

Comparison of Health-Related Quality of Life Changes in Prostate Cancer Patients Undergoing Laparoscopic versus Robotic-Assisted Laparoscopic Radical Prostatectomy: A Systematic review

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Purpose: To compare the effects of RALP and LRP on health-related QoL following radical prostatectomy, focusing on studies performed via validated QoL questionnaires measuring particularly general health-related QoL.

Material and Methods: A systematic search was conducted using Web of Science, PubMed (MEDLINE) on 15 January 2023 with the following search terms solely or in combination: "robotic radical prostatectomy", "laparoscopic radical prostatectomy," and "quality of life". After retrieving the titles and abstracts of selected articles, the full texts of related articles were screened.

Results: After full-text evaluation, among 185 articles, 23 articles were found eligible for inclusion. Hoze et al. reported that the global health status at the 12th month of the surgery was almost the same in both groups according to EORTC-QLQ-C30 scores (76.3 in the RALRP group vs. 76.1 in the LRP group). Wang et al. reported a 75 point of EORTC-QOL-C30 global health status ten years after LRP. Wyler et al. found that the 1-3 month EORTC-QLQ-C30 global health score was significantly worse than the baseline score, 65.3±18.3 vs. 77.2±18.2; however, it returned to baseline in 13-24 months (77.7±16.8) even proceed baseline score in experienced hands at 49-58 months follow up, 78.2±17.8 vs. 85.3±15.5. The frequently used patient-reported quality of life questionnaire following RALRP was EORTC-QLQ.

Conclusion: Both robotic-assisted and laparoscopic radical prostatectomy are valid treatment options to achieve a good quality of life following surgery. The intermediate and long-term results in regard to QoL are comparable between the two procedures. RALRP might be superior to LRP in terms of immediate health-related quality of life, which might contribute to early recovery of urinary function.

Keywords: robotic-assisted surgery; laparoscopic surgery; radical prostatectomy; quality of life

INTRODUCTION

Prostate cancer is the second most frequent malignancy of men world-wide, following lung cancer. The incidence and mortality of prostate cancer increase with age, and the mean age at the time of diagnosis was found to be 66 years. In 2018, a total of 1,276,106 newly diagnosed prostate cancer cases were registered across the world. The mortality of prostate cancer also varies considerably world-wide⁽¹⁾. After the first diagnosis of prostate cancer by J. Adams in 1853, remarkable changes have emerged in the diagnosis and treatment of prostate cancer⁽²⁾. While patients were presenting with metastatic prostate cancer in the past with the discovery of prostate-specific antigen (PSA) in the 1970s⁽³⁾ and improvement in diagnostic tests and surgical techniques, there has been a dramatic increase in patients treated by prostatectomy⁽²⁾. Treatment alternatives for men diagnosed with localized prostate cancer include expectant management, surgery, and radiation⁽⁴⁾. After the description and evolution of anatomic radical prostatectomy by Walsh⁽⁵⁾ in 1998, with the reduction in the morbidity of the procedure, it gained popularity and became widely applicable

world-wide. Thanks to the developments in technology, a revolution in surgical approaches had taken place, and minimally invasive surgical techniques like laparoscopic and robotic-assisted prostatectomy became a viable alternative to open surgery⁽⁶⁾. Following the description in 1991, laparoscopic radical prostatectomy has undergone several modifications. Laparoscopic radical prostatectomy (LRP) is also technically difficult, which warrants long training periods with high caseloads. The da Vinci[®] (Intuitive Surgical, CA, USA) robotic system was introduced in 2001 and has gained popularity in the urologic field since it overcomes many performance limitations associated with standard laparoscopy⁽⁶⁾. It has been shown that approximately 40% of all radical prostatectomies performed in the United States in 2006 were performed with robotic assistance. The early reports also demonstrated that laparoscopic surgery was associated with decreased blood loss and decreased risk of blood transfusion⁽⁷⁾.

Although there have been several treatment options in localized prostate cancer with similar oncological outcomes, quality of life (QoL) is a relevant criterion for patients when selecting the treatment modality. Each treatment modality has different effects on QoL. Erec-

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Table 1. Details of the patients and characteristics of the studies included the study

No	Authors	Year	Study design	Surgery Type	Patient number	Questionnaire	Age (years)	1st mnt	3rd mnt	6th mnt	12th mnt
1	Acar C et al.	2014	Prospective database, retrospectively analyzed	RARP vs brachytherapy vs AS	65	EORTC QLQ	59.50	81.57 (mean point)			
2	Anceschi, U et al	2013	Prospective database, retrospectively analyzed, controlled	PDR	52	SF-36	67.2	92	81	66	66
3	Aning, JJ et al	2018	Prospective study	RARP	357	FACT-P	64.5	64	53	50	50
4	Dijkstra-Eshuis, J et al.	2015	Prospective randomized controlled study	RARP	121	KHQ (General health)	63.7	24.48			
5	Feng, M et al	2020	Prospective controlled study	LRP	112	GQLI-74	64.5				
6	Garcia-Sanchez, C et al.	2017	Prospective	RARP vs brachytherapy vs AS	42	SF-36	60.00	63.3 (at discharge)			
7	Haga, N et al.	2016	Prospective observational	RARP (vs patient with LUTS without LUTS)	100	QoL index	43	67 (57-76)	2.80		
8	Haga, N et al.	2018	Prospective cohort	RARP	88	QoL index	57	65 (52-78)	2.5		
9	Hagens, MJ et al.	2022	Retrospective	RARP	528	EORTC QOQ-C30	67 (63-71)				
10	Hikita, K et al.	2022	Retrospective RARP Nerve-sparing	RARP	187	QOL index	65(49-76)	4(3-5)	3(1-4)	2(1-4)	2(1-3)
11	Holze, S et al.	2022	Non-nerve sparing Multicenter, randomized controlled	RARP vs LRP	47	EORTC QLQ-C30	64(52-76)	5(3-6)	4(2-5)	3(1-4)	2(1-3)
12	Joshi N et al.	2010	Prospective controlled MFRR Control	RARP	107	EORTC QLQ-C30	65 (59-69)	61.8	71	74	76.3
13	Namiki, S et al.	2005	Prospective	LRP vs RRP	166	SF-36	65(59-70)	61.6	69.2	73.4	76.1
14	Namiki, S et al.	2006	Prospective	LRP vs RRP vs PRP	45	SF-36	60.8+9.1	54.9+16.6	61.3+14.9	59.8+13.3	61+19
15	Rush, S et al.	2015	Retrospective	RARP vs OP	974	PORPUS-P	60.4+7.8	50.4+14.5	63.8+16.4	63.6+14.6	56.3+14.5
16	Umari, P et al.	2021	Prospective database, retrospectively analyzed,	RARP	483	EQ-5D	64.7+5.8	84.7+11.2 (mean point)	61.8+7.5		
17	van der Poel et al.	2009	Retzius sparing Prospective	RARP	201	EORTC QLQ-C30	62.8+7.4	0.81+0.18	0.93+0.12	0.95+0.11	0.93+0.14
18	van der Poel et al.	2009	Prospective	RARP	282	EORTC QLQ-c30	57.7+0.8	61.8+0.7	85.5+14.7		
19	Wang, CX et al.	2018	Prospective randomized controlled trial	RARP	70	SF-36	61.8+0.7	59.9+5.7	83		
20	Wang, EYH et al.	2014	Prospective	RARP	49	EORTC QLQ-C30	60.1+5.7	69.2+6.7	75.4+8.1	79.9+6	85.7+7.4
21	Wang, LS et al.	2011	Prospective database, retrospectively analyzed	RARP	100	QOL	61.1+5.6	70.1+5	71+7.1	75.7+5.9	79.9+6.7
22	Wyler, SF et al.	2007	Prospective	LRP	343	EORTC QOL-C30	63.3+6.3	65.3+18.3			
23	Xylinas, E et al.	2010	Prospective database	RARP	50	EORTC- QOL	60.8 (49-71)	36	34	29.5	

PDR: personal modified posterior reconstruction technique PFT: Pelvic floor physiotherapy IPP: intravesical prostatic protrusion
 MFRR: Median fibrous raphe reconstruction PRP: Perineal radical prostatectomy PORPUS-P: Patient-Oriented Prostate Utility Scale-Psychometric
 EQ-5D: European Quality of live group 5 KHQ: King's health Questionnaire

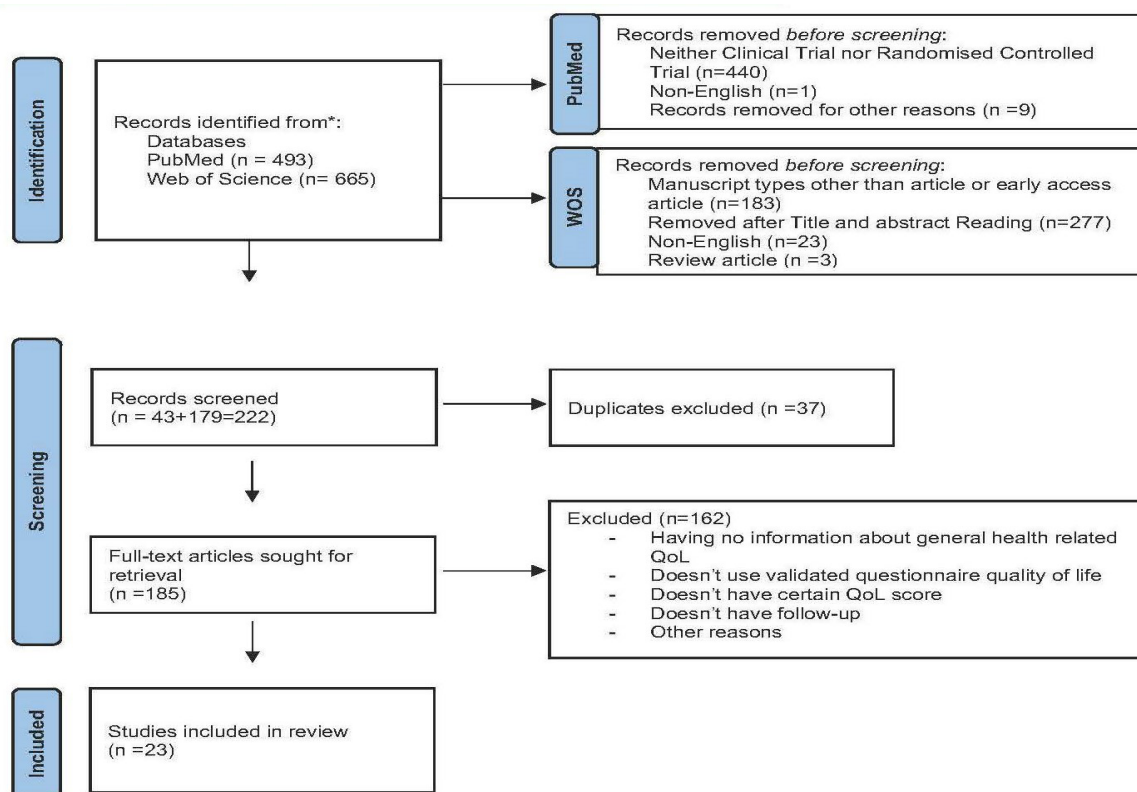


Figure 1. Identification of Studies via databases and registers..

tile dysfunction and urinary incontinence are the most responsible factors associated with diminished QoL⁽⁸⁾. In several studies, robotic-assisted laparoscopic prostatectomy (RALP) and LRP have been shown to have superior functional outcomes compared to radical retropubic prostatectomy⁽⁹⁾. Since RALP has a higher cost compared to LRP, mainly due to increased surgical supply and operating room costs, LRP might be the treatment of choice for patients to decrease operating costs while maintaining some QoL compared to RALP⁽¹⁰⁾. In this review, we aimed to compare the effects of RALP and LRP on health-related QoL following radical prostatectomy, focusing on studies performed via validated QoL questionnaires measuring particularly general health-related QoL.

MATERIAL AND METHODS

Search Strategy

Relying on the PRISMA criteria⁽¹¹⁾, a systematic search was conducted using Web of Science, PubMed (Medline) on 15 January 2023 with the following search terms solely or in combination: "robotic radical prostatectomy", "laparoscopic radical prostatectomy," and "quality of life". After retrieving the titles and abstracts of selected articles, the full texts of related articles were screened. The PICO: Population (P), Intervention (I), Comparison (C), Outcomes (O) approach was used to determine eligibility criteria⁽¹²⁾. We thus selected studies in which patients diagnosed with prostate cancer (P), underwent radical prostatectomy (I) was compared according to surgical approach (via robotic-assisted laparoscopic surgery or pure laparoscopic surgery) (C), to assess health-related QoL (O). The article selection

process is shown in **Figure 1**. Our exclusion criteria were as follows:

- Studies related to prostatectomy for benign urological diseases
- Studies not using a validated QoL questionnaire
- Studies only evaluating particular quality of life domains
- Studies don't have a follow up
- Studies don't have a certain health-related quality of life scores i.e. presenting outcomes with graphics.
- Studies not written in English,
- Review articles, editorials/letters, case reports, conference/meeting abstracts, and replies to authors.

Data Extraction

Articles relevant to our subject of interest were retrieved and evaluated independently by two authors. First authors, year of the study, number and age of patients, type of surgery, QoL questionnaire, health-related QoL scores at postoperative 1st, 3rd, 6th, and 12th months.

RESULTS

In search of the aforementioned databases, we identified a total of 1158 (493 PubMed, 665 WOS) related studies. Among 490 PubMed studies, 50 were Clinical Trials or randomised controlled studies. Ten studies were excluded for the following reasons: non-English language: 1 and found non-eligible after the title and abstract reading: 9. Three studies were retrieved from citation matching. Among 665 WOS studies, 486 were excluded due to the following: not in article format: 183, not-written in English: 23, review articles: 3, found non-eligible after the title and abstract reading:

277. Then PubMed and WOS database was merged. Among 222 studies, 37 were excluded due to duplication. After full-text evaluation, among 185 articles, 23 articles were^(8,13-34) found eligible for inclusion (**Figure 1**).

The utilized questionnaires in the studies were as follows: The European Organization for Research and Treatment of Cancer Quality of Life questionnaire (EORTC- QLQ), The 36-Item Short Form Health Survey (SF-36), Functional Assessment of Cancer Therapy – Prostate (FACT-P), King's health Questionnaire (KHQ), The gastrointestinal quality of life index (GQLI-74), Quality of Life Index (QoL index), PORPUS-P (Patient-Oriented Prostate Utility Scale-Psychometric) and Euro Quality of Life 5 Dimensions (EQ-5D) (**Table 1**).

The frequently used patient-reported quality of life questionnaire following RALRP was EORTC-QLQ^(8,13,21,23,28,29,34). The mean QoL score was 81.57 in the study by Acar et al.⁽¹³⁾, the 6th-month score varied between 89 and 99 in the study by Hagens et al.⁽²¹⁾, 1st and 12 months scores varied between 61.8 and 76.3 in Holze et al.'s study⁽⁸⁾. The 6th-month score was 60 and 64 in the study by Joshi et al.⁽²³⁾, and the 6th-month score varies between 60⁽²⁹⁾ and 85.5 ± 14.7⁽²⁸⁾ in two studies by Van der Poel et al.. The results of the study by Xylinas et al.⁽³⁴⁾ are hard to interpret since the details of the questionnaire were only given in graphics.

In their RCT, including 681 QoL data evaluable patients, Hoze et al.⁽⁸⁾ reported that RARP patients returned to baseline global health status (three vs. six months) and social functioning (6 vs. 12 months) earlier compared to LRP patients. Short-term recovery of urinary symptoms was also found to be superior in RALRP patients than in LRP patients. Interestingly, the global health status at the 12th month of the surgery was almost the same in both groups according to EORTC- QLQ-C30 scores (76.3 in the RALRP group vs. 76.1 in the LRP group). In another study with a relatively small number of patients (42 patients), Wang et al.⁽³¹⁾ reported a 75 point of EORTC-QOL-C30 global health status ten years after LRP. In their study, Wyler et al.⁽³³⁾ investigated whether the learning curve of laparoscopic novices has a negative impact on patients' QoL following LRP. They found that the learning curve of laparoscopic novices does not have a negative impact on patient QoL, such as at intermediate and long-term follow-up, patients reached their baseline or scored even better in all domains except for sexual functioning. The 1-3 month EORTC-QLQ-C30 global health score was significantly worse than the baseline score, 65.3 ± 18.3 vs. 77.2 ± 18.2; however, it returned to baseline in 13-24 months (77.7 ± 16.8) even proceed baseline score in experienced hands at 49-58 months follow up, 78.2 ± 17.8 vs. 85.3 ± 15.5.

In some studies, authors aimed to evaluate different surgical approaches on QoL. Anceshi et al.⁽¹⁴⁾ investigated the impact of posterior Denonvilliers' reconstruction (PDR) technique on LRP outcomes. They concluded that PDR was associated with higher continence rates at 1st and 3rd postoperative months. In their study, Haga et al.⁽²⁰⁾ evaluated the feasibility of using barbed sutures in vesicourethral anastomosis during RARP. They reported that QoL index was higher in the barbed suture group than nonbarbed suture group at 1,9, 12 months. Hikita et al.⁽²²⁾ compared the outcomes of nerve-sparing RARP and non-nerve sparing RARP. They found that

nerve-sparing had a strong impact on urinary incontinence in the early postoperative period. Joshi et al.⁽²³⁾ applied median fibrous raphe reconstruction (MFRR) to their patient undergoing RARP and did not find any superiority compared to controls.

Umari et al.⁽²⁷⁾ investigated the outcomes of RARP and retzius sparing RARP. They found that Retzius sparing RARP is associated with better immediate continence than standard RARP.

DISCUSSION

Currently, prostate cancer patients expect not only the best oncological outcomes but also functional outcomes as well as good quality of life. Minimal invasive surgeries, namely robotic-assisted laparoscopic prostatectomy and pure laparoscopic radical prostatectomy, promise decreased pain medication need, hospital stay, and convalescence. At the beginning of laparoscopic radical prostatectomy, the operation time was too long, and questions were raised on the feasibility of the procedure as well as its learning curve. However, with the improvement of surgical instruments, intracorporeal suturing expertise operation times decreased, and functional outcomes increased. Finally, with the development of robotic-assisted procedures, the technical challenges of laparoscopy were overcome⁽⁶⁾. Robot-assisted radical prostatectomy has become the standard care of surgical treatment of localized prostate cancer in many institutions world-wide. Parallel to the increased oncological and functional outcome expectations following surgery, men are seeking more accessible patient-centered information about the treatment options for PCa, associated adverse events, and their effect on the quality of life to make a treatment decision⁽¹⁵⁾.

There have been various questionnaires to evaluate the patient quality of life including EORTC-QLQ⁽¹³⁾, Patient-Reported Outcome Measurement Information System (PROMIS)⁽³⁵⁾, International consultation on incontinence questionnaire short form (ICIQ-SF)⁽¹⁴⁾, the Medical Outcomes Study 36-Item Short Form (SF-36)⁽¹⁴⁾, the King's Health Questionnaire (KHQ)⁽¹⁶⁾, the short form of the international continence society (ICS) male questionnaire (ICSMALESF-Q)⁽³⁶⁾, Generic Quality of Life Inventory-74 (GQLI-74)⁽¹⁷⁾, the UCLA Prostate Cancer Index⁽²⁵⁾ and QOL index⁽¹⁹⁾. These surveys are not superior to each other. Some measure the quality of life in general, while others measure the quality of life based on specific symptoms that are specific to a disease. The UCLA Prostate Cancer Index is a 20-item questionnaire that evaluates the prostate cancer-specific HRQOL in six separate domains⁽³⁷⁾. The SF-36 includes eight health domains as physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, general mental health, social functioning, energy/fatigue, and general health perceptions⁽³⁸⁾. EORTC-QLQ-C30 is utilized to evaluate the overall QoL of cancer patients. It consists of QoL domains including the physical, social, emotional, and cognitive functions, vitality/fatigue, pain, general health status, overall QoL, and life satisfaction⁽¹³⁾. King's Health Questionnaire (KHQ) includes eight domains as: general health, role limitations, physical limitations, social limitations, personal, emotional sleep/energy disturbance, symptom severity⁽³⁹⁾.

The deterioration in QoL following radical prostatecto-

my has been shown in several studies; however, there is a scarcity of data head-to-head comparing QoL between RARP and pure laparoscopic prostatectomy. To the best of our knowledge, there is only one randomized controlled trial comparing⁽⁸⁾ the clinical, functional, and oncological outcomes as well as QoL-related data via patient-reported outcome measures.

Many surgical modifications have been made to improve surgical and functional outcomes in both laparoscopic and robotic assisted surgeries^(14,20,23,27). Some of them were found to have a positive impact on early postoperative outcomes particularly in immediate continence rates.

The paucity of randomized controlled studies, different study designs, different evaluation protocols, and questionnaires in various patient cohorts make it difficult to compare laparoscopic and robotic-assisted laparoscopic radical prostatectomy in terms of general health-related quality of life. However, according to the limited data gathered, it might be said that laparoscopic radical prostatectomy and RALRP have comparable general quality of life outcomes in intermediate and long-term follow-ups. RALRP might be superior to LRP in terms of immediate health-related quality of life, which might contribute to early recovery of urinary function.

It should be mentioned that this review study has some limitations. For example, different inclusion and exclusion criteria in the studies, various quality of life measures, various follow-up schemes, and reporting manner are other significant limitations. Age and ethnicity of the patients as well as the learning curve of the surgeon thus the quality of the surgical procedure might also affect the outcomes. In addition, due to the lack of standardized follow-up schemes with the same questionnaires, it was impossible to conduct either pooling or meta-analysis of the extracted data.

CONCLUSIONS

Both robotic-assisted and laparoscopic radical prostatectomy are valid treatment options to achieve a good quality of life following surgery. The intermediate and long-term results in regard to QoL are comparable between the two procedures. RALRP might be superior to LRP in terms of immediate health-related quality of life, which might contribute to early recovery of urinary function.

CONFLICT OF INTEREST

Authors declared that there is no conflict of interest related to this article.

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