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Osteoporosis from a traumatologist's point of view

Osteoporoza oczami chirurga urazowego

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Summary

According to contemporary definition osteoporosis is a condition characterized by reduced quality of bone tissue and resulting increase of fracture risk. Low-energy fractures are common in the population of patients over 50 years. Traumatologist typically meets patients with osteoporosis when treating fractures they already suffered. Apart from fracture treatment this is the time to perform fracture risk assessment. Osteoporotic bone fracture is a risk factor for another fracture. FRAX tool is useful for the purpose of identifying patients with elevated fracture risk requiring further diagnostics and treatment. Not only pharmacological treatment is needed. The risk of sustaining the fracture is further elevated by reduced concentration of vitamin D. Vitamin D insufficiency affects bone metabolism and quality of muscle tissue. Reduction of muscle strength in proximal myopathy leads to increase in the risk of falls and fractures. Risk of falling is also influenced by medication – including hypnotic drugs – and their use should be limited.

Key words: osteoporosis, fracture, treatment

Streszczenie

Według współczesnej definicji osteoporoza jest chorobą charakteryzującą się obniżeniem wytrzymałości tkanki kostnej i w efekcie zwiększeniem ryzyka wystąpienia złamań. Złamania niskoenergetyczne są powszechne w populacji osób po 50 roku życia. Lekarze traumatolodzy z pacjentem z osteoporozą najczęściej spotykają się w czasie leczenia złamania, którego pacjent już doznał. Poza leczeniem samego złamania równie ważnym etapem postępowania powinna być ocena czynników ryzyka wystąpienia kolejnych złamań. Przebycie złamania osteoporotycznego jest jednym z tych czynników. W ocenie ryzyka złamania znajduje zastosowanie narzędzie FRAX. Umożliwia ono identyfikację pacjentów wymagających dalszej diagnostyki i leczenia. Należy podjąć nie tylko działania farmakologiczne. Ryzyko doznania złamania zwiększają także powszechne w naszej populacji niedobory witaminy D₃. Niedobory witaminy D wpływają niekorzystnie nie tylko na metabolizm tkanki kostnej, lecz także mięśniowej. Osłabienie mięśni posturalnych w przebiegu miopatii proksymalnej zwiększa ryzyko upadku. Stosowanie suplementacji witaminy D zmniejsza ryzyko upadku oraz ryzyko złamań. Dodatkowo na ryzyko upadku wpływa stosowanie niektórych leków, np. nasennych, których przyjmowanie należy ograniczać.

Słowa kluczowe: osteoporoza, złamanie, leczenie

Osteoporosis is a disease, which manifests with reduced resistance of the bone tissue resulting in an increased incidence of fractures. Osteoporosis and corresponding low-energy fractures are common in elderly patients. It is estimated that the risk of a future fracture occurrence for a 50-year-old female is 50% and for a 50-year-old male – 30% (1, 2). Osteoporosis influences the risk of death and the life expectancy of patients suffering from this disease by increasing the risk of fracture occurrence (3). The purpose of this brief presentation is to analyse such aspects in management of patients with osteoporosis, which are crucial

from the trauma surgeon's point of view. We will not analyse details regarding treatment methods or clinical differentiation of this disease.

MODERN PERCEPTION OF OSTEOPOROSIS

Initial definitions of osteoporosis based its diagnosis on the result of a densitometric analysis. The lowered density of the bone tissue detected in the densitometric analysis correlates with an increased risk of fracture. However, low-energy fractures also occur in patients who do not meet densitometric criteria of osteoporosis (T-score lower than – 2.5). This observation was the

base for performing clinical studies, which identified many factors increasing the risk of fracture occurrence. They include, i.a. the patient's age, his/her BMI, occurrence of the proximal femoral fracture in the patient's parents and smoking cigarettes by the patient (4). The FRAX tool developed by WHO facilitates easy calculations of the fracture risk by considering many risk factors, including or excluding the result of the densitometric evaluation (5). A ten-year risk of fracture occurrence at the level of > 10% is recognized as significant and with other risk factors it constitutes an indication for treatment introduction (4). Fracture risk of over 20% is direct indication for treatment. Therefore diagnosis of osteoporosis and indication for treatment are based on fracture risk and not solely on result of densitometry.

OSTEOPOROTIC FRACTURE AS THE RISK FACTOR FOR THE OCCURRENCE OF ANOTHER FRACTURE

Osteoporotic fracture is defined as the fracture occurring after trauma typically not resulting in fracture, such as fall from own height or occurrence of spontaneous fractures (after excluding other causative factors).

Traumatologists meet patients with osteoporosis when treating fractures that patients have already suffered. In such a situation, the primary prevention of fractures is not applicable. Treatment of the injury is the most important in management of the patient. Sometimes, as it is in the case of proximal femoral fractures, the patient's life may depend on the successful treatment of such fracture. The next and equally important stage in management should be the evaluation of the risk factors for the occurrence of other fractures (6, 7) (or referring the patient to facilities specialised in osteoporosis). In such a situation, a former low-energy fracture, which occurred in the patient, is one of the analysed risk factors (8, 9).

The 10-year fracture probability can be calculated with FRAX tool (5), which is available also in Polish. On the website the on-line calculator can be found or printable table can be downloaded. The FRAX tool in-

cludes following risk factors: age and sex, BMI, previous fracture, hip fracture in parents, current smoking, steroid therapy, rheumatoid arthritis, secondary osteoporosis (in patients with diabetes type I, hyperthyroidism, hypogonadism, malnutrition or malabsorption) and alcohol intake over 3 units a day. Many identified risk factors are not included in FRAX, such as occurrence of falls, reduced muscle strength as measured in "stand up and go" test or reduction in vitamin D concentration.

It should be stressed, that symptomatic vertebral fracture and hip fracture are very strong risk factors. Risk of sustaining further fractures is specifically high in this population.

With FRAX tool it is possible to calculate 10-year fracture risk with or without densitometric data. Densitometry is therefore most valuable in patients with moderate risk as calculated with use of other parameters. In patients with very high fracture risk (e.g. patients that sustained hip fracture) densitometry will not influence diagnosis of osteoporosis (but it may be valuable in treatment).

Figure 1A presents an application of the FRAX tool to calculate a 10-year risk of fracture in a 75-year-old female patient with normal BMI (equal to 23.9), who is not carrying other risk factors. Figure 1B presents the same patient burdened with a past low-energy fracture, for example with a distal radial fracture. As it is noticeable, the fact of fracture occurrence places this patient within the area of increased risk of another fracture occurrence; further diagnosis and probably treatment is indicated. It is worth emphasizing that the FRAX database has been recently expanded with data related to the Polish population (5).

EFFECT OF VITAMIN D CONCENTRATION

Vitamin D deficiency is common among elderly patients (10). Reduced concentration of vitamin D may lead to insufficient suppression of PTH excretion and secondary hyperparathyroidism. As a result, osteomalacia develops, which lowers resistance of the bone tis-

Figure 1 consists of two screenshots of the FRAX tool interface, labeled A and B. Both screenshots show a form for calculating the 10-year risk of fracture. The form includes fields for age (75), sex (Female), weight (65 kg), and height (165 cm). It also includes checkboxes for various risk factors, such as osteoporosis, alcohol consumption, BMD, and fractures. In screenshot A, the patient has no fractures, and the calculated 10-year risk is 3.1% (Major osteoporotic: 8.0, Hip fracture: 3.1). In screenshot B, the patient has a past low-energy fracture (Przebyte złamanie), and the calculated 10-year risk is 5.5% (Major osteoporotic: 14, Hip fracture: 5.5).

Fig. 1 A, B. Ten-year risk of osteoporotic fracture occurrence in a 75-year-old female patient without other risk factors; the patient presented at the right side of the figure is burdened with a past low-energy fracture (5).

sue. At the same time, we know more and more about the effects of this vitamin on other tissues, besides the bones. The suitable concentration of vitamin D is necessary for the normal function of muscles. Low concentration of this vitamin leads to development of proximal myopathy, which manifests with lowered muscle strength, especially targeting large muscles such as the quadriceps femoris muscles (10). This way, insufficient vitamin D supply to the organism increases the risk of fracture occurrence as a result of two mechanisms: by lowering resistance of the bone tissue and influencing the risk of a fall resulting from lowered muscle strength (11). It should be emphasised that increase in risk fracture precedes manifestation of osteomalacia, which is a late symptom. Randomized studies revealed the influence of 800 IU of vitamin D supplementation on lowering the risk of fracture occurrence (12, 13).

According to current recommendations patients over 50 years, including fracture patients, from October to April should be supplemented with 800-1000 units of vitamin D. Patients with reduced sun exposure should receive supplementation during whole year (14). In case of reduced calcium intake, which is common in Poland, calcium should be supplemented, too.

FRACTURES AS A RESULT OF FALLS

The statement that fractures in elderly persons occur as a result of falls is obvious. However, its clinical implications are important. Pharmacological and non-pharmacological interventions to reduce the incidence of falls lead to reduction of number of fractures irrespectively to bone quality. In recent years, more and more attention is paid to risk factors influencing the risk of falls (15). Very often falls are resulting from slippery floors or slippery shoes. The patient who fell at his/her

own home should be instructed how to secure the apartment by eliminating at least loose carpets or cables lying on the floor. Even minimal interventions such as changing slippers to boots with shoelaces influence risk of sustaining the fracture. If patient reports feeling of lightheadedness neurological and cardiological assessment should be performed. The risk of falls is also influenced by drugs. Several groups of medication including sleep-inducing, antidepressant and sedative drugs increase the risk of falls. Their use should be limited (16, 17).

SUMMARY – CARE OVER A PATIENT WITH A LOW-ENERGY FRACTURE

Low-energy fractures (which in elderly patients occur most frequently) should be analysed from a broader perspective than only in terms of effective treatment of a fractured bone. Such broad-view management is promoted for example by the American Orthopaedic Association with the initiative "Own the bone" (18, 19). The purpose of this initiative is to improve quality of care over a patient with a past fracture. It is recommended to undertake additional actions in order to lower the risk of occurrence of other fractures (20). Among other things, AOS recommends use of the period following the fracture treatment for counselling on calcium and vitamin D supply, the benefits of maintaining physical activity, smoking cessation and actions performed in order to lower the risk of falls. Further actions recommended by AOS include analysis of the bone density in patients, in whom this evaluation is indicated, and improving communication with the family doctor and the patient by sending letters, which explain the need of further care after fracture treatment (21). Similar principles of management should undoubtedly be implemented in our country as well.

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