For 70 years following Hugh Hampton Young's perineal radical prostatectomy series, there were surprisingly few alterations to the surgical technique and approach. However, advances in pelvic anatomy and surgical technique to control bleeding from the dorsal venous complex (DVC) coupled with preservation of the neurovascular bundles (NVBs) decreased morbidity and led to a conversion from the perineal to the retropubic open approach. The advent of prostate-specific antigen (PSA) afforded a measure of the completeness of surgical resection and led to additional technical modifications and a drop in the acceptable postprostatectomy PSA threshold from 0.4 or less to less than 0.1. At around the same time that PSA was introduced, Schuessler and colleagues performed a series of 9 laparoscopic radical prostatectomies (LRPs) with a mean operative time of 9.4 hours, concluding that there were no advantages compared with the gold standard open radical prostatectomy (ORP). However, at the turn of the century, European urologists reported shorter operative times and consistently reproducible advantages of the laparoscopic approach, promoting acceptance of this technique.

Introduced in 1999, the da Vinci Surgical System (Intuitive Surgical Inc, CA, USA) was initially intended for cardiac surgery; however, Abbou and colleagues reported the use of the robotic platform for radical prostatectomy in a single case report with an operative time of 420 minutes. The feasibility of this new approach was also shown by Binder and Kramer in a series of 10 robotic-assisted laparoscopic radical prostatectomies (RALPs) with a 30% positive margin rate and 1 case requiring open conversion. The robotic surgical system allows for technical advantages such as three-dimensional magnified vision, enhanced ergonomics, tremor filtration, motion scaling, and improved manual dexterity, from wristed capabilities that allow for 6 degrees of freedom of movement that overcomes some of the limited motion of pure laparoscopy. Less than a decade after its introduction, RALP was used in 75% to 85% of radical prostatectomies performed in the United States in 2008.

Although enthusiasm for this approach may be driven by good outcomes from studies from high-volume centers, 70% of all radical prostatectomies in the United States are performed by low-volume surgeons, whose findings may go unpublished. A population-based analysis of Surveillance Epidemiology and End Results (SEER)-Medicare linked data demonstrated that those undergoing LRP and RALP versus radical retropubic prostatectomy (RRP) experienced
shorter hospitalizations (2 vs 3 days) and fewer heterologous transfusions (2.7% vs 20.8%) and strictures (5.8% vs 14%). These advantageous outcomes were likely driven by intrinsic qualities of the minimally invasive approach, such as small incisions with less tension on the abdominal wall, pneumoperitoneum, and superior visualization of the anastomosis. However, LRP and RALP compared with RRP were associated with more genitourinary complications (4.7% vs 2.1%) and diagnoses of incontinence (15.9% vs 12.2%) and erectile dysfunction (26.8% vs 19.2%). Subanalyses demonstrated that cystograms were obtained with 3 times greater frequency with RALP and LRP versus RRP (31.4% vs 9.9%), which may explain the higher rates of anastomotic leak diagnoses. This finding coupled with the greater risk for urinary retention from earlier attempts at catheter removal may contribute to the greater frequency of genitourinary complications observed with RALP and LRP versus RRP.

This article describes the learning curve associated with RALP, reviews in detail the challenging steps of the operation, describes the authors’ RALP technique, and concludes with tips to overcome the learning curve.

LEARNING CURVE: THE CHALLENGE OF RADICAL PROSTATECTOMY

In 1936, Wright16 introduced the concept of a learning curve by proposing a mathematical model for the aircraft industry. Since then, it has been used to characterize the diminishing amount of time required to perform a specific repeated task.17 However, in the surgical field, no standard definition has been accepted,18 and the surgical learning curve is typically defined as the number of cases a surgeon needs to perform a particular procedure to achieve acceptable operative times and reasonable outcomes19; alternatively, it is a self-declared point at which a surgeon reaches a comfort zone when performing a procedure.18

Part of the difficulty in establishing an exact definition is that individuals have different goals when performing a new procedure. Highly experienced surgeons tend to focus on different outcomes than novice surgeons, which could prolong their perception of their learning curve.18 Moreover, the learning curve also depends on subjective measures such as surgeon confidence, attitude, and previous experience with crossover applicability.19

Population-based studies of RRP have shown that greater surgeon experience is associated with fewer perioperative complications, anastomotic strictures, and shorter lengths of stay.20,21 Hu and colleagues22 demonstrated that greater LRP and RALP surgeon volume was associated with fewer anastomotic strictures and better cancer control. A study of more than 7000 RRPs at 4 US centers23 revealed that the learning curve for biochemical recurrence plateaus at 250 cases, and the 5-year probability of recurrence was 10.7% for those treated by surgeons with 250 RRRPs, but 17.9% for surgeons with fewer than 10 prior RRPs. Using a similar study design for establishing an LRP cancer control learning curve, Vickers and colleagues24 demonstrated that the 5-year biochemical recurrence rate for surgeons who performed 10, 250, and 750 prior LRRPs were 17%, 16%, and 9%, respectively.

The learning curve for RALP is less challenging than LRP.10 Patel and colleagues15 estimated that 20 to 25 cases are required to achieve proficiency with RALP. Conversely, Herrell and Smith18 defined a learning curve of 150 RALPs for an experienced open surgeon to achieve similar outcomes compared with RRP and 250 RALPs to obtain surgeon comfort and confidence. For laparoscopic surgeons transitioning to RALP, Jaffe and colleagues25 found that the positive-margin rate for an experienced laparoscopic surgeon was 58% in the first 12 cases, decreasing to 9% after 180 cases.

At the Brigham and Women’s Hospital, a single surgeon (JCH) performed more than 700 RALPs after logging 76 RRPs during residency and 397 RALPs during fellowship training. In contrast to the studies mentioned earlier, it was found that the RALP learning curve extends beyond 250 cases, as significant improvements in estimated blood loss (EBL), operative time, and overall complications were observed throughout the first 700 cases. The EBL and operative times were 270.1 mL and 225.8 minutes, respectively during the first 100 cases, and decreased to 197.2 mL and 126.8 minutes during cases 600 to 700. The positive margin rate decreased from 17% for the first 100 cases to 12% after 400 cases, and remained constant up to 700 cases.

The rapid, widespread diffusion of the robotic technique, in conjunction with the RALP learning curve, may help explain why RRP had better outcomes in genitourinary complications, incontinence, and erectile dysfunction in a recent population-based observational cohort study using SEER-Medicare claims.15 Although learning curves are unavoidable for new techniques, surgeons have the responsibility to portray realistic expectations of outcomes to patients, based on their own data. A recent review of hospital Web sites showed that significant misinformation regarding RALP outcomes has been disseminated: more than 50% of the RALP Web sites...
had no information regarding erectile function recovery, and of those that did, 50% stated that RALP had better erectile function outcomes than RRP.26 Such misinformation relays unrealistic expectations, and patients striving to maintain a high level of continence and erectile function may self-select for RALP based on misleading marketing. Consequently, patients treated with RALP may have higher levels of treatment regret than those undergoing RRP.27 In addition, this potential selection bias may also explain the findings of increased risk of erectile dysfunction and incontinence in RALP patients.

TECHNICAL CHALLENGES OF RALP

**Accessing the Space of Retzius: Extraperitoneal Versus Transperitoneal Approach**

RALP may be performed via an extraperitoneal or transperitoneal approach. The extraperitoneal approach was first described by Raboy and colleagues in 1997.28 In retrospective comparative studies, Ruiz and colleagues29 observed greater operative times in the transperitoneal group with similar early oncologic results for both techniques, whereas Brown and colleagues30 reported a slightly increased risk of ileus after the transperitoneal approach. No other significant differences between the 2 techniques have been reported.31,32

The potential advantages of the extraperitoneal technique include: (1) confinement of potential postoperative bleeding or anastomotic leaks to the closed extraperitoneal space; (2) simulation of the RRP anatomy; (3) absence of bowel in the surgical field; (4) less need for an extreme Trendelenburg position, which improves ventilation, especially in obese patients; and (5) less risk of intra-abdominal complications such as bowel injuries.11,33

The potential disadvantages are: (1) limited working space; (2) additional time and equipment required to create the extraperitoneal space; and (3) contraindications in patients with previous extended suprapubic laparotomy, or bilateral hernia repairs.11

**Bladder Neck Dissection: Standard Technique Versus Bladder Neck Preservation**

Bladder neck dissection is one of the most difficult steps for newcomers to LRP and RALP.34 The absence of tactile sensation and unfamiliar laparoscopic anatomy may prove challenging for those inexperienced with minimally invasive approaches to radical prostatectomy, as shown by the wide variation in techniques to facilitate this step.35,36

The standard dissection technique makes no attempt to preserve the muscle fibers of the bladder neck, which results in a larger bladder neck requiring a reconstruction before the urethrovesical anastomosis. Bladder neck preservation has been associated with several advantages, including a lower risk of bladder neck contracture,37 lower rates of ureteral injury,35 and earlier return of continence.38–41 However, others have suggested that preservation of the bladder neck compromises cancer control by increasing the risk of positive margins at the prostate base with no effect on continence.42–45

The authors retrospectively evaluated outcomes in a series of 619 men, with 271 submitted to the standard technique and 349 submitted to bladder neck preservation. Bladder neck preservation was associated with earlier return of continence (0 pads per day) and better mean urinary function scores after 24 months of follow-up, using a self-reported validated quality-of-life instrument, the Expanded Prostate Cancer Index (EPIC) short form.46 Moreover, no differences were observed regarding positive margins at the prostate base.47

**Nerve-sparing Technique**

Nerve preservation during RALP is a challenging and critical step, as it affects postoperative sexual function and cancer control. Several techniques for the release of the NVBs have been described. In an attempt to decrease the rate of positive margins, Villers and colleagues48 introduced the concept of the extrafascial dissection for ORP. With the improved visualization from laparoscopic approaches, new techniques of interfascial and intrafascial dissection of the NVBs have been proposed.49 Savera and colleagues50 first described the intrafascial approach, suggesting that the lateral aspect of the fascia also contains bundles of sensitive parasympathetic nerves, which are not preserved by the traditional technique. With this technique, Menon and colleagues51 reported a 13% positive margin rate and 100% intercourse rate in patients undergoing bilateral nerve-sparing surgery at 48 months of follow-up (with or without oral medication). Others52 replicated the feasibility of this technique but with less noteworthy sexual function results and a higher positive margin rate, especially for patients with pT3 disease. Curto and colleagues53 presented their experience with the intrafascial approach with an overall positive margin rate of 30.7% in more than 2800 procedures. Moreover, the precise role of these nerve fibers spared in the intrafascial approach but sacrificed in the
interfascial approach remains unknown and warrants further study.

Regardless of the intra- versus interfascial technique used for nerve sparing, the type and amount of energy used during dissection of the neurovascular bundles is of vital importance for preservation and early recovery of sexual function. In a canine experimental model, Ong and colleagues described the use of hemostatic energy sources such as monopolar, bipolar, or ultrasound in proximity to the NVBs is associated with the loss of erectile response to cavernous nerve stimulation acutely and after 2 weeks of follow-up.

Other sources of energy have been used in an attempt to control bleeding near the NVBs. Recently, Gianduzzo and colleagues studied the use of potassium titanyl phosphate (KTP) laser energy during nerve-sparing RRP in a canine model. They compared KTP laser with ultrasonic and athermal cold scissors dissection, and found the KTP laser provided effective hemostasis with minimum injury to the adjacent tissues, similar to the amount imparted by the athermal technique. Haber and colleagues proposed an energy-free technique with the use of a bulldog clamp and delicate sutures to control the NVBs. In this technique, a Doppler ultrasound is also used to identify the NVBs, avoiding damage to these structures. Although thermal injuries are significant, Ahlering and colleagues described the eventual recovery of sexual function after 24 months in patients submitted to use of thermal energy during NVB dissection, suggesting these injuries are reversible in the long-term.

The authors’ approach to nerve sparing has been described in detail elsewhere. In short, the authors perform a sharp athermal technique with Weck clips and cold scissors after identification of the posteromedial and anterolateral prostatic contours.

**Apical Dissection**

The apical dissection is one of the most crucial steps in RALP. The surgeon aims to maximize preservation of the urinary sphincter with total resection of the prostate apical tissue, targeting an optimal balance between continence and cancer control.

Different techniques have been described to minimize incontinence after radical prostatectomy. Klein refined the apical dissection technique by describing the mobilization of the distal third of the prostate with minimal damage to the external sphincter. Recently, Porpiglia and colleagues described a selective suture of the DVC for LRP.

In this technique, the DVC is sectioned and a selective suture of the plexus is performed with 1 or 2 stitches, avoiding the incorporation of surrounding tissue. At 3 months, 80% of the patients who underwent selective suture ligation of the DVC were continent, compared with 53% of the patients who had surgery without selective suture ligation. Menon and colleagues described their technique of apical dissection, using an adaptation of the same technique previously described for RRP. The DVC is controlled with a single figure-of-eight stitch before it is divided down to the urethra. In their retrospective study, 96% of patients were socially dry (use of 1 pad or less per day) after 3 months of follow-up. Other intraoperative attempts to improve early continence have included the placement of the puboperiurethral stitch after the ligation of the DVC. Patel and colleagues described a suspension technique that resulted in higher continence rates at 3 months after the procedure.

The prostatic apex is generally regarded as the most common site of iatrogenic positive margins. Walsh proposed that positive apical margins commonly occur during the release of the DVC and the striated sphincter. Ahlering and colleagues showed that the use of an endovascular stapler to control the DVC decreased the positive margin rates from 27% to 5%, compared with a suture ligation technique. Guru and colleagues proposed that using cold incision of the DVC without previous suture ligation also resulted in lower apical margin rates during RALP. Men who underwent prostatectomy with cold incision apical dissection showed a positive margin rate of 2%, whereas patients with suture ligation had a positive margin rate of 8%.

**Vesicourethral Anastomosis**

For those early in the learning curve, the vesicourethral anastomosis may be one of the most challenging and time-consuming steps of RALP. Several techniques have been described. A single-knot continuous vesicourethral anastomosis for LRP was proposed by van Velthoven and colleagues. This technique was rapidly adopted for LRP and has been transferred to RALP. This continuous suture is fast and easy to perform, requiring just 1 knot. In a porcine model of vesicourethral anastomosis, continuous suturing was compared with an interrupted suture technique. Both techniques had similar rates of anastomotic leaks. However, histopathologic examination revealed more muscle-layer fibrosis in the group with interrupted sutures, suggesting a higher risk of anastomotic stricture.
On the other hand, the lack of haptic feedback and the potential for suboptimal suture tension after knot tying may increase the risk of anastomotic leakage. Several techniques have been described to mitigate this risk, such as the use of a Lowsley tractor and the use of an absorbable Lapra-Ty (Ethicon Inc, San Angelo, TX, USA) to keep tension and ensure an optimal posterior approximation. The authors’ technique of vesicourethral anastomosis combines the more reliable posterior approximation of the interrupted suture with the advantages of the faster running suture.

**THE Brigham & Women’s Hospital Technique**

**Positioning/Setup**

The patient is initially placed in the supine position with legs extended on flat split leg boards. The split leg boards are spread to allow the robot to dock, and the hips are extended about 20°. The patient’s arms are tucked and secured with the aid of arm sleds. All pressure points are well padded. After the patient is prepared and draped, a 16-Fr urethral catheter is placed. A Veress needle or Hassan technique is used to achieve pneumoperitoneum to an intra-abdominal pressure of 15 mm Hg. The patient is then reclined in a full Trendelenburg position to approximately 30° for a transperitoneal approach (Fig. 1), a standard 6-port template is used (Fig. 2), and a 4-arm da Vinci robot is docked. A zero-degree camera is used exclusively throughout the operation, obviating scope changes. The authors start with a curved monopolar scissor in the right da Vinci arm and a bipolar Maryland dissector in the left arm, with a ProGrasp in the fourth arm, docked at the left anterior superior iliac spine. The assistant uses a suction irrigator through a 5-mm assistant trocar positioned cephalad to the umbilicus at the right rectus margin and a nontraumatic grasper through a 12-mm assistant trocar placed just medial to the right anterior superior iliac spine. The monopolar and bipolar currents are set to 25 W.

**Accessing the Retropubic Space of Retzius**

The operation commences with the high transection of the median umbilical ligament and urachus using generous monopolar cautery to avoid potential bleeding from a patent umbilical vessel. The peritoneal incision is carried just lateral to the umbilical ligaments, as they course posteriorly to their origin from the hypogastric artery, until the vas deferens is reached. The retropubic space of Retzius is then entered by separating the bladder from the anterior abdominal wall until the pubis is identified. The ProGrasp (fourth arm) applies cephalad traction to the bladder, while overlying fat is cleared from the proximal prostate, the prostatovesical junction, and the endopelvic fascia. The superficial dorsal vein is cauterized with bipolar energy before transaction.

**Anterior Bladder Neck Sparing Division**

Midprostatic and anterior vesical hemostatic sutures are placed with a 2-0 Vicryl (Ethicon Inc, San Angelo, TX, USA) on a CT-1 needle. Three-dimensionalized anterior-cephalad tension to the bladder is applied by retracting the bladder dome with the fourth arm ProGrasp. This motion tents the anterior bladder to form a ridge that ends distally at the detrusor apron. In addition, this motion allows for visualization of the urethral catheter balloon, as the empty bladder caves in around

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**Fig. 1.** Patient positioned to 30° of steep Trendelenburg position with legs spread on flat split boards and hips extended about 20°.
the balloon. At the proximal detrusor apron, the bladder neck is sharply dissected with the cold scissors while bipolar current is used for hemostasis. The use of bipolar current minimizes the amount of tissue charring, allowing for easier identification of the natural tissue planes. The linear fibers of the bladder neck transitioning to the prostatic urethra are identified in the midline, and the remaining bladder muscle fibers are teased away from the prostate base, preserving a funneled bladder neck. After 270° anterior circumferential dissection of the bladder neck as it transitions to the prostatic urethra, the urethral catheter balloon is deflated, and the bladder neck is incised as distally as possible.47 The assistant grasps the tip of the urethral catheter using a 1-handed intra- and extracorporeal technique, elevating the prostate. The posterior bladder neck is divided in the midline (Fig. 3) until the posterior longitudinal fascia of the detrusor muscle is encountered (Fig. 4). For optimal three-dimensionalized traction, the fourth arm ProGrasp retracts the posterior prostate anteriorly, while the assistant grasps the posterior bladder neck for countertraction. Subsequent incision of the posterior longitudinal fascia reveals the seminal vesicles and vas deferens. With the aid of bipolar current for hemostasis, the dissection is continued sharply in a posterior-lateral plane, with care to avoid a posterior cystotomy, entry into the prostate base capsule, or early transection of the lateral pedicle, which can result in bleeding. The dissection is continued until adipose tissue is encountered lateral to the bladder neck, a landmark known as the “fat pad of Whitmore” (J. Montie, personal communication, 2009), which defines the posterior-lateral limit of the bladder neck dissection, as the NVB lies in close proximity. This complete unhinging of the bladder from the prostate allows for better access to the vasa deferentia.

**Isolating the Seminal Vesicles/Posterior Dissection**

The fourth arm ProGrasp is readjusted to grab the ampulla of vas and place it on anterior traction. The vas deferens is dissected free from its investing sheath and cut after the assistant places a 10-mm Weck clip on the proximal end. The assistant grasps the proximal cut vas, and the artery to

**Fig. 2.** Standard 6-port template: 12-mm camera trocar just cephalad to the umbilicus, two 8-mm ports placed 17 cm from base of penis and 8 cm from midline on right and left, 8-mm fourth-arm port placed 1 fingerbreadth superior-lateral to the left anterior iliac spine, 12-mm assistant port placed 2 fingerbreadths superior-lateral to right anterior iliac spine, and a 5-mm assistant port placed cephalad, and just medial, to the right-arm 8-mm port.

**Fig. 3.** Isolation of the posterior bladder neck while the assistant elevates the prostate by applying tension to the Foley catheter.

**Fig. 4.** The fourth arm provides anterior traction on the prostate base, while the assistant grasps the posterior bladder neck.
the vas deferens is identified and secured with small clips or selective use of bipolar current. Frequent readjustment of the fourth arm ProGrasp on the seminal vesicle is helpful in providing the appropriate traction needed to dissect the seminal vesicle free sharply. Thermal energy is avoided to prevent injury to the nearby NVB. Instead, small pedicle windows are created at the tip of the seminal vesicle and small titanium or Weck clips are applied. The contralateral seminal vesicle is dissected in the same manner.

Next, the fourth arm ProGrasp elevates both seminal vesicles, and a sharp incision is made in the midline until the glistening posterior Denovilliers sheath is identified. With the assistant placing downward traction on the rectum, the posterior dissection is continued between the prostatic and Denovilliers fascia if a nerve-sparing approach is being used. For higher-risk patients, such as those with high-volume, high-grade disease or those with a palpable nodule, the dissection is performed leaving the entire Denovilliers fascia with the specimen. A triangle is created with the rectum as the base, the lateral pedicle as the sides, and the middle of the posterior prostate as the apex. The assistant provides countertraction by retracting the corners of the triangle base in a posterior-lateral fashion. Dissection is continued laterally and distally until the medial border of the NVB is appreciated. This maneuver thins out the vascular pedicle, which facilitates subsequent clip placement, and defines the posterior medial prostate contour.

Athermal Lateral Pedicles

A sweeping motion of the monopolar scissors is used to bluntly identify a natural cleavage plane to reflect the levator fascia away from the prostatic fascia until tiny nerve plexus components are identified coursing lateral to the prostate. This technique clearly defines the anterior lateral prostate contour. With the lateral pedicle placed on traction, a series of large Weck clips are used to ligate and divide the lateral pedicle vessels in an athermal fashion. Next, the NVB is gently teased off the prostate to the apex in an antegrade manner using a combination of sharp and blunt dissection (Fig. 5). Tumor characteristics determine the amount of periprostatic tissue that is left with the prostate. The contralateral lateral pedicle and NVB are dissected in a similar manner.

Apical Dissection

The prostate is placed on cephalad traction by the fourth arm ProGrasp. The puboprostatic ligaments are transected sharply and the prostate apex is further dissected from the levator fascia. The detrusor apron, the arteries and veins within, are sharply divided, and selective bipolar cautery is used to stop arterial bleeders while allowing pneumoperitoneum to minimize venous bleeding (Fig. 6). The distal NVB is swept laterally from the urethra at the apex, and the lateral pillars of the urethra are sharply transected, completely freeing up the prostate and urethra from its surrounding structures. The anterior 270° of urethra are incised until the urethral catheter is identified.

Next, the only instrument changes are made, inserting large needle drivers into both right and left Da Vinci arms. A 3-0 Vicryl on a CT-3 needle is used to re-approximate the cut edges of DVC with a horizontal mattress suture. We believe this precise selective suturing of the DVC provides excellent visualization of the prostatic apex and reduces the risk of positive apical margins and
damage to the rhabdosphincter continence mechanism compared with preplaced sutures or staples.

**Urethral Anastomosis**

The authors prefer a combined running and interrupted suture technique for urethrovaginal anastomosis. The posterior stability of this technique is provided by 3 interrupted sutures placed under direct visualization of the knots placed inside the anastomosis on the mucosa, while the remainder of the anastomosis is performed in an efficient running fashion. Two absorbable 3-0 polygalactin sutures cut to 18 cm (7 in) on a CT-3 needle are used.

The urethral catheter is retracted and a 6 o’clock posterior urethral suture is placed inside out before division of the posterior urethra, preventing urethral retraction. The posterior urethra is transected, and the specimen is placed in a laparoscopic bag. Pneumoperitoneum pressure is then brought down to 5 mm Hg, and meticulous hemostasis is obtained with clips or selective suture ligation. The initial suture is then placed on the corresponding posterior bladder neck incorporating mucosa. A surgeon’s knot is tied on the bladder neck side to allow for knot tension without tearing the urethral stump. Next 2 lateral posterior sutures are placed on each side of the 6 o’clock suture, with the knot tied on the bladder mucosa. The contralateral needle driver is then used to place full-thickness single bites outside in through the bladder and inside out through the urethra. These sutures are then run in this continuous fashion until both needles are brought out through the urethra at 12 o’clock. Typically 2 or 3 throws of each needle are required. One of the needles is brought inside out on the bladder side so the sutures are tied down across the anastomosis on the mucosa, while the remainder of the anastomosis is performed in an efficient running fashion. Two absorbable 3-0 polygalactin sutures cut to 18 cm (7 in) on a CT-3 needle are used.

**Retrieval of Specimen/Closure**

A Jackson-Pratt drain is placed through the fourth arm port into the pelvis. The supraumbilical port incision is lengthened to allow for specimen removal. The fascia is closed with 0 Vicryl on a UR-6 needle with 3 to 4 figure-of-eight sutures. The skin is reapproximated with a subcuticular suture.

**TIPS FOR THE BEGINNER**

Although the learning curve for RALP is significant, several measures may shorten the process. A dedicated robotics team must be formed. Initially, this requires significant hospital support, but pays dividends in the long-term. A dedicated surgical assistant is arguably the most helpful. The assistant’s role in providing adequate exposure and visualization through retraction and suction, and in applying clips accurately and expeditiously, cannot be overstated. Furthermore, an experienced assistant is able to troubleshoot many of the robotic issues that may arise at the bedside, allowing the surgeon to focus on surgical technique. Moreover, an anesthesiologist familiar with the operation is better able to handle the physiologic effects of prolonged insufflation in the steep Trendelenburg position. An inexperienced anesthesiologist may base fluid management on expectations of blood loss from RRP, leading to overhydration and possible pulmonary edema and congestive heart failure in men with significant cardiovascular disease.

The surgeon unfamiliar with laparoscopy must also learn to depend on visual cues as opposed to tactile feedback. Visual cues are especially important in identifying tissue characteristics and anatomic planes. Rethinking the steps of the operation compared with RRP will also decrease blood loss at critical steps of RALP, leading to better visualization and efficient dissection rather than repeated attempts at hemostasis and guessing the location of the correct anatomic planes. For instance, the authors perform an antegrade RALP in contrast to RRP, which is performed in a retrograde fashion and requires ligation of the DVC initially. Instead, the authors perform the bladder neck dissection first, leaving the apical dissection and the DVC for later. There are several advantages to reversing this sequence. First, the venous anatomy is highly variable at the apex, and incurring blood loss early can obscure anatomic planes for subsequent steps such as nerve-sparing and bladder neck dissection. Moreover, bladder neck dissection and ligation of the lateral pedicles early in RALP leads to an absence of venous back-bleeding when dividing the DVC as one of the final steps. However, because the DVC has not been ligated early, back-bleeder clips must be applied before dividing the lateral pedicle to ensure hemostasis and adequate visualization.

The authors have switched from the posterior approach to seminal vesicle dissection to the anterior approach through the bladder neck because of improved exposure. Dissecting out the vasa deferentia through a peritoneal incision in the cul-de-sac leads to operating in a hole. The fourth
arm is occupied with retracting the sigmoid colon cephalad and an assistant instrument is occupied with holding the upper cut edge of the peritoneum to provide exposure. This technique results in poor exposure if bleeding is encountered, often leading to more liberal use of energy for hemostasis.

Another critical component to overcome the learning curve is the continued assessment of technique. This assessment is best done by recording all procedures and reviewing them shortly after. Without the stress of performing an operation, viewing recorded video can provide valuable information about details that facilitate an operation, such as what the fourth arm is doing, and how the assistant is providing exposure. In addition, the neophyte surgeon should review video of more experienced robotic surgeons. A prospectively collected database of perioperative, pathologic, and quality-of-life outcomes should be kept and reviewed for self-assessment, in particular, as modifications of surgical technique may take 18 to 24 months (the interim required for recovery of urinary and sexual function to plateau) to manifest in improved functional outcomes.

The authors believe many of the basic tenets of open surgery must be applied to RALP. A detailed understanding of pelvic anatomy is critical. Meticulous attention to detail and a dedication to performing the same surgical steps in a repetitive fashion are necessary to overcome the prolonged learning curve. Maintaining exposure is necessary for safe and reproducible RALP. The surgical assistant’s grasper and fourth arm of the robotic system must always be positioned to provide traction and countertraction, allowing for easier visualization of surgical planes. The surgeon should also avoid working in a hole, which results in poor visualization and difficulty controlling bleeding.

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