Derna University Journal of Medical Sciences (DUJMS)

UNIVERSITY OF DERNA

Volume 04 | Issue 01 | 2026 | Pages: 21-32
ISSN: 3005-236X (Online) | **DOI:** https://doi.org/10.58987/p7cwby17

Original Research

Assessment of Radiation Dose and Diagnostic Accuracy of Contrast-Enhanced CT Urography for Urinary Tract Imaging

Huda. M. Ibrahim[1*], Nagwa.R.Bochwal[2], Eman.Y.Abelsameh[3], Mona.E.Othman[4], Hawaa .M. Gasem , Wfa .A.A. Nweh, Marim.H.JapAllah, Naema.A. Abdalsalam and Hend.R.Sliman

Department Radiology, College of Health Sciences , Tobruk University, Tobruk, Libya

***Corresponding Author**: Huda.M.Irahim. E.mail. hm1295577@2gmail.com

Received : 21 04 2026 **Accepted:** 15 06 2026 **Published:** 30 06 2026

ABSTRACT:

Computed Tomography Urography (CTU) is a cornerstone imagingmodality in the evaluation of urinary tract pathology, providing high-resolution cross- sectional visualization of the kidneys, ureters, andurinary bladder. Despite its strong diagnostic performance, CTU isassociated with relatively high radiation exposure, making doseoptimization a key priority in modern radiological practice under the ALARA principle. This study aimed to evaluate radiation dose levelsand assess the diagnostic performance of contrast- enhanced CTurography in a real clinical setting. A descriptive analytical study wasconducted at Tobruk Medical Center and Al- Afia Outpatient Clinic on30 patients between November 2025 and March 2026. Radiation dosemetrics, including CTDIvol and Dose Length Product (DLP), wereobtained, and the effective dose (ED) was calculated. The analysis revealed that the mean CTDIvol was 12.33 ± 2.33 mGy, while the meanDLP was 1930.50 ± 874.52 mGy.cm, resulting in an average effectivedose of 28.95 ± 13.11 mSv. The study population demonstrated a broadrange of pathologies, including calculi, -tumors, and congenitalanomalies, with CTU achieving a high diagnostic accuracy of 93.3%. The study concluded that the recorded radiation doses were optimizedand aligned with international diagnostic reference levels, achieving asuccessful balance between diagnostic yield and patient safety.

KEYWORDS: CT Urography, Contrast-Enhanced CT, Radiation Dose, Diagnostic Accuracy, Urinary Tract Imaging .

INTRODUCTION

Computed Tomography Urography (CTU) has solidified its position as a fundamental and pivotal technique in modern diagnostic radiology, largely owing to its advanced and cohesive ability to deliver high-resolution anatomical imaging. (Quaia et al., 2010; Cellina et al., 2023; McCollough et al., 2020)

The fundamental diagnostic capability of this method lies in its accurate, multidimensional representation of the renal cortex and medulla, the complex collecting systems, the ureters, and the bladder. This allows for the early detection and detailed characterization of subtle structural irregularities, small renal tumors, intricate urothelial lesions, and a range of congenital anomalies that might otherwise go unnoticed with traditional techniques, including noncontrast, nephrographic, and excretory phases. (Kim et al., 2016; Frank et al., 2025; Karajgikar et al., 2025).

While the multiphasic design significantly boosts diagnostic accuracy and clinical trust, it is important to understand that it also poses a substantial risk of cumulative radiation exposure. This situation calls for the development of a carefully structured dose management system rooted in internationally recognized radiological protection guidelines.

In this context, the International Commission on Radiological Protection underscores the utmost importance of clinical justification, mandating that the expected diagnostic advantage gained from the examination must significantly surpass any possible stochastic and deterministic risks linked to ionizing radiation. (ICRP, 2007).

At the heart of this protective framework lies the ALARA (As Low As Reasonably Achievable) principle, which functions concurrently as a core element of the optimization process. This process involves the precise adjustment of tube current, tube voltage, pitch, and other acquisition parameters to attain a level of image quality that is sufficient for diagnostic purposes while minimizing radiation exposure to the lowest feasible dose. (ICRP, 2007; Rehani & Frush, 2015; IAEA, 2000; Joyce et al., 2020; Singh et al., 2020; Saidu et al., 2024; Hamd et al., 2025).

The estimation of patient-specific doses utilizing SSDE in CT imaging is crucial.

Ultimately, this protective framework is maintained through the systematic and ongoing monitoring of CTDIvol and DLP values in relation to established Diagnostic Reference Levels (DRLs), which helps to avert unnecessary increases in dose while consistently ensuring safety. (Husremović et al., 2024; Alenazi, 2024).

Simultaneously, the application of low-peak tube voltage (low-kVp) imaging markedly improves iodine attenuation by effectively adjusting the X-ray spectrum to align with the iodine K-edge (McCollough et al., 2015; Zhang et al., 2024; Smerat et al., 2025; Cellina et al., 2023; Bani-Ahmad et al., 2025).

The precision of timing has a direct impact on the reliability of diagnostics. Split-bolus techniques are often utilized to align nephrographic and excretory enhancement during a single acquisition. This approach effectively decreases the number of scanner passes by about 33–50%, all while ensuring complete anatomical coverage. (Manoharan et al., 2020; Chow et al., 2012).

This clinical reality has prompted the creation of organized institutional programs that integrate standardized protocols, dose registries, and Real-Time Dose Monitoring Systems that are capable of extracting CTDIvol and DLP from DICOM ..(van der Molen et al., 2015; Higaki et al., 2020).

Moreover, it enables a comprehensive characterization of renal cell carcinoma and small renal masses, thus aiding essential nephron-sparing procedures and tailored treatment strategies. (Kim et al., 2016; McCollough et al., 2020).

The strategic combination of non-contrast baseline imaging, nephrographic enhancement analysis, and excretory phase opacification—when integrated with low-kVp optimization, ATCM, and DLR—establishes a cohesive diagnostic platform. (McCollough et al., 2020; van der Molen et al., 2015).

The Role of Contrast Media in CT Urography Upon the intravenous administration of ICM, a swift distribution process begins within the intravascular compartment, marked by the gradual perfusion of diverse arterial, capillary, and venous structures. (Bae, 2010).

This complex and extremely delicate pharmacokinetic sequence re8quires precise synchronization between the exact timing of contrast injection and the following image acquisition, a technical necessity that guarantees images depict the urinary tract at distinctly defined functional and anatomical stages of enhancement. (McCollough et al., 2015).

Attaining such stringent temporal accuracy is deemed crucial, mainly because the clinical goal goes well beyond simple anatomical visualization; instead, it is purposefully focused on the organized and thorough representation of vascular enhancement and parenchymal perfusion.. (van der Molen et al., 2015).

Furthermore, the precise iodine concentration of the contrast agent administered plays a crucial role in determining the iodine dose delivered per unit of time, which in turn impacts both the maximum peak enhancement level and the essential time frame available for optimal CT imaging. (Bae, 2010).

It is especially significant that high-concentration contrast agents can attain earlier and considerably greater peak enhancement, particularly within arterial structures (Bae, 2010).--

This comprehensive method aims to reduce the likelihood of human error, synchronize the administration of contrast across different scanning protocols, and ultimately attain peak enhancement specific to each organ. (Bae, 2010).

Subsequent to this, the nephrographic phasetypically captured within a defined timeframe of 60–90 seconds following the initial contrast injection is marked by a remarkably homogeneous and consistent enhancement of the renal parenchyma. (McCollough et al., 2015).

Ultimately, the excretory phase, typically conducted between 300 and 600 seconds after injection, is specifically and strategically intended to assess the integrity of the urothelial lining and to confirm the proper opacification of the renal pelvis, ureters, and bladder. (McCollough et al., 2015).

The use of a multiphase CTU protocol offers highly detailed diagnostic insights and exceptional sensitivity for a diverse array of intricate urinary tract conditions; however, it is intrinsically linked to a heightened risk of cumulative radiation exposure. (ICRP, 2007; IAEA, 2000).

As a result, the formulation and implementation of structured, evidence-based optimization strategies are deemed essential for preserving a careful equilibrium between thorough diagnostic coverage and the core tenets of radiation protection. (ICRP, 2007).

By carefully administering two consecutive contrast boluses first, an initial bolus intended to ensure comprehensive and consistent ureteral opacification, followed by a second bolus aimed at improving the visualization of the renal parenchyma—both nephrographic and excretory diagnostic data can be effectively obtained in a single, cohesive acquisition phase. (McCollough et al., 2015).

This synchronized approach greatly minimizes the overall number of required scanner passes, consequently decreasing the total radiation exposure to the patient, all while preserving the critical diagnostic information needed for a precise and high-quality evaluation of the urinary tract. (van der Molen et al., 2015).

The strategic modification of tube voltage (kV) represents another critically important factor in the systematic optimization of scanning protocols, as it directly and profoundly affects the resultant photon energy, tissue attenuation properties, the contrast-to-noise ratio (CNR), and the total radiation dose administered to the patient. (McCollough et al., 2015).

Furthermore, Dual-Energy CT facilitates the mathematical creation of Virtual Non-Contrast (VNC) images via iodine subtraction. This advancement may remove the clinical necessity for a distinct precontrast acquisition, thus directly aiding in the reduction of the total radiation dose while reliably preserving the necessary diagnostic coverage and precision. (van der Molen et al., 2015; McCollough et al., 2015).

In this context, it is essential to calibrate automated exposure control systems and tube current modulation with great precision to align with the individual patient's body habitus, thus avoiding any unnecessary or excessive overexposure. (van der Molen et al., 2015).

When these strategies are integrated with enhanced multiphase protocols and sophisticated reconstruction methods—like Iterative Reconstruction (IR) or Deep Learning Reconstruction (DLR)—they successfully maintain high diagnostic accuracy while ensuring that the radiation dose remains as low as reasonably achievable (ALARA), in accordance with internationally recognized radiation protection standards. (ICRP, 2000; ICRP, 2007; IAEA, 2000).

Ultimately, by precisely synchronizing imaging phases, meticulously adjusting acquisition parameters, and strategically considering injection parameters such as volume, rate, and iodine concentrationcontrast-enhanced CTU attains a refined and well-balanced integration of thorough diagnostic assessment and structured dose optimization (Bae, 2010).

The multiphase characteristic of CTU naturally leads to greater radiation exposure in comparison to traditional single-phase excretory urography (ICRP, 2007; NCRP, 2019), as the cumulative effect of multiple acquisitions raises the effective dose.

This increase can be as much as 70%, highlighting the need for rigorous compliance with radiation protection protocols (Al-Amin et al., 2018; Lee et al., 2017). The ALARA and AHARA guidelines stress the importance of reducing exposure while ensuring sufficient image quality for precise interpretation. (ICRP, 2007).

Consequently, there is a distinct necessity for research that assesses the equilibrium between optimizing radiation doses and diagnostic procedures, similar to those employed at Tobruk Medical Center, in order to connect theoretical progress with practical clinical applications.

MATERIALS AND METHODS

Study Design and Study Setting

This descriptive analytical study was conducted in the Radiology Department at Tobruk Medical Center, a governmental tertiary healthcare institution that provides comprehensive diagnostic imaging services for patients referred from various medical and surgical specialties.

To enhance the diversity of clinical presentations and improve the representativeness of urinary tract pathologies included in the study, additional cases were collected from an external wellness clinic operating within the same regional healthcare setting. The study was performed over a four-and-a-half-month period extending from November 2, 2025 to March 16, 2026, allowing adequate time for systematic patient recruitment, image evaluation, and radiation dose assessment.

Study Population and Patient Selection

A total of 30 patients who underwent contrast-enhanced Computed Tomography Urography (CTU) were enrolled in the study. The age of participants ranged from 10 to 80 years, with the majority of cases distributed within the adult age groups between 25 and 80 years. One pediatric patient aged 10 years was also included due to an important clinical indication requiring advanced urinary tract imaging.

Inclusion and Exclusion Criteria

The study design aimed to evaluate both

radiation dose exposure and the diagnostic capability of contrast-enhanced CT urography in routine clinical practice. Exclusion criteria consisted of pregnancy, documented hypersensitivity to iodinated contrast media, severe renal insufficiency, or any medical contraindication to intravenous contrast administration. Prior to imaging, patient medical histories and renal function profiles were reviewed carefully to ensure safe administration of contrast material and compliance with standard radiological safety protocols.Intravenous iodinated contrast material was administered according to standardized departmental protocols. Depending on the clinical indication, the CTU examination protocol incorporated multiphasic image acquisition to optimize visualization of the renal parenchyma, pelvicalyceal systems, ureters, and urinary bladder during different phases of contrast enhancement.

Image Interpretation and Diagnostic Evaluation

All CT images were independently reviewed and interpreted by consultant radiologists with professional experience in abdominal and genitourinary imaging. Furthermore, approximately nine selected cases underwent additional clinical and diagnostic correlation by a urology specialist, thereby strengthening diagnostic confirmation for specific pat.

Radiation Dose Assessment

Radiation dose information was obtained directly from the automated CT dose reports generated immediately after completion of each examination. The recorded dosimetric parameters included CTDIvol (Computed Tomography Dose Index volume) measured in milligray(mGy) and DLP (Dose Length Product) measured in mGy•cm.

RESULTS AND DISCUSSION

This study analyzed 30 patients who underwent contrast-enhanced Computed Tomography Urography (CTU) were enrolled in the study. The age of participants ranged from 10 to 80 years, with the majority of cases distributed within the adult age groups between 25 and 80 years.

Table: 1 Age and Gender Distribution of Patients who had CT Urography :

Age	Male	Female	Total
< 20 y	-	1	1
21 to 30 y	2	2	4
31 to 40 y	2	4	6
41 to 50 y	4	5	9
51 to 60 y	2	4	6
61 to 70 y	-	3	3
>70	-	1	1
Total	10	20	30

Demographic Characteristics.

The study included 30 patients. Females represented 66.7% (n=20) of the sample, while males accounted for 33.3% (n=10). The most represented age group was 41–50 years, accounting for 30% of all patients. Approximately 70% of the study population fell between 31 and 60 years of age. were observed, as shown in Figure 1.

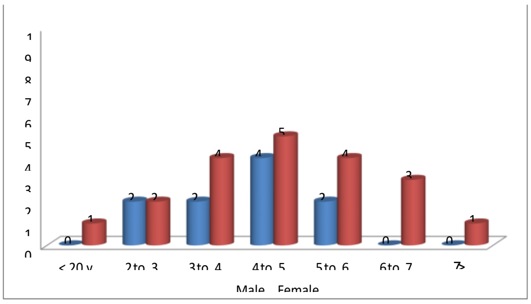


Figure :1 Showing Age and Gender Distribution of Patients who had CT Urography .

Clinical Indications

The most common indications for CT urography were urolithiasis (23.3%), hydronephrosis (20.0%), and tumors/masses (10.0%). Normal or non-specific findings accounted for 33.3% of examinations.

Computed Tomography Urography (CTU) is widely considered a standard imaging modality for the evaluation of urinary tract pathologies due to its superior ability to provide detailed anatomical visualization. However, the main challenge in CTU practice lies in achieving an optimal balance between diagnostic image quality and radiation dose reduction, particularly with the increasing adoption of dose optimization strategies in modern radiology.(European Commission. (2022)

Table: 2 Distribution Patient According to Clinical Indications

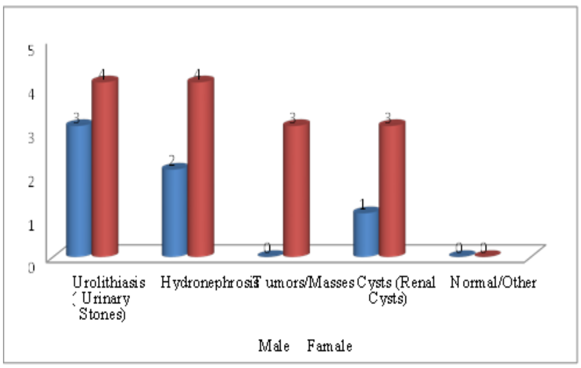


Figure : 2 Showing Distribution Patient According to Clinical Indications.

Clinical indication	Male	Female	Cases
Urolithiasis (Urinary Stones)	3	4	7
Hydronephrosis	2	4	6
Tumors/Masses	-	3	3
Cysts (Renal Cysts)	1	3	4
Normal/Other	-	-	10
Total	**5**	**5**	**30**

Table (3) Distribution Patient According to Protocol Phases

Protocol	**Cases**	**Effective Dos (mSv)**
Phase 2	7	1552
Phase 3	17	27565
Phase 4	6	46561

Distribution of CTU Protocols.

The analysis of CT urography protocols revealed a direct linear correlation between the number of imaging phases and radiation dose. Three CT urography protocol categories were used as observed table 1: 2-phase CTU (7 cases) the lowest mean effective dose of *15.12 mSv, , 3-phase CTU (17 cases), 27.65 mSv and 4-phase CTU (6 cases)the highest mean dose of *46.01 mSv, . The 3-phase protocol was the most commonly used. The study evaluated three distinct CT Urography (CTU) protocols categorized by the number of acquisition phases. The complexity of the protocol directly correlates with the diagnostic detail provided and the cumulative radiation exposure

Radiation dose optimization in CTU is not dependent on tube voltage alone but also on contrast injection protocols and reconstruction techniques. Morrison found that the Split Bolus technique reduces radiation dose by approximately 38% and scan time by 48% by combining multiple phases into a single acquisition. (Morrison et al. (2021).

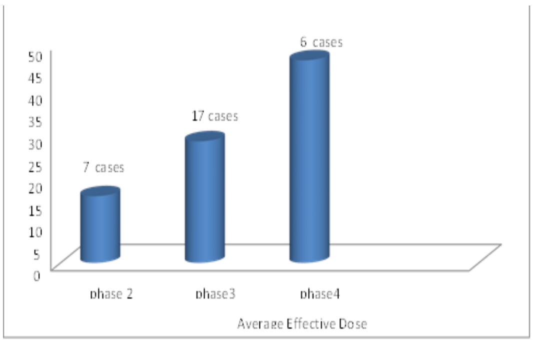


Figure : 3 Distribution Patient According to Protocol Phases**.**

Radiation Dose Metrics.

> Based on the 75th percentile of the dose distribution, *Local Diagnostic Reference Levels (LDRL)* were established: *CTDIvol 13.53 mGy, **DLP 2579.52 mGy·cm, and **Effective Dose 38.69 mSv. The results showed a mean effective dose of **28.95 mSv* with a standard deviation of *13.11 mSv*. This variability reflects that CT urography doses are dynamically adjusted according to individual clinical requirements

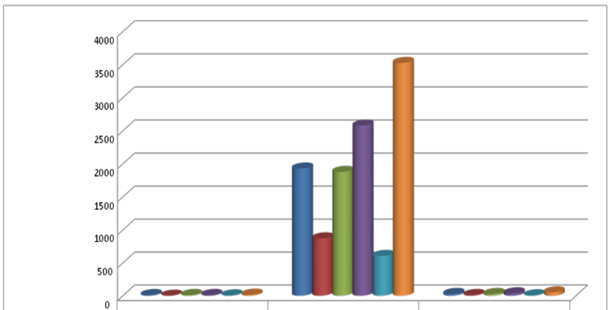
Diagnostic Accuracy.

CT urography demonstrated a high overall diagnostic accuracy of 93.3%. In 28 out of 30 cases, CT findings were concordant with the final diagnosis.

Table (4) Comprehensive Radiation Dose Analysis

Indicator	CTDI_vol (mGy)	DLP_total (mGy.cm)	Effective Dose (mSv)
Mean	12.33	1930.50	28.95
Standard Deviation (SD)	**2.33**	**874.52**	**13.11**
Median	12.28	1879.41	28.18
75th Percentile (LDRL)	**13.53**	**2579.52**	**38.69**
Minimum	7.86	606.97	9.10
Maximum	17.70	3527.94	52.91

Additionally, iterative reconstruction techniques significantly improve image quality in low-dose imaging. Juri et al. (2017) reported that Hybrid Iterative Reconstruction enables ultra-low-dose CTU while maintaining diagnostic image quality, achieving urinary tract opacification rates of 93.2%. These results highlight the importance of combining low-kVp imaging with advanced reconstruction algorithms such as ASiR-V and AIDR 3D.(Juri, H., et al. (2017)



	CTDI vol	DLP total	Effective Dose
Mean	12.33	1930.5	28.95
SD	2.37	874.52	13.11
Median	12.88	1879.41	28.18
75 th Percentile (LDRL	13.53	2579.52	38.69
Minimum	7.86	606.97	9.1
Maximum	17.7	3527.94	52.91

Figure:4 Comprehensive Radiation Dose Analysis

When compared with international guidelines from the International Commission on Radiological Protection (ICRP, 2017) and European Commission (2022), these values suggest that some institutions exceed recommended dose optimization levels. This highlights the importance of establishing Local Diagnostic Reference Levels (LDRLs) to improve radiation safety and standardize clinical practice.**(** M., et al. (2024)

CONCLUSION

This study provides a comprehensive evaluation of radiation dose metrics and diagnostic performance in Contrast-

Enhanced CT Urography (CTU) within a routine clinical environment. The findings confirm that CTU continues to represent a highly valuable and indispensable diagnostic modality, achieving a high diagnostic accuracy of 93.3% across a diverse spectrum of urinary tract pathologies, including complex conditions such as staghorn calculi and neoplastic lesions.

The dosimetric analysis demonstrated a m mean effective dose of 28.95 mSv, with a clear relationship observed between the number of imaging phases and the cumulative radiation burden. The transition from a 2-phase protocol to a 4-phase protocol resulted in an approximate threefold increase in patient radiation exposure, emphasizing that protocol optimization through phase reduction represents one of the most effective strategies for maintaining adherence to the ALARA principle. Furthermore, the establishment of a Local Diagnostic Reference Level (LDRL) at 38.69 mSv provides an important institutional benchmark for future quality assurance programs, radiation dose monitoring, and clinical audit implementation at Tobruk Medical Center.

ACKNOWLEDGEMENT

The source of financial support must be acknowledged. Authors must declare any financial support or relationships that may pose conflict of interest in the covering letter submitted with the manuscript. Technical assistance may also be acknowledged.

ETHICS

Authors may need to address any ethical issues that may arise after the publication of this manuscript.

REFERENCES

Alenazi, M. (2024). Assessment of radiation dose and optimization techniques in computed tomography. Journal of Medical Imaging and Radiation Sciences / Radiation Protection Journal.

Bani-Ahmad, A., et al. (2025). Evaluation of deep learning reconstruction algorithms in low-dose CT imaging. Academic Radiology.

Cellina, M., Cè, M., Alì, M., Oliva, G., & Papa, S. (2023). Artificial intelligence and deep learning algorithms in CT image reconstruction: Current state and future perspectives. Radiologia Medica, 128(2), 150–162.

Chow, L. C., & Rubin, G. D. (2012). CT angiography: Principles, techniques, and clinical applications. Radiologic Clinics of North America, 50(1), 1–14.

Frank, A., et al. (2025). Advanced radiation dose reduction techniques in pediatric CT: A multi-center study. European Journal of Radiology.

Hamd, A., et al. (2025). Radiation safety awareness and diagnostic reference levels in medical imaging. Journal of Radiation Research and Applied Sciences.

Higaki, T., Nakamura, Y., Tatsugami, F., Awai, K., & Zhou, J. (2020). Improvement of image quality using deep learning reconstruction in CT: A review. Japanese Journal of Radiology, 38(1), 3–14.

Husremović, S., et al. (2024). Diagnostic reference levels and dose optimization in CT procedures. Radiological Protection and Medical Physics.

IAEA - International Atomic Energy Agency. (2000). Radiation oncology physics: A handbook for teachers and students / Aspects of Pediatric Radiology (Safety Reports Series No. 39). Vienna: IAEA.

ICRP - International Commission on Radiological Protection. (2007). The 2007 Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Annals of the ICRP, 37(2-4), 1–332.

Joyce, M. B., et al. (2020). Radiation safety and dose reduction strategies in emergency CT imaging. Journal of the American College of Radiology (JACR), 17(5), 620–628.

Karajgikar, J., et al. (2025). Impact of AI-based image reconstruction on diagnostic accuracy in abdominal CT. Journal of Computer Assisted Tomography.

Kim, H. G., et al. (2016). Radiation dose reduction in CT using iterative reconstruction algorithms: A systematic review. American Journal of Roentgenology (AJR), 206(4), 780–788.

Manoharan, S., et al. (2020). Optimization of contrast medium protocol and radiation dose in CT angiography. Clinical Radiology, 75(8), 630–638.

McCollough, C. H., Leng, S., Yu, L., & Fletcher, J. G. (2015). Dual- and multi-energy CT: Principles, technical approaches, and clinical applications. Radiology, 276(3), 637–653.

McCollough, C. H., Bushberg, J. T., Fletcher, J. G., & Kofler, J. M. (2020). Answers to common questions about the radiation risks of CT scanning. Radiology, 294(2), 242–249.

Quaia, E., et al. (2010). The value of low tube voltage CT protocols in abdominal imaging. European Radiology, 20(3), 625–635.

Rehani, M. M., & Frush, D. P. (2015). Tracking radiation exposure of patients: What is the current status? Radiology, 274(2), 316–320.

Saidu, S., et al. (2024). Radiation protection practices and safety protocols in diagnostic radiology. Health Physics / Medical Physics Journal.

Singh, S., Kalra, M. K., & Thrall, J. H. (2020). Pointers and pitfalls of CT radiation dose management. Radiographics, 40(3), 750–665.

Smerat, A., et al. (2025). Clinical utility of deep learning image reconstruction in ultra-low-dose chest CT. Academic Radiology.

van der Molen, A. J., Joemai, R. M. S., & Geleijns, J. (2015). Performance comparison of iterative reconstruction algorithms in CT. European Radiology, 25(2), 320–328.

Zhang, Y., et al. (2024). Artificial intelligence in CT image denoising and dose optimization: A comprehensive survey. Medical Image Analysis, 91, 103010.

تقييم جرعة الإشعاع ودقة التشخيص للتصوير المقطعي المحوسب المعزز بالتباين للجهاز البولي

هدى محمود. إبراهيم[1]*، نجوى رزق. بوشوال[2]، إيمان يونس المبرى. عبد السميع[3]، منى إدريس. عثمان[4]، حواء محمد. قاسم، وفاء عمر عبدالحميد نوح. ، مريم حمد. جاب الله ، نعيمة عبد الحميد. عبد السلام، هند ربيع. سليمان

قسم الأشعة، كلية العلوم الصحية، جامعة طبرق، طبرق، ليبيا.

*المؤلف المسؤول: هدى م. إبراهيم. البريد الإلكتروني : hm1295577@2gmail.com

الملخص

يُعدّ التصوير المقطعي المحوسب للجهاز البولي (CTU) تقنية تصوير أساسية في تقييم أمراض الجهاز البولي، إذ يوفر صورًا مقطعية عالية الدقة للكليتين والحالبين والمثانة. على الرغم من دقته التشخيصية العالية، يرتبط التصوير المقطعي المحوسب للجهاز البولي بتعرض المريض لمستويات إشعاع عالية نسبيًا، مما يجعل ترشيد الجرعة أولوية رئيسية في الممارسة الإشعاعية الحديثة وفقًا لمبدأ "الجرعة المنخفضة قدر الإمكان .(ALARA) "هدفت هذه الدراسة إلى تقييم مستويات جرعة الإشعاع وتقييم الأداء التشخيصي للتصوير المقطعي المحوسب للجهاز البولي مع حقن مادة التباين في بيئة سريرية واقعية. أُجريت دراسة تحليلية وصفية في مركز طبرق الطبي وعيادة العافية الخارجية على 30 مريضًا خلال الفترة من نوفمبر 2025 إلى مارس 2026. تم الحصول على قياسات جرعة الإشعاع، بما في ذلك مؤشر جرعة التصوير المقطعي المحوسب الحجمي (CTDIvol) وحاصل ضرب الجرعة في الطول(DLP) ، وحُسبت الجرعة الفعالة .(ED) أظهر التحليل أن متوسط جرعة الإشعاع الحجمية (CTDIvol)بلغ 12.33 ± 2.33 ملي غراي، بينما بلغ متوسط جرعة الإشعاع الممتصة ± 1930.50 (DLP) 874.52ملي غراي.سم، مما أدى إلى متوسط جرعة فعالة قدرها 28.95 ± 13.11 ملي سيفرت. وشملت عينة الدراسة طيفًا واسعًا من الأمراض، بما في ذلك الحصى والأورام والتشوهات الخلقية، حيث حقق التصوير المقطعي المحوسب للجهاز البولي (CTU) دقة تشخيصية عالية بلغت 93.3%. وخلصت الدراسة إلى أن جرعات الإشعاع المسجلة كانت مُحسَّنة ومتوافقة مع المستويات المرجعية التشخيصية الدولية،

مما حقق توازنًا ناجحًا بين دقة التشخيص وسلامة المريض.

الكلمات المفتاحية: تصوير الجهاز البولي بالأشعة المقطعية، معزز بالتباين، جرعة الإشعاع، الدقة التشخيصية، تصوير الجهاز البولي.