
CASE REPORT

Prostate Cancer: Diagnosis, Imaging, and Robotic Surgery

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ABSTRACT

Prostate cancer is the third most common cancer affecting men in Hong Kong, and the fifth leading cause of cancer death in Hong Kong males. The diagnosis of prostate cancer is confirmed by biopsy. The cancer detection rate may be enhanced by judicious use of imaging studies and adopting an increased biopsy core protocol, particularly of the far lateral zone. Treatment of localised prostate cancer can range from active surveillance and irradiation to radical prostatectomy, depending on the patient and disease status. In terms of surgical treatment, robot-assisted laparoscopic radical prostatectomy represents one of the latest and most significant advances in minimally invasive surgery. Compared with open prostatectomy, this method is associated with significantly lower transfusion rates, faster patient recovery, and reduced hospital stay. For the surgeon, the advantages of this technique include improved vision and better instrument handling. It allows meticulous dissection of the prostate apex and neurovascular bundle so that sexual function may be preserved. Continence rates can be as high as 90% in patients who undergo this surgical procedure. In experienced hands, a positive surgical margin rate of less than 10% for localised disease can be achieved. Over the long term, robot-assisted laparoscopic radical prostatectomy has been associated with high rates of biochemical control. This article discusses the diagnosis of prostate cancer, with special focus on biopsy and surgical treatment with robot-assisted laparoscopic radical prostatectomy in the management of localised prostate cancer.

Key Words: Biopsy; Laparoscopy; Prostatectomy; Prostatic neoplasms; Robotics

中文摘要

前列腺癌：診斷、放射及機械臂輔助手術

葉錦洪

前列腺癌是香港男性中第三大最常見的癌症，亦是香港男性第五大癌病死亡原因。前列腺癌的診斷須通過活組織化驗證實。適當地使用影像檢查及增加活檢組織的數目，尤其在遠外側區抽取組織，有助提高癌症的檢出率。早期前列腺癌的治療視乎病人及疾病狀況，從積極監測、放射治療（電療）、到前列腺癌根治手術不等。手術治療方面，機械臂輔助腹腔鏡前列腺癌根治術是微創手術中最嶄新的突破之一，與開放性前列腺切除手術相比，輸血率顯著降低、病人恢復較快、且住院時間較短。對外科醫生來說，這項技術的優點包括改善視野及儀器操控，從而可令切割前列腺尖部及神經血管束等重要部位時更細緻，以幫助保存性功能；接受這項手術的病人中，排尿控制率可高達90%。對於早期癌症，手術若由富經驗的外科團隊進行，可達到小於10%的手術切緣陽性率。機械臂輔助腹腔鏡前列腺癌根治術已證明有高效的癌病控制。本文討論了前列腺癌的診斷，並重點探討活組織化驗及機械臂輔助腹腔鏡前列腺癌根治術，在治療早期前列腺癌中的應用。

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INTRODUCTION

In Hong Kong, the incidence of prostate cancer has steadily increased from 1999 to 2008. It is the third most common cancer, and the fifth leading cause of cancer mortality in Hong Kong men.¹ Open radical prostatectomy for the treatment of prostate cancer was first described by Walsh et al in 1983.² This landmark technique enabled early control of the dorsal venous complex (one major source of bleeding) and intra-operative assessment of the extent of the tumour, with preservation or wide excision of the nerves where necessary, thereby allowing preservation of sexual function to be attempted when appropriate. The next major surgical advance for localised prostate cancer was laparoscopic-assisted radical prostatectomy. This soon evolved to robotic-assisted surgery using the same platform of minimally invasive surgery. The robotic surgery technique was well-received in the USA and, subsequently, in Europe. Reportedly, up to 80% of all surgically treated prostate cancers in the USA are now robot-assisted. In Asia, robot-assisted laparoscopic radical prostatectomy was first introduced to Singapore 10 years ago and to Hong Kong in 2005. This article focuses on the Hong Kong experience with biopsy of the prostate for diagnosis, and the use of robot-assisted laparoscopic surgery to treat prostate cancer. The clinical scenarios of a patient are used to facilitate some of the discussion.

CASE REPORT

A 54-year-old man presented to a private clinic in Hong Kong in a healthy and fit state. He had minimal lower urinary tract symptoms. He was found to have a prostate-specific antigen (PSA) of 7.3 ng/ml. Based on the elevated PSA, the patient underwent a transrectal systemic biopsy including laterally directed cores. Multiple core biopsies revealed a single-zone, Gleason score 3+3 disease, with minimal focus. Additional imaging for staging was not deemed necessary since his PSA level was <10 mg/ml, his Gleason grading was 3+3 and he only had one positive core.

The patient was considered to be a suitable candidate for active surveillance, robot-assisted laparoscopic radical prostatectomy, and irradiation (including brachytherapy). After being presented with the treatment options, the patient opted to undergo robot-assisted laparoscopic radical prostatectomy, together with lymph node dissection. The final histopathology confirmed the presence of minimal focus Gleason 3+3 disease, negative surgical margins, and negative lymph

nodes. At his last follow-up, he had a nadir PSA level of <0.03 ng/ml. He was also continent, sexually active, and able to resume usual exercise, including golf.

DISCUSSION

Screening and Prostate Biopsy

Interestingly, the latest guidelines from the American Urological Association do not recommend routine screening for prostate cancer in men aged 40 to 54 years with an average risk.³ Nevertheless, the patient in this case was screened as part of a health-check package that included a panel of tests covering numerous parameters.

In the presence of elevated PSA, with no other obvious accountable cause, a biopsy of the prostate was discussed, especially in the setting of a fit, middle-aged man. Clinically, some of the main challenges in prostate biopsy include missed diagnosis of cancer and mischaracterisation of cancer. Cancers may be missed when they are small, when the prostate is relatively large, or when the biopsy technique itself is inadequate. In terms of the biopsy technique, detection rates may be improved by changing the targeted locations of the biopsy. Switching from the sextant biopsy method to a 10 to 12 core biopsy (particularly of the far lateral zone) may improve detection by up to 30%.⁴ The use of 'robotic'-assisted biopsy or dual imaging modalities, such as magnetic resonance imaging-ultrasound fusion, are promising developments that may further improve the biopsy yield and accuracy.⁵

Mischaracterisation of the size, location, and grade of prostate cancer may also occur. It is well known that among all diagnoses of localised prostate cancers made from initial biopsy, pathological upgrade and upstage occur in up to 30% of cases, subsequent to further histopathology findings following radical prostatectomy.⁶ Ideally, the goal would be to improve the predictive value and accuracy of the biopsy technique such that it would be possible to reliably and consistently distinguish between Gleason grade 4 and grade 3 disease.

In the current case, an extensive laterally directed prostate biopsy was performed. This method has been demonstrated to increase the rate of cancer detection by up to 35% compared with the standard sextant biopsy, and is most effective in patients with PSA of <10 ng/ml.⁷ Clinicians should be mindful that this type of biopsy can be an unpleasant experience and the use of intravenous sedation or monitored anaesthesia care should be considered, when appropriate.

Robot-assisted Laparoscopic Radical Prostatectomy

The treatment of prostate cancer requires a delicate balancing act to control cancer, while also attempting to preserve urinary control and sexual function. While active surveillance is a viable option for some patients, for others, irradiation may be an effective way of treatment. The claimed advantages of minimally invasive, robot-assisted laparoscopic radical prostatectomy compared with open prostatectomy include reduced blood loss and shorter hospital stay. These advantages have been realised in the Hong Kong experience, as in other parts of the world.^{8,9} Transfusion rates in a local series of robot-assisted surgeries have been around 3%, compared with 50% to 60% typically associated with open surgery. Moreover, lower transfusion rates tend to translate to better patient recovery.

The perspective of the surgeon is somewhat more difficult to measure. However, it is a common and acknowledged experience that vision with robot-assisted laparoscopic surgery is excellent and the handling intuitive. With magnified visualisation of the various aspects of the prostate and its delicate relationship with vital surrounding tissues, it is possible to achieve good preservation of the urethral tissue and neurovascular bundle, thereby enabling preservation of continence and sexual function. However, nerve-sparing surgery may not be possible when there is multifocal disease, especially of high-grade (grade 4 or above) prostate cancer.

In terms of outcomes, the cancer control rate following this type of surgery is largely dictated by the severity of the original disease. In organ-confined disease, the aim should be to achieve a positive surgical margin rate of less than 10% among patients. Currently, reported results from multiple centres across Hong Kong performing robot-assisted laparoscopic radical prostatectomy is more reflective of the 'learning phase' of some centres, in the sense that positive surgical margin rates are somewhat higher than expected, from a cumulative case series of 200 robot-assisted laparoscopic surgeries. It is hoped that, with greater experience, more favourable rates for positive surgical margin will be achieved. In terms of long-term biochemical control of disease, an analysis of 1384 patients in the USA with a median follow-up of 5 years reported a control rate of 86.6%.¹⁰ Finally, following robot-assisted laparoscopic radical prostatectomy, the continence rate in patients can be as high as 90%,

particularly in experienced centres.¹¹

CONCLUSION

Minimally invasive robot-assisted laparoscopic radical prostatectomy is associated with better patient outcomes compared with open prostatectomy, such as significantly lower transfusion rates, faster recovery, and shorter hospital stay. As robotic technology significantly improves visualisation and instrument handling, it may be associated with preservation of continence and sexual function. Furthermore, it is associated with favourable long-term rates of biochemical control. Although the uptake of robot technology for assisting laparoscopic radical prostatectomy has been relatively slow in Asia compared with that in western countries, it is likely to increase in the future as centres gain more experience, and patient outcomes continue to improve. It remains that successful treatment of prostate cancer should ideally incorporate cancer control, as well as preservation of urinary and sexual function.

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