

Research Article

“Maximum Preservation Radical Prostatectomy”: Oncological, functional and other contemporary aspects of Retzius Sparing Robotic Assisted Radical Prostatectomy

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Introduction

The surgical treatment of prostate cancer (PCa) had as its initial milestone the first prostatectomy, performed by H.H. Young at the Johns Hopkins Hospital, in 1904 [1], however, the procedure only reached a fundamental role after 1982, based on a better understanding and description of the male pelvic anatomy, by Walsh [2-6] and other [7-11]. Subsequently, minimally invasive approaches emerged: laparoscopic prostatectomy (1992) [12] and robot- assisted laparoscopic prostatectomy (RALP) (2000) [13], which modified and optimized the execution of key surgical steps of this procedure, such as bladder neck preservation, nerve-sparing dissection, and prostate apex management [14]. Nevertheless, there is a continuous debate about the benefits offered by minimally invasive approaches and their superiority over the conventional open surgery, in order to justify additional costs and the spread of those [15]. Some superior results have already been demonstrated in terms of recovery time, return to normal activities and shorter hospitalization, as well as, less bleeding and postoperative pain; however, with equivalent oncologic outcomes [16].

The advent of robotic technology and its inherent advantages, such as 3D image magnification providing higher quality of image and greater visualization and definition of the operative field, as well as, instruments with better articulation and greater mobility and precision [17], has led to a better anatomical description of structures related to the urinary continence and erectile function mechanisms: demonstration of the neurovascular bundles (NVBs) arrangement, bounded by the anterior layer of the Denonvilliers fascia posteriorly,

prostatic fascia medially, and lateral pelvic fascia laterally, in a potential avascular plane [18,19], identification of autonomic ganglion cells in the pelvic plexus around the bladder and the prostate [20,21] and of erectile nerves in the “veil of Aphrodite” along the anterolateral aspect of the prostate [22].

In attempt to improve the results, refinements and new approaches have been implemented to RALP technique. In 2010, Galfano, et al. described Retzius-Sparing Robotic Assisted Laparoscopic Radical Prostatectomy (RS-RARP) aiming to obtain early recovery of continence and erectile function (EF), using the Douglas’s space instead of the Retzius’s space, standardized on conventional RARP (C-RARP) [23]. The RS-RARP works like a continuation in an anterior direction of the posterior approach to the vasa and seminal vesicles through a posterior peritonectomy, first described as a part of initial step of laparoscopic RP by Guillonneau and Vallencien, in 2000 [24]. Following the concept of “nerve-sparing” [25-27] and using the most recent modifications of the technique it allows the possibility of performing completely intrafascial dissection and retaining the integrity of the endopelvic fascia and the “Aphrodite’s veil” [28], with the Bocciardi approach, the veil is not opened at any point [29], which preserves the neurovascular structures on the anterior surface of the prostate, and avoid the section of the

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Submitted: 03 April 2020

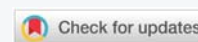
Approved: 29 April 2020

Published: 30 April 2020

How to cite this article: Tobias-Machado M, Sarmiento EO, Nunes-Silva I, Zampolli HC. “Maximum Preservation Radical Prostatectomy”: Oncological, functional and other contemporary aspects of Retzius Sparing Robotic Assisted Radical Prostatectomy. Arch Cancer Sci Ther. 2020; 4: 024-028.

DOI: 10.29328/journal.acst.1001018

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puboprostatic ligaments, important for the stability of the the external urinary sphincter. It also maintains the integrity of the dorsal venous plexus (DVP) and the small arteries running through the Santorini plexus, that seem to have an accessory role in blood supply to the striated sphincter [30,31].

Considering all aspects above described of this technique we called RS-RARP as "maximum preservation RARP" when compared with other techniques that divided support structures to reconstruct after cutting.

The objective of this paper were review results of the contemporary best evidence available reporting further special situations when this tecninque could be interesting.

Best literature data

Recent systematic reviews have been published by Mukherjee, et al., Eden, et al., Genes, et al., Checcucci, et al., Tai, et al., all of which approaching the best possible scenario - the so desired "pentafecta" [32,33], which consists of:

Positive surgical margins (PSM): There have is a controversy regarding if RS-RALP promote higher surgical positive margin rates or not [34,35]. Mukherjee, et al. found a not significant trend towards higher positive surgical margins in RS approach, with more PSM rates for T2 than T3 cases – similarly to other studies that have also shown differences between these stages [36,37]. Eden, et al. showed a trend toward a higher apical and radial PSM in RS-RARP cases, but also without significant value [37-39]. Some investigators have advised against performing RS- RARP if the tumor involves the anterior region [28]. On the other hand Genes, et al. and others also did not find significant differences between the two groups [28,30,40-43]. Moreover, one might argue that this difference in PSM rate might be also related to the learning curve associated with the RS approach. Indeed, *Galfano et al.* showed a statistically significant reduction in PSM rate after 100 procedures performed [30].

Since almost all studies focused on low- and intermediate-risk PCa, there is a gap in reporting the RS approach for the high-risk and locally advanced disease. Nyarangi, et al. published the results of a cohort of 50 men with high-risk PCa treated with RS-RARP, after 1 year of follow-up, and found that this approach is feasible, oncologically safe, associated with few perioperative complications and offers good results regarding recovery of urinary continence but long term oncological outcomes are awaited and the first results from erectile function need to be confirmed [46].

Biochemical recurrence (BCR): Mukherjee et al. and Phukan, et al. showed that short term biochemical free survival appears to be similar between the two approaches [40,44,47], but according to Eden, et al. it is impossible given the limited follow-up to comment biochemical recurrence rates [38].

Early complications: According to Eden, et al. and other authors, intra- and post-operative complications rates did not show significant differences between RS group and conventional anterior approach [14,28,30,37,38].

Eden, et al. has found a significant decrease in symptomatic urinary tract infection (UTI) rates after RP when a suprapubic catheter was used [38].

Checcucci, et al. found similar transfusion rates and no significant difference in terms of estimated blood loss [14,37,38].

Continence recovery: Mukherjee, et al. and other authors also found that RS-RARP shows some early continence recovery benefit, with better continence rates at 1 and at 3 months, which is likely to have some clinical relevance [38,47]. Additionally, other papers reported that in comparison to the conventional anterior approach, RS-RARP promoted a significantly faster and higher overall continence recovery immediately after the surgery, at 10 days, 1-2 weeks, 4 weeks, 3, 6 and 12 months after surgery [14,28,34,42,48], and the International Prostate Symptom Score (IPSS) at 3 months after surgery significantly favored the RS group [28]. In contrast, according to Phukan, et al. RS-RARP did not alter 6 and 12-month continence rates [40], and a randomized controlled trial concluded that men undergoing C-RARP still reached similar levels of continence at 90 days and beyond [44].

Erectile function: Although Phukan, et al. have reported similar erectile function rates between both approaches [40], the EF recovery rates of RS-RARP remain unclear [47] and there is a lack of randomized controlled trials comparing both techniques [14,28]. A randomized controlled trial comparing each approach did not show statistically significant difference in erection sufficient for intercourse at 12 months after procedure [42].

Other caracteristics of RS-RARP: Extrapolating the pentafecta, other important aspects were analyzed: a further advantage of RS-RARP includes a shorter operating time through the omission of several steps done during C-RARP. Checcucci, et al. showed a statistically significant and shorter operating time with RS-RARP and a significantly shorter console times than did c-RARP [34], but with a questionable clinical significance [14]. Eden, et al. and Genes, et al. published similar operating time for both approaches [28,38]. Similar post-operative hospital stay was found between them [34,37,38].

One author reported that one disadvantage of RS-RARP is that it is more challenging than the conventional technique [28] but this is not consensual [49]. The potential difficulties of this approach include a small workspace, no lateral aiming point when dissecting the lateral pedicles of the prostate, an inability to look into the bladder after bladder neck division to check the position of ureteric orifices, and an inverted



relationship between the bladder and prostate during dissection and reconstruction – large anterior tumors might be better performed by C-RARP [38]. Thus, case selection when starting one's initial experience of RS-RARP is essential to safeguard patients and minimize the inevitable initial increase in operating time [38,48].

Bocciardi had dramatic improvement in PSM rates from his first 100 patients (22%) to the next 100 (10%), indicating a prolonged learning curve [30], and Lim reported a significant console time difference between their first and second 25 cases [37].

Another drawback of this technique is that pelvic lymph node dissection (PLND) cannot be performed without new incisions, usually made towards the apex of the triangle formed by the medial umbilical ligament and the vas deferens. These incisions are not closed and suction drains can be placed at the end of the procedure to reduce the risk of lymphocele formation [30,39,43]. Although not statistically significant, it was found that PLND during RS-RARP might be detrimental to early continence outcomes, due to the greater possibility of damage to nerve fibers innervating the pelvic floor [37] but this is not observed clinically due to excellent early recovery of continence obtained.

Although there is no express recommendation for intraoperative frozen biopsy the RS approach allows easier secondary resection of potentially involved NVBs.

In the same way RS-RARP can be of particular benefit to patients who might otherwise be expected more difficult access as after laparoscopic TEP mesh hernia repair or after renal transplantation. In this particular situations all the steps of the surgery can be done under the mesh/graft without the need to disturb it [38].

Apart from improving the quality of life of a patient, early and superior continence with RS-RARP is likely to have a positive economic impact on individual cost per case and global healthcare services, also decreasing the number of cases requiring surgical correction of urinary incontinence after prostatectomy [14,28,34,40,47,50].

As for erectile function, the results are not well informed and further clinical trials are needed to assess sexual function in this scenario [14,28,40].

RS-RARP is a promising approach and has the potential to become the future of prostate cancer surgery. All reviews unanimously concluded that the literature on RS-RARP has few well designed studies, which represents a natural step during the exploration of a new surgical technique. Future clinical trials preferably with a prospective and multicenter randomized design are required to improve the current evidence regarding this novel approach.

The technological advances have allowed better anatomical understanding and knowledge of radical prostatectomy, allowing modifications to the operative technique and bringing undeniable benefits. Although RS-RARP approach probably require proctoration to achieve proficiency, recent paper show that it has proven to be safe and feasible during the learning curve period [51]. As a new technical alternative, long-term oncological outcomes remain unclear and the surgeon must pay attention to own surgical margins and compare with videotapes to improve personal results. In experienced hands since high risk cases can be performed with acceptable results [52].

RS-RARP equivalent results can be obtained with anterior approach by Bordeaux's group [53]. They report a medial preservation of pubovesical arc and control of small branches of dorsal venous complex at bladder neck, no traction dissection of neurovascular bundle (DVC) and preservation major DVC(51). More recently others described some variations easier to reproduce with similar results.

As a new frontier a preliminary report 7 cases utilizing single port (SP) to perform RS-RARP with success [54].

Conclusion

The concept of maximum preservation rather than section and reconstruction seems to offer faster recovery and excellent preliminary results. As functional results after 1year of RS-RARP are really impressive, long-term outcome data are required to determine whether this approach had oncological equivalence similar to other variations of RARP.

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