

Rehabilitation in Osteoporosis - therapeutic challenge?

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Abstract

Introduction. Osteoporosis is a disease of the entire skeleton, characterized by decrease bone mass and microarchitectural alterations of bone tissue, which result in increased bone fragility and predisposition to bone fractures. **Materials and methods.** Accessing standard medical databases: Medline, Embase, Database, Pubmed and the Cochrane Register of Controlled Studies to review new pharmacological studies and non-pharmacological therapies in osteoporosis. Statistical analysis performed from the data extracted from the observation sheets from June 2019 to December 2019 by Dr. Liliana Stanciu. **Results and discussions.** The complex balneo-physical-kinetic treatment is an important link in the treatment of the disabling pathology for the patient, with an important clinical resonance. **Conclusion.** Osteoporosis is a pathology that decreases the patient's quality of life. There are complementary therapies to pharmacological treatment with immediate and long lasting results.

Keywords: *mud, osteoporosis, balneal, hormones,*

Introduction

Osteoporosis is a progressive systemic skeletal disease (1) characterised by decreased bone mineral density and microarchitectural damage of bone tissue with increased susceptibility to fractures (2), which can subsequently cause a functional deficit, with decreased quality of life, in the absence of an adapted medical rehabilitation program. Osteoporosis classification criteria published by World Health Organization (WHO) according to DXA (dual energy X-ray absorptiometry) osteodensitometry are as follows, represented in Table 1.

Table 1 Data from Kanis et al (3).

Classification	T-score
Normal	≥ -1.0
Low bone mass (osteopenia)	Between -1.0 and -2.5
Osteoporosis	≤ -2.5
Severe or established osteoporosis	≤ -2.5 with one or more fractures

Most women with osteoporosis are asymptomatic, which makes epidemiological research especially difficult (4). The main factors associated with low bone mineral density (BMD) are old age, menopause, a history of previous fractures and smoking. Women with a higher body mass index who performed regular physical activity and followed hormone replacement therapy had a lower prevalence of low bone mineral density (5). Recently, Baccaro et al. reported that female patients with osteoarthritis who are going through menopause for a longer period of time, have balance disorders, associated

functional deficit, have a higher prevalence of osteoporosis (6). Additional skeletal and extra-skeletal factors, such as bone geometry, microdamage, mineralization, age, and a wide range of clinical risk factors, including family history, previous fracture, and fall risk, contribute to the overall assessment of fracture risk (7-10). Many of these factors are identified with FRAX score. It estimates the 10-year probability of hip fracture and major osteoporotic fracture based on individual's risk profile (11). Several determined factors are the subject of clinical research (12-19) using new imaging techniques, such as Quantitative Computed Tomography (QCT) and High Resolution (Peripheral) QCT (20, 21) and minimally invasive approaches for establishing the structure of bone material (22). Although there is evidence of their predictive capacity for fractures (23, 24), none of these modalities appear to reliably exceed BMD in predicting different types of osteoporotic fractures, and their general lack of availability and validation in the clinical setting only attributes an adjunct role to the determination of BMD measured by DXA. In contrast, trabecular bone score (TBS) is a new imaging technique, based on standard DXA imaging and appears to be an index of bone texture that provides additional skeletal information to standard BMD results (25). TBS is not a direct measure of bone microarchitecture, but is related to 3D bone characteristics, such as number of trabeculae, trabecular organization, and connection density [26, 27]. A high TBS seems to represent a strong, fracture-resistant microarchitecture, while a low TBS reflects a weak, fracture-prone microarchitecture. Thus, there is evidence that TBS can differentiate between two three-dimensional (3D) microarchitectures that have the

same bone density but different trabecular features. TBS is generally obtained by reanalysing DXA images of lumbar spine AP, which allows direct comparison with a BMD and application to existing data sets. The latter opportunity has led to a rapid increase of published research assessing its potential role in the evaluation and management of osteoporosis. Lumbar TBS, like BMD, is an age-dependent variable. There are few changes in TBS between the ages of 30 and 45 years. Subsequently, there is a progressive decrease with age (28), which is more relevant in women than in men. The decrease percentage with age is similar to that for the lumbar spine of BMD, as well as short-term reproducibility (26).

Spinal radiography is of particular importance for patients at risk for osteoporosis, as the presence of asymptomatic vertebral fractures significantly increases the risk of new fractures, both axial and peripheral, (29) and may change the therapeutic approach, especially in patients with osteopenia. Spinal radiographs should be performed for women who have dropped ≥ 2.5 cm in height over a 2-year period, with associated pain or changes of vertebral static, as well as for people with chronic glucocorticoid use (30,31).

Material and method

Accessing standard medical databases: Medline, Embase, Database, Pubmed and the Cochrane Register of Controlled Studies to review new pharmacological studies and non-pharmacological therapies in osteoporosis. A retrospective study was performed on the consultation sheets of patients hospitalised within Balneal and Rehabilitation Sanatorium of Techirghiol during June-December 2019, with attending physician Dr.Stanciu Liliana. The rehabilitation treatment applied daily to the patients included in the study during the hospitalization consisted of peloidotherapy and hydrokinetotherapy in the therapeutic pool with water from Techirghiol Lake or in Techirghiol Lake during the summer and adjuvant procedures (electrotherapy, physiotherapy, massage therapy)(32,33). The study was carried out with the approval of Ethics Council within Balneal and Rehabilitation Sanatorium. Considering a total number of 453 hospitalizations performed during the study period, a number of 83 patients presented a diagnosis of Osteoporosis / Osteopenia, a pathology that is a criterion of inclusion in the study. The items considered in the statistical analysis were the following:

1. Age
2. Gender
3. Area of origin
4. Body weight and height (BMI)
5. Diagnosis and date of diagnosis
6. Axial T-score, peripheral T-score, DXA on bone mineral density assessment (BMD)
7. VAS at hospital admission and VAS at discharge
8. Mud and baths

9. Presence/absence of fragility fractures
10. Associated pathology
11. Medication

Results and discussions

In this scientific approach, 453 consultation sheets were included in the study among the patients hospitalised at Balneal and Rehabilitation Sanatorium of Techirghiol. Of these, only 83 consultation sheets (18.32%) were included in the study. The remaining 370 patients (81.68%) were not diagnosed with Osteoporosis/Osteopenia (Table 2).

Table 2. Included in the study

		Frequency	Percent
Valid	Yes	83	18.32
	No	370	81.68
	Total	453	100.00

Predominant patients from our study are aged between 60-70 years, with a number of 47 people (56.63%). Between the ages of 70 and 80 years, there were 20 patients (24.10%), and the category with the fewest patients was between 50-60 years, with only 16 patients (19.28%), according to table 3.

Table 3. Age (in years)

		Frequency	Percent
Valid	[50-60)	16	19.28
	[60-70)	47	56.63
	[70-80)	20	24.10
	Total	83	100.00

The evaluation of patients in the present scientific research reported that a number of 2 patients (2.41%) were men and the remaining 81 patients (97.59%) were women, a major difference between the proportion of patients in terms of item studied, namely the gender (Table 4).

Table 4. Gender

		Frequency	Percent
Valid	Female	81	97.59
	Male	2	2.41
	Total	83	100.00

Only a number of 13 patients (15.66%) came from rural areas, and the remaining 70 patients (84.34%) from urban areas, probably due to a greater addressability to medical recovery services (Table 5).

Table 5. Area of origin

		Frequency	Percent
Valid	Urban	70	84.34
	Rural	13	15.66
	Total	83	100.00

The statistical analysis of patients in the study revealed that the diagnosis of Osteopenia (Op) predominated with a number of 46 patients, 55.42%. A number of 13 patients, 15.66% were diagnosed with Osteoporosis (OP) Type I- post menopause, 25.30%, 21 patients with senile OP Type II. Only a number of 3 patients, 3.61% were diagnosed with axial OP, concomitantly with peripheral Op (Table 6).

Table 6. Types of osteoporosis

	Frequency	Percent
Valid Op	46	55.42
OP Type I	13	15.66
OP Type II	21	25.30
Ax OP + Perif Op	3	3.61
Total	83	100.00

The statistical analysis indicated that 37 patients, 44.58% were diagnosed with OP, in a relatively similar proportion to patients diagnosed with Op- 46 patients, 55.42% (Table 7).

Table 7. Comparative Diagnosis

	Frequency	Percent
Valid OP	37	44.58
Op	46	55.42
Total	83	100.00

The results obtained after the performed statistical analysis present that a number of 57 patients, 68.67%, followed a treatment with sapropelic mud of Techirghiol inside the sanatorium, while, 31.33%, 26 patients a mud treatment, in contrast therapy regimen in the Cold Baths Department of sanatorium (Table 8).

Table 8 Mud treatment

	Frequency	Percent
Valid Inside	57	68.67
Outside	26	31.33
Total	83	100.00

81 patients, 97.59%, were identified as having the indication of hydrokinotherapy in therapeutic pool for the treatment performed. Only 2 patients, 2.41%, did not follow this form of therapy. This result highlights the special therapeutic importance of hydrokinotherapy for patients with changes in bone mineral density (34), as is shown in Table 9.

Table 9. Pool treatment

	Frequency	Percent
Valid Yes	81	97.59
No	2	2.41
Total	83	100.00

The statistical analysis indicates that 4 patients, 4.82%, associated the diagnosis of hypertension- high blood pressure (HBP) with decreased bone mineral density. A number of 36 patients, 43.37%, presented the diagnosis of Discopathy (DDD). The association of HBP with Diabetes Mellitus (DM) was registered for a number of 3

patients, 3.61%, while HBP and DDD were registered for a number of 34 patients, 40.96%. Diabetes was associated with the diagnosis of Discopathy for a single patient, 1.20%. Association of 3 comorbidities, Hypertension, Diabetes mellitus, Discopathy was present in case of 4 patients, 4.82%. A single patient, 1.20%, was analysed as associating other pathologies than those mentioned above with a higher frequency among patients who go to the sanatorium (35,36), according of Table 10.

Table 10. Associated pathology

	Frequency	Percent
Valid HBP	4	4.82
DDD	36	43.37
HBP+DM	3	3.61
HBP+DDD	34	40.96
DM+DDD	1	1.20
HBP+DM+DDD	4	4.82
Other pathologies	1	1.20
Total	83	100.00

Axial fractures were reported for a number of 2 patients, 2.41%, and a number of 17 patients, 20.48%, recorded peripheral fractures. 2.41% of patients had both axial and peripheral fractures. 62 patients were identified, 74.70%, as not presenting fractures (Table 11).

Table 11. Presence of Fractures

	Frequency	Percent
Valid Axial fractures	2	2.41
Peripheral fractures	17	20.48
Axial and peripheral fractures	2	2.41
No fracture	62	74.70
Total	83	100.00

This point of statistical analysis indicates that only a number of 21 patients, 25.30, presented a fracture, at hospitalisation as a pathological antecedent, while 74.70%, 62 patients did not present this pathology.

A number of 32 patients, 38.6%, did not take any medication to help increase bone mineral density. The administration of bisphosphonates was identified for 9 patients, 10.8%, and of Alpha D3 for 38.6%, representing 32 out of a total of 83 patients. Mixed administration of two drug classes was reported for a number of 10 patients, 12.0% (Table 12).

Table 12. Medication

	Frequency	Percent
Valid Bisphosphonates	9	10.8
Alpha D3	32	38.6
Mixed medication	10	12.0
No medication	32	38.6
Total	83	100.0

For the distribution by age categories, it is noted that out of 45 hypertensive patients, one person (1.2%) was in the age range of 50-60 years, the predominant patients were aged between 60-70 years with a number of 28 people

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.024	1	.876		
Fisher's Exact Test				1.000	.696
Pearson Chi-Square	.573	1	.449		
Fisher's Exact Test				.484	.303

(33.7.0%), and there were 16

Between the two variables Diagnosis- Pool There is NO dependency relationship (an association, a connection): $\chi^2_{calc} = 0.024$, $df = 1$, $p = 0.876 > \alpha = 0.05$ (37). Also between the two variables Diagnosis- Mud, there is NO dependency relationship (an association, a connection): $\chi^2_{calc} = 0.573$, $df = 1$, $p = 0.449 > \alpha = 0.05$ (Chi-Square Test) (37) (Table 14).

Table 13

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	20,73	2	.001
Pearson Chi-Square	11,791	3	.008

Table 15. Box-Plot graphical representation of VAS values at hospital admission /discharge.

Hypothesis Test Summary

Null Hypothesis	Test	Sig.	Decision
The median of differences between 1 VAS Internare and VAS Externare equals 0.	Related-Samples Wilcoxon Signed Rank Test	.000	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

The values of Visual Analogue Scale (VAS) at hospital admission were between 5 and 10 with a median value of 7 and an IQR between 7 and 8. The VAS values at discharge were between 2 and 7 with a median value of 4 and an IQR between 3 and 5. There are statistically significant differences between the median values of VAS at hospital admission/discharge ($p < 0.001$, Wilcoxon Signed Rank Test) (38). At discharge, the VAS values are lower than at hospital admission (Table 15).

Table 16. Graphical representation (Bar + Error Bars 1SD) of average values of Age for groups in the study.

Diagnosis	N	Minimum	Maximum	Mean	Std. Deviation
OP Age(in years)	37	50.00	79.00	66.54	6.85
Op Age(in years)	46	51.00	79.00	63.52	6.70

Age values for patients (Table 16) with OP ranged from 50 to 79 years, with a mean value of 66.54 years and a standard deviation of 6.85 years. Age values for patients with Op ranged from 51 to 79 years, with a mean value of 63.52 years and a standard deviation of 6.70 years. Between the mean age values corresponding to the two groups, it is considered that there are statistically significant differences ($t = 2.020$, $df = 81$, $p = 0.047 < \alpha = 0.05$, Independent Samples t-Test)(39).

Table 17

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8,120	3	.044

Between the two variables Diagnosis at hospital admission-Height, there is a dependency relationship (an association, a connection): $\chi^2_{calc} = 8.120$, $df = 3$, $p = 0.044 < \alpha = 0.05$ (Chi-Square Test) (37-39)(Table 17).

Conclusion: Osteoporosis is a pathology that decreases the patient's quality of life (40). There are complementary therapies to pharmacological treatment with immediate and long lasting results. The complex balneo-physical-kinetic treatment is an important link in the treatment of the disabling pathology for the patient, with an important clinical resonance (41-43).

There are a number of medical investigations that help determine the risk of fracture, which are not yet widely used: Trabecular Bone Score - involves medical equipment that can determine it and does not exist in all medical centers that provide diagnosis and treatment for osteoporosis, Frax score - even if it does not involve additional determinations compared to osteodensitometry DXA, it is not used by clinicians. As a medical specialty, Recovery, Physical Medicine and Balneology is mainly concerned with the diagnosis of osteoporosis, but also the risk of fracture, this disease is actually involving various functional deficits, which reduces the quality of life of patients with osteoporosis (44,45).

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