IN DEVELOPMENT COUNTRY, WHAT IS THE IMPACT OF A CLINICAL PATHWAY AND IMPLANT OF FEMORAL NECK FRACTURES’ TREATMENT IN SUBJECTS AGED OVER 65? INTERNAL FIXATION VS PROTHESIS. RETROSPECTIVE STUDY.

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ABSTRACT

Introduction Considering all femoral bone injuries, femoral neck fractures cause the largest number of surgical, medical and economic problems. The research aimed to determine, within the tested sample, the benefits of the
treatment of femoral neck fractures in Development National Health program with primary femoral prosthesis vs internal fixation.

**Patients and methods.** The study involved 102 patients. The following parameters were monitored: radiographic processing, BMD, times of sustaining the fracture, admission and surgical treatment, preoperative and postoperative complications and etc.

**Results** The average age of patients was 86.2 years. FNFs (femoral neck fractures) were classified using Garden's classification: Type I accounted for 0% of femoral neck fractures, Type II for 5.88%, Type III for 50.98% and Type IV for 43.14%. The time interval between injury and surgery amounted to 3.9 days and chronic illnesses were reported in 50% of the patients. Fractures were treated with internal fixation: 22.54% with Müller plate, 2.94% with screws; and with endoprostheses: Austin-Moore partial endoprosthesis was used in 50.98% of the patients, cemented total endoprosthesis in 4.9%, and non cemented total prosthesis in 14.7%. General inhalation anesthesia was used in 37.25% and spinal anesthesia in 64.75% of the patients. 31.37% of the patients experienced complications. There were significant statistical differences in the time of verticalisation and full weight-bearing between the patients treated with endoprosthesis and those treated with internal fixation.

**Conclusion** In less physically active elderly patients secondary surgeries can be avoided by performing primary arthroplasty. With displaced fractures there is a high risk of femoral head necrosis and Non Union. In patients under the age of 65 who can endure a secondary operation in case of failure, the treatment of choice is internal fixation. Patients over the age of 65 need to be treated with primary arthroplasty in order to avoid secondary operations.

**Key words:** FEMORAL NECK FRACTURE, TREATMENT, INTERNAL FIXATION, PRIMARY ARTHROPLASTY

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**Introduction**

Using national discharge and medical claims data, we studied the epidemiology of femoral fractures (FNF) from 1996 to 2006. The annual hip fracture incidence declined from 600/100,000 to 400/100,000, without decline in the more rare femur fractures. Incidence rates for subtrochanteric and femoral shaft fractures were each below 20 per 100,000[1]. The most prognostic classification for this injures is the Garden’ classification (1961)[2,3] FNFs mostly occur in people over 65 years of age. In nursing homes that percentage runs as high as 40%. Etiologically speaking, most frequently these are 'small-scale' traumas; household falls account for 52.2%, street accidents for 35.5%, and other etiological factors for 12.4% of cases [4,5]. In developed countries there are special communities, designed to be senior-friendly. Calcium- and vitamin D-deficient diet, long-term use of certain drugs, nicotine and alcohol, all constitute risk factors for FNF [6-7]. Commonly in patients who are under 70 years of age the best way is the internal fixation and in case of failure, endure a secondary operation, the treatment method is the arthroplasty [8,9]. Patients who are over 70-75 years of age should be treated with primary arthroplasty in order to avoid secondary operations [9].

This retrospective study reported the impact of a clinical pathway and a hip implant standardization vs internal fixation in development country like Bosnia and Herzegovina.
Material and methods

The study was conducted on 102 patients treated at the Traumatology Clinic Banja Luka between January 1, 2009 and January 15, 2013. Upon admission, FNFs were radiographically examined and the data on the Garden type of fracture were entered, the bone mineral density (BMD) in the first month following the injury was measured, and the times of sustaining the fracture, admission and surgical treatment were verified. Preoperative pathology was documented, as well as postoperative complications, duration of surgery, amount of blood consumption. The monitored parameters were as follows: early physical therapy, verticalisation, independent mobilisation with axillary crutches, partial and full weight bearing on the operated leg and walking without crutches, hospital inpatient length of stay and the time of the commencement of rehabilitation in physical therapy. The results of the surgical treatment were assessed based on radiological follow-up. With internal fixation, the result was considered good if lateral angulation was less than 15 degrees, if there was no varus angulation and if contour lines in the calcar region were good. The position of the wedge plate was good if it was in the bottom half of the femoral head bone, below Ward's triangle, and if there was no sign of the head penetration. The position of the screw was good if the screw head laid between the middle and lower parts of the head in anteroposterior projection, and centrally or in the back of the neck in lateral projection, and with deviation not exceeding 10 degrees, and the distance between the screw top and the head cortex ranged between 5 and 10 mm. Any deviation from these parameters was considered a poor result. The result of the treatment with endoprosthesis was considered good if the femoral anteversion of the endoprosthesis was between 5 and 10 degrees, and the prosthesis stem extended centrally, placed in a neutral position, for varus-valgus position. Any deviation from these parameters was considered a poor result.

Results

There were 58 women (55.9%) and 44 men (44.1%) in the treated group. The oldest patient was 96 and the youngest one was 64. The average age of the patients was 86.2; 71.5 for men and 82.7 for women. Statistically, with FNF, there is a significant age difference between the men and women in the tested sample. FNFs were classified using Garden's classification. The treated group comprised 6 patients (5.88%) with a Garden Type II fracture, 52 (50.98%) with a Garden Type III fracture, and 44 (43.14%) with a Garden Type IV fracture. The average time between admission and surgery was 4.1 days for patients who were treated for FNF with endoprosthesis, and 3.7 days for patients who were treated for FNF with internal fixation. The patients who were treated for FNF with endoprosthesis stayed in hospital for 15 days, and those who were treated with internal fixation for 19.2 days.

Long-term chronic illnesses were registered in 51 patients (50%) upon their admission. High blood pressure and heart problems were the most common ones, in 39 patients (38%), then there was diabetes mellitus in 7 (6%), renal failure in 2 (1.9%), and osteoporosis in 51 patients (50%). Since this is a retrospective and prospective study, it is likely that not all data were entered in the case history and the number of the chronically ill might have been higher. Chronic illnesses were present in 26 male patients (25%) and in 25 female patients (24%) FNF was treated with internal fixation; 23 patients (22.54%) were treated with the Müller plate, 3 (2.94%) with screws, 56 (50.98%) with Austin-Moore partial endoprosthesis, 5 (4.9%) with cemented total endoprosthesis and 15 (14.7%) with non-cemented total endoprosthesis.

The youngest patients with Garden Type II fracture were treated with the Müller plate and screws. The results were not encouraging. The protrusion of the plate into the acetabulum was registered in 2 patients (1.9%), screw fractures in 2 (1.9%), plate fractures in 4 (3.9%), infraction of internal fixation in 2 (1.9%) and pseudoarthrosis of femoral neck in 3 (29%). Surgical procedures were performed under general inhalational anesthesia in 36 patients (37.25%) and under spinal anesthesia in 66 of them (64.75%).
Tab. 1: Average number of patients with complications (32%) in a sample of 102 patients

In the primary surgical treatment of FNFs, complications were registered in 32 (31.37%) out of 102 patients (Diagram 1). The complications in question were pulmonary embolism in 5 patients (4.9%), trombophlebitis in 5 (4.9%), protrusion of the plate into the acetabulum in 2 (1.9%), screw fractures in 2 (1.9%), plate fractures in 4 (3.9%), bleeding where revision was done in 2 (1.9%), infection after internal stabilisation in 2 (1.9%), endoprosthetic infection in 3 (2.9%) and periprosthetic fracture in 2 (1.9%).

Out of 102 patients treated for FNF, in 47 (41%) of them a BMD test was performed in the first month following the fracture. BMD testing could not be performed at our Department, and people were required to come to the proper follow-up examination with the obtained relevant finding. Forty-seven patients had their findings done on Hologic QDR 4500 (S/N 4957 at the "Miroslav Zotović" Banja Luka, Centre for Physical Therapy. The results were as follows: 21 patients (45%) had osteopenia and 26 (55%) had osteoporosis.

Discussion

Persons over the age of 65 are considered elderly and those over the age of 80 very elderly. There are still controversies about the advantages of certain surgical treatments of FNF. The age and need for physical activity are taken into account [6,7]. In younger, healthy and physically active people, every attempt to treat should be directed at protecting and keeping the femur. In patients who are less physically active, i.e. the elderly, secondary operations can be
Avoided by performing primary arthroplasty. In displaced fractures there is a high risk of femoral head necrosis and non union [8–9]. The incidence of femoral head necrosis in 10-20% of cases in the treatment of FNF with internal stabilisation on average 20-40% of non union cases. In Europe, the population aged 65 and over made up 12-17% of people in 2002, and the estimates are that they will make up 20-25% in 2025 [8].

In terms of all trauma cases, hip fractures make up 10% of all fractures. Their prevalence is different in developed and undeveloped countries. The reason for that is the fact that in 2002 the population aged 0-15 made up 30% of the population in developing countries (11).

In Croatia, about 15% of postmenopausal women have osteoporosis (approx. 130.000) and about 30% (260.000) have osteoarthritis. Less than 10% of patients are treated. According to the research undertaken in Croatia involving more than 10.000 persons over the age of 50, it was established, by using ultrasound to measure the heel bone density.

The mortality caused by hip fractures within the first year from sustaining the fracture amounts to between 12 and 20% and is almost the same in countries with very different healthcare standards [10]. The increase in the elderly population and urbanization of the world outside Europe and North America will result in the increase in FNFs. Some researchers believe that in 30% of the elderly population an endogenous disorder is in Hong Kong, where the Chinese make up 97% of the population, there are 31.5% of FNF cases per 100.000 population, 20.3% in Singapore, and 5.6% in Johannesburg [11]. The FNF percentage varies depending on the season; it is more common in winter (37%) and less common in summer (15%) [12]. A growing number of elderly people today live a healthy life, they are more active, and consequently live longer. Despite an increase in the average age of FNF patients, the mortality rate has not changed significantly and it ranges between 2 and 46% [8].

A retrospective study was conducted to analyze the clinical data of 42 elderly patients who had been treated for femoral neck fracture with DHS in our department between June 2009 and November 2011. There were 21 males and 21 females with a mean age of 68.5 years (range 60-75 years). According to the Garden Classification, there were 19 cases of type II, 21 cases of type III and 2 cases of type IV fractures. By the Singh Index Classification, there were 3 cases of level 2, 19 cases of level 3 and 20 cases of level 4 fractures. The Harris criterion, complications and function recovery after operation were analyzed. Their results were: average hospitalization time in 42 patients 11.2 days (range 7-21 days). All patients were followed up for 12-26 months (mean 18 months).

No lung infection, deep venous thrombosis or other complications occurred. Partial backing-out of the screws was found in 2 cases. The internal fixation device was withdrawn after fracture healing. Internal fixation cutting was found in 1 case, and he had a good recovery after total hip arthroplasty. The time for fracture healing ranged from 3-6 months (average 4.5 months). According to Harris criterion, 15 cases were rated as excellent, 24 good, 2 fair and 1 poor. The Harris scale was significantly improved from 30.52±2.71 preoperatively to 86.61±2.53 at 6 months postoperatively (P<0.05). They concluded the DHS, being minimal invasive, allowing early activity and weight-bearing, is advisable for treatment of elderly patients with femoral neck fracture. In addition, it can avoid complications seen in artificial joint replacement. It is especially suitable for patients with mild osteoporosis[13].

Sakala et al[14] discussed arguments concerning indications and selection of implants and operative techniques for arthroplasty in the treatment of femoral neck fractures. Their analysis is based on long-term experience with surgical treatment of patients with hip fractures and on the evaluation of a large number of publications by well-known specialists. The assessed group included 4795 patients treated at their institution between 1997 and 2010, of whom 1532 underwent hip replacement, with 1032 receiving hemiarthroplasty (HA) and 500 having total hip replacement (THR) indicated for femoral neck fractures[14]. A painful hemiarthroplasty due to acetabular cartilage erosion and subsequent head protrusion is still a challenging clinical problem[14]. The most important factor in prevention of this complication remains strict adherence to indication criteria. A metal monoblock hemiarthroplasty should be indicated only in very old patients with serious co-morbidities or in patients whose pre-operative mobility has been greatly restricted. For the other cases, a modular prosthesis is preferred because it allows for more exact alignment and, if necessary, its conversion to a total hip prosthesis is relatively easy[14]. The stem to be implanted should be the one used in standard THR procedures[14]. A ceramic modular head then enables hemiarthroplasty to function for long with a low risk of cartilage erosion and head protrusion[14]. Even if the choice of an optimal prosthesis, in terms of its biomechanical and biological properties, has been correct, the prosthesis’ long life span and good functioning still depends on the surgeon’s adherence to the principles of the correct operative technique (the head
center situated 1 to 2 mm below the level of the apex of the greater trochanter, 12- to 15-degree anteversion, articular capsule suture, and re-insertion of external rotator tendons if the Koch-Langenbeck approach is used. This is the only way of minimizing acetabular erosion and other complications[14]. Indications for total replacement include, in addition to fractures at joints affected by arthritis, most often a displaced fracture of the femoral neck found in younger patients still in good general health with a good prospect for a long life. Even if dislocation and loosening occur in these patients more often than in those with a THR procedure indicated for other reasons (primary or post-dysplastic arthritis), this therapy offers fewer complications and longer functioning in comparison with other methods of treating femoral neck fractures. A cemented prosthesis can be regarded as the standard implant; however, if the proximal femur shows good quality cortical bone, an uncemented implant can be used without a greater risk of future loosening[14]. In the absence of hip arthritis which lead to the development of subchondral sclerosis required for the correct acetabular cup fixation, a hybrid THR with an expansion cup or a screw-in cup is recommended[14].

Many authors reported in their study strongly suggest that THR provides a better outcome than IF for elderly, relatively healthy, lucid patients with a displaced fracture of the femoral neck[15-17]. Piscitielli et al.[18] reported in Italy there were 86,719 FNFs with a 10.0% increase over 4 years. They observed a predominance of women (77.1%) and a strong age effect: 92.7% of patients were ≥65 years old and 80% of fractures occurred in women aged ≥75, showing a clear relationship with the incidence of osteoporosis. Hospitalizations due to acute myocardial infarction (AMI) after 45 years of age in 1999 were only 9% higher than those for hip fracture, although this difference increased over the 4 examined years up to 24%. Considering the DRGs costs, hip fractures resulted in being more expensive than AMI overall and concerning elderly people.

Conclusion

In a developing nation such as Bosnia and Herzegovina, the national health system can be put to hard testing for costs due to FNFs. Currently, to reduce costs and improve outcomes we choose:

In less physically active elderly patients secondary surgeries can be avoided by performing primary arthroplasty. With displaced fractures there is a high risk of femoral head necrosis and Non Union. In patients under the age of 65 who can endure a secondary operation in case of failure, the treatment of choice is internal fixation. Patients over the age of 65 needs to be treated with primary arthroplasty in order to avoid secondary operations.

References


