Comparison of surgical, functional and oncological outcomes of innovatively “three-port” and traditionally “four-port” laparoscopic radical prostatectomy in patients with prostate cancer

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Abstract

Background: To compare the surgical, functional and oncological outcomes between innovatively "three-port" and traditionally "four-port" laparoscopic radical prostatectomy (LRP) in patients with prostate cancer (PCa).

Methods: We retrospectively collected the data of PCa patients treated at our institutions from June 2012 to May 2016. According to the inclusion criteria, a total of 234 patients were included in the study, including 112 in group A (four-port) and 122 in group B (three-port). The perioperatively surgical characteristics, functional and oncological outcomes were compared between groups.

Results: None of statistical difference in the baseline parameters were detected between these two groups. Compared with group A, the operative time (OT) and estimated blood loss (EBL) were significantly less in group B. The similar follow-up results were obtained in the rate of positive surgical margin (PSM), prostate specific antigen (PSA) biochemical recurrence and continence after LRP without any statistically significant difference. An identical conclusion was also received in comparison of overall survival (OS) and biochemical recurrence-free survival (BRFS) between both groups.

Conclusion: Innovatively "three-port" LRP can significantly shorten the OT and reduce the EBL compared with the traditionally "four-port" LRP. Meanwhile, it does not increase the positive rate of PSM and PSA biochemical recurrence. "Three-port" LRP could be popularized in the future in view of its superior surgical technique, considerably functional outcomes and remarkably oncological control.

Background

The incidence rate of PCa is the second in the male cancers and the fifth in the major causes of cancer deaths worldwide, which accounts for 15% of newly diagnosed tumors [1]. The incidence of PCa is also increasing in China, which has become the highest incidence tumor in the male genitourinary system [2, 3]. For the localized PCa, RP is still the first-line treatment option, enabling patients to obtain more than 10 years of life expectancy [4].

Since LRP was reported in the 1990s [5], it has been widely applied based on its advantage of less surgical trauma and faster recovery. Moreover, with the emergence of robotic surgical platform, its unique three-dimensional vision, fine intracavitary manipulator and ergonomic design make robot-assisted laparoscopic radical prostatectomy (RARP) widely used throughout the world in the recent 10 years [6-8]. Although RARP can overcome the disadvantages of the traditional LRP and shorten the learning curve, it must be admitted that its cost is relatively high [9]. Such huge medical costs thus make it difficult to promote in the developing countries. To make a balance between a low price and more precise manipulation, our center innovatively applied "three-port" LRP instead of the traditionally "four-port" LRP from the year of 2012.

In this investigation, we retrospectively compared the perioperatively surgical parameters between the innovatively “three-port” and traditionally “four-port” LRP. More importantly, the functional and oncological outcomes including PSM, PSA biochemical recurrence, continence, short-term OS and BRFS were also compared to make this technique more practical and suitable for the future promotion.

Methods

We retrospectively collected the data of PCa patients receiving LRP at our institutions from June 2012 to May 2016. The diagnosis of PCa was confirmed by a transrectally B-ultrasonography guided prostate biopsy at our institutions 1-8 weeks before the LRP. In order to ensure the accuracy of the experimental data, the patients receiving puncture of prostate in the other hospitals were excluded into this trail.

From the year of 2012, patients who met the following criteria were operated by the “three-port” technique: (1) the volume of prostate measured by B-ultrasonography preoperatively was less than 40ml; (2) B-ultrasonography showed that the middle lobe of prostate did not protrude into the bladder; (3) the body mass index (BMI) was less than 24kg/m^2. The other patients who were not in conformity with the above requirements were still performed by the “four-port” LRP. Accordingly, a total of 234 patients were included in the study, including 112 in group A (four-port) and 122 in group B (three-port). Among them, a total of 17 “three-port” patients were intraoperatively converted to “four-port”. 5 cases were converted because of the bleeding requiring the assistant’s aspirator to suck, simultaneously with the other 12 cases changed for the larger prostate volume unable to lift and expose the surrounding tissues sufficiently only by the surgeon himself.

The intraoperative vision, exposure and manipulation of “three-port” LRP could be simply summarized as a “six steps” - “step by step” procedure. (1) The subcutaneous fat was initially cleared to expose the rectus fascia, and the extra-peritoneal space was further enlarged down the pelvis using the Harmonic scalpel exposing the important structures and anatomic landmarks around the bladder and prostatic gland. The bilateral endopelvic fascia was sharply divided, exposing the muscle fibers attached to the lateral and apical portions of the prostate. Then, the prostate was freed in an antegrade fashion from the bilateral surrounding tissue in which the puboprostatic ligament was dissected proximal to the prostate. Afterwards, the dorsal vein complex (DVC) was oversewed using a 1-0 polyglycolic acid absorbable suture just distal to the prostate apex (**Figure 1A**). (2) After the ligation of DVC, the bladder neck and prostate were separated by scissors. In this step, several methods could be helpful in proper identification of the bladder neck, including (a) the visual identification of the point of transition of the prevesical fat to the anterior prostate, (b) intermittent and repetitive caudal retraction of the urethral catheter balloon and (c) using a forcep to grasp and retract the dome of the bladder in a cephalad direction resulting in “tenting” of the bladder neck at its attachment to the prostate. The anterior bladder was subsequently divided until the urethral catheter was identified and the posterior bladder neck was exposed (**Figure 1B**). (3) After the bladder neck transection, the seminal vesicles were individually identified, dissected and divided from 5 to 7 o’ clock of the bladder neck (**Figure 1C**). (4) Afterwards, the anterior retraction of the vasa deferentia and seminal vesicles could help with identification of the proper plane between the prostate and rectum. The Denonvilliers fascia could be subsequently separated from the posterior prostate by careful blunt and sharp dissection until to the prostatic apex and laterally to the prostatic pedicle. Ligasure and bipolar electrocautery could be used for control of the prostatic pedicle (**Figure 1D**). (5) Until now, antegrade dissection had allowed complete mobilization of the lateral, basal and posterior prostate, leaving only the urethra from the prostate apex. As much urethral length as possible should be maintained, the prostate apex could be dissected in a retrograde fashion by harmonic scalpel with the Foley catheter extracted from the incision (**Figure 1E**). (6) The last but not least, a single needle running suture method for vesicourethral anastomosis was usually applied. The technique was initiated by performing a fixed suture at the posterior lip of bladder neck at 3-4 o' clock and tying the first knot. Another suture at the nearby position of the first suture was performed to leave the first knot outside. From 5-8 o' clock, sutures were performed every one o' clock to secure the posterior approximation. After the posterior vesicourethral anastomosis was achieved, a catheter was inserted into the bladder and the anterior vesicourethral anastomosis was performed, which was finally tested by inflow of 100 ml saline to ensure water tightness (**Figure 1F**). After a careful examination of the surgical field, a drain was placed in the pelvis. The specimens were placed in an endobag and retrieved from the incision after removal of the laparoscopic port. The abdominal incisions were finally closed in the usual fashion.

The perioperatively surgical characteristics, functional and oncological outcomes were compared between groups. The surgical characteristics included OT, EBL, hospitalization and drainage days. The recovery of urinary control function after operation was evaluated according to the use of daily urine pad, and 0-1 piece of urinary pad per day was defined as a satisfied urinary continence [10]. The oncological outcomes were evaluated by the parameters of PSM, PSA biochemical recurrence rate, OS and BRFS obtained by the follow-up records. The PSA biochemical recurrence was defined as PSA $\geq$ 0.2ng/ml, OS was defined as the time from the end of operation to death or follow-up due to any reason, and BRFS was defined as the time from the end of operation to the occurrence of PSA biochemical recurrence or death or the end of follow-up.

All the data were analyzed by SPSS 20.0 versions. Categorical variables were represented by frequency and percentage. Continuous variables conforming to normal distribution were represented by mean ± standard deviation (SD), and continuous variables not conforming to normal distribution were represented by median and range. Chi-square test or Fisher exact test were used for categorical variables, with t test or Mann-whitney test for continuous variables. Bilateral $P < 0.05$ was defined as a statistically significant difference.

Results

The baseline characteristics of patients in both groups were listed in **Table 1**. None of statistical difference in the baseline parameters were detected between these two groups. The perioperatively surgical data of these two groups were shown in **Table 2**. The average OT in group A was 105.06mins, and that of the group B was 92.28mins (P=0.001). The average EBL in group A was 121.90mL, and that of the group B was 103.85mL (P=0.031). The postoperative hospitalization in group A was 4.54 days, and that of the group B was 4.50 days (P=0.812). The drainage days in group A was 3.47 days, and that of the group B was 3.43 days (P=0.743). Compared with group A, the OT and EBL were significantly less in group B.

The functional and oncological outcomes of the two groups were revealed in **Table 3**. There was no significant difference in the postoperative T stage and Gleason scores. By analyzing the oncological outcomes of two methods, the mean rate of PSM in the two groups was 32.1% and 32.0% respectively (P=1.000), and the PSA biochemical recurrence rate was 10.7% and 10.7% respectively (P=1.000). In the evaluation of the degree of urinary control recovery at 3 months, 6 months and 12 months after operation, the satisfied urinary continence in group A was obtained in 92/112 cases (82.1%), 97/112 cases (86.6%) and 102/112 cases (91.1%). The corresponding rate was 94/122 cases (77.0%), 99/122 cases (81.1%) and 104/122 cases (85.2%) in group B. The P value for each period between both groups were 0,423, 0.340 and 0.242 respectively. Above all, the similar results were obtained in the rate of PSM, PSA biochemical recurrence and continence after “three-port” or “four-port” LRP without any statistically significant difference (P>0.05).

By depicting a curve of OS and BRFS, a more accurate reflection of oncological outcomes was demonstrated in **Figure 2**. In the follow-up periods, the OS was 100% with the 71.6% of BRFS in group A, and the OS was 100% with the 73.2% of BRFS in group B. There was no significant difference in OS (P=0.300) and BRFS (P=0.800) between these two groups.

Discussion

For the early localized PCa, RP is still the most widely used treatment method. With the continuous progress of technology, LRP and RARP both embody the advantages of small trauma, less postoperative pain and rapid postoperative recovery. What’s more, RARP has unique advantages such as flexible operation equipment, three-dimensional vision and short learning curve, which has been widely applied by many centers in many developed countries [11]. Several systematic reviews and meta-analysis results had shown that RARP took the advantages of perioperatively surgical data, lower PSM, satisfied urinary continence and sexual function over LRP, but some researchers believed that there existed no dramatic difference in tumor prognosis between LRP and RARP [12-15]. However, it is worth noting that many studies have shown that RARP has a higher cost than LRP due to the increased cost of surgical instruments [9, 14, 16]. Based on the limitation of cost and medical resources, LRP is still an important choice for many underdeveloped and developing countries.

Since it was first reported in 1997 [17], the traditionally “four-port” or “five-port” LRP has been widely used in the world. Reviewing the literatures concerning traditional LRP, Rassweiler et al [18] reported 219 cases with an average OT of 218mins and an average EBL of 800ml; Hu et al [19] reported 358 cases with an average OT of 246mins and an average EBL of 200ml; Ploussard et al [20] reported 219 cases with an average OT of 175.5mins and an average EBL of 800ml. Compared with the results above and the traditionally “four-port” LRP performed by ourselves, our clinical practice in “three-port” LRP showed that the average OT (92.28mins) and EBL (103.85mL) were notably improved. In **Table 4**, combining our “three-port” LRP data with other urologists’ experience, it can be clearly revealed that our mean OT and EBL is superior to RARP and the conventionally “four-port” LRP. It is believed that the improvement of perioperatively surgical data is mainly related to the rationality and advantages of the “three-port” technique. Additionally, it may also be contributed to the fact that the surgeon launched the innovatively “three-port” LRP after fully mastering the traditionally “four-port” LRP. Retrospectively analyzing our database, nearly 100 cases of traditionally “four-port” LRP were completed before the “three-port” LRP was developed in 2012. However, with the progress of current technology and the visualization of laparoscopic teaching methods, we believe that young doctors can directly perform the “three-port” LRP even though the youths are still in the initial stage of the traditionally “four-port” LRP without spending the learning curve. It is not necessary to go through the learning curve process from “four-port” to “three-port” technique. Certainly, it is strongly suggested that the young doctors should perform the “three-port” LRP with the guidance of experienced doctors who have been skilled and proficient in this technique.

PSM is an important index to evaluate the prognosis of PCa after RP, which is closely related to PSA biochemical recurrence and postoperative adjuvant treatment [33]. According to the systematic review, it is uncertain whether RARP has advantages over LRP in controlling the PSM. It has been reported that the rate of PSM in LRP is 12.0% - 22.2%, while that of RARP is 13.5% - 22.5% [12, 19, 34-35]. Our results suggest that the rate of PSM in “three-port” and “four-port” technique were 32.0% and 32.1% without any statistical difference. BCR is another critical index of oncological outcomes closely related to PSM. Our conclusion revealed that the 1-year BCR of “three-port” and “four-port” was both 10.7% similarly compared with the recent literatures [36-37]. The above results indicated that “three-port” LRP did not significantly increase PSM and BCR, which could be controlled at a better level on the basis of rich surgical experience. Finally analyzed by the description of OS and BRFS, it was further confirmed that “three-port” LRP could guarantee a satisfactory survival rate.

The recovery of urinary control is a considerable aspect to evaluate the functional prognosis after RP. Asimakopoulos et al [37] reported that the urinary control rates at 3 months, 6 months and 1 year after LRP were 63.3%, 75.0% and 83.3%, respectively. Ploussard et al [20] reported that the urinary control rates of 1377 patients with LRP at 3 months, 6 months and 1 year were 39.4%, 58.9% and 68.5%, respectively. Porpiglia et al [38] reported that the urinary control rates of LRP at 3 months, 6 months and 1 year were 61.6%, 73.3% and 83.3%, respectively. Our results stated that the urinary control rates of “three-port” LRP at 3 months, 6 months and 1 year were 77.0%, 81.1% and 85.2% respectively, providing a stable recovery of urinary continence without increasing the incidence of postoperative urinary incontinence.

In conclusion, the “three-port” LRP can significantly shorten the OT and EBL, without increasing the rate of PSM, PSA biochemical recurrence and urinary incontinence. More importantly, it could obtain a considerable outcome in the tumor prognosis. Its main advantages were: (1) more fast recovery by reducing a puncture trocar; (2) avoiding improper traction and auxiliary operation by inexperienced assistants; (3) a triangle layout providing sufficient space, meanwhile reducing the fatigue of the surgeon. Admittedly, it must be addressed that there still existed some defects and disadvantages in the “three-port” LRP: (1) it is mainly suitable for extraperitoneal operation, not for the transperitoneal manipulation. If the extended lymph node dissection plans to be implemented, it needs to be converted to the traditionally “four-port” LRP; (2) if the prostate volume is larger, the operator will be limited in a narrow space, and thus the assistant is required to assist in providing an adequate exposure by adding an additional port ; (3) if there is much bleeding during the operation, the assistant is still demanded to suck the blood by using an aspirator in the fourth port.

This study was a retrospectively and non-randomized controlled study with inherent selection bias. In this study, the follow-up time of tumor prognosis and functional prognosis is relatively short. In the future, a prospectively randomized controlled study with a large sample and long-term follow-up is needed to further confirm the advantages of “three-port” LRP in surgical, functional and oncological outcomes.

Conclusions

In conclusion, innovatively “three-port” LRP can significantly shorten the OT and reduce the EBL compared with the traditionally “four-port” LRP. Meanwhile, it does not increase the positive rate of PSM and PSA biochemical recurrence. “Three-port” LRP could be popularized in the future in view of its superior surgical technique, considerably functional outcomes and remarkably oncological control.

Abbreviations

laparoscopic radical prostatectomy (LRP)

prostate cancer (PCa)

operative time (OT)

estimated blood loss (EBL)

positive surgical margin (PSM)

prostate specific antigen (PSA)

overall survival (OS)

biochemical recurrence-free survival (BRFS)

robot-assisted laparoscopic radical prostatectomy (RARP)

body mass index (BMI)

dorsal vein complex (DVC)

standard deviation (SD)

Declarations

- **Ethics approval and consent to participate**

This experiment was approved by Peking University First Hospital. All of the patients consent to participate in this research.

- **Consent for publication**

Yes

- **Availability of data and materials**

N/A

- **Competing interests**

None

- **Funding**

None

- **Authors' contributions**

XB and CSD carried out the design of this research, analysis and interpretation of data, and drafted the manuscript. PYJ participated in the collection of data and data analysis. ZQ assisted in the design of this research and project development. All authors read and approved the final manuscript.

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References

[1] Ferlay J, Soerjomataram I, Dikshit R, et al. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. Int J Cancer, 2015, 136: e359-386.

[2] Wong MC, Goggins WB, Wang HH, et al. Global incidence and mortality for prostate cancer: analysis of temporal patterns and trends in 36 countries. Eur Urol, 2016, 70: 862-874.

[3] Chen W, Zheng R, Baade PD, et al. Cancer statistics in China, 2015. CA Cancer J Clin, 2016, 66: 115-132.

[4] Mottet N, Bellmunt J, Bolla M, et al. EAU-ESTRO-SIOG guidelines on prostate cancer. Part 1: screening, diagnosis, and local treatment with curative intent. Eur Urol, 2017, 71: 618-629.

[5] Guillonneau B, Cathelineau X, Barret E, et al. Laparoscopic radical prostatectomy: technical and early oncological assessment of 40 operations. Eur Urol, 1999, 36: 14-20.

[6] Robertson C, Close A, Fraser C, et al. Relative effectiveness of robot-assisted and standard laparoscopic prostatectomy as alternatives to open radical prostatectomy for treatment of localised prostate cancer: a systematic review and mixed treatment comparison meta-analysis. BJU Int, 2013, 112: 798-812.

[7] Zihni AM, Ohu I, Cavallo JA, et al. Ergonomic analysis of robot-assisted and traditional laparoscopic procedures. Surg Endosc, 2014, 28: 3379-3384.

[8] Lee GI, Lee MR, Clanton T, et al. Comparative assessment of physical and cognitive ergonomics associated with robotic and traditional laparoscopic surgeries. Surg Endosc, 2014, 28: 456-465.

[9] Forsmark A, Gehrman J, Angenete E, et al. Health economic analysis of open and robot-assisted laparoscopic surgery for prostate cancer within the prospective multicentre LAPPRO trial. Eur Urol, 2018, 74: 816-824.

[10] Lepor H, Kaci L, Xue X. Continence following radical retropubic prostatectomy using self-reporting instruments. J Urol, 2004, 171: 1212-1215.

[11] Trinh QD, Sammon J, Sun M, et al. Perioperative outcomes of robot-assisted radical prostatectomy compared with open radical prostatectomy: results from the nationwide inpatient sample. Eur Urol, 2012, 61: 679-685.

[12] Novara G, Ficarra V, Rosen RC, et al. Systematic review and meta-analysis of perioperative outcomes and complications after robot-assisted radical prostatectomy. Eur Urol, 2012, 62: 431-452.

[13] Tewari A, Sooriakumaran P, Bloch DA, et al. Positive surgical margin and perioperative complication rates of primary surgical treatments for prostate cancer: a systematic review and meta-analysis comparing retropubic, laparoscopic, and robotic prostatectomy. Eur Urol, 2012, 62: 1-15.

[14] Huang X, Wang L, Zheng X, et al. Comparison of perioperative, functional, and oncologic outcomes between standard laparoscopic and robotic-assisted radical prostatectomy: a systemic review and meta-analysis. Surg Endosc, 2017, 31: 1045-1060.

[15] Cao L, Yang Z, Qi L, et al. Robot-assisted and laparoscopic vs open radical prostatectomy in clinically localized prostate cancer: perioperative, functional, and oncological outcomes: a systematic review and meta-analysis. Medicine (Baltimore), 2019, 98: e15770.

[16] Bolenz C, Freedland SJ, Hollenbeck BK, et al. Costs of radical prostatectomy for prostate cancer: a systematic review. Eur Urol, 2014, 65: 316-324.

[17] Schuessler WW, Schulam PG, Clayman RV, et al. Laparoscopic radical prostatectomy: initial short-term experience. Urology, 1997, 50: 854-857.

[18] Rassweiler J, Seemann O, Schulze M, et al. Laparoscopic versus open radical prostatectomy: a comparative study at a single institution. J Urol, 2003, 169: 1689-1693.

[19] Hu JC, Nelson RA, Wilson TG, et al. Perioperative complications of laparoscopic and robotic assisted laparoscopic radical prostatectomy. J Urol, 2006, 175: 541-546.

[20] Ploussard G, de la Taille A, Moulin M, et al. Comparisons of the perioperative, functional, and oncologic outcomes after robot-assisted versus pure extraperitoneal laparoscopic radical prostatectomy. Eur Urol, 2014, 65: 610-619.

[21] Akand M, Celik O, Avci E, et al. Open, laparoscopic and robot-assisted laparoscopic radical prostatectomy : comparative analysis of operative and pathologic outcomes for three techniques with a single surgeon’s experience. Eur Rev Med Pharmacol Sci, 2015, 19 : 525-531.

[22] Cáceres F, Cabrera PM, García-Tello A, et al. Safety study of umbilical single-port laparoscopic radical prostatectomy with a new DuoRotate system. Eur Urol, 2012, 62: 1143- 1149.

[23] Nakane A, Akita H, Okamura T, et al. Feasibility of a novel extraperitoneal two-port laparoendoscopic approach for radical prostatectomy: an initial study. Int J Urol, 2013, 20: 729-733.

[24] Papachristos A, Basto M, Marvelde LT, et al. Laparoscopic versus robotic-assisted radical prostatectomy : an Australian single-surgeon series. ANZ J Surg, 2015, 85 : 154-158.

[25] Goeman L, Salomon L, La De Taille A, et al. Long-term functional and oncological results after retroperitoneal laparoscopic prostatectomy according to a prospective evaluation of 550 patients. World J Urol, 2006, 24: 281-288.

[26] Juan HC, Yeh HC, Li CC, et al. Complications of laparoscopic radical prostatectomy–a single institute experience. Kaohsiung J Med Sci, 2012, 28: 550-554.

[27] Hruza M, Bermejo JL, Flinspach B, et al. Long-term oncological outcomes after laparoscopic radical prostatectomy. BJU Int, 2013, 111 : 271-280.

[28] Park JW, Won LH, Kim W, et al. Comparative assessment of a single surgeon's series of laparoscopic radical prostatectomy: conventional versus robot-assisted. J Endourol, 2011, 25: 597-602.

[29] Pierorazio PM, Mullins JK, Eifler JB, et al. Contemporaneous comparison of open vs minimally-invasive radical prostatectomy for high-risk prostate cancer. BJU Int, 2013, 112: 751-757.

[30] Drouin SJ, Vaessen C, Hupertan V, et al. Comparison of mid-term carcinologic control obtained after open, laparoscopic, and robot-assisted radical prostatectomy for localized prostate cancer. World J Urol, 2009, 27: 599-605.

[31] Xylinas E, Durand X, Ploussard G, et al. Evaluation of combined oncologic and functional outcomes after robotic-assisted laparoscopic extraperitoneal radical prostatectomy: trifecta rate of achieving continence, potency and cancer control. Urol Oncol, 2013, 31 : 99-103.

[32] Tasci AI, Tufek I, Gumus E, et al. Oncologic results, functional outcomes, and complications rates of robotic-assisted radical prostatectomy : multicenter experience in Turkey including 1499 patients. World J Urol, 2015, 33 : 1095-1102.

[33] Karakiewicz PI, Eastham JA, Graefen M, et al. Prognostic impact of positive surgical margins in surgically treated prostate cancer: multi-institutional assessment of 5831 patients. Urology, 2005, 66: 1245-1250.

[34] Kasraeian A, Barret E, Chan J, et al. Comparison of the rate, location and size of positive surgical margins after laparoscopic and robot-assisted laparoscopic radical prostatectomy. BJU Int, 2011, 108: 1174-1178.

[35] Sooriakumaran P, Srivastava A, Shariat SF, et al. A multinational, multi-institutional study comparing positive surgical margin rates among 22393 open, laparoscopic, and robot-assisted radical prostatectomy patients. Eur Urol, 2014, 66: 450-456.

[36] Dahl DM, Barry MJ, McGovern FJ, et al. A prospective study of symptom distress and return to baseline function after open versus laparoscopic radical prostatectomy. J Urol, 2009, 182: 956-965.

[37] Asimakopoulos AD, Pereira Fraga CT, Annino F, et al. Randomized comparison between laparoscopic and robot-assisted nerve-sparing radical prostatectomy. J Sex Med, 2011, 8: 1503-1512.

[38] Porpiglia F, Morra I, Lucci Chiarissi M, et al. Randomised controlled trial comparing laparoscopic and robot-assisted radical prostatectomy. Eur Urol, 2013, 63: 606-614.

Tables

Table 1 The patients’ baseline characteristics in both groups

	Overall	Group_A	Group_B	P value
	234	112	122	
n (SD))	66.92 (7.80)	67.07 (8.75)	66.79 (6.85)	0.781
an (SD))	13.90 (6.43)	14.22 (6.24)	13.60 (6.62)	0.465
eason Scores (%)				0.597
	69 (29.5)	29 (25.9)	40 (32.8)	
	49 (20.9)	28 (25.0)	21 (17.2)	
	14 (6.0)	5 (4.5)	9 (7.4)	
	85 (36.3)	41 (36.6)	44 (36.1)	
	6 (2.6)	3 (2.7)	3 (2.5)	
	11 (4.7)	6 (5.4)	5 (4.1)	
(%)				0.638
	11 (4.7)	4 (3.6)	7 (5.7)	
	32 (13.7)	14 (12.5)	18 (14.8)	
	160 (68.4)	81 (72.3)	79 (64.8)	
	28 (12.0)	11 (9.8)	17 (13.9)	
	3 (1.3)	2 (1.8)	1 (0.8)	

Table 2 Intraoperatively surgical parameters in both groups

	Overall	Group A	Group B	P value
	234	112	122	
. (SD))	98.40 (30.27)	105.06 (30.79)	92.28 (28.57)	0.001
n (SD))	112.49 (64.05)	121.90 (67.09)	103.85 (60.11)	0.031
zation (mean (SD))	4.52 (1.14)	4.54 (1.34)	4.50 (0.93)	0.812
Days (mean (SD))	3.45 (0.90)	3.47 (1.01)	3.43 (0.79)	0.743

Table 3. Patient characteristics

	Overall	Group_A	Group_B	p
	234	112	122	
(%)				0.809
	16 (6.8)	8 (7.1)	8 (6.6)	
	125 (53.4)	63 (56.2)	62 (50.8)	
	56 (23.9)	24 (21.4)	32 (26.2)	
	37 (15.8)	17 (15.2)	20 (16.4)	
(%)				0.638
	16 (6.8)	7 (6.2)	9 (7.4)	
	70 (29.9)	27 (24.1)	43 (35.2)	
	100 (42.7)	57 (50.9)	43 (35.2)	
	3 (1.3)	1 (0.9)	2 (1.6)	
	30 (12.8)	12 (10.7)	18 (14.8)	
	7 (3.0)	3 (2.7)	4 (3.3)	
	8 (3.4)	5 (4.5)	3 (2.5)	
Margin (%)				1
	159 (67.9)	76 (67.9)	83 (68.0)	
	75 (32.1)	36 (32.1)	39 (32.0)	
calRecurrence (%)				1
	209 (89.3)	100 (89.3)	109 (89.3)	
	25 (10.7)	12 (10.7)	13 (10.7)	
ce(%)				
nth	186 (79.5)	92 (82.1)	94 (77.0)	0.423
th	196 (83.8)	97 (86.6)	99 (81.1)	0.340
onth	206 (88.0)	102 (91.1)	104 (85.2)	0.242

Table 4 A synopsis of published series on the surgical treatment of PCa

Reference	Treatment	No. of patients	OT (min)	EBL (ml)	Drainage days (d)	Hospitalization days (d)
Akand M [21] et al	ORP	50	255	602	16.3	9.1
Caceres F [22] et al	single-port LRP	31	207	258	NA	2.9
Nakane A [23] et al	two-port LRP	22	259	946	6	NA
Akand M [21] et al	conventional LRP	308	208.5	526	8.2	3.2
Papachristos A [24] et al	conventional LRP	100	195	300	NA	2
Goeman L [25] et al	conventional LRP	550	188	390	5.9	4.6
Juan HC [26] et al	conventional LRP	41	294	200	8	10
Hruza M [27] et al	conventional LRP	500	256	NA	NA	NA
Akand M [21] et al	RARP	79	242.6	234	6.8	3.2
Papachristos A [24] et al	RARP	100	195	300	NA	2
Park JW [28] et al	RARP	44	371	220	8	7
Pierorazio PM [29] et al	RARP	105	NA	NA	NA	NA
Drouin SJ [30] et al	RARP	71	199.6	310.7	8.1	4.4
Ploussard G [20] et al	RARP	1009	128.9	515.4	8.0	4.0
Xylinas E [31] et al	RARP	500	NA	NA	NA	NA
Tasci AI [32] et al	RARP	1499	181.9	225.4	2.3	2.9
Our series	three-port LRP	122	92.28	103.85	4.50	3.43

Figures

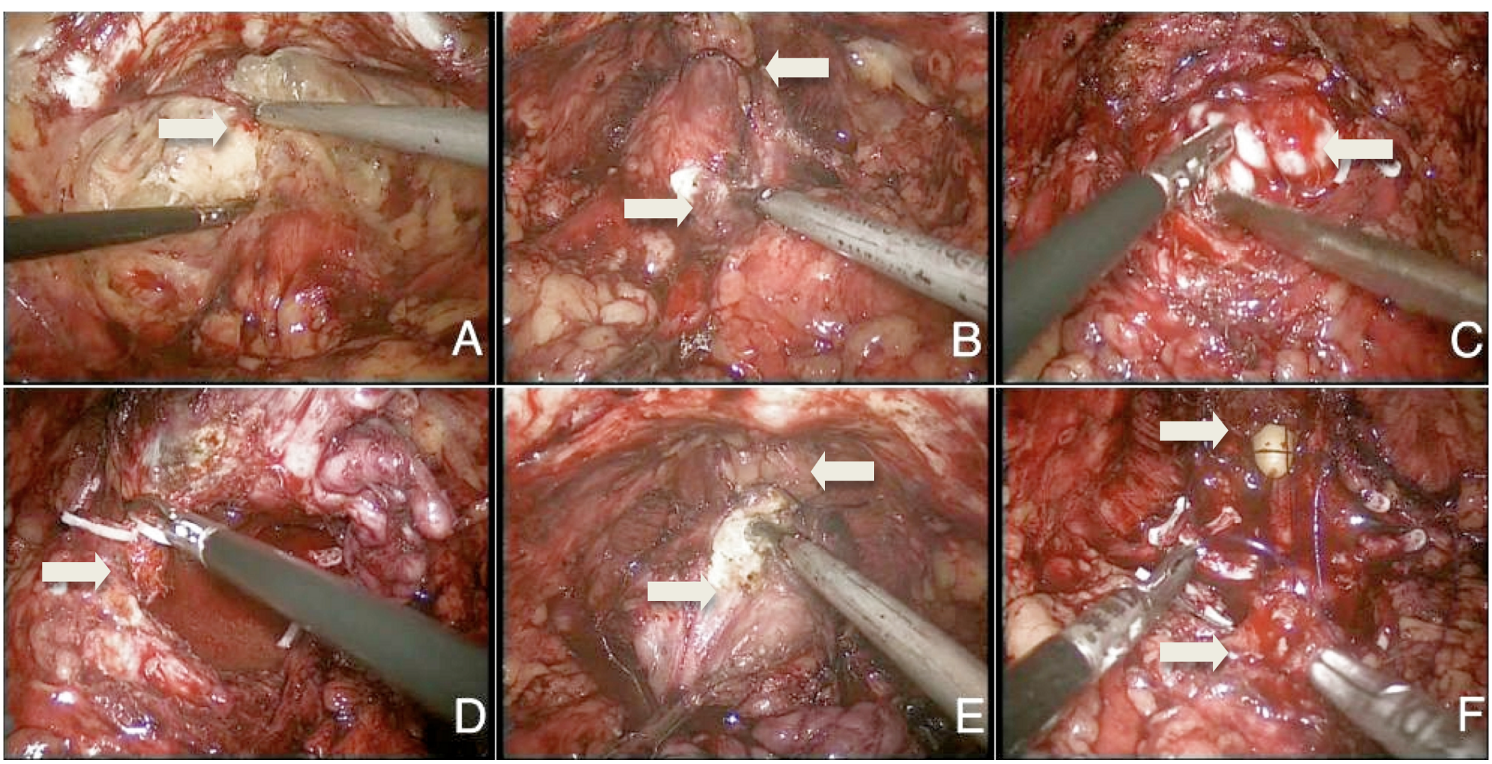

Figure 1

The “six step” - “step by step” procedure. (A) The dissection of the endopelvic fascia (white arrow indicated). (B) The transection of the bladder neck (lower white arrow indicated) after the DVC (upper white arrow indicated) was ligated. (C) The dissection of the seminal vesicles (white arrow indicated). (D) The division of the prostatic pedicle (white arrow indicated). (E) The dissection of prostatic apex (lower white arrow indicated) close to the ligated DVC (upper white arrow indicated). (F) The anastomosis of urethra (upper white arrow indicated) and bladder neck (lower white arrow indicated).

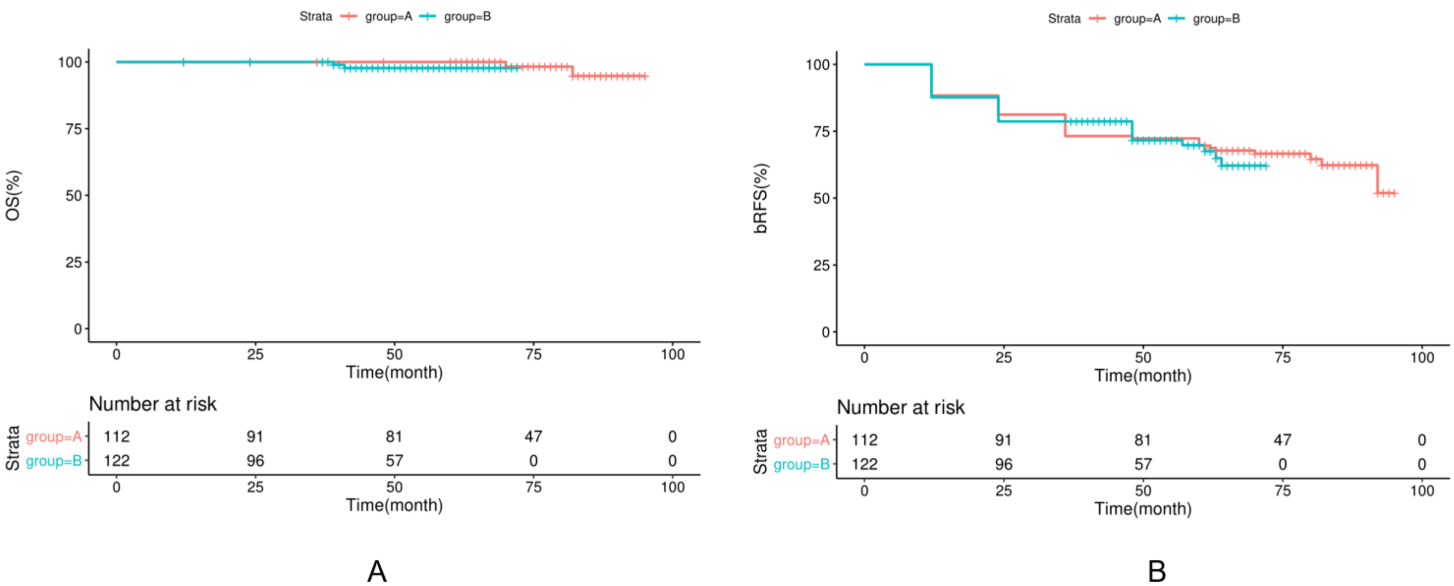

Figure 2

The survival rate of PCa patients after LRP. (A) The OS rate of PCa patients in group A (red line) and group B (green line). (B) The BRFS rata of PCa patients in group A (red line) and group B (green line).