Journal of Advanced Zoology

ISSN: 0253-7214
*Volume **44** Issue **S-6 Year 2023** Page **1699:1706***

Ultrasound Diagnosis of Urolithiasis

Akhmedov Farkhod Khakimovich[1]

[1]*Bukhara State Medical Institute, Bukhara Branch of RSCEMC.*
Email: ahmedovfarhod1313@mail.ru

**Corresponding author's E-mail: ahmedovfarhod1313@mail.ru*

Article History

Received: 08 June 2023
Revised: 21 Sept 2023
Accepted: 08 Dec 2023

Abstract

Urolithiasis is a metabolic disease caused by various exogenous or endogenous factors, often has a hereditary nature and is determined by the presence of a stone in the urinary system. The causes and mechanism of stone formation remain open in urology. There is still no definitive theory for the development of urolithiasis. The main symptoms of urolithiasis are pain, hematuria, dysuria and stone passage. Urolithiasis (UCD) is one of the most common urological diseases and ranks second in the world after inflammatory nonspecific diseases of the kidneys and urinary tract.

Keywords: *Urolithiasis, Computed Tomography, Ultrasound, Magnetic Resonance Imaging, CT Perfusion*

1. Introduction

Its share among all urological diseases is about 40% [1]. In 70% of patients, ICD is diagnosed at the age of 30–60 years, and there is a predominance of males. The increase in morbidity [2], the severity of complications, the tendency to relapse, and the predominant affection of young and most able-bodied people make the diagnosis and treatment of nephrolithiasis one of the most important problems of urology [3]. One of the manifestations of urolithiasis is renal colic, which is caused by occlusion of the ureter, resulting in increased intracavitary pressure, impaired intrarenal blood flow with pronounced edema of the renal parenchyma. In the first four hours after the onset of obstruction, an increase in renal blood flow is observed as a result of preglomerular vasodilation of the renal vessels. After four hours, blood flow decreases and ureteral pressure increases due to postglomerular vasoconstriction. Increased ureteral pressure activates the renin-angiotensin system and increases the level of vasoconstrictors, which is manifested by a decrease in renal blood flow and urinary tract pressure due to narrowing of the afferent arterioles [6]. Timely and accurate diagnosis of urolithiasis helps to avoid complications of the disease. The purpose of the study. Study of changes in the functions of the kidneys and ureter in urolithiasis.

2. Materials And Methods

Study and diagnose changes in the kidneys and ureters using ultrasound, CT and laboratory tests for urolithiasis. Ultrasound machines Mindray 6600, EsaoteMylab 40.

3. Results and Discussion

Urolithiasis (UCD) is one of the most pressing health problems worldwide. The significant prevalence of urolithiasis in the population (at least 5% of the population in industrialized countries) forces us to constantly study the etiology and pathogenesis, search for effective prevention mechanisms, improve diagnostic methods, as well as develop new technologies for conservative and surgical treatment. Currently, one of the pressing issues is the choice of radiological diagnostic method for predicting and assessing the effectiveness of treatment in patients with urolithiasis. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. Changes in renal blood flow in patients with urolithiasis depend on the nature of the urodynamic disturbance, the location and size of the stone, the duration of the disease, the presence of complications, and the age of the patient. Therefore, assessment of perfusion is necessary when studying renal function. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. Currently, one of the pressing issues is the choice of radiological diagnostic method for predicting and assessing the effectiveness of treatment in patients with urolithiasis. Improvement of

various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. Changes in renal blood flow in patients with urolithiasis depend on the nature of the urodynamic disturbance, the location and size of the stone, the duration of the disease, the presence of complications, and the age of the patient. Therefore, assessment of perfusion is necessary when studying renal function. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. Currently, one of the pressing issues is the choice of radiological diagnostic method for predicting and assessing the effectiveness of treatment in patients with urolithiasis. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. Changes in renal blood flow in patients with urolithiasis depend on the nature of the urodynamic disturbance, the location and size of the stone, the duration of the disease, the presence of complications, and the age of the patient. Therefore, assessment of perfusion is necessary when studying renal function. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. Changes in renal blood flow in patients with urolithiasis depend on the nature of the urodynamic disturbance, the location and size of the stone, the duration of the disease, the presence of complications, and the age of the patient. Therefore, assessment of perfusion is necessary when studying renal function. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. Changes in renal blood flow in patients with urolithiasis depend on the nature of the urodynamic disturbance, the location and size of the stone, the duration of the disease, the presence of complications, and the age of the patient. Therefore, assessment of perfusion is necessary when studying renal function. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. presence of complications, age of the patient. Therefore, assessment of perfusion is necessary when studying renal function. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis. presence of complications, age of the patient. Therefore, assessment of perfusion is necessary when studying renal function. Improvement of various methods of radiodiagnostics in assessing renal blood flow opens up new opportunities in monitoring the treatment of patients with urolithiasis.

Urolithiasis (UCD) is one of the most pressing clinical problems in urology, as the prevalence of the disease grows annually by 0.5-5.3%. In most patients, ICD is detected at the most working age - 30-50 years [6-8]. Radiation diagnostics and its role in the diagnosis of urolithiasis have traditionally received much attention in the literature, but the capabilities of radiological research methods in assessing the results of treatment of patients with urolithiasis have not been sufficiently studied. Improving various methods of radiation diagnostics in assessing renal blood flow.

Ultrasonography.Ultrasound (US) is a widely used method for imaging the urinary system. Ultrasound examinations have such advantages as non-invasiveness, absence of ionizing radiation, wide availability, low cost and good resolution.Kidney ultrasound standards vary depending on the characteristics of the human body, symptoms and medical history. Therefore, you should not judge deviations from the norm yourself - entrust this task to a specialist! The doctor will be able to take into account all the necessary factors and correctly interpret the results of a kidney ultrasound.

Usuallythe norm[*Kidney ultrasound*] *The following indicators are considered:*

Kidney size:

In adults:

- Length – 100-120 mm
- Width – 50-60 mm
- Thickness – 40-50 mm

In children, the norm depends on the age of the child.

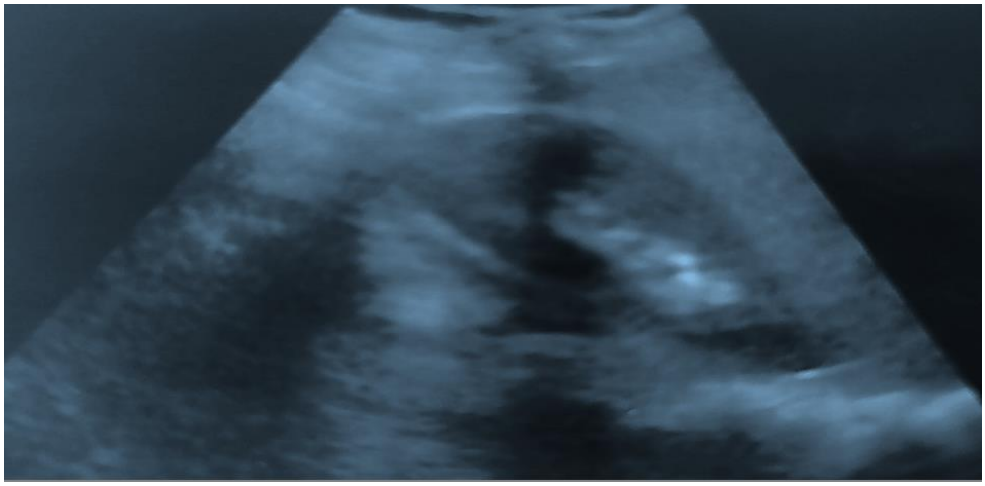
- Number of buds – 2 pieces.
- Shape - "bean grain"

- Location:
    - Right kidney - in the area of the 12th thoracic vertebra and the second lumbar vertebra
    - Left kidney - in the area of the 11th thoracic vertebra and the first lumbar vertebra
- Echogenicity is homogeneous.
- Parenchyma thickness – 14-26 mm
- Blood flow speed – from 50 to 150 cm/sec

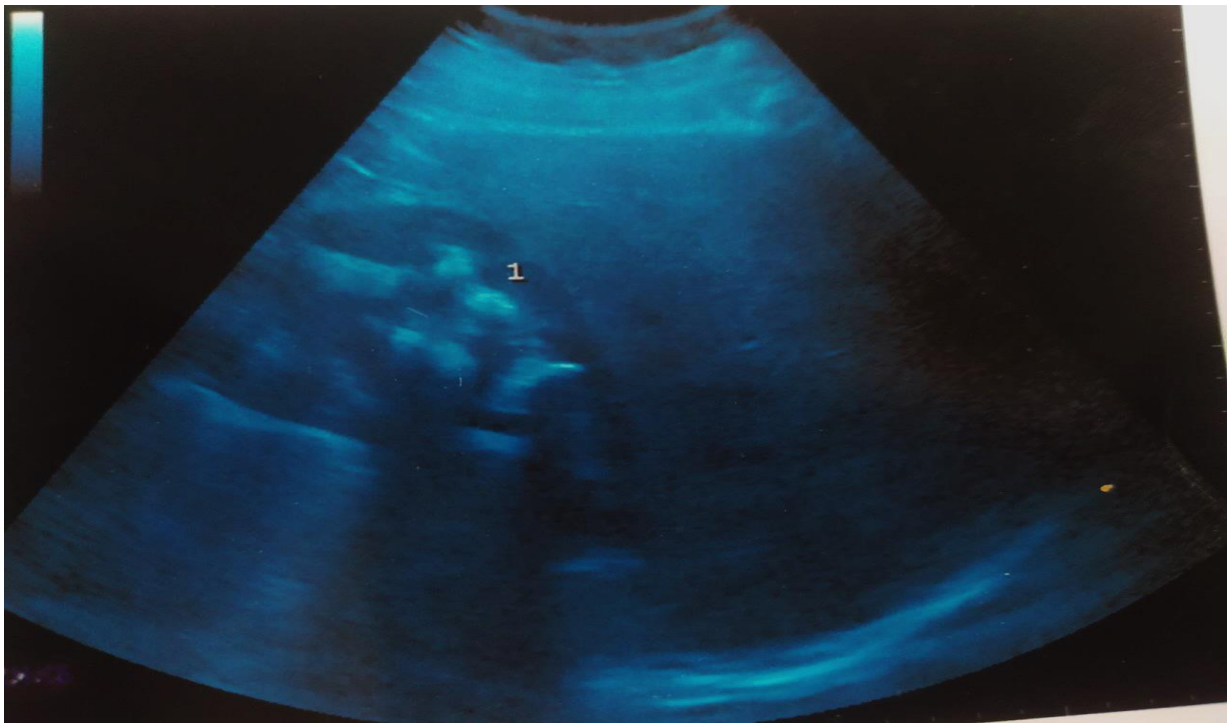
Ultrasound has proven itself well as a method of primary research in cases of suspected urolithiasis. Renal ultrasound is the preferred imaging modality for detecting hydronephrosis [7]. However, examining kidney stones using ultrasound has its drawbacks. That the sensitivity of ultrasound in detecting stones less than 3 mm is extremely low and reaches only 13%. In addition, ultrasound examinations of poorly defined kidney stones often exaggerate stone size, which may influence treatment management [9]. Regarding the study of renal blood flow, ultrasound cannot be used to evaluate it. The spread of Doppler ultrasound in recent years, as well as the appearance of publications on the use of pulsed wave mode for measuring angle-independent parameters, suggest that Doppler ultrasound may be useful as a method complementing echography in diagnosing urolithiasis and monitoring treatment. New possibilities opened up when the development of two-dimensional ultrasound scanning made it possible to non-invasively study the vascular bed. The diagnostic criteria of this method are: ultrasound image of the lumen of the vessel, its diameter and wall thickness. When developing a method for combined evaluation of ultrasound images of a vessel in real time and analysis of the Doppler frequency shift spectrum, a new technique was created - duplex scanning. Ultrasound was provided with a new technique - duplex scanning with color Doppler flow mapping, the essence of which was to code in different colors the direction and speed of blood flow in the lumen of the vessel. The first stage of the study is the process of obtaining images of the renal arteries and veins. In color mapping mode, the position of the vessel is specified, as well as its course and branching pattern. The second stage is to study the spectrum of blood flow velocities in a pulsed mode. A test volume with a depth of 2-4 mm is selected. The scanning angle is corrected so that the line defining the scanning inclination angle coincides with the long axis of the vessel in the area under study. A minimum Doppler filter (50 MHz) is installed. The minimum level of pulse repetition frequency at which there is no distortion of the Doppler spectrum is determined, the baseline level is established, after which blood flow velocities are measured. After long-term studies, some parameters for assessing renal blood flow were identified, in particular the resistance index. The resistance index is defined as the ratio of the difference between the maximum systolic blood flow velocity and the final diastolic blood flow velocity to the maximum systolic velocity. To a greater extent, it reflects the state of the microcirculatory bed (tone, state of the wall of arterioles and capillaries). The resistive index study is used in urology to assess the functioning of a renal transplant.

There has been debate for many years regarding the appropriateness of using the resistance index to assess renal blood flow during ureteral stone obstruction. According to many authors, the resistive index is a good indicator of renal blood flow, compared with other indicators, and one of the reliable diagnostic signs of renal colic [8-10]. Researchers have differing opinions about the specificity of this method when an attack lasts more than 72 hours. The index also differs between complete and partial ureteral obstruction. According to some authors, the most valuable data comes from a comparative assessment of blood flow in the affected and healthy kidney; in addition, compared to other methods, color Doppler mapping is a non-invasive and easily reproducible research method. Thus, Doppler sonography is an informative method for assessing renal blood flow in patients with urolithiasis. Studies have revealed a slowdown in blood flow and vascular resistance in the intrarenal arteries, which return to baseline on average by the 7th day after DLT. Obstructive changes in the postoperative period significantly slow down the process of normalizing blood flow, which is extremely important for patients who need repeated sessions of lithotripsy. In the presence of these changes in the preoperative period, blood flow indicators are initially reduced. Of great interest are the slowdown in blood flow and the increase in vascular resistance in the contralateral kidneys, as well as the fact that in the damaged kidney, blood flow indicators are disturbed to a greater extent in the area adjacent to the calculus, Multislice computed tomography (MSCT) limited to the level of obstruction once it has been identified using MRU. This is necessary to reduce radiation exposure. In a study by Blandino et al. (2003) to identify a stone in the ureter as the cause of renal colic, a combined study of MRU and limited MSCT had a sensitivity of 98%, while the sensitivity of a full MSCT scan of the urinary system was 100%. Moreover, the effective radiation dose was 5.4 times lower in a combined

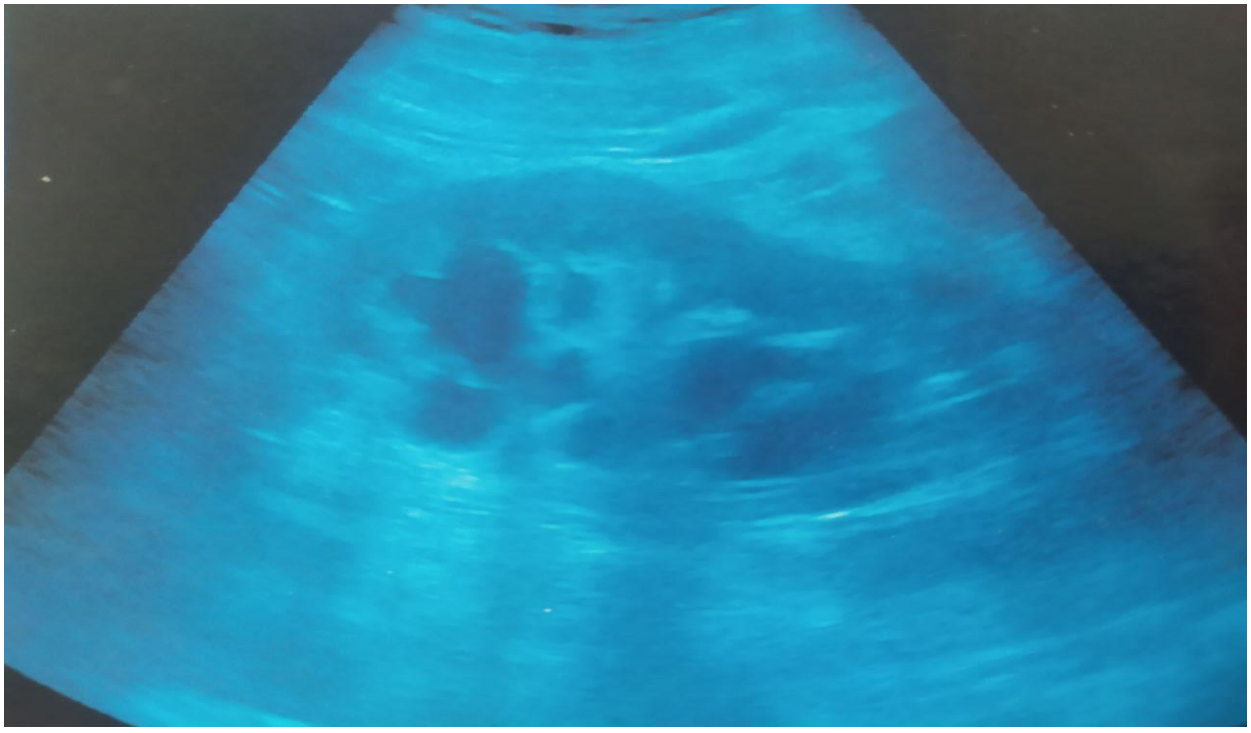
study of MRU and limited MSCT [11]. The CT perfusion method is based on temporary changes in tissue after the administration of iodinated contrast agents. Perfusion is the flow of blood through a unit volume of tissue. There is a linear relationship between an increase in tissue density and the iodine concentration in the tissue. Perfusion reflects an objective quantitative characteristic of tissue, in which, using mathematical models and special software, changes in tissue density are assessed, which directly reflects the transport of oxygen-containing and nutrients in it at the level of capillaries of the microvasculature. The CT perfusion method is based on the fact that after an intravenous bolus administration of a contrast agent, the degree of its concentration in the organ under study is measured; to register this, the entire organ or tumor is scanned at various time intervals. However, the use of renal CT perfusion as an advanced imaging method has a number of limitations, primarily associated with the lack of uniform standardized low-dose scanning protocols, the use of which would be optimal in multidisciplinary hospitals equipped with multispiral computed tomographs. Another problem remains the uncertainty of the possible variability of CT perfusion results when using different software for data processing. All of the above determines the relevance of CT studies.



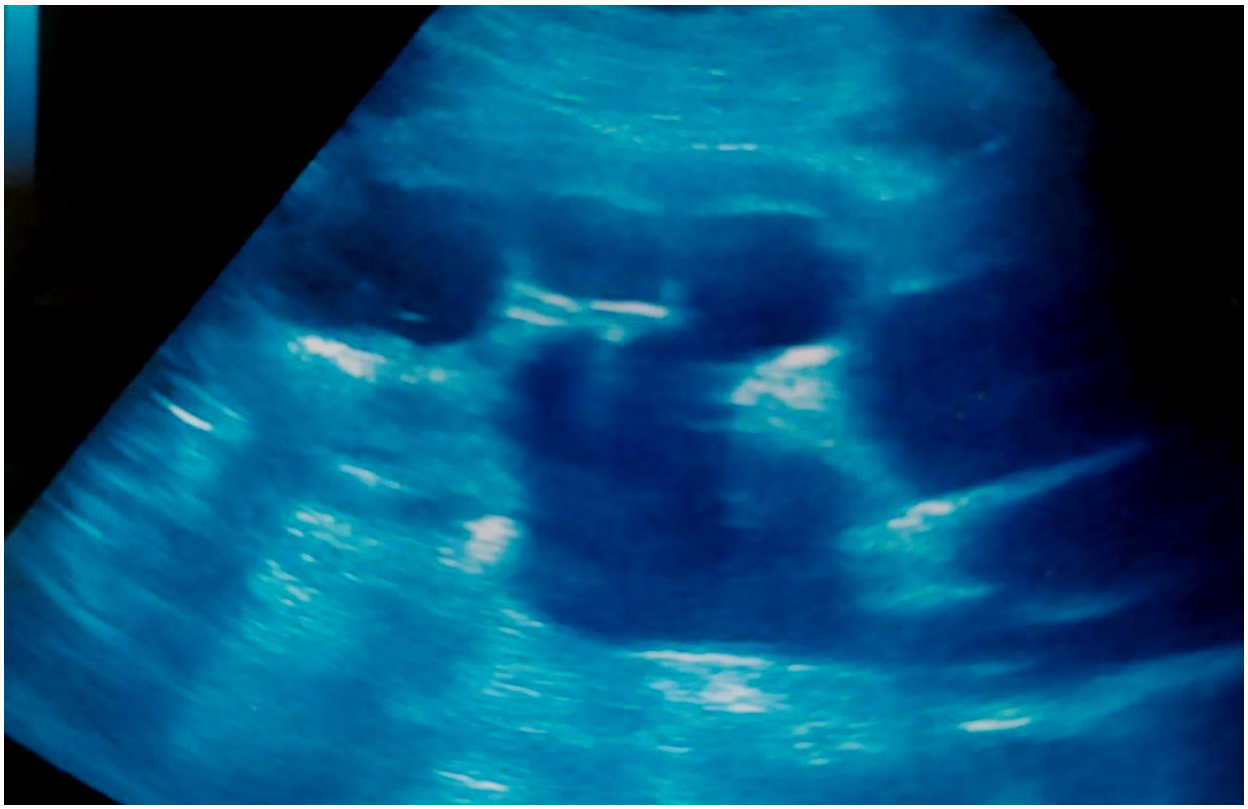
Picture 1: Small kidney stones



Picture 2: ICD of the right kidney

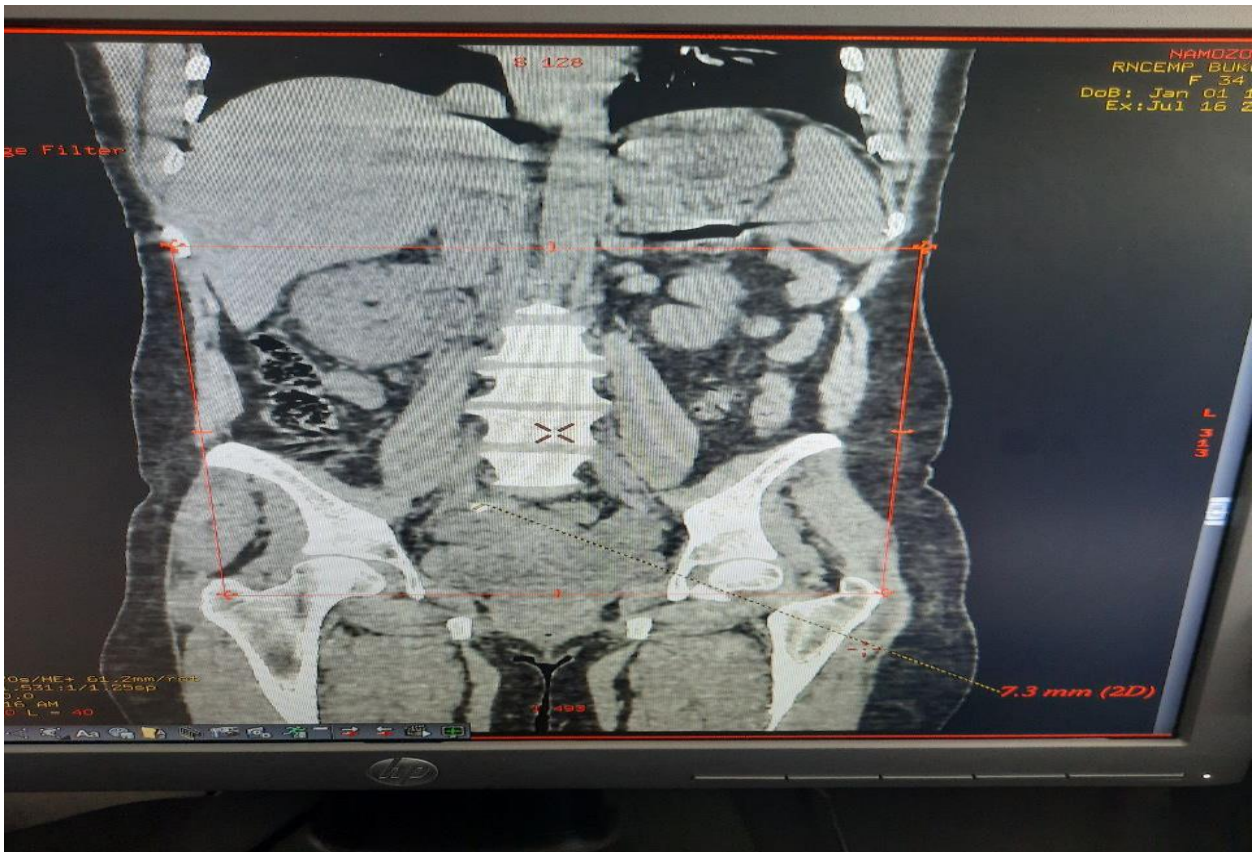


Picture 3: Hydronephrosis 1-2 degrees



Picture 4: Hydronephrosis 4 degree.

In 2022, the Charitable Foundation of the Russian Research Center for Emergency Medicine performed about 3,756 ultrasound scans of the kidneys, of which 3,278 cases were with urethrohydronephrosis, in 2023, for 9 months, 2,334 ultrasound scans of the kidneys with urethrohydronephrosis were 2,047 cases, 3,123 cases of kidney ICD in 2022, 1,003 in 2023, of which MSCT was performed. 451 cases in 2022, In 2023, there were 559 incidents in 9 months. Patients were admitted to the emergency department with attacks of renal colic; after examination by a urologist, patients underwent ultrasound and laboratory examinations. Some patients underwent, if necessary, MSCT of the kidneys, ureter, and bladder. When examining most cases, ultrasonography of patients shows hydronephrosis of the affected kidney. During our own research, over the past month, about 97 patients came to the emergency department, in 27 cases diagnosed with urolithiasis, kidney stones, 70 cases of urethrohydronephrosis of the kidneys, of these patients, in 39 cases, an MSCT of the kidneys was performed, in which a ureteral calculus was determined, after which these patients underwent stenting ureter.



4. Conclusion

The authors are grateful for the support and helpful comments provided by the Department of Oncology and Medical Radiology of the Bukhara State Medical Institute, the Bukhara branch of the Republican Scientific Center for Emergency Medical Care, as well as other experts consulted during this process.

References:

Adam A, Dixon AK. Chapter 1 “Ultrasound and General Principles”. In: Adam A (editor). Grainger & Allison’s diagnostic radiology. 5th ed. Philadelphia: Churchill Livingstone/Elsevier; 2008.

2. Richmond J. Radiological diagnosis of kidney stones. Nephrology. 2007;12:S34–

3. Westphalen AC, Hsia RY, Maselli JH, Wang R, Gonzales R. Radiological imaging of patients with suspected urinary tract stones: national trends, diagnoses, and predictors. Acad Emerg Med. 2011;18:S31-6.

4. Akhmedov F.Kh., Zhumayeva M.M. Ultrasound in gallstone disease, Acute Calculous Cholecystitis, Patient Selection for Lhe, Bile Duct Change Before and After Surgery //CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES- 2022.- V.3 . – No.3.- C-322-324.

https://cajmns. centralasianstudies.org/index.php/CAJMNS/article/view/788//

5. Akhmedov F. Kh. 2. Zhumaeva M. M. Comparative Morphometry of the Intra-And Extrahepatic Biliary Tracts, Bile Sphincters in Patients with GSD Undergoing Classical and Laparoscopic Cholecystectomy //RESEARCH JOURNAL OF TRAUMA AND DISABILITY STUDIES// 2022.- page 231 -241.

6. Akhmedov F. Kh., Zhumaeva M. M. MORPHOLOGICAL CHANGES IN Cholelithiasis // EURASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES- ISSN 2181-287X- 2 (12) 2022. - C - 274-283. https://doi.org/10.5281/zenodo.7381138

7. Akhmedov F. Kh., Zhumaeva M. M. Ultrasound Diagnosis of the Gallbladder in Gallstone Disease // AMALIY VA TIBBIYOT FANLARI ILMIY JURNALI - ISSN: 2181-3464.-1(7). -2022.-B.-15-21.

8. Akhmedov F. Kh., Zhumaeva M. M. Comparative Morphometry of the Intra- and Extrahepatic Biliary Tracts and Biliary Sphincters in Patients with GSD // AMALIY VA TIBBIYOT FANLARI ILMIY JURNALI - ISSN: 2181-3464.-1(7). -2022.-B.-22-27.

9. Akhedov F. Kh., Jumaeva N. Kh. Jumaeva M.M. COMPARATIVE MORPHOMETRY OF THE BILIARY TRACTS AND BILE SPHINCTERS IN PATIENTS WITH GSD UNDERGOING CLASSICAL AND LAPAROSCOPIC CHOLECYSTECTOMY.// Uzbek Scholar Journal

(https://uzbekscholar.com/index.php/uzs/article/view/466)

10. Akhmedov F.Kh., Zhumaeva M.M. Billiary Sludge // Research Journal of Trauma and Disability Studies- ISSN: 2720-6866.-1(12). -2022.-S.-73-82.

11. Akhmedov F. Kh., Jumaeva M. M. Ultrasound Comparative Morphometry in Patients with Conventional Cholecystectomy//Journal of Natural and Medical Education. -2023.- Volume 2, Issue 3. ISSN: 2835-303X. -P. 168-173.
13. Akhmedov F. Kh., Jumaeva M. M. Ultrasound Comparative Morphometry of Intra- And Extrahepatic Bile Ducts after Laparoscopic Cholecystectomy // Journal of Natural and Medical Education. -2023.- Volume 2, Issue 3. ISSN: 2835-303X. -P. 174-179.
13. Zhumaeva M. M. Ot Tosh Kasalligida Ut Kopi Devorining Morphological Va Gistokimyovyi Ozgarishlar //AMALIY VA TIBBIYOT FANLARI ILMIY JURNALI.- 2023.- Jild: 02 Nashr: 04.-B.-1-4.
14. Jumaeva M. M. Informativeness of Ultrasound in the Diagnosis of Changes in the Wall of the Gallbladder in Cholecystitis// CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCE Vol 4 No 3 (2023): CAJMNS ISSN:2660-4159 –P. 657-660. http://cajmns.centralasianstudies.org
15. Zhumaeva M.M. HISTOCHEMICAL METHOD FOR DIAGNOSTICS OF DESTRUCTIVE FORMS OF ACUTE CHOLECYSTITIS// CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCE Vol 4 No 3 (2023): CAJMNS ISSN:2660-4159 –P. 670-673. http://cajmns.centralasianstudies.org