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Development of Innovative Rod Apparatus for Treatment of Long Bones of the Lower Limb in Multiple and Combined Injuries

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Abstract: Diabetes mellitus (DM) is a metabolic disorder resulting from a defect in insulin secretion, and it has been described as a public health challenge of the 21st century. A survey was carried out in Gashua metropolis Yobe State Northeas Nigeria between August, 2021 and February, 2022, to ascertain the prevalence of Diabetes mellitus (DM) among the residents. Out of One hundred (100) blood samples that were collected from age group 15-60 years and analysed in the Haematology unit, Yobe State Specialist Hospital Gashua, prevalence rate of 14(14. 0)% was observed **.** The gender of study population was also considered where more positive samples were observed among females than their male counterparts. The higher prevalence of Diabetes mellitus recorded could be attributed to increase in individual-level risk factors. There is a need for strategic planning towards change in lifestyle amongst in order to reduce the devastating effects of the disease.

Keywords: Prevalence, Diabetes, Residents, Gashua, Yobe, Nigeria.

Relevance. In the world, according to WHO, "...every year 5.8 million people die from severe injuries, and the number of people who become severely disabled exceeds this figure by more than three times. The mortality rate for abdominal injuries in combination with traumatic brain injury is 72.3%, for thoracoabdominal injury - 47.3%, in combination with damage to the musculoskeletal system - 38%. Today, numerous scientific studies are being conducted to improve the diagnosis and treatment of patients with polytraumas. Methods for improving and using minimally invasive approaches and low-traumatic devices for external fixation are being studied, algorithms and markers are being developed to reduce the mortality rate and possible complications. The complex multicomponent reaction of the body to severe mechanical damage is considered as a single whole in the interaction of all the links that make it up. In this regard, the study of the immunology of trauma is an important direction in the study of traumatic disease (TB), and deepening knowledge in this area will significantly improve the effectiveness of medical care for victims, providing the opportunity for earlier correction at the pathogenetic level. The introduction in our country of modern technologies using the basic principles of "Damage control" has improved the results of treatment of victims with polytraumas, however, the frequency of unsatisfactory results of surgical treatment still remains high. The action strategy for the five priority areas of development of the Republic of Uzbekistan for 2017-2021 sets the task of "developing and improving the system of medical and social care." In accordance with this, the use of new technological solutions for transosseous osteosynthesis and assessment of markers of the systemic inflammatory response of the body (SIRR) in fractures of long bones of the lower extremity with multiple and combined injuries to prevent and reduce the disability of patients and improve their quality of life is one of the pressing problems of traumatology and orthopedics .

Purpose of the study: improve the results of treatment of fractures of long bones of the lower extremitiesfor multiple and combined injuries, byRdevelopment and implementation of an optimal method of osteosynthesis with correction of the systemic inflammatory response of the body and a method for predicting the course of a traumatic disease.

Object of study There were 226 patients with fractures of the long bones of the lower extremities with multiple and combined injuries treated at the TMA Multidisciplinary Clinics over the period from 2011. By

2019

Research methods. During the study, the following methods were used: clinical, instrumental (x-ray, multispiral computed tomography, Doppler ultrasound scanning of the vessels of the lower extremities, ultrasound densitometry of the calcaneus), SVOO markers, experimental and statistical methods.

We have developed 3 models of devices, new designs and devices for osteosynthesis of fractures of the proximal end, tibia and pelvic bones with central dislocation of the femoral head and received patents:

1. Rod apparatus for the treatment of long bone fractures. Utility model FAP No. 00737 dated 06/08. 2012

2. Device for the treatment of fractures of the proximal end of the femur. Utility model FAP No. 01180 dated 02.22.2017

3. Method for treating fractures of the pelvic bones, acetabulum and central dislocations of the femur. Utility model FAP No. 01441 dated November 26, 2019

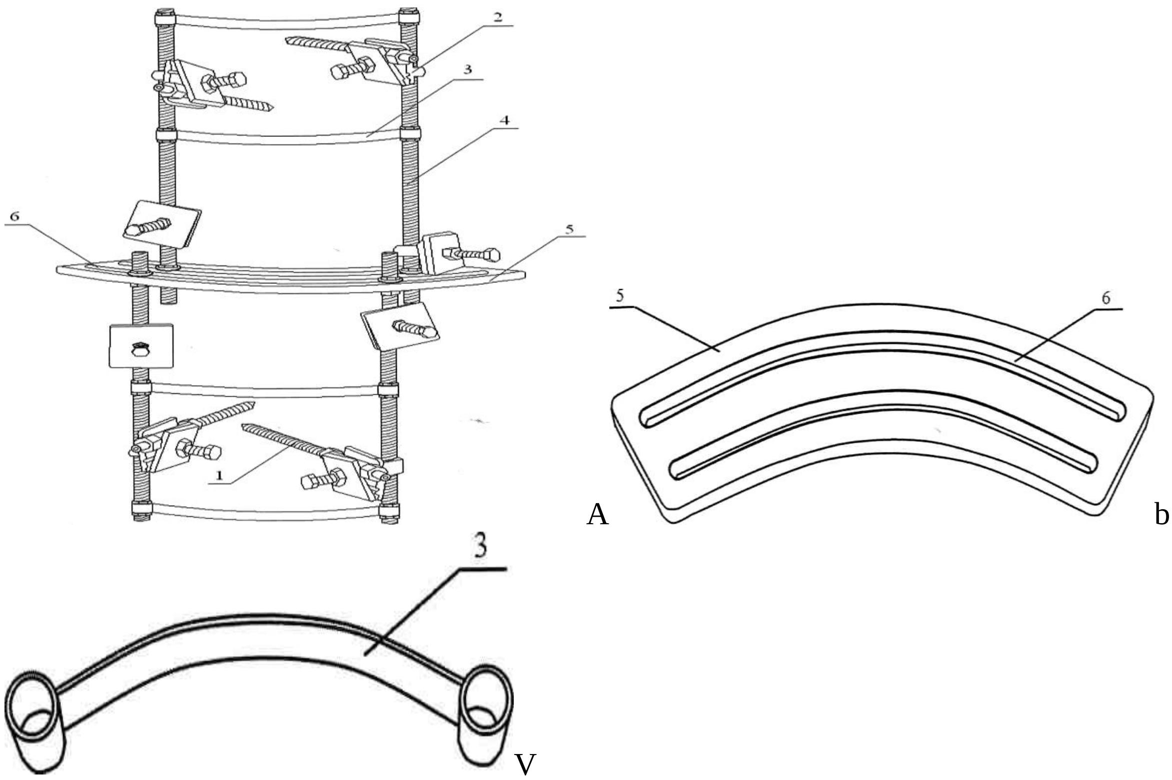
In Fig. 3.1. shows a set of parts for a rod apparatus of a new design for the treatment of fractureslong bones (Extract from the protocol of the ethical committee No. 1/22-1529 dated February 25, 2021).

Rice. 3.1. Photo of a set of parts for a new design rod apparatus

Rod apparatus for the treatment of long bone fractures (1st model)

The objective of the proposed device is to increase convenience, stability and ease of use. To solve this problem, we have developed a rod apparatus of a new design for osteosynthesis of diaphyseal fractures of long bones of the lower limb. The rod apparatus for the treatment of fractures of long bones is based on one middle arc support in the form of an arcuate plate with two slots along the length, which make it possible to eliminate rotational and longitudinal displacements of bone fragments. Threaded ties improve the stability of fixation throughout the entire treatment period.

The rod apparatus containsfour arc supports (3), connected in pairs by threaded ties (4) and cantilever rods (1) installed in brackets (2), (Fig. 3.2).



Rice. 3.2. Rod apparatus for the treatment of fractures of long bones: a – general view, b – support, c – view of the arcuate plate from the side of two slots made along the length.

The device is equipped with a middle support in the form of an arcuate plate (5) with two slots (6) made along the length, in which two threaded ties (4) are fixed on opposite sides of the support, connecting two supports (3) in pairs, while the brackets (2), in which cantilever rods (1) are installed, secured to threaded ties (4), and threaded ties (4) are fixed on an arcuate plate (5) with two slots made along the length. In Fig. 3.3. a photo-rod device for the treatment of long bone fractures is shown: side view (a), front view (b).

(A)

(b)

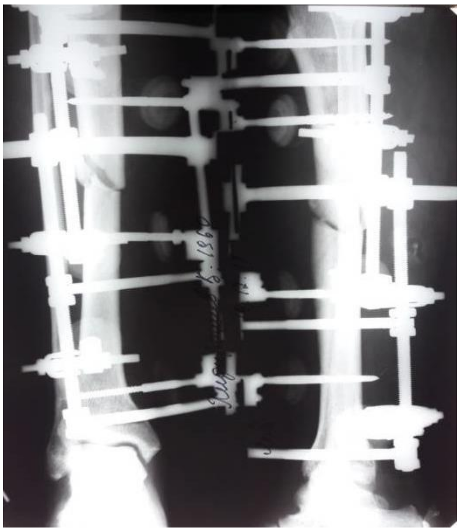
Fig.3.3. Photorod apparatus for the treatment of fractures of long bones: side view (a), front view (b).

Thus, the proposed device is novel and can be used in practical medicine.

Osteosynthesis technique. The rod apparatus for the treatment of long bone fractures is used as follows. The proposed device is applied to the patient on the operating table. The device is assembled using arc supports (3) and threaded ties (4), then applied to the damaged segment. Under spinal anesthesia, gross mixtures of bone fragments are eliminated and, using an electric drill, a channel is formed at the level of the metaphyseal part in the proximal and distal fragments and crossing cantilever rods (1) are inserted at 45° to the axis of the bone along the frontal plane and rods to each other - 30°, then using brackets (2), fixed to threaded ties (4) and distraction is performed. The advantage of the bracket is that it has the ability to change its position along the frontal and horizontal planes and can connect cantilever rods with threaded rods at any angle of 360o. A control X-ray is taken (Fig. 3.4) and, based on the X-ray images, rotational displacements are eliminated using a middle support made in the form of an arcuate plate (5), in which two slots are made along the length (6) and threaded ties (4) are installed, moving them Using the grooves and based on the control x-ray, the insertion site of the cantilever rods (1) is determined and marked on the skin with marks of some kind of dye.

Rice. 3.4.Control radiography.

Cantilever rods (1) should be inserted into the fragments perpendicular to the bone axis. Focusing on the designated projection marks, using an electric drill, drill channels in each of the fragments along the anterior inner surface of the tibia with a 4 mm drill, through both cortical layers, trying, if possible, to go through the central axis of the bone. Then install the first pair of cantilever rods (1) in the prepared holes in the anterior-internal direction, retreating 3-5 cm from the fracture line, at an angle of 45° and 30° to the frontal plane. In a similar way, after drilling the cortical layer, a second pair of cantilever rods (1) is inserted into each of the fragments of the tibia in the anterior internal direction and fixed to threaded ties (4) using brackets (2). A control x-ray is taken. If it is necessary to eliminate the mixing of bone fragments along the length, use the compression-distraction functions of the rod apparatus. A repeat radiograph is taken, and if the displacement of bone fragments has been eliminated, compression of the bone fragments is given (Fig. 3.5.).



Rice. 3.5. Control radiography after completion of surgery

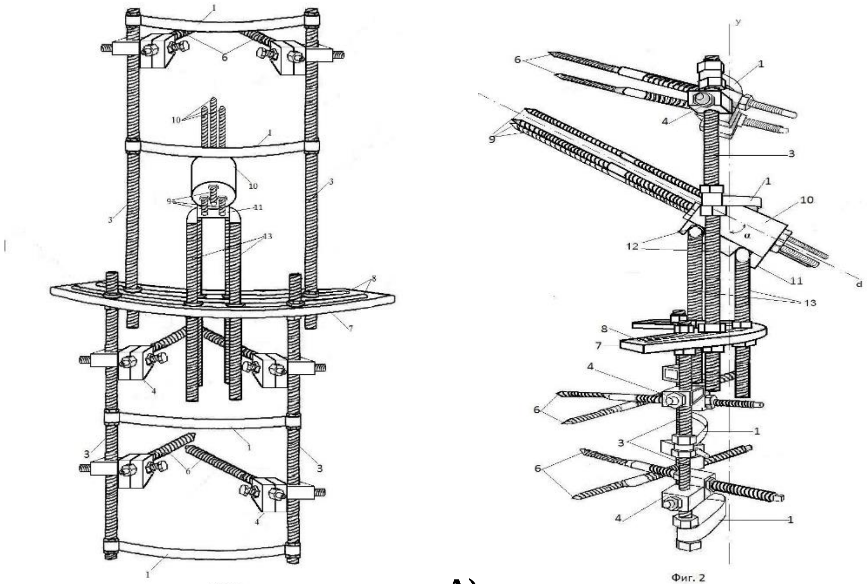
Rice. 3.6. General view of the rod apparatus after fixation.

After inserting each rod into a bone fragment, sterile wipes moistened with alcohol are applied to the wound through which the rod passes. 3-5 days after surgery, patients are allowed to walk with crutches. A general view of the rod apparatus after fixation on the damaged segment is shown in (Fig. 3.6.).

Device for the treatment of fractures of the proximal end of the femur (2nd model)

The disadvantage of the known devices is the complexity of the design, inconvenience in use, andunstable fixation,antiversion angles of the femoral neck are not taken into account,no possibility of compression of bone fragments in the dynamics of treatmentAndlimitation of osteosynthesis type of fractures.

Taking into account the above-mentioned disadvantages of previously proposed devices, a new model of the device has been developed for the treatment of fractures of the proximal end of the femur, which makes it possible to correct the above-mentioned disadvantages. The proposed rod apparatus (Fig. 3.7) contains four arc supports (1) with holes (2), connected in pairs with threaded ties (3). The brackets (4) are equipped with holes (5) for fixing to threaded ties (3); it is possible to fix cantilever rods (6) in them. The middle support in the form of an arcuate plate (7) has two slots (8) along its length, in which two threaded ties (3) are fixed on opposite sides of the support (7), connecting two arcuate supports (1) in pairs, and the length of the support (7) with slots (8) are 4-5 cm longer than the length of the remaining supports (1). The clamp for the cantilever rods (9) is made in the form of a combined cylinder (10) and parallelipiped (11) and is installed at an obtuse angle α=115-145°. Angle α is selected depending on the anatomical features of the patient's neck-diaphyseal angle in the designated interval, the average statistical angle is 127° relative to the vertical axis y of the device, while the cylindrical part (10) is made with three holes parallel to its axis d for cantilever rods (9) and is installed coaxially with the neck, and on the sides of the parallelipiped (11) there are holes (12) in which two U-shaped threaded ties (13) with upper parts (14) are fixed. The ends of the U-shaped threaded ties (13) are fixed in the slots (8) of the middle support (7), while the upper parts (14) of the U-shaped threaded ties (13) act as the axes of these threaded ties (13) and allow them to change its position relative to the latch. A drawing of the device and a general view of the rod apparatus for the treatment of the proximal end of femur fractures are shown in Figure 3.7. and 3.8.



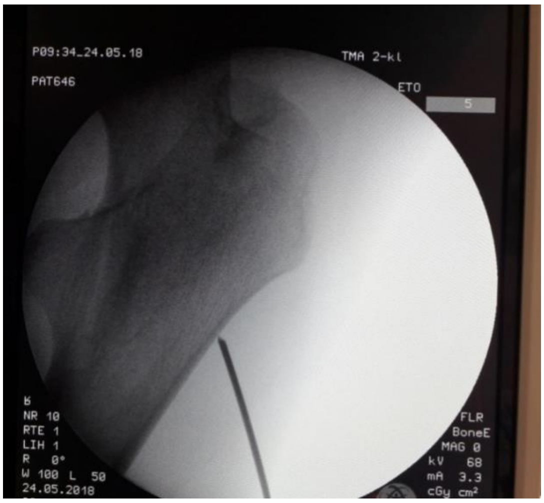
A) b)

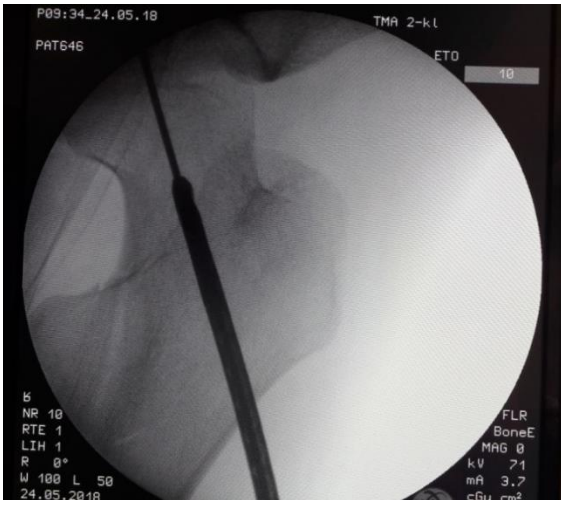
Rice. 3.7. Rod apparatus for the treatment of fractures of the proximal end of the femur, a – front view, b – side view

Osteosynthesis technique. Closed reduction of femoral fragments is carried out on an orthopedic table under the control of an electron-optical converter (EOC) or through a series of control X-rays. The device is assembled using arc supports (1) with holes (2) for threaded ties (3), then applied to the damaged segment. After spinal anesthesia under the control of an image intensifier, gross mixing of bone fragments is eliminated using the Whitman method (Fig. 3.9). Using an electric drill, an Ilizarov wire is inserted into the neck of the femur (Fig. 3.10) and a canal is formed using a cannulated cutter (or drill), (Fig. 3.11.) and a Shchanz rod (9) is inserted into the formed canal, at an angle of 60° to the frontal plane, (Fig. 3.12.).

Rice. 3.8. ABOUTgeneral view of the rod device for the treatment of fractures of the proximal end of the femur

Fig. 3.9. Under the control of the image intensifier, bone fragments are repositioned according to the Whitman method

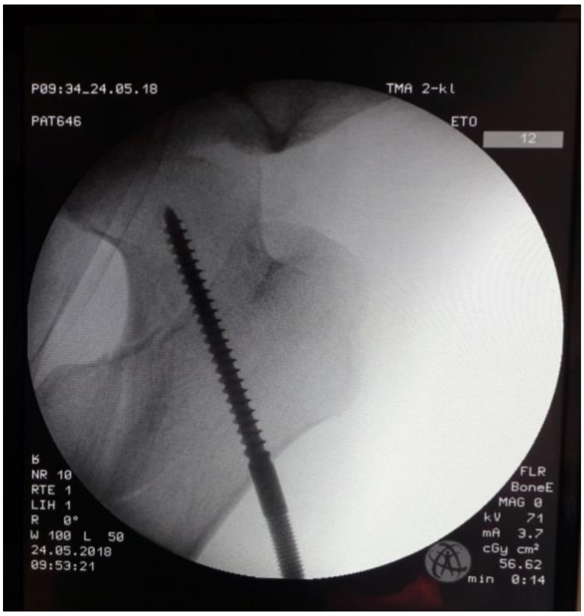


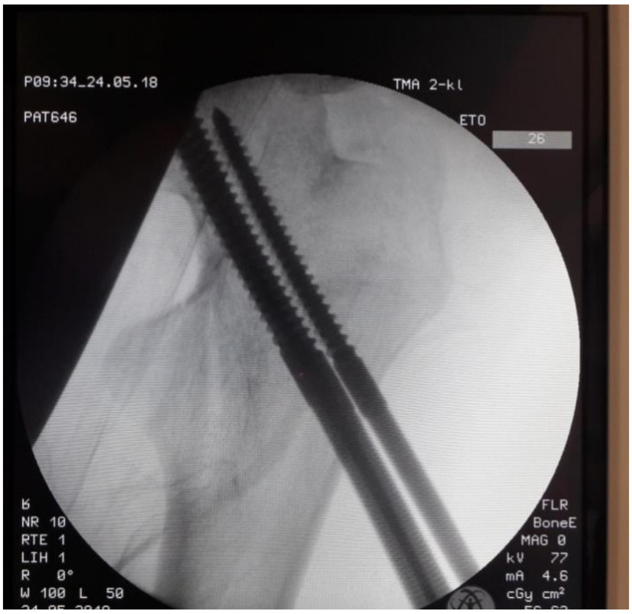


Rice. 3.10.Control of insertion of the needle under the image intensifier tube.

Rice. 3.11. Formation of a canal with a cannulated cutter into the neck femur under the image intensifier.

Two more channels are formed parallel to each other and the axis of the femoral neck; two more clamp rods (9) are inserted into the formed channels (Fig. 3.13.).





Rice. 3.12. Insertion of the Schantz rod into the formed canal in the femoral neck under the image intensifier.

Rice. 3.13. In parallel, a Schantz rod was inserted into the femoral neck under the image intensifier.

In this case, the retainer is fixed in the slots (8) of the arcuate plate (7) using U-shaped threaded ties (13). Rotational displacements are also eliminated with the help of a middle support made in the form of an arcuate plate (7), in which two slots (8) are made along the length and threaded couplers (3) are installed, which can move in the slots (8). Then the latch is installed at an obtuse angle α=115-145° relative to the vertical axis y of the device using two U-shaped threaded ties (13) installed in the holes (12) of the parallelipiped part (11) of the latch, the installation height of the U-shaped threaded ties (13) in the slots (8) of the middle support (7) are adjusted, achieving a coaxial position of the cylindrical part (10) of the fixator with the neck of the femur, while the angle α, depending on the anatomical features of the patient, varies in the range of 115-145°, thereby fixing the fragments. In Fig. Figure 3.14 shows a general view of the rod apparatus for the treatment of fractures of the proximal end of the femur.

Fig.3.14. General view of the rod apparatus after osteosynthesis for a fracture of the proximal end of the femur.

In order to stabilize the bone fragments, the cantilever rods (6) are installed intersecting: the first pair in the proximal part of the femur and two pairs on the upper third and middle third of the femur, at an angle of 45° along the axis of the femoral segment and 30° in relation to each other of the cantilever rods to the frontal plane, if necessary, additional pairs of cantilever rods 6 can be installed and fixed on threaded ties (3).

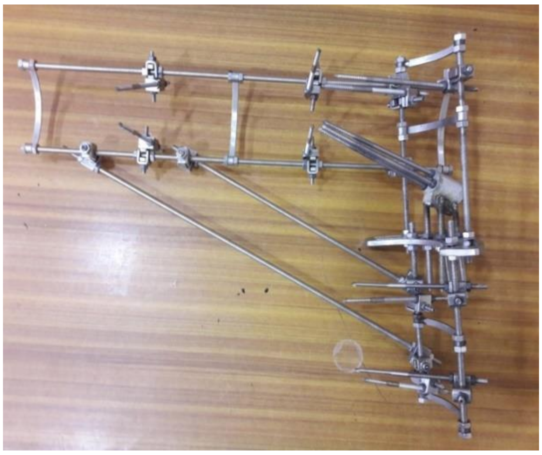
Advantages of using the developed external fixation rod devices 1 and 2 –y models:

- Due to its minimal invasiveness, it can be used in the first hours after injury, and early stable fixation of bones in long bone fractures helps reduce pain, which is an anti-shock measure;
- Technical conditions and arrangement ensure reposition of bone fragments and stable fixation;
- Corrects the antiversion angle of the femoral neck and the neck-shaft angle in subtrochanteric fractures;
- There is a possibility of compression of bone fragments in the dynamics of treatment;
- The versatility of osteosynthesis for different types of fractures;
- Facilitates patient care and provides the opportunity for early activation and rehabilitation, reduces the possibility of developing complications.

Method for treating fractures of the pelvis, acetabulum and central dislocations of the femur (3rd model)

The combination of fractures of the pelvic bones, acetabulum and central dislocations of the femoral head is one of the leading causes of severe diseases and disability. At the moment, there are many known ways to treat acetabular fractures and their consequences. However, there is insufficient stability and functionality of the hip joint, and the impossibility of reducing the central dislocation of the femoral head when combined with ilium fractures. These methods, when implemented, even with strict adherence to all additional recommendations and operations, such as precise reposition of bone fragments when they are displaced, postoperative observation and adjustment of the position of bone fragments during secondary displacement, stable fixation, minimally invasive intervention, have unsatisfactory treatment results. Long-term consequences of unsatisfactory reposition and unreliable fixation of fragments are coxarthrosis, heterotopic ossification, aseptic necrosis of the femoral head.

In this regard, we have set the task of increasing the stability and functionality of the hip joint, the possibility of reducing the dislocation of the femoral head in combination with fractures of the ilium, and conducting effective osteosynthesis in combination of fractures of the proximal end of the femur, pelvic bones and the floor of the acetabulum. To solve the problem, we developed a rod device of the 3rd model (Fig. 3.15.), which allows the reduction of the central dislocation of the femoral head, With implementation of reposition bone fragments bottom acetabulum, With fixation of bone fragments of the pelvis and a combination of fractures of the proximal end of the femur.



Rice. 3.15. General view of the device for the treatment of pelvic bone fractures, the bottom of the acetabulum and central dislocations of the femur bones (3rd model).

Osteosynthesis technique. Position the patient on his back, under spinal anesthesia, in order to reposition the bone fragments of the bottom of the acetabulum and reduce the central dislocation, insert an Ilizarov wire into the neck of the femur and, using a connulated cutter, form two channels parallel to each other and to the axis of the femoral neck and at 60o to the axis of the femur (Fig. 3.13.). Next, the cantilever rod is inserted into the formed channel, and the retainer is secured in the slots of the arcuate plate using U-shaped threaded ties. Next, a wire is passed at the level of the anterior superior and anterior inferior iliac spine, which serves as a conductor for forming a canal with a cannulated cutter (Fig. 3.16. and Fig. 3.17.) and cantilever rods are inserted.

Rice. 3.16. Formation of a canal along the anterosuperior and anterioinferior iliac spine	**Figure 3.17. Insertion of the formed canal rods along the anterior superior and anterior inferior iliac spine**

Then the first part is connected to the second part of the apparatus (Fig. 3.18.) and distraction is given on the lower limb until the central dislocation of the femoral head is reduced, with the elimination of the mixing of bone fragments of the bottom of the acetabulum under the control of the image intensifier.

Advantages of using the developed external fixation rod apparatus of the 3rd model:

- Due to its minimal invasiveness, it can be used in the first hours after injury, and early stable fixation of the pelvic bones helps stop bleeding, reduce pain and is an important point in anti-shock measures;
- Technical conditions and arrangement ensure reposition of bone fragments and provide stable fixation;
- There are various options for the configuration of the device depending on the fractures of the pelvic bones, and the possibility of installing the device of the "pelvis-femur" system allows you to reduce bone fragments of the bottom of the acetabulum with reduction of the central dislocation of the femoral head;

Figure 3.18. General view of the device after installation.

- Facilitates patient care and provides the opportunity for early activation and reduces various secondary complications.

Clinical example.

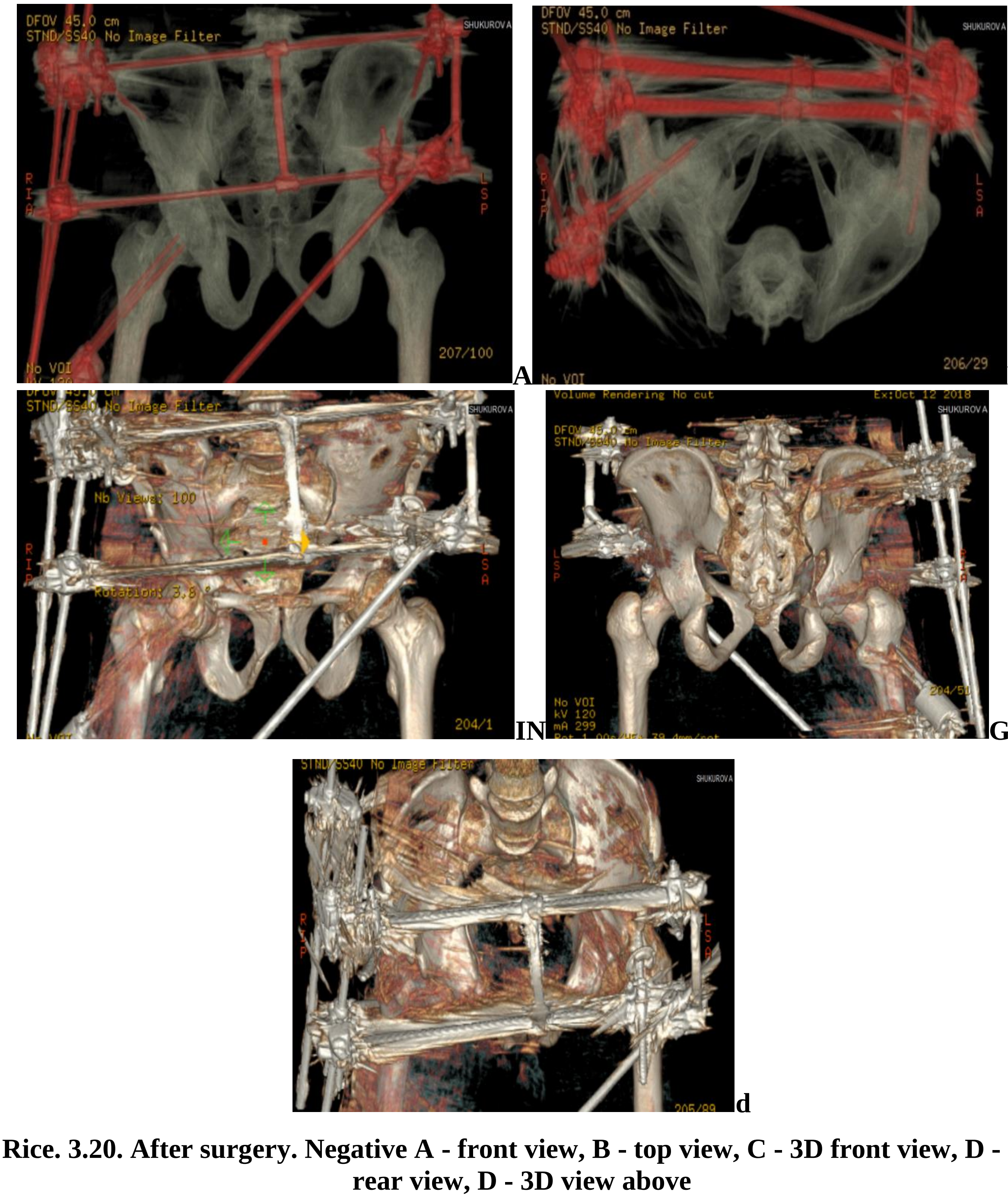
Patient A., born in 1980 Diagnosis. Combined injury. CCI. Concussions. Closed fracture of the iliac wing, the bottom of the acetabulum on the right with mixed bone fragments. Contusion of soft tissues of the lumbar spine. Abrasion of the right elbow joint. According to the AO classification -2018.62B3.3 (Fig. 3.19.).

From the anamnesis, according to the patient, he fell from a 2-3 meter height 1 hour before admission.

After a clinical and radiological examination and exclusion of damage to internal organs, the right lower limb was placed in skeletal traction with a load of 6.0 kg. After preoperative preparation, on the 2nd day from the moment of injury, aSteosynthesis of ANF pelvic bones model 3(Fig. 3.20).

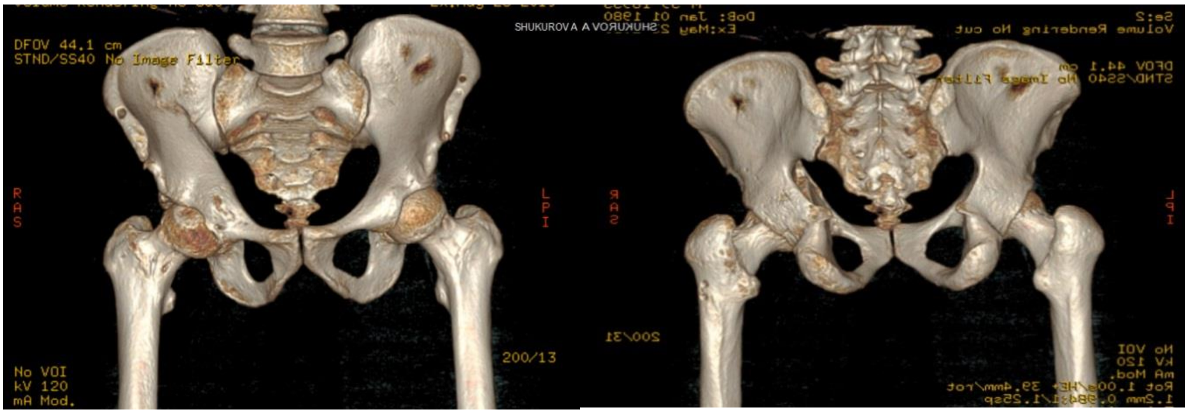
On the 5th day after the injury, the patient was prescribed a course of rehabilitation measures: the patient began to walk independently with the help of crutches.

Rice. 3.19.A- upon admission, B - 3D (side view), C - 3D (rear view)



Rice. 3.20. After surgery. Negative A - front view, B - top view, C - 3D front view, D - 3D rear view, D - 3D view above

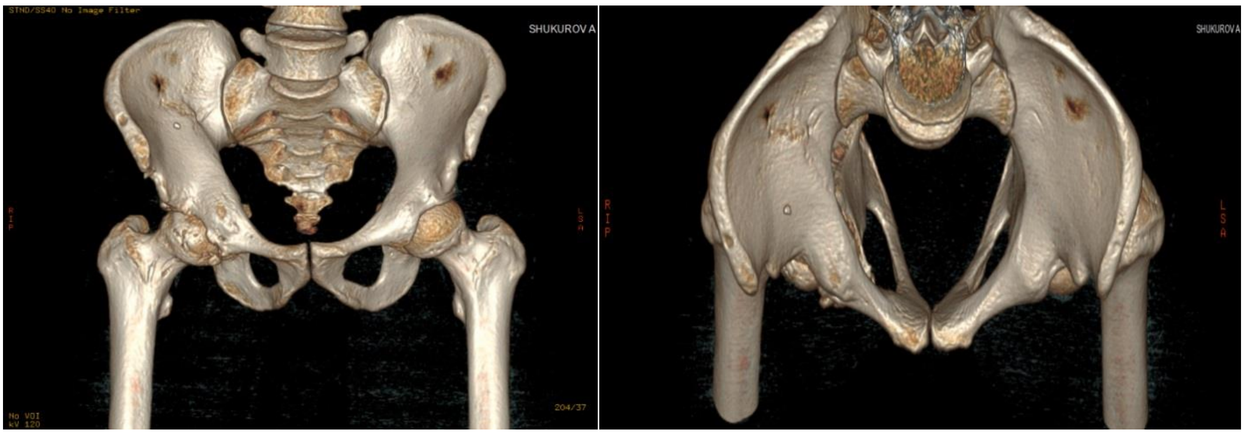
Rice. 3.21. After 4 weeks, the Patient began to walk with the help of crutches.



A **B**

Rice. 3.22. After 24 weeks. A-3D in front, B-3D in back.

The postoperative period proceeded without complications, which allowed the patient to be discharged from the hospital on the 16th day in satisfactory condition. After 4 weeks, the patient began to walk with the help of crutches (Fig. 3.21). After 24 weeks, fusion of the bone fragments was observed (Fig. 3.22), after which the device was dismantled. At a follow-up examination after 12 months, the x-ray (Fig. 3.23) shows restoration of the anatomical structure.



A **B**

Rice. 3.23. After 1 year. A-3D front view, B-3D top view.

On functional examination, the patient walks independently, without pain, but complains of limited flexion in the right knee joint by 5 degrees compared to the healthy side (Fig. 3.24).


A


B

Rice. 3.24. Functional result, after 12 months. (A and B).

The proposed ANF method was used in 4 patients and in all cases positive results were obtained, and they are not included in our studies. The proposed ANF is currently under study and will be provided in future scientific research papers.

Thus, from one set of parts for the rod apparatus, we developed ANF rod apparatuses of 3 models and achieved the functionality of the new design to the point of universality. Minimally invasiveness, which is the main functional component for ANF and can be used in the first hours after injury, and early stable fixation of bones of fractures of long bones helps reduce pain, which is an anti-shock measure for combined injuries. Technical conditions and layout ensure reposition of bone fragments in all planes of mixing and stable fixation. Facilitates patient care and the possibility of early activation and rehabilitation and reduces the development of complications.

Conclusions. The advantages of AVF developed by our design are as follows:

- ease of installation on injured limbs;
- reduces the time of surgical placements.
- The developed device complies with the laws of biomechanics, the “metal-bone” distance is maintained throughout the entire limb due to the stepped shape of the device, which enhances stability and maintains it until the consolidation of the fracture occurs. Also, when walking, the load on the fracture area is reduced.
- carrying out early osteosynthesis with an external fixation device for fractures of long bones in victims with multiple fractures allows to stabilize the general condition of patients and the local condition.
- makes it possible to carry out early development of movements in adjacent joints.
- preserves parafracture hematoma and nutrient vessels and creates conditions conducive to the fusion of bone fragments.

- rigid stabilization of bone fragments eliminates pain, which promotes early activation of patients and anatomical and functional recovery.

Based on the experimental studies of the spatial fixation apparatus and the obtained numerical results of laboratory tests, appropriate conclusions can be drawn.A technique has been developed for measuring micro-displacements of parts of the spatial fixation apparatus system under the action of tensile, compressive and torsional loads of varying intensity, models 1 and 2.

Literature

1. Shernazarov F, Tohirova J, Jalalova D. TYPES OF HEMORRHAGIC DISEASES, CHANGES IN NEWBOENS, THEIR EARLY DIAGNOSIS. Science and innovation. 2022;1(D5):16-22.
2. Zhalalova DZ. The content of endothelin and homocysteine in blood and lacrimal fluid in patients with hypertensive retinopathy Web of Scientist: International Scientific Research Journal. ISSUE. 2022;2:958-963.
3. D.Jalalova, X.Raxmonov, F.Shernazarov. THE ROLE OF C-REACTIVE PROTEIN IN THE PATHOGENESIS OF VISUAL VASCULAR DISEASES IN PATIENTS WITH ARTERIAL HYPERTENSION. SAI. 2022;1(8):114-121. doi:10.5281/zenodo.7335637
4. D.Jalalova, X.Raxmonov, F.Shernazarov. SIGNIFICANCE OF ENDOTHELIAL DYSFUNCTION IN THE DEVELOPMENT OF RETINOPATHY IN PATIENTS WITH AH AND WAYS OF ITS CORRECTION. SAI. 2022;1(8):101-113. doi:10.5281/zenodo.7335616
5. Shernazarov F, Zuhridinovna JD. MICROCIRCULATION DISORDERS IN THE VASCULAR SYSTEM OF THE BULBAR CONJUNCTIVA IN THE INITIAL MANIFESTATIONS OF CEREBRAL BLOOD SUPPLY DEFICIENCY. Science and innovation. 2022;1(Special Issue 2):515-522.
6. D.Jalalova, N.Normatova, F.Shernazarov. GENETIC MARKERS FOR THE DEVELOPMENT OF DIABETIC RETINOPATHY. SAI. 2022;1(8):919-923. doi:10.5281/zenodo.7443019
7. Нарбаев А, Джураева З, Курбонова Н, Кувондиков Г, Давранова А, Содиков С. Особенности изучения многофакторного управления сахарным диабетом 2 типа. *Журнал проблемы биологии и медицины*. 2017;(4 (97)):78-79.
8. Хамраев Х, Содиков С, Хамраева Д, Собирова Д. Клинико-функциональное состояние печени у больных с сахарным диабетом. *ЖПБМ*. 2018;(1 (99)):189-191.
9. Содиков С, Каримова Н, Каримова З. Реабилитация больных пожилого возраста сахарным диабетом 2-типа. *ЖПБМ*. 2017;(4 (97)):105-106.
10. Хамидова МН, Исматова ИФ, Бердиеров ЖШ, Негматова ГШ, Даминов АТ. САХАРНЫЙ ДИАБЕТ И COVID-19. *Eurasian Journal of Medical and Natural Sciences*. 2022;2(13):190-204.
11. Шухратовна СД, Кахрамонович ЮУ, Махмудович КТ. Структурные изменения сосудисто-стромального комплекса щитовидной железы при эутиреоидной и токсических формах зоба. *Научный журнал*. 2019;(10 (44)):67-69.
12. Собиржоновна КН, Саллохидинович СС, Акбаровна ОМ. Эпидемиологический Статус И Факторы Риска Сахарного Диабета На Сегодняшний День. *Miasto Przyszłości*. 2023;32:212-219.
13. Salimova DE, Daminnov AT. A CLINICAL CASE BASED ON THE EXPERIENCE OF TREATING HYPERTENSION IN A PATIENT WITH TYPE 2 DIABETES MELLITUS, OBESITY AND VITAMIN D DEFICIENCY. *Educational Research in Universal Sciences*. 2023;2(12):150-154.

14. Takhirovich DA. ASSESSMENT OF HEARING FUNCTION IN INDIVIDUALS WITH TYPE 2 DIABETES. *American Journal of Pediatric Medicine and Health Sciences (2993-2149)*. 2023;1(9):124-126.
15. Alimdjanovich RJ, Babajanovich KZ, Bahadirovich SZ, Shukurullaevich AD. АНТЕГРАДНАЯ АНГИОСКЛЕРОТЕРАПИЯ ЛЕВОЙ ТЕСТИКУЛЯРНОЙ ВЕНЫ. *JOURNAL OF BIOMEDICINE AND PRACTICE*. 2023;8(4). Accessed June 14, 2024. https://tadqiqot.uz/index.php/biomedicine/article/view/8309
16. Ярмухамедова НА, Ризаев ЖА. ИЗУЧЕНИЕ КРАТКОСРОЧНОЙ АДАПТАЦИИ К ФИЗИЧЕСКИМ НАГРУЗКАМ У СПОРТСМЕНОВ СО ВТОРИЧНЫМИ ИММУНОДЕФИЦИТАМИ. *Журнал гуманитарных и естественных наук*. 2023;(6):128-132.
17. П.б Г, Ж.а Р, Н.л Х, Бобоев КТ. ПОЛИМОРФИЗМ ГЕНА MTHFR (A1298C) И ВРОЖДЕННЫЕ ПОРОКИ ЧЕЛЮСТНО-ЛИЦЕВОЙ ОБЛАСТИ. *Conferences*. Published online November 10, 2023:62-63.
18. Saadh MJ, Mustafa MA, Kumar S, et al. Advancing therapeutic efficacy: nanovesicular delivery systems for medicinal plant-based therapeutics. *Naunyn-Schmiedeberg's Arch Pharmacol*. Published online May 3, 2024. doi:10.1007/s00210-024-03104-9
19. Allayarov A, Rizaev J, Yusupov A. ADVANTAGES OF LASER TREATMENT OF DIABETIC RETINOPATHY: ANALYSIS OF CLINICAL DATA. *Science and innovation*. 2024;3(D4):142-145.
20. Patel AA, Mohamed AH, Rizaev J, et al. Application of mesenchymal stem cells derived from the umbilical cord or Wharton's jelly and their extracellular vesicles in the treatment of various diseases. *Tissue and Cell*. 2024;89:102415. doi:10.1016/j.tice.2024.102415
21. Ризаев Ж, Ергашева М. Bolalarda neyroinfektsiyadan keyin kelib chiqadigan nogironlikning tibbiy jihatlarini tahlil qilish. *САПАПКИ*. 2024;1(1):32-33.
22. Allayarov A, Rizaev J, Yusupov A. CLINICAL EFFICACY OF LASER TREATMENT OF DIABETIC RETINOPATHY. *Science and innovation*. 2024;3(D4):138-141.
23. Alieva D, Rizaev J, Sadikov A. COVID-19 PANDEMIC AND ANALYSIS OF THE CURRENT EPIDEMIOLOGICAL SITUATION IN UZBEKISTAN AND NEIGHBOURING COUNTRIES OF CENTRAL ASIA AND THE WORLD (Analytical review). *Young Scholar's Academic Journal*. 2024;3(2):16-29.
24. Alimdjanovich RJ, Shakirdjanovich KO, Isamiddinovich KA, Kizi RMA. Dynamics of Local Immunity of the Oral Cavity at the Stages of Treatment. *NATURALISTA CAMPANO*. 2024;28(1):2335-2337.
25. Alieva DA, Rizaev JA, Sadikov AA. EPIDEMIOLOGICAL ASSESSMENT OF THE COVID-19 SITUATION AMONG THE SPORTS COMMUNITY. *EPRA International Journal of Research and Development (IJRD)*. 2024;9(5):376-379.
26. Blagonravova AS, А БС, Rizaev ZA, А РЖ, Gileva OS, С ГО. Horizons of international cooperation: medical science, practice and education. *Perm Medical Journal*. 2024;41(1):168-170. doi:10.17816/pmj411168-170
27. Alimdjanovich RJ, Shakirdjanovich QO, Isamiddinovich KA, Kizi RMA. Stress and Periodontal Disease (Review Article). *NATURALISTA CAMPANO*. 2024;28(1):2338-2342.
28. Rizaev, J. A., Sh, A. M., Kubaev, A. S., & Hazratov, A. I. (2022). Morphological Changes in the Oral Mucous Membrane in Patients with COVID-19. *American Journal of Medicine and Medical Sciences*, *12*(5), 466-470.
29. Кубаев, А. С., Каршиев, Ш. Г., & Базаров, Б. (2022). Наш опыт хирургического лечения переломов нижней челюсти. *Журнал Биомедицины и практики*, *7*(1).

30. Мақсудов, Д. Д., Кубаев, А. С., & Максудов, Д. Д. (2022). ВИРУСЛИ ГЕПАТИТНИНГ В ТУРИ БИЛАН ОҒРИГАН БЕМОРЛАРНИНГ ЮЗ-ЖАҒ СОҲАСИДАГИ ФЛЕГМОНАЛАРНИ КОМПЛЕКС ДАВОЛАШ ДАСТУРИ. *Биология*, (4), 137.

31. Ризаев, Ж. А., Абдуллаев, А. С., & Кубаев, А. С. (2022). ПЕРСПЕКТИВЫ ЛЕЧЕНИЯ НЕВРИТОВ В КОМПЛЕКСЕ С ЭТИЛМЕТИЛГИДРОКСИПИРИДИНА СУКЦИНАТ И КОМБИЛИПЕН. In *Современная медицина: новые подходы и актуальные исследования* (pp. 20-24).

32. Хикматулоевна ММ, Саидолимович КА, Исомидинович ХА. АНАЛИЗ ОККЛЮЗИОННО-АРТИКУЛЯЦИОННОГО ВЗАИМООТНОШЕНИЯ У ПАЦИЕНТОВ С СИНДРОМОМ БОЛЕВОЙ ДИСФУНКЦИИ ВИСОЧНО-НИЖНЕЧЕЛЮСТНОГО СУСТАВА. *Conferencea*. Published online May 26, 2022:195-196.

33. Марупова МХ, Кубаев АС, Хазратов АИ. ДИАГНОСТИКА И ЛЕЧЕНИЕ СИНДРОМА БОЛЕВОЙ ДИСФУНКЦИИ ВИСОЧНО-НИЖНЕЧЕЛЮСТНОГО СУСТАВА. *Central Asian Academic Journal of Scientific Research*. 2022;2(5):109-112.

34. Элбековна НН, Мухамедович МИ, Эмильевна ХЛ. ИЗУЧЕНИЕ ЧУВСТВИТЕЛЬНОСТИ МИКРОФЛОРЫ ПОЛОСТИ РТА У ПАЦИЕНТОВ, ПОДВЕРГАЮЩИХСЯ СЪЕМНОМУ И НЕСЪЕМНОМУ ОРТОДОНТИЧЕСКОМУ ЛЕЧЕНИЮ, ПРИ ИСПОЛЬЗОВАНИИ НЕКОТОРЫХ ЛЕКАРСТВЕННЫХ ПРЕПАРАТОВ. *ЖУРНАЛ СТОМАТОЛОГИИ И КРАНИОФАЦИАЛЬНЫХ ИССЛЕДОВАНИЙ*. 2022;3(2). Accessed June 14, 2024. https://tadqiqot.uz/index.php/oral/article/view/5013

35. Бахтиёрович ГП, Алимжанович РЖ, Лукмонович ХН, Тухтабаевич БК. ОСОБЕННОСТИ ВСТРЕЧАЕМОСТИ АЛЛЕЛЬНОГО ПОЛИМОРФИЗМА Ile462Val В ГЕНЕ CYP1A1 СРЕДИ ПАЦИЕНТОВ С ВРОЖДЕННЫМИ ПОРОКАМИ ЧЕЛЮСТНО-ЛИЦЕВОЙ ОБЛАСТИ. *ЖУРНАЛ СТОМАТОЛОГИИ И КРАНИОФАЦИАЛЬНЫХ ИССЛЕДОВАНИЙ*. 2023;4(4). Accessed June 14, 2024. https://tadqiqot.uz/index.php/oral/article/view/8226

36. А РЖ, А МО, Р ДН. ОСОБЕННОСТИ КЛИНИЧЕСКИХ СИМПТОМОВ И ФУНКЦИОНАЛЬНОГО СОСТОЯНИЯ РЕСПИРАТОРНОЙ СИСТЕМЫ БОЛЬНЫХ С БЫСТОРПРОГРЕССИРУЮЩИМ ПАРОДОНТИТОМ В КОМОРБИДНОМ СОСТОЯНИИ. *Conferencea*. Published online February 11, 2023:40-44.

37. А РЖ, А СМ, О ХФ. Оценка Осведомлённости Семейных Врачей Поликлиник, Кардиологов И Терапевтов О Высокотехнологичной Медицинской Помощи С Использованием Телемедицинских Технологий В Самаркандской Области. *JSML*. 2023;1(2):102-105.

38. Ж.а Р, А РД, А МО, Н.р Д. ПАРАЛЛЕЛИ ИММУНОЛОГИЧЕСКИХ И КЛИНИЧЕСКИХ ПОКАЗАТЕЛЕЙ У БОЛЬНЫХ БРОНХИАЛЬНОЙ АСТМОЙ С КОМОРБИДНОЙ ПАТОЛОГИЕЙ ПОЛОСТИ РТА. *European Journal of Interdisciplinary Research and Development*. 2023;12:96-103.

39. Бахтиёрович ГП, Алимжанович РЖ, Лукмонович ХН, Тухтабаевич БК. ПОЛИМОРФНЫЕ ГЕНЫ ЦИКЛА ФОЛАТОВ И ВРОЖДЕННЫЕ ПОРОКИ ЧЕЛЮСТНО-ЛИЦЕВОЙ ОБЛАСТИ. *ЖУРНАЛ СТОМАТОЛОГИИ И КРАНИОФАЦИАЛЬНЫХ ИССЛЕДОВАНИЙ*. 2023;4(4). Accessed June 14, 2024. https://tadqiqot.uz/index.php/oral/article/view/8220

40. Sarkhadovich AA, Saidalimovich KA, Alimdjanovich RJ. ПОРОГ ВОЗБУДИМОСТИ ПРИ НЕВРИТЕ НИЖНЕАЛЬВЕОЛЯРНОГО НЕРВА. *JOURNAL OF BIOMEDICINE AND PRACTICE*. 2022;7(4). Accessed June 14, 2024. https://tadqiqot.uz/index.php/biomedicine/article/view/5521

41. Марупова МХ, Кубаев АС, Хазратов АИ. УСОВЕРШЕНСТВОВАТЬ МЕТОДЫ ДИАГНОСТИКИ И ЛЕЧЕНИЯ ПАЦИЕНТОВ С СИНДРОМОМ БОЛЕВОЙ ДИСФУНКЦИИ ВИСОЧНО-НИЖНЕЧЕЛЮСТНОГО СУСТАВА. *Евразийский журнал медицинских и естественных наук*. 2022;2(5):164-167.

42. Ризаев ЖА, Ахророва МШ, Кубаев АС, Хазратов АИ. CHANGES IN THE MUCOUS MEMBRANES OF THE ORAL CAVITY IN PATIENTS DEPENDING ON THE CLINICAL COURSE OF COVID-19. *ЖУРНАЛ СТОМАТОЛОГИИ И КРАНИОФАЦИАЛЬНЫХ ИССЛЕДОВАНИЙ*. 2022;3(1). Accessed June 14, 2024. https://tadqiqot.uz/index.php/oral/article/view/7158

43. Alimjanovich RJ, Shavkatovna AM, Saidolimovich KA, Isamiddinovich KA. CLINICAL AND IMMUNOLOGICAL ASPECTS OF THE RELATIONSHIP OF THE ORAL CAVITY AND COVID-19. *Thematics Journal of Education*. 2022;7(2). Accessed June 14, 2024. https://thematicsjournals.in/index.php/tjed/article/view/1024

44. Marupova MH, Kubaev AS, Khazratov AI. DIAGNOSIS AND TREATMENT OF PAIN SYNDROME TEMPOROMANDIBULAR JOINT DYSFUNCTION SYNDROME. *Вестник магистратуры*. 2022;(5-1 (128)):10-11.

45. Alimdjanovich RJ, Yakubovna EM. MEDICO-SOCIAL ASPECTS OF CHILDHOOD DISABILITY. *JOURNAL OF BIOMEDICINE AND PRACTICE*. 2023;8(3). Accessed June 14, 2024. https://tadqiqot.uz/index.php/biomedicine/article/view/7705

46. Ghasemi Darestani N, Gilmanova AI, Al-Gazally ME, et al. Mesenchymal stem cell-released oncolytic virus: an innovative strategy for cancer treatment. *Cell Communication and Signaling*. 2023;21(1):43. doi:10.1186/s12964-022-01012-0

47. Исамиддинович МФ, Саидолимович КА, Журахановна ПБ. METABOLIK SINDROM BILAN KECHAYOTGAN YUZ-JAG‘ SOHASI FLEGMONALARINING KLINIKO-IMMUNOLOGIK XUSUSIYATLARI. *ЖУРНАЛ СТОМАТОЛОГИИ И КРАНИОФАЦИАЛЬНЫХ ИССЛЕДОВАНИЙ*. 2022;3(4). Accessed June 14, 2024. https://tadqiqot.uz/index.php/oral/article/view/7016

48. Алимджанович РЖ, Саидолимович КА. ORTTIRILGAN YUZ-JAG‘ NUQSONLARI BO‘LGAN BEMORLARGA ORTOPEDIK STOMATOLOGIK YORDAMNI TASHKIL ETISHNI SOTSIOLOGIK BAHOLASH. *ЖУРНАЛ СТОМАТОЛОГИИ И КРАНИОФАЦИАЛЬНЫХ ИССЛЕДОВАНИЙ*. 2022;3(3). Accessed June 14, 2024. https://tadqiqot.uz/index.php/oral/article/view/7123

49. A.s K, Sh.G K. PATIENTS ASSOCIATED INJURIES WITH FRACTURES OF THE MAXILLOFACIAL REGION: 118 PATIENTS REVIEW. *Достижения науки и образования*. 2022;(1 (81)):90-94.

50. Alimdjanovich RJ, Hayitqulovich KJ, Jumayevna YR. SCIENTIFIC SUBSTANTIATION OF ORGANIZATIONAL FORMS OF ACTIVITY OF NURSING STAFF OF REHABILITATION DEPARTMENTS (Review of literature). *European Journal of Interdisciplinary Research and Development*. 2023;12:208-211.

51. Marupova MH, Kubaev AS, Khazratov AI. THE ESSENTIAL ROLE OF DIAGNOSTIC AND TREATMENT METHODS FOR PATIENTS WITH TEMPOROMANDIBULAR JOINT PAIN DYSFUNCTION SYNDROME. *World Bulletin of Public Health*. 2022;10:141-142.

52. Jasur R, Farangiza V. The Use of Modern Technologies in the Diagnosis of Functional Disorders of the Temporomandibular Joint (Literature Review). *Central Asian Journal of Medical and Natural Science*. 2023;4(5):593-597. doi:10.17605/cajmns.v4i5.1875