

Rehabilitation in peripheral non femoral fractures: a review

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Summary

This paper is a short review of the available information on peripheral non femoral fractures (PNFF) which are strictly related to osteoporosis. Particular attention is focused on wrist fractures in view of their frequent occurrence as indicated by world wide statistics. Of special interest is the definition of risk groups (old age), risk areas (developed countries) and risk factors. Reference is made to 2008 WHO guidelines for fracture risk assessment. PNFF are a serious concern to health authorities because their high incidence in constant growth, causes a serious burden on the health budget. The pathway of patient care is described, from initial evaluation (including bone fragility, multi-morbidity and risk factors) to specific diagnosis and treatment. The multiplicity of etiological factors involved requires multidisciplinary approach. This aspect justifies the importance given to rehabilitation, which is the longest part of patient care and is strictly connected to preventive measures. There is ample reference to falls, to exercises, to appropriate sports, to complications and to active and passive mobilization. The paper suggests research in areas related to PNFF, to health economics, epidemiology, prevention, health education, training and multidisciplinary coordination.

KEY WORDS: osteoporosis, peripheral non femoral fractures, rehabilitation pathway.

Introduction

Low bone density and previous fractures are risk factors for almost all types of fractures but each type of fracture has its own unique risk factor. Fractures of the vertebrae (spine), proximal femur (hip) and distal forearm (wrist) have long been regarded as the main osteoporosis fractures (1).

Osteoporosis is a systemic condition and adults who sustained a fracture are 50 to 100% more likely to have another one of a different type. In the year 2000 in the world there were an estimat-

ed 9 million osteoporosis fractures of which 1.6 million were at the hip, 1.7 million at the forearm and 1.4 million were vertebral fractures (2). Osteoporosis fractures are a significant cause of morbidity and mortality worldwide but particularly in developed countries. In Europe in 2000 were recorded almost 3.1 million new osteoporosis fractures of which 24% were at the forearm. In Italy there were 70 million femur, 20.000 vertebral and 19.000 wrist fractures. Colles' fracture is the most common wrist fracture (almost 80% of the forearm fractures) and it is frequently the consequence of an indirect trauma due to fall on an outstretched, extended wrist. A previous wrist fracture increases the risk of a future wrist fracture and doubles the risk of other osteoporosis fractures. The relative risk of a future fracture is increased with age and around 80 years becomes slightly higher than that of the general population. Fortunately osteoporosis fractures are preventable. Epidemiological research could provide better understanding and could help focus efforts on prediction of fractures in people at greatest risk. Effective and cost effective treatments are available but they are often not implemented. The majority of women does not receive any treatment during the year following a fracture. Failure to implement or tardy implementation of preventive measures as well as poor treatment compliance lead to deterioration of health economic outcome. Health economists estimate that osteoporosis-related costs will increase in Europe from 40 million Euro in 2000 to almost 80 million in 2050 (3).

A 3 year follow-up study of 158.940 women showed that wrist fracture may have a predictive 3 year risk of any future osteoporosis fracture for older and younger postmenopausal women independent of baseline bone mineral density (BMD) and common osteoporosis risk factors. Therefore more consideration should be given to evaluating and managing osteoporosis in younger and older women with a history of wrist fracture independent of their BMD (4). The rehabilitation pathway is a procedure that includes: management of patients presenting bone fragility, risk evaluation, diagnosis, treatment. The latter may be: basic, pharmacological, rehabilitation.

For each fracture consideration is first given to the trauma scheme and to risk evaluation. The trauma may be inadequate, with or without risk factors. Anamnesis and clinical examination lead to the diagnosis of primary osteoporosis. The following examinations are then performed: laboratory, X-ray of the spine, Thoraco-lombar MOC.

If the trauma is adequate (with or without risk factors) there is no further evaluation. Then anamnesis and clinical examination will lead to the diagnosis of secondary osteoporosis and to further evaluation. The pathway ends with the formulation of the pharmacological treatment and of a rehabilitation protocol. The treatment may be conservative or surgical.

For the risk evaluation reference is made to recent WHO guidelines (2008) called FRAX (Fracture Risk Assessment Tool). The guidelines relate to the absolute risk of fracture within 10 years and take into account not only bone densimetry but also 12 clinical risk factors specific for osteoporosis and related fractures. The risk factors used are the following: age, sex, weight, height, previous fracture, parent fractured hip, current smoking, glucocorticoids, rheumatoid arthritis, secondary osteoporosis, alcohol (3 or more units per day), BMD (5).

BMD measurement is an important component of the evaluation

of risk fracture. However this approach is rather limited because it considers only the "actual risk" of fracture rather than the "life time risk" or the risk projected in a realistic time period (example 10 years) and does not take into account the influence of other very critical risk factors.

During anamnesis/clinical examination the following information is collected: weight/height, menarche/menopause, nutrition, pharmacological therapy (past and present), level of activity, fractures in the anamnesis, falls in the anamnesis, risk factors for secondary osteoporosis.

The following are considered high risks for secondary osteoporosis: liver and kidney severe chronic pathology, steroid drugs (>7,5 mg for more than 6 months), malabsorption (Chron disease), rheumatoid arthritis, systemic inflammatory syndromes, hyperthyroidism, primary hyperparathyroidism, antiepileptic drugs.

The rehabilitation protocol is global and specific. The objectives of the general therapeutic exercise are: prevention of fractures in all skeletal sites, increase of bone mass in all districts, maintenance or improvement of bone quality, improvement of balance with reduction of falls, maintenance of effectiveness during the years of treatment.

For the mechanical modulation of bone metabolism, osteocytes, submitted to mechanical weight through various factors, are capable to exercise osteogenic activity on other bone cells (7).

Prevention of falls in older persons has been given particular attention by an international panel of geriatricians and orthopedic surgeons in 2001. Risk factors for falls identified in 16 studies that examined risk factors are: muscle weakness, history of falls, gait deficit, balance deficit, use of assistive device, visual deficit, arthritis, impaired ADL, depression, cognitive impairment and age above 80 years. Among the risk factors: history of falls, muscle weakness and gait deficit achieve the highest score.

Falls are among the most common and serious problems facing the elderly persons. Multifactorial interventions can be considered for the prevention of falls among the community dwelling older persons, in long term care and assisted living settings. There is good evidence of benefits from exercise in falls prevention. Exercise needs to be sustained for sustained benefit. There is preliminary evidence to support the use of Tai Chi Chuan (a Chinese martial art considered also a therapeutical exercise). Consideration for prevention of falls is also given to: environmental modifications, medications, assistive devices, behavioral and educational programs. Other potential interventions may regard: bone strengthening medications, cardiovascular, visual, footwear interventions (6).

Among sports, tennis, aerobics, gymnastics and power training are advisable. However in older persons it is more appropriate to walk, climb stairs, dance, gymnastics for the elderly and calisthenic exercises (7).

Objectives of the specific rehabilitation treatment are: regaining of global function, reacquisition of characteristics of agility and dexterity of hand, wrist and elbow, and of the capacity both of articular and miotendinous parts, prevention of complications.

Complications of Colles' fracture may be: rigidity, algodystrophy, functional limitation. Treatment planning considers the following aspects: type of fracture, stability, presence of possible associated lesions, type of patient. Functional resolution is faster in young patients than in older ones. In the rehabilitation pathway consideration is given to the type of surgical intervention.

Immobilization phase: the conservative treatment lasts 5 weeks. Osteosynthesis with plate lasts 2 weeks. External fixing: neutralization for the first 4 weeks, dinamization for the successive 3 weeks. The rehabilitation treatment starts during the period of immobilization whatever the treatment (invasive or otherwise). Care should be taken of oedema of the hand and of the articulations not involved in the process (8). The latter must be mobilized actively and passively in order to maintain the integrity of the joint capsule and to prevent tendon thickening and adhesions.

The rehabilitation protocol states that after removal of the immo-

bilization it is necessary to proceed to active, passive and counter resistance exercises (with or without tutors) under the guidance of the rehabilitation therapist. Exercises must be progressive, but must be initiated early already on first or second day. Lympho-drenage is needed in case of oedema which is frequent and related to invasive treatment. Its presence reduces the mobility of the whole upper limb with negative effect in all directions. Global mobilization of the wrist includes: flexion and extension, abduction (ulnarization) and adduction (radialization), longitudinal rotation, prono-supination of the forearm, mobilization against resistance for regaining of strength. Sessions should be daily for 30 minutes for 2 weeks. Exercises of auto-posture aim at producing tension of periarticular and articular elements. They involve flexion with ulnar inclination (subject standing with forearm in supination, hand dorso-faced lying on table top then forearm is vertically pressing on the table) and extension associated to radial inclination (subject standing, palm of hand on the table then forearm in vertical position, arm and forearm in pronation).

Exercises at home are an essential part of the rehabilitation treatment. The program of active exercises to perform at home consists of grasping with rubber aid (hand group) of variable and increasing density to perform at least 4 to 6 times a day for 2 to 3 weeks. Specific exercises are mirror therapy, continue passive mobilization, exercises with materials with different elastic coefficient. Thus in dealing with the rehabilitation treatment of Colles fracture it is fundamental not to limit ourselves to the specific post-fracture protocol but also to establish a rehabilitation pathway which foresees the global care of the patient with fragility fractures. An important aspect of such pathway is represented by the education of the patient explaining to him/her the problem without dramatizing but suggesting on the most appropriate solutions. In this context the recommendations of the National Osteoporosis Foundation (NOF) may be very useful. NOF Recommendations concerning health of the bone in 5 steps are: take Ca and vitamin D, avoid smoking and alcohol, talk to your doctor on bone health, test bone density and take medication if necessary, control your weight and muscle development.

The present brief overview on peripheral non femoral fractures (PNFF) emphasizes the importance of this pathology from the epidemiological and the economic view points. PNFF are strictly connected to osteoporosis, prevail in elderly people mainly in developed countries which justifies the expectation of their increase in the future. A multiplicity of factors are involved in their etiology, which explains the involvement of different types of specialized professions, whose coordination is difficult to achieve, in spite of the availability of effective preventive, therapeutic and rehabilitation measures. While therapy (invasive or otherwise) is limited in time, prevention and particularly rehabilitation require attention for longer periods and greater involvement in the patient care. Several problems arise from the above situation, particularly as regards coordination, definition of responsibilities, availability of peripheral services and, most of all, from costs. It seems desirable, especially for health planners to give greater attention to the economic aspects, stimulating and supporting public health research and health economists involvement.

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