Fişa suspiciunii de plagiat / Sheet of plagiarism's suspicion	Indexat la: 0115/06

Opera suspicionată (OS) Suspicious work	Opera autentică (OA) Authentic work

OS	BURNARIU, A. and NECULA, R. The particularities of proximal femur fractures and possibilities of fixation. *Bulletin of the Transilvania University of Braşov* Series VI: Medical Sciences. Vol. 5 (54) No. 2. 2012. 135-140.
OA	PESCE, V., DOMENICO SPECIALE, D., SAMMARCO, G., PATELLA, S., SPINARELLI, A., and PATELLA, V. Surgical approach to bone healing in osteo-porosis. *Clinical Cases in Mineral and Bone Metabolism*. 6(2). 2009. 131-135.

Incidența minimă a suspiciunii / Minimum incidence of suspicion	
p.135: 06s – p.136:23d	p.134: 01s – p.134: 43s
p.137: 04s – p.138:05d	p.132: 14d – p.133: 09s

Precizare:

Prin notația p.15:01 – p.17:17 se înțelege că fragmentul de text preluat fără indicarea proveniență în opera suspicionată este cuprins integral între rândul 01 al pag.15 şi rândul 17 al pag.17.

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THE PARTICULARITIES OF PROXIMAL FEMUR FRACTURES AND POSSIBILITIES OF FIXATION

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Abstract: *In 1990 an estimated 1.3 million fractures of the hip occurred worldwide, a figure which is expected to double by 2025 and to increase to 4.5 million by 2050. The average age of these patients is about 80 years and 75% are female. Approximately half of these fractures will be intracapsular. Fracture healing is a complex biological process with a temporal and spatial sequence that may be influenced by biological (age, gender, disease) and mechanical (reduction, osteosynthesis) factors. The fractures in osteoporotic patient have specific findings about the site, anatomo-phatology, therapeutic approach, almost always surgical, and the prognosis. Fractures of the osteoporotic proximal femur, together with vertebral fractures, very common in osteoporotic patients, are a significant source of mortality and morbidity.*

Key words: *hip fractures, osteosynthesis, osteoporotic bone.*

1. Introduction

In 1990 an estimated 1.3 million fractures of the hip occurred worldwide [1], a figure which is expected to double by 2025 and to increase to 4.5 million by 2050. The average age of these patients is about 80 years and 75% are female. Approximately half of these fractures will be intracapsular.

Although internal fixation with lag screw or dynamic hip screw is recommended for most non-displaced fractures of the femoral neck, the optimal treatment for displaced fractures of the femoral neck is controversial. Options for operative treatment of displaced include: reduction and internal fixation; unipolar hemiarthroplasty; bipolar hemi-arthroplasty; and total hip arthroplasty [2].

Comorbidities of the patients and current socioeconomic changes in healthcare led to reconsideration of closed reduction and internal fixation of femoral neck fractures as an alternative treatment modality. With correct decision - making, proper reduction, and proper consideration of the biomechanical principle of three-point fixation, minimally invasive screw fixation of femoral neck fractures is a safe and inexpensive procedure even in elderly

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patients [3]. The treatment of extracapsular fractures is less controversial and requires internal fixation.

2. Possibilities of fixation

Many internal fixation devices have been recommended for the treatment of pertrochanteric fractures, including extramedullary and intramedullary implants. The sliding hip screw is a tried and tested device for fixation of these fractures with excellent results reported [4]. An intramedullary implant inserted in a minimally invasive manner is better tolerated in the elderly [5].

Fig. 1. *Pertrochanteric fracture*

2.1. Dynamic hip screw fixation

The dynamic hip screw (DHS fig.2) seems to have a biomechanical disadvantage when compared with intramedullary devices because the load bearing in the proximal femur is predominantly shared by the calcar. Intramedullary devices have a shorter lever arm and have reduced tensile strain on the implant reducing the risk of implant failure [6].

On the other hand the intramedullary nail has a significantly increased risk of fracture at the tip of nail. Studies comparing the gamma nail and sliding hip screw have found higher incidence of complications and re-operation rates with the gamma nail and no difference in long term functional outcomes [7].

Fig. 2. *Basicervical fracture – Dynamic hip screw fixation*

2.2. Intramedullary nails

The intramedullary nails are better implants for unstable reverse oblique fractures while the sliding hip screw better for stable inter-trochanteric fractures [8]. External fixation for pertrochanteric fractures has been mainly used in elderly high-risk patients [9]. It should be considered as an alternative for elderly and frail patients, those with multiple injuries, those with unstable, complex fractures which may not be adequately treated by internal fixation [10].

Fig. 3. *Pertrochanteric fracture – Gamma nail fixation*

3. Considerations about metaepiphyseal fractures. Surgical and technical aspects

Fracture healing is a complex biological process with a temporal and spatial sequence that may be influenced by biological (age, gender, disease) and mechanical (reduction, osteosynthesis) factors [11]. Osteoporotic patients are characterized by poor bone quality, loss of bone mass and microarchitectural deterioration of bone tissue [12], [13]. The fractures in these patients present the surgeon with difficult treatment decision and surgical fixation [14]. When fragility fractures occur, urgent treatment is needed [20]. The attention is on improving pharmacological therapy in order to preserve bone mass and thus decrease fracture risk [11], but the major problem facing the surgeon is the difficulty in obtaining secure fixation of an implant to osteoporotic bone, when surgery is necessary, which is reflected in a dramatic increase in the rate of failure of implant fixation [12], [13], [16]. There is less cortical and cancellous bone, so that the pullout strength of implants is reduced [21]. Pullout is a possibility, especially if low density bone is encountered [22]. Some changes in surgical technique are required, including the use of relative stability techniques [21], [23]. Current studies mainly focus on preventing osteoporotic fractures. In recent years, the literature has provided evidence of non-physiological fracture healing in osteoporotic bone, with important implications [24]. The fractures in osteoporotic patient have specific findings about the site, anatomo-phatology, therapeutic approach, almost always surgical, and the prognosis. Fractures of the osteoporotic proximal femur, together with vertebral fractures, very common in osteoporotic patients, are a significant source of mortality and morbidity [25], [26]. They compromise the functional activity of the patient and worsen the co-morbidities, including the osteoporosis itself. The therapeutic approach to osteoporotic fractures requires prompt mobilization with full loading of the affected limb as soon as possible, and treatment of chronic disease including the osteoporosis [26]. The specific demands involved in the treatment of osteoporotic fractures calls for specific solutions [27]. The main treatment goal should be preservation of function even at the expense of restoration of exact anatomy [27].

In general, researchers and developers have worked on three different approaches: adapted anchoring implants, improved load distribution, and augmentation techniques [23]. The load can often exceed the strain tolerance of osteoporotic bone. This may result in microfracture, resorption of the

bone, failure of fixation [16] and increased rate of complications (non-union, malunion, re-operation). Various treatment methods and innovations have been attempted in order to improve the past poor results [28]. The surgical techniques and devices, which are able to restore as well as possible the local anatomy with a reduced strain at the bone implant interface, are auspicable in osteoporotic bone fractures [16], [29].

Fig. 4. *Femoral cervix fracture – screws fixation*

4. Conclusions

Cornell [30] found that surgeons are learning to modify the classic techniques of internal fixation to adapt them to the elderly population; screws should be placed into the best quality of bone available; when using plate fixation, stable bone contact at the fracture site is the most important factor in reducing strain in the plate. Augmentation techniques may improve anchorage in osteoporotic bone, using bone autograft or allograft, bone cement or bone substitute. Fracture treatment of patients with osteoporosis really needs an interdisciplinary approach [23]. It is difficult to reproduce in clinical studies the influence of osteoporosis on implant fixation, due to the lack of accurate osteoporosis assessment, absence of complication definitions and heterogeneous inclusion criteria in these studies [31].

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