Impact of previous inguinal hernia repair on transperitoneal robotic prostatectomy

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Objective: *Several investigators have noted that previous inguinal hernia repair with or without the use of prosthetic mesh might be a relative contraindication for open or laparoscopic radical prostatectomy due to the presence of adhesions and the difficulty of tissue dissection. We aimed to evaluate the impact of previous hernia repair on the performance and feasibility of robotic prostatectomy.*

Materials and methods: *We performed a retrospective analysis of 354 patients who underwent robotic prostatectomy at our institution. The three patient groups were: 292 patients who had no prior hernia repair (group 1), 50 patients who had prior inguinal herniorrhaphy without the use of prosthetic mesh (group 2), and 12 patients who had prior inguinal herniorrhaphy with the use of prosthetic mesh. We compared operative time (surgeon console time), estimated blood loss, and operative complications (bladder, bowel, and/or vascular injuries) in the three groups.*

Results: *Patients with no prior herniorrhaphy (group 1), prior herniorrhaphy without mesh (group 2), and prior herniorrhaphy with mesh (group 3), had similar mean operating times (126.9 minutes, 129.3 minutes and 145.6 minutes, respectively) and similar mean estimated blood loss (152.5 ml, 140.6 ml, and 141.6 ml, respectively) during radical prostatectomy. However, compared to the group of patients who had no prior hernia repair, the group who had prior herniorrhaphy with the use of mesh had a significantly longer mean console operating time (145.6 versus 126.9 minutes, p = .012).*

Conclusion: *Previous hernia surgery, with or without the use of prosthetic mesh, did not represent a significant barrier to the performance of transperitoneal robotic prostatectomy.*

Key Words: prostate cancer, robotics, radical prostatectomy, hernia, pelvic lymph node dissection, space of Retzius

Introduction

Approximately 700,000 inguinal hernia repairs are performed in the United States each year.[1] With the growing popularity of minimally invasive surgery, many of these procedures are done laparoscopically with the aid of prosthetic mesh.[2] Many patients who undergo hernia repair might subsequently be diagnosed with localized prostate cancer and may opt for surgical treatment (radical prostatectomy). There are conflicting reports in literature regarding the feasibility of performing either laparoscopic or traditional, open retropubic radical prostatectomy in patients who have had prior hernia repair, since in performing the herniorrhaphy, the placement of the prosthetic mesh or the manipulation of the inguinal hernia sac might lead to significant adhesions, residual scarring, and fibrosis of the space of Retzius.[3] This might make traditional, open surgery or minimally invasive laparoscopic surgery more difficult, with increased risk of bladder, bowel, and/or vascular injury.

Katz et al reported a case of bilateral laparoscopic inguinal hernia repair using polypropylene mesh that caused obliteration of the space of Retzius and resulted in halting the radical retropubic prostatectomy.[4] Other case reports noted similar difficulties in patients who had prior bilateral laparoscopic inguinal hernia repair using prosthetic mesh and now had dense

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adhesions between the prostate and pelvic side wall.[5] However, Brown and Dahl recently reported successful laparoscopic radical prostatectomy in two patients who had prior inguinal herniorrhaphy using prosthetic mesh.[6] Similarly, Erdogru et al confirmed the feasibility of laparoscopic radical prostatectomy following laparoscopic hernia repair using prosthetic mesh; in this study, having a prior hernia repair did not adversely affect perioperative parameters such as operative time, blood donation, and surgical complications.[7]

Over 3000 robotic radical prostatectomies have been performed in our institution, and to date, there have not been any surgical complications or halted surgeries due to prior hernia repair. To our knowledge, no previously published studies have evaluated the feasibility of robotic radical prostatectomy in patients with previous inguinal hernia repair.

We aimed to evaluate the impact of prior inguinal herniorrhaphy (with or without the use of prosthetic mesh) on perioperative and intraoperative parameters in patients undergoing robotic radical prostatectomy at our institution.

Material and methods

We performed a retrospective analysis of 354 consecutive patients who underwent robotic radical prostatectomy at our institution over a 6-month period. Baseline and surgical parameters included patient age, clinical stage of prostate cancer, preoperative prostate specific antigen (PSA) levels, biopsy Gleason sum, body mass index (BMI), operating times (surgeon console time), intraoperative estimated blood loss (EBL), intraoperative complications (injury to the bladder, bowel, or vascular system), blood transfusion rates, analgesic requirements, hospital stay, and duration of catheterization.

Based on the type of prior hernia repair (if any), the patients were divided into three groups: 292 patients who had no prior hernia repair (group 1), 50 patients who had prior inguinal herniorrhaphy without the use of a prosthetic mesh (group 2), and 12 patients who had prior inguinal herniorrhaphy (4 bilateral and 8 unilateral repairs) with the use of a prosthetic mesh (group 3). Groups 2 and 3 (those who had prior hernia repair) comprised 17% of the study population. Prior herniorrhaphy with the use of a prosthetic mesh was done using either laparoscopic or traditional open surgery.

The study was approved by the Institutional Review Board (IRB) at our center and was performed in accordance with the Health Insurance Portability and Accountability Act. Robotic radical prostatectomy was performed using our Vattikuti Institute prostatectomy (VIP) technique, which was described previously.[8] We determined the mean, standard deviation (SD) and 95% confidence interval (CI) for EBL, BMI, hospital stay, mean console operating time, and total operating time (skin incision to skin closure). The t-test was used to compare the differences in the mean values of these parameters (except for total operating time) between the three patient groups; $p < 0.05$ was considered to be significant.

TABLE 1. **Patient characteristics and operation variables in 354 patients who underwent radical prostatectomy, Mean ± SD, (95% CI)**

Patient characteristic/ prostatectomy operation variable	Group 1 no prior hernia repair n = 292	Group 2 prior hernia repair without mesh n = 50	Group 3 hernia repair with mesh n = 12
EBL, ml	152.5 ± 101.5 (140.9-164.1)	140.6 ± 65.4 (121.7-159.5)	141.6 ± 59.7 (103.2-179.6)
BMI, kg/m^2	27.2 ± 3.5 (26.9-27.7)	27.8 ± 3.7 (26.8-28.9)	27.5± 4.1 (24.8-30.3)
Mean hospital stay, days	1.2 ± 0.3 (1.0-1.6)	1.1 ± 0.4 (1.0-1.2)	1.4 ± 0.9 (0.3-2.5)
Mean console op. time, min	126.9 ± 30.6 (123.2-130.6)	129.3 ± 35.8 (118.9-140.0)	145.6 ± 47.6 (113.7-177.5)
Mean total op. time, min	153.4 ± 47.8 (101.3-189.4)	157.8 ± 57.8 (105.7-192.5)	183.6 ± 80.6 (116.0-253.3)

BMI = body mass index; EBL = estimated blood loss; Total Op. Time = skin incision to skin closure

TABLE 2. **Two tailed t-test values**

	BMI	Console operative time	EBL	Hospital stay
No hernia repair versus hernia repair without mesh	0.31	0.63	0.43	0.47
Hernia repair without mesh versus hernia repair with mesh	0.81	0.089	0.96	0.18
No hernia repair versus hernia repair with mesh	0.81	0.012	0.71	0.95

BMI = body mass index; EBL = estimated blood loss; $p < 0.05$ = significant

Results

The patient characteristics and perioperative parameters for the study participants are shown in Table 1. The patients who had undergone hernia repair without prosthetic mesh had a mean age of 62 years, and those who had undergone hernia repair with prosthetic mesh had a mean age of 59 years.

Patients with no prior herniorrhaphy (group 1), prior herniorrhaphy without mesh (group 2), and prior herniorrhaphy with mesh (group 3), had similar mean operating times (126.9 minutes, 129.3 minutes and 145.6 minutes, respectively) and similar mean EBL (152.5 ml, 140.6 ml, and 141.6 ml, respectively) during radical prostatectomy, Table 1.

The average hospital stay was similar in all three groups (1.1 to 1.4 days), and no patient suffered intraoperative bowel, bladder, or vascular injuries related to dissection of the space of Retzius following previous hernia surgery. One patient from group 2, previous hernia repair without mesh, presented 16 days after discharge with an incarcerated inguinal hernia, which was repaired.

Compared with the group of patients who had no prior hernia repair, the group who had prior herniorrhaphy with the use of mesh had a significantly longer mean console operating time (145.6 versus 126.9 minutes, $p = .012$), Tables 1 and 2. There were no other statistically significant differences in EBL, hospital stay, BMI, or console operating times among the three groups, Table 2.

Of the 354 patients, 23 had a previous appendectomy, 7 had a previous laparoscopic cholecystectomy, 8 had an exploratory laparotomy, 2 had a previous nephrectomy, and 2 had a previous bowel resection. When needed, lysis of adhesions was carried out laparoscopically prior to docking the robot and starting the surgery.

Discussion

There have been reports in the literature that having prior inguinal hernia repair can cause complications in subsequent traditional, open prostatectomy or laparoscopic radical retropubic prostatectomy; the complications may result in increased patient morbidity and inability to complete the prostatectomy.[4] Complications may arise from the dissection of dense fibrous tissue and adhesions that result from reactions to previous tissue manipulation and previously placed prosthetic mesh. Bilateral mesh placement may complicate surgery further, as the exposure of the space of Retzius and pelvic lymph node dissection may be compromised due to the extent of the fibrosis.[7] Hernia repair using prosthetic mesh has also been thought to be a relative contraindication to pelvic lymph node dissection on the ipsilateral side. This may be secondary to poor visualization of the obturator fossa, thereby increasing the risk of injury to nerves and vascular tissue in the region.[9] Reports in the literature have shown that for many of these patients, external beam radiation therapy and/or radical perineal prostatectomy are appropriate alternatives to radical retropubic prostatectomy.[10]

Dense adhesions from previous abdominal surgery or hernia repair can affect operating times as well as overall morbidity. Minimally invasive laparoscopic surgery in those patients with prior hernia repair may be associated with a greater degree of difficulty, thereby possibly increasing the risk of intra-operative complications. To our knowledge, the feasibility of robotic radical prostatectomy in patients with prior inguinal hernia repair (which was performed with or without the use of prosthetic mesh) has not been previously reported.

Transperitoneal laparoscopic radical prostatectomy, although technically challenging, has proven to be feasible in the face of bilateral inguinal hernia repair with mesh.[6] Yet completion of the procedure might only be

possible in the hands of very experienced laparoscopic surgeons. This limits the options for patients who have had previous hernia repair and who desire minimally invasive prostatectomy.

At our institution, robotic radical prostatectomy has become the standard of care for localized prostate cancer. In the current analysis of patients who underwent robotic prostatectomy at our center, we evaluated data from patients who underwent prior inguinal hernia repair with and without mesh and compared these two patient populations to patients who did not have prior inguinal hernia repair. We found that overall morbidity and complications were not significantly increased in the patients who had undergone previous inguinal hernia surgery. Statistical significance was only reached when comparing operative times between patients who had previously undergone hernia repair with mesh versus those who did not have prior hernia repair. Although increased time was taken for exposure of the space of Retzius in patients who had undergone previous inguinal hernia surgery with mesh, this procedure did not lead to increased morbidity, since no vascular, bladder, or bowel related injuries were reported.

The intraperitoneal dissection associated with robotic radical prostatectomy allows the surgeon to enter a plane of dissection far above the area of scarring related to previous hernia repair. Visualization of tissue planes and changes in tissue characteristics, such as development of dense fibrous tissue as a result of previous inguinal surgery, may not be well appreciated in traditional open surgery. This increased visualization aids in the safe and efficacious exposure of the space of Retzius. We use a combination of cautery and sharp dissection to expose the space of Retzius and release the bladder from its peritoneal attachments to the anterior abdominal wall. The peritoneal cavity is visualized using a 30-degree upward looking lens, Figure 1. The right and left medial umbilical ligaments are identified. A vertical incision is made just lateral to the medial umbilical ligaments and carried down to the level of the vas deferens. A plane is created through this incision and dissection within this plane is carried down into the space of Retzius, to the pubic arch, Figure 2. This is carried out laterally to both the left and right medial umbilical ligaments. A transverse incision is then made extending from the left to right medial umbilical ligament so as to detach the peritoneum along with the median and medial umbilical ligaments from their anterior abdominal wall attachments. The extraperitoneal space is then developed after transecting the median and medial umbilical ligaments, Figure 3. The bladder, prostate, and bowel drop posterior, and the

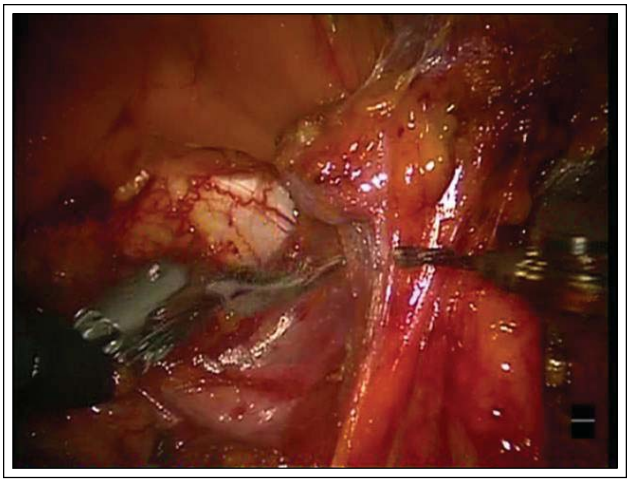

Figure 2. Dissection of peritoneum sac with mesh.

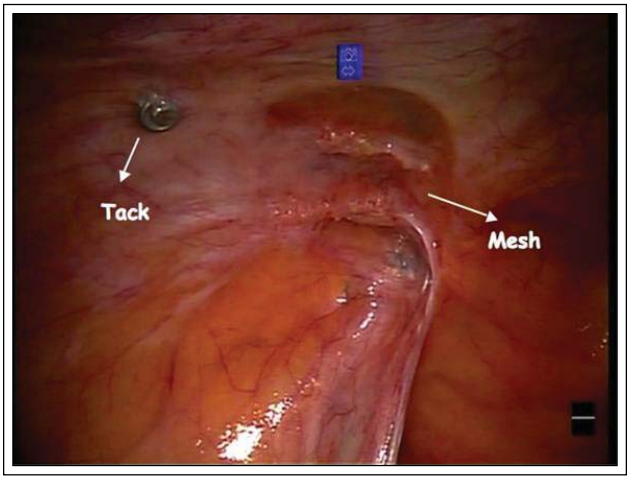

Figure 1. Intraperitoneal view of hernia.

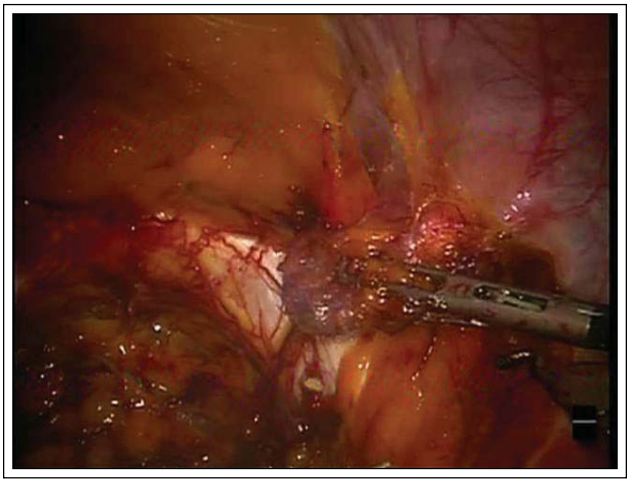

Figure 3. Exposure of the space of Retzius.

rest of the operation is performed within the extraperitoneal space.[7] With dense scarring or adhesions from prior inguinal surgery, this may appear to be quite challenging. We believe that magnified and improved visualization of tissue planes, inherent to robotic-assisted surgery as well as traditional laparoscopic surgery, may allow access into the relatively less scarred plane, and easier tissue manipulation, thereby decreasing overall morbidity and complications, and lessening the chance of bowel, bladder, and/or vascular injuries.[11]

Lymph-node dissection can also be complicated by previous hernia repair, as scarring and fibrosis may cause dense peritoneal and/or bowel adhesions limiting access to the pelvic lymph nodes. At our institution, pelvic lymph-node dissection is carried out immediately after exposure to the extraperitoneal space. No patient with a history of hernia repair suffered vascular-, nerve-, or lymph-related complications during pelvic lymph-node dissection. This suggests that robotic techniques for pelvic lymph node dissection are feasible and safe.

Conclusion

We conclude that previous hernia repair, whether completed with or without mesh, does not represent a contraindication for robotic radical prostatectomy performed with a transperitoneal approach. In our series of robotic radical prostatectomies, previous hernia repair did not significantly affect operative times, operative EBL, or intraoperative complications. Prostatectomy operative times for patients who had previous hernia repair with mesh were significantly greater than for patients who had no previous hernia repair.

One limitation of our study is that it was a retrospective analysis. A prospective analysis of hernia repair and space of Retzius exposure as well as pelvic lymph node dissection might provide further insight in developing a technique for safe and efficacious completion of robotic prostatectomy.

To date, robotic radical prostatectomy has been performed in over 3000 patients in our center, and we have experienced no significant increase in difficulty when performing this procedure in patients who have undergone previous hernia surgery. We recommend, however, that institutions embarking upon a robotics program proceed with caution when encountering patients with prior hernia repairs. We believe that the da Vinci robotic system allows surgeons to achieve easier tissue manipulation and dissection, so it could be used by even less experienced urologists to provide patients with a minimally invasive treatment option for prostate cancer.

To summarize, robotic radical prostatectomy may be considered a valid treatment option for patients who have undergone previous inguinal hernia surgery, with or without mesh placement, and in whom morbidity associated with dissection of the space of Retzius and pelvic lymph node dissection may be increased by using more traditional approaches. □

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