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Developments and Breakthroughs in Urology during the Last Decade

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Within a decade, the specialty of Urology developed at a rapid manner, taking advantage of the technological progress along with the clinical and laboratory research. In an effort to minimize postoperative morbidity, and to optimize the surgical outcome, Urology was marked by the entrance of robotic technology using the da Vinci Surgical System™. Urology is probably the only surgical discipline which adopted the robotic platform like no other, as shown by the global acceptance and penetration of the system [1]. More important is the fact that in certain procedures and more particularly in procedures that combine the oncological and the functional outcome (radical prostatectomy, partial nephrectomy), the robotic approach has become the golden standard therapy. The superiority of robotics for the above interventions has been shown by numerous international clinical studies and meta-analysis of high scientific standing [2-6]. Today, the majority of urological procedures can be performed robotically-assisted and their indications are increasing daily. Robotic surgery is surgery of millimeter precision, offering unmatched magnified three-dimensional vision, degrees of freedom beyond the reach of the human hand, filtering of physiological tremor, elimination of the expected fatigue of the surgeon after several hours of surgery. Last, robotics gives the possibility of surgery "single hole» ("single-site surgery"), providing the epitome in minimally invasive surgery [7]. It should be noted that robotics has stimulated the development and application of new technologies in surgery (immunofluorescence - FIREFLY™ display, mini-scopes, image-guided surgery, molecular imaging, etc).

The urological armamentarium of endoscopic-transurethral surgery was greatly enhanced by the introduction of digital flexible tools (digital flexible scopes) and advanced lasers, which have revolutionized the treatment of calculi of the kidney, and the diagnostic and therapeutic approach of upper urinary tract tumors [8]. The standard transurethral resection of the prostate (TUR-P) for the treatment of symptomatic benign prostatic hyperplasia has been replaced nowadays by bipolar systems using saline (TURiS) or using lasers (KTP-Green light / HoLEP / Thulium) with minimal blood loss and elimination of the known absorption syndrome, which limited the older approaches.

Enormous progress was also observed in imaging with the advent of systems and biomarkers of excellent sensitivity and specificity. Especially, in oncological diseases, the use of positron emission tomography (PET) has opened new horizons. Identification of prostate cancer has become easier, combining ultrasound with elastography, multiparametric MRI (mpMRI) and genetic markers that help to distinguish clinically significant cancers (Progensa PCA3, Oncotype DX, Prolaris, Prostate Health Index) [9,10]. The use of different wavelengths and specific "photosensitive" substances have created the so-called photodynamic cystoscopy (HEXVIX™, narrow band imaging) which increases the resolution in the imaging of urothelial tumors [8]. Very recently, the role of optical coherence tomography (OCT) has emerged [11].

At the level of the pharmaceutical industry important steps were made in the synthesis of more selective drugs in benign prostatic hyperplasia (tamsulosin, silodosin), in overactive bladder (solifenasin, fesoterodine, mirabegron, neurostimulation/InterStim™), premature ejaculation (Dapoxetine), in Peyronie's disease (injectable collagenase). Novel targeted chemotherapy and oncological drugs for advanced kidney cancer (tyrosine kinase inhibitors), androgen inhibitors (abiraterone acetate, enzalutamide, degarelix, abarelix, Ra-233). Additionally, new chemotherapeutic protocols have enabled the preservation of the institution in cancers that previously required a radical surgical treatment (bladder cancer).

Finally, future clinical applications might be associated with pluripotent stem cells (stem-cell therapies) and biomechanically engineered anatomical structures, such as the external sphincter of the urethra, the neurovascular bundles responsible for erectile function, the bladder and the ureter [12,13].

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