УДК: 616.718.41/.45-001.5-07/08(048.8)
HTTPS://DOI.ORG/10.37647/0132-2486-2022-113-2-80-85

Proximal Femoral Fractures: Structure, Factors of Occurrence, and Treatment Principles (Literature Review)

Kalashnikov A.V.[1], Lazarenko Yu.V.[2], Kalashnikov O.V.[1]✉

Summary. *Proximal femoral fractures (PFF) constitute a significant medical and social problem, as they cause reasonable economic loss throughout the world. In 1990, the number of such traumas reached about 1.3 million, and by 2050, it is expected within 7-21 million cases. With the share of 17% in the structure of locomotion system traumas, they have large mortality and invalidity rate among the injured. The research analyzes international literature sources on incidence, factors of occurrence, mechanisms of development, and known classifications of PFF patients; basic methods of conservative and surgical treatment, as well as rehabilitation principles for this category are provided. We have found that, despite a large amount of literature, a clinical and diagnostic approach to the differentiated use of internal fixation for PFF is still not finally developed.*

Key words: *proximal femoral fractures; analysis of literature sources; factors of occurrence; known classifications; treatment, rehabilitation.*

Introduction

Proximal femoral fractures (PFF) constitute a significant medical and social problem, as they cause reasonable economic loss throughout the world. Within musculoskeletal trauma, their share equals 17%. Among them, 50-55% are femoral neck fractures, 35-40% are fractures of trochanteric, and 5-10% are fractures of subtrochanteric areas [1]. In the USA, the average annual number of extra-articular PFF in senior patients is 97 cases out of 100,000 persons (63 females and 34 males) [2]. About 104,000 PFF patients are hospitalized every year in Germany. According to statistics and demographic analysis, this value may triple within the nearest 10-15 years [3]. The incidence of PFF in Germany is about 110-130 cases per 100,000 persons a year, and their structure includes prevailing femoral neck fractures (57%), followed by pertrochanteric (36%) and subtrochanteric (7%) ractures. One out of five women over 80 years old and five out of ten over 90 years old suffer from extra-articular PFFs [4]. Considering the modern demographic trends, there is a constant growth in the incidence of PFF fractures attributable to osteoporosis [5-7]. In Europe, Scandinavian states have the largest share of femoral fractures. In Norway, according to the Norway Central Bureau of Statistics, the frequency of PFF from 1998 till 2003 for persons 50 years old and older was 1263 per 100 thousand women and 452 per 100 thousand men [8]. In 1990, the number of such traumas throughout the world was about 1.3 million, and by 2050, it may reach 7-21 million cases. In the USA, cases of PF fractures reach about 30% of the total number of hospitalized patients, and expenses for their treatment make approximately 8 billion USD a year. In the UK, the total annual number of hospitalized PFF patients makes 1.5 million; they occupy about 20% of orthopedic beds in the total number of patients with locomotion system disorders [9].

There are many factors of PFF occurrence in senior patients. The frequency of femoral fractures depends directly on the way of life and increases in a group of persons with low body mass [10, 11] and low physical activity [12, 13]. These factors may also include smoking tobacco [14, 15] and unfavorable social status [16]. The risk of PFF increases in patients after an acute cerebrovascular accident (insult) [17], in a terminal stage of renal impairment [18, 19], and with a reduced visual function [20].

The matter of what occurs first – fracture of fall – remains open. In practice, over 90% of all PF fractures result from a fall. By trauma mechanism, all PPF may split into two main groups. In young patients, the fractures occur after a high-energy trauma: road accidents or fall from height. About 90% of all fractures in this area in senior persons are the result of low-energy trauma, i.e. just fall on their trochanteric area. A PFF requires a combination of 4 factors to take place: 1) a fall on the upper third of a thigh, 2) weak protective reflexes to prevent the strong fall, 3) a rapid muscle contraction during the fall and improper quantity of subcutaneous adipose tissue,

✉ *Kalashnikov O.V., Kalashnikov26@ukr.net*
[1]SI "Institute of Traumatology and Orthopedics of NAMS of Ukraine", Kyiv
[2]Military Medical Clinical Center of the Central Region, Vinnytsia

a local shock-absorber, and 4) low bone tissue density [21]. Elderly patients with PF fractures after low-energy traumas quite often have concomitant injuries, such as radial distal metaepiphysis and proximal shoulder fractures. Craniocerebral injuries, traumas to the cervical spine, thorax, abdomen, and extremities are typical of young PPF patients after high-energy trauma [22].

In femoral neck fractures, in the majority of cases, the fracture line goes transversely through the neck in its thinnest part or is slightly oblique. The first dislocation of fragments after a femoral fracture caused by external factors is extended upon the influence of muscular retraction. If the fracture occurs in the proximal fragment, no muscles influence the femoral head, and it remains in a neutral position or (comparatively rear case) turns in the acetabular cavity with a simultaneous distal fragment displacement. Regularly, the distal fragment gets displaced upward, backward, and outside. Long biarticular femoral muscles displace the extremity upwards, while *m. iliopsoas* turns it outwards [23].

In lateral fractures, displacement of fragments' is also typical: the neck-shaft angle decreases, the proximal fragment is in abduction, the ruptured small trochanter shifts upwards under the influence of *m. iliopsoas*. Under the influence of gravity, the thigh shifts backwards, and the whole lower limb rotates externally. Usually, a different displacement of fragments is not observed due to a wide fracture area, and in presence of a periost and many muscular attachments [23].

Garden had subdivided fractures into 4 types depending on femoral neck fan-shaped trabeculae (a medial bundle) displacement [24].

Garden classification

Type I – the angle between trabeculae in the femoral head and neck metaphysis is over 160°. In the author's opinion, this fracture type is followed by minimum blood circulation impairment and is considered classical incomplete.

Type II – trabeculae and the lower cortical layer are ruptured but not displaced. The femoral head viability prognosis is relatively positive.

Type III fracture is followed by varus deformation of the femoral neck. The distal fragment remains in an external rotation and abduction; the rear lower block remains intact, forming an angle, open forward. Such fractures are frequently accompanied by comminuted rear neck fractures.

Type IV fracture is associated with the rupture of all synovial connections. On radiograms, femoral head trabeculae are slightly displaced downwards regarding the femoral neck metaphysis trabeculae. These fractures are often complicated with femoral head aseptic necrosis. In the author's opinion, type 4 fractures extend the indications for hip arthroplasty [25]. According to many authors, this classification allows prognostication of femoral head viability.

The Pauwels classification includes only subcapital femoral neck fractures. Its background is the relation between the fracture line and a horizontal one [24, 26].

Pauwels classification

Type I – the fracture line is in 30° inclination to a horizontal one; displacement forces are focused on compression of fragments.

Type II – the fracture line is in 50° inclination to a horizontal line.

Type III – the fracture line is in 70° inclination to a horizontal line.

Carrying out metal osteosynthesis considering this classification, the author recommends the following: in type I, osteosynthesis should be performed with three screws because they dislocate the forces focused on compression. In type II and type III fractures, the angle between the fracture line and a horizontal one increases and sliding forces grow, demanding more rigid fixation to obtain a stable osteosynthesis. For these fractures, it is recommended to support nail osteosynthesis with a cancellous screw [24].

AO Fellowship in Switzerland has the following classification:

1. (B1) subcapital fractures without a displacement;
2. (B2) transcervical;
3. (B3) subcapital displaced fractures.

In his more detailed classification, Muller (1990) has distinguished fractures of the head, neck, and trochanter [24, 26].

Muller classification

A – fractures in the trochanteric area:

A1 – a juxta-articular fracture in a trochanteric area, pertrochanteric, simple;

A2 – a juxta-articular fracture in a trochanteric area, pertrochanteric, comminuted;

A3 – a juxta-articular fracture in a trochanteric area, intratrochanteric.

B – femoral head fractures:

B1 – subcapital with a slight shift;

B2 – transcervical femoral neck fracture;

B3 – subcapital femoral neck fracture, not impacted, displaced.

C – femoral head fractures:

C1 – split femoral head fracture;

C2 – pressed femoral head fracture;

C3 – head and neck fracture.

Pipkin has offered a much more detailed classification of femoral head dislocation fractures [24].

Pipkin classification

Type I: femoral head fracture interior to the *fovea centralis*;

Type II: fracture extended superior to the *fovea centralis*;

Type III: any femoral head fracture with an associated femoral neck fracture;

Type IV: any femoral head fracture with an associated acetabular fracture.

Nowadays, the most frequently used is AO classification [27].

AO classification

This classification reflects the whole range of proximal femoral fractures:

A – trochanteric fracture, pertrochanteric, simple:

A1 – the fracture line goes along the intertrochanteric line;

A2 – the fracture line goes through the greater trochanter;

A3 – the fracture line goes below the lesser trochanter.

A2 – comminuted pertrochanteric fracture, pertrochanteric comminuted: 1 intercalated fragment; 2 – two or more intercalated fragments; 3 – the fracture line extends 1 cm below the lesser trochanter.

A3 – the fracture in the intertrochanteric area: 1 – simple, oblique; 2 – simple, transverse; 3 – comminuted.

B – femoral neck fractures:

B1 – femoral neck fracture, subcapital, with slight displacement: 1 – compressed valgus over 150^0; 2 – compressed valgus less than 150^0;

B2 – transcervical neck fracture: 1 – neck base; 2 – neck diaphysis, adduction; 3 – transcervical, not displaced;

B3 – subcapital neck fracture, not impacted, without a displacement; 1 – a moderate displacement, varus, external rotation; 2 – moderate displacement, varus, with a vertical shortening and external rotation; 2 – expressed displacement.

C – femoral head fractures:

C1 – split head fracture; 1 – *ligamentum teres* avulsion; 2 – *ligamentum teres* rupture; 3 – large fragment.

C2 – depression fracture: 1 – posterosuperior fracture; 2 – anterosuperior fracture; 3 – split depression fracture.

C3 – femoral head and neck fractures: 1 – split and transverse neck fracture; 2 – split and subcapital neck fracture; 3 – neck depression fracture.

Especially essential is the study of PFF patients' mortality. According to WHO, mortality in this category of senior patients with PFF makes 12-15% [28]. From 18% to 28% of senior patients die within one year after the injury [29-33]. According to German experts, the in-hospital mortality associated with this trauma is about 6%. The long-term mortality in these groups demonstrates, that 10% of patients die in half of a year, and in one year, this value grows to 22.2-27.6 % [34, 35]. As a rule, this is connected to the fact that senior PFF patients have severe concomitant pathologies, which almost always leads to their decompensation stage. Exacerbation of concomitant diseases (coronary heart disease, arrhythmia, arterial hypertension, diabetes mellitus type II, renal and liver impairment) and complications (myocardial infarction, pneumonia, pulmonary edema, pulmonary arteria thromboembolism, vascular impairment, cystitis, bed sores) may lead to death [36-38].

Anatomic features of this area stipulate a large share of complications during treatment of fractures, i.e. fragments nonunion, femoral head aseptic necrosis, pseudoarthrosis, hip contractures, shortening, or malposition of a limb [39]. These complications make the extremity unable to dead load, and the patients become weaky and need nursing care. Many of them become bedbound, and others die from complications: bedsore, pneumonia, or decompensated concomitant diseases [40].

Surgical treatment of PFF decreases significantly the mortality of patients. Nowadays, it is a method of choice, and frequently the only chance to save a patient's life and to restore the lost workability, ability to move independently, and fulfill daily routine tasks [41-43]. Compared to skeleton traction, surgical treatment does not lead to rapid growth in mortality. It allows early activation of patients and makes the care easier [44]. The period when the surgery should take place is ambiguous. Of course, the surgery must be performed as early as possible, although pre-surgical preparation is also required. If a patient is in stable condition, the surgery is recommended if possible within the first 24 hours after the injury. Postponing the surgery to more than 2 days increases the risk of post-surgical mortality within the first year, even among the patients who took care of themselves, are in an adequate mental health, and were able to walk independently before the injury [45]. As a rule, the method of anesthesiology does not affect the outcome [46]. A prospective study of senior patients with trochanteric fractures demonstrated that the older a patient is, the weaker is his somatic status. They need a longer in-hospital period, compared to femoral neck fracture patients. In 2 months after the surgery, neck fracture patients demonstrated better recovery compared to trochanteric fractures patients, and they have lower mortality risk within the period from 2 to 6 months after the trauma [47, 48].

The choice of a method of treatment, terms of surgical intervention, reposition accuracy, fixation strength, and early activation of the patients are essential for outcomes. To choose an appropriate method of treatment and predict the outcomes, important factors are the age of a patient, general and local status, type of a fracture, gender, physical activity extent before the injury.

Nowadays, developed countries widely implement minimally invasive, less traumatic technologies for proximal femoral nails (Trochanteric gamma nail G 3 – STRYKER, PFN A – SYNTHES, ChFN – ChM). This method of surgical treatment of long bone fractures is applied in 60–70 % of cases [49, 50]; it is an organ-preserving surgery, on the contrary to total hip arthroplasty.

There are a few literature sources paying attention to elaboration of clinical and diagnostic approaches to the differentiated use of internal fixation devices in PFF treatment [3, 27], and a few of them enlighten the ways to solve this problem. Out of the recent researches devoted to this matter is the one performed at the SI "Institute of Traumatology and Orthopedics of NAMS of Ukraine" (Ph.D. dissertation by Yuriichuk L.M.) [51], where the author has extended indications to total hip arthroplasty, especially in pertrochanteric fractures of senior and old patients.

The long-term outcomes of PPF treatment may be assessed as positive only if a patient remains alive within 1 year after the injury, does not require external assistance, and is returned to the previous activity level. However, only 25% of PFF patients after the surgery boast a quality of life recovery. The share of the 1st and 2nd groups of disability among the initially examined patients according to these consequences of fractures reach 15%; 28% of them are persons of workable age [1].

Rehabilitation after the surgical treatment stipulates the return of patients to their previous activity level. Senior and old persons should be independent in their everyday living and unburdensome for their relatives. Those of workable age will return to their work, not burdening the society; otherwise, they should be maintained as disabled. To solve this medical social problem, rehabilitation potential, the index of the summary, general conditions, anatomical and functional potential, and social adaptation of a patient must be determined.

Conclusions

We have discovered that, despite a large amount of literature, a clinical and diagnostic approach to the differentiated use of internal fixation for PFF is still not finally developed.

Conflict of interests. The authors declare no conflict of interest towards the present article.

References

1. Гайко ГВ, Корж МО, Калашніков АВ, Герасименко СІ, Полішко ВП. Аналіз стану травматологічно-ортопедичної допомоги населенню України в 2006-2007 рр. Довідник. К: Видавнича компанія "Воля"; 2008.134 с.
Gaiko GV, Korzh MO, Kalashnikov AV, Herasymenko SI, Polishko VP. Analysis of orthopedic-traumatology support of Ukrainians in 2006-2007. Dovidnyk. K: Vydavnycha kompaniia "Volia"; 2008. 134 s. [in Ukrainian].
2. Brauer CA, Coca-Perraillon M, Cutler DM, Rosen AB. Incidence and mortality of hip fracturesin the United States. JAMA 2009;32(14):1573–79. DOI: 10.1001/jama.2009.1462.
3. Ананко АА, Бабко АН. Современная травматологическая тактика при проксимальных переломах бедренной кости (обзор немецкой литературы). Український медичний часопис. 2007;1(57):75-80.
Ananko AA, Babko AN. The modern traumatology tactics in proximal femoral fractures (a review of German sources). Ukrainskyi medychnyi chasopis. 2007;1(57):75-80. [in Russian].
4. Корж НА, Герасименко СИ, Климовицкий ВГ, Лоскутов АЕ, Романенко КК, Герасименко АС, Коломиец ЕН. Распространенность переломов костей и результаты их лечения в Украине (клинико-эпидемиологическое исследование). Ортопедия, травматология и протезирование. 2010;(3):5-14.
Korzh NA, Herasimenko SI, Klimovitskiy VG, Loskutov AYe, Romanenko KK, Gerasimenko AS, Kolomiets YeN. The frequency of bone fractures and results of their treatment in Ukraine (clinical epidemiological study). Ortopediya, travmatologiya i protezirovanie. 2010;(3):5-14. [in Russian].
5. Strom O, Borgstrom F, Kanis JA, Compston J, Cooper C, McCloskey EV, et al. Osteoporosis: burden, health care provision and opportunities in the EU: a report prepared in collaboration with the International Osteoporosis Foundation (IOF) and the European Federation of Pharmaceutical Industry Associations (EFPIA)// Arch Osteoporos - 2011. - 6. - P. 59-155. DOI: 10.1007/s11657-011-0060-1.
6. Johnell O, Kanis JA. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. Osteoporos Int. 2006;17:1726-33. DOI: 10.1007/s00198-006-0172-4.
7. Kanis JA, Johnell O. Requirements for DXA for the management of osteoporosis in Europe. Osteoporos Int. 2005;16:229-38. DOI: 10.1007/s00198-004-1811-2.
8. Bjorgul K, Reilkeras O. Incidence of hip fracture in a southeastern Norway: a study of 1,730 cervical and trochanteric fractures. Int Orthop. 2007;31(5):665-69. DOI: 10.1007/s00264-006-0251-3).
9. Roberts KC, Brox WT, Jevsevar DS, Sevarino K. J Management of hip fractures in the elderly Am. Acad Orthop Surg. 2015 Feb;23(2):131-7. DOI: 10.5435/JAAOS-D-14-00432.
10. Langlois JA, Visser M, Davidovic LS, Maggi S, Li G, Harris TB. Hip fracture risk in older white men is associated with change in body weight from age 50 years to old age. Arch. Intern Med.1998;158:990-6. DOI:10.1001/archinte.158.9.990.
11. Farahmand BY, Michaelsson K, Baron JA, Per-Gunnar P, Sverker L. Body size and hip fracture risk. Swedish Hip Fracture Study Group. Int. J. Epidemiology. 2000;11:214-19.
12. Farahmand BY, Persson PG, Michaelsson K, Baron JA, Alberts A, Moradi T, et al. Physical activity and hip fracture: a population-based case-control study. Swedish Hip Fracture Study Group. Int. J. Epidemiol. 2000;29:308-314. DOI: 10.1093/IJE/29.2.308.
13. Gregg EW, Pereira MA, Caspersen CJ. Physical activity, falls, and fractures among older adults: a review of the epidemiologic evidence. J. Am. Geriatr. Soc. 2000;48:883-93.
14. Stewart A, Calder LD, Torgerson DJ, Seymour DG, Ritchie LD, Iglesias CP, et al. Prevalence of hip fracture risk factors in women aged 70 years and over. QJM: An International Journal of Medicine. 2000;93:677-80. DOI: 10.1093/qjmed/93.10.677.

15. Hoidrup S, Prescott E, Sorensen TI, Gottschau A, Lauritzen JB, Schroll M, et al Tobacco smoking and risk of hip fracture in men and women. Int. J. Epidemiol. 2000;29(2):253-9. DOI: 10.1093/ije/29.2.253.
16. Bacon WE, Hadden WC. Occurrence of hip fractures and socioeconomic position. J. Aging Health. 2000;12:193-203.
Ramnemark A, Nilsson M, Borssen B, Gustafson Y. Stroke, a major and increasing risk factor for femoral neck fracture. Stroke. 2000;31:1572-7.
17. Alem AM, Sherrard DJ, Gillen DL, Weiss NS, Beresford ShA, Heckbert SR, et al. Increased risk of hip fracture among patients with end-stage renal disease. Kidney Int. 2000;58:396-9. DOI: 10.1046/j.1523-1755.2000.00178.x.
18. Coco M, Rush H. Increased incidence of hip fractures in dialysis patients with low serum parathyroid hormone. Am. J. Kidney Dis. 2000;36:1115-21.
19. Ivers RQ, Norton R, Cummings RG, Butler M, Campbell AJ. Visual impairment and risk of hip fracture. Am. J. Epidemiol. 2000;152:633-639.
20. Cummings SR, Nevitt MC, Cummings SR. Ahypothesis: the causes of hip fractures. J. Gerontol. 1989;44:107-111.
21. Hwang LC, Lo WH, Chen WM. Intertrochanteric fractures in adults younger than 40 years of age. Arch. Orthop. TraumaSurg. 2001;121(3):123-126.
22. Котельников ГП, Миронов СП. Травматология: национальное руководство. М.: ГЭОТАР-Медиа; 2018.776 с.
Kotelnikov GP, Mironov SP. Traumatology: the national guide. M.: GEOTAR-Media; 2018. 776 p. [in Russian].
23. Анкин НЛ, Анкин ЛН. Травматология. Европейские стандарты диагностики и лечения. Киев: Книга-плюс; 2012. 464 с.
Ankin NL, Ankin LN. Traumatology. European standards of diagnostics and treatment. Kiev: Kniga-plyus; 2012. 464 p. [in Russian].
24. Garden R.S. Low-angle fixation in fractures of the femoral neck. J. Bone Joint Surg.1961;43B:647.
25. Корнилов НВ. Травматология и ортопедия: руководство для врачей: в 4 т. СПб.: Гиппократ; 2006. 622 с.
Kornilov NV. Traumatology and orthopedics. Physician's guide in 4 vol. St-Petersburg: Gippokrat; 2006;622 p. [in Russian].
26. Мюллер МЕ, Алльговер М, Шнайдер Р, Вилленгер ХМ. Руководство по внутреннему остеосинтезу: Спрингер-Верлаг; 1996. 750 с.
MullerME, AllgowerM, ShneiderR, WillengerHM. The guide on internal osteosynthesis: Springer-Verlag; 1996. 750 p. [in Russian].
27. Kanis JA, Oden A, Johnell O, De Laet C, Jonsson B, Oglesby AK. The components of excess mortality after hip fracture. Bone. 2003;32:468-73. DOI: 10.1016/s8756-3282(03)00061-9.
28. Lee AYJ, Chua BSY, Howe TS. One-year outcome of hip fracture patients admitted to a Singapore hospital: quality of life post-treatment. Singapore Med J. 2007;48(11):996. PMID: 17975688.
29. Kates SL, Mendelson DA, Friedman SM. Comanaged care for fragility hip fractures (Rochester model). Osteoporos Int. 2010;21(4):621-5. DOI: 10.1007/s00198-010-1417-9.
30. Fierens J, Broos PLO. Quality of life after hip fracture surgery in the elderly. Acta Chir Bel. 2006;106(1):393-96. DOI: 10.1080/00015458.2006.11679913.
31. Giversen IM. Time trends of mortality after first hip fractures. Osteoporos Int. 2007;18(6):721-32. DOI: 10.1007/s00198-006-0300-1.
32. Moran CG, Wenn RT, Sikand M, Taylor AM. Early mortality after hip fracture: is delay before surgery important. J Bone Joint Surg Am. 2005;87:483-9. DOI: 10.2106/JBJS.D.01796.
33. Bosch U, Schreiber Th, Skulek M. Minimal invasive Osteosynthese der medialen Schenkelhalsfraktur bei betagten Patienten. Trauma und Berufskrankheit. 2003;1:35-41.
34. Geiger F, Schreiner K, Schneider S, Pauschert R, Thomsen M. Proximal fracture of the femur in elderly patients. The influence of surgical care and patient characteristics on postoperative mortality. Orthopade. 2006;35(6):651-8. DOI: 10.1007/s00132-006-0930-1.
35. Ngobeni RS. Mortality in elderly patients with intertrochanteric fractures: three years' experience. SA orthop. J. 2010;9(1):55-60.
36. Alzahrani K, Gandhi R, Davis A, Mahomed N. In-hospital mortality following hip fracture care in southern Ontario. Can J Surg. 2010;53:294-8. PMID:20858372.
37. Giversen IM. Time trends of mortality after first hip fractures. Osteoporos Int. 2007;18(6):721-32. DOI: 10.1007/s00198-006-0300-1.
38. Zuckerman JD, Skovron ML, Koval KJ, Aharonoff G, Frankel VH. Postoperative complications and mortality associated with operative delay in older patients who have a fracture of the hip. J. Bone Joint Surg. Am. 1995;77-A:1551-6. DOI: 10.2106/00004623-199510000-00010.
39. Kang HY,Yang KH, Kim YN, Moon SH, Choi WJ, Kang DR, Park SE. Incidence and mortality of hip fracture among the elderly population in South Korea: a population-based study using the national health insurance claims data. BMC Public Health. 2010;10:230. DOI: 10.1186/1471-2458-10-230.
40. Kanis JA, Burlet N, Cooper C, Delmas PD, Reginster JY, Borgstrom F, Rizzoli R. European guidance for the diagnosis and management of osteoporosis in postmenopausal women. Osteoporos Int. 2008;19(4):399-428. DOI: 10.1007/s00198-008-0560-z.
41. Cheng MT, Chiu FY, Chuang TY, Chen ChM, Chen TH. Experience in the use of the long Gamma nail for 16 femoral shaft fracture that have occurred following initial Asian Pacific Gamma nail fixation for pertrochanteric fractures. Injury. 2006;37(10):994-9. DOI: 10.1016/j.injury.2006.01.038.
42. Fogagnolo F, Kfuri MJr, Paccola C. Intramedullary fixation of pertrochanteric hip fractures with the short AOASIF proximal femoral nail. Arch. Orthop. Trauma. Surg. 2004;124:31-7. DOI: 10.1007/s00402-003-0586-9.
43. Ioannidis G, Papaioannou A, Hopman WM, Akhtar-Danesh N, Anastassiades T, Pickard L, et al. Relation between fractures and mortality: results from the Canadian Multicentre Osteoporosis Study. CMAJ. 2009;181(5):265-271.DOI:10.1503/cmaj.081720.
44. Williams A, Jester R. Delayed surgical fixation of fractured hips in older people: impact on mortality. J. Adv. Nurs. 2005;52(l):63-69.
45. Koval KJ, Aharonoff GB, Rosenberg AD, Schmigelski C, Bernstein RL, Zuckerman JD. Hip fracture in the elderly: the effect of anesthetic technique. Orthopedics. 1999;22:31-34. DOI: 10.3928/0147-7447-19990101-05.
46. Fox KM, Magaziner J, Hebel JR, Kenzora JE, Kashner TM. Intertrochanteric versus femoral neck hip fractures: differential characteristics, treatment, and sequelae. J. Gerontol. A Biol. Sci. Med. Sci. 1999;54:635-40. DOI: 10.1093/gerona/54.12.m635.
47. Рибачук ОІ, Кукуруза ЛП, Торчинський ВП. Тотальне ендопротезування кульшового суглоба протезом конструкції УкрНДІТО (методичні рекомендації). Київ; 1999. 20 с. Rybachuk OI, Kukuruza LP, Torchynskyi VP. Total hip arthroplasty using UkrNDITO prosthesis (Methodical recommendations). Kyiv; 1999. 20 p. [in Ukrainian].

48. Lee YK, Chung CY, Park MS, Lee KM, Koo KH. Intramedullary nail versus extramedullary plate fixation for unstable intertrochanteric fractures: decision analysis Arch. Orthop. Trauma Surg. 2013;133(7):961-8. DOI: 10.1007/s00402-013-1764-z.
49. Efstathopoulos NE, Nikolaou VS, Lazarettos JT. Intramedullary fixation of intertrochanteric hip fractures: a comparison of two implant designs Int. Orthop. 2007;31(1):71-76. DOI: 10.1007/s00264-006-0128-5.
50. Юрійчук ЛМ. Ендопротезування кульшового суглоба у хворих похилого та старечого віку з через- та міжвертлюговими переломами стегнової кістки [автореферат дис. на здобуття наук. ступ. канд. мед. наук]. Київ: ДУ "Інститут травматології та ортопедії АМН України"; 2009. 24 с.
Iuriichuk LM. Hip arthroplasty in elderly and old patients with per-and intractochanteric femoral fractures. [avtoreferat dys. na zdobuttia nauk. stup. kand. med. nauk]. Kyiv: DU "Instytut travmatolohii ta ortopedii AMN Ukrainy"; 2009. 24 s. [in Ukrainian].

Переломи проксимального відділу стегнової кістки: структура, чинники виникнення та принципи лікування (Огляд літератури)

Калашніков А.В.[1], Лазаренко Ю.В.[2], Калашніков О.В.[1]
[1]ДУ "Інститут травматології та ортопедії НАМН України", м. Київ
[2]Військово-медичний клінічний центр Центрального регіону, м. Вінниця

Резюме. *Переломи проксимального відділу стегнової кістки (ППВСК) є великою медико-соціальною проблемою та завдають значних матеріальних збитків у всіх країнах. Кількість подібних травм у світі в 1990 році становила близько 1,3 млн, а до 2050 року передбачається в межах 7-21 млн випадків. Вони становлять 17% у структурі травм опорно-рухової системи, з високим відсотком летальності та інвалідності уражених хворих. Проведено аналіз джерел світової літератури щодо розповсюдженості, чинників виникнення, механізму розвитку та відомих класифікацій пацієнтів із ППВСК, наведено основні методики консервативного й оперативного лікування та принципи реабілітації цієї категорії хворих. Визначено, що, незважаючи на велику кількість літературних джерел, остаточно не розроблений клініко-діагностичний підхід до диференційованого застосування внутрішньої фіксації при ППВСК.*

Ключові слова: *переломи проксимального відділу стегна; аналіз літературних джерел; чинники виникнення; відомі класифікації; лікування; реабілітація.*