

BIOENGINEERING AND MEDICAL-SURGICAL SCIENCES

UNITO - Innovative Endourology in the management of Urolithiasis, BPO, and transplant-related complications: from technology to everyday clinical practice

Funded By	UNIVERSITA' DEGLI STUDI DI TORINO [Piva/CF:02099550010]
Supervisor	GONTERO PAOLO - paolo.gontero@polito.it
Contact	Biancone Luigi Rinaldi Mauro
Context of the research activity	Comparative evaluation and clinical application of innovative endourological technologies, devices, and techniques for the treatment of benign prostatic obstruction (BPO), urolithiasis, ureteral strictures, vesico-ureteral reflux (VUR), non-muscle invasive bladder cancer NMIBC), and upper tract urothelial carcinoma (UTUC), with particular focus on kidney-transplanted patients.
	Endourology has undergone a profound transformation in recent years, driven by the development of highly specialized, minimally invasive techniques, novel devices, and advanced energy sources. These innovations have revolutionized the treatment of a wide range of urological disorders, offering reduced morbidity, faster recovery, and improved precision. However, the rapid evolution of technology calls for structured, evidence-based evaluation to guide its integration into clinical practice—particularly in complex and vulnerable populations such as kidney-transplanted patients. This project is centered on a comprehensive comparison and application of state-of-the-art endourological techniques in the treatment of three critical urological domains: urolithiasis, benign prostatic obstruction (BPO), and transplant-related urological complications, including ureteral strictures and vesico-ureteral reflux (VUR). The overarching goal is to assess the efficacy, safety, and adaptability of these approaches, with a particular focus on their use in kidney transplant recipients, who pose unique clinical challenges due to altered anatomy, immunosuppression, and graft preservation concerns. Specific Objectives: 1. Assessment of Innovative Techniques for Urolithiasis: - o Comparative analysis of modern stone treatment modalities, including flexible ureteroscopy with single-use and digital scopes, lithotripsy with different lasers (TFL, pTm:YAG, Ho:YAG), and miniaturized percutaneous nephrolithotomy (mini-PCNL). - o Evaluation of outcomes such as stone-free rates, operative time, complication rates, and hospital stay.

Objectives	- o Subgroup analysis in transplanted patients, with focus on allograft safety, anatomical challenges (e.g., ureteral implantation site), and recurrence prevention strategies. 2. Advancements in BPO Management: - o Review and comparison of novel techniques such as EEP (Endoscopic Enucleation of the Prostate) and MISTs (Minimally Invasive Surgical Treatments) in comparison with the long-lasing gold standard (TURP, TransUrethral Resection of the Prostate). - o Analysis of their application in patients with immunosuppression or anatomical con-siderations post-transplant. - o Long-term evaluation of efficacy, continence preservation, and avoidance of catheter dependency, particularly critical in transplant recipients. 3. Management of Ureteral Strictures and VUR in Transplanted Patients: - o In-depth exploration of endoscopic management strategies including balloon dila-tion, laser endoureterotomy, endoureteral stenting, and endoscopic injection for VUR. - o Comparison of these methods with open and laparoscopic approaches in terms of graft preservation, complications, and re-intervention rates. - o Use of real-time imaging and navigation-assisted systems to enhance safety and ac-curacy in the transplanted urinary tract. 4. Technology Evaluation and Decision-Making Algorithms: - o Objective benchmarking of available technologies, integrating cost-effectiveness, learning curve, and clinical versatility. - o Development of clinical decision-making algorithms tailored to specific pathologies and patient subgroups (e.g., transplant vs. non-transplant). - o Incorporation of patient-reported outcomes and quality-of-life measures into treat-ment evaluation frameworks. 5. Creation of a Prospective Clinical Registry: - o Establishment of a dedicated, prospective database to systematically collect data on procedures, outcomes, and follow-up in both general and transplant-specific cohorts. - o Use of registry data to support real-world evidence, identify predictors of success or failure, and refine clinical protocols. This project aims to bridge the gap between technological innovation and practical application by producing actionable insights into how new endourological tools can be most effectively employed across diverse urological pathologies. Special attention will be paid to graft preservation, infection risk minimization, and functional outcome optimization in transplant patients—a population often underrepresented in clinical trials but increasingly prevalent in urological practice.
Skills and competencies for the development of the activity	The candidate must hold a Master's Degree in Medicine and a Specialization in Urology, with documented expertise in endourology. Prior experience in both surgical practice and clinical research within the field is essential. Strong skills in interdisciplinary teamwork, a good knowledge of the English language, and a demonstrated motivation for research and innovation in transplant medicine and endourology are required. The candidate is expected to hold some scientific publications related to the topic . International experience in the field is considered an asset.