

# Perioperative outcome of initial 190 cases of robot-assisted laparoscopic radical prostatectomy – A single-center experience

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## ABSTRACT

**Objective:** To analyze the perioperative outcome of the first 190 cases of robot-assisted laparoscopic radical prostatectomy performed at our center from July 2006 to December 2010.

**Materials and Methods:** Operative and recovery data for men with localized prostate cancer undergoing robot-assisted radical prostatectomy at our center were reviewed. All surgeries were performed using the 4-arm da Vinci-S surgical robot. Preoperative data included age, body mass index (BMI), prostate specific antigen (PSA) level, prostate weight, biopsy Gleason score and TNM staging, while operative and recovery data included total operative time, estimated blood loss, complications, hospital stay and catheter time. These parameters were evaluated for the safety and efficacy of this procedure in our center.

**Results:** The mean age of our patients was  $65 \pm 1.2$  years. The mean BMI was  $25.20 \pm 2.88$  and the median PSA was 14.8 ng/ml. Majority of our patients belonged to clinical stage T2 (51.58%). The mean total operative time was  $166.44 \pm 11.5$  min. Six patients required conversion to open procedure and there was one rectal injury. The median estimated blood loss was  $302 \pm 14.45$  ml and the median duration of hospital stay was 4 days. The overall margin positivity rate was 12.63%.

**Conclusion:** Despite our limited robotic surgery experience, our perioperative outcome and complication rate is comparable to most contemporary series. Robot-assisted laparoscopic prostatectomy (RALP) is easy to learn and provides the patient with the benefits of minimally invasive surgery with minimal perioperative morbidity.

**Key words:** Outcome, perioperative, prostatectomy, robotic

## INTRODUCTION

Radical prostatectomy is an established treatment modality for localized prostate cancer. The morbidity associated with open surgery was the reason behind the search for less-invasive treatment options. Catalona *et al.*, in their series of 1870 patients undergoing

open radical retropubic prostatectomy, noted a mean blood loss of 1395 ml and a complication rate of 10%.<sup>[1]</sup> Schuessler reported his initial experience in laparoscopic radical prostatectomy in 1992.<sup>[2]</sup> But the long learning curve of laparoscopy in radical prostatectomy facilitated the introduction and acceptance of robotic technology in Urology.<sup>[3,4]</sup>

The robotic system provides many advantages: Three-dimensional vision, enhanced magnification, tremor filtering, motion scaling, the “endowrist” technology which helps in intracorporeal suturing and ergonomic comfort. Although there are no prospective randomized studies comparing open and robot-assisted laparoscopic prostatectomy (RALP), available data from retrospective case series suggest that RALP is associated with significantly less blood loss and shorter time to convalescence.<sup>[5-7]</sup> While most surgical techniques have equivalent outcomes in high-volume centers with a large experience, we evaluated the outcomes for the initial cases of RALP at our center which

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had limited previous experience of open and laparoscopic radical prostatectomy. This study represents the first such reasonably large experience from a single center in the developing world.

## MATERIALS AND METHODS

We acquired a 4-arm *da Vinci-S* surgical robot and began performing RALP in July 2006. Preoperative assessment included detailed history and clinical examination along with serum PSA, biopsy Gleason score, bone scan and contrast-enhanced computed tomography (CT) scan or magnetic resonance imaging (MRI) in all cases. Baseline demographic data such as age, body mass index (BMI), comorbidities, previous surgeries and hormonal therapy were recorded. Clinical staging was done as per TNM staging and only the cases with clinical T<sub>1-2</sub>, N<sub>0</sub>, M<sub>0</sub> were considered for RALP. (However, three patients with doubtful T3a lesions on preoperative imaging also underwent surgery.) A time gap of 6 weeks was kept after diagnosis on prostate biopsy and 3 months after transurethral resection of prostate (TURP) before performing RALP. All surgeries were performed using the modified Vattikuti Institute prostatectomy (VIP) technique.<sup>[8]</sup> This study represents the consolidated results of four surgeons with different levels of experience from a single center. Lymphadenectomy was considered for patients with PSA >10 ng/ml and biopsy Gleason score >6. Unilateral or bilateral nerve sparing was done wherever feasible. Total operative time including time for port placement, docking of robot, dissection, anastomosis and lymphadenectomy were separately recorded. Perioperative complications, blood loss, requirement for blood transfusion were also recorded. All postoperative specimens were studied by trained uropathologists at our institute. Details of histopathologic assessment were recorded including final Gleason score, margin positivity, seminal vesicle or lymph node involvement. Patients were then followed up at regular intervals with serial monitoring of PSA and assessment of functional outcomes of continence and erectile function. All patients provided informed consent for the procedure.

## RESULTS

The study included 190 consecutive cases of localized prostate cancer, who underwent RALP at our center (from July 2006 to December 2010). The demographic details, perioperative details, histopathologic outcomes, and perioperative complications are given in Tables 1–5. The short-term complications were divided according to Clavien classification system.<sup>[9]</sup> The most common complication in our series was prolonged drain output which was seen in 14 patients. Thirteen patients needed blood transfusion. Eight patients developed intestinal obstruction in the postoperative period, of whom four were managed conservatively and four patients required surgical intervention. Some technical problems were also encountered during the course of robotic

**Table 1: Patient characteristics**

No. of patients	190
Mean age (range)	65 ± 1.2 years; (50–76)
Mean BMI (range)	25.20 ± 2.88 (16–37)
BMI:	
18.5–24.9 (normal)	91 (47.89%)
25–29.9 (overweight)	78 (41.05%)
30–34.9 (obesity)	19 (10.0%)
>35 (severe obesity)	2 (1.05%)
Average prostate size ± SD (g)	42.06 ± 18.35 (14–165)
Prostate >90 g	5 (2.63%)
Mean serum PSA (ng/ml) (range)	19.8 ± 9.5 (0.3–66.0)
Median PSA (ng/ml)	14.8
Serum PSA (ng/ml)	
<4	14 (7.37%)
4.1–10	60 (31.58%)
10.1–20	66 (34.74%)
>20	50 (26.31%)
Average biopsy Gleason score ± SD	6.15 ± 0.76
Biopsy Gleason score	
5	21 (11.05%)
6	110 (57.89%)
7	40 (21.05%)
8–10	19 (10.0%)
Clinical stage T	
T1b	24 (12.63%)
T1c	65 (34.2%)
T2a	73 (38.42%)
T2b	25 (13.16%)
T3a	3 (1.58%)
Previous abdominal surgery	21 (11.05%)
Previous hernia surgery	12 (6.31%)
Preoperative hormonal therapy	18 (9.47%)
Previous TURP	30 (15.8%)
Large median lobe	11 (5.8%)
Comorbidities	Diabetes (22), hypertension (98), asthma (6), coronary artery disease (20), chronic obstructive airway disease (14), hypothyroidism (4), psoriasis (1), pulmonary TB (2), glaucoma (1), seizures (2), syringomyelia (1), fronto-temporal brain abscess (1), parkinsonism (1), sarcoidosis (1)

surgery in a few cases.<sup>[10]</sup> Most of these were overcome with technical assistance during the course of surgery with some addition to total operative time and only one case required conversion to open technique due to mechanical failure of a robotic arm.

Biochemical recurrence was defined by a PSA of 0.2 ng/ml

**Table 2: The mean operative time (in min) for various parts of robotic procedure**

Port placement	9 ± 2.2 (8–16)
Docking of robot	6 ± 1.8 (6–9)
Dissection time	88.50 ± 16.5 (50–160)
Anastomosis time	34.45 ± 12.5 (15–120)
Lymphadenectomy time	22 ± 3.86 (20–36)
Total time	166.44 ± 11.5 (99–320)

**Table 3: Intraoperative and postoperative data**

Open conversion	6 (3.16%) (bleeding: 3, large median lobe: 1, dense periprostatic adhesions/unclear anatomy: 1, technical fault in robotic arm: 1)
Rectal injury	1 (0.52%)
Median blood loss (ml)	302 ± 14.45 (50–1700)
No. of patients requiring transfusion	13 (6.8%)
Median duration of hospital stay (days)	4 days (2–19)
Mean catheterization time (days)	12 days (8–24 days)

**Table 4: Histopathologic outcomes**

Average Gleason score ± SD	6.80 ± 0.85
Margin positive	24 (12.63%) (posterolateral 15, base 4, apex 5)
Extra prostatic extension	16 (8.4%)
T2 margin positivity	4.20%
Seminal vesicle involvement	18 (9.47%)
Lymph node metastasis	6 (3.15%)
Median lymph node yield in patients who underwent bilateral pelvic lymphadenectomy	7.5
Perineural involvement	36 (18.94%)
Adenocarcinoma of prostate	182
TCC of prostate	1
Neuroendocrine differentiation	1
Chronic prostatitis/benign prostatic hyperplasia	6

or higher and which rises on a subsequent occasion. For assessment of oncologic outcomes, only patients who had completed a minimum of 1 year of follow-up were included in the analysis (165 patients). Biochemical recurrence-free survival rate for a mean duration of follow-up of 27.5 months was 92%.

## DISCUSSION

The benefits of the robot are most apparent for surgeries in areas of the body which are anatomically confined and difficult to access by open surgical means, like the deep pelvis. Accordingly, robotic system has been used most commonly in the field of urology, with most studies

**Table 5: Complications according to Clavien classification system**

Grade	Complication	No. of patients
1	Prolonged drain output	14
	Limb paraesthesia	1
	Urinoma	Nil
	Lymphocele	Nil
	Deep vein thrombosis	Nil
2	Blood transfusion	13
	Post-op intestinal obstruction requiring expectant management	4
	Wound infection	1
3a	Slipping of Foley's catheter; required endoscopic insertion and suprapubic cystostomy	2
	Clot retention	6
3b	Urine retention following catheter removal	6
	Intestinal obstruction requiring surgical intervention	4
4a	Perioperative respiratory compromise	1
4b	Pulmonary embolism	Nil
5	Multiorgan dysfunction	Nil
	Death	Nil

reporting its use in radical prostatectomy. Advantages include easier ergonomics; scaled, filtered and miniaturized movements for easier and precise dissection and suturing in the confines of true pelvis; magnified 3D and stable vision; and shorter learning curve than pure laparoscopic technique. Several studies are now available, documenting good short- and long-term outcomes with the use of this technology.<sup>[11-14]</sup> However, given the cost of robotics, the system is still new to developing nations with limited resources. We acquired 4-armed *da Vinci-S* surgical system in 2006 and have since been offering robot-assisted surgery to all cases of clinically localized prostate cancer. The purpose of this study was to review our experience of RALP, assess the perioperative outcomes of the first 190 cases and to compare the results with previously established reports.

The mean age of our patients undergoing robotic prostatectomy was 65 ± 1.2 years, which is higher than that reported in western case series. Menon *et al.*<sup>[11]</sup> reported mean age of 57.4 years, while Mikhail *et al.*<sup>[12]</sup> reported it to be 58.4 years in their series. A comparable average age of 63.2 years has been reported by Patel *et al.*<sup>[13]</sup> Our higher average age may be due to a lower overall incidence of prostate cancer for all ages in our country due to racial and environmental differences. It may also reflect the absence of widespread PSA screening in our country whereby cases present at a later stage of disease at higher age and higher PSA. The mean serum PSA was 19.8 ± 9.5 ng/ml, which is nearly three times that reported in many other western studies. This was in spite of the fact that the average prostate

size in our series ( $42.06 \pm 18.35$  g) was somewhat smaller than some other reported series like Menon *et al.*<sup>[11]</sup> ( $48.6$  g) and Tewari *et al.*<sup>[12]</sup> ( $45.3 \pm 12.3$  g). In the series reported by Tewari *et al.*,<sup>[14]</sup> the mean serum PSA was  $6.4 \pm 2.47$  ng/ml, while it was  $6.9$  ng/ml in the series reported by Patel *et al.*<sup>[13]</sup> Majority of our patients (34.74%) had a serum PSA in the range of 10–20 ng/ml unlike most other series where the highest proportion of cases belong to PSA category of <10 ng/ml. The high PSA may be due to higher stage (T2) in our series compared with T1c in other series and also due to overall higher PSA values in Indian men related to chronic prostatitis.<sup>[15]</sup> A consistent long-term oncological follow-up shall be able to better address this question in the near future. The majority of our patients (57.89%) had a biopsy Gleason score of 6 which is similar to that reported in other series.<sup>[10,12,13]</sup> Another important difference was that 38.42% of our patients belonged to clinical stage T2a while 34.2% were of clinical stage T1c. In the series by Tewari *et al.*,<sup>[14]</sup> nearly one-half of the patients (49.7%) belonged to clinical stage T1c. Consistent with the overall physical built and nutritional status in our general population, the mean BMI of our patients was  $25.20 \pm 2.88$ , which is lower than that reported in series from the western world.<sup>[13,14]</sup>

As regards surgical outcome, our mean total operative time of  $166.4 \pm 11.5$  min (inclusive of time for port placement, docking of robot, dissection, anastomosis and lymphadenectomy) is comparable to  $160 \pm 28$  min as reported by Tewari *et al.*<sup>[14]</sup> Others have reported shorter mean operative times of 122 min<sup>[11]</sup> and 130 min.<sup>[13]</sup> Patel *et al.*<sup>[13]</sup> noted that the operative duration decreased as the surgeon's experience increased; their mean for the first 50 cases was 202 min and for the last 100 cases was less than 100 min. The estimated median blood loss was also higher in our series (302 ml) with 13 patients (6.8%) requiring blood transfusion. Tewari *et al.*<sup>[14]</sup> reported a mean blood loss of  $160 \pm 28$  ml, while Menon *et al.*<sup>[11]</sup> reported it to be 111 ml. In their first 100 cases, Mikhail *et al.*<sup>[12]</sup> reported a mean blood loss of  $339.9 \pm 238.4$  ml. The reduced blood loss is one of the chief advantages of RALP over open surgery. Our conversion rate was 3.16% (6 cases) with no conversions in the last 100 cases. Patel *et al.*<sup>[13]</sup> reported 0.6% conversion rate in their series of 500 patients, while Mikhail *et al.* reported 7% conversion rate in their first 100 patients. There was one rectal injury which was recognized intraoperatively and successfully managed by primary closure in two layers along with omental interposition. Our longer postoperative stay in the hospital compared to western series is related to the fact that the majority of cases were kept admitted till drain removal, unlike the practice of discharge with drain in the western world. In 91% of patients, the drain was removed on third postoperative day when the drain output was less than 50 ml/day. None of our patients developed the complication of urinoma. Deep vein thrombosis and pulmonary embolism are other complications which we have not witnessed in our series. This is despite the fact that we do not routinely

give deep venous thrombosis prophylaxis. Early ambulation within 6 hours of surgery may be a reason for the absence of this complication. Voiding cystogram was done between days 10 and 14 and catheter was removed if there was no leak. The mean catheterization time was 12 days. However, the catheter duration was mostly dictated by protocol rather than patient condition.

Our perioperative complication rate is comparable to most contemporary series.<sup>[16-19]</sup> This is despite the fact that we have limited experience of RALP. Ours is a multispeciality urology department in a tertiary referral center. The bulk of our operative cases include stone disease, bladder and kidney cancer and reconstructive surgery. Clinically localized prostate cancer suitable for surgery constitutes only a small fraction of our surgical case load. We have had no laparoscopic radical prostatectomy experience prior to commencing robotic surgery. This further reiterates the fact that robotic surgery is easy to learn and not associated with the steep learning curve as witnessed in conventional laparoscopic surgery.

For any new treatment modality/option to gain widespread global acceptance, the outcomes need to be reproducible across various centers and patient population groups. Although RALP has now become a validated treatment option in the management of patients with localized prostate cancer, all reports have come from high volume centers from the western world.

The developing countries have now started embracing the robotic technology but there is lack of data from these centers. Our experience is the first such from the Indian subcontinent. Furthermore, as highlighted in the article, the Indian population presents certain unique characteristics which may affect the outcomes of RALP. The higher age at presentation, the higher stage at diagnosis and the higher PSA values (due to chronic prostatitis) are some of these factors. Visiting surgeons to our center have remarked on the changes they need to incorporate with regard to port position and the inherent challenges in operating on the Indian males with smaller pelvis diameters compared to the Caucasian population.

Despite the reported advantages, robotic technology has not yet become popular in developing nations because of its prohibitive cost. However, with proven advantages and increasing awareness and skills of the surgeons, this technology is sure to gain acceptance in the near future. Hopefully, the cost of establishing a robot and its running cost will also decrease relatively with its increasing penetration into the medical system.

## CONCLUSION

This report demonstrates the good perioperative outcomes of RALP even in initial cases. Despite the limited prior

experience in radical prostatectomies, the outcomes of RALP in our series are comparable to those reported in the literature from centers with larger experience. RALP allows transition from open to minimally invasive surgery with a small learning curve.

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