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Original research

Incidence and outcomes of ventral hernia repair after robotic retropubic prostatectomy: A retrospective cohort of 570 consecutive cases☆

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HIGHLIGHTS

- Incidence of VH after RRP has been most likely underreported.
- Obesity and diabetes are the main risk factors predisposing patients to develop VH after RRP.
- Laparoscopic VHR can be safely performed in patients undergoing previous robotic surgery.
- More studies are needed to analyze variable extraction techniques in RRP and incidence of VH.

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ABSTRACT

Background: Robotic retropubic prostatectomy (RRP) has become one of the most commonly performed robotic procedures in the United States. Ventral hernia (VH) has been increasingly recognized as an important complication after laparoscopic procedures, in general. However, data related to VH after robotic procedures is relatively scarce, especially after RRP. With increasing popularity of RRP, the purpose of this study was to look at the incidence of VH and outcomes of ventral hernia repair (VHR) after RRP.

Methods: All patients who underwent RRP at a single institution between January 2012 and June 2014 were studied retrospectively using electronic medical records.

Results: A total of 570 patients underwent RRP, of which 33 (5.8%) developed VH during the study period. Fourteen (42%) patients were obese and five (15%) had diabetes. One patient (3%) had a surgical site infection after RRP and two (6%) patients were on immunomodulators/steroids. Median duration to develop VH after RRP was 12 (1–25) months. Out of the 33 patients with VH, ten (33%) underwent VHR; five laparoscopic and five open. Median size of hernia defect and mesh used was 25 (1–144) cm^2 and 181 (15–285) cm^2, respectively. Median length of hospital stay and follow up was 0 (0–4) days and 12 (1–14) months, respectively. One patient who had initial VHR done at an outside institution had a recurrence. Thirty-two (97%) patients were alive at their last follow up. One patient died secondary to progression of prostate cancer. There was no significant 30 day morbidity (surgical site infection, fascial dehiscence, pneumonia, acute kidney injury, myocardial infarction). Of patients who decided non-operative management of VH (n = 23, 67%), none developed a complication requiring emergent surgical intervention.

Conclusion: The incidence of VH after RRP is likely underreported in prior studies. Repair, either laparoscopic or open, is safe and effective in experienced hands. Patients who decide on watchful waiting can be followed with minimal risk of incarceration/strangulation. Further studies are needed to analyze the extraction techniques after RRP and correlate with incidence of VH.

1. Introduction

Since the introduction of robotic retropubic prostatectomy (RRP) in 2001, it has become a surgical gold standard to treat patients with prostate cancer [1]. In the United States alone, up to one

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third of 200,000 patients diagnosed with prostate cancer undergo radical prostatectomy [2,3]. Sixty seven percentages of radical prostatectomies were done robotically among urologists who underwent board certification or recertification in 2010 [4]. Outcomes of RRP have been extensively studied and have been found to be comparable to open with respect to margins, continence and erectile dysfunction [5,6]. Moreover, RRP has proven to be extremely cost-effective as any other minimally invasive technique and has reduced postoperative length of stay and pain [7].

Port-site or extraction site hernias have become more common after minimally invasive surgery. Previous studies have reported a rate of 0.5%–16.7% of incisional hernia after minimally invasive surgeries, with higher incidence related to longer incisions [8,9]. Specifically, ventral incisional hernia(VH) are being reported more commonly after laparoscopic procedures but reports after RRP are scarce. With increasing popularity of robotic techniques, the purpose of this study was to look at VH rates after RRP.

2. Materials and methods

All patients who underwent any robotic retropubic prostatectomy (RRP) from January 2012 through June 2014 were included. The primary endpoint of the study was incidence of midline VH as diagnosed by computed tomography (CT) of the abdomen or clinical examination, whichever came first. The hernia defect was measured by two independent observers and the mean obtained. Patients who underwent RRP were followed by their primary urologists and when a ventral 'bulge' was indentified on exam, they were either diagnosed clinically or radiographically; and sent to the general surgeon for further evaluation. Among the others, few patients were referred by outside physicians after imaging was obtained to diagnose a hernia and a small number of patients were diagnosed clinically. All VH surgeries were performed by four board certified surgeons during the entire study period at a single institution.

All RRP were performed by board certified urologists at our institution. Closing technique is uniform among all urologists performing RRP and involves closing the fascia with 'O' Vicryl suture. Operative technique for laparoscopic VHR has been published by our group at multiple occasions. Open repair of VH involved a standard retrorectus repair using a polypropylene mesh.

The study was conducted retrospectively using a prospectively maintained database after obtaining approval from the institutional review board. Preoperative characteristics including sex, age at VH diagnosis, time between VH diagnosis and surgery, comorbidities, use of immunomodulators or steroids, and history of any ventral hernia prior were recorded. Intraoperative parameters of VH repair included type of repair, status of urgency, size of the hernia defect and mesh used, estimated blood loss, operative time, length of hospitalization and intraoperative complications. Follow up data included postoperative morbidity and mortality, and incidence of recurrence. Last follow up was established based on the patients last visit involving an abdominal exam at our institution.

Data was extracted and analyzed using Statistical Packaging for Social Sciences (SPSS) v 22.0 (IBM Corp, Armonk, NY). Continuous variables are represented as median and range whereas categorical variables are represented as percentages.

3. Results

A total of 570 patients underwent RRP during the study period (Table 1). Median age at VH diagnosis was 67 years (range, 54–78 years). Median time between RRP and VH diagnosis was 12 months (range, 1–25 months). Most common comorbidity among patients who developed ventral hernia was obesity (n = 14, 42%) followed by diabetes mellitus (n = 5, 15%).

Table 1
Patient demographics and preoperative characteristics.

Variables, median (range)[a]	Total patients, N = 570
Incidence of VH after RRP, N (%)	33 (5.8)
Age at VH diagnosis, years	67 (54–78)
Age at VH surgery, years	70 (61–78)
Time between RRP and VH diagnosis, months	12 (1–25)
Time between RRP and VH surgery, months	16 (8–29)
Time between VH diagnosis and surgery, months	6 (2–19)
Comorbidities, N (%)	
Diabetes mellitus	5 (15)
Coronary artery disease	4 (12)
Chronic obstructive pulmonary disease	1 (3)
Obesity	14 (42)
Use of immunomodulators before surgery	2 (6)
Steroid use	0 (0)
History of ventral hernia before RRP, N (%)[b]	2 (6)
Surgical site infection after RRP, N (%)	1 (3)

[a] Unless indicated.
[b] Both VH prior to RRP were repaired open without mesh at outside hospitals.

A total of 33 patients (5.8%) developed a VH after RRP for the entire cohort. Out of these, ten patients (33%) underwent VH repair, five (15.1%) had a laparoscopic repair and five (15.1%) had an open repair (Table 2). All patients underwent elective hernia repair. Median size of hernia defect was 25 cm^2 (range, 1–144 cm^2) and median size of mesh used was 181 cm^2 (range, 15–285 cm^2). There was no intraoperative or postoperative mortality or morbidity. Median length of follow up was 12 months (range, 1–14 months).

Total of 23 patients (67%) decided not to undergo VHR, none of whom developed a complication requiring emergent surgical intervention during follow up.

4. Discussion

Prostate cancer is one of the most commonly diagnosed cancers among men in the United States [2]. With the increase in diagnosis, there is a steady increase in the number of robotic prostatectomies being performed. As a result, more patients are being referred to general surgeons to evaluate and treat ventral hernia resulting from RRP. There is very little data in the literature regarding this subset of

Table 2
Operative and Postoperative variables.

Variables, median (range)[a]	Total patients, N = 33
Patients undergoing VH surgery N (%)	10 (33)[b]
Laparoscopic	5 (15.1)
Open	5 (15.1)
Elective VH surgery, N (%)	10 (100)
Size of hernia defect, cm^2	25 (1–144)
Size of mesh, cm^2	181 (15–285)
Duration of surgery, minutes	108 (36–275)
Length of hospital stay, days	0 (0–4)
Length of follow up, months	12 (1–14)
Recurrence, N (%)	1 (12.5)[c]
Alive at last follow up, N (%)	32 (97)[d]
Complications, N (%)	
Surgical site infection	0 (0)
Fascial dehiscence	0 (0)
Pneumonia	0 (0)
Acute kidney injury	0 (0)
Myocardial infection	0 (0)
Pulmonary embolism	0 (0)
Ileus	0 (0)
Clostridium Difficile infection	0 (0)

[a] Unless indicated.
[b] 2 patients had VH repair in their hometown. Info not available.
[c] Patient operated at outside hospital.
[d] 1 patient died secondary to progression of prostate cancer.