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SURGICAL TREATMENT OF ELDERLY AND SENILE PATIENTS WITH TRANSTROCHANTERIC FRACTURES OF THE FEMUR

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The aim of the work *was to analyze the functional results of surgical treatment in elderly and senile patients with transcavitary fractures depending on the method of osteosynthesis.*
Materials and methods. *134 elderly and senile patients with transtrochanteric fractures of the femur type 31A1.1-A1.3 according to AO/ASIF were examined (average age - 72.4±9.3 years). The patient underwent osteosynthesis with a DHS fixator, a PFNA rod and a Gamma nail according to indications. The functional result of the treatment was determined by radiographic signs of fusion, the Harris scale, and complications detected during the period of 1, 3, 6, and 12 months of examination.*
Results and their discussion. *The functional result according to the Harris scale dramatically prevailed in the first six months after surgical treatment with intramedullary osteosynthesis. For the DHS fixator, the indicator improved from 29.8 points in the first month to 57.7 at the sixth month, for the PFNA rod - from 50.7 points to 76.9, and for the Gamma nail from 50.1 to 76.7, respectively.*
Consolidation of a transtrochanteric fracture in treated elderly and senile patients was observed in 83.33 % of cases after extramedullary osteosynthesis, and in 90.22 % of cases after intramedullary osteosynthesis. Complications of extramedullary osteosynthesis included instability of the fixator with migration and fracture of the fixator, during intramedullary osteosynthesis – migration of the cervical blade "cut-out" and fracture of the rod.
Conclusions. *The functional result in elderly and senile patients with transtrochanteric fractures after intramedullary osteosynthesis has advantages over extramedullary osteosynthesis. The results of the calculation of the Harris scale indicators, among which the evaluation of the restoration of gait, movements and resistance of the injured limb were decisive, are significantly higher in osteosynthesis with a Gamma nail and a PFNA rod in comparison with a DHS fixator. Complications that occurred in the three groups of the study coincide with the average international indicators and are not significantly low with intramedullary osteosynthesis. Improvement of surgical treatment methods is urgent and requires the search for complex treatment approaches in elderly and senile patients with transtrochanteric fractures*
Keywords: *transtrochanteric fracture, osteosynthesis, elderly and senile patients*

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1. Introduction

The number of fractures of the proximal part of the femur (PPF) in elderly and senile patients is increasing every year both among the world population and in Ukraine, which is a serious medical and social problem [1–3]. The frequency of PPF fractures in the elderly in the structure of injuries is 27–40 % of fractures of all localizations, of which 3–52 % are transtrochanteric fractures [2, 3]. In 90 % of cases, PPF fractures occur due to systemic osteoporosis in the elderly and senile [1–4] during a fall. The total number of osteoporotic fractures increased rapidly in the 21st century. Both according to the research materials of WHO specialists and scientists in Ukraine, the population of older age groups has been growing rapidly over the last ten years [1, 4], and, accordingly, the number of osteoporotic fractures is also progressively increasing [4]. Annually, the number of PPF fractures in the world is 2.5 million cases, and by 2050, the rate of damage to this area may reach 6-7 million [1–5]. Transtrochanteric fractures are a sentence for such patients, because in addition to long-term loss of motor activity, it is also a reason for a decrease in life expectancy. According to many researchers, mortality in elderly patients with transtrochanteric fractures during the first year is about 20–30 % [4, 5], and during the next year the mortality is 13 % [5].

Elderly and senile patients with transtrochanteric fractures require long-term treatment, expensive medical

and social care. In almost all cases, the injured need hospitalization for inpatient surgical treatment. The main goal of this treatment is early mobilization of the patient. Only stable and functional osteosynthesis provides a combination of mechanical and biological conditions for fracture union [2, 3, 5], creates an opportunity to ensure the activity of the operated limb in the early postoperative period and promote the restoration of its function. Many specialists prefer the method of low-traumatic, stable-functional, intramedullary osteosynthesis in the treatment of patients with transtrochanteric fractures. The conducted studies characterize intramedullary osteosynthesis as a method of stable fixation, which reduces the percentage of possible secondary displacements and migration of the blade and contributes to a better functional result in the restoration of limb function [3, 6, 7, 8]. The works of specialists who highlight a different position are based on the effectiveness of the use of extramedullary osteosynthesis in patients with transtrochanteric fractures [5, 9, 10]. Differences of opinion between specialists regarding the superiority of DHS or PFNA, Gamma nail or other structures continue [5, 10]. Characterizing the advantage of the effectiveness of the treatment of this or that method of osteosynthesis, the share of complications of surgical treatment remains quite high and reaches from 8–25 % and up to 50 % according to various data [3–6]. These circumstances force scientists to search for new differentiated approaches to the treatment of patients with osteoporotic fractures of the acetabulum.

The aim of the research – to compare the clinical and functional results of surgical treatment of elderly and senile patients with transcavitary fractures depending on the method of osteosynthesis.

2. Materials and methods

An analysis of the treatment of 134 patients who were operated on in the trauma department of the KNP "Regional Clinical Hospital of the Ivano-Frankivsk Regional Council" from 2011 to 2020 was carried out. The age of the patients ranged from 60 to 90 years, with an average of 72.4±9.3 years. The majority were female patients - 103 (76.87 %), 31 (23.13 %) were male.

The study was conducted in compliance with the code of ethics approved by the Ethics Committee of Ivano-Frankivsk National Medical University dated December 23, 2013, No. 75/13, and informed consent was obtained from all participants (in accordance with the requirements of the Declaration of Helsinki).

Upon admission, all patients underwent radiography of the proximal part of the thigh with the hip joint in the anteroposterior plane. Patients were operated on the 1st-3rd day after admission to the hospital. When choosing the method of osteosynthesis, the complexity of the fracture and the displacement of the fragments were assessed according to the AO/ASIF classification. In 48 (35.82 %) patients, transtrochanteric fractures belonged to the group of stable type A1 fractures (31A1.1.), in 86 (64.18 %) the fractures were unstable (31A1.2-A1.3). The distribution of patients is shown in Table 1.

Table 1

Distribution of patients with transvertebral fractures according to the AO/ASIF classification

Localization of the fracture	Type of fracture			Total abs.(%)
	31A1.1 abs.(%)	31A1.2 abs.(%)	31A1.3 abs.(%)	
Proximal part of the femur	48 (35,82)	61 (45,52)	25 (18,66)	134 (100)

Osteosynthesis was performed according to indications. The DHS fixator was used in 42 (31.34 %) patients of the I group with simple fractures of type 31A1.1. In the II group of patients, osteosynthesis was performed with a PFNA rod in 57 (42.54 %) cases, and with a Gamma nail in 35 (26.12 %) cases in the third group of patients. It is important to note that intramedullary osteosynthesis was performed both in the case of unstable fractures of type 31A1.2-A1.3 and in fractures of type 31A1.1.

Anatomical repositioning was performed on an orthopedic table under the control of an electronic-optical transducer. In case of fragmental unstable fractures, closed reduction did not always allow for a satisfactory alignment of the fragments by the closed method. In case of unstable transtrochanteric fractures, the presence of two or more fragments was sometimes the reason for lengthening the duration of closed repositioning and the insertion of a navigation needle into the intramedullary canal of the distal fragment. In 4 (2.98 %) cases of patients of II-III groups of intramedullary osteosynthesis, the lateral cervical access to the acetabulum area was increased for additional open reposition of the displaced lateral wall.

In the postoperative period, patients were activated on the first - second day after the operation, put in bed, lifted to the healthy limb. On the 3rd or 4th day, patients were helped to move around the ward with support on a walker without support on the injured limb. In all patients, the postoperative wound healed with primary tension.

Statistical processing of the research results was carried out using the Statistica 6.0 program. Digital data processing was carried out using the Student method in the Ecxel program.

3. Research results

The analysis of treatment results was evaluated by radiological data of fracture healing, functional status of the hip joint, which was determined by the Harris scale, and complications.

Consolidation of the fracture was observed during control radiographs at 3 and 6 months. In a larger number of patients, consolidation took place in average physiological terms. In patients of the first group, complications were observed in the form of migration of the cervical dynamic screw, a violation of the stability of the fixator with varus deformation in two, a fracture of the fixator

occurred, non-union - in 7 patients. Five patients underwent rheosynthesis using a PFNA rod. In one patient, the migrated DHS fixator was removed, and a total cement arthroplasty of the hip joint was performed. One patient refused a repeat operation and was subsequently dropped out of follow-up. Complications leading to repeated surgical intervention and prolongation of consolidation of a transcavitary fracture during extramedullary osteosynthesis is 16.67 %.

Among the patients of the second group, an unsatisfactory result was observed in five patients. In three patients, a fracture of the rod occurred at the level of the cervical screw, in another – a "cut-out" effect. All patients underwent reosteosynthesis with a long PFNA rod. In the fifth patient, the "cut-out" effect occurred without cutting the head. The patient did not put any load on the operated limb until the fracture healed with an extended period.

In the third group, three patients had complications in the form of a fracture of the Gamma nail also in the place of passage of the cervical screw, in one, migration of the cervical screw with secondary displacement of the fragments. All patients underwent reosteosynthesis with a long Gamma nail. Complications leading to repeated surgical intervention and prolongation of consolidation of a transcavitary fracture during intramedullary osteosynthesis is 9.78 %.

Restoration of the function of the injured limb in relation to the type of osteosynthesis differed in patients already in the early postoperative period. Patients who underwent intramedullary osteosynthesis of a fracture performed a dosed load on the operated limb almost on the 10–14th day. Patients after DHS osteosynthesis with a fixator noted severe pain during axial load and could not perform dosed static resistance of the limb.

Determination of the function of the hip joint according to the Harris scale was carried out 1, 3, 6, and 12 months after surgical treatment of patients. Thus, after DHS osteosynthesis with a fixator, the average score of the Harris scale in the first month was 28.8 points, and in the 12th month – 65.1 points. After osteosynthesis of PFNA with a rod, the average indicator of the Harris scale in the first month was 50.7 points, at 12–79.5, and after osteosynthesis with a Gamma nail – 50.1 and 79.2, respectively. The dynamics of indicators of recovery of the function of the injured limb after various methods of osteosynthesis are presented in Table 2.

Table 2

Changes in the functional index of recovery of the injured limb according to the Harris scale

Study groups	Harris average (in points)			
	1 month	3 months	6 months	12 months
I	29.8	37.4	57.7	70.3
II	50.7	59.8	76.9	79.5
III	50.1	59.9	76.7	79.2

4. Discussion of research results

When evaluating the results of treatment, it is important to note the advantage of intramedullary osteosynthesis in the early postoperative period. So, in the first and third month after surgical treatment, the function of the limb was restored better, the Harris scale indicator prevailed in patients of the second and third groups compared to the first. On the sixth month, the resistance of the limb in the patients of the first group was restored and the Harris scale indicator improved.

Thus, according to Singh N. K. and co-authors [10], there was no significant difference between the groups of patients with stable intertrochanteric fractures who underwent osteosynthesis with DHS and PFNA-II fixators when assessing the duration of fusion, the frequency of complications and the modified Harris Hip & SF-12 index through three months, six months and one year of follow-up.

When characterizing complications, it is important to pay attention to the rate of fracture of intramedullary fixation rods. This can be explained by a significant reduction in pain after surgical treatment in the injured limb and satisfactory resistance, which allowed to increase the load until the consolidation of the fracture. Among the main reasons for the secondary displacement of bone fragments and the occurrence of "cut-out", the following are known: the type of fixator, the quality of repositioning of the fragments, the positioning of the cervical component of the nail.

Considering the intramedullary and extramedullary methods of osteosynthesis, insignificant differences in the total number of complications between these methods can be noted. Therefore, positioning the advantage of reliable and stable fixation does not prevent the possibility of complications and loss of confidence in a satisfactory result. Therefore, the search for approaches to improve the results of surgical treatment of transcavitary fractures in the elderly and senile remains relevant.

Study limitations. When conducting our study, patients with concomitant diseases that significantly affect the prolongation of the fracture healing period, regardless of the method of surgical treatment, were not included.

Prospects for further research. The prospect of further research is to study the long-term results after surgical treatment of elderly and senile patients with transtrochanteric fractures by various methods.

5. Conclusions

1. The functional result in elderly and senile patients with transtrochanteric fractures after intramedullary osteosynthesis has advantages over extramedullary osteosynthesis. The results of the calculation of the Harris scale indicators, among which the evaluation of the restoration of gait, movements and resistance of the injured limb were decisive, are significantly higher in osteosynthesis with a Gamma nail and a PFNA rod in comparison with a DHS fixator.

2. Complications that occurred in the three groups of the study coincide with the average international indicators and are not significantly low in intramedullary osteosynthesis. Improvement of surgical treatment methods is urgent and requires the search for complex treatment approaches in elderly and senile patients with transtrochanteric fractures.

Conflict of interests

The authors declare that they have no conflict of interest in relation to this research, including financial, personal, authorship or other nature, which could affect the research and its results presented in this article.

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Data availability

The manuscript has no associated data.

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