

Paradigm Shift in the Management of Benign Pelvic Neurogenic Tumors: A Single Institution Experience

Subbiah Shanmugam¹, Pravenkumar RR²

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ABSTRACT

Background and objective: Benign neurogenic tumors are relatively rare in the pelvis and are mostly benign. These tumors are in proximity to multiple structures given the bony confines of the pelvis and its complex anatomy, thus making it a surgical challenge. From the conventional open surgical approach, we have moved on to laparoscopic excision. We sought to analyze the outcomes of surgical excision of such tumors.

Materials and methods: Data of patients who underwent excision of benign pelvic neurogenic tumors either by open or laparoscopic surgery at our institution between 2016 and 2022 were reviewed and analyzed.

Results: A total of seven patients underwent surgery, four by laparotomy and three by laparoscopy. Six patients had tumors located in the presacral space, and one was found in the lateral wall of the pelvis. The mean operative time was less in laparoscopy (140 vs 125 minutes), with a mean blood loss of 100 (90–110) mL. The mean duration of hospital stay was less in laparoscopy (7 vs 4 days). Three patients of open surgery had postoperative complications whereas no complications occurred after laparoscopy. Postoperative pathological examinations showed three schwannomas and four neurofibromas. No patient experienced local recurrence during a mean follow-up period of 30 months.

Conclusion: Laparoscopy is a feasible alternative approach to open surgery for resection of pelvic neurogenic tumors with the advantages of better visualization and preservation of pelvic neurovascular structures, minimal operative morbidity, lesser postoperative pain, and shorter hospital stay.

Keywords: Laparoscopic excision, Neurofibroma, Pelvic malignancy, Pelvic neurogenic tumors, Presacral neurofibroma, Presacral schwannoma, Presacral tumors, Schwannoma.

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INTRODUCTION

Malignant peripheral nerve sheath tumors, ganglioneuromas, schwannomas, neurofibromas, ganglioneuroblastomas, neuroblastomas, and ependymomas are included in the spectrum of neurogenic tumors. The most frequent benign tumor in the Mayo Clinic series of neurogenic pelvic tumors was schwannomas, while the most common malignant lesions were malignant peripheral nerve sheath tumors. Most neurofibromas and schwannomas are nonaggressive, slow-growing tumors. Histologically, schwannoma is a more homogeneous neoplastic growth of mature Schwann cells as opposed to neurofibroma and MPNST. Schwannomas are quite uncommon in the pelvis and are typically found in the head and neck, mediastinum, and extremities. Most patients have minor, nonspecific symptoms or are asymptomatic. Urinary retention, intestinal obstruction, and pelvic pain are all possible effects of large tumors. Lately, there has been a significant rise in the detection rates of these tumors due to incidental discovery by imaging for various reasons. Typically, benign schwannomas and neurofibromas are encapsulated, single, well-circumscribed tumors and malignant transformation rarely occurs. It can be difficult to distinguish between benign and malignant neurogenic tumors before surgery with imaging alone. So preoperative biopsy is paramount for the surgical strategy and approach.¹

Because of the intricate anatomy and bony constraints of the pelvis, and the tumors being in proximity to pelvic viscera, it presents a surgical challenge. Conventionally, these tumors are excised by an open approach. According to Woodfield's algorithm, tumors below the S3 vertebral level should be operated by a combined open anterior-posterior approach or posterior approach

¹Department of Surgical Oncology, Kilpauk Medical College; Government Royapettah Hospital, Chennai, Tamil Nadu, India

²Department of Surgical Oncology, Government Royapettah Hospital, Chennai, Tamil Nadu, India

Corresponding Author: Subbiah Shanmugam, Department of Surgical Oncology, Kilpauk Medical College; Government Royapettah Hospital, Chennai, Tamil Nadu, India, Phone: +91 9360206030, e-mail: subbiahshanmugam67@gmail.com

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alone.² Laparoscopy has refuted this algorithm and helps in the excision of large tumors located below S3. With our experience of using laparoscopy in gynaecological and rectal cancer surgery, we have shifted our operative approach for such tumors from open to laparoscopy.

MATERIALS AND METHODS

Patients

Data of patients who underwent excision of benign pelvic neurogenic tumors either by open or laparoscopic surgery at our institution between 2016 and 2022 were reviewed and analyzed.

The demographic data were collected. Symptoms, radiological characteristics, tumor location, and size were analyzed. Few patients



Fig. 1: Laparoscopic ports

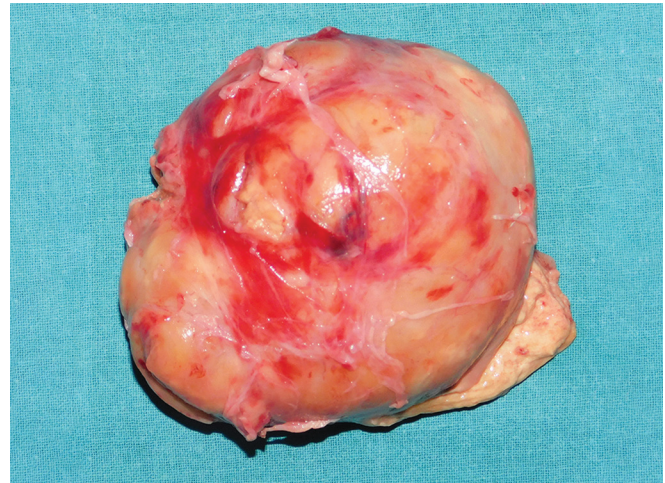


Fig. 3: Laparoscopically excised tumor

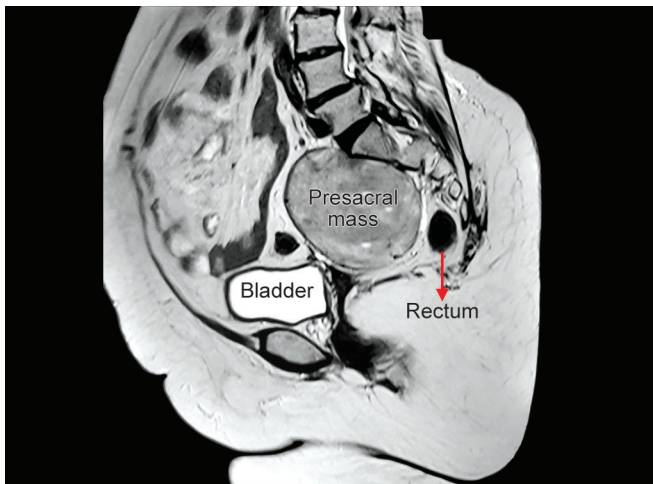


Fig. 2: MRI showing presacral tumor

required a biopsy. Data about surgical approach, operative time, blood loss, complications (Clavien-Dindo), duration of hospital stay, and recurrence were collected and analyzed.

Surgical Procedure

After preoperative bowel preparation, patients were placed in a low lithotomy position and bladder catheterized. In the open anterior approach, a lower midline incision was used and after the incision of the pelvic peritoneum, taking into consideration the anatomical spaces (retrorectal space and pararectal space), ureters, iliac vessels and its branches, hypogastric plexus/nerves, and presacral venous plexus were preserved while carefully dissecting the mass from fascia propria and presacral fascia. Tumors were completely excised. In laparoscopy, five ports were used similar to gynecological or rectal surgery (Fig. 1). A 30-degree telescope was used and a harmonic scalpel was the energy source. Dissection was similar to open surgery and a specimen was placed in an endobag and retrieved through a small suprapubic incision (Figs 2 and 3). The procedure was performed by a senior surgeon with expertise in advanced laparoscopic cancer surgery.

RESULTS

Patient and Tumor Characteristics, Imaging, and Biopsy

Seven patients were operated in this period. There were three males and four females, with a mean age of 58. Only two patients were symptomatic with defecation difficulty and urinary retention. The others were incidentally detected by imaging. The mean size was 9 cm (8–11 cm) and all of them were in the retrorectal space except for one tumor which was in the lateral pelvic wall. Four patients were operated by open surgery and three by laparoscopy. Recently, our approach had shifted to laparoscopy except for a case that was operated by open approach due to previous open abdominal surgery and adverse comorbid condition. CT/MRI was mostly confirmatory of benign solid tumor. Tumors were homogeneous and well encapsulated. Two cases had suspicious imaging features of a malignant tumor. Image-guided trans gluteal/sacral approach biopsy was done and both were reported as a benign neurogenic tumor.

Surgical Procedure, Complications, and Postoperative Course

With a mean blood loss of 100 (90–110 mL), laparoscopy required less operative time (125 vs 140 minutes) compared to open surgery. After a laparoscopy, the average length of hospital stay was shorter (4 vs 7 days). Three patients of open surgery had postoperative complications whereas no complications occurred after laparoscopy. One patient had a surgical site infection which settled with IV Antibiotics. Another patient had urinary retention which took 6 months to settle. One patient had significant intraoperative blood loss. Postoperative pathological examination showed three schwannomas and four neurofibromas. During a mean follow-up period of thirty months, no patient reported a local recurrence. The results are summarized in Tables 1 and 2.

DISCUSSION

In the context of pelvic surgery, laparoscopy is frequently employed, particularly for benign and malignant gastrointestinal and gynecological tumors. Regarding the scientific validity of this

Table 1: Summary of all patients

S.No.	Age, Sex	Symptom	Location	Size (cm)	Approach	Operative time (min)	Blood loss (mL)	Complications	Duration of hospital stay (days)	Postop HPE
1	48, F	Asymptomatic	Retrorectal	8	Open	148	250	Wound infection	8	Neurofibroma
2	58, F	Defecation difficulty	Retrorectal	9	Open	139	260	Urinary retention	7	Neurofibroma
3	60, M	Asymptomatic	Lateral pelvic wall	7	Open	132	190	Nil	6	Schwannoma
4	64, M	Urinary retention	Retrorectal	10	Lap	118	110	Nil	5	Neurofibroma
5	54, F	Asymptomatic	Retrorectal	9	Lap	125	90	Nil	3	Schwannoma
6	62, M	Asymptomatic	Retrorectal	11	Open	141	600	Bleeding	7	Neurofibroma
7	57, F	Asymptomatic	Retrorectal	10	Lap	132	100	Nil	4	Schwannoma

Table 2: Surgical outcomes

Analysis	Open surgery	Laparoscopic surgery
Mean operative time (min)	140	125
Mean blood loss (mL)	325	100
Mean duration of stay (days)	7	4
Complications	3/4 patients	Nil
Recurrence	Nil	Nil

method for treating retro rectal tumors, opinions differ. There are not many studies in the literature; the majority are case reports and case series.^{3,4} A magnified and clear view of the pelvic viscera is one benefit of laparoscopy. Better visualization of the small surgical field is made possible by the 30° scope, particularly in the case of a narrow male pelvis. The pneumoperitoneum aids in the dissection of retroperitoneal space (retrorectal/pararectal). Better exposure to the operation field, improved anatomical details, decreased chance of unintentional tumor spillage, and reduced colon manipulation are all made possible by laparoscopy. These factors translate into better visualization and preservation of neurovascular structures, less intraoperative blood loss, minimal operative morbidity, and shorter duration of hospital stay.

In open surgery, there was significant blood loss in one case due to inadvertent injury to the presacral venous plexus. One case had prolonged postoperative urinary retention which took six months to settle. Our study shows laparoscopic approach has less blood loss, less operative time, shorter duration of hospital stay, and no complications compared to open surgery. Our results are similar to that of the case series by Nedelcu et al. and Zhou et al.^{5,6}

Our experience in laparoscopic rectal and gynecological cancer surgery made us shift our approach toward these benign neurogenic tumors. Based on our observations, we think that a surgeon who chooses to treat these lesions with laparoscopy needs to have the necessary expertise since the surgeon's proficiency with laparoscopic dissection of this area enables them to treat lesions that are below the S3–S4 level. The two major complications are inadvertent rectal wall opening and neurovascular injuries. We have not encountered these in our limited experience.

There is no cut-off point to determine which approach (open or laparoscopic) is best, although research indicates that lesion size can complicate the procedure. To remove the specimen during laparoscopic surgery, we made a little incision across the suprapubic area. In laparoscopic surgery, we used a small suprapubic incision to extract the specimen. The largest lesion size to have been safely removed laparoscopically as per literature stands at 11 cm.⁶ In our study, the largest laparoscopically excised lesion measured 11 cm. A laparoscopic procedure is generally recommended only for benign tumors.

Deng et al. have shown that laparoscopy is a feasible approach for pelvic schwannomas.⁷ Our results also show that laparoscopy is a feasible approach for benign neurogenic tumors. Owing to the complexity and specific location of the tumor, the surgical approach must be tailored based on patient factors, the characteristics of the tumor, and the surgeon's expertise.

CONCLUSION

Laparoscopy is a feasible alternative approach to open surgery for the resection of benign pelvic neurogenic tumors with the advantages of better visualization of pelvic viscera and preservation of pelvic neurovascular structures thereby reducing operative morbidity and discomfort, and shorter hospital stay.

ORCID

Subbiah Shanmugam  <https://orcid.org/0000-0001-5289-3953>

Pravenkumar RR  <https://orcid.org/0000-0002-6032-183X>

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