The past, present and future of minimally invasive therapy in urology: A review and speculative outlook.

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Abstract

Introduction: Twenty-five years of SMIT represents an important date. In this article we want to elaborate the development of minimally invasive surgery in urology during the last three decades and try to look 25 years ahead. Material and methods: As classical scenarios to demonstrate the changes which have revolutionized surgical treatment in urology, we have selected the management of urolithiasis, renal tumour, and localized prostate cancer. This was based on personal experience and a review of the recent literature on MIS in Urology on a MEDLINE/PUBMED research. For the outlook to the future, we have taken the expertise of two senior urologists, middle-aged experts, and upcoming junior fellows, respectively. Results: Management of urolithiasis has been revolutionized with the introduction of non-invasive extracorporeal shock wave lithotripsy (ESWL) and minimally invasive endourology in the mid-eighties of the last century obviating open surgery. This trend has been continued with perfection and miniaturization of endourologic armamentarium rather than significantly improving ESWL. The main goal is now to get rid of the stone in one session rather in multiple non-invasive treatment sessions. Stone treatment 25 years from today will be individualized by genetic screening of stone formers, using improved ESWL-devices for small stones and transuretereal or percutaneous stone retrieval for larger and multiple stones. Management of renal tumours has also changed significantly over the last 25 years. In 1988, open radical nephrectomy was the only therapeutic option for renal masses. Nowadays, tumour size determines the choice of treatment. Tumours >4 cm are usually treated by laparoscopic nephrectomy, smaller tumours, however, can be treated either by open, laparoscopic or robot-assisted partial nephrectomy. For patients with high co-morbidity focal tumour ablation or even active surveillance represents a viable option. In 25 years, imaging of tumours will further support early diagnosis, but will also be able to determine the pathohistological pattern of the tumour to decide whether the patient requires removal, ablation or active surveillance. Management of localized prostate cancer underwent significant changes as well. 25 years ago open retropubic nerve-sparing radical prostatectomy was introduced as the optimal option for effective treatment of the cancer providing minimal side-effects. Basically, the same operation is performed today, but with robot-assisted laparoscopic techniques providing 7-DOF instruments, 3D-vision and tenfold magnification and enabling the surgeon to work in a sitting position at the console. In 25 years, prostate cancer may be managed in most cases by focal therapy and/or genetically targeting therapy. Only a few patients may still require robot-assisted removal of the entire gland. Discussion: There has been a dramatic change in the management of the most frequent urologic diseases almost completely replacing open surgery by minimally invasive techniques. This was promoted by technical realisation of physical principles (shock waves, optical resolution, master-slave system) used outside of medicine. The future of medicine may lie in translational approaches individualizing the management based on genetic information and focalizing the treatment by further improvement of imaging technology.