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Robot-assisted laparoscopic neurolysis for pudendal neuralgia occurring after Richter's sacrospinofixation procedure: A 4-steps technique

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ABSTRACT

Introduction: Richter's procedure can be responsible for a pudendal neuralgia when the sacrospinofixation device induces a trauma of the pudendal nerve, that roams under the sacrospinous ligament. In case of a direct compression or irritation of the nerve, the patient can experience a neuropathic pain immediately after surgery, needing a surgical revision. Other patients experience a progressive neuropathic pain several months after surgery, due to a postoperative fibrosis secondary to a hematoma. To demonstrate the feasibility of a neurolysis using a robot-assisted laparoscopy for the pudendal neuralgias occurring after Richter's sacrospinofixation technique.

Material and methods: Between 2021 and 2024, 6 consecutive patients suffering of a pudendal neuralgia after a Richter's procedure were treated with a robot-assisted laparoscopic neurolysis in our center. We report our technique with a narrated video footage.

Results: Robot-assisted laparoscopy for a pudendal neurolysis in 4 steps: Opening of the peritoneum between the external iliac vessels and the umbilical ligament Dissection of the internal iliac and pudendal arteries up to the pudendal nerve Releasing of the pudendal nerve and its branches from the fibrosis Resection of the sacrospinous ligament up to the fixation device The technique was carried out with favorable outcomes.

1. Opening of the peritoneum between the external iliac vessels and the umbilical ligament
2. Dissection of the internal iliac and pudendal arteries up to the pudendal nerve
3. Releasing of the pudendal nerve and its branches from the fibrosis
4. Resection of the sacrospinous ligament up to the fixation device

Conclusion: We demonstrate the feasibility of our technique using a robot-assisted laparoscopy for a complete pudendal neurolysis in case of a neuralgia occurring after Richter's sacrospinofixation.

Introduction

Sacrospinous ligament fixation (SSLF – Richter) procedure is a widely performed surgical technique for pelvic organ prolapse repair [1, 2]. However, this approach can lead to pudendal neuralgia when the fixation device induces trauma to the pudendal nerve, which runs beneath the sacrospinous ligament [3]. Pudendal neuralgia was reported in 3 to 12 % of the cases, and may present as immediate postoperative neuropathic pain due to direct compression of the nerve or as delayed neuropathic pain months later, often associated with postoperative fibrosis secondary to a hematoma [4,5]. The robotic approach offers unmatched precision and enhanced visualization, crucial for addressing the complex anatomical challenges associated with pudendal neuralgia [6]. This video aims to demonstrate the feasibility of robot-assisted laparoscopic neurolysis for pudendal neuralgia following SSLF procedure.

Materials and methods

Patient characteristics

Between 2021 and 2024, six consecutive patients suffering from pudendal neuralgia after a SSLF procedure were treated with robot-assisted laparoscopic neurolysis at our center. Patient characteristics are described in Table 1. All patients experienced neuropathic pain in the pudendal sensitivity area even standing up or laying down. Among

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Table 1
Baseline characteristics of the study cohort prior to robot-assisted laparoscopic neurolysis.

	Median (range), or frequency
Age, years	74 (64–88)
Time from SSLF to surgery, weeks	34 (3–786)
Numeric Pain Rating Scale	8,5 (8–10)
Sitting position tolerance, minutes	7 (1–15)
SSLF side:	
Right	5
Left	1
Fixation device:	
Absorbable suture	1
Non-absorbable suture	4
Non-absorbable staple	1

these patients:

- Two patients developed neuropathic pain immediately after their SSLF surgery, suggesting direct nerve trauma.
- Four patients presented symptoms within six months after surgery, likely due to nerve compression caused by postoperative fibrosis, often associated with hematoma formation.

The type of fixation device was described in Table 1. In none of these cases was an early transvaginal revision attempted at the referring centers.

Objective

The objective is to demonstrate the feasibility of robot-assisted laparoscopic neurolysis for pudendal neuralgia following a SSLF procedure using a narrated video.

Surgical technique

The surgical technique used in these cases was adapted from our previously described approach for robot-assisted laparoscopic neurolysis in pudendal neuralgia patients [6]. This approach was tailored to address the specific anatomical challenges presented by the SSLF procedure. All procedures were performed by the same surgeon (CO), who have a high level of expertise in robotic surgery and neuropelveology. Under general anesthesia, patients were positioned in dorsal decubitus with a 30° trendelemboug. A Da Vinci X robot (Intuitive Surgical) was employed with a side-docking to the opposite side of the operated nerve. Four 8mm trocars were placed horizontally in line under the umbilicus, with a 10 mm trocar for the scrub nurse. The four arms were employed with a 30° laparoscopic optic, a long grasper, a Maryland grasper, and scissors. The robot-assisted neurolysis was performed in four distinct steps:

- Step 1: Opening of the peritoneum. The peritoneum was incised between the external iliac vessels and the umbilical ligament to gain access to the paravesical space.
- Step 2: Dissection of the internal iliac and pudendal arteries. The internal iliac vessels and the pudendal artery were carefully dissected to identify and follow the pudendal nerve along its course.
- Step 3: Neurolysis of the pudendal nerve and its branches. The pudendal nerve and its branches were meticulously released from surrounding fibrosis after transection of the sacrospinous ligament, and then medialized from the ischiatic spine ensuring future additional trauma.
- Step 4: Resection of the sacrospinous ligament and fixation device. The sacrospinous ligament was excised up to the fixation device, which was removed to eliminate any residual nerve compression.

The peritoneum was closed with an absorbable 3/0 Vicryl.

Data collection and analysis

Data were collected prospectively preoperatively, during hospital stay, and at the 4 months follow-up consultation. Excel software (Microsoft®) was employed for basic descriptive statistics.

Results

The robot-assisted laparoscopic neurolysis was successfully performed in all six patients. Per and post-operative data are reported in Table 2. Postoperative management included: an immediate removal of the urinary catheter at the end of the procedure, no abdominal drainage, an enhanced postoperative recovery protocol with oral intake and mobilization on day 0. All patients were discharged on postoperative day 2 with instructions to avoid perineal trauma and to use an ergonomic cushion for sitting.

A Clavien-Dindo grade 1 complication was observed in one patient, consisting of a hematoma at a laparoscopic trocar site, which resolved spontaneously without intervention. Patients were reevaluated during follow-up consultations at four months postoperatively (Table 2).

The detailed outcomes and surgical steps are also presented in the accompanying narrated video.

Discussion

SSLF is a recognized technique for pelvic organ prolapse repair, but complications such as pudendal neuralgia can severely impact patient quality of life [3–5]. This study highlights the feasibility and efficacy of robot-assisted laparoscopic neurolysis in addressing these difficult conditions.

Our result reported a significant impact on pain experience with an immediate improvement after surgery. These findings support the argument to practice an extended pudendal neurolysis additionally to the removal of the fixation device from the sacrospinous ligament in delayed postoperative conditions. Robot-assisted laparoscopic approach offers significant advantages, including enhanced visualization, precision, and access to the entire course of the pudendal nerve from its sacral roots S2-S4 to its distal branche [6,7]. This approach also allows for the safe resection of fibrosis and the sacrospinous ligament even in difficult delayed postoperative conditions. Even none of our patients did benefit of it in their first medical center, an immediate trans-vaginal surgical revision should be tried to remove the fixation device when an acute neuropathic pain is experienced within the first postoperative hours by the patients [3]. Vodegel E et al reported a 21 patients study using a trans-vaginal approach for a deferred suture removal [8]. Among them, only 71% had a successful removal at the first attempt, 57 % were free of pain and 38 % experienced a reduction of pain. This point underlines the poor visualization using the trans-vaginal approach in postponed revision, where limited access may impede comprehensive neurolysis. Deferred conditions may also expose to an enhanced risk of nerve damage, bleeding and perineal trauma. Regarding these complications, Vodegel

Table 2
Per and postoperative results (NPRS: Numeric Pain Rating Scale).

	Median (range), or frequency
Per operative data:	
operative time after docking, minutes	96 min (82–118)
blood loss < 50 ml	6/6
NPRS at post operative day 2	2 (0–3)
Clinical outcomes after 4 months:	
NPRS score	0.2 (0–2)
Patient Global Impression of Change (PGIC) score	1 (1–2)
Sitting tolerance exceeding 120 minutes	6/6
Pelvic organs prolapse recurrence	0/6

et al reported a global 42,9 % of side effect, including additional nerve trauma with bladder hypocontractility [7].

As a prevention to any neurological trauma during SSLF, surgeons must be aware about the frequent anatomical variations of the SSL, the pudendal nerve and its branches. Several anatomical studies recommended to perform the fixations 2 cm medially to its ischiatic spine end to lower the risk of nerve trauma [9,10]. In the meta-analysis of Amari et al, the use of anchor fixation device was associated to more pain complication [3]. The use of absorbable or non-absorbable stiches did not affect the postoperative pain experience in the study of Padoa et al. [11] Our experience would advise to choose an easily removable fixation device, like stiches. Neuropathic pain understanding should also be improved by the surgeons performing SSLF, as it would offer the opportunity for an early identification of nerve trauma and surgical revision. Indeed, most of the publications about SSLF did not report details about pain experience (neuropathic or non-neuropathic), even the area indicating the concerned nerve (pudendal, posterior cutaneous nerve of the tight, sciatic, inferior cluneal, inferior rectal, …). Pain should not be considered as a failure but lead to a better understanding of the complex anatomy of the pelvis, where the neuropelveology addresses its contribution.

Regarding prolapse recurrence, whereas only 71 % could benefit of a suture removal using their trans-vaginal approach, Vodegel et al reported 29 % of prolapse recurrence in their study with a pelvic organ prolapse quantification (POP-Q) stage of $\geq$2 [8]. Among them, 19 % were symptomatic and undergone an additional surgery. In our cohort, no significant prolapse recurrence were reported after 4 months of follow-up, although fixation removal was completed. This favorable outcome may be attributed to the delay between the SSLF and our robotic surgery, that led enough healing time to create a surrounding pelvic organ fibrotic support not only depending on the fixation device. Also, the minimally invasive surgical approach allows an enhanced visualization and a selective resection of the sacrospinous ligament with the fixation device, while preserving vaginal adhesions to surrounding tissues. By maintaining these adhesions, the anatomical integrity and support of the pelvic organs are likely preserved within the first months. These results need to be confirmed after a longer follow-up and a larger cohort.

As for the trans-vaginal surgical postponed revision, the laparoscopic approach exposes to a high risk of vascular and neurological injury. However, in our cohort no vascular or significant neuromuscular side-effect were observed, and only one Clavien-Dindo 1 complication was reported. These results are aligned with our previously published robot-assisted laparoscopic experience in pudendal nerve neurolysis [6]. The stepwise technique we described minimizes these risks by ensuring a careful dissection and avoiding unnecessary manipulation of critical structures. Additionally, this type of surgery requires a high level of expertise in robotic surgery and neuropelveology knowledge to ensure patient safety and optimize outcomes. Future studies with larger sample sizes and longer follow-up periods are essential to confirm these findings and to evaluate the broader applicability of this technique.

Conclusion

Robot-assisted laparoscopic neurolysis is a feasible and effective technique for treating pudendal neuralgia following LLSF. The robotic approach offers unmatched precision and enhanced visualization, crucial for addressing the complex anatomical challenges associated with pudendal neuralgia. Our results underscore the importance of robotic technology and specialized surgical expertise in managing challenging pelvic neuralgias.

Disclosure statement

none.

Ethical approval

IRB approval was not required. Written informed consent was obtained from the patient for utilization of personal data. There is no information permitting to identify the patient.

Patient consent statement

The authors have obtained and archived patient consent for video recording and publication in advance of the video recording of the procedure.

Individual contributions

	Author Initials OC	Author Initials AM	Author initials HR	Author Initials BM
Conceptualization	x			
Methodology	x		x	
Software	N/A	N/A	N/A	N/A
Validation	x		x	x
Formal analysis	N/A	N/A	N/A	N/A
Investigation	x		x	x
Resources	x			
Data Curation	x			
Writing - Original Draft	x			x
Writing - Review & Editing	x			x
Visualization	x	x	x	x
Supervision				x
Project administration	x			
Funding acquisition	N/A	N/A	N/A	N/A

CRediT authorship contribution statement

Olivier Celhay: Writing – original draft, Investigation, Conceptualization. **Aurore Maire:** Writing – review & editing, Validation. **Horace Roman:** Validation, Supervision, Methodology. **Benjamin Merlot:** Validation, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

The video related to this article can be found online at: doi:10.1016/j.urolvj.2025.100330.

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