Male Pelvic Leiomyoma: Organ-Preserving Resection of a Deep Vascular Tumour in the Seminal Vesicle Using the Da Vinci Xi Robotic System

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ABSTRACT

Pelvic leiomyomas are rare in males, with most cases reported as isolated instances. This study presents a case of a 57-year male with a deep vascular leiomyoma located in the Denonvilliers fascia, who experienced urinary frequency and nocturia. Imaging revealed a well-defined pelvic tumour, and pathology confirmed the diagnosis of a vascular leiomyoma of mesenchymal origin. Given the tumour's size, deep location, and proximity to vital structures, robotic-assisted laparoscopic resection using the Da Vinci Xi system was performed. The procedure successfully preserved organ function achieved complete tumour excision with minimal blood loss and resulted in no complications. Postoperative recovery was uneventful, and no recurrence was observed at the 20-month follow-up. This case highlights the advantages of robotic surgery for complex pelvic tumours, expands its application in urological procedures, and underscores the importance of organ-preserving techniques for benign tumours in challenging locations.

Key Words: *Da Vinci, Posterior bladder approach, Pelvic mass, Leiomyoma*.

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INTRODUCTION

Pelvic leiomyomas are predominantly observed in females, with reports of male pelvic vascular leiomyomas being exceedingly rare. Existing literature primarily focuses on open surgical approaches for treating pelvic leiomyomas, with no documented cases of robotic-assisted laparoscopic resection of deep vascular leiomyomas in the seminal vesicle while preserving organ function.[1,2]

This article presents an interesting case of the successful organ-preserving resection of a deep vascular leiomyoma in the seminal vesicle using a posterior bladder approach, performed with the assistance of the Da Vinci Xi robotic system. The report highlights the clinical features and diagnostic process of the case, demonstrating the feasibility and advantages of the Da Vinci Xi system for posterior bladder access surgeries. Furthermore, it expands the application of robotic systems in urological pelvic surgeries and provides valuable insights into organ-preserving techniques for treating benign pelvic tumours. This case contributes to the understanding and recognition of this rare condition in male patients, broadening the clinical perspective on its diagnosis and management.

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CASE REPORT

A 57-year male presented to a local hospital with complaints of perineal discomfort and nocturia (2–5 times per night), but without dysuria or gross haematuria. Ultrasound imaging revealed a pelvic mass, prompting further evaluation. Magnetic resonance imaging (MRI) at our hospital identified a slightly hyperintense lesion on T1- and T2-weighted images, measuring approximately 4.3 × 2.8 cm. The mass was located posterior to the right prostate, demonstrating mild diffusion restriction and heterogeneous enhancement. It caused deformation and displacement of the right posterior prostate, right seminal vesicle, and rectal wall, and was indistinctly demarcated from the right obturator internus muscle (Figure 1). Serum prostate-specific antigen (PSA) levels were within normal limits.

To establish a diagnosis, an ultrasound-guided transperineal biopsy of the prostate and pelvic mass was performed. Pathological analysis revealed a spindle cell tumour with vascular proli-feration. Immunohistochemical staining showed the following profile: SMA (+), Desmin (+, focal), Caldesmon (+), CD34 (+ for vessels), CD117 (-), STAT6 (-), HMB45 (-), S-100 (-), NKX3.1 (-), and Ki-67 (+ at <5%), consistent with vascular leiomyoma. A prostate biopsy indicated benign tissue.

The patient's medical history included the excision of a back lipoma and the removal of a vocal cord polyp. On June 27, 2023, robotic-assisted laparoscopic resection of the pelvic tumour was performed under general anaesthesia. Intraoperative findings revealed a well-encapsulated, 4 × 2 cm mass located

posterior to the right prostate, compressing the right seminal vesicle, ureter, and anterior rectal wall. The tumour was mildly adherent to surrounding tissues and demonstrated a rich blood supply. Complete excision was achieved while preserving adjacent organs and surrounding normal tissues (Figure 2, 3).

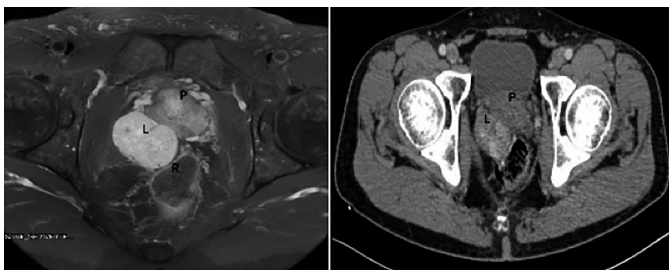

Figure 1: The leiomyoma was located deep between the apex of the prostate and the rectum, MRI imaging of the pelvic mass show a slightly hyperintense lesion located posterior to the right prostate, measuring approximately 4.3 × 2.8 cm. CT imaging of the pelvic mass show that causes deformation of the right posterior prostate, right seminal vesicle, and rectal wall.
R: Rectum; P: Prostate; L: Leiomyoma's.

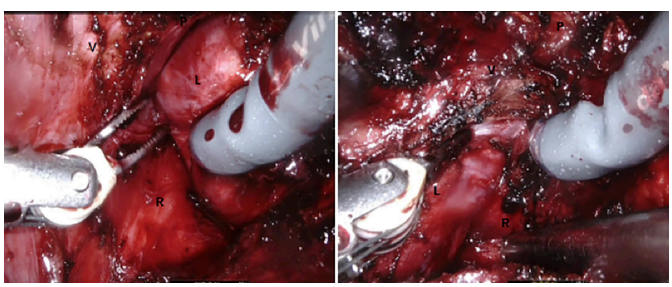

Figure 2: Intraoperative view of the pelvic mass during robotic-assisted laparoscopic resection. The 4 × 2 cm well-encapsulated mass is seen posterior to the right prostate, compressing the right seminal vesicle and anterior rectal wall. The tumour shows a rich blood supply and is mildly adherent to surrounding tissues. Complete excision was achieved, preserving adjacent organs.
R: Rectum; P: Prostate; L: Leiomyoma's.

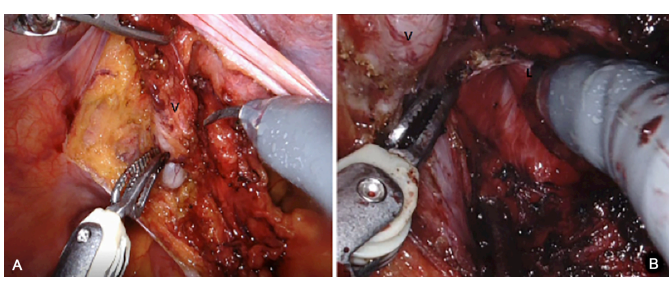

Figure 3: (A) The robotic arm (Arm 1) retracted the left seminal vesicle, gradually dissecting the space between the prostate and rectum layer by layer. (B) The mass was progressively exposed along the space between the seminal vesicle and rectum.
V: Seminal vesicle; L: Leiomyoma's.

Postoperative pathological analysis confirmed a vascular leiomyoma of mesenchymal origin, measuring 4.2 × 2.8 × 2.1 cm, with low proliferative activity. Immunohistochemical results were as follows: CK (pan) (-), EMA (-), Desmin (partial+), SMA (+), Caldesmon (+), CD34 (-), S-100 (-), HMB45 (-), SOX10 (-), D2-40 (-), CD31 (-), ERG (-), p53 (partial+), MDM2 (-), CD4 (few+), and Ki-67 (3–5%).

The patient had an uneventful postoperative recovery, with urinary catheter removal on day two and resolution of urinary frequency. He was discharged on postoperative day three. At 20 months post-surgery, the patient showed no recurrence.

DISCUSSION

Leiomyomas are spindle cell tumours originating from mesenchymal tissues, typically resulting from the proliferation of smooth muscle cells. These benign smooth muscle tumours are classified into several types, including cutaneous leiomyomas, vascular leiomyomas, and visceral leiomyomas (e.g., benign metastatic leiomyomas, disseminated peritoneal leiomyomatosis, and venous leiomyomatosis). While leiomyomas are predominantly seen in women—most commonly in the uterus—male pelvic leiomyomas are rare. They typically originate from the urogenital system and are largely documented in case reports. These tumours have been identified in various anatomical locations, including the kidneys, ureters, seminal vesicles, spermatic cord, bladder, prostate, and urethra.[1] Due to their rarity, the pathogenesis of male smooth muscle tumours remains unclear, with no established link to male-specific traits. In this case, the pathological findings confirmed the diagnosis of a vascular leiomyoma.

Angioleiomyoma (ALM), a common benign soft tissue tumour, is classified as a perivascular tumour in the 2020 fifth edition of the World Health Organisation classification of bone and soft tissue tumours.[2] ALM is believed to originate from the adventitia of small venous vessels. Naito *et al*.[3] suggested that parathyroid hormone-related peptide, through autocrine or paracrine mechanisms, creates a microenvironment conducive to vascular smooth muscle cell formation, promoting the growth of vascular leiomyomas. While ALM most frequently occurs in the limbs, it is less commonly observed in the trunk or head.[4] ALM in the Denonvilliers fascia, as seen in this case, is exceedingly rare.

Vascular leiomyomas primarily affect women between the ages of 30 and 60 years, often presenting as solitary, slow-growing tumours with a typical diameter of less than 2 cm.[4] However, the tumour in this patient measured approximately 4 cm at its largest diameter. Clinical manifestations of pelvic ALM are often non-specific. The loose connective tissue structure and rich blood supply in the pelvic and retroperitoneal regions allow these tumours to develop in deep, concealed locations, surrounded by hollow organs, which complicates early diagnosis. Symptoms such as abdominal masses, pain, or compression of adjacent organs (e.g., haematuria, flank pain, urinary frequency, urgency, dysuria, or post-void dribbling) generally occur only when the tumour reaches a substantial size.[5] In this case, the patient sought medical attention due to increased urinary frequency and nocturia, leading to the discovery of a tumour deep within the Denonvilliers fascia.

Retroperitoneal tumours are often malignant, with sarcomas being common in this region. Since clinical signs of retroperitoneal tumours are not distinctive, imaging modalities such as ultrasound, CT, and MRI are essential for evaluation. MRI is particularly valuable for diagnosing smooth muscle tumours, which often appear as low-signal lesions on T2-weighted images. In this patient, an enhanced MRI revealed a pelvic

tumour with slightly prolonged T1 and T2 signals, mild diffusion restriction, and significant enhancement—features atypical of smooth muscle tumours. The tumour presented as a well-defined, solid, nodular mass without specific imaging characteristics, necessitating histopathological and immunohistochemical analysis for a definitive diagnosis.[6]

Ultrasound-guided transperineal biopsies of the prostate and pelvic tumour confirmed the prostate to be benign and the pelvic mass to be a vascular leiomyoma. This clarified that the tumour was unrelated to the prostate and originated from benign mesenchymal tissue. Given the patient's significant urinary symptoms, the tumour's deep location, and its close proximity to critical adjacent organs, surgical intervention was deemed necessary. The tumour was well-encapsulated and had clear boundaries from surrounding tissues.

The immunohistochemical markers used in this case were pivotal in confirming the diagnosis of a vascular leiomyoma by highlighting smooth muscle differentiation (SMA, Desmin, Caldesmon), vascular features (CD34), and low proliferative activity (Ki-67), while excluding malignancy and other potential diagnoses.

Treatment options for pelvic ALM include arterial embolisation, cryoablation, surgical resection, and observation.[7] Surgery is typically reserved for symptomatic cases, tumours with potential malignancy, or rapidly growing masses. Most vascular leiomyomas arise from venous vessel walls, limiting the effectiveness of arterial embolisation. Techniques such as cryoablation or radiofrequency ablation may pose risks to adjacent organs, particularly for deep-seated tumours, and lack clinical precedent for pelvic ALM. Surgical resection remains the preferred treatment for such cases.[8]

Currently, no standardised treatment exists for male pelvic leiomyomas. Open surgery, while effective, is associated with greater trauma and prolonged recovery. Laparoscopic surgery offers a minimally invasive alternative but has limitations in the confined pelvic space, particularly in small pelvis patients.[7] In this case, the tumour's deep location and proximity to critical structures (rectum, prostate, seminal vesicles, and ureters) added complexity to surgical resection. The Da Vinci Xi robotic system addresses many limitations of laparoscopy, offering enhanced precision and flexibility. Its 3D visualisation capabilities improve anatomical detail, facilitating organ-sparing techniques.

Compared with laparoscopic surgery, robotic surgery does not show significant advantages in hospitalisation duration or recovery time. Crippa *et al*., in a comprehensive retrospective cohort study, reported that while laparoscopic surgery is associated with shorter operative times, robotic surgery offers distinct advantages, including reduced blood transfusion requirements and fewer complications.[9] In the present case, the estimated blood loss was minimal (approximately 10 mL), with no complications observed. The patient resumed a normal diet and activities by postoperative day two.

Similarly, Prete *et al*.[10] conducted a meta-analysis on robotic and laparoscopic surgeries in pelvic procedures, demonstrating comparable perioperative outcomes. Robotic surgery exhibited a lower conversion rate to open surgery but was associated with significantly longer operative times compared to laparoscopy. The extended operative time is primarily due to the additional time required for robotic system setup and operative field establishment.

This case underscores the feasibility of robotic-assisted posterior bladder approach surgeries and broadens the application scope of robotic systems in pelvic urological procedures. It also provides valuable experience in treating deep benign pelvic tumours with organ-preserving techniques. However, further clinical cases are needed to establish optimal surgical strategies and assess long-term outcomes for male pelvic leiomyomas.

PATIENT'S CONSENT:

The patient or their legal guardian has provided informed consent for the publication of this case report.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

LX, XZ: Collected data and drafted the manuscript.
YX: Collected the data.
HZ: Supervised the paper, design, and review.
All authors approved the final version of the manuscript to be published.

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