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Precision surgery and genitourinary cancers

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Abstract

The landscape of the surgical management of urologic malignancies has dramatically changed over the past 20 years. On one side, better diagnostic and prognostic tools allowed better patient selection and more reliable surgical planning. On the other hand, the implementation of minimally invasive techniques and technologies, such as robot-assisted laparoscopy surgery and image-guided surgery, allowed minimizing surgical morbidity. Ultimately, these advances have translated into a more tailored approach to the management of urologic cancer patients. Following the paradigm of "precision medicine", contemporary urologic surgery has entered a technology-driven era of "precision surgery", which entails a range of surgical procedures tailored to combine maximal treatment efficacy with minimal impact on patient function and health related quality of life. Aim of this non-systematic review is to provide a critical analysis of the most recent advances in the field of surgical uro-oncology, and to define the current and future role of "precision surgery" in the management of genitourinary cancers.

Keywords: Precision surgery; Uro-oncology; Genitourinary cancer; Prostate cancer; Bladder cancer; Kidney cancer; Robotic surgery

Introduction

The landscape of the surgical management of urologic malignancies has dramatically changed over the past 20 years. On one side, better diagnostic and prognostic tools allowed better patient selection and more reliable surgical planning. On the other hand, the implementation of minimally invasive techniques and technologies, such as robot-assisted laparoscopy surgery and image-guided surgery, allowed minimizing surgical morbidity. Ultimately, these advances have translated into a more tailored approach to the management of urologic cancer patients. Following the paradigm of "precision medicine", contemporary urologic surgery has entered a technology-driven era of "precision surgery", which entails a range of surgical procedures tailored to combine maximal treatment efficacy with minimal impact on patient function and health related quality of life.[1] The aim of this non-systematic review is to

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provide a critical analysis of the most recent advances in the field of surgical uro-oncology, and to define the current and future role of "precision surgery" in the management of genitourinary cancers, with a focus on prostate, bladder and kidney cancer.

Prostate cancer

Prostate cancer continues to have a high incidence in most industrialized countries, despite decreasing mortality rates.[2] Standardization in multi-parametric MRI techniques allowed better identification of clinically significant cancers,[3] as well as better disease staging.[4] Active surveillance has taken the stage and has been implemented with different protocols worldwide for very low-risk, low-risk, and selected intermediate-risk disease.[5,6] A better understanding of tumor biology and the availability of novel prognostic and diagnostic tools have significantly changed the paradigm in the management of this disease. Several genomic tests – such as Prolaris®, Oncotype DX®, and Decipher® – are already commercially available, and are now being used, in addition to traditional clinical nomograms, although their role is yet to be defined.[7] Recent introduction of 3D printing technology might further facilitate surgical planning (Fig. 1).

After the golden era of laparoscopic prostate surgery, modern prostate cancer surgery has been mainly driven by the rapid adoption of robot-assisted laparoscopy radical prostatectomy (RARP),[8,9] which now represents the gold standard treatment option in most industrialized countries.[10,11] Moreover, the implementation of multi-parametric MRI imaging to prostate biopsy techniques[12] (Fig. 2) has paved the way to the concept of "focal therapy".[13] This paragraph will be focused on these two main areas of clinical interest.

Robotic surgery for prostate cancer

Refinements in RALP technique

One of main advantages of robotic surgery is certainly represented by the magnification of the surgical field, allowing a better visualization and easier appreciation of fine anatomical details. Overall, a better understanding of surgical anatomy of the prostate has translated into recognition of key anatomical structures, and its possible variations. Thus, the RARP procedure can be regarded as an individualized operation that can be tailored to the specific characteristics of the patient and the cancer.[14] The "trifecta" (cancer control, continence, and potency) has become the standard metrics to assess the outcomes of RARP,[15] as patient reported health related quality of life is regarded as an important parameter to consider in prostate cancer treatment.[16] Therefore, refinements in surgical technique have been mainly directed towards the preservation of patient's functions, namely urinary continence and sexuality.

Factors contributing to the continence status of men undergoing prostate cancer surgery have been extensively investigated. Besides preoperative parameters (such as age, prostate size, membranous urethral length, and BMI), the impact of surgical dissection, damage to neurovascular bundles, and postoperative fibrosis have been recognized

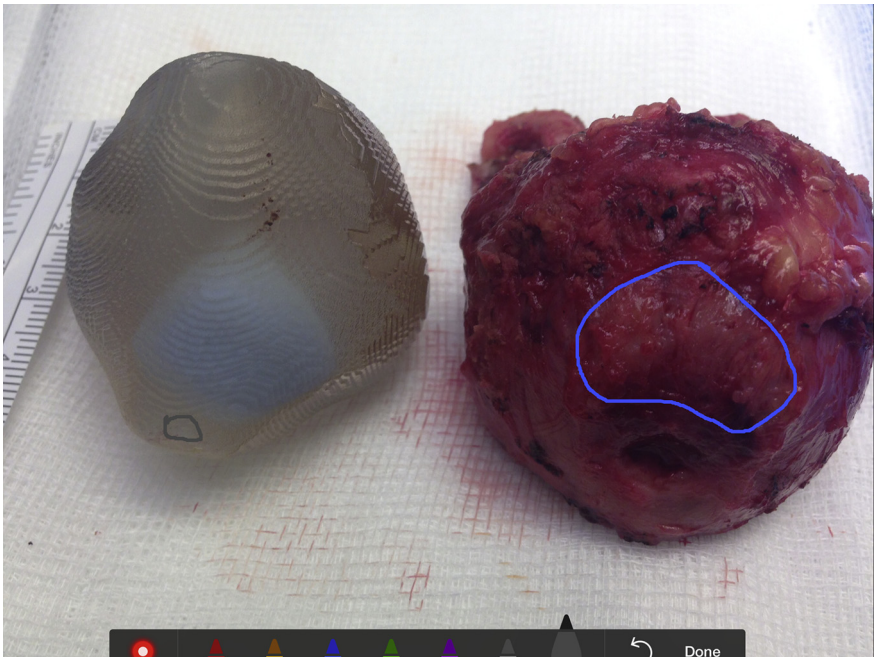

Figure 1. 3D printed prostate showing anterior T3 tumor close to sphincter (courtesy of Prof. Prokar Dasgupta, King's College London, Guy's Hospital, London, UK).

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