

Catheter-Based Renal Therapy: Minimally Invasive Approaches to Renal Disease Management

Introduction

Catheter-based renal therapy encompasses a range of minimally invasive, image-guided procedures designed to diagnose and treat renal vascular and parenchymal disorders. These therapies have become increasingly important as alternatives to open surgical approaches, particularly in patients with chronic kidney disease or significant comorbidities. By utilizing percutaneous catheter techniques, clinicians can target renal pathology with greater precision, reduced procedural risk, and faster recovery. Catheter-based interventions now play a key role in modern nephrology and interventional medicine [1,2].

Discussion

Catheter-based renal therapies are most commonly applied in the management of renal vascular conditions. Renal angiography, angioplasty, and stenting are used to evaluate and treat renal artery stenosis in selected patients with resistant hypertension or progressive renal dysfunction. These procedures allow restoration of renal blood flow while avoiding the morbidity associated with surgical revascularization. Similarly, catheter-based embolization techniques are widely used to manage renal tumors, arteriovenous malformations, and hemorrhage following trauma or biopsy [3-5].

In the context of dialysis care, catheter-based techniques are essential for vascular access management. Image-guided placement of tunneled and non-tunneled dialysis catheters enables safe and rapid initiation of hemodialysis. Endovascular interventions such as angioplasty, thrombectomy, and stent placement are routinely performed to maintain and salvage arteriovenous fistulas and grafts, prolonging access lifespan and reducing dependence on central venous catheters.

Catheter-based therapies also support diagnostic evaluation. Selective renal vein sampling and pressure measurements provide valuable information in complex hypertension or transplant-related cases. Advances in catheter design, imaging guidance, and contrast-sparing techniques have enhanced procedural safety, particularly for patients with limited renal reserve.

Despite their advantages, catheter-based renal therapies require specialized expertise, careful patient selection, and attention to potential risks such as bleeding, contrast-induced nephropathy, and vascular injury. Multidisciplinary collaboration and standardized protocols are essential to optimize outcomes and minimize complications.

Conclusion

Catheter-based renal therapy has transformed the management of renal and renovascular diseases by offering targeted, minimally invasive treatment options. These interventions improve diagnostic accuracy, preserve renal function, and reduce procedural morbidity in appropriately selected patients. As technology continues to advance and operator experience grows, catheter-based approaches will play an increasingly central role in renal

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care. Their integration into comprehensive, patient-centered treatment strategies represents a significant step forward in the management of kidney disease.

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