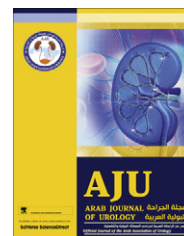




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LAPAROSCOPY/ROBOTICS

ORIGINAL ARTICLE

Extraperitoneal laparoscopic radical prostatectomy: A prospective 2-year single-surgeon experience with 171 cases

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Prostate;
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ABBREVIATIONS

(E)LRP, (extraperitoneal) laparoscopic radical prostatectomy; PSM, positive surgical margin; PDE5-I, phosphodiesterase-5 inhibi-

Abstract Objective: To assess the safety and the oncological and functional efficacy of a prospective series of extraperitoneal laparoscopic radical prostatectomy (ELRP).

Patients and methods: This prospective study included 171 consecutive patients (mean age 62.9 years, SD 6.5) who underwent ELRP by one surgeon between January 2008 and December 2009. The variables analysed were operative duration, blood loss, conversion rate, complications, hospital stay, duration of catheterisation, and the oncological results. We also assessed the rates of continence and erectile function.

Results: There were no conversions to open surgery. The mean (SD) operative duration was 112.7 (19.4) min, the blood loss was 372.1 (219.1) mL, the hospital stay was 6.8 (2.0) days, and the duration of catheterisation 6.7 (1.5) days. Collectively, 23.4% (40/171) of patients had positive surgical margins. Urinary continence at 1, 3, 6 and 12 months was achieved in 63.3% (95/150), 88.6% (78/88), in 90.3% (121/134) and 92.1% (117/127) of patients, respectively. The respective percentages

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tor; PGE2, prostaglandin E2; RRP, radical retropubic prostatectomy; RALP, robotic-assisted laparoscopic prostatectomy

for physiological erections after nerve-sparing ELRP at the same times were 11.8% (13/110), 11.8% (13/110), 18.2% (20/110) and 25.5% (28/110). The overall potency recovery rates (including patients on pharmacotherapy) were, respectively, 26.4% (29/110), 35.5% (39/110), 52.7% (58/110) and 69.1% (76/110), for the nerve-sparing procedure.

Conclusion: ELRP gave good oncological and functional results, especially in terms of urinary continence.

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Introduction

Because of the increased incidence of localised prostate cancer as a result of screening programmes, minimally invasive prostatectomy is being continuously developed [1]. Since the first report in 1997 by Schuessler et al. [2], laparoscopic radical prostatectomy (LRP) has been widely used throughout the world. The extraperitoneal LRP (ELRP) approach mimics the reference standard of open retropubic radical prostatectomy (RRP). However, in the modern era of the transperitoneal robotic-assisted laparoscopic prostatectomy (RALP), the use of LRP has been questioned [3]. Nevertheless, since the 2008 economic crisis, the interest in the cheaper 'pure LRP' has re-emerged. Here we present the results of a 2-year prospective series of 171 consecutive patients who were treated by one surgeon using ELRP.

Patients and methods

In this prospective study, after institutional ethical approval, we enrolled 171 consecutive patients with localised prostate cancer who underwent ELRP by one surgeon (E.M.) in the authors' institution (Le Mans, France) from January 2008 to December 2009. This is a high-yield private surgical clinic and the surgeon is experienced in all urological laparoscopic techniques, having started this series after sufficient experience with LRP. The patients enrolled had a positive standard 10-core ultrasonography-guided prostate biopsy under local peri-prostatic anaesthesia with 2% lidocaine. Every patient with a positive biopsy was offered LRP.

Data were prospectively collected and entered in a secure custom-made database, after approval of the scientific committee of the institution. The follow-up was scheduled over 12 months.

Surgical technique

We used a five-port ELRP according to the technique described previously [4]. In particular, the retroperitoneal space was created with a 0° endoscope. The endopelvic fascia was incised and the puboprostatic ligaments were preserved. Dissection was antegrade, starting in the bladder neck, which was incised with care

to ensure its preservation. The anterior aspect of the Denonvilliers' fascia was opened, the vas deferentia incised and the seminal vesicles dissected. The posterior aspect of the Denonvilliers' fascia was opened and dissection continued with preservation of the neurovascular bundles. Nerves were spared using an interfascial dissection technique, which included the use of 2-mm metallic clips. Moreover, electrocautery coagulation was not used and care was taken to minimise traction. Bilateral nerve-sparing was offered to all patients with a PSA level of < 10 ng/mL, a Gleason score of ≤ 6 (3 + 3) and ≤ cT2b disease, and with pelvic MRI negative for extracapsular extension. Unilateral nerve-sparing was used in patients with suspected contralateral extraprostatic disease.

The dorsal vein complex was ligated with a figure-of-eight suture, which was fixed to the pubic bone with no tension. This anterior suspension of the dorsal vein complex had the objective of improving immediate and long-term postoperative continence [4]. Thereafter, the anterior urethra was sectioned, and a suture (polyglactin 4/0) was placed in its anterior aspect (entry at the 10 and 1 o'clock positions, and exit at the 11 and 2 o'clock positions, respectively), to plicate the anterior peri-urethral tissues, which are spread and cut during apical dissection. This plication suture reinforces the anterior fibromuscular stroma, to facilitate early postoperative continence [4]. Afterwards, the posterior urethra was sectioned and the vesicourethral anastomosis made using six interrupted sutures. The pelvic lymph nodes were dissected when the patient's PSA level was > 10 ng/mL.

Perioperative evaluation and follow-up

The perioperative variables analysed were: operative duration (defined as the time between the first skin incision and the end of incision closure), blood loss, rate of conversion to open surgery, complications (intra- and early postoperative), hospital stay, and duration of bladder catheterisation. According to the surgeon's subjective assessment the nerve-sparing technique (unilateral or bilateral) and bladder neck preservation were also evaluated as 'adequate' or 'inadequate'. This was related to possible difficulties during tissue dissection

and preservation of the neurovascular bundles (e.g., due to adhesions after the biopsy), and in the case of the bladder neck, to large median lobes or previous surgery.

The variables used to assess the oncological outcome were: Gleason score, pTNM staging, rates and location of positive surgical margins (PSMs), and the biochemical recurrence rates (PSA \geq 0.2 ng/mL). Surgical margins were deemed positive if there were cancer cells in the inked margins of the pathology specimen.

The functional outcome was assessed by evaluating urinary continence and potency rates. We defined continence as wearing no pads, and sexual potency as having erections sufficient for intercourse with or without pharmacotherapy, i.e. phosphodiesterase-5 inhibitors (PDE-5I) and prostaglandin E2 (PGE2). These results were collected using medical questioning of the patients at the follow-up visits.

Results

The mean (SD) age of the patients was 62.9 (6.5) years and the preoperative PSA level was 8.2 (4.3) ng/mL. Collectively, the patients' characteristics are detailed in

Table 1 The preoperative characteristics and peri-operative variables in the 171 patients.

Variable	Mean (SD) or n (%)
Age (years)	62.9 (6.5)
PSA (ng/mL)	8.2 (4.3)
<i>Gleason score</i>	
5 (3 + 2)	1 (0.6)
6 (3 + 3)	115 (67.3)
7 (3 + 4)	37 (21.6)
7 (4 + 3)	17 (9.9)
8 (4 + 4)	1 (0.6)
Prostate volume (mL)	52.4 (20.9)
Body weight (kg)	78.2 (11.7)
Body mass index (kg/m ²)	26.2 (4.4)
Operative duration (min)	112.7 (19.4)
Blood loss (mL)	372.1 (219.1)
<i>Nerve sparing</i>	
Yes	48 (28.7)
No	118 (96.7)
<i>Unilateral</i>	
Bilateral	4 (3.3)
Bilateral	99 (81.1)
Perfect*	23 (18.9)
<i>Not perfect*</i>	
Bladder neck preservation	112 (70.8)
Perfect†	46 (29.2)
Not perfect†	
Pelvic lymph node dissection	31 (18.1)
Conversions	0
Hospital stay (days)	6.8 (2.0)
Duration of catheterisation (days)	6.7 (1.5)

*Surgeon's intraoperative subjective appreciation of the quality of the nerve sparing.

†Surgeon's intraoperative subjective appreciation of the quality of the bladder neck preservation.

Table 1. The mean (SD) operative duration was 112.7 (19.4) min, and the estimated blood loss was 372.1 (219.1) mL. We used the nerve-sparing technique in 123 patients (72%), which was bilateral in four and unilateral in 119. Subjectively, the nerve-sparing technique was considered as adequate in 99 and inadequate in 24 patients. The bladder neck preservation technique was considered as adequate in 112 and inadequate in 11 patients. A concomitant pelvic lymph node dissection was done in 31 patients (18.1%). There were no conversions to open surgery. The mean (SD) hospital stay was 6.8 (2.0) days and the catheterisation time was 6.7 (1.5) days (**Table 1**). There were no major complications.

Oncological outcome

The general oncological results are detailed in **Table 2**; the histopathology report showed Gleason scores of 6, 7 and 8 in 38.4%, 56.1% and 3.6% of prostate specimens, respectively. The TNM staging is given in **Table 2**. PSMs were recorded in 40 cases (23.4%) and the relevant data are presented in **Table 3**. The rate of PSMs increased to 26.3% when the nerve-sparing technique was considered as adequate, and decreased to 13.6% when evaluated as inadequate (**Table 3**). When nerve-sparing surgery was not done the PSM rate was as 21.7%. Furthermore, PSMs were predominantly in the apex, with a slight tendency to the right side (**Table 3**). Moreover, PSMs were multifocal in 15 patients (37.5%). Last, of the overall cases with PSMs, 90% were in pT2 specimens and 10% in pT3 specimens. At 1 month after surgery the PSA level was < 0.1 ng/mL in 95.9% of patients. Biochemical recurrence was recorded in 17 patients (9.9%). In 13 of these patients a nerve-sparing

Table 2 Postoperative histological data.

Variable	n (%)
<i>Pathological T stage</i>	
pT2a	12 (7.1)
pT2b	13 (7.6)
pT2c	120 (70.6)
pT3a	21 (12.4)
pT3b	4 (2.4)
pT4	0
<i>Pathological N stage</i>	
N-	30 (97)
N+	1 (3)
<i>Gleason score</i>	
5 (2 + 3)	1 (0.6)
5 (3 + 2)	2 (1.2)
6 (3 + 3)	63 (38.4)
7 (3 + 4)	65 (39.6)
7 (4 + 3)	27 (16.5)
8 (4 + 4)	4 (2.4)
8 (5 + 3)	2 (1.2)

Table 3 The oncological outcomes.

Variable	<i>n</i>
<i>Positive margins</i>	
Overall	40
<i>Stratified by nerve-sparing status</i>	
Nerve-sparing	26
No nerve-sparing	13
<i>Stratified by staging</i>	
pT2	36
pT3	4
<i>Stratified by location</i>	
Left apex	17
Right apex	19
Left middle third	6
Right middle third	10
Left base	3
Right base	4
<i>Stratified by Gleason score:</i>	
2 + 3	1
3 + 3	6
3 + 4	23
4 + 3	7
4 + 4	1
5 + 3	2
Undetectable PSA at 1 month, overall	6
Biochemical recurrence at 12 months, overall	17
<i>Stratified by nerve-sparing status</i>	
Nerve-sparing	4
No nerve-sparing	13

technique was not used. Patients with a biochemical recurrence were treated with radiotherapy.

Functional outcomes

Follow-up data were available for 150 patients (87.7%) at 3 months, 134 (78.4%) at 6 months and 127 (74.3%) at 12 months. The lack of follow-up data in our clinic was because patients had chosen to return to their local urologist or general practitioner for follow-up care. The

functional outcomes, including urinary continence and potency, are detailed in Table 4.

Complete continence, defined as no pad use, is detailed for each category in Table 4, at 1, 3, 6 and 12 months. When the bladder neck preservation was considered adequate, the continence rates were greater than when inadequate, at 68.7%, 91.1%, 92.5% and 96.8%, respectively, for each follow-up assessment.

Among those patients undergoing a nerve-sparing technique the recovery of potency is detailed in Table 4 for those on PDE-5Is and/or PGE2, PDE-5Is, or no medication. In patients who had an inadequate nerve-sparing technique the potency results were as poor as those who had no nerve-sparing technique (Table 4).

Discussion

The surgical treatment of localised prostate cancer has developed rapidly, driven by technological advances that have made minimally invasive prostatectomy feasible [5,6]. The contemporary surgical approaches of LRP and RALP are considered standard treatments in urology departments across North America, Europe and centres of excellence world-wide. Nevertheless, despite the widespread adoption of minimally invasive approaches there are only a few robust studies directly comparing the results of these techniques with the standard approach of RRP [5]. Until standardised prospective comparative analyses of RRP, LRP and RALP are established, comparative outcome data will remain imperfect [7]. Urological researchers must strive to provide the best available outcome data through accurate prospective data collection and consistent outcome reporting [7]. Thus we prospectively assessed the results of ELRP by one surgeon who performs more than 85 cases per year. Interestingly, among the present 171 cases there was no conversion to open surgery and the mean operative time was 112 min.

Table 4 The functional outcomes during the follow-up.

Variable, <i>n</i> (%)	Follow-up, months			
	1	3	6	12
Continence, overall	95 (63.3)	78 (88.6)	121 (90.3)	117 (92.1)
<i>Bladder neck preservation</i>				
Adequate	68 (68.7)	51 (91.1)	49 (92.5)	30 (96.8)
Inadequate	15 (46.8)	17 (85.0)	16 (94.1)	9 (75.0)
<i>Overall potency:</i>				
with no pharmacotherapy	13 (8.3)	14 (9.0)	21 (13.5)	29 (18.6)
Nerve-sparing	13 (11.8)	13 (11.8)	20 (18.2)	28 (25.5)
No nerve-sparing	0	1 (2.2)	1 (2.2)	1 (2.2)
including patients on PDE5-I	21 (13.5)	22 (14.1)	34 (21.8)	39 (25.0)
Nerve-sparing	21 (19.1)	21 (19.1)	33 (30.0)	38 (34.5)
No nerve-sparing	0	1 (2.2)	1 (2.2)	1 (2.2)
including patients on PDE5-I and/or PGE2	29 (18.6)	41 (26.3)	61 (39.1)	82 (52.6)
Nerve-sparing	29 (26.4)	39 (35.5)	58 (52.7)	76 (69.1)
No nerve-sparing	0	2 (4.3)	3 (6.5)	6 (13.0)

In the present series the PSM rate was 23.4%, which was similar to that in other studies of LRP or RALP. In an international multicentre study of LRP with 8544 patients, Secin et al. [8] reported an overall PSM rate of 22%. For RALP, Villavicencio et al. [9] used this technique in 100 patients, with a PSM rate of 21%. A comparative study among the three radical prostatectomy methods found no statistically significant difference in PSM rates or biochemical recurrence [10]. In the same study, only the preoperative PSA level and the number of PSM foci were statistically significant independent predictors of biochemical recurrence. This has been confirmed in another recent study [11]. Interestingly, the nerve-sparing technique did not increase the PSM rate in the present series, with rates of 26.3% and 28.2% for nerve-sparing and no nerve-sparing techniques, respectively. Another interesting result was that the PSM rate was lower for patients with pT3 disease than for those with pT2 (16.0% vs. 24.8%, respectively). This is probably because patients with cT3 disease, as detected by pelvic MRI, were not offered a nerve-sparing technique and the dissection had wider margins of resection.

The functional outcome data were collected using medical questioning only. That we did not use any certified questionnaires, both for continence and erectile function, is a limitation to the present study. The present continence rate of 92.1% at 12 months was comparable to the rates reported for both LRP and RALP series. We also found that good bladder neck preservation, as subjectively evaluated during ELRP by the surgeon, was associated with better continence results at 12 months than for unsatisfactory preservation (96.8% vs. 78.0%, respectively). Recently, So et al. [12] reported a single-surgeon series of 100 patients who underwent LRP, with continence rates of 73.2% at 12 months after surgery. In another single-centre series with 216 patients undergoing LRP, 89% were continent at 12 months after surgery [13]. In one of the largest series of RALP, in 500 patients, by Patel et al. [14], the continence rate was 95%, while in a smaller series of 100 patients the continence rate was 91%. The 12-month potency recovery rate in the present series was 69% for the nerve-sparing technique. Novara et al. [13] reported a 60% potency rate at 12 months, while So et al. [12] gave an overall potency rate of 48.6% at 12 months and a potency rate for the nerve-sparing technique of 57.1% at 12 months. For RALP, Asimakopoulos et al. [15] reported a potency rate of 56%, Patel et al. [14] a potency rate of 78% and Villavicencio et al. [9] a 62% potency rate. Lastly, we showed that an inadequate nerve-sparing technique resulted in potency rates similar to those after no nerve sparing.

Recent comparative studies from high-volume centres, showed that RRP, LRP and RARP are all safe options for treating patients with localised prostate cancer,

giving similar overall complication rates [16–19]. However, LRP and RALP were associated with less operative blood loss and a lower risk of transfusion than for RRP [16]. Furthermore, a recent study that compared the cost of LRP with RRP found that costs for the former were slightly less than those for the latter [17]. A longer operative time and disposable-instrument expenses were offset by the shorter hospital stay, fewer blood transfusions and less analgesic requirements for the LRP group. Further financial advantages for LRP will probably be achieved with additional reduction of operating-room time and by minimising the use of disposables. This is very important in the era of the current economic crisis in Europe, which questions the advantages of the costly RALP.

In conclusion, ELRP provides very good oncological and functional results, especially in terms of urinary continence. Robotic assistance provides a less steep learning curve and has obvious advantages in terms of vision and technical ease for certain steps of the procedure. Nevertheless, in the hands of an experienced laparoscopic surgeon, the functional and oncological results do not seem to differ between (E)LRP and RALP. Furthermore, LRP is less time-consuming and cheaper than RALP. As LRP mimics the anatomical approach of RRP and has similar costs (in contrast to the very expensive RALP), relevant comparative randomised studies are encouraged.

Conflict of interest

None.

Funding

None.

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