Combined Inguinal Hernia Repair With Prosthetic Mesh During Transperitoneal Robot Assisted Laparoscopic Radical Prostatectomy: A 4-Year Experience

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Purpose: Inguinal hernias are detected in 20% to 30% of patients undergoing radical prostatectomy. We report our experience with concomitant transperitoneal robot assisted laparoscopic radical prostatectomy and intraperitoneal inguinal herniorrhaphy using prosthetic mesh.

Materials and Methods: A retrospective review was performed of the medical records of 533 consecutive robot assisted laparoscopic radical prostatectomies performed by 1 surgeon from June 2002 to April 2007. All cases that included combined herniorrhaphy were recorded in a prospective database, reviewed and compared against a cohort of patients matched for body mass index and age who underwent robot assisted laparoscopic radical prostatectomy alone.

Results: A total of 49 concurrent herniorrhaphy procedures were performed in 40 patients for 31 unilateral (left side in 30 and right side in 19) and 9 bilateral inguinal hernias. Five patients underwent prior ipsilateral inguinal herniorrhaphy, and 3 each underwent contralateral and prior bilateral repair. Preoperatively 15 of 40 patients (37.5%) had a definite inguinal hernia, 5 (12.5%) had noticeable weakness of the external ring and 20 (50%) had a completely normal physical examination. Compared with a matched cohort undergoing robot assisted laparoscopic radical prostatectomy alone there were no significant differences in smoking history, narcotic use, hospital stay or complications. Hernia repair added approximately 10 minutes of operative time. Postoperatively 1 of 49 hernias (2.0%) recurred at 4 months during a median followup of 15.3 months. There were no complications related to hernia repair.

Conclusions: Concurrent repair of inguinal hernias during transperitoneal robot assisted laparoscopic radical prostatectomy using prosthetic mesh is technically feasible and effective, and without increased complications or morbidity.

Key Words: prostate, hernia, robotics, laparoscopy, prostatectomy

Unapparent inguinal hernias are found incidentally in 20% to 30% of patients undergoing radical prostatectomy.[1,2] Clinically manifested, postoperative inguinal hernias can complicate prostatectomy in up to 20% of patients.[2,3] Risk factors for this complication are prior hernia repair, wound infection, advanced age and cigarette smoking.

Simultaneous prostatectomy and inguinal herniorrhaphy have been previously accomplished by open and standard laparoscopic approaches. With the introduction of the da Vinci® surgical system a large number of prostatectomies are now being done robotically worldwide. Given the high number of incidental inguinal hernias that may be identified and repaired during radical prostatectomy, it is imperative to evaluate and establish the feasibility, safety and outcomes of the robotic approach. To our knowledge we report the first experience with concomitant transperitoneal RALP and intraperitoneal herniorrhaphy using prosthetic mesh. We compared this hernia cohort to a matched group of patients who did not undergo concurrent hernia repair.

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METHODS

After receiving institution review board approval we retrospectively reviewed the medical records of 533 consecutive RALPs performed by 1 surgeon (TA) from June 2002 to April 2007. A total of 49 concurrent herniorrhaphies were performed in 40 patients (7.5%). Preoperative patient characteristics (age, BMI and pertinent smoking history) and postoperative parameters (MS, ketorolac use, hospital stay, estimated blood loss and complications) were entered into a prospective database. A cohort of 40 patients matched for age and BMI who underwent RALP alone without hernia repair was selected as a control group. Statistical comparisons between the groups were performed using the 2-tailed paired Student t test.

Our surgical technique for transperitoneal RALP was previously described.[4] After completing pelvic lymph node dissection when indicated, and ensuring a watertight vesicourethral anastomosis all hernias were repaired robotically using the zero degree lens modified after the Stoppa technique.[5] After reducing the hernia sac a swatch of flat Marlex® mesh in 19 cases, a polypropylene cone mesh plug in 16, Proceed® coated mesh in 10, and a combination of umbrella and flat mesh in 2 was secured with interrupted 3-zero Dexon™ or 3-zero Tevdek®. Two patients had a small defect that did not require mesh placement and was repaired with suture alone. Direct hernias were repaired with

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a cone-shaped mesh placed into the defect or a 2 × 3 to 4 × 6 cm mesh sheet, of which each was secured to Cooper's ligament inferiorly and along the superolateral borders to the rectus sheath. Initially a 5 mm laparoscopic ProTack™ device was used through the right lower quadrant assistant port to secure the flat mesh along the pubic bone. Additional interrupted sutures were placed along the superolateral portions of the mesh as needed. For indirect defects the mesh was sutured between the iliopubic tract and transverse arch lateral to the inferior epigastric vessels. Reperitonealization was performed in several early cases by tacking the peritoneum up over the mesh to the anterior abdominal wall but later this was not performed after anastomotic leakage occurred.

All patients were treated with our routine postoperative pain management pathway, including 15 to 30 mg ketorolac intravenously every 6 hours and opioids as needed. All narcotic doses (Vicodin®, Percocet®, Dilaudid® and Demerol®) were converted to MS for the purpose of analysis.

RESULTS

A total of 49 concurrent inguinal herniorrhaphies were performed in 40 patients for 9 bilateral (22.5%) and 31 unilateral (77.5%) hernias. We performed our first combined RALP and inguinal hernia repair early in our series at case 32. Of the hernias 30 (61.2%) were on the right and 19 (38.8%) were on the left. A total of 43 hernias were direct (93.9%) and 3 were indirect (6.1%). Average patient age was 62.4 years. Average BMI was 26.8 kg/m^2. Of the patients 11 (27.5%) had a history of hernia repair, which was ipsilateral in 5 and contralateral in 3, while 2 with a right inguinal hernia underwent prior bilateral repair and 1 with bilateral hernias underwent previous bilateral repair. On preoperative physical examination 15 of 40 patients (37.5%) had a definite inguinal hernia, 5 (12.5%) had an abnormal examination with noticeable weakness of the external ring or fullness without a definite hernia and 20 (50%) had a completely normal physical examination (table 1).

There was no significant difference between the hernia group and the control group for any analyzed parameters, including smoking history, postoperative MS or ketorolac use, estimated blood loss, hospital stay or complications (table 2). Median hospital stay for patients with hernia and controls was 26.7 vs 26.3 hours (p = 0.89). The hernia group did not require significantly more narcotics and ketorolac than the nonhernia group (3.8 vs 4.2 MS, p = 0.72 and 92.5 vs 82.3 mg, p = 0.36). Additional operative time for hernia repair was less than 10 minutes in all cases.

TABLE 1. *Hernia cohort findings*

	No. Pts (%)
Unilat	31 (77.5)
Bilat	9 (22.5)
Lt	30 (61.2)
Rt	19 (38.8)
Direct	46 (93.9)
Indirect	3 (6.1)
Prior surgical repair:	
Ipsilat	5 (12.5)
Contralat	3 (7.5)
Bilat	3 (7.5)
None	29 (72.5)
Preoperative examination:	
Definite hernia	15 (37.5)
Abnormal*	5 (12.5)
Normal	20 (50.0)

* No obvious hernia, but definite weakness of external inguinal ring or inguinal fullness.

TABLE 2. *Hernia vs no hernia cohorts*

	Hernia	No Hernia	p Value
No. pts	40	40	
Age	62.4	62.4	0.99
BMI (kg/m^2)	26.8	26.6	0.77
No. smoking:			
Current	3	1	0.64
Previous	16	15	0.96
Never	21	22	0.34
Length of stay (hrs)	26.7	26.3	0.89
Narcotics (MS)	3.8	4.2	0.72
Ketoralac (mg)	92.5	81.3	0.36
Estimated blood loss (ml)	91.5	104.6	0.17

Median followup was 15.3 months (range 1 week to 4.3 years). There were no mesh related complications. One hernia that was repaired with umbrella mesh recurred 4 months after RALP. During subsequent open hernia repair migration of the umbrella mesh was noted in this patient. There were no recurrences in the sheet and Proceed mesh groups. One patient experienced postoperative urine leakage. After completion of a watertight vesicourethral anastomosis the peritoneum was fixed to the anterior abdominal wall to cover (reperitonealize) the mesh. The patient was treated with prophylactic antibiotics and placement of a percutaneous 8Fr pigtail drain under CT guidance to prevent mesh infection.

DISCUSSION

The incidence of inguinal hernias in the general male population is approximately 5%. The development of clinically manifest inguinal hernias after radical prostatectomy has been reported in 7% to 21% of cases.[6–9] Stranne et al compared the incidence of postoperative inguinal hernias in 152 patients who underwent open radical retropubic prostatectomy with the incidence in 953 in whom prostate cancer was treated without surgery.[8] The incidence of inguinal hernias in the operative vs nonoperative cohorts was 8.6% vs 2.4% (p = 0.01). Ichioka et al retrospectively reviewed a series of 246 patients undergoing radical prostatectomy, cystectomy or pelvic lymph node dissection.[9] The incidence of postoperative inguinal hernias in these groups was 21.3%, 11.4% and 5.4%, respectively.

Coincidental inguinal hernias at surgery have been reported in up to 33% of patients with prostatectomy.[2] Watson et al noted a 13% incidental inguinal hernia rate in patients undergoing laparoscopic procedures.[10] Fukuta et al retrospectively reviewed preoperative CT in 98 patients undergoing radical prostatectomy and found 20 (20.4%) subclinical inguinal hernias.[1] Postoperatively 11 of these patients (55%) had clinically evident inguinal hernias for an estimated risk of 60.6% (OR 7.3).

Risk factors for post-prostatectomy inguinal hernias are prior hernia repair, wound infection, advanced age and cigarette smoking. In the open prostatectomy series by Lodding et al postoperative inguinal hernias developed in 9 of 14 patients with a history of hernia surgery.[11] Likewise 27.5% of patients in our series had a history of hernia repair.

Inguinal hernias may be more common in smokers vs nonsmokers, which could be linked to peripheral tissue hypoxia.[12] Smokers with direct hernias have higher serum neutrophil elastase and decreased incisional collagen deposition, which may have a role in hernia formation.[13,14] However, in the current study there was no difference in smoking history between the hernia and nonhernia groups. Other factors, such as postoperative straining to defecate and Kegel exercises, may also contribute to hernia formation in the setting of an already weakened abdominal wall.

A concern with the use of prosthetic material for inguinal hernia repair is the risk of mesh infection. However, mesh infection after laparoscopic transperitoneal inguinal herniorrhaphy is rare. In a review of 2,500 consecutive laparoscopic transperitoneal inguinal mesh hernia repairs Schultz et al did not observe a single mesh infection.[15] Even when mesh is placed into clean contaminated or contaminated fields, the risk of infection is exceedingly low.[16] Because it is not possible to restore peritoneal integrity after the bladder is dropped from the abdominal wall during laparoscopic transperitoneal prostatectomy, there is the possibility of the mesh coming in contact with urine. To minimize this risk a combined extra peritoneal prostatectomy and intraperitoneal hernia repair approach has been described to separate the mesh from the urethrovesical anastomosis.[17] However, our review of published simultaneous inguinal mesh herniorrhaphy and prostatectomy series does not support this practice with no increased risk of mesh infection for 1 approach over the other.[2,18–20]

Another concern with prosthetic mesh is the potential risk of bowel adhesions. Early in our series we generally attempted to reperitonealize the mesh. However, in 1 case after ensuring a watertight vesicourethral anastomosis retacking the peritoneum over the mesh caused excess tension on the anastomosis, which resulted in postoperative leakage. Since then, we have changed to Proceed mesh, which recently became available at our institution. Proceed is a coated mesh that is resistant to adhesion formation. It is composed of a monofilament polypropylene sheet combined with an oxidized, regenerated cellulose fabric encapsulated with polydioxanone.

Short-term results with the combined robotic approach have been excellent. During a median followup of 15 months we observed 1 recurrence (2.0%), which is comparable to that in other series.[2,15,17,20] No patient has reported inguinal, scrotal or testicular discomfort, or paresthesia. In our initial group of patients we used an umbrella type of plug mesh, which was deployed inside the internal ring with the apex first in an orientation opposite to that of open hernia repair. We found that this obliterated the hernia dead space well. However, we noted 1 recurrence with this approach due to mesh migration and we have since changed our technique. Currently we use a swatch of flat Proceed mesh, which is sutured over the hernia defect at multiple points. We have not observed any recurrences since adopting this technique.

Concurrent hernia repair and prostatectomy was first performed in 1949 by McDonald and Huggins via 2 separate open incisions.[19] Several contemporary series have described the combined procedure with standard laparoscopy via the extraperitoneal, transperitoneal or combined route.[17,20] To our knowledge we describe the first combined procedure in a robotic series. In the current study prostatectomy and herniorrhaphy were performed using the da Vinci robot transperitoneally.

We believe that the robotic approach may offer some advantages. With superb visualization from 3-dimensional magnification (10×) all hernias were easily identified and reduced. The entire hernia repair added less than 10 minutes of operative time in all cases. Because of the ease of this procedure, we were able to incorporate it early in the learning curve of our prostatectomy series (case 32 of 533). Initially we used the ProTack laparoscopic stapling device to secure the mesh inferiorly along the pubic bone, as described in the general surgery literature. Currently we no longer use the ProTack device and we exclusively use sutures to secure the mesh, even along the pubic bone and Cooper's ligament. We found that the intuitive articulating instruments of the robot facilitated suturing the mesh in place.

The only predictor of postoperative inguinal hernias that could be affected at surgery is correction of a subclinical hernia. Failure to identify or repair these hernias is associated with a significant negative impact on patient quality of life. Untreated inguinal hernias can lead to discomfort and complications from bowel strangulation or obstruction and they may require subsequent open surgery. Although during RALP the hernia defect is usually apparent, a normal-appearing internal ring during intraoperative inspection does not preclude hernia. We have recently seen several postoperative hernias in patients who had no intraoperative evidence of a hernia.

Complications from performing herniorrhaphy during laparoscopic prostatectomy are rare. In the current series with more than 15 months of followup no complications related to herniorrhaphy or the use of mesh were seen. Furthermore, there were no significant additional patient analgesic requirements or prolonged hospital stay.

CONCLUSIONS

Incidental inguinal hernias noted during radical prostatectomy should be repaired to prevent clinically symptomatic postoperative hernias. Simultaneous repair of inguinal hernias with prosthetic mesh during transperitoneal RALP is technically feasible and effective without increased complications or morbidity attributable to its application.

Abbreviations and Acronyms

BMI	=	body mass index
CT	=	computerized tomography
MS	=	morphine sulfate equivalents
RALP	=	robot assisted laparoscopic radical prostatectomy

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EDITORIAL COMMENTS

These authors share their early experience. We found similarly favorable outcomes in 48 hernias repaired at laparoscopic radical prostatectomy.[1] While we have had good results, it is important to remain cautious about the potentially serious complications that are possible with laparoscopic hernia repair. In a large, randomized study of open vs laparoscopic hernia repair the only life threatening and major complications were observed in the laparoscopic group and the hernia recurrence rate was higher.[2] The most widely used technique for laparoscopic hernia repair is the totally extraperitoneal pro-peritoneal approach. This is favored because mesh is completely excluded from contact with bowel, thus, minimizing the potential for devastating erosion of bowel on the mesh surface. The need for mesh fixation tacks or sutures, which can cause neuralgia, is decreased by the totally extraperitoneal pro-peritoneal technique because the peritoneum stabilizes the mesh. Before performing laparoscopic hernia repair the urologist should become familiar with the mature literature and techniques that are well established in hernia surgery.

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These authors from one of the centers where RALP is being pioneered present their experience with simultaneous repair of inguinal hernias detected before or during the procedure. Indeed, about 10% (not 20% to 30%) of patients undergoing laparoscopic or open radical prostatectomy present with an inguinal hernia. According to this the authors repaired such hernias in 40 of 533 patients undergoing RALP at their institution. Technically this can be easily performed using prosthetic mesh. There are 2 options, including transperitoneal and extraperitoneal hernioplasty.

As reported by the authors, a flat mesh should be preferred over the umbrella cone type. A coated mesh may decrease any complications related to contact of the mesh with bowel, particularly when using a transperitoneal approach. However, a coating mesh may have different properties with respect to the infiltration of fibrous tissue. We still prefer a standard simple polypropylene mesh but this requires closure of the peritoneal defect after the mesh has been placed. For this reason we prefer an extraperitoneal approach when an inguinal hernia is detected before the procedure. With the extraperitoneal approach the mesh is placed over the defect and automatically covered by the peritoneum. Moreover, there is no need of mesh fixation, ie by sutures or staplers such as the ProTack device. This approach obviates the risk of stapling branches of the genitofemoral nerve. However, we put a special compressing dressing, as after angiography, on the respective inguinal ring.

In addition to these technical details, another issue should be emphasized. As in open surgery, urologists are also capable of repairing inguinal hernias laparoscopically without the assistance of a surgical colleague. We have experience with more than 300 laparoscopic hernia repairs during the last 10 years, including about 50 done simultaneously with laparoscopic radical prostatectomy. There are no reasons to bother as long as the technique is performed properly. Following reduction of the hernia the vas deferens and spermatic chord must be isolated (they are urological structures). Thereafter the peritoneum (it belongs to every surgical specialty) must be dissected to provide proper mesh placement. This article should stimulate groups at other laparoscopic active urological centers with and without the da Vinci device.

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REPLY BY AUTHORS

An extraperitoneal approach is well established in inguinal hernia surgery and overcomes many of the concerns with the use of mesh. We found the transperitoneal approach to be straightforward, and have not encountered any problems with more than 100 hernia procedures to date.