Feasibility of planned mini-laparotomy and adhesiolysis at the time of robotic-assisted radical prostatectomy in patients with prior major abdominal surgery

Emad Rajih, MD;[1,2] Naif Alhathal, MD;[1] Abdullah M. Alenizi, MD;[1] Assaad El-Hakim, MD[1]

[1]Department of Surgery, Division of Robotic Urology, Hôpital du Sacré-Cœur de Montréal, Université de Montréal, Montreal, QC, Canada; [2]Department of Urology, Taibah University, Madinah, Saudi Arabia

Cite as: *Can Urol Assoc J* 2016;10(3-4):E125-9. http://dx.doi.org/10.5489/cuaj.3295

Abstract

Introduction: Our aim was to report our experience on the feasibility of completing radical prostatectomy robotically after planned open adhesiolysis for prior major abdominal surgery with previous midline laparotomy scar.

Methods: We searched our prospectively collected database of robotic assisted-radical prostatectomy (RARP) performed between October 2006 and October 2012 by a single fellowship-trained surgeon to identify all patients who underwent planned initial mini-laparotomy for release of abdominal adhesions at time of RARP. Among 250 RARP patients, five patients fulfilled these criteria.

Results: All patients had prostatectomy completed robotically. The mean values of patients' demographics were as follows: Age 61.8 years (range 54–69), body mass index 30.7 (range 24.3–45.3), and prostate volume 41.5 ml (range 30.8–54). Mean operative time was 245 min (range 190–280) and estimated blood loss 410 ml (range 300–650). Median hospital stay was one day (range 1–7). Postoperatively, there was one prolonged ileus, which resolved spontaneously, and one myocardial infarction.

Conclusions: Robotic completion of radical prostatectomy after open adhesiolysis is feasible. This approach maintains most minimally invasive advantages of RARP, despite a slightly longer hospital stay. In the best interest of patients, robotic surgeons are encouraged to finish the case robotically rather than attempting an open approach.

Introduction

Robotic assisted-radical prostatectomy (RARP) has been well established as a standard treatment for localized prostate cancer in many centres worldwide. In addition to its known advantages, RARP has been shown in recent meta-analyses to improve functional outcomes when compared to other approaches. Furthermore, the oncological outcomes are similar.[1-3] Robot-assisted abdominal laparoscopic surgery has been advocated to decrease analgesia requirements, lessen blood loss, and improve return of bowel function.[4]

With the increased use of RARP, most training programs have abandoned open technique. Therefore, many trainees are unfamiliar with open prostatectomy. We present our preliminary results and feasibility of planned mini-laparotomy and adhesiolysis at the time of RARP.

Methods

After ethical committee approval, we searched our prospectively collected database of RARP performed between October 2006 and October 2012 by a single fellowship-trained surgeon to identify all patients who underwent planned initial mini-laparotomy for release of abdominal adhesions at time of RARP.[5] Laparotomy and adhesiolysis were pre-planned based on patient history of major or multiple abdominal surgeries and the presence of lower midline abdominal scar.

Patient demographics and baseline parameters were collected, including detailed history of prior abdominal surgeries. Intraoperative data and postoperative complications (<30 days) were recorded on a standardized data collection sheet. Patients signed informed consent and were aware of the chance of conversion to open radical prostatectomy.

Surgical technique

We usually create pneumoperitoneum using a standard Veress needle technique. However, in cases of multiple previous abdominal surgeries with a scar close to the umbilicus, we use the Hasson technique to avoid inadvertent bowel injury. Minor and moderate adhesions encountered during trocar placement are released laparoscopically prior to docking. In this series of five cases, we were required to extend Hasson incision due to dense and severe adhesions. Therefore, a mini-laparotomy was performed through a 7–10 cm midline infra-umbilical incision or following

the preexisting scar. Adhesions were divided sharply under direct vision and the incision was extended inferiorly as needed. The midline rectus fascia was then closed with a running 0-Vicryl, leaving enough space for the camera port cephalad. Other trocars were placed under direct vision in a standard manner after creation of pneumoperitoneum (Fig. 1). We encountered some CO_2 leakage at the beginning of our experience, but we developed a technique of anchoring the fascia stitches to the camera port, and hence, sealed any potential source of gas leak. The robot was then docked and RARP followed.

We used the athermal robotic technique of prostatectomy with few modifications.[6,7] At the end of the procedure, the specimen was extracted through the same mini-laparotomy incision. Urethral catheter removal was planned on postoperative Day 7 without cystogram. A Jackson-Pratt drain was routinely placed and removed on postoperative Day 1.

Results

Among 250 RARP patients, a total of five had pre-planned open mini-laparotomy at time of RARP.[5] Patient cohort had the following previous surgeries: first patient had four umbilical hernia repairs with mesh and remote laparoscopic cholecystectomy; second patient had a history of peritonitis and bowel resection with remote right inguinal hernia repair with mesh (Fig. 2); two patients had sigmoidectomy for perforated diverticulitis, one of whom with subsequent incisional hernia repair; the last patient had aortobiiliac bypass surgery with extensive xyphopubic midline scar (Table1).

Patient values are as follows: mean age 61.8 years (range 54–69); prostate-specific antigen (PSA) 5.2 ng/ml (range 1.75–7.90); body mass index (BMI) 30.7 (range 24.3–45.3); and prostate volume 41.5 ml (range 30.8–54). Mean operative time, skin to skin, was 245 min (range 190–280), estimated blood loss 410 ml (range 300–650) and urethral catheterization time 7.4 days (range 7–9). Median length of hospital stay was one day (range 1–7). The average time for mini-laparotomy with open adhesiolysis was 44 min (range 30–80).

One patient had prolonged ileus that resolved spontaneously and was discharged on Day 7. Another patient developed non-ST elevation myocardial infarction (NSTEMI) that needed intensive care unit admission and medical treatment; he was discharged on Day 4 after surgery with no complications (Table 2). The latter patient had a history of coronary artery disease and refused radiation therapy; he recovered fully afterwards.

Oncological outcome showed one patient who had focal positive margin (20%) on the posterolateral aspect of the prostate; he was sent for salvage external beam radiotherapy (Table 3). Functional outcomes showed one patient with urinary incontinence who was using two pads/day. The mean time for no pad use for the other four patients was 7.3 months (range 6–24). Mean time for sexual intercourse was 9.7 months in the three out of five patients who regained function.

Discussion

Patients with previous history of major abdominal surgery are at increased risk of developing intra-abdominal adhesions. With increasing use of da Vinci Surgical System, the number

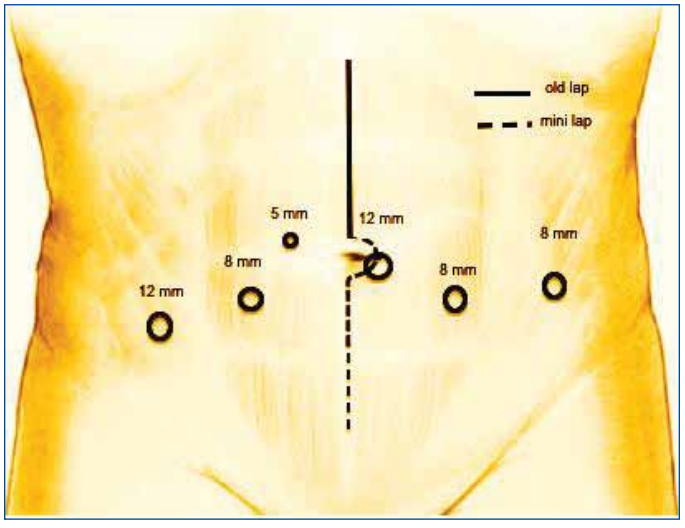

Fig.1. Diagram explaining the mini-laparotomy incision over the old laparotomy incision and their relation to trocar sites.

Fig. 2. Multiple old scars after old laparotomy for peritonitis/bowel resection and right inguinal hernia repair with mesh and overlying mini-laparotomy scar on long-term followup.

Table 1. Preoperative characteristics

Number	1	2	3	4	5	Mean/Rate
Age	61	66	54	69	59	61.8
PSA (ng/ml)	7.48	7.9	4.5	1.75	4.58	5.24
Clinical stage	T1c	T2c	T2a	T2a	T1c	T1c 60% T2a 40%
Gleason sum	8 (4+4)	7 (3+4)	7 (3+4)	6 (3+3)	7 (3+4)	7
Prostate volume (ml)	49.9	54	30.8	41.4	33	41.5
BMI	45.3	25.8	30.3	24.3	27.9	30.7
I-PSS	2	5	14	33	3	11.4
SHIM	20	20	8	1	20	13.8
Previous surgery	4 umbilical hernia repair with mesh	Bowel resection (Peritonitis) RIH repair with mesh	Sigmoidectomy (Diverticulitis and peritonitis), Incisional hernia	Sigmoidectomy (Perforated diverticulitis and peritonitis)	Aortobiiliac bypass	NA

BMI: body mass index; I-PSS international prostate symptoms score; NA: not applicable; PSA: prostate-specific antigen; RIHR: right inguinal hernia repair; SHIM: sexual health inventory for men.

of patients with previous major abdominal surgery undergoing robotic surgery has increased.[8,9] Abdominal adhesions can be dense and difficult to manage by minimally invasive approaches and may affect subsequent transperitoneal surgery, including robotic procedures. Furthermore, previous abdominal surgery with midline scar has been considered by some as a relative contraindication for minimally invasive surgery.[8] The main challenge is either difficulty in establishing access or inserting subsequent ports. During robotic surgery, it is crucial to perform a wide laparoscopic adhesionlysis before docking the robot.[10] Yet, many urologists embraced the robotic technology with little or no previous open or laparoscopic radical prostatectomy experience. In fact, RARP has replaced open radical prostatectomy (ORP) in many centres worldwide.[11-14] As is well-established, minimally invasive prostatectomy is associated with decreased blood loss and blood transfusion rate, shorter length of hospital stay, and fewer perioperative complications compared to ORP.[11]

In comparison to the entire cohort of 250 patients previously published by our group,[5] mean age for patients who underwent mini-laparotomy was 61.8 years (range 54–69) vs. 60.2 years (range 41–74); PSA 5.2 ng/ml (range 1.75–7.90) vs. 7 (range 0.7–26.4); BMI 30.7 (range 24.3–45.3) vs. 27.9 (range 19.5–46); and prostate volume 41.5 ml (range 30.8–54) vs. 35.8 (range 12–101). Mean operative time, skin to skin, was 245 min (range 190–280) vs. 224 min (range 164–284), estimated blood loss 410 ml (range 300–650) vs. 317 ml (range 50–1000) and urethral catheterization time 7.4 days (range 7–9) vs. 7.1 days (range 6–13) in mini-laparotomy and the 250-patient cohort, respectively. With mini-laparotomy, a minor increase in operative time and blood loss was noticed. However, these are expected findings, given the associated adhesions. Moreover, the oncological outcome in the 250-patient cohort was comparable, with an overall positive margin rate of 30%.

To the best of our knowledge, this is the first study of elective open adhesiolysis followed by RARP. Brajtbord et al described completion of RARP after laparotomy for excision of unexpected intra-operative finding of Meckel's diverticulum at time of radical prostatectomy; however, that was an unexpected laparotomy.[15] The authors reported insertion of robotic trocars (including the camera port) under direct visualization through the laparotomy incision and then the fascia

Table 2. Perioperative data

Number	1	2	3	4	5	Mean/Rate
OR time (min)	240	290	225	280	190	245
Docking time (min)	38	80	37	30	35	44
EBL (ml)	500	300	300	650	300	410
Nerve sparing	Bilateral	Bilateral	Unilateral	Unilateral	Bilateral	Bilateral 60% Unilateral 40%
Intraoperative complication	None	None	None	None	None	0%
Postoperative complication	None	Ileus	None	NSTEMI	None	Minor 20% Major 20%
LOS (days)	1	7	1	4	1	2.8
Catheter removal (day)	7	9	7	7	7	7.4

EBL: estimated blood loss; LOS: length of stay; NSTEMI: non-ST segment elevation myocardial infarction; OR: operation room.

Table 3. Functional and oncologic outcomes

Number	1	2	3	4	5	Mean/Rate
P stage	T2c	T2c	T2c	T3a	T2c	T2 80%, T3 20%
Gleason sum	6 (3+3)	7 (3+4)	7 (3+4)	7 (3+4)	7 (3+4)	G6 20%, G7 80%
SM	-	+	-	-	-	+SM 20%
Prostate wt.	74	60	42	45	39	52
FU (months)	24	60	57	68	30	47.8
I-PSS	6	2	2	11	0	4.2
SHIM	1	1	4	1	17	5.4
Time for 0-pad (months)	24	11	6	NA (1pad)	6	7.3
Time for intercourse (months)	NA – no erection	8	9	NA – no erection	12	9.7
BCR (months)	No	19 EBRT	No	No	No	20%

BCR: biochemical recurrence; EBRT: external beam radiotherapy; FU: followup; I-PSS: international prostate symptoms score; P stage: pathological stage; SHIM: sexual health inventory for men; SM: surgical margin; wt: weight.

was closed completely. Our technique is somewhat different in that we elected to close the fascia only partly starting from the inferior border of the incision, leaving enough space to insert the camera port at the upper part of the laparotomy incision with anchoring stitches to avoid gas leak. This avoided unnecessary creation of new trocar site for the camera.

Extensive adhesions usually restrict available position for trocar insertion and may lead the surgeon to select inappropriate trocar sites to avoid adhesions. However, by performing a mini-laparotomy and adhesolysis, we inserted all trocars in optimal position and avoided potential robotic arms conflict. Furthermore, robotic laparoendoscopic single-site radical prostatectomy is a possible technique that can avoid further adhesiolysis and insertion of further trocars and can accommodate the large midline incision by using the GelPort® trocar.

Nazemi et al found that a history of abdominal surgery was associated with 54% chance of peritoneal adhesions in contrast to only 28% if no previous abdominal surgery was done.[16] Also, the presence of abdominal adhesions did not increase the perioperative morbidity; however, it did increase the operative time compared to patients without abdominal adhesions.[16] Similarly, in our series, mean operative time was longer (245 min compared to 224 min). Alternatively, Siddiqui et al reported no significant differences in operative time between patients who required adhesiolysis vs. those who did not in a large cohort of RARP; however, all degree of adhesions were included.[9] The authors divided adhesions into three categories depending on the time used for adhesiolysis —mild, moderate, or severe. When severe (dense) adhesions were encountered, they described a technique similar to our technique, where they performed an open adhesiolysis, closed the fascia, and placed the camera port in the incision, then proceeded with RARP.[9] Once adhesions are released widely, robotic surgery usually follows uneventfully.

Several publications have reported ORP to be technically more hazardous in the setting of previous abdominal surgery, especially hernia repair with mesh, as it obliterates the retropubic space.[9,17-19] In our case series, sigmoidectomy secondary to diverticulitis was seen in two patients who had dense fibrotic adhesions; the second cause was multi-recurrent umbilical hernia repair with mesh. The same was reported by Siddiqui et al, where the most common causes of severe adhesions were history of colectomy followed by hernia repair with mesh.[9]

Endoscopic extraperitoneal radical prostatectomy, on the other hand, sounds attractive when peritoneal adhesions are expected. This approach was advocated by some European centres as a better alternative to open surgical attempts in patients with previous laparoscopic hernia repairs.[20,21] However, we do not have enough experience with laparoscopic/robotic extra-peritoneal radical prostatectomy. And familiarity with transperitoneal approach allowed successful completion of RARP in all five cases with no intraoperative complications. As a matter of fact, bowel injury is exceedingly rare (0.001%) in patients with history of peritoneal adhesions.[9]

The da Vinci surgical system has empowered urologists to perform more complex procedures using minimally invasive approaches. Parallel to this shift in technology, surgeons are expected to face increasing number of more challenging cases with complicated situations.[22] It is customary that patients with extensive adhesions and multiple prior abdominal and pelvic surgeries are referred for radiotherapy.[5] RARP with mini-laparotomy is a compelling approach that can be offered, as shown in our series. Functional and oncological outcomes were comparable to standard RARP.

The current report describes a way to accomplish radical prostatectomy by minimally invasive approach in patients with prior major abdominal surgery where laparoscopic adhesiolysis is difficult and unsafe due to extensive peritoneal

adhesion that cannot be lysed laparoscopically. In the present era of RARP, many surgeons became less facile with ORP and, as already shown, outcomes parallel surgical expertise. Therefore, in the best interest of patients, robotic surgeons are encouraged to finish the case robotically rather than attempting an open approach. We showed in the current series that outcomes were comparable with our RARP series and, for the most part, minimally invasive advantages were maintained. In the future, comparing this technique with open retropubic prostatectomy in a prospective manner might further delineate its advantages and shortcomings.

Conclusion

Past history of major abdominal/pelvic surgery should not automatically be considered a contraindication for RARP. Dense abdominal adhesions can be safely and effectively managed by a planned open adhesiolysis through mini-laparotomy. RARP will follow in a standard fashion after fascial closure. We demonstrated feasibility of this approach with low complications and comparable oncological and functional outcomes.

Competing interests: The authors declare no competing financial or personal interests.

Acknowledgment: Dr. Emad Rajih acknowledges Taibah University for scholarship support of his fellowship training at the Division of Robotic Urology, Université de Montréal.

This paper has been peer-reviewed.

References

1. Berryhill RJ, Jhaveri J, Yadav R, et al. Robotic prostatectomy: A review of outcomes compared with laparoscopic and open approaches. *Urology* 2008;72:15-23. http://dx.doi.org/10.1016/j.urology.2007.12.038
2. Ficarra V, Novara G, Rosen RC, et al. Systematic review and meta-analysis of studies reporting urinary continence recovery after robot-assisted radical prostatectomy. *Eur Urol* 2012;62:405-17. http://dx.doi.org/10.1016/j.eururo.2012.05.045
3. Rocco B, Matei DV, Melegari S, et al. Robotic vs. open prostatectomy in a laparoscopically naive centre: A matched-pair analysis. *BJU Int* 2009;104:991-5. http://dx.doi.org/10.1111/j.1464-410X.2009.08532.x
4. Nix J, Smith A, Kurpad R, et al. Prospective randomized controlled trial of robotic vs. openradical cystectomy for bladder cancer: Perioperative and pathologic results. *Eur Urol* 2010;57:196-201.http://dx.doi.org/10.1016/j.eururo.2009.10.024
5. Al-Hathal N, El-Hakim A. Perioperative, oncological, and functional outcomes of the first robotic prostatectomy program in Quebec: Single fellowship-trained surgeon's experience of 250 cases. *Can Urol Assoc J* 2013;7:326-32. http://dx.doi.org/10.5489/cuaj.319
6. El-Hakim A, Leung RA, Richstone L, et al. Athermal robotic technique of prostatectomy in patients with large prostate glands (>75 g): Technique and initial results. *BJU Int* 2006;98:47-9. http://dx.doi.org/10.1111/j.1464-410X.2006.06252.x
7. El-Hakim A, Al-Hathal N, Al-Qaoud T, et al. Novel uroflow stop test at time of catheter removal is a strong predictor of early urinary continence recovery following robotic-assisted radical prostatectomy: A pilot study. *Neurourol Urodyn* 2015;34:60-4. http://dx.doi.org/10.1002/nau.22481
8. Chen RN, Moore RG, Cadeddu JA, et al. Laparoscopic renal surgery in patients at high risk for intra-abdominal or retroperitoneal scarring. *J Endourol* 1998;12:143-7. http://dx.doi.org/10.1089/end.1998.12.143
9. Siddiqui SA, Krane LS, Bhandari A, et al. The impact of previous inguinal or abdominal surgery on outcomes after robotic radical prostatectomy. *Urology* 2010;75:1079-82. http://dx.doi.org/10.1016/j.urology.2009.09.004
10. Menon M, Shrivastava A, Tewari A, et al. Laparoscopic and robot assisted radical prostatectomy: Establishment of a structured program and preliminary analysis of outcomes. *J Urol* 2002;168:945-9. http://dx.doi.org/10.1016/S0022-5347(05)64548-X
11. Heidenreich A, Bastian PJ, Bellmunt J, et al. EAU guidelines on prostate cancer. Part 1: Screening, diagnosis, and local treatment with curative intent-update 2013. *Eur Urol* 2014;65:124-37. http://dx.doi.org/10.1016/j.eururo.2013.09.046
12. Lowrance WT, Eastham JA, Savage C, et al. Contemporary open and robotic radical prostatectomy practice patterns among urologists in the U.S. *J Urol* 2012;187:2087-92. http://dx.doi.org/10.1016/j.juro.2012.01.061
13. Mohler J, Bahnson RR, Boston B, et al. NCCN clinical practice guidelines in oncology: Prostate cancer. *J Natl Compr Canc Netw* 2010;8:162-200.
14. Volpe A, Ahmed K, Dasgupta P, et al. Pilot validation study of the European Association of Urology Robotic Training Curriculum. *Eur Urol* 2014. [Ahead of print] http://dx.doi.org/10.1016/S1569-9056(14)60740-5
15. Brajtbord JS, Lavery HJ, Jacob BP, et al. Continuing robotically? The completion of a robot-assisted radical prostatectomy after laparotomy. *J Endourol* 2010;24:1613-6. http://dx.doi.org/10.1089/end.2009.0528
16. Nazemi T, Galich A, Smith L, et al. Robotic urological surgery in patients with prior abdominal operations is not associated with increased complications. *Int J Urol* 2006;13:248-51. http://dx.doi.org/10.1111/j.1442-2042.2006.01273.x
17. Cooperberg MR, Downs TM, Carroll PR. Radical retropubic prostatectomy frustrated by prior laparoscopic mesh herniorrhaphy. *Surgery* 2004;135:452-3. http://dx.doi.org/10.1016/j.surg.2003.10.014
18. Katz EE, Patel RV, Sokoloff MH, et al. Bilateral laparoscopic inguinal hernia repair can complicate subsequent radical retropubic prostatectomy. *J Urol* 2002;167:637-8. http://dx.doi.org/10.1016/S0022-5347(01)69102-X
19. Cook H, Afzal N, Cornaby AJ. Laparoscopic hernia repairs may make subsequent radical retropubic prostatectomy more hazardous. *BJU Int* 2003;91:729. http://dx.doi.org/10.1046/j.1464-410X.2003.04163.x
20. Stolzenburg JU, Anderson C, Rabenalt R, et al. Endoscopic extraperitoneal radical prostatectomy in patients with prostate cancer and previous laparoscopic inguinal mesh placement for hernia repair. *World J Urol* 2005;23:295-9. http://dx.doi.org/10.1007/s00345-005-0001-y
21. Rassweiler J, Sentker L, Seemann O, et al. Laparoscopic radical prostatectomy with the Heilbronn technique: An analysis of the first 180 cases. *J Urol* 2001;166:2101-8. http://dx.doi.org/10.1016/S0022-5347(05)65514-0
22. Rajih ES, Al-Otaibi MF, Alkhudair WK. Robotic transmesocolonic pyelolithotomy of horseshoe kidney. *Int Braz J Urol* 2015;41:179-80. http://dx.doi.org/10.1590/S1677-5538.IBJU.2015.01.25

Correspondence: Dr. Assaad El-Hakim, Department of Surgery, Hôpital Sacré Cœur de Montréal, Université de Montréal, Montreal, QC, Canada; Assaad.elhakim@gmail.com