment of an otherwise treatable disease. From the Results of our study it is obvious that: Osteoporosis is ***more common*** *in females, (90.62%), rural areas (62.5%) and illerate (84.37%) which is probably due to GIT disorders and poor oral intake of Vitamin D and bad renal status. All cases of osteoporosis present with Backache and majority with generalized body aches as well. Haemoglobin, less than 10 gm (53.12%), raised ESR, (65%) subnormal serum calcium level (71%) decreased serum phosphate level (100%) and bone changes, in plain X-rays are the* ***best investigations*** *to establish the diagnosis. Patient with the other systemic causes like GIT disorders and renal failure should be checked for latent osteoporosis.*

Key words: *Osteomalacia; Osteoporosis, Osteopenia, ESR, looser zones (pseudofractures)*

INTRODUCTION

Osteomalacia is a disorder in which mineralization of the organic matrix of the skeleton is defective in the adults. Unlike rickets in the children, this disorder involves the diaphysis of the long bone and the vertebra as the epiphyseal growth plates are already closed. This itself is not a specific disease but is a constellation of the radiographic and histopathologic features involving the bone.

For the sake of clear description this can be classified into following 11 broader sub types each of which is further divided according to different diseases.

i. Due to vitamin D deficiency.
ii. Due to GIT disorders.
iii. Due to disorders of vitamin D metabolism.
iv. Intractable chronic acidosis, chronic renal failure.
v. Phosphate depletion.
vi. Generalized tubular disorder (Fanconi Syndrome).
vii. Primary mineralization defects.
viii. Rapid bone formation, osteopetrosis.
ix. Fibrogenesis imperfecta ossicum.
x. Oncogenic osteomalacia in granulomas, hemangiomas, fibroma, carcinoma prostrate.

To summarize both the calcium features include skeletal deformities, fractures, weakness, hypotonia, tetany, seizures, and irritability. The deformities may be overlooked; diffuse skeletal pain and bony tenderness, along with the hesitancy to walk due to fractures of the vertebra and ribs.

Radiologically the general features include the loss of trabeculae and thinning of the cortices producing homogeneous ground glass appearance, more specific however, is the looser zone (pseudo-fracture) that is due to the mechanical stress of the pulsation of the vessels over the pubic raised, femoral neck, outer edge of scapula, upper fibula and metatarsals. The radionuclide studies reveal "hot spots" over these areas.

Sub periosteal erosion may sometimes be seen in cases of secondary hyperparathyroidism along the diaphyseal cortices.

In renal tubular acidosis although there will be thickening of the cortices and trabecular of long bones (renal osteodystrophy); the Osteoid will be weak and devoid of proper mineralization.

The different disorder. Serum calcium may be low or normal, phosphate levels are invariably decreased; 25 (OH) D levels are low however the 1, 25 (OH) 2D may be normal or increased due to secondary hyperparathyroidism. Alkaline phosphates levels may be normal but can be raised in fractures and during the course of the therapy. The standard treatment is usually 800-4000 IU of NTD (0.02-01 mg) daily for 6-12 weeks followed by 200 –400 IU supplements over 6 months.

Pseudo-fractures require a dose of 2000 IU (0.5 mg) and visually heal in six months.

Intravenous calcitruol 0.5-lug per kg may be required in severe cases especially in patients with chronic renal failure.

AIMS AND OBJECTIVES

The objective of this study was to assess the clinical features of Osteomalacia, mimicking discogenic disorder in Neurosurgical practices.

MATERIAL AND METHOD

This is an observational descriptive study of cases collected over a period of two years in the Neurosurgery department Lady Reading Hospital, and Department of Medicine, Hayatabad Medical Complex Peshawar who after careful review was found to have osteomalacia but presented to neurosurgeon due to backache and pain in the extremities especially the lower limbs. This constitute those cases who were definitively diagnosed and excluded the other potential cases of osteomalacia which might have been disposed off from the OPD due to overload and non availability of in patient vacancy. These patients actually mimicked

neurosurgical problems it was only after a careful review that diagnosis of osteomalacia was achieved. As ideally the physicians should have evaluated these patients we decided to conduct this observational study for academic interest and more importantly the benefit of the sufferers, as this was a missed opportunity at diagnosis. These patients continue to suffer due to lack of proper set up of diagnosis and treatment at the primary and secondary level of health survives as the majorities were referred directly to neurosurgeon and General Physician.

We used a preformed proforma with set parameters of age, sex, marital status, literacy level, occupation, the number of children in the females, whether they were breat fed or not, the previous medical and surgical history, drug history. A special note was made of the main presenting symptoms, this was tallied with the plain radiological features, CT scan and MRI was done in selected cases to exclude concomitant or latent neurosurgical and orthopedic disease. Laboratory findings were noted separately in the headings of anemia, ESR, serum calcium levels, serum alkaline PO4 as and serum phosphate levels.

All the data so collected was expressed as mean ± standard deviation. SPSS **soft ware** was used for statistical analysis.

A limited number of cases were followed up after the appropriate treatment and as was expected the majority did not turn up once their complaint is corrected.

Patients with gastrointestinal treat GIT disorders and chronic renal failure were also excluded from the study for obvious reasons.

RESULTS

Out of the total 32 cases (n=32); 29 (90.62%) were females and 3 (9.37%) were male so a M : F ratio of 1:9.8 was noted as shown in Table 1. These patients belonged to adult age group with a range of 14 to 45 years, the mean age being 23 years. Of the 29 females 7 (24.13%) cases were multiparae; 9 (31.03%) were non multipara, 5 (17.24%) did not have any issues despite marriage and 8 (27.58%) cases were unmarried as shown in Table 2.

Table 1: *Male female ratio.*

Sex	Male	Female	Total
No.	3	29	32
%	9.37%	90.62%	100%

Table 2: *Para v/s non Para.*

No.	Current status	Total No.	Percentage
1.	Multiparae	7	24.13
2.	non multipara	9	31.03
3.	Married	5	17.24
4.	Unmarried	8	27.58

Of the Three males, all (100%) were married. Among the 16 females cases with children; 12 (75%) were actively breast-feeding at that time while 4 (25%) were non breast-feeding as shown in Table 3.

Illiterate constituted the majority 27 (84.37%) cases while only 2 (6.25%) cases were graduated, 3 (9.37%) cases only had matriculation as shown in Table 4. Twenty (62.5%) cases belonged to rural localities while only 12 (37.4%) were referred from urban centers as shown in Table 5. Still more interesting was the fact that 23 (71.8%) cases reported adequate exposure to sunlight. The clinical features included backache in 32 (100%) cases, pain in both the

Table 3: *Lactating v/s non lactating.*

Brest feeding female	12	75%
Non Brest feeding	04	25%

Table 4: *Education ratio.*

Education	Number	Percentage
Illiterate	27	84.37%
Matriculate	03	9.37%
Graduate	02	6.25%

Table 5: *Rural Urban ratio.*

Area	Number	%
Rural	20	62.5%
Urban	12	37.4%
Total	32	100%

Table 6: *Current Problem.*

Clinical Presentation	No. of patients
Backache	32 (100%)
Pain in both legs	14(43.79%)
Generalized body aches	29(90.62%)

leg in 14 (43.79%) generalized body aches in 29 (90.62%) cases, bony tenderness in 26 (81.25%) cases as shown in Table 6. Past history of hospitalization was noted in 19 (59.37%) cases, of these 14 (73.68%) were admitted in medical units without proper diagnosis and 5 (26.31%) cases had surgical admission while 3 patients under going spinal surgery and 2 patients having bone biopsy from the apparently suspicious lesion on x-ray. laboratory results showed **hemoglobin** of less than 10gm% in only 17 **(53.12%)** cases in the rest 15 (46.87%) cases it was normal. **ESR** was used as a prognostic indicator and was raised in 21 **(65.62%)** cases only in levels more than 30mm 1st hour.

The **serum calcium** levels were **low** in 23 **(71.87%)** cases while it was normal in 9 (28.12%) cases as shown in Table 8. The **serum phosphates** level was **invariably low (almost 100%)** in all cases. The serum alkaline phosphates levels however varied and were markedly raised only in cases of stress fractures; 14 (43.75%) cases.

The plain x-ray showed Osteopenia in 9 (28.12%) cases and looser zones in 23 (71.9%) cases. Of these looser zones (pseudo-fractures) 8 (25%) were noted in the pubic rami, 9 (28.13%) were noted in the subtrochanteric area of the femur, 2 (12.5%) were noted in the scapula and one in the fibula bone. Changes in the rib were noted in 2 (6.25%) cases.

A combination of all the above features was noted in 13 (40.62%) cases.

DISCUSSION

The distinction between medicine and surgery may be the arbitrary terminology for the health providers who direct their attention at a specified specialty in the west where every citizen is health ensured and the state is bound to spend a specified amount on the health care of its citizen. Condition however is quite different in a third world country like Pakistan and the NWFP being a further down the road in terms of health care delivery system in Pakistan. Consequently our study might be taken as tip of an iceberg of the prevailing situation in this province. People fail to get a proper medical record/check up and as a result every individual has no obligation to first report to the primary and secondary health care facility. He or she directly can visit the specialty of his choice and get on self-examined. More disturbing is the fact that physicians may be treating a surgical cause and the surgeon doing the vice versa. Our study highlighted this big yield of 32 diagnosed metabolic cases that presented to neurosurgeon; it is high time for improving the basic health setup as well as proper referrals in addition to the quality healthy education. The fact that 14 cases (43.75%)[1] had stress fracture speaks volume of the inadequate diagnosis and treatment.

Moreover, our study demonstrated a visible change in the rural/urban set up and the history of exposure to **sunlight**. This shows that **other factors involved** in **osteoporosis** must also be looked into by the health professional. **Women** were shown to be affected more (90.62%)[2] in our study compared to the study by RIGGs BL in which male were equally affected. That is another indicator of our poor socioeconomic status where women are neglected in every field. No demonstrable variations were noted in our study regarding the status of lactation and married status, comparable to the study of widener N[3].

Although there is no consensus on optimal levels of 25-hydroxyvitamin D as measured in serum, vitamin D deficiency is defined by most experts as a 25-**hydroxyvitamin D level** of less than **20 ng per milliliter (50 nmol per liter)**.[4] 25-Hydroxyvitamin D levels are inversely associated with parathyroid hormone levels until the former reach 30 to 40 ng per milliliter (75 to 100 nmol per liter), at which point parathyroid hormone levels begin to level off (at their nadir).[5] Furthermore, intestinal calcium transport increased by 45 to 65% in women when 25-hydroxyvitamin D levels were increased from an average of 20 to 32 ng per milliliter (50 to 80 nmol per liter).[6] Given such data, a level of 25-hydroxyvitamin D of 21 to 29 ng per milliliter (52 to 72 nmol per liter) can be considered to indicate a relative insufficiency of vitamin D, and **a level of 30 ng per milliliter or greater can be considered to indicate sufficient vitamin D**.[7] Vitamin D intoxication is observed when serum levels of 25-hydroxyvitamin D are **greater than 150 mg** per milliliter (374 mnol per liter).

With the use of such definitions, it has been estimated that **1 billion** people worldwide have vitamin D **deficiency** or insufficiency.[4] According to several studies, 40 to 100% of U.S. and European elderly men

and women still living in the community (not in nursing homes) are deficient in vitamin D.[4] More than 50% of postmenopausal women taking medication for osteoporosis had suboptimal levels of 25-hydroxyvitamin D — below 30 ng per milliliter (75 nmol per liter).[8]

Children and young adults are also potentially at high risk for vitamin D deficiency. For example, 52% of Hispanic and black adolescents in a study in Boston[9] and 48% of white preadolescent girls in a study in Maine[10] had 25-hydroxyvitamin D levels below 20 ng per milliliter. In other studies, at the end of the winter, 42% of 15- to 49-year-old black girls and women throughout the United States had 25-hydroxyvitamin D levels below 20 ng per milliliter,[11] and 32% of healthy students, physicians, and residents at a Boston hospital were found to be vitamin D–deficient, despite drinking a glass of milk and taking a multivitamin daily and eating salmon at least once a week.[12]

In Europe, where very few foods are fortified with vitamin D, children and adults would appear to be at especially high risk.[13] People living near the equator who are exposed to sunlight without sun protection have robust levels of 25-hydroxyvitamin D — above 30 ng per milliliter.[14] however, even in the sunniest areas, vitamin D deficiency is common when most of the skin is shielded from the sun. In studies in Saudi Arabia, the United Arab Emirates, Australia, Turkey, India, and Lebanon, **30 to 50%** of children and adults had 25-hydroxyvitamin D levels under **20 ng per milliliter**.[15] Also at risk were **pregnant and lactating women** who were thought to be immune to vitamin D deficiency since they took a daily prenatal multivitamin containing 400 IU of vitamin D (70% took a prenatal vitamin, 90% ate fish, and 93% drank approximately 2.3 glasses of milk per day)[16] 73% of the women and 80% of their infants were vitamin D–deficient (25-hydroxyvitamin D level, <20 ng per milliliter) at the time of birth.[17]

In short our patents differ from the western countries where the **sun light** exposure is the dominant factor[18] for the osteoporosis comparable to our set up where a detailed **GIT, neuro-endocrine and renal profile** is advisably looked into as a cause for osteoporosis.

RECOMMENDATIONS

(A) Daily Requirement

Recommendations from the Institute of Medicine for adequate **daily intake of vitamin D** are +**200 IU** for children and adults up to 50 years of age, +**400 IU** for adults 51 to 70 years of age, and +**600 IU** for adults 71 years of age or older.[19] However, most experts agree that without adequate sun exposure, children and adults require approximately 800 to **1000 IU per day**.[13]

(B) Treatment

Children with vitamin D deficiency should be aggressively treated to prevent rickets.[13]

I) Since **vitamin D_2** is approximately 30% less effective as compared to vitamin D_3 in maintaining serum **25-hydroxyvitamin D levels**,[20] Serum dose of vitamin D_2 will be **three times** higher as compared to vitamin D^3 to maintain sufficient levels.

A cost-effective method of correcting vitamin D deficiency and maintaining adequate levels is to give patients a **50,000-IU capsule of vitamin D_2 once a week for 8 weeks**, followed by 50,000 IU of vitamin D_2 **every 2 to 4 weeks thereafter**.[21]

II) Alternatively, either **1000 IU of vitamin D_3 per day** (available in most pharmacies) or **3000 IU of vitamin D_2 per day** is effective.[21]

Strategies to use **100,000 IU of vitamin D_3 once every 3 months** have been shown to be effective in maintaining **25-hydroxyvitamin D** levels at **20 ng** per **milliliter** or higher and are also effective in reducing the risk of fracture.[22]

Intravenous calcitruol 0.5-lug per kg may be required in severe cases especially in patients with chronic renal failure.

To summarize:

1. Osteomalacia is a preventable disease.
2. Simple markers of the disease like hemoglobin, serum calcium and serum phosphate levels can help in the diagnosis.
3. Plain x-rays are rewarding in the typical cases.
4. A proper system of referral should be established at the primary and secondary health care levels, which could optimize the use of resources and facilitate in the diagnosis and treatment of disease.

CONCLUSION

Depending upon our socioeconomic, literacy and health care delivery apparatus, strange observations can be made in very specialized field of health profession. Neurosurgery is no exception to it as a sizeable number of chronic backache and bone pain syndrome patients averaging 1.34 cases per month over the two years study has demonstrated the need for more

primary health care delivery system as well as proper referral for the adequate and timely treatment of an otherwise treatable disease.

From the Results of our study it is obvious that:

1. Osteoporosis is more common in females, 90.62% were female.
2. It is more common in Rural areas (62.5%) and illerate (84.37%) which is probably due to GIT disorders and poor oral intake of Vitamin D and bad renal status.
3. All cases of osteoporosis present with Backache and majority with generalized body aches as well.
4. Haemoglobin, less than 10 gm (53.12%), raised ESR, (65%), subnormal serum calcium level (71%) decreased serum phosphate level (100%) and bone change, in plain X-rays are the **best investigations** to establish the diagnosis.
5. Patient with the other systemic causes like GIT disorders and renal failure should be checked for latent osteoporosis.

Address for Correspondence:
Dr. Mumtaz Ali
Asst. Prof of Neurosurgery, PGMI LRH
Peshawar

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