

# **EXPERIENCE OF APPLICATION OF SIMULTANE SURGERY IN PATIENTS WITH SKELETAL INJURY COMPLICATED WITH DEEP VENOUS THROMBOSIS OF THE LOWER LIMBS AND PELVIS**

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**Abstract:** The analysis of the results of examination and treatment of 15 operated patients with deep vein thrombosis of the lower extremities and pelvis in combination with skeletal trauma in the departments of vascular surgery and traumatology of the RSCOMP for the period from 2017 to 2019 was carried out. All patients underwent a simultaneous operation, the purpose of which was the prevention of pulmonary embolism and the elimination of skeletal trauma. Depending on the level of the thrombotic process, 13 patients underwent IVC clipping and 2 patients underwent ligation of the femoral vein in combination with the traumatological stage of the operation.

**Key words:** deep vein thrombosis (DVT) of the lower extremities, pulmonary embolism (PE), clipping of the inferior vena cava (IVC), cava filter, endoprosthetics, osteosynthesis.

Patients were discharged with improvement; mortality and early postoperative complications were not observed. In no case was the clinic of thromboembolism of the branches of the pulmonary artery observed in our patients. Thus, performing a simultaneous operation allows early prevention of pulmonary embolism and stabilization of bones, avoiding repeated use of anesthetic aid and activating patients in the early postoperative period, which is an important measure for the prevention of retrombosis and improves the course of the disease.

The creation of the Republican Scientific Center for Emergency Medical Aid in our country and the opening of adjacent departments in the structure of the center confronted us with a situation

where the main flow of patients with emergency pathology began to concentrate in one place. Directly patients with skeletal trauma and deep vein thrombosis of the inferior vena cava (IVC) system, requiring intervention of at least two specialties, became the reason that made us tackle this problem more closely.

Deep vein thrombosis of the lower extremities and pelvis is one of the most pressing problems in modern traumatology and vascular surgery. According to the literature and clinical observations, up to 80 - 85% of thrombosis affect the veins of the IVC system. This is known to be due to "bipedal locomotion", as well as the peculiarities of blood flow [4, 16, 13].

A number of authors indicate that complications in the form of thrombosis in the inferior vena cava (IVC) system, in the absence of their drug prophylaxis, are observed up to 80% in patients with femoral fractures [10,8]. Such a high frequency of deep vein thrombosis (DVT) of the lower extremities in trauma is associated with damage to the vessel wall, forced hypodynamia and, as a result, slowing down of venous blood flow, which is one of the main conditions for thrombus formation [5, 1].

Thromboembolic complications often occur in patients with damage to the musculoskeletal system, including during surgery [1]. So after hip arthroplasty, deep vein thrombosis of the lower extremities and pelvis is observed in 45 - 70% of cases, after hip osteosynthesis - in 30 - 70% [15, 2]. As you know, deep vein thrombosis of the lower extremities and pelvis is the most common cause (up to 70-90%) of the development of such a formidable complication as pulmonary embolism (PE). Mortality from PE in patients with femoral fractures after osteosynthesis reaches 5.9%, and after hip arthroplasty occurs in 2.4% of cases [6].

The clinical manifestations of deep vein thrombosis (DVT) of the lower extremities and pelvis in combination with fractures of the long bones can often be nonspecific. The error rate can reach up to 50% due to the development of post-traumatic edema and non-recognition of edema of thrombotic etiology [11].

As an additional diagnosis of DVT, many authors recommend color duplex scanning (CDS) by the method of choice [17, 12]. This method is distinguished by its non-invasiveness, safety, the ability to conduct express diagnostics and multiple dynamic studies. CDS allows you to diagnose the localization of thrombosis, the nature of blood clots and identify extravascular soft tissue changes (hematomas, abscesses, lymphadenopathies, etc.).

However, the CDS method has some drawbacks when examining patients of this category. The possibilities of the latter are limited due to pain during the compression effect of the transducer, edema, and the presence of immobilization devices that restrict access to the limb.

Also, when thrombosis is localized in the iliofemoral segment, it is not always possible to visualize the proximal end of the thrombus. Thus, this research method can be supplemented with retrograde ilio-cavagraphy. However, this method has a number of disadvantages such as invasiveness, the likelihood of allergic reactions and the presence of contraindications for impaired renal function. The feasibility of using this method of examination may be the case if it is supplemented by the implantation of a cava filter.

To date, the most rational method for treating injuries of large bones of the extremities is surgical. Restoration of the integrity of bones during surgical treatment using various methods of osteosynthesis or endoprosthetics can significantly reduce the overall treatment time, lead to early activation and improve functional outcomes. However, the presence of DVT in

combination with skeletal injury is a subject of debate regarding the management of these patients [7].

A number of authors adhere to the conservative treatment of the acute period of deep vein thrombosis with immobilization of the injured limb and subsequent osteosynthesis at the stage of post-thrombophlebitic syndrome [3]. Others suggest staged surgery to prevent PE and subsequent skeletal restoration. However, embologic venous thrombosis is considered as an indication for urgent surgical treatment, and the choice of the type of operation and its sequence depends on the capabilities of a particular medical institution and the availability of related specialists.

At the same time, with the accumulation of the number of clinical observations, it becomes obvious that it is possible and necessary to determine the tactics of managing this category of patients.

**Purpose:** to evaluate the effectiveness of simultaneous operations in patients with fractures of the bones of the lower extremities complicated by deep vein thrombosis of the inferior vena cava system.

**Material and methods.** The analysis of the results of examination and treatment of 15 operated patients with deep vein thrombosis of the lower extremities and pelvis in combination with skeletal trauma in the departments of vascular surgery and traumatology of the RSCMP for the period from 2017 to 2019 was carried out.

According to our data, in 31.4% [14] of patients with fractures of the femur and pelvis, thrombosis of the IVC system was noted. The introduction of low-molecular-weight heparin into the standard of treatment made it possible to reduce the number of these complications by 3.65 times (8.6%). Despite this, there are still patients with embolism-prone forms of thrombosis, so we consider it possible to share the experience of simultaneous operations in this pathology.

The material for the study was 15 patients aged 52 to 75 years, referred from other medical institutions with fractures of the bones of the lower extremities, complicated by embolic deep vein thrombosis of the lower extremities and pelvis, who underwent simultaneous operations.

(73.4%) patients, after an injury and examination, were diagnosed with a closed fracture of the femoral neck with displacement of bone fragments, 2 (13.3%) patients - a closed subcapital fracture of the femoral neck and 2 (13.3%) patients - a closed fracture of the patella with a divergence of bone fragments. All patients were initially treated conservatively using immobilization of the affected limbs. Despite the intake of indirect anticoagulants and antiplatelet agents, 7-12 days after the injury, all patients were diagnosed with deep vein thrombosis of the lower extremities and pelvis.

In order to diagnose thrombosis of the inferior vena cava (IVC) system, as well as to establish the level of thrombosis and its form, CDS was used in all patients (n = 15). Ultrasound scanning of the veins of the lower extremities and IVC was performed using color Doppler mapping of the frequency shift using an EUB-6000 "Hitachi" apparatus. A 5.5-12 MHz transducer was used to locate the NK veins; a 2-4 MHz transducer was used for the iliac and IVC.

According to the results of the examination, in 13 (86.7%) cases (12 patients with a closed fracture of the femoral neck and 1 patient with a closed fracture of the patella), iliofemoral venous thrombosis was detected and in 2 (13.3%) cases, (1 patient with a closed fracture of the

femoral neck and 1 patient with a closed fracture of the patella), revealed thrombosis at the level of the femoral vein. It should be noted that in all cases deep vein thrombosis was observed precisely on the side of the skeletal injury and had an embolism-hazardous character.

All patients, after examination and preliminary preparation, on average 2-3 days after hospitalization, underwent a simultaneous operation. It should

be emphasized that the first stage in all cases was the surgical prophylaxis of pulmonary embolism and the second stage was the restoration of the integrity of the skeleton.

The nature of the performed simultaneous operations is presented in Table 1.

Таблица № 1

№	Название операций	Кол-во
1	Клипирование НПВ. Тотальное эндопротезирование тазобедренного сустава эндопротезом BG «Италия».	7
2	Клипирование НПВ. Закрытая репозиция перелома шейки бедренной кости с остеосинтезом компрессирующими винтами.	5
3	Клипирование НПВ. Открытое ушивание надколенника.	1
4	Перевязка бедренной вены (рассасывающимся шовным материалом) ниже впадения ГБВ. Открытое ушивание надколенника.	1
5	Перевязка бедренной вены (рассасывающимся шовным материалом) ниже впадения ГБВ. Открытая репозиция и интрамедуллярный остеосинтез правой бедренной кости штифтом с блокированием.	1

The "kava-clip" developed at the Center, made of a titanium alloy, after experimental studies (TsNIL-1 LMI named after I.P. Pavlov) on dogs, histological examination showed the absence of a pronounced reaction of the tissues of the vein wall and retroperitoneal tissue to "kava -clip "(QC). (Fig. 1, 2).

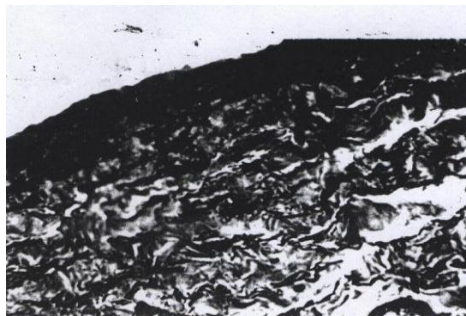


Figure 1. LEL histogram. Normal histological structure of the caudal vein of the control dog (hematoxylin-eosin staining, x200 magnification)



Figure 2. IVC histogram in the clip area. Histological structure of the caudal vein of

the dog in the area of cava-clipping, 6 months after the operation. Vein walls without structural changes (staining with hematoxylin-eosin, x200 magnification).

"Kava-clip" of standard sizes was pre-fabricated at the factory by stamping from a titanium alloy wire with a diameter of 1.3-1.5 mm, we also proposed, patented (No. IAP 03441 dated September 28, 2007) and made a special tool for the imposition of QC (Fig. 3).

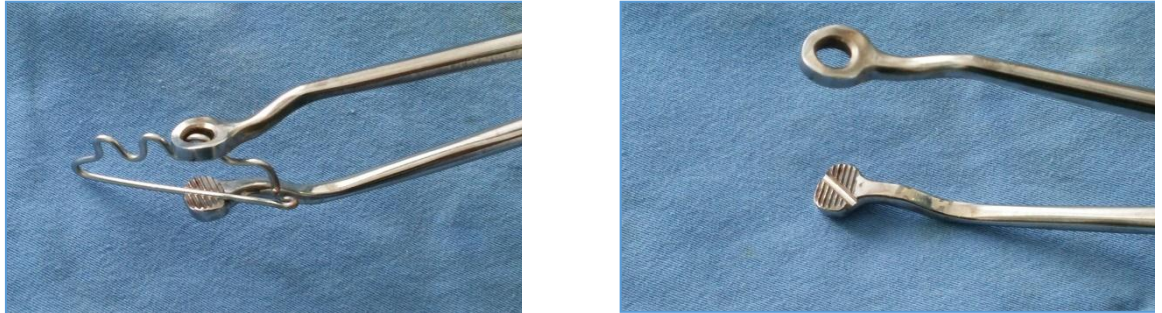
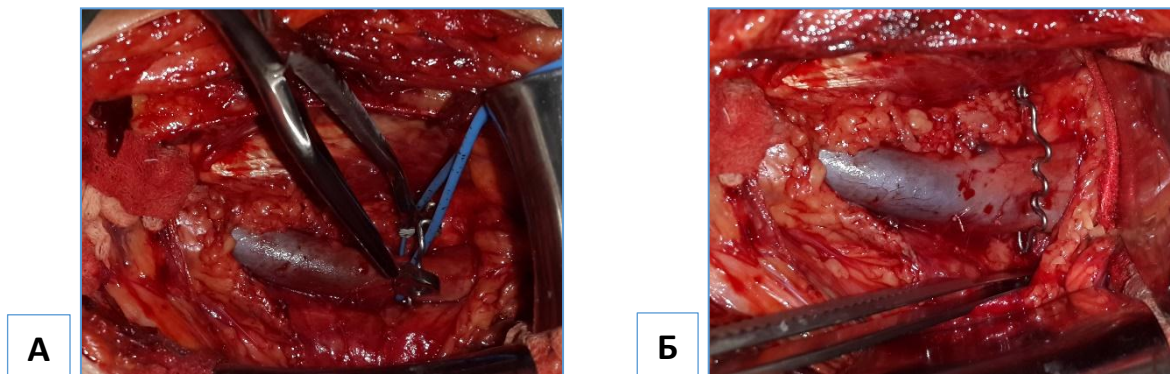


Figure: 3. The type of the tool for the application of CC, for its reliable fixation at the time of its application in the depth of the operating wound, at the end of the latter there is a special slot. "Kava-clip" is easily applied, having previously brought its straight part under the wall of the selected and mobilized segment of the inferior vena cava. After that, the CC is fixed by closing it with a special tool and fixed to the psoas muscle (Fig. 4).



**Figure: 4. Installation of the QC on the LEL using a specially designed tool (A) and the view of the LEL immediately after its application (B).**

13 patients underwent partial IVC stenosis by applying a cava clip below the renal vein orifice. Of these, in 7 cases this operation was combined with total hip arthroplasty with BG "Italy" endoprosthesis, 5 patients underwent closed reduction of a femoral neck fracture with osteosynthesis with compression screws and in 1 case open suturing of the patella.

Two patients underwent ligation of the femoral vein below the confluence of the deep femoral vein, in one case in combination with open reduction and intramedullary osteosynthesis of the right femur with a locking pin and in the second case with open suturing of the patella.

All observed patients received the same anticoagulant therapy from the moment of admission. Clinical example.

□ Patient: A. Age: 70 y. No. 23134/1034

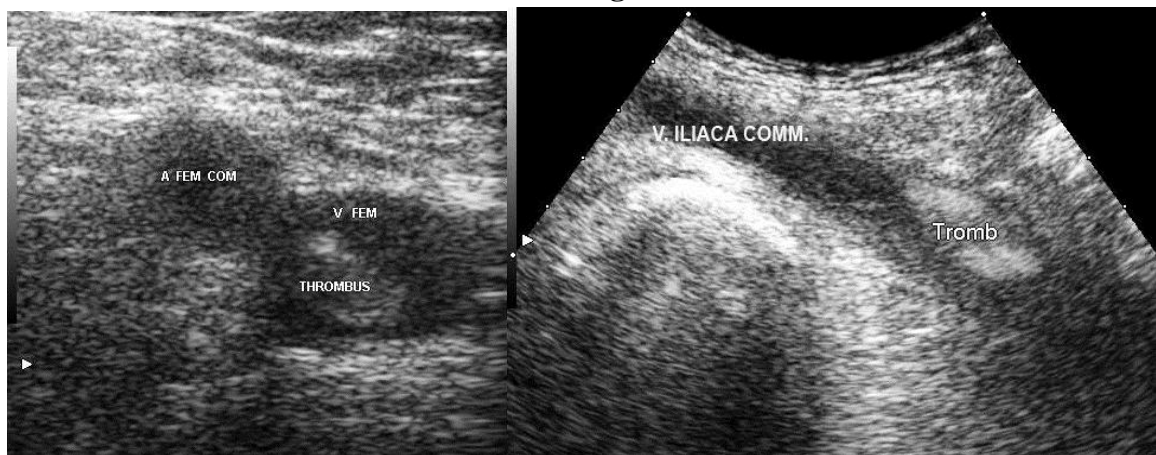
□ Date of receipt: 18.05.2019

□ ANAMNESIS: she was injured as a result of falling at home on her right side, in connection with which she received outpatient treatment. 7-8 days after the injury, she noted the appearance of edema on the right leg.

- During the examination for CDS, ultrasound signs of iliofemoral venous thrombosis on the right were revealed (Fig. 6). R-graph shows a closed subcapital fracture of the right femoral neck with displacement of bone fragments (Fig. 5).
- Given the location of the fracture and the nature of thrombosis, as well as the high risk of massive pulmonary embolism, it was decided to perform a simultaneous operation.



**Fig. 5 X-ray at admission: subcapital fracture of the right femoral neck with displacement of bone fragments**



**Fig. 6 CDS on admission: ultrasound signs of thrombosis of the ilio-femoral segment (A thrombus in the femoral vein, B thrombus in the iliac vein).  
The first stage of the operation: Clipping the IVC (Fig. 7, 8).**

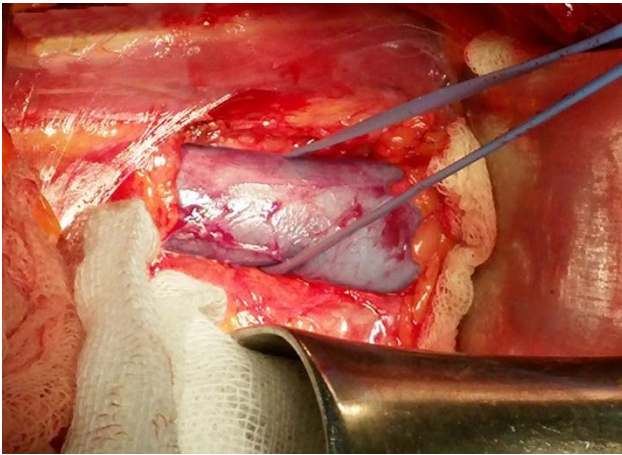


Fig 7. Isolation of NPS.

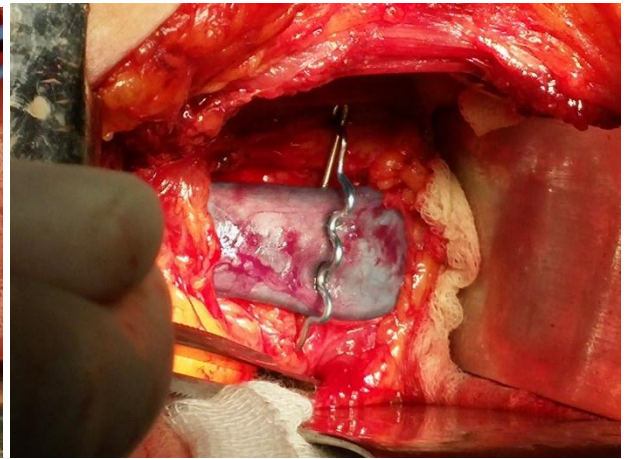


Fig 8. NIP clipping.

The second stage of the operation: Total arthroplasty of the right hip joint with an endoprosthesis from BG Italy (Fig. 9, 10, 11, 12).

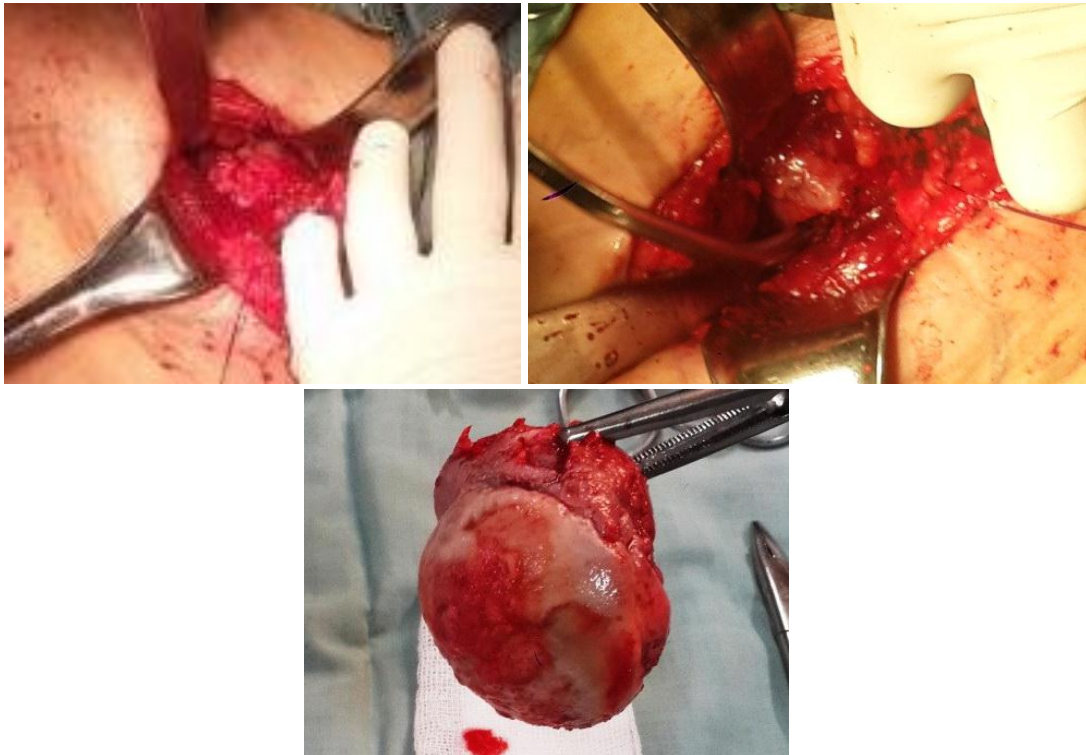


Fig. 9. Anterior access to the hip joint and removal of the femoral head

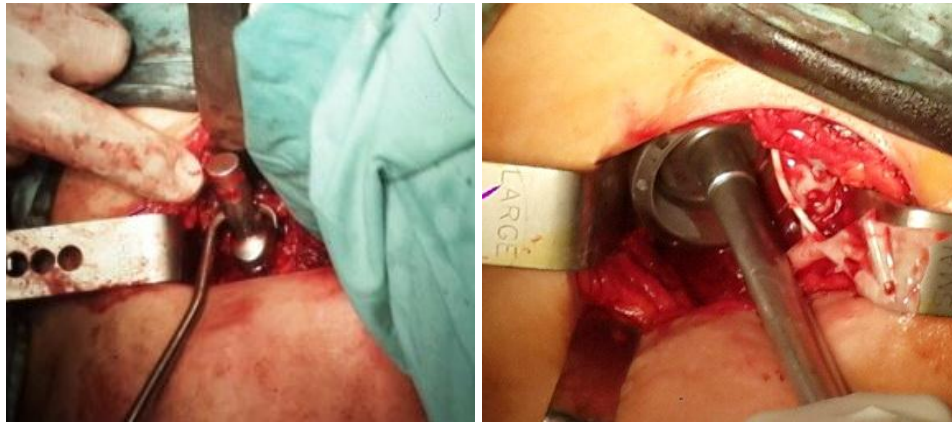


Fig.10. Femoral component placement



Fig.11. Installation of the acetabular component

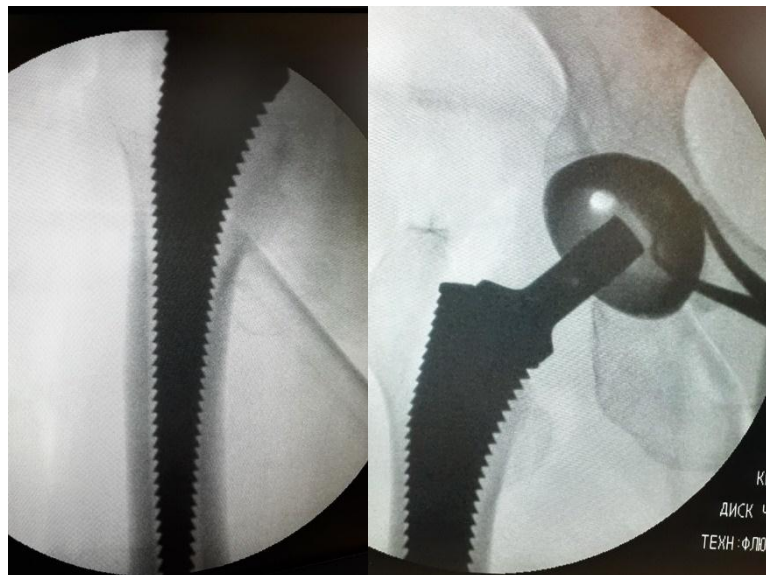


Fig. 12. intraoperative image intensifier control (standing of the endoprosthesis stem and acetabular component).





Fig. 13. local status on the 5th day after the operation.



Figure: 14. Phlebography.

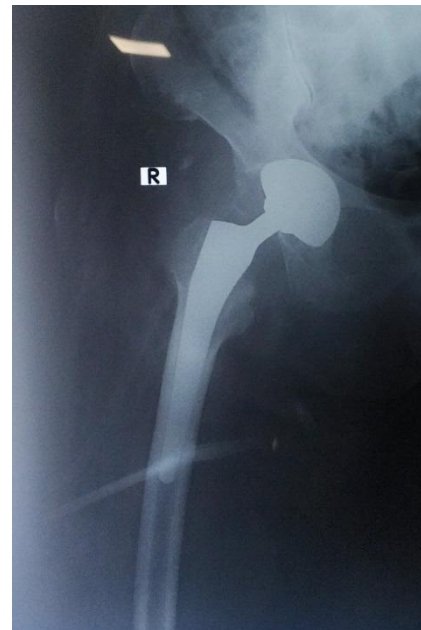


Figure: 15. X-ray control

On the 7th day, the patient underwent control phlebography with visualization of the vena cava at the site of the cava-clip application; blood flow through the vein was preserved (Fig. 14). A control X-ray was also made (Fig. 15).

In a satisfactory condition the patient was discharged for outpatient observation and treatment on the 10th day after the operation.

**Results, complications and discussion.** All patients were discharged with improvement; mortality and early postoperative complications were not observed. In no case of thromboembolism of the branches of the pulmonary artery were observed in our patients.

To date, in patients with skeletal trauma of the lower extremity, which was complicated by deep vein thrombosis, we suggest the following treatment options.

The first option is conservative management of the patient with immobilization of the injured limb. There are practically no positive aspects of this tactic, the negative is the risk of complications associated with prolonged bed rest and physical inactivity.

The second option is the endosurgical installation of the "cava filter", followed by the correction of injuries of the ODA. A positive aspect is the low invasiveness of the method due to the lack of additional surgical access to the vessels. The disadvantages include organizational and technical conditions, the installation of a cava filter is possible only in specialized medical institutions, the possibility of complications associated with finding a cava filter in the lumen of a vein, and the relative high cost of the method.

The third option is to perform staged operations: open surgery to prevent PE (plication or clipping of IVC), followed by the second stage - performing fracture correction. A positive condition for this tactic is the prevention of PE and a decrease in the time of anesthesia and surgical trauma. However, at the same time, the likelihood of complications associated with limiting the activation of the patient in view of the persisting fracture remains. It is also required to perform repeated surgical treatment, which can cause a deterioration in the psychological and somatic state of the patient.

We have proposed the execution of simultaneous operations, i.e. the first step is to perform an operation on the vessels (clipping or plication of the IVC), the second step, immediately in one anesthesia, to perform an operation to correct the fracture. This tactic makes it possible to perform an operation aimed at preventing PE and stabilizing bones at an earlier date, avoiding repeated use of anesthetic aid to patients and is important in terms of economic efficiency. It also makes it possible to activate patients in the early postoperative period, which is an important measure for the prevention of retrombosis and improves the course of the disease.

#### Conclusions:

1. Performing simultaneous operations in the conditions of functioning of the emergency medical service, carried out in patients with skeletal injury in combination with deep vein thrombosis of the lower extremities and pelvis, can eliminate not only the high risk of pulmonary embolism, but also create conditions for early activation of patients and rehabilitation.
2. The use of cava-clipping with a titanium clip of our own design is a reliable and safe method of surgical prevention of PE.
3. If complicated forms of acute venous thrombosis occur in combination with skeletal trauma, the optimal method for preventing PE is simultaneous surgical correction.

#### Bibliography:

1. Vardanyan A.V. Postoperative venous thromboembolic complications are a real danger and modern methods of prevention. *Angiology and Vascular Surgery* 2008; 14 (1): 67-72.
2. Vlasov SV, Safronov NF, Vlasova IV, Evsyukov AV, Milyukov A.Yu. Thromboembolic complications in the treatment of proximal femoral fractures. *Polytrauma* 2012; 3: 23-28
3. Ershov D.S., Kopenkin S.S., Skoroglyadov A.V. Prevention and treatment of deep vein thrombosis of the lower extremities in hip arthroplasty (literature review). *Traumatology and Orthopedics* 2015; 2: 14-19
4. Kirienko A.I., Matyushenko A.A., Andriyashkin V.V. Thrombosis in the inferior vena cava system. *Phlebology* 2001; 208-227.
5. Kotelnikova G.P., Mironova S.P. *Traumatology: national guide / ed ...: GEOTAR-Media* 2011; 1100 s.

6. Nikulina NN, Terekhovskaya Yu. V. Epidemiology of pulmonary embolism in the modern world: analysis of morbidity, mortality and problems of their study. Russian journal of cardiology. 2019; 24 (6): 103-108
7. Okley DV Modern surgical tactics in patients with acute deep vein thrombosis of the lower extremities and pelvis. Bulletin of VDNZU "Ukrainian Medical Stomatological Academy" 2018; 3 (51): 343-350
8. Panchenko E.P. The role of antithrombotic therapy in the prevention and treatment of venous thrombosis in traumatology and orthopedics. Materials of the city symposium. Russian State Medical University, Moscow City Health Department 2002; 22 -24.
9. Dalen J.E. Pulmonary embolism: what have we learned since Virchow? Natural history, pathophysiology, and diagnosis. Chest 2002; 122 (4): 1440-56
10. Geerts W.H. Prevention of venous thromboembolism: the Seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. Chest. 2004; 126 (3): 338-400.
11. Kahn SR. The clinical diagnosis of deep vein thrombosis: integrating incidence, risk factors and symptoms and signs. Arch Intern Med. 1998; 158 (21): 2315-2323.
12. Kesieme E., Kesieme C., Jebbin N., Irekpita E., Dongo A. Deep vein thrombosis: a clinical review. Journal of Blood Medicine 2011; 2: 59–69
13. Paramo J. A., de Gaona E. R., Garcia R. et al. Diagnosis and management of deep venous thrombosis. Rev Med Univ Navarra 2007; 51 (1): 13-17.
14. Tulyakov R.P. Phlebothrombosis and the risk of pulmonary thromboembolism in patients with mechanical trauma of the pelvis and lower extremities: Dis. ... Candidate of Medical Sciences-Tashkent 2008: 144 p.
15. Cherniy VI, Kolesnikov AN, Gorodnik GA Assessment of the risk of thromboembolic complications and the effectiveness of various methods of prevention in critically ill patients. Practical Angiology 2008; 7-8: 28-34.
16. Schwalb P.G., Ukhov Yu.I. Pathology of venous return from the lower extremities. Monograph 2009; 152s.
17. Shulgina L.E., Karpenko A.A., Kulikov V.P., Subbotin Yu.G. Ultrasound criteria for venous thrombosis embolism. Angiology and Vascular Surgery 2005; 11 (1): 43-51

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