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Is There Any Evidence of Superiority between Retropubic, Laparoscopic or Robot-Assisted Radical Prostatectomy?

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ABSTRACT

Purpose: To compare the perioperative, short-term and long-term postoperative results of radical retropubic prostatectomy (RRP), laparoscopic radical prostatectomy (LRP) and robotic assisted laparoscopic prostatectomy (RALP) in the most recent studies evaluable.
Materials and Methods: Using PubMed we have undertaken a search based on references from major and recent articles with considerable sample sizes.
Results: The operative blood loss and the risk of transfusion were lower in the laparoscopic and robotic-assisted approaches. The surgical duration was shorter in the open and robotic group. Regarding the positive margins, continence and potency no substantial differences between the RRP, LRP, and RALP were found.
Conclusions: Our results suggest that no one surgical approach is superior in terms of functional and early oncologic outcomes. Potential advantages of any surgical approach have to be confirmed through longer-term follow-up and adequately designed clinical studies.

Key words: *retropubic prostatectomy; open prostatectomy; laparoscopic prostatectomy; robotic prostatectomy; outcomes*
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INTRODUCTION

Improvements in the knowledge of the anatomy of Santorini's dorsal venous complex, the neurovascular bundle and the striated urethral sphincter have allowed significant updates to surgical technique and subsequently to the standardization of the anatomic radical retropubic prostatectomy (RRP), as described by Walsh in 1982 (1,2). Many other important contributions have provided, by detailed anatomical studies, the optimization of the surgical technique, with the purpose of reducing short-term and long-term complications (3-10). Regardless of the vital importance of cancer control, patients are frequently concerned with any negative effects on urinary continence and sexual potency after surgery. Any effort to reduce these two important functional side- effects is a crucial goal for treatment innovations. The innovation of RRP has the potential to improve these side-effects.

Therefore, there is a growing interest in the development and improvement of minimally invasive approaches, to maintain the oncologic quality of care as well as to reduce the effect of treatments on patients' quality of life. Minimally invasive surgery (MIS) is a term which includes a variety of proce-

dures that prefer closed or local procedures with "less trauma" to open surgery. The classification of MIS is being constantly updated to include surgical techniques which allow reduced damage, decreased morbidity, less postoperative pain, shorter hospital stays and better cosmetics in conjunction with comparable diagnostic accuracy and therapeutic outcome to open surgery. As a result, laparoscopy and robotics have been widely used in urology for the treatment of prostate cancer particularly in recent years. In 1992 laparoscopic radical prostatectomy (LRP) was proposed by Schuessler et al. (11) but only standardized by Gaston in 1997. Some centers in Europe developed LRP, a technically demanding procedure with a significant learning curve and apparently good oncologic and functional results, after proper training (12-14).

In 2000 Binder and Kramer (15) reported the first LRP assisted by a robotic master-slave system (Da Vinci, Intuitive Surgical, Sunnyvale, CA.) and Menon et al. (16) standardized the robotic assisted laparoscopic prostatectomy (RALP) technique. Since then there has been increasing popularity of this new technology and several series have been published, with a significant contribution to the widespread diffusion of this approach (17,18). RALP offers many benefits reducing the difficulty involved in performing complex laparoscopic urologic procedures, particularly for non-laparoscopic surgeons (19,20). Therefore, its application might already yield a real advantage by shortening learning curves compared to conventional laparoscopy (21).

Despite the broad diffusion of LRP and RALP in recent years, only a few studies comparing the results of the new approaches to the classical retropubic technique are currently available. To date no randomized trials, to our knowledge, have been undertaken. MIS continues to evolve, however, further evaluation is required in order to confirm and validate the published reports (22). Meta-analyses allow for the pooling and quantification of results from different studies. As a result, we performed a systematic review to compare perioperative, cancer control, urinary continence, and sexual potency outcomes of the latest studies evaluating the three surgical techniques.

MATERIAL AND METHODS

Search Strategy

A search was conducted in October 2009 using Pub Med (of National Library of Medicine and the National Institutes of Health, including the MEDLINE database) from 2000 to 2009. We also performed additional searches based on references from relevant review articles both in English and in French. However, a special emphasis was placed on the latest publications.

We used citations and combinations of the terms "prostatectomy" and "outcome", key words as "open", "robotic", "laparoscopic", "continence" and "potency". We simply retrieved publications that referenced cancer control outcomes (i.e., pT2, pT3, positive margins, and localized disease) and functional outcomes as urinary continence or sexual potency and only included studies with a minimum sample size of 60 patients. Articles published only as abstracts and reports from meetings were not included in the review.

The authors independently reviewed the records in order to select the papers pertinent to the subject of the review. Outcomes were tabulated and analyzed from the resulting articles. Comparative and non-comparative studies were included.

Study Selection

After initial screening of inappropriate abstracts, the reference search identified 52 publications with major records, which we then studied in detail for content relevant to this review. Thirty-seven reports were identified (44702 patients) which had the latest pertinent results and were therefore suitable for data comparison (Table-1).

PERIOPERATIVE OUTCOMES (Table-2)

Operative Length

The evaluation of the operative time in different and heterogenic series is very complicated

Table 1 *– Studies included in the comparison between RRP, LRP and RALP.*

Author	Year	Type of study	Center	N patients
Badani (17)	2007	NC : R	S	2766
Patel (18)	2008	NC : R	S	1500
Rocco (26)	2009	C : O/R	S	360
Farnham (29)	2006	C: O/R	S	103
Hu (30)	2006	C : L/R	S	358
Schroeck (41)	2008	C : O/R	S	362
Krambeck (42)	2009	C: O/R	S	882
Touijer (46)	2008	C : O/L	S	1430
Zorn (53)	2007	NC : R	S	744
Chan (54)	2008	C : O/R	S	660
Murphy (55)	2009	NC : R	S	400
Ham (56)	2009	NC : R	S	321
Martina (57)	2005	NC : L	S	114
Rozet (58)	2005	NC : L	S	600
Lein (59)	2006	NC : L	S	1000
Christopher (60)	2008	NC : L	S	1000
Mirandolino (61)	2009	NC : L	M (4)	780
Gosseine (62)	2009	C : L/R	S	125
Stolzenburg (63)	2009	NC : L	M (3)	2400
Hsu (64)	2003	NC : O	S	1024
Han (65)	2004	NC : O	S	9035
Kundu (66)	2004	NC : O	S	3477
Roehl (67)	2004	NC : O	S	3478
Ward (68)	2004	NC : O	S	7268
Saranchuck (69)	2005	NC : O	S	1133
Jurczok (70)	2007	C : O/L	S	240
Joseph (71)	2006	NC : R	S	325
Mottrie (72)	2007	NC : R	S	184
Borin (73)	2007	NC : R	S	400
Van der Poel (74)	2009	NC : R	S	151
Lepor (75)	2004	NC : O	S	491
Jacobsen (76)	2007	C : O/L	S	239
Tewari (77)	2008	NC : R	S	215
Link (78)	2005	NC : L	S	122
Rassweiler (79)	2006	NC : L	S	562
Walsh (80)	2000	NC : O	S	64
Michl (81)	2006	NC : O	S	389
				44702

NC= non-comparative; C = comparative; O = Open; L= Laparoscopic; R= Robotic; S = Single institution; M = Multi-center.

Table 2 – *Perioperative results of RRP, LRP and RALP series.*

Study	Year	N (patients)	OR Time (min)	Mean EBL (mL)	% Transfused	Positive Margin Rate (%)		
						pT2	pT3	Total
Robotic								
Badani (17)	2007	2766	154	142	1.5	13	35	12.3
Zorn (53)	2007	744	234	222	1.2	12.9	44.8	18.8
Schroeck (41)	2008	362	-	150	-	-	-	29.3
Patel (18)	2008	1500	105	111	0.5	4	34	9.3
Chan (54)	2008	660	207	140	0.8	11.3	45	17.9
Murphy (55)	2009	400	186	-	2.5	9.6	42.3	19.2
Rocco (26)	2009	120	215	200	-	17	34	22
Ham (56)	2009	321	219	402	-	-	-	33.3
Weighted means		6873	141.75	158.22	1.20	10.48	37.45	15.33
Laparoscopic								
Martina (57)	2005	114	-	-	-	7.4	48,3	17
Rozet (58)	2005	600	173	380	1,2	14.6	25.6	17.7
Hu (30)	2006	358	246	200	2.2	-	-	-
Lein (59)	2006	1000	266	-	-	15	21,1	-
Christopher (60)	2008	1000	177	200	0.4	18.5	56,3	13,3
Mirandolino (61)	2009	780	124.9	335.9	5.3	16.4	34.6	19.58
Gosseine (62)	2009	125	241	538	6.4	-	-	-
Stolzenburg (63)	2009	2400	150.7	-	0.7	-	-	-
Weighted means		6377	179.13	289.5	1.62	15.99	35.85	16.49
Open								
Hsu (64)	2003	1024	131	813	-	-	-	-
Han (65)	2004	9035	-	-	-	7.7	26.9	14.7
Kundu (66)	2004	3477	-	-	-	-	-	-
Roehl (67)	2004	3478	-	-	-	-	18,1	19
Ward (68)	2004	7268	-	-	-	28	58	38
Saranchuck (69)	2005	1133	-	-	-	-	-	13
Farnham (29)	2006	103	-	664	2.9	-	-	-
Jurczok (70)	2007	240	120	550	9	-	-	-
Krambeck (42)	2009	564	204	-	13.1	-	-	-
Weighted means		26322	152.20	755.60	10.85	16.75	36.78	23.42

LRP = laparoscopic radical prostatectomy; RRP = radical retropubic prostatectomy; RALP = robotic assisted laparoscopic prostatectomy.

due to discrepancies in reporting this data to include set-up and pelvic lymph node dissection, especially when reporting on console docking time which often is not mentioned in the studies or not included in the overall operative time and consequently leading to potential bias. Contrary to what was initially thought,

open radical prostatectomy (RP) surgery was not in our review the one with the lowest operative duration (10 minutes more than RALP). This might be partially explained by the small number of studies of open RP with the variable time, particularly in the latest and largest series. In fact, there has been a lack of studies of open RP since the beginning of this decade and most of the numbers of the last reports came from comparative and retrospective studies. Nowadays, the institutions and surgeons with huge numbers in RRP do not report their updated series. However, in the randomized clinical trial of Guazzoni et al. (23) on level of evidence 1b, the operative time was slightly longer in LRP than in open RP. Rozet et al. (24) conducted a comparative study of robotic versus pure laparoscopic radical prostatectomy and showed that there was no significant difference in median operative time between the groups in centers with substantial laparoscopic experience.

We noticed in the different studies of robotic or laparoscopic interventions a decreasing mean surgical time from the first cases particularly in the 2009 series Patel et al. (18), evaluating a single-surgeon's experience of 1500 consecutive RALPs, recently reported a decrease in the duration from 120 min. in the first 300 cases to 105 min in the last 300 patients of the series. This was in agreement with the review conducted by Ficarra et al. (25), which showed that RALP is more time-consuming than RRP in the earlier phase of the learning curve, but that such differences disappeared with a larger robotic cohort of cases.

Blood Loss and Transfusion

After comparing the blood loss and transfusion rate it seems that open RP has a higher estimated blood loss and subsequently a greater need for transfusion. Beside the fact that most of the last series of RRP do not include these two variables, the practice behavior of some surgeons can diverge widely, as well as the absolute indications for a blood transfusion. This means that in some institutions the need for blood transfusion can depend on predetermined hemoglobin levels alone, others only when patients are symptomatic and others still as standardized protocol. Thus, a comparison between different studies might be biased essentially by practice patterns. It has been hypothesized to be a hallmark advantage of pneumoperitoneum laparoscopy and tight haemostatic control as most intraoperative blood loss originates from the venous sinuses, the tampon effect created by pneumoperitoneum helps to reduced blood loss, as well the early identification and meticulous ligation of vessels facilitates the limitation of blood loss. Guazzoni et al. (23) demonstrated lower blood loss and transfusion rates in the patients randomized to LRP (level of evidence: 1b). In Rocco et al. (26) comparison analysis showed that the mean blood loss during RALP was significantly lower than in RRP (200 vs. 800 mL; $P < 0.001$). The cumulative analysis of Ficarra et al. (25) showed that blood loss and transfusion rates were significantly lower in the patients undergoing LRP. The review of Parsons et al. (27) showed that the laparoscopic/robotic-assisted prostatectomy group was associated with significantly less operative blood loss, a 77% decreased risk of perioperative transfusion and considerably decreased incidence of perioperative transfusion compared to the open RP. According to Tewari et al. (28) and Farnham et al. (29) and like pure LRP, RALP showed considerably less blood loss and lower transfusion rates compared to RRP (level of evidence: 2b). Blood loss and transfusion rates in the LRP and RALP series were overlapping, according to Hu et al. (30) On the other hand, Lepor (31) compared the rate of allogeneic blood transfusion reported by experts performing open and laparoscopic surgery in institutions of reference and concluded that there seem to be no clinically significant differences between transfusion rates among expert surgeons performing open versus LRP.

SURGICAL MARGIN STATUS

The most important objective of radical prostatectomy is the oncologic cure (31). The great majority of biochemical recurrences will develop within the first 5 years after surgery (32). As this type of cancer is usually a slow growing disease it will take many years before the true impact of radical prostatectomy on cancer control is known. The positive surgical margins (PSM) percentage after RP is an independent predictive factor of biochemical recur-

rence, local recurrence and the development of distant metastasis especially in patients with extracapsular extension and high-grade disease (33). Hence, the PSM is one of the major outcomes to be evaluated in any surgical treatment proposed for prostate cancer. However, it is important to recognize that a PSM does not always indicate the presence of residual disease or that a negative margin assumes total eradication of the disease (34). Positive margin rate depends not only on the surgical technique but also on different factors such as the pathologist's criteria (35), patient selection (36), the period in which the surgery took place, and whether the margin status is also based on additional tissue sampling (37). For that reason, assessment of positive margin rates between the different techniques of radical prostatectomy should theoretically only compare cases from the same period and with matching criteria. Several studies such as Atug et al. (38) and Patel et al. (39) showed that surgeon's experience and learning curve could affect and predict the oncologic outcome after surgery, by lowering PSM percentages with increased surgeon practice. However, a recent study by Shah et al. (40) suggests that an excellent oncologic outcome can be obtained during the learning curve. Positive margin status should also be distributed according to its pathologically stage: organ confined (pT2) versus those with extracapsular extension (pT3). Thus, a positive margin in men with pT2 disease is most likely attributable to a breach of technique from an inadvertent capsular incision. The results are conflicting for the comparison of PSM rates among the different surgical techniques (open, laparoscopic and robotic). In Parsons et al. (27) review of comparative studies showed no significant differences in overall risk or incidence of PSM between the three approaches and tumor stage. Similarly, Schroek et al. (41) and Krambeck et al. (42) found no significant difference in PSM rates between RALP and RRP and no considerable difference in the risk of prostate-specific antigen (PSA) recurrence after adjusting for clinical and pathological variables. A paper by Hu et al. (43) in 2008 compared open RP and MIS (pure laparoscopic or robotic assisted) by extracting the information directly from Medicare database, eliminating selection bias, between the years 2003 and 2005. The outcomes included salvage treatments and complications. In this publication, disease control was established by checking the need for secondary cancer treatments (salvage radiation therapy or adjuvant hormonal therapy) after one year of follow-up. Men undergoing MIS had a dramatic increase in secondary salvage cancer treatments for presumed failure to control the disease. Frota et al. (44) in a comparative study also indicated a similar oncologic outcome for the different techniques. In contrast with these results, Smith et al. (45) reported a lower overall incidence of PSM after RALP than RRP, 15% and 35%, respectively. The incidence of PSM rate according to pathological stage was also higher in the open series than in the RALP groups (in pT2 tumors, 9.4% for RALP vs. 24.1% for RRP, in pT3 tumors, 50% for RALP vs. 60% for RRP). Likewise, in a cumulative analysis of positive surgical margins, Ficarra et al. (25) showed a statistically significant difference in favor of RALP over RRP (relative risk 1.58, 95% CI 1.29–1.94; $P < 0.001$) but no statistically significant variation was found when the analysis was limited to only those patients with pT2 prostate cancer.

FUNCTIONAL OUTCOMES

Urinary Continence (Table-3)

Continence is defined using many different definitions, leading to a lack of standardized criteria of continence, restricting the matching of continence rates between different surgical approaches. Another limitation is the availability of short and long-term follow-up in the investigations and variation of data collection methods. In the evaluation of continence we might use a pad test, bother due to incontinence or physical examination. Although incontinence post-radical prostatectomy should be measured with self-administered disease-specific quality-of-life instruments, the questionnaire capturing pad use, bother and degree of incontinence raises questions about patients' global perceptions of continence after open radical prostatectomy. Since men with total control or occasional dribbling, men requiring no pads or a single pad over a 24-hour interval, and men with none or a low level of inconvenience due to incontinence, consistently considered themselves continent, thereby legitimizing these definitions of continence after

Table 3 *– Continence of RRP, LRP and RALP series.*

Study	Year	N (patients)	Age (y)	Follow-up (month)			
				1	3	6	12
Robotic							
Joseph (71)	2006	325	60	56	93		96
Mottrie (72)	2007	184	62	71	89	97	-
Borin (73)	2007	400	61.2	70.5	89	97	-
Krambeck (42)	2009	294	61	-	-	-	91.8
Murphy (55)	2009	395	60.2	-	-	-	91.4
Rocco (26)	2009	120	63	-	70	93	97
Van der Poel (74)	2009	151	60	-	-	54	70
Weighted means		1869	60.86	65.31	88.05	88.84	90.66
Laparoscopic							
Rozet (58)	2005	498	62	-	-	-	98
Martina (57)	2005	114	66	71	94	96	-
Lein (59)	2006	952	62	-	-	-	76
Christopher (60)	2008	1000	62	-	-	-	94.9
Mirandolino (61)	2009	780	64.6	-	-	-	87.9
Gosseine (62)	2009	125	61.7	-	47	70	83
Stolzenburg (63)	2009	2400	63.3	-	71.7	-	94.7
Weighted means		5869	62.95	71.00	71.49	82.40	90.75
Open							
Kundu (66)	2004	2737	61	-	-	-	93
Lepor (75)	2004	491	58.8	-	70.9	87.2	92.1
Jacobsen (76)	2007	172	-	-	-	-	87
Touijer (46)	2008	222	-	-	-	-	75
Krambeck (42)	2009	564	61	-	-	-	93.7
Rocco (26)	2009	240	63	-	63	83	88
Weighted means		4426	60.85	-	68.31	85.82	91.58

LRP = laparoscopic radical prostatectomy; RRP = radical retropubic prostatectomy; RALP = robotic assisted laparoscopic prostatectomy.

radical prostatectomy. In this review, the definition of continence-adopted to calculate the outcomes, when more than one definition was available in the study, was the use of no absorbent pads or the use of one pad only for security. Likewise, the heterogeneous follow-up and the different data make it even harder to compare the studies. Our comparison between studies revealed a continence rate in the 6-month and the first year that was virtually equal between the three different approaches but with a slight advantage for the RRP (91.6%). In the short-term follow-up the RALP group presented a quicker improvement of continence with 88% as opposed to 71% and 68% of LRP and RRP, respectively. Age appears to have a negative impact on continence and the open RP group, which presents the best outcome after the first year of follow-up, has the lowest mean age (60.85 years). We should also take into consideration the fact that this comparison

is probably biased by an enormous lack of data from the first trimester, especially in the open RP group. Tewari et al. (28) in a non-randomized comparative study have also suggested that RALP presented earlier continence recovery than RRP. Similarly, RALP provided a significantly better continence outcome than RRP in a matched-pair analysis by Rocco et al. (26) In contradiction to the prior outcomes, several studies such as Krambeck et al. (42) have shown equivalent continence rates for RRP 93.7%, and RALP 91.8%, at the 1 year follow-up (P = 0.344). The paper by Touijer et al. (46), showed a statistically significant difference in favor of RRP; patients undergoing LRP had a 2-fold higher risk of being incontinent. However, a cumulative analysis by Ficarra et al. (25) suggests that the continence rates after RRP or LRP are similar. Comparing LRP and RALP a paper by Joseph et al. (47) also did not find differences in continence rates in a follow-up of 6-month after surgery. Finally, Parsons et al. (27) showed no significant difference between LRP or RALP and RRP (relative risk 1.07, 95% CI 0.75 - 1.5, P = 0.70; relative difference 0.03, 95% CI - 0.06 to 0.12, P = 0.49), after having analyzed urinary continence rates within a 1 year follow-up in four comparative studies. Nevertheless, in general, very little data on continence is available in studies comparing RALP to LRP or to RRP. Expressive conclusions on whether any particular technique is better in achieving continence are unfeasible. Fortunately, the vast majority of men reach continence within 1 year of the surgical procedure (48).

Potency (Table-4)

Potency is one of the most complex and important outcomes to compare after RP. Similar to continence, it has no clear definition but is commonly accepted as the capability to achieve a spontaneous erection and/or maintain an erection adequate for intercourse. However, as there is a lack of standardized assessment of postoperative potency the researchers use different ways to assess potency. Most studies used some form of questionnaire (International Index of Erectile Function, Expanded Prostate Cancer Index Composite) as well as telephone or personal interviews. Without homogeneous methods for defining and evaluating erectile sexual function and sexual satisfaction, comparison of potency rates in the different studies will not determine which surgical technique accomplishes superior potency outcomes. The probability of recovered potency is time dependent (49), so it is important to have a minimum follow- up period of 12 to 18 months. Recent studies have suggested that erectile function continues to improve in some men years after radical prostatectomy (50). Most of the studies used in this review do not have such a long follow-up period and commonly they record the rates for the 12-month period after the surgery, although they frequently lack information regarding the short-term period (1-3 months). Consequently, we could only analyze the state of potency rates in the medium term (1 year). For post-operative potency, numerous factors came into play such as age, baseline potency, baseline sexual activity, the stability of any relationship, cardio-vascular comorbidities and the use of medications. Only the age factor was considered in the majority of the studies. The other significant factors, such as partner relationships were not commonly mentioned: a patient who had regained his erection might not have a sexual partner and as a result will not answer a questionnaire or an interview as regards whether or not they have had intercourse after prostatectomy. Younger patients regained their potency better, as showed in the laparoscopic group with a medium age of 58 years and a 73.88% potency rate after 12 months. Besides, the type of prostatectomy (open, laparoscopic or robotic) that is performed, the type of nerve-sparing procedure, surgical technique used during dissection (cautery-free technique) and the surgeon's experience also contribute to the final potency status. Some of the studies analyzed specified whether they performed nerve-sparing technique, if it was bilateral or only unilateral and rates of potency for each subgroup. Although bilateral nerve-sparing procedures show, in general, better functional outcomes than those with only unilateral or nerve-excising procedures, we chose to evaluate only the overall potency rate as most of the studies, especially in the open PR group, lacked this information. We reached a mean overall potency rate that was very close between the three different approaches in the range of 71-74%, which represents a very interesting outcome for the population studied. Whether there is difference in the potency rates after

Table 4 *– potency of RRP, LRP and RALP series.*

Study	Year	N (patients)	Age (y)	Overall Potency (at ≥ 12 months)
Robotic				
Joseph (71)	2006	325	60	77.1
Mottrie (72)	2007	184	62	-
Tewari (77)	2008	215	60	87
Krambeck (42)	2008	294	61	-
Rocco (26)	2009	120	63	61
Murphy (55)	2009	395	60.2	62
Van der Poel (74)	2009	151	60	-
Weighted means		1684	60.65	71.63
Laparoscopic				
Martina (57)	2005	114	66	32
Link (78)	2005	122	58.3	54.3
Rassweiller (79)	2006	562	-	72.4
Christopher (60)	2008	1000	62	65.6
Mirandolino (61)	2009	780	64.6	60.9
Stolzenburg (63)	2009	2400	55	84.9
Weighted means		4978	58.65	73.88
Open				
Walsh (80)	2000	64	57	86
Kundu (66)	2004	1834	61	75
Saranchuck (69)	2005	647	58	62
Michl (81)	2006	389	63.5	-
Touijer (46)	2008	222	-	58.5
Krambeck (42)	2009	564	61	62.8
Rocco (26)	2009	240	63	88.00
Weighted means		3960	60.80	70.76

LRP = laparoscopic radical prostatectomy; RRP = radical retropubic prostatectomy; RALP = robotic assisted laparoscopic prostatectomy.

RRP, LRP or RALP is still not clear. We observed very similar results, nevertheless different studies have reported contradictory conclusions. Krambeck et al. (42) reported comparable potency rates between RALP and RRP after 1 year of follow-up (RALP 70.0%, RRP 62.8%, P = 0.081). Likewise, Frota et al. (44) concluded that there were no comparative studies showing superior results in terms of potency from one technique to the others. Roumeguere et al. (51) also reported comparable potency rates of open versus laparoscopic radical prostatectomy after 1 year, whereas Namiki et al. (52) reported delayed return of sexual function with laparoscopic radical prostatectomy. Other studies' results, such as those by Rocco et al. (26), had opposite findings and showed higher potency rates after RALP than RRP at 3, 6 and 12

months (RALP 31%, 43% and 61%, respectively; RRP 18%, 31% and 41%, respectively; P = 0.006, 0.045 and 0.003, respectively). Likewise, Tewari et al. (28) suggested earlier potency recovery after RALP rather than RRP.

CONCLUSION

According to the operative blood loss and transfusion outcomes, it appears that the results were better in the laparoscopic and robotic-assisted approaches, though in terms of surgical duration outcome, the open and robotic groups seem to have shorter times. Regarding the positive margins, continence and potency, it appears that there are no substantial differences between the three variants. Thus, it was not possible to confirm the superiority of any one surgical approach in terms of functional and early oncologic outcomes even though it was not subject to statistical analysis. Although it was not the goal of this work, many other outcomes (tissue damage, in-hospital stay, costs, health related quality of life, recurrence and cancer-specific survival rates) can and should be assessed in the future when comparing these techniques, taking into account that most of the time these records can be very complex or extremely subjective for scrutiny. The lack of prospective randomized studies precludes definitive conclusions. Hence, the ideal study design for comparing the three approaches would be a trial in which patients are randomized to these techniques, applying the same clinical pathways and methodology for assessing outcomes performed by surgeons with the same level of skill and experience. One thing is for certain: the selection of the best surgeon, rather than the surgical approach is the most crucial aspect.

CONFLICT OF INTEREST

None declared.

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EDITORIAL COMMENT

Open radical prostatectomy is the gold standard and most widespread treatment for clinically localized prostate cancer.

With wider availability of minimally invasive radical prostatectomy techniques, there is a debate regarding the standard treatment of the management of localized prostate cancer.

Because no prospective, randomized trials comparing the different techniques have been performed, outcomes must be assessed from published series by centers that focus on the three techniques.

The operative blood loss and the risk of transfusion are lower in the laparoscopic and robotic-assisted approaches. The surgical duration is usually shorter in the open and robotic group. As regards positive margins, continence and potency no substantial differences between the techniques were found.

As the authors concluded perfectly: "The lack of prospective randomized studies precludes definitive conclusions. Hence, the ideal study design for comparing the three approaches would be a trial in which patients are randomized to these techniques, applying the same clinical pathways and methodology for assessing outcomes performed by surgeons with the same level of skill and experience. One thing is for certain; the selection of the best surgeon, rather than the surgical approach is the most crucial aspect."

Further research is needed to examine the specific techniques used by experienced surgeons that are associated with improved outcomes.

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EDITORIAL COMMENT

The authors' endeavor to compare the outcomes of open, laparoscopic and robot-assisted radical prostatectomy is a challenging one. The results of this study reveal concerning findings with regards to the quality of evidence in the literature. A decade after the introduction of robot-assisted technique of radical prostatectomy, the quality of data is embarrassing making it almost impossible to draw any conclusions from an extensive review of publications undertaken by the authors. The call for randomized controlled trials is justified. However, an even more important topic must not be overseen: a striking paucity of high quality non randomized data. The authors acknowledge several difficulties in their study emphasizing differences in data collection, definition of outcomes and reporting of those in the literature. Moreover, it is apparent how the reported results mostly reflect academic, high volume institutions and highly experienced surgeons and may not be generalized to other settings.

The search for the best approach to radical prostatectomy must consider several issues including oncologic, functional and quality of life out-

comes as well as surgeon's expertise, and the ever more pressing issue of healthcare costs. Obtaining high quality data with accurate and uniform definitions is of paramount importance as it allows accurate analysis of the surgeon's experience and enables a direct comparison with other settings. Until such data is available, neither equivalence, nor superiority of one approach over another can be claimed.

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EDITORIAL COMMENT

By means of a systematic review of the international literature, the authors did not find significant differences between the results achieved through open radical retropubic prostatectomy, pure radical laparoscopic prostatectomy and the robot-assisted laparoscopic surgery. The differences found in the details only enhance the importance of the main conclusion - there are no differences between the three techniques in over 44,000 patients that were analyzed. Although the robotic technique is in evidence, there is no solid scientific basis for its alleged superiority, as other have demonstrated (1).

The great flaw of this paper was not including perineal surgery in its analysis. The results of the perineal surgery are competitive in relation to the other techniques and it deserved a comparison in a systematic review such as this one (2).

The pure laparoscopic surgery and the retropubic surgery both have high rates of complications, even when performed by great experts (3). The final truth in the treatment of prostate cancer is yet to be declared.

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