Oncological and functional outcomes of a large Canadian robotic-assisted radical prostatectomy database with 10 years of surgical experience

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Introduction: *Robotic-assisted radical prostatectomy (RARP) has grown to be the predominant global surgical approach to treat localized prostate cancer. However, there is still limited access to robotic technology and little data from Canadian cohorts. Herein, we report on our oncological and functional outcomes after 10 years of surgical experience.*

Materials and methods: *Prospective data from 1,034 RARP cases performed by two high-volume experienced surgeons at two academic centers were collected from October 2006 to June 2017. Preoperative characteristics, surgical, oncological and functional outcomes were assessed up to 72 months postoperative.*

Results: *D'Amico risk distribution was 26.1%, 59.8% and 14.1% for low, intermediate and high risk prostate cancer. Median (interquartile range) operative time, blood loss and hospital stay were 170 minutes (145-200), 200 mL (150-300) and 1day (1-1), respectively and 1.4% received blood transfusion. Intraoperative complications occurred in 3.8%. Postoperatively, 32 (3.1%) and 138 (13.3%) men harbored major (Clavien III-IV) and minor complications (Clavien I-II), respectively. Among the 630 men (64.2%) with pT2 and 349 men (35.6%) with pT3 disease, stage-specific positive surgical margin rates were 15.7% and 39.0%, respectively. Urinary continence rates at 6, 12 and 72 months were 72.7%, 83.5% and 84.9%, respectively. In men without preoperative erectile dysfunction, potency was observed in 45.6%, 59.4% and 69.5% at 6, 12 and 72 months, respectively. Biochemical recurrence occurred in 105 patients (10.2%).*

Conclusion: *Mid-term oncological outcomes in two large Canadian centers demonstrate comparable results to non-Canadian centers of excellence. RARP appears to be safe with acceptable surgical, oncological and functional outcomes in a publicly funded single-payer healthcare system.*

Key Words: prostate cancer, robotic-assisted radical prostatectomy, complication rate, oncological outcomes, biochemical recurrence, continence, potency

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Introduction

Prostate cancer is the leading cancer in men, affecting one out of seven men during their lifetime.[1] According to the 2017 Canadian Cancer Statistics, 21,300 patients will be diagnosed with prostate cancer during the year.

Various treatment options, including watchful waiting, active surveillance, radiotherapy and surgery, are available.[2] Systematic reviews and meta-

analyses suggest that radical prostatectomy (RP) may represent the most effective treatment modality leading to lower overall and prostate-cancer specific mortality compared to both watchful-waiting and radiotherapy,[3,4] especially in patients with high risk disease.[5,6] RP can either be performed laparoscopically, robotically assisted, or via an open approach.

Robotic-assisted radical prostatectomy (RARP), initially described in 2001,[7] has become increasingly more used for surgical treatment of localized prostate cancer. In 2011, at least 80% of RP were performed with robotic assistance in the United States.[8,9] Similarly, in 2014, over 60% of RP in the United Kingdom were performed robotically assisted.[10]

Advantages of robotic surgery include shorter hospital stay, reduced intraoperative blood loss and lower complication rates. Furthermore, recent studies have reported decreased positive surgical margins (PSM) as well as improved potency and continence outcomes.[11,12]

Unfortunately, in Canada, with a uniquely publicly funded single-payer healthcare system, the adoption of RARP has been markedly slower. In 2016, only four provinces (Ontario, Quebec, Alberta and British Columbia) had access to the da Vinci Surgical System (Intuitive Surgical Inc, Sunnyvale, CA, USA) while up to 70% of RP were still being performed via laparotomy.[13] Consequently, few Canadian centers have published on oncological and functional outcomes using RARP.[14] We sought to expand the currently limited Canadian RARP literature by presenting updated results from a cohort with more than a thousand patients with a complete account of intraoperative and postoperative complications as well as oncological and functional outcomes after 10 years of RARP experience.

Materials and methods

A total of 1,034 patients with clinically localized prostate cancer underwent RARP between October 2006 and April 2017. RARP cases were performed by two high-volume, experienced, fellowship-trained surgeons in two teaching hospitals affiliated to the University of Montreal. Preoperative parameters, perioperative and postoperative outcomes, including oncological and functional outcomes, were prospectively collected. Follow up was conducted at 1, 3, 6, 9, 12 months, then every 6 months up to 3 years and finally annually regular intervals up to 6 years. Any patient who was a surgical candidate was offered RARP and no men had previous pelvic radiation or other neo-adjuvant therapy.

Surgical technique

RARP surgical technique was performed as previously described,[15-17] as well as the nerve-sparing technique.[18] Lymph node dissection was performed in patients with a probability > 2% of nodal metastases, according to the online Memorial Sloan Kettering Cancer Center nomogram, as recommended by the current version of the National Comprehensive Cancer Network clinical practice guidelines for prostate cancer.[19] Urinary foley catheter was routinely removed without a cystogram on postoperative day 4 or day 7. Decision to perform either interfascial, considered as nerve preservation, versus partial extrafascial or wide extrafascial resection, considered as nerve resection, was made preoperatively based on the Memorial Sloan Kettering Cancer Center nomogram for prediction of extracapsular extension.

Data collection

After institutional-review board approval, patient demographics were collected, including age, preoperative prostate specific antigen (PSA), body mass index (BMI), trans-rectal ultrasound (TRUS) prostate size, Gleason score, clinical tumor stage, International Prostate Symptoms Score (IPSS) and Sexual Health Inventory for Men (SHIM). Intraoperative parameters as well as early postoperative complications (< 30 days) were collected and categorized using the Clavien-Dindo classification[20] as recommended by the European Urological Association's guidelines.[21] Oncological outcomes included pathologic Gleason score, pathological tumor stage, surgical margins, extra-capsular extension and seminal vesicle invasion. All specimens were reviewed by dedicated academic urologic-pathologists. Clinical and pathological tumor staging was done according to the latest American Joint Committee on Cancer (AJCC) guidelines.[22] Biochemical recurrence (BCR) was defined as a PSA ≥ 0.2 ng/mL on two separate occasions as is recommended by the American Urological Association.[23] Men with BCR were all referred to radiation oncology for salvage radiotherapy. Men with increasing PSA without diagnosis of BCR (i.e. PSA < 0.2ng/mL) and unfavorable pathology were offered the possibility to obtain early salvage radiotherapy after discussion with our radiation oncologist.

Finally, postoperative PSA, IPSS, SHIM, number of pads or security liner used per 24 hours and Erection Hardness Score (EHS) were collected at each visit. Continence was defined as the use of 0 pads per 24 hours. Potency was defined as a EHS ≥ 3 or a SHIM score ≥ 17 (with at least a score of 3 on question number 2) with or without the use of phosphodiesterase type 5 inhibitors (PDE5-I).[24] We followed the

penile rehabilitation protocol of Mulhall et al post-prostatectomy, aiming for at least three erections per week by using PDE5-I and intracavernosal injections predominantly.[25]

Statistical analysis

The IBM SPSS statistics package (IBM Corporation, version 23.0, Armonk, NY, USA) was used for analysis. The median followed by the interquartile range (Q1-Q3) was used as a measure of central tendency, unless specified otherwise. Kaplan-Meier analyses graphically depicted biochemical recurrence free-survival (BCRFS). Subgroup analyses of BCRFS focused on preoperative D'Amico risk, pathologic Gleason score and pathological tumor stage with and without positive surgical margins.

TABLE 1. **Preoperative characteristics and perioperative outcomes**

Variable	**Median**	**Q1-Q3**	**Range**
Age (years)	61	56-66	40-76
Body mass index	26.9	24.8-29.4	17.4-50.5
Preoperative PSA (ng/mL)	5.6	4.5-7.7	0.3-68.0
Preoperative TRUS prostate volume (mL)	36.3	28.0-47.0	10.0-160.0
Preoperative IPSS	6	3-11	0-35
Preoperative SHIM	21	16-24	0-25
Preoperative SHIM	**Frequency (n = 992)**	**Rate**	
< 12	143	14.4%	
12-16	121	12.2%	
17-21	272	27.4%	
> 21	456	46.0%	
Biopsy Gleason score	**Frequency (n = 1030)**	**Rate**	
6	309	30.0%	
7	611	59.3%	
8-10	113	10.7%	
Clinical TNM stage	**Frequency (n = 1021)**	**Rate**	
cT1a/b	3	0.3%	
cT1c	737	72.2%	
cT2	270	26.4%	
cT3	11	1.1%	
D'Amico risk	**Frequency (n = 1032)**	**Rate**	
Low	270	26.1%	
Intermediate	617	59.8%	
High	145	14.1%	
Perioperative outcomes			
Operative time	170	(145-200)	65-516
Docking time	14	11-17	0-80
Open or laparoscopic conversion, n	0		
Estimated blood loss (mL)	200	150-300	50-1300
Transfusion rate, n (%)	14 (1.4%)		
Hospitalization (days)	1	1-1	1-23
Nerve preservation	**Frequency (n = 1014)**	**Rate**	
Bilateral NSS	459	44.3%	
Unilateral NSS	238	23.5%	
None NSS	317	31.2%	

PSA = prostate-specific antigen; TRUS = trans-rectal ultrasound; IPSS = International Prostate Symptoms Score; SHIM = Sexual Health Inventory for Men; NSS = nerve-sparing surgery

Results

Table 1 summarizes patient characteristics within our cohort. Median patient age, BMI and follow up was 61 years (IQR 56-66), 26.9 kg/m^2 (24.8-29.4), and 30 months (12-48), respectively. Forty-six percent of men had no preoperative erectile dysfunction (SHIM ≥ 21), and 27.4% had mild erectile dysfunction (17 ≤ SHIM < 21). Preoperative median PSA was 5.6 ng/mL (4.5-7.7) and median TRUS prostate volume was 36 cc (28-47). Biopsy Gleason score ≥ 7 was found in 69.9% of patients. Clinical stage T2 and T3 accounted for 26.4% and 1.1% of our cohort, respectively. A total of 152 men (14.7%) progressed while on active surveillance and were included in our analysis. Overall, 13 patients had missing values for clinical tumor stage, and 3 for Gleason score. According to D'Amico, 26.1%, 59.8% and 14.1% harbored low, intermediate, and high risk prostate cancer, respectively. A total of 620 cases (60.0%) were performed by surgeon one, and 414 cases (40.0%) were performed by surgeon two.

Median operative time was 170 minutes (145-200), median estimated blood loss was 200 mL (150-300) and 14 patients (1.4%) received blood transfusion. Intraoperative complications occurred in 39 cases (3.8%), with no perioperative or postoperative mortality, as well as no conversion to open intervention. Median hospital stay was 1 day (1-1). 459 patients (45.3%) had bilateral nerve-sparing surgery, 238 (23.5%) had unilateral nerve-sparing and 317 (31.2%) had no nerve-sparing, Table 1.

Overall, a total of 11 (1.1%) major Clavien IV early (within 30 days) postoperative complications occurred, including renal failure (n = 9) and myocardial infarction (n = 2). All 11 patients had a fully functional recovery. 23 (2.3%) men had Clavien III complications, Table 2.

On final pathology, 35.7% of cases were non-organ confined (≥ pT3). Of all patients, 73.7% harbored Gleason score 7 and 11.2% harbored Gleason 8-10. In 24.0% cases a Gleason upgrading was recorded. The overall PSM rate was 22.7%; 15.7% and 39.0% in pT2 and pT3 disease, respectively, Table 3. A total of 105 patients (10.2%) experienced BCR: 54 (5.2%)

TABLE 2. **Intraoperative and early (< 30 days) postoperative complications**

Clavien classification	**n (%)**	
		Intraoperative complications
n/a	37 (3.6%)	Capsulotomy (5), bladder injury (4), rectal injury (3), epigastric vessels injury (3), bladder neck tear (3), VUA leak (3), cystostomy (3), transfusion (2), ST elevations (2), trocar loss (2), small bowel injury (1), urethral tear (1), accessory pudendal injury (1), DVC bleeding (1), atrial fibrillation (1), exposure keratitis (1), omental bleeding (1)
		Postoperative complications (n = 186, 18.0%)
I	98 (9.5%) Among 87 patients	Urinary retention (32), hematoma (18), pain (13), gross hematuria (9), wound dehiscence (7), constipation (5), VUA leak (3), scrotal swelling (2), subcutaneous emphysema (2), Reynaud syndrome (1), urinoma (1), incisional hernia (1), nausea (1), wound infection (1), dizziness (1), femoral nerve paresis (1)
II	54 (5.2%) Among 51 patients	Wound infection (19), transfusion (14), UTI (7), osteomyelitis (3), cardiac arrhythmia (3), pulmonary embolism (3), DVT (2), epididymo-orchitis (2), SIADH (1)
IIIa	15 (1.5%)	Ileus-nasogastric tube (6), Hematuria-cystoscopy (3), VUA-cystoscopy (2), bladder neck stricture-cystoscopy (1), hematoma-drainage (1), pneumothorax (1), pelvic lymphocele-drainage (1)
IIIb	8 (0.8%)	Bowel evisceration (2), VUA (2), incisional hernia (1), major pelvic hemorrhage (1), small bowel obstruction (1), rectal injury (1)
IVa	11 (1.1%)	Acute renal failure (9), myocardial injury (2)
V	0	Death (0)

VUA = vesico-urethral anastomosis; DVC = dorsal venous complex; UTI = urinary tract infection; DVT = deep vein thrombosis; SIADH = syndrome of inappropriate anti-diuretic hormone secretion

received radiotherapy alone, 15 (1.5%) androgen-deprivation therapy (ADT) alone and 22 (2.1%) received a combination of both modalities and 14 patients refused any treatment or did not yet receive any. An additional 40 patients (3.9%) received "ultra-early" salvage radiotherapy, 7 (0.7%) in combination with ADT, for slowly rising PSA values that did not met BCR cut off (i.e. PSA ≤ 0.2 ng/mL). A total of 30 patients (2.9%) received adjuvant radiotherapy. BCR free survival (BCRFS) at 5-year after RARP was 82.5%. After stratification according to D'Amico risk, D'Amico high risk patients demonstrated worse BCRFS rates compared to low risk patients, Figure 1a. Patients with pT3 disease, PSM or higher pathologic Gleason score showed worse BCRFS rates compared to patients with organ-confined disease, Figure 1b and Figure 1c.

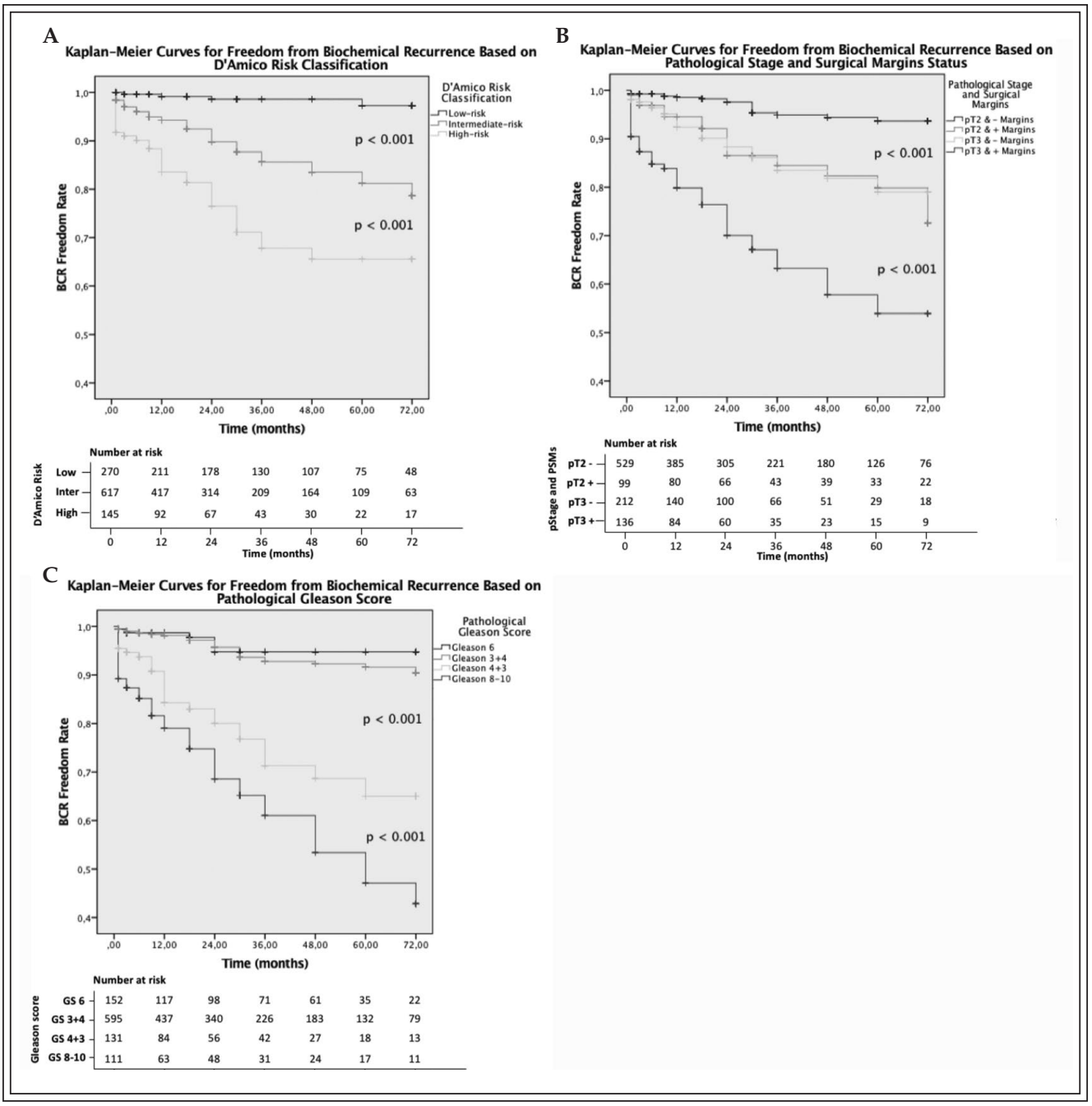

Figure 1. Kaplan-Meier plot depicting biochemical recurrence free-survival based on D'Amico risk classification **(A)**, based on pathological staging and status of surgical margins **(B)** and based on pathological Gleason score **(C)**.

TABLE 3. **Postoperative oncological outcomes**

	Frequency	Rate
Pathology Gleason score		
Gleason 6	149	15.1%
Gleason 7	728	73.7%
Gleason 8-10	111	11.2%
Gleason upgrading	248	24.0%
Pathological staging		
pT0	1	0.1%
pT2a/b	114	11.7%
pT2c	516	52.6%
pT3a	283	28.8%
pT3b	66	6.7%
pT4	1	0.1%
Positive surgical margin		
pT2	99	15.7%
pT3	136	39.0%
Biochemical recurrence	105	10.2%
Salvage XRT alone	54	5.2%
Salvage ADT alone	15	1.5%
Salvage XRT + ADT	22	2.1%
"Ultra-early" salvage XRT	40	3.9%
Adjuvant XRT	30	2.9%

XRT = radiotherapy; ADT = androgen-deprivation therapy

TABLE 4b. **Postoperative functional outcomes**

Time of follow up	Bilateral nerve-sparing	
	Potency	Potency preop SHIM ≥ 21
6 months (n = 850)	50.3%	66.8%
12 months (n = 750)	62.7%	76.8%
24 months (n = 590)	67.9%	83.8%
36 months (n = 432)	67.0%	83.0%
48 months (n = 348)	69.4%	86.6%
60 months (n = 244)	67.2%	77.6%
72 months (n = 165)	73.8%	85.3%

potency defined as EHS ≥ 3 or SHIM ≥ 17 (with or without PDE5-inhibitors)

Overall urinary continence (0-pads) rates at 1 month, 6 months, 12 months, 24 months, and 36 months were 37.6%, 72.6%, 83.4%, 87.5%, and 87.6%, respectively. Overall postoperative potency rates were 32.0%, 43.5%, 50.1%, and 50.1% at 6, 12, 24, and 36 months, respectively. Potency rates of patients without preoperative erectile dysfunction (SHIM ≥ 21) and bilateral nerve-sparing were 66.8%, 76.8%, 83.8%, and 83.0% at 6, 12, 24, and 36 months, Table 4a and 4b, respectively.

TABLE 4a. **Postoperative functional outcomes**

Time of follow up	All cohort Continence (0 pads)	Continence (1 liner)	Incontinence (1 pad)	Incontinence (2 pads)	Incontinence (≥ 3 pads)	Potency Preop	Potency SHIM ≥ 21
6 months (n = 850)	72.7%	82.3%	10.5%	4.1%	3.1%	32.0%	45.6%
12 months (n = 750)	83.5%	88.7%	7.4%	2.3%	1.6%	43.5%	59.4%
24 months (n = 590)	87.5%	91.2%	6.8%	1.5%	0.5%	50.1%	67.7%
36 months (n = 432)	87.8%	90.5%	6.2%	2.6%	0.7%	50.1%	65.8%
48 months (n = 348)	88.7%	91.6%	5.4%	2.1%	0.9%	56.2%	74.0%
60 months (n = 244)	84.3%	88.3%	7.8%	2.2%	1.7%	56.5%	70.2%
72 months (n = 165)	84.9%	87.5%	8.5%	2.0%	2.0%	58.8%	69.5%

potency defined as EHS ≥ 3 or SHIM ≥ 17 (with or without PDE5-inhibitors)

Discussion

Despite available extended international medical literature on RARP, publications from Canadian centers are limited. Herein, we report on the largest Canadian RARP database of 1,034 patients with a complete account of intraoperative, postoperative complications, oncological and long-term functional outcomes after 10 years of surgical experience. Our study demonstrates some noteworthy findings.

First, our perioperative complication rate was as low as 3.6%, while our postoperative rate was 18.0%, with 3.4% being major complications (Clavien III and IV). All these patients had a fully functional recovery. Furthermore, perioperative mortality was 0%, in 3 cases (0.3%) a rectal injury was recorded and 1.4% received blood transfusion. These rates are significantly lower compared to the surgical goals for open RP, set by the updated Cancer Care Ontario guidelines, namely < 1%, < 1% and < 10% for mortality, rectal injury and transfusion, respectively.[26] Moreover, our overall PSM rate was 22.7%, 15.7% for pT2 disease and 39.0% for pT3 disease. The old recommendation from the Cancer care Ontario guidelines was a PSM rate < 25% for pT2, however, this was replaced by "aim to achieve a negative margin, while ensuring a balance between margins rate and functional outcomes". While only 1.1% of our patients were clinically diagnosed with non organ-confined disease (i.e. ≥ cT3), 35.7% of our cohort had a final pathology showing ≥ pT3. This is most likely due to the unreliability of the digital rectal exam to diagnose extraprostatic extension. This was also shown in another large study that only 2.4% of 13,135 patients were initially staged as ≥ cT3, while 19.6% ended-up with ≥ pT3 disease.[27]

Our results were overall similar to other large cohort studies. For example, Ploussard et al showed a 31.3% overall PSM rate (19.6% for pT2 and 47.4% for pT3) as well as 4.7% and 16.4% for intraoperative and postoperative complications out of 1009 RARP cases.[28] Tasci et al reported on 1,499 RARP patients. Of those, 14.4% harbored PSMs (6.1% for pT2 and 37.1% for pT3), 0.3% and 5.8% for intraoperative and postoperative complications, respectively, in 1,499 RARP patients.[29] It is however important to note that only 4.8% of Tasci et al's cohort was high risk. Sooriakumaran et al reported a crude PSM rate of 13.8% in over 7,697 international RARP cases.[30] Pautler and colleagues published the only other RARP Canadian study with 305 patients.[31] They reported an overall PSM rate of 16.1%, 10.2% for men with pT2 and 32% with pT3.

It is important to keep in mind that our data includes the learning curve of one surgeon, potentially explaining the higher PSM rate we reported. Indeed, we noted a significant improvement during our study. For example, when comparing our first 250 operated patients to our last 250 patients, the PSM rate for pT2 disease went from 25.1% to 10.6% (p = 0.008).

Second, BCR occurred in 10.2% of patients, with a 5-year BCRFS of 82.5%. Higher preoperative D'Amico risk, as well as pT3, PSM and pathologic Gleason score were associated with worse BCRFS. Previous reports of BCR are variable due to different lengths of follow up as well as different risk distribution of the patients, ranging from 3.2% at 1 year[32] to 15.2% at over 6 years[33] of follow up. A more recent study with 5,670 patients, 43.6% men with intermediate and 15.1% with high risk prostate cancer, reported BCR of 14.1% after a median follow up of 4.2 years and a BCRFS at 5-year of 83.3%.[34]

It is noteworthy that 15% of our cohort had a postoperative Gleason score of 6. We were vigilant to offer active surveillance to all patients that would qualify for it preoperatively; some did not because of number of cores involved or percentage of the cores involved. However, the final decision was always according to the patient's choice and preference.

Third, we evaluated functional outcome after RARP. Young patients with good functional status are increasingly being diagnosed and operated for prostate cancer.[35] It has been demonstrated that urinary incontinence and erectile dysfunction are a significant source of anxiety and associated with a reduced quality of life.[36] Nerve-sparing approach has been shown to improve functional outcomes after RARP.[37,38] Therefore, in recent years, surgeons have aimed to perform bilateral nerve-sparing surgery while ensuring optimal oncological control. In our cohort, 44.4% and 23.0% of our patients had bilateral and unilateral interfascial nerve-sparing procedures, respectively. Our continence rates were 61.4% at 3 months, 83.4% at 1 year and 84.9% at 6-year. These results showed that 1-year continence status is likely a good measure of long term continence. Potency rates for the entire cohort were 25.3%, 43.5%, 50.1% and 58.8% at 3 months, 1, 2 and 6-years, respectively. It is important to note that only 46.0% had no erectile dysfunction preoperatively. In patients with no erectile dysfunction preoperative, overall 1-year, 2-year and 6-year potency rates were 59.4%, 67.7% and 69.5%. Bilateral nerve sparing surgery improved 3 months, 1-year, 2-year and 6-year potency rate to 44.6%, 62.7%, 67.9% and 73.8% for the overall cohort, and to 62.7%, 76.8%, 83.8% and 85.3% for patients with no erectile dysfunction preoperatively, respectively.

These results compare favorably to other high-volume centers. For example, Abdollah et al reported a continence rate of 85.2%, 89.1% and 91.2% at 1, 2 and 3 years, respectively, within a cohort of 769 D'Amico high risk RARP patients.[39] They reported a potency rate of 33.8%, 52.3% and 69.0% at the same postoperative intervals for preoperative potent men (SHIM ≥ 17). In 2015, Haglind et al compared open retropubic RP to RARP in a non-randomized prospective controlled trial. They found a 12-month continence rate of 78.7% and a potency rate of 29.9% in 1,718 patients who underwent RARP.[40] Similarly, Tasci et al reported a continence rate of 88.7% and a potency rate of 58.2% at 12 months.[29] Finally, a recent systematic review published in 2018 included the results of 118,655 patients who underwent RARP: despite significant heterogeneity between the included studies, the 12-month continence and potency rates were 79.3% and 31.8%, respectively.[41] In Canada, Fuller et al reported a 70% continence rate at 12 months using the same definition for continence, compared to the current manuscript.[31] Unfortunately, they did not report on erectile dysfunction.

Our study has numerous strengths and distinguishes itself from previous contributions. We report on the largest Canadian RARP cohort with two high-volume fellowship trained surgeons with over 10-years of experience, offering data uniformity. We demonstrated low complications rate with good intermediate oncological and functional outcomes of robotic prostatectomy in a single-payer healthcare system. Our study emphasizes the importance of the learning curve of RARP, showing clinically and statistically significant improvement of PSM rate even after more than 250 operated patients. It adds evidence on the limited Canadian literature and demonstrate the feasibility and safety of RARP in a large Canadian cohort. Therefore, improvements and further efforts are required to make RARP easier available in Canada. However, this might prove difficult given the associated increased cost of RARP in our socialized medical system.

Our study is not devoid of limitations. Despite reporting on the largest Canadian cohort of RARP cases, our study is retrospective and uncontrolled in nature. This can lead to biases such as underestimating some complications (patients could have gone to another hospital or clinic for treatment) or recall bias. Second, only 16% of our initial cohort had a 6-year follow up. Most of the patients did not have their surgery more than 6 years ago; while others were unfortunately lost to follow up despite the surgeons' attempt to contact them by e-mail or phone. The patients had access to their surgeon's email which enabled them to communicate any adverse event, thus still favoring relatively reliable results. It is important to note that our patient population was referred to individual RARP expert surgeon, within a health care delivery system where, as of 2016, only 30% of radical prostatectomies were robotically-assisted. This might not be compared to other settings, such as in the United-States or in France, where the proportion of RARPs is much higher. Selection biases for referral in other countries or provinces might also be different.

Conclusion

To the best of our knowledge, our study represents the largest Canadian experience published with over 1,000 patients undergoing RARP and 10 years of experience. Our analysis shows overall good and favorable oncological and long term functional results when compared to other international high-volume RARP centers. It emphasizes the long learning curve of more than 250 patients. Our complication rate was acceptable, confirming that RARP is feasible with favorable outcomes in the Canadian publicly funded single-payer healthcare system. A prospective trial to compare RARP, laparoscopic RP and open RP could be performed in Canadian men to gain better evidence for the safety of RARP in Canada. □

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