Case Report

Two cases of pelvic schwannomas simultaneously resected with the prostate by robot-assisted surgery

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Abbreviations & Acronyms
MRI = magnetic resonance imaging
PSA = prostate-specific antigen
RARP = robot-assisted radical prostatectomy

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How to cite this article: Nishikimi T, Yoshino Y, Yamada H *et al*. Two cases of pelvic schwannomas simultaneously resected with the prostate by robot-assisted surgery. *IJU Case Rep*. 2021; **4**: 277–281.

Received 17 February 2021; accepted 28 April 2021. Online publication 7 June 2021

Introduction: Schwannoma is a rare benign tumor of peripheral nerves arising from Schwann cells of the ubiquitous nerve sheath. The operative steps and technical aspects of robotic resection of pelvic schwannoma are described herein.

Case presentation: We describe two patients with pelvic tumors simultaneously resected with the prostate by robot-assisted surgery: a 69-year-old man with schwannoma of the right side of the pelvic floor and a 68-year-old man with schwannoma in the left pelvis. As metastasis of prostate cancer could not be ruled out, tumorectomy was performed using robotic-associated prostatectomy. Malignancy was absent in the two pelvic tumors, and the patients were diagnosed with schwannoma.

Conclusion: For surgery in a narrow deep pelvis, robot-assisted surgery is minimally invasive, offers excellent mobility of robotic instruments and visibility of three-dimensional view, and is a useful approach.

Key words: pelvic schwannoma, prostate cancer, prostatectomy, robot-assisted surgery, schwannoma.

Keynote message

We report two cases of pelvic schwannomas that were managed during robot-assisted radical prostatectomy. Robotic surgical systems have good operability. Thus, they may serve as an effective treatment option for schwannomas occurring in the pelvic cavity with a small maneuverable space.

Introduction

Schwannoma is a benign tumor. It arises from Schwann cells and is commonly located in the head and neck region (44.9%) and extremities (32.6%) but rarely in the retroperitoneum (0.7–2.7%).[1,2] We present two cases of pelvic schwannomas that were simultaneously resected during RARP.

Case presentation

Patient 1

The patient was a 69-year-old man with a PSA level of 12.6 ng/mL. After a prostate biopsy was performed, prostate cancer with a Gleason score of 4 + 5 = 9 was detected in 11 out of 12 biopsy sites (right: 6/6, left: 5/6). Preoperative MRI showed a tumor lesion measuring 39 × 33 mm in diameter on the right side of the pelvic floor (Fig. 1a,b). We could not confirm whether the pelvic tumor had arisen from prostate cancer through the lymph node or from other metastases; thus, robot-assisted resection of the prostate and the pelvic floor tumor was performed.

Surgery was performed under general anesthesia. The patient was placed in a 25-degree head-down tilt. Six ports were placed according to the usual procedure of RARP performed

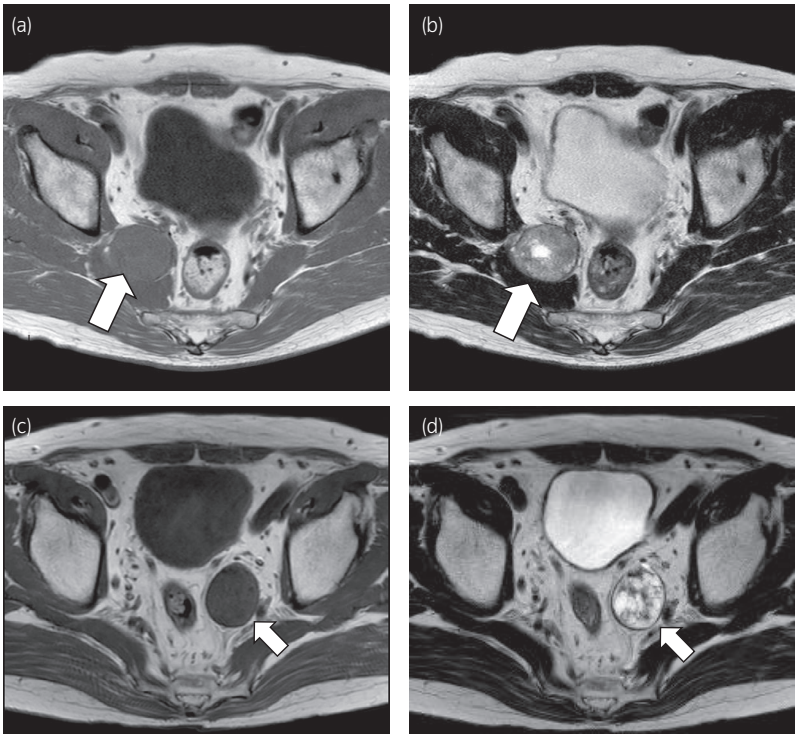

Fig. 1 MRI. (a,b) (Patient 1) A tumor lesion measuring 39 × 33 mm in diameter on the right side of the pelvic floor that was isointense to muscle on T1-weighted images (a). The T2-weighted images (b) showed mild hyperintensity at the margins and hyperintensity on the inside. No contrast enhancement was observed. (c,d) (Patient 2) Pelvic MRI findings revealed a well-circumscribed mass on the ventral side of the left piriformis muscle measuring 38 × 31 mm in diameter. The inside of the mass was isointense on T1-weighted images (c) and heterogeneously hyperintense on T2-weighted images (d).

at our hospital: one port for the robotic camera, three ports for the robotic arms, and 12 and 5-mm ports for assistant use.

Surgery was performed via a transperitoneal approach, and pelvic tumor was resected by robot-assisted surgery (Fig. 2a-f). After prostatectomy and left lymphadenectomy were performed under robotic assistance, surgery was completed. The operative time was 6 h and 6 min. The console time for the right pelvic tumor was 3 h and 8 min and that for the prostate was 1 h and 27 min. Blood loss was minimal; no other intraoperative complications were observed.

Histopathological findings were consistent with schwannoma. There were no malignant features (Fig. 3a). The prostate cancer was a poorly differentiated adenocarcinoma with a Gleason score of 4 + 5 = 9 at stage ly0, v0, pn0, sv0, EPE0, RM0, n(−), pT2c.

The patient started ambulation on postoperative day 1. However, he presented paresthesia and muscular weakness. Thus, he underwent rehabilitation and was discharged on day 7. He continued rehabilitation in an outpatient setting and recovered the ability to perform daily living activities without difficulty in approximately 6 months after surgery. As 5 years has passed since surgery, neither prostate cancer nor schwannoma has recurred.

Patient 2

This was a 68-year-old man in whom medical checkup revealed pelvic lymphadenopathy; his PSA level was 3.92 ng/mL. Prostate biopsy was performed, and prostate cancer with a Gleason score of 3 + 4 = 7 was detected in 4 out of 10 biopsy sites (right: 1/5, left: 3/5). MRI also revealed a mass (38 × 31 mm in diameter) in the left pelvis. Because lymph node metastasis of prostate cancer could not be ruled out, endocrine therapy with bicalutamide and leuprorelin was started. Although his PSA level decreased to 0.248 ng/mL, the mass in the left pelvis remained unchanged and was unlikely to have metastasized from the prostate cancer. Pelvic MRI findings revealed a well-circumscribed mass on the ventral side of the left piriformis muscle measuring 38 × 31 mm in diameter (Fig. 1c,d).

The prostate and the left pelvic tumor were resected under robotic assistance. As with case 1, the patient was placed in a 25-degree head-down tilt, ports were placed according to the usual procedure of RARP. Surgery was performed via a transperitoneal approach and pelvic tumor was resected by robot-assisted surgery (Fig. 2g-l). No large nerve was observed in the proximity of the tumor unlike those observed in case 1. After prostatectomy and right and left lymphadenectomy were subsequently performed under robotic assistance, surgery was completed. The operative time was 4 h and 45 min. The console time for the left pelvic tumor was 1 h and 38 min and that for the prostate was 1 h and 57 min. Blood loss was 100 mL; no other intraoperative complications were observed.

Histopathological findings were consistent with schwannoma. There were no malignant features (Fig. 3b). In the prostate, the glandular epithelial components were markedly atrophic, and mild lymphocytic infiltration and fibrosis were observed, but without residual tumor cells. The histological therapeutic effect was grade 3b (no residual cancer cells were seen after hormonal therapy), ly0, v0, pn0, sv0, EPE0, RM0, ypT0, ypN0(0/3).

On postoperative day 1, the patient started ambulation without exhibiting any sensory or motor deficits, and rehabilitation was initiated. On postoperative day 8, he was

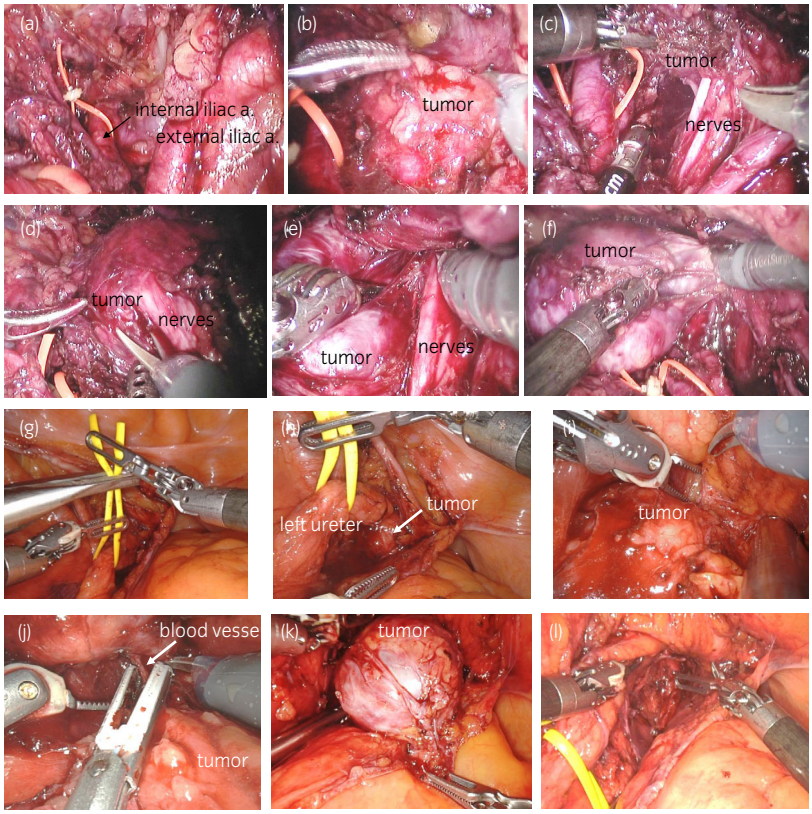

Fig. 2 Pelvic schwannomas resected by robotassisted surgery. (a-f) Patient 1. (a) The right internal iliac artery was taped. (b) When the veins branching from the internal iliac vein were treated with a sealing device, the location of the tumor was identified. (c) Then, the tumor was carefully dissected, while revealing the bundles of nerves accompanying the tumor. (d) For the areas adjacent to the nerves, no thermal device was used, and tumor resection by using a cold device was attempted. (e,f) The tumor was separated from the nerves carefully to prevent its rupture and nerve damage (e) and removed (f). (g-l) Patient 2. (g) After peritoneal incision, the left ureter was located and taped. (h) When it was separated by pulling laterally, the tumor was identified. (i) The tumor was carefully dissected using fenestrated forceps in the left hand. (j) Cords, such as blood vessels, running around the tumor were treated with a sealing device. (k,l) The tumor was freed and removed.

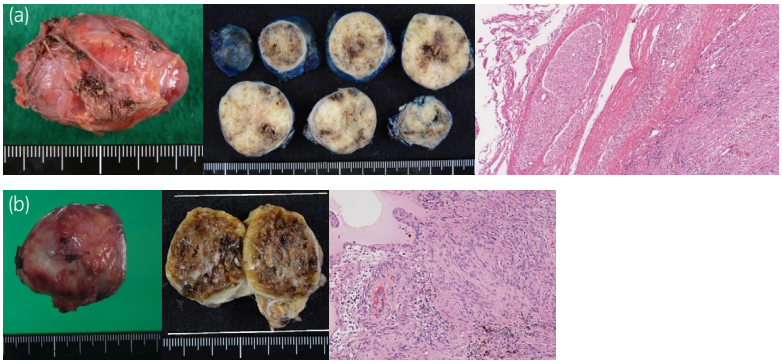

Fig. 3 Histopathological findings. Histopathological findings were consistent with schwannoma. There were no malignant features. (a) Right pelvic schwannoma (Patient 1). (b) Left pelvic schwannoma (Patient 2).

discharged without complications. As 9 months has passed since surgery, neither prostate cancer nor schwannoma has recurred. He is currently under follow-up.

Discussion

Schwannoma presents few specific clinical symptoms, and even hematological tests do not show characteristic findings. Computed tomography often shows low-density and internally heterogeneous mass lesions,[3] and MRI often shows low-to-intermediate signal intensity on T1-weighted images and high signal intensity on T2-weighted images.[4,5] In the two cases presented herein, although similar MRI findings were observed (Fig. 1), a definitive diagnosis based only on clinical symptoms and diagnostic imaging findings that were less specific was difficult. Both patients had concomitant prostate cancer; thus, metastasis could not be ruled out. Although the clinical courses suggested that the tumors were more likely to be other types of pelvic tumors than metastases from prostate cancer, it was difficult to completely rule out the possibility of metastasis from prostate cancer before surgery. In both cases, we considered to perform preoperative biopsies under computed tomography guidance or with other techniques. When we consulted radiologists in our hospital, they thought that biopsies were associated with the risk of vascular injury and technical difficulties. A preoperative biopsy is an option, as surgery may be avoided in patients without subjective symptoms and those with benign tumors. However, there are concerns about the risk of vascular or other organ injury and dissemination of malignant tumors. Furthermore, biopsy of tumors located deep in the pelvis may be difficult to perform because tissue collection is challenging.[6]

Table 1 Case reports of robot-assisted resection of pelvic schwannoma

	Publication year	Age/sex	Affected side	Size (mm)	Operative time	Blood loss	Nerve preservation	Postoperative neurological complications
Konstantinidis KM	2011	27/F	Right	63 × 40	Unknown	Unknown	Possible	None
Constance D	2012	Case 1: 34/F	Right	50	80 min	Small	Possible	None
		Case 2: 58/F	Right	44 × 40	140 min	Small	Possible	None
Jia Z	2016	33/M	Midline	100 × 97	100 min	200 mL	Possible	None
Perrin H	2017	27/M	Right	35 × 41	130 min	15 mL	Possible	None
Chopra S	2017	46/M	Left	60 × 49	240 min	100 mL	Combined obturator nerve resection	Recovered after rehabilitation
Molly A	2017	62/M	Right	50 × 40	Unknown	100 mL	Possible	None
Nikolaos L	2020	58/M	Left	9 × 5	210 min	100 mL	Possible	Recovered after rehabilitation
Our cases	2021	Case 1: 69/M	Right	39 × 33	188 min†	15 mL	Possible	Recovered after rehabilitation
		Case 2: 68/M	Left	38 × 31	98 min†	100 mL	Possible	None

†The console time for resection of schwannoma is presented because the prostate was simultaneously resected with schwannoma in our cases 1 and 2.

Surgical resection of schwannomas may cause complications, such as neuropathy, at a certain frequency because a schwannoma is a neurogenic tumor. Thus, possible postoperative development of neuropathy in addition to general precautions for surgery should be discussed with the patient. As Constance *et al*. reported, surgery assisted by neurosurgeons may also be considered.[7]

As resection of a pelvic schwannoma is performed in the small pelvic cavity, laparoscopic surgery is superior to open surgery in terms of operability. Furthermore, robot-assisted surgery involves the use of robotic arms equipped with joints under a three-dimensional view of the surgical field. As such, robot-assisted surgery may better contribute to the preservation of nerves than open surgery and conventional laparoscopic surgery. A search on PubMed yielded seven reports of robot-assisted resection of a pelvic schwannoma,[7–13] indicating that a robotic surgical system is useful for preserving the function of nerves from which a schwannoma arises because of the good view of the surgical field and operability. In addition, postoperative neurological complications were not reported in five of the eight reports.[7,9,10,12,13] Chopra *et al*. reported that despite 5- to 6-cm composite resection and anastomosis of the obturator nerve, the patient recovered without deficits in daily living activities after 9 months of postoperative rehabilitation.[11] We have summarized the previously reported cases and ours in Table 1.

Our patients had prostate cancer; thus, we could not confirm whether the pelvic tumor was derived from prostate cancer through the lymph node or from other metastases. As such, we simultaneously performed radical prostatectomy and resection of the pelvic tumor under robotic assistance. The pelvic tumors did not firmly adhere to either nerves or blood vessels. In prostate cancer, RARP is more effective for preserving nerves for erectile function because of its better operability than conventional open surgery and laparoscopic surgery.[14,15] Avoiding nerve damage during schwannoma resection is preferred. Particularly for tumors occurring in the pelvic cavity with limited maneuverable space, robot-assisted surgery may be an effective treatment option. However, further investigations are warranted to ascertain the safety and usefulness of robot-assisted surgery.

Conclusion

Robot-assisted surgery may be an effective treatment option even for schwannoma occurring in the pelvic cavity with a small maneuverable space because of the good operability of robotic surgical systems.

Author contributions

All authors read and approved the final manuscript.

Ethical approval

The protocol for this research project has been approved by a suitably constituted Ethics Committee of the institution. Informed consent was obtained from the subjects.

Conflict of interest

The authors declare no conflict of interest.

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