22 Retzius Sparing Robot-Assisted Radical Prostatectomy: Evolution, Technique and Outcomes

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Introduction and History

Radical prostatectomy (RP) continues to be one of the most common definitive treatment approaches for men diagnosed with clinically localized prostate cancer, with over 80% of RPs (as of 2015) in the US being done via the robotic approach [1]. Along with ensuring perioperative safety, the trifecta (urinary continence, erectile function and surgical margins) have long served as aspirational benchmarks for a successful robot-assisted RP (RARP). Ever since the inception of RARP and its initial reports by Menon and colleagues [2], myriad technical modifications have attempted to minimize urinary incontinence and improve urinary function-associated quality of life (QoL). Sparing the space of Retzius (Retzius sparing RARP, or posterior RARP) is one of the few approaches to optimize UC that is supported by Level 1 evidence [3–7].

The idea of sparing the space of Retzius during a radical prostatectomy is by itself not new: indeed, the initial descriptions of perineal radical prostatectomy by Hugh Hampton Young centered around approaching the prostate transperineally without dropping the bladder or disrupting the anterior pelvic support. This approach, however, became less popular after the description of radical retropubic prostatectomy in late 1940s, despite reports describing continence rates of nearly 90–95% with perineal prostatectomy. Kavoussi's group attempted performing a Retzius sparing laparoscopic radical prostatectomy in the 1990s [8]. In their series of nine patients, the operating time was almost 9 h, blood loss ranged from 500–800 mL, and around 33% patients had serious complications. Even in the hands of one of the world's leading laparoscopic surgeons, the authors concluded that minimally invasive radical prostatectomy did not offer any significant benefits. Yet, somewhat remarkably, 6/9 (66%) were completely continent, with an additional 2 (22%) requiring one pad/day. Regardless, laparoscopic radical prostatectomy did not achieve much popularity in the US, until Menon's path breaking descriptions for RARP (that recapitulated open retropubic prostatectomy) revolutionized minimally invasive surgery [9].

Ten years later, Aldo Bocciardi and colleagues renewed interest in Retzius-sparing robotic prostatectomy in a small published series of three patients, noting a continence of 66% [10]. This was followed by a more formal evaluation in 200 patients, with a continence rate of 90% (defined as no pad/one safety liner) 1 week after catheter removal, and approximately 75% were potent 1 year after surgery [11]. Halfway across the world, Rha's group [12] and our own unpublished data showed similar results with Retzius-sparing prostatectomy: ~90% were either dry or using one safety liner 1 month postoperatively. Encouraged by these findings, we conducted the first randomized controlled trial comparing the standard (anterior) approach to Retzius-sparing (posterior) approach [5]. The results convincingly were in favor of Retzius sparing RARP.

Anatomical Basis for Retzius-Sparing Prostatectomy

The standard (anterior) RARP approach starts off with incising across the median and medial umbilical ligaments that hold up the bladder to the anterior abdominal wall and developing the space of Retzius (Fig. 22.1). In contrast, RS-RARP entails accessing the prostate from the rectovesical space by incising the pouch of Douglas. Theoretic rationale for expediting continence recovery through this approach are

1. Sparing the anterior pelvic support structures (dorsal venous complex, accessory pudendal arteries if any, pubovesical and puboprostatic ligaments, detrusor apron and the endopelvic fascia) and potentially allowing a more thorough Intrafascial dissection [11, 13]. Indeed,

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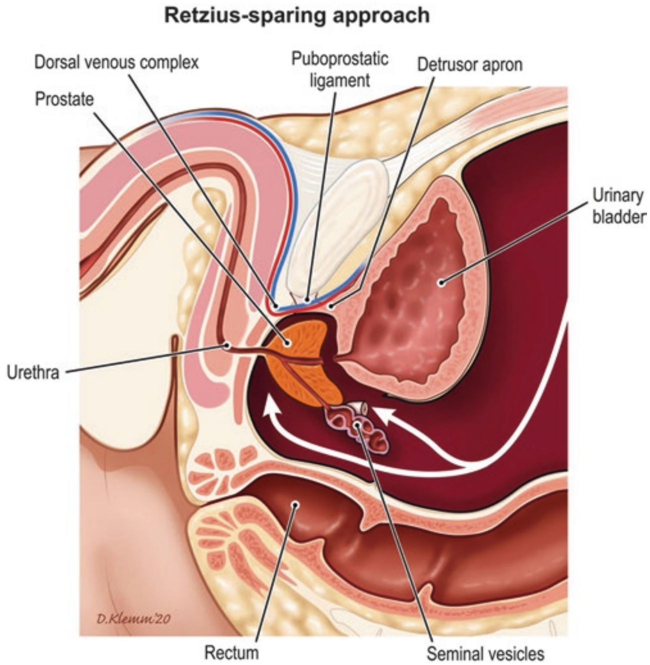

Fig. 22.1 White arrows illustrate the access for Retzius-sparing robot-assisted radical prostatectomy. (Borrowed, with permission, from Davis et al. [16])

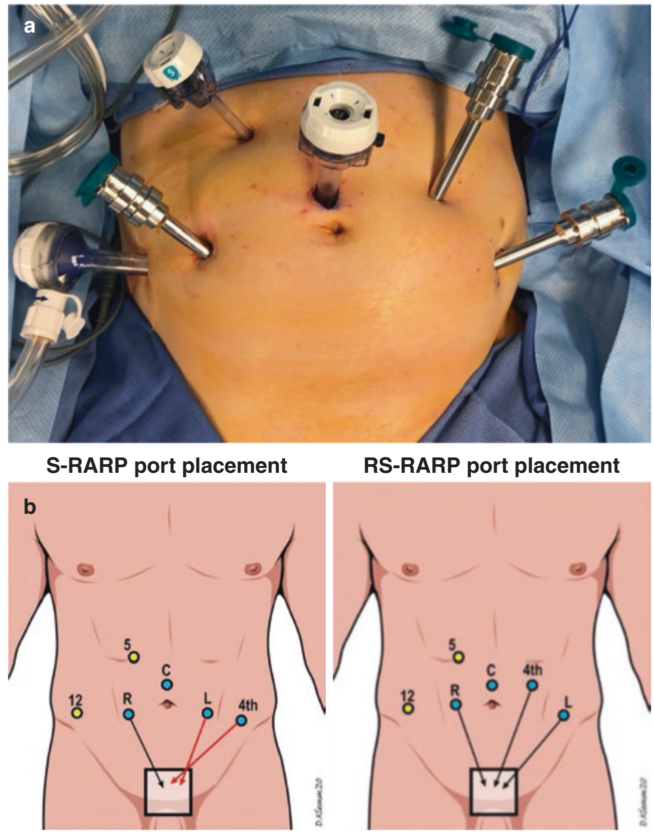

Fig. 22.2 Actual (**a**) and schematic (**b**) Schematic of port placement for both RS-RARP and S-RARP. Some groups place the Prograsp forceps is placed in the left medial robotic port and in a more caudal position, as this minimizes instrument clashing in the small operative space. *RS-RARP* Retzius-sparing robot-assisted radical prostatectomy, *S-RARP* standard robot-assisted radical prostatectomy. (Borrowed, with permission, from Egan et al. [17])

Chang and colleagues [14] showed that RS-RARP was associated with lesser bladder neck descent (calculated as bladder neck to pubic symphysis ratio on postoperative cystogram) compared to standard RARP, and the degree of descent was independently associated urinary continence recovery (HR 0.048, p = 0.006). Alternatively, RS-RARP may allow preservation of a longer membranous urethra (>12.1 mm on MRI imaging based on a recent study), which translated into faster continence recovery [15].

2. Decreasing or obviating the need for ligation of dorsal venous complex (DVC), which can have variable degree of overlap with the external urethral sphincter, especially at the level of the apex (up to 37%) [13, 16].

Current Technique for RSP

Port placement for RSP is slightly different from anterior RARP, and further needs to be modified based on patient's habitus, co-existing abdominal pathologies/prior surgeries, and comparatively smaller working space with the Retzius sparing approach. In our group, we have used the similar port placement to the conventional port placement, since some of the attempted RSP converted to anterior RARP due to body habitus. The camera port is placed below the umbilicus and 30°-up lens is used for the entire dissection of the prostate gland and the anastomosis. Alternatively, the camera port can be placed above the umbilicus and 0° lens can be used. Egan and colleagues [17] suggested a modified port placement: swapping the left arm (with the Maryland bipolar) and the fourth arm (with the Prograsp forceps) such that the fourth arm is medial and left arm is more lateral (Fig. 22.2).

Once the abdominal cavity is entered into and the sigmoid colon is mobilized out of the way, the sacrogenital fold (semilunar fold of parietal peritoneum between the bladder anteriorly and the rectum posteriorly) is grasped and incised for about 5–7 cm just above the level of vas deferens (VD) (Fig. 22.3).

In contrast to other practices, our technique starts with posterior dissection prior to the VD and SV dissection. Posterior dissection involves creating the posterior plane by incising into the leaves of the Denonvilliers' fascia, which is then carried down towards the apex and laterally towards the neurovascular bundles at the apex and the mid-gland of the prostate as intra-, inter- or extra-fascial nerve sparing, depending upon the intended degree of nerve sparing and visual approximation of tumor extent (Fig. 22.4). The

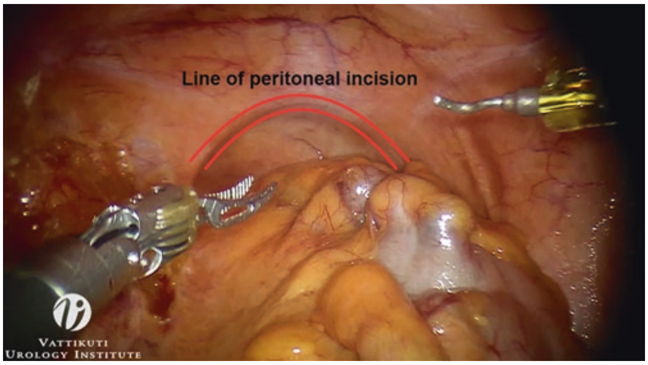

Fig. 22.3 Initial incision is made through the pouch of Douglas. (Borrowed, with permission, from Dalela et al. [5])

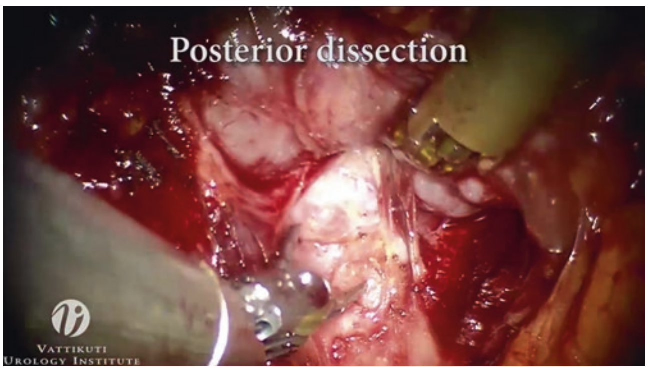

Fig. 22.4 Dissection through Denonvilliers' fascia to create a posterior plane. (Borrowed with permission, from Dalela et al. [5])

Prograsp (and suction by the bedside assistant) can be vital in providing countertraction, since working space can be limited. This posterior dissection prior to SV and VD dissection might eliminate the special need for suspension stitch to pull up the SV and VD during the posterior dissection.

Alternatively, VD/SV dissection can be performed prior to posterior dissection. The VD is dissected and followed towards the ampulla and seminal vesicles, which is freed from the posterior aspect of the bladder anteriorly and the Denonvilliers' fascia posteriorly. The VD is transected. The Prograsp forceps (or the assistant grasper) provide countertraction by retracting the ipsilateral ampulla of vas/SV contralaterally.

- Some authors may leave a 1-cm remnant of tip of the SV (SV-sparing), in an effort to maximize preservation of neuronal cage surrounding it that may contribute to recovery of erectile function [3].
- Others [10, 17] use a suspension stitch (such as a 3-0 prolene) on a Keith needle that goes through the anterior abdominal wall, cut edge of the sacrogenital fold of peritoneum, looping behind the SV and VD, and back out to the abdominal wall where they are secured with clamps. This frees the Prograsp for retraction for the remaining posterior and lateral dissection.

The ipsilateral SV/cut end of VD are retracted anteromedially, and the posterolateral plane is developed using a combination of blunt and sharp dissection.

Following adequate creation of a posterior plane, small individual vessels penetrating the prostate are clipped (using 5 mm clips) or cauterized (using bipolar grasper). Dissection at the base of the prostate continues until the plane cooperate with the dissected plane at the mid-gland and the apex. The authors start the bladder neck dissection prior to the circumferential dissection of the prostate gland as described by another group. The key point for the bladder neck dissection is that the posterior bladder and the trigone cover the base of the prostate like an apron and the posterior bladder wall needs to be peeled off from the base of the prostate to identify the posterior bladder neck. The lateral dissection of the prostate might be helpful to identify the bladder neck.

Once the lateral plane is developed, dissection curves anteriorly, where the anterior detrusor apron is gently swept away from the anterior surface of the prostate (Fig. 22.5). The left hand can provide upward traction on the bladder, with the Prograsp maintaining posterior retraction on the prostate. The prostate has now been freed circumferentially, remaining attached at the apex caudally and bladder neck cranially. The latter is then identified and circumferentially dissected, and then transected posteriorly. This exposes the Foley catheter, which is withdrawn, and Bladder neck dissection continues anteriorly. After anterior bladder neck is transected, the dissection is advanced to the anterior surface of the prostate (Fig. 22.6). The Prograsp is again repositioned to provide downward traction, and the previously dissected anterolateral plane can be followed to remain underneath the detrusor apron and dorsal venous complex (DVC) using blunt and bipolar dissection. The apex is freed of any attachments, and the urethra is divided sharply just distal to it, maximizing the length of preserved membranous urethral stump.

Urethrovesical anastomosis (UVA) presents some unique challenges with the Retzius-sparing approach, given the opposite orientation of bladder and prostate in standard vs. Retzius-sparing approach. We perform our UVA using two single 6 or 9 in. 3-0 V-loc on CV-23 needle. Anastomosis begins at the 1 o'clock position, outside-in on the anterior bladder neck, and inside-out bite at the 1 o'clock of the anterior urethra. After the second bite at the 11 o'clock of the anterior bladder neck, the stitch is cinched down tight enough to approximate the anterior anastomosis. The anastomosis is then sequentially carried out anticlockwise from the 11 o'clock to the 8 o'clock position (Fig. 22.7a–c).

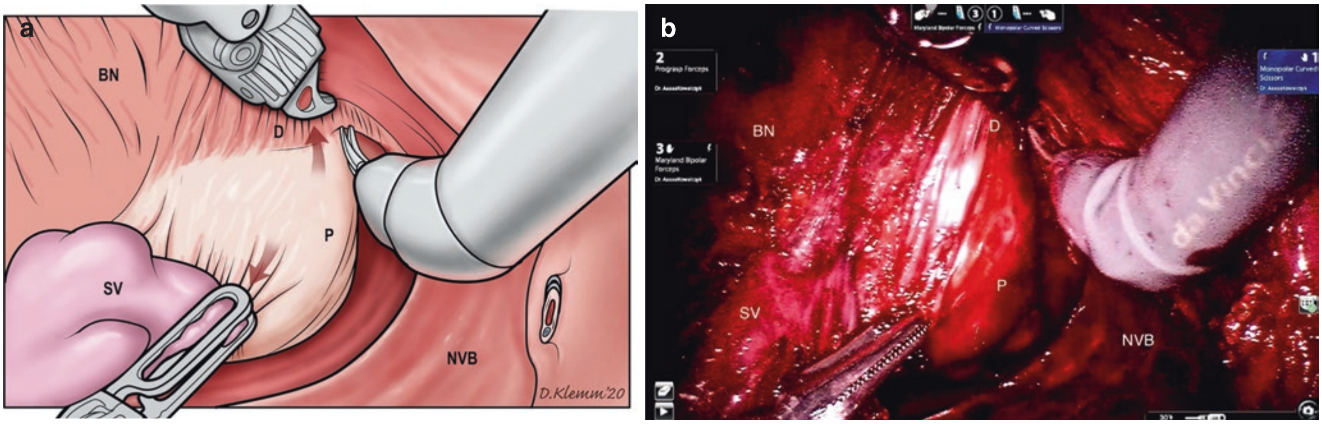

Fig. 22.5 Showing the development of the anterior plane, schematic (**a**) and intraoperative (**b**) description. The anterolateral surface and apex of the prostate are further developed prior to dissecting the bladder neck. Continuous upward traction on the bladder with the left hand along with posterior retraction with the Prograsp will often reveal the interface between the detrusor fibers and prostate, and this is developed from the apex to the medial bladder neck utilizing gentle monopolar and blunt dissection. *BN* bladder neck, *D* detrusor, *NVB* neurovascular bundle, *P* prostate, *SV* seminal vesicle. (Borrowed, with permission, from Egan et al. [17])

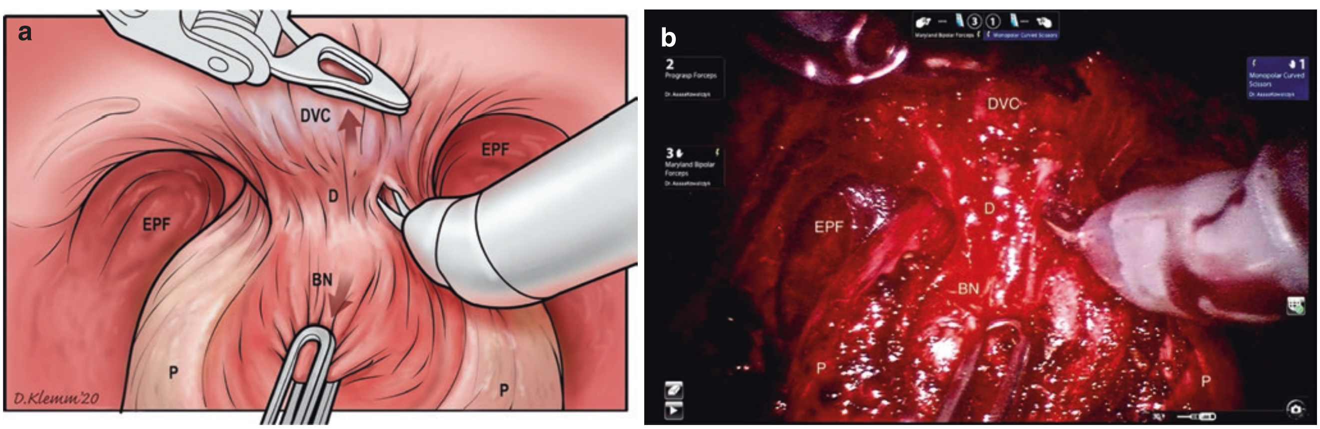

Fig. 22.6 After transection of the bladder neck, the plane between the anterior prostate and the dorsal venous complex is developed (schematic (**a**) and intraoperative (**b**) images). Blunt and bipolar dissection allows maintaining the correct plan, and the apex is used as a visual guide during dissection. If necessary, the posterior portion of the DVC can be entered if the plane is difficult to establish or in men with anterior lesions. *BN* bladder neck, *D* detrusor, *DVC* dorsal venous complex, *EPF* endopelvic fascia, *P* prostate. (Borrowed with permission, from Egan et al. [17])

A second V-loc suture is then introduced, and the anastomosis starts at the 2 o'clock position on the bladder neck from the outside to the inside. Same as the first stitch, the stitch is cinched down after 3 o'clock bladder bite (Fig. 22.7d). The anastomosis is then continued clockwise up to the 5 o'clock position. The 7 o'clock and 6 o'clock stitches are then placed using the initial and the second V-loc sutures respectively. Additional bites may be taken to reinforce the anastomoses, and the anastomosis is completed by burying in or tying off. If the size of the bladder neck is wider than what was planned, the second stitch may start in between the 1- and 11-o'clock stitches, so called anterior bladder neck reconstruction. Alternatively, bladder neck reconstruction at 3- and 9-o'clock of the bladder neck can be done using extra sutures prior to UVA.

Closing off the pouch of Douglas is optional based on surgeon's preference and 3-0 V-Loc can be used to close it. At our institution, the pouch of Douglas is not necessarily closed.

Pelvic lymph node dissection (PLND) is performed by making a longitudinal peritoneal incision at the junction of the VD and external iliac artery. The external iliac vessels are identified, and the obturator lymph nodes are dissected off the lateral surface of the bladder. Care should be taken to identify some critical structures such as the obturator nerve and the ureter during PLND. The anterior packet is well cauterized or clipped with 10 mm Hem-o-Lok clips, and the posterior packet is dissected away from the iliac bifurcation. Above steps are repeated for the contralateral side. Peritoneal incisions are left open to avoid lymphocele.

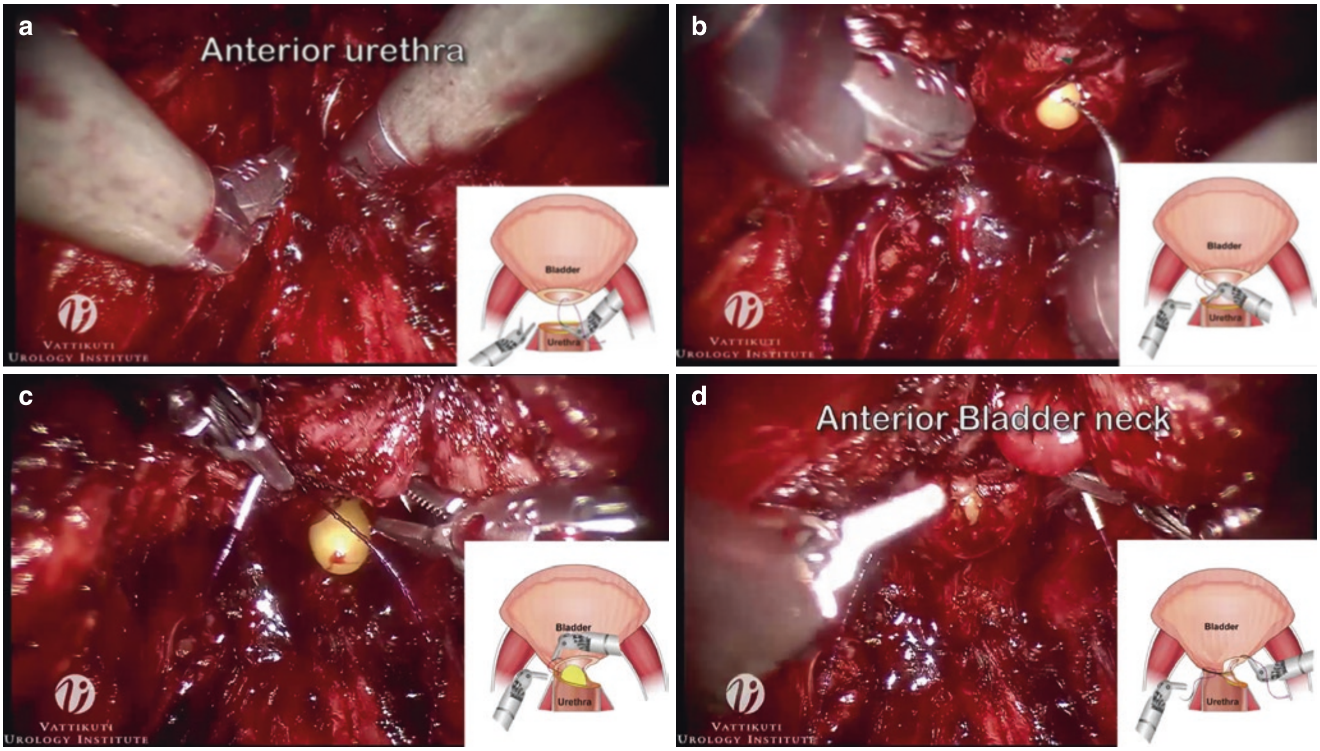

Fig. 22.7 (**a**–**d**) Steps of the urethro-vesical anastomosis. (Borrowed, with permission, from Dalela et al. [5])

Current Evidence: Summary of Outcomes for Retzius-Sparing Radical Prostatectomy

These have been summarized in multiple meta-analyses, and one Cochrane review [18] (Fig. 22.8, Tables 22.1 and 22.2). Overall, perhaps no other technical modification of robotic radical prostatectomy has been so extensively studied in a Level 1 fashion.

Functional Outcomes

Urinary Continence

As can be assessed from Tables 22.1 and 22.2, the major benefits of the Retzius sparing approach are realized in terms of functional outcomes, specifically expediting recovery of urinary continence. As of May 31, 2021, five randomized controlled trials comparing RS-RARP to standard RARP have been reported, all conducted in different countries and all consistently showing faster recovery of continence with Retzius sparing approach [3–7]. Another trial is ongoing at Heidelberg University, Germany (NCT03787823), results of which should be forthcoming shortly.

Continence rates (measured as no pads or use of one safety pad/day) following catheter removal have approached ~50–70% [3, 5, 6] rising to ~70–90% a month postoperatively and ~90–95% 3 months after surgery [3–7], significantly better compared to standard RARP at those time points. This was further confirmed in our detailed analyses including pad weights. Similar results have been seen from non-randomized retrospective comparisons between the two approaches. Of note, Level 1 evidence so far has focused on early continence (<3–6 months postoperatively) as their primary end point. Longer term follow up of our trial [19] showed that the incremental continence benefit of RS-RARP approach was muted at 1-year follow up, with 98% continence rate (0–1 pad/day) compared to 93% with standard approach (log rank $p = 0.09$), and while a statistically higher proportion of men were using 1 pad/day with the standard approach, there was no difference in pad weights compared to RS-RARP. Non-randomized data from other institutions have suggested sustained continence benefit with the RS approach 1 year after surgery [17], although this may be related to lower continence rates in the standard RARP arm (81.4% vs. 97.6% for RS-RARP).

More importantly, only one trial [7] included patients with clinically high risk disease (n = 36, ~33% of study population): twice as many (~58%) men with D'Amico high risk disease were continent 1 week post catheter removal with RS-RARP compared to standard (29%), although the smaller sample size precluded statistical significance ($p = 0.08$). While a recently reported prospective non-randomized comparison between RS and standard RARP included 37%

Study	Age (years)	Clinical stage	Surgeon experience	No participants per arm	No participants receiving nerve sparing	Continence definition (pads/day)	Primary outcome	Secondary outcomes	Duration of follow-up (months)
Asimakopoulos 2019	RS: 66 Standard: 65	cT1-cT2, Gleason score ≤ 7, PSA ≤10 ng/mL	< 50 cases each technique	RS: 45 Standard: 57	RS: 39 (86.7%) Standard: 44 (77.1%)	0	Continence rates at catheter removal	PSM	6
Bhat 2020	N/A	T1 or T disease	> 400 cases	N/A	N/A	0	BCR, urinary continence return, erectile function	Operative time, blood loss, PSMs	12
Dalela 2017	RS: 60 Standard: 60	Low–intermediate risk (NCCN)	"varying levels of expertise" including residents and fellows	RS: 59 Standard: 60	RS: 37 (62.7%) Standard: 39 (65%)	0–1	Continence rates within 1 week of catheter removal	PSM, BCR, adverse events	12
Kolontarev 2016	Median age: 67.4	Not reported	N/A	RS: 39 Standard: 40	Not reported	0–1	Urinary continence within 1 week of catheter removal	Urinary bother symptoms	3
Qiu 2020	RS: 68 Standard: 67	low, intermediate, and high risk (EAU)	> 200 RS approach > 300 standard approach	RS: 55 Standard: 55	RS: 36 (65.5%) Standard: 38 (69.1%)	0	Urinary continence within 1 week of catheter removal	PSM, BCR, adverse events	12

BCR: biochemical recurrence; cT: clinical stage; EAU: European Association of Urology; PSA: prostate-specific antigen; PSM: positive surgical margin; N/A: not applicable; NCCN: National Comprehensive Cancer Network; RALP: robotic-assisted laparoscopic prostatectomy; RS: Retzius-sparing.

Fig. 22.8 Summary table showing the characteristics of randomized controlled trials comparing Retzius-sparing robot-assisted radical prostatectomy (RARP) with standard RARP

patients with clinically high risk disease, their outcomes were not separately analyzed. Nyarangi-Dix et al. [20] operated upon 50 men with clinically high risk PCa: 3-month continence rates after RS-RARP were 82% (0–1 pad; 50% 0 pad) and increased to 98% (72% with 0 pad/day) at 12 months, despite 34% undergoing adjuvant radiotherapy.

In line with aforementioned data, a recent Cochrane review concluded that RS-RARP probably improves continence 1 week after catheter removal (moderate certainty, relative risk [RR] 1.74), may improve continence 3 months after surgery (low certainty, RR 1.33) and probably results in little to no difference in continence at 12 months postoperatively (moderate certainty, RR 1.01) [18].

Sexual Function

Although preservation of DVC and pudendal arteries may theoretically impact recovery of sexual function, we [19] and others [17] have not noted a statistically significant improvement with RS-RARP. A year after surgery, about 44% of preoperatively potent men had s Sexual Health Inventory for Men score ≥17 with either approach, and 86% men undergoing RS-RARP (vs. 69% with S-RARP) were able to have intercourse (p = 0.5). The Cochrane review [18] therefore concluded that there is uncertainty about the effect of RS-RARP on potency 12 months after surgery (RR 0.98).

Oncological Outcomes

As referenced earlier, most of the evidence for RS-RARP has been limited to low-intermediate risk disease, with only one randomized trial (~33% [7]) and prospective non-randomized series (~37% [21]) including a sizeable proportion of men with clinically high risk prostate cancer. Interestingly, despite our cohort of predominantly clinically intermediate risk, 45% of RS-RARP cohort eventually harbored pT3 disease [5, 19] which was the same proportion noted in the Qiu trial comprising 33% clinically high risk PCa. In contrast, Nyarangi-Dix retrospectively reviewed the outcomes of 50 men with exclusively clinically high-risk PCa [20].

Postoperatively, one of the criticisms of RS-RARP approach has been the higher risk of positive surgical margins (PSM): the Cochrane review [18] states with low certainty that RS-RARP may increase positive surgical margin (RR 1.95). Data from RCTs show a PSM rate of 25–30% in RS-RARP (compared to ~15% in S-RARP). While these differences were not statistically significant, and the proportion of non-focal PSM (defined as PSM ≥2 mm) was much lower in both groups, they were (non-significantly) accentuated in men with pT3 disease (35–40% with RS-RARP vs. ~20–25% with S-RARP) . Further, as expected, PSMs were more likely to occur anteriorly or at the apex with RS-RARP [7, 11, 17, 19], with some authors advocating partial DVC

Table 22.1 Summary of findings from published randomized controlled trials comparing standard robot-assisted radical prostatectomy (S-RARP) with Retzius-sparing RARP

Author, year, (region)	Primary time point for continence	Continence definition	Continence outcomes	Potency	Pertinent histopathology	Positive surgical margins	BCR-free survival
Dalela et al. 2017 (USA) [5]	1 week after catheter removal	0–1 ppd 0 ppd Median Pad weights	48% vs. 71%* 15% vs. 42%* 1 week: 25 vs. 5 g* 2 week: 12 vs. 0 g* 1 month: 5 vs. 0 g*	n/a	75% clinically intermediate risk pT3 disease: 23% vs. 45%*	Overall: 13.3% vs. 25% pT3 disease: 21.4% vs. 37%	0.91 vs. 0.91
Asimakopoulos et al. 2019 (Italy) [3]	Immediately after catheter removal		30% vs. 51.3%* At 6 months: 64% vs. 90%* Median TTC: 21 vs. 1 day*	n/a	70% biopsy GG1, 33% pT3	Overall: 10% vs. 28% pT3: 22.2% vs. 41.2%	n/a
Kolontarev et al. 2016 (Russia)[a] [6]	1 week after surgery (? Immediately after catheter removal)	0–1 ppd	25% vs. 46.1%* At 3 months: 82.5% vs. 94.8%	n/a	n/a	n/a	n/a
Qiu et al. 2020 (China) [7]	1 week after catheter removal	0 ppd	Overall: 30.9% vs. 69.1%* At 6 months: 90% vs. 93% HR 1.56 (RS vs. S-RARP)* Clinically high risk patients: 29.4% vs. 57.9% ($p = 0.08$) At 6 months: 100% vs. 95% (HR 1.26, $p = 0.1$)	n/a	~33% overall had clinically high risk disease, with 20% ≥ GG4 ~45% overall with pT3 disease	Overall: 14.5% vs. 23.6% Clinically high risk: 23.5% vs. 36.8% pT3 disease: 25.9% vs. 36.4% PSM location: Apex (37.5%) and lateral (50%) vs. lateral (38.5%) and anterior (30.8%)	At 12 months: 95% vs. 90% ($p = 0.1$)
Bhat et al. 2020 (India)[a] [4]	1 month post-op	0 ppd	23% vs. 80%* At 6 months: 86% vs. 96%*	n/a	n/a	n/a	n/a
Menon et al. 2018[b] (USA) [19]	6–12 months postop	0–1 ppd 0 ppd	93% vs. 98% 74% vs. 92% (6 months)* 88% vs. 96% (12 months)	ESI at 12 months: 86% vs. 69% SHIM ≥ 17 at 12 months: 44.6% vs. 44.1%	75% clinically intermediate risk pT3 disease: 23% vs. 45%*	Overall: 13.3% vs. 25% pT3 disease: 21.4% vs. 37%	At 18 months: 92.7% vs. 83.8%

ppd pads per day, *SHIM* Sexual Health Inventory for Men, *ESI* erection for intercourse
*$p < 0.05$
[a]Only abstract forms available
[b]One-year follow up of Dalela et al. study

resection anteriorly to potentially decrease PSMs at this location [12]. More recent studies have however, allayed some of these concerns, especially with wider acceptance of the RS approach and overcoming the learning curve [22]. Recent prospective comparative series have shown similar rates of overall and nonfocal PSMs in RS-RARP vs. S-RARP [17, 21], and more importantly, no difference in biochemical recurrence free survival at 1–1.5 year follow up (long term data pending). Even amongst 50 men with clinically high risk PCa undergoing RS-RARP (84% with ≥pT3 disease) and >50% of those undergoing adjuvant therapy, 1-year recurrence-free survival was 96% [20].

Challenges, Limitations and Opportunities

Certain surgical scenarios such as very large prostates/ median lobes, post-TURP, kidney transplant recipients and salvage prostatectomies may present increased complexities and technical challenges, however do not preclude performance of RS-RARP, especially with adequate experience with the technique. One of the stated challenges with the Retzius sparing approach is men with large prostates or median lobes, given the smaller working space to start off with. However, studies from high volume center have shown

Table 22.2 Summary of findings from published non-randomized controlled trials comparing standard RARP (S-RARP) with Retzius-sparing RARP (RS-RARP)

Author, year (country)	Continence definition	Continence outcomes	Potency	Pertinent histopathology	Positive surgical margins	BCR-free survival
Lim et al. 2014 (South Korea) [12] S-RARP n = 50 RS-RARP N = 50	0–1 ppd 0 ppd	1-month post op: 74% vs. 92%* 50% vs. 70%*	n/a	Biopsy Gleason 8–10: ~18% in either arm pT3: ~18% in either arm	Overall: 14% vs. 14% pT3 disease: 24% vs. 18%	n/a
Sayyid et al. 2017 (USA) [36] S-RARP n = 100 RS-RARP n = 100 (Prospective study)	Mean pad number	3-month post op: 3.2 vs. 1.5* 6-month post op: 2.3 vs. 0.9*	n/a	Clinically high risk: ~25% either arm pT3 disease: 23% vs. 34%	Overall: 13% vs. 17%. pT3 disease: 47.1 vs. 47.8%	n/a
Eden et al. 2018 (UK) [37] S-RARP n = 40 RS-RARP n = 40	0 ppd 0–1 ppd	1-month post op: 37.5% vs. 90% 70% vs. 97.5%	n/a	n/a	pT2 disease: 7.7 vs. 16.7% pT3 disease: 14.3% vs. 31.8%	n/a
Lee et al. 2020 (South Korea) [38] S-RARP n = 609 RS-RARP n = 609 (Propensity score matched cohort)	<1 safety liner/day	1-month post op: 9% vs. 45%* 6-month post op: 77% vs. 98%*	n/a	Biopsy Gleason 8–10: 29 vs. 26% Clinical high risk: ~50% in either arm pT3 disease: 43% vs. 39%	pT2 disease: 15% vs. 11% pT3 disease: 32% vs. 36%	n/a
Egan et al. 2021 (USA) [17] S-RARP n = 70 RS-RARP n = 70	EPIC-CP urinary incontinence scores 0–1 ppd	6 weeks post op: 4.4 vs. 3.2* 6 month: 2.4 vs. 1.7* 12-month: 81.4% vs. 97.6%*	12-month ESI: 62.9% vs. 65.7%	Clinical high risk: ~10% in either arm pT3 disease: ~33% in either arm	Overall: 30% vs. 34% Location: posterior (70.6%) vs. anterior (52%)	1-year: 82% vs. 87%
Umari et al. 2021 (UK) [21] S-RARP n = 201 RS-RARP n = 282 (Prospective study)	0–1 ppd	58.1% vs. 70.4%* No difference in overall urinary scores	Mean IIEF scores at 12-months: 10.5 vs. 8.9 (p = 0.2)	37% D'Amico high risk RS-RARP 30% pT3 disease	Overall: 13.9% vs. 15.6% pT3 disease: 20.3% vs. 33.7% (p = 0.2)	1-year: 93% vs. 98.6%*

EPIC-CP Expanded Prostate Cancer Index Composite for Clinical Practice, *IIEF* International Index for Erectile function, *ESI* erection sufficient for intercourse, *ppd* pad per day
*$p < 0.05$

that although larger prostates (>60–80 mL) may be associated with more blood loss and longer console time, immediate and 3-month urinary continence rates (~80% and 90%, respectively) were comparable to smaller ones [23, 24]. Similarly, even in men with enlarged median lobes >10 mm (longitudinal distance from the bladder neck to the highest portion of the median lobe of the prostate as measured on preoperative MRI), RS-RARP expedited continence recovery (HR 1.83, p = 0.002) without compromising perioperative outcomes, blood loss or BCRFS [25]. Rha and colleagues recently published a short case series of 17 patients undergoing RS-RARP with a history of prior transurethral resection of prostate, with no significantly inferior outcomes [26].

Other concerns with the Retzius sparing approach entail the higher risk of positive surgical margins, especially in the anterior or apical location. While studies so far have not conclusively proven this association, patients with anterior tumors, clinical T3 disease or body mass index may nonetheless demand higher technical expertise coupled with continuous evolution and adaptation of surgical technique. Perioperative complications have been comparable, and once again, likely to improve with the learning curve as with all new approaches (including standard RARP). One notable complication has been the potential for higher incidence of postoperative lymphoceles: one series noted a symptomatic lymphocele rate of 18% (most of which required percutaneous drainage) [9], although this was not noted in our experience (7–8% with both standard and RS-RARP) since lateral peritoneal incisions for pelvic lymphadenectomy remain open with either approach.

Like with all new surgical techniques, there is a likely element of learning curve. A multi-institutional analysis of 14 surgeons showed that console time, continence and rate of Clavien-Dindo ≥2 complications improved over the first 50 cases, while reducing rate of PSMs may take longer [11, 22]. However, no appreciable learning curve phenomenon was seen in other high volume centers [27], including ours [5], suggesting that the impact of learning curve can be safely mitigated by expert proctoring and prior experience with robotic prostatectomy platform. Specifically, given the predilection of anterior PSMs, patients with high risk anterior or transitional zone tumors on preoperative MRI may be offered S-RARP [28], or a wider dissection with partial DVC resection may be performed anteriorly in experienced hands and appropriately counseled patients [12].

Potentially Beneficial Scenarios

On the other hand, RS-RARP can be a valuable tool in the armamentarium in patients who have had prior inguinal hernia/extraperitoneal mesh surgeries, by virtue of avoiding that space entirely [29]. Similarly, patients with kidney transplant in-situ may be good candidates for RS approach [29, 30]. Interestingly, Chang et al. noted that RS-RARP was associated with a lower risk of postoperative inguinal hernia over a 3-year follow up: of the 6.3% patients (53 out of 839) who had an inguinal hernia, 79% had undergone standard RARP [31]. The authors postulate that this is likely due to maintaining the attachment between the bladder and anterior abdominal wall structures, preserving the myopectineal orifice ("shutter mechanism") and preventing medialization and dilation of internal ring.

Modifications of the Retzius-Sparing Approach

Lastly, given the documented superiority of RS-RARP in expediting continence recovery, different groups have proposed modifications of the Retzius sparing approach in an effort to make it more reproducible. Ash Tewari's group in New York [32] proposed a "hood" technique for performing RARP (Figs. 22.9 and 22.10), whereby the surgery proceeds in the usual S-RARP fashion after developing the space of Retzius, going through the anterior/posterior bladder neck to the retrotrigonal layer posteriorly, and developing the plane between detrusor apron and anterior fibromuscular stroma anteriorly, such that a hood of tissue remains behind (including puboprostatic ligaments, arcus tendineus, puboperinealis muscle, retrotrigonal layer and Denonvilliers' fascia for posterior musculofascial reconstruction). The authors reported urinary continence rates similar to RS-RARP (83% 1 month after catheter removal), without adversely affecting complication rate or positive surgical margin (6%), although the majority of patients had pT2 disease (81%) and patients with high risk disease or anterior tumors were excluded. Zhou and colleagues in China discussed a transvesical, Retzius-sparing approach, where a cystotomy is made on the postero-superior aspect of the bladder and the prostate is accessed through a circumferential incision around the internal urethral meatus/bladder

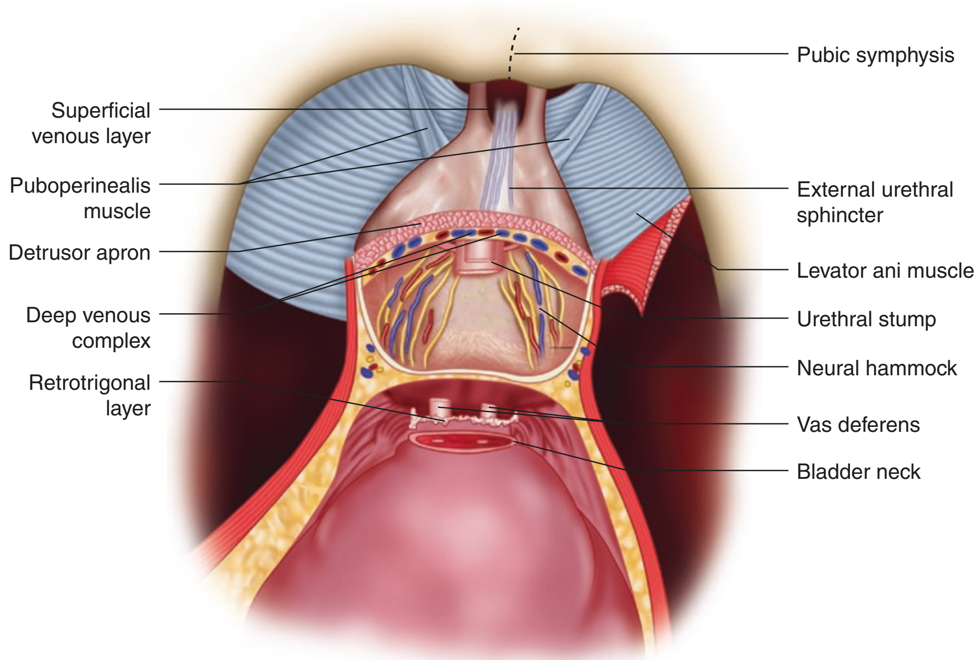

Fig. 22.9 Sketch demonstrating hood surgical anatomy. Anatomical components of the hood surround and safeguard the membranous urethra and the external urethral sphincter, and thereby urethrovesical anastomosis. 1 = pubic symphysis; 2 = external urethral sphincter; 3 = superficial venous layer; 4 = puboperinealis muscle; 5 = levator ani muscle; 6 = detrusor apron; 7 = urethral stump; 8 = deep venous complex; 9 = neural hammock; 10 = vas deferens; 11 = retrotrigonal layer; 12 = bladder neck. (Borrowed, with permission, from Wagaskar et al. [32])

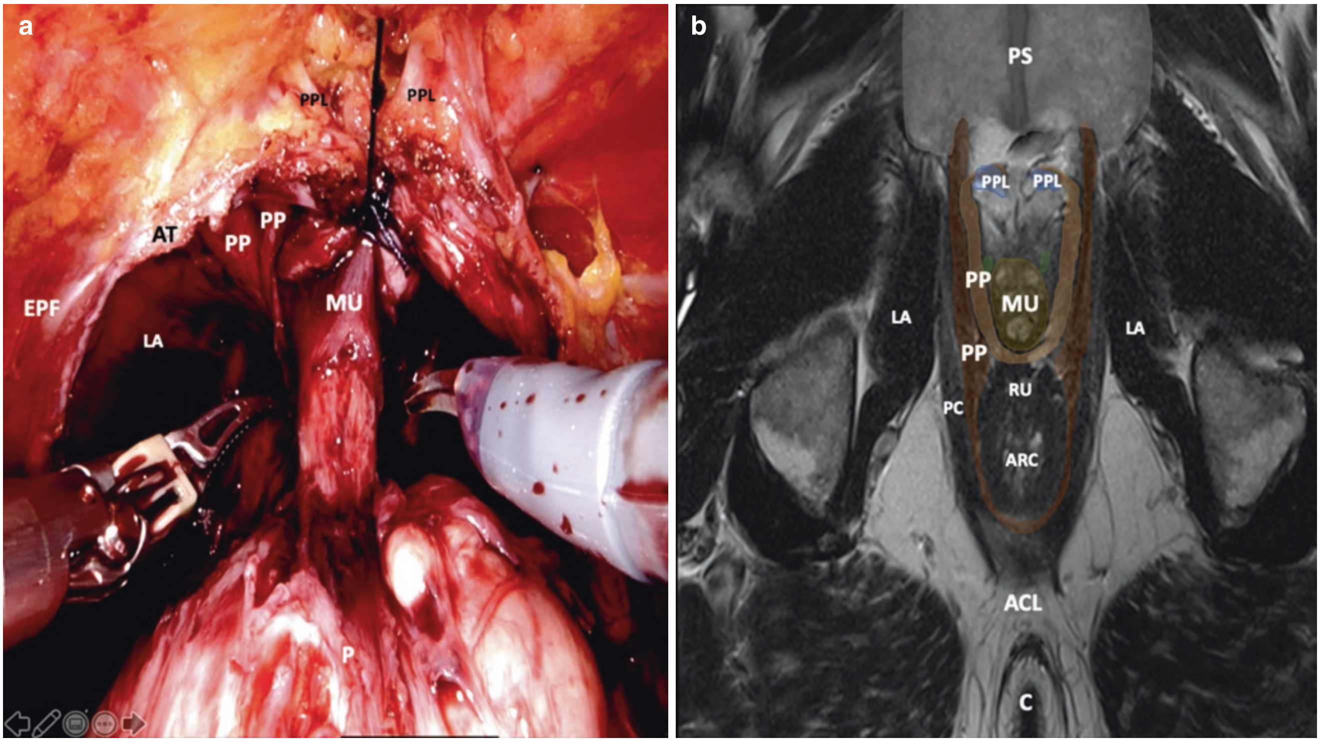

Fig. 22.10 MRI and intraoperative images corresponding to section **b**. (**a**) Intraoperative image showing the membranous urethra and muscles surrounding the urethral sphincter. (**b**) MRI of the pelvis (cross section) corresponding to the intraoperative image. *ACL* anococcygeal ligament, *ARC* anorectal canal, *AT* arcus tendineus, *C* coccyx, *EPF* endopelvic fascia, *LA* levator ani, *MRI* magnetic resonance imaging, *MU* membranous urethra, *PC* prostatic capsule, *PP* puboperinealis muscle, *PPL* puboprostatic ligaments, *PS* pubic symphysis, *RU* rectourethralis muscle. (Borrowed, with permission, from Wagaskar et al. [32])

neck [33]. Continence outcomes (0–1 ppd) were comparable to RS-RARP performed through the posterior (pouch of Douglas) approach (91% 1 week after catheter removal) with a PSM rate of 11.4%, although their series did not include clinically high risk, anterior tumor or pathological T3 disease [34]. Kaouk and colleagues adapted the transvesical Retzius-sparing approach to the single-port RARP platform (making a 2-cm vertical cystotomy extracorporeally through a 4 cm vertical midline incision and a "floating" single port with Gelpoint mini docked inside the bladder, with 75% (15/20) continent immediately post catheter removal, 30% harboring ≥pT3a disease and 15% with PSMs [35].

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