

Fluoroscopy in Nephrology: Enhancing Precision in Renal Interventions

Introduction

Fluoroscopy has become an essential imaging modality in modern nephrology, particularly with the expansion of interventional and image-guided procedures. By providing real-time X-ray visualization, fluoroscopy allows nephrologists and interventional specialists to perform complex vascular and renal interventions with greater accuracy and safety [1,2]. Its integration into nephrology practice has transformed the management of dialysis access, renal vascular disease, and central venous procedures, reducing reliance on open surgical techniques and improving patient outcomes.

Discussion

The primary advantage of fluoroscopy in nephrology is its ability to provide continuous, real-time imaging during procedures. It is widely used in the placement of tunneled and non-tunneled dialysis catheters, ensuring accurate catheter positioning within central veins and optimizing dialysis efficiency. Fluoroscopy also plays a critical role in the creation, maintenance, and salvage of arteriovenous fistulas and grafts. Procedures such as angioplasty, thrombectomy, and stent placement rely on fluoroscopic guidance to identify stenosis, thrombosis, and anatomical variations [3,4].

In renal vascular interventions, fluoroscopy is indispensable for procedures such as renal angiography, angioplasty, stenting, and embolization. It enables precise navigation of catheters and guidewires within renal vessels, facilitating targeted therapy while minimizing injury to surrounding structures. When combined with contrast-sparing strategies or adjunctive imaging modalities such as ultrasound and intravascular ultrasound, fluoroscopy can be used safely even in patients with advanced kidney disease [5].

Despite its benefits, fluoroscopy involves exposure to ionizing radiation, raising concerns for both patients and healthcare providers. Adherence to radiation safety principles, including minimizing fluoroscopy time, using low-dose settings, and employing protective equipment, is essential. Advances in fluoroscopic technology, such as digital imaging, pulsed fluoroscopy, and improved detector sensitivity, have significantly reduced radiation exposure while maintaining image quality.

The growing role of fluoroscopy has also influenced nephrology training, with increased emphasis on procedural skills and imaging interpretation. Collaborative practice models involving nephrologists, interventional radiologists, and vascular specialists further enhance procedural success and patient safety.

Conclusion

Fluoroscopy is a cornerstone imaging modality in interventional nephrology, enabling precise, minimally invasive diagnosis and treatment of renal and vascular conditions. Its real-time imaging capability has expanded the scope of nephrology practice and improved outcomes for patients requiring dialysis access and renal interventions. With

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appropriate training, radiation safety measures, and technological advancements, fluoroscopy can be used effectively and safely. As interventional nephrology continues to evolve, fluoroscopy will remain a fundamental tool supporting high-quality, patient-centered renal care.

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