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The Lister AirSeal® port closure technique – Initial patient outcomes

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ABSTRACT

INTRODUCTION The 12-mm AirSeal® port is widely used in robotically assisted laparoscopic prostatectomy due to its ability to maintain stable pneumoperitoneal pressures and smoke evacuation. However, it creates a potential risk of port site hernia. We have traditionally used EndoClose™ to perform full thickness closure of this port, but noted that patients experienced increased pain related to this procedure, which sometimes persisted for several months.

Using the Da Vinci Si we performed peritoneal closure with 2-0 vicryl by switching the fourth arm to the right master controller. The external oblique sheath was closed outside with 1 Ethibond.

MATERIALS AND METHODS We performed this closure in 20 consecutive patients (group 1). Postoperative day 1, 2 and post-discharge telephone consultation pain scores (1–10) were recorded and compared with the previous 20 consecutive patients who had the EndoClose closure (group 2).

RESULTS We recorded an instructional video to enable reproduction of the new technique. The mean length of stay was 1.5 days for patients in group 1 and 1.9 days for those in group 2 ($P = 0.04$). There was no difference in operating time or average day 1 pain scores. Post-discharge follow-up call revealed 1 of 20 patients who had AirSeal port site pain in group 1 and 5 of 17 in group 2 ($P = 0.04$). Pain scores also tended to be higher for group 2.

CONCLUSIONS Our preliminary analysis of this novel technique to close the AirSeal port in two separate layers improves post-operative pain related to this port site.

KEYWORDS

Robotic surgical procedures – Prostatic neoplasms – Minimally invasive surgical procedures

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Introduction

The AirSeal® (ConMed, NY, USA) port has been widely adopted in robotically assisted laparoscopic prostatectomy as well as other laparoscopic and robotically assisted procedures due to its ability to provide valve-free access and to maintain stable pneumoperitoneal pressures and smoke evacuation.[1] For robotically assisted laparoscopic prostatectomy and cystoprostatectomy we have been using the 12-mm version, as this instrument allows for great utility for the bedside assistant. However, the larger size of the port site has a potential increased risk of port site hernia.[2]

Towards the beginning of our robotic series we were simply closing the outer sheath of the port site, but we encountered one case where a patient presented two weeks following robotically assisted laparoscopic prostatectomy with small-bowel obstruction. On computed tomography of the abdomen and pelvis, he was found to have a loop of small bowel herniated through the peritoneum and strangulated within the muscle wall (Fig 1). On exploration, he was found to have an intact sheath but a viable loop of small bowel stuck between the muscle layers of the lateral abdominal wall. We therefore changed to using the Endo Close™ (Medtronic, MN, USA) to perform full-thickness closure of this port with 1 Ethibond® (Ethicon) suture. We noted, however, that our patients sometimes experienced increased pain related to this port site, which sometimes persisted for several weeks, and even months, postoperatively.

In September 2016, we decided to change to a novel approach and close this port in two layers: a peritoneal layer closed robotically prior to undocking and the external oblique layer closed outside together with the other wounds. We were interested to see whether this would improve our patients' postoperative port site pain. The technique is demonstrated in the accompanying video.

At the end of the case and prior to undocking, we used the Da Vinci® Si (Intuitive Surgical, Inc., Sunnyvale, CA, USA) to performe a robotic peritoneal closure with 2-0 vicryl.

If there is a specimen bag, the string is transferred to a port or position optimal for future extraction. The (left) fourth arm of the robot is switched to the right master

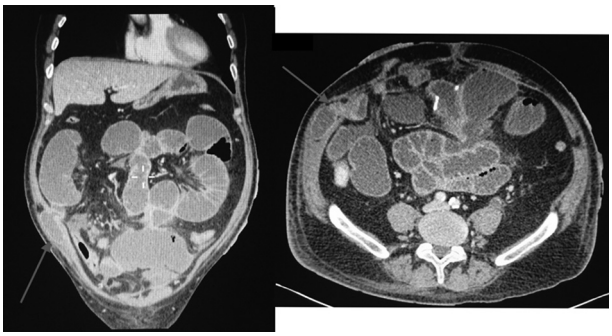

Figure 1 Port site hernia deep to the external oblique sheath.

controller and the right instrument is removed. Two robotic needle drivers are introduced into the left arm and the newly reassigned right (fourth) arm. A 2-0 vicryl is introduced through the AirSeal port, followed by the port trocar. The gas is switched to another port (eg 5-mm sucker port). The port is slowly withdrawn by the bedside assistant and the console surgeon closes the peritoneal layer with a figure-of-eight or horizontal mattress suture. The end of the suture can be snapped using the robotic instruments and the needle can be removed through the 5-mm sucker port. This closure is airtight allowing for future steps such as insertion of a drain or removal of ports under vision. The pneumoperitoneal pressure can be reduced (eg 6 mmHg) to allow for easier knot tying. If there are difficulties in extracting the needle through the small port it can be straightened using the robotic arms prior to extraction. The outer layer of the port site is closed after undocking and specimen extraction with 1 Ethibond to the external oblique sheath.

Materials and methods

Study design

We performed a retrospective audit of 20 consecutive patients undergoing a robotically assisted laparoscopic prostatectomy who had closure of the AirSeal port using the above technique (group 1). We compared this group with the previous 20 consecutive 'control' patients who had the EndoClose full thickness closure (group 2).

Outcome measures

We recorded operating time, postoperative day 1 and day 2 (if applicable) average daily pain scores (patients were asked to rate their pain at regular intervals during the day using discrete integers 0–10, where 0 was no pain and 10 the worst pain imaginable) and length of stay for both groups. Average pain scores were calculated by adding all the pain scores for the day and dividing by the total number of scores taken. We also attempted to follow up with all patients with a telephone consultation at least eight weeks or longer following surgery. The EndoClose group were expectedly called at a greater interval postoperatively as this was a retrospective consultation. We enquired whether patients still had any postoperative pain, the location of this pain and the average score (discrete integers 0–10 as above).

Statistical analysis

Comparison between the two groups was performed using the two-tailed T-test for continuous variables and the chi-square test for categorical variables. *P*-values of 0.05 or less were considered significant.

Results

A total of 20 robotically assisted laparoscopic prostatectomies were performed between September and December 2016 (group 1) and 20 between May and September 2016 (group 2). All operations were performed by the same consultant surgeon. The study was conducted over a total of 12 months. The baseline characteristics and immediate postoperative follow-up of the two groups is outlined in Table 1. The mean length of stay was 1.5 days (± 0.6 days), (median 1 day, range 1–3 days) for patients in group 1 and 1.9 (± 0.8 days), (median 2 days, range 1–3 days) days for those in group 2 ($P = 0.04$). There was no significant difference in operating time (201 ± 38.9 minutes in group 1 and 198 ± 35.2 minutes in group 2, $P = 0.75$) or average postoperative day 1 pain score (0.7 ± 0.97 in group 1 and 1.1 ± 0.93 in group 2, $P = 0.10$). For postoperative day 2 the pain scores were slightly different (0.4 ± 0.97 in group 1 and 1.9 ± 2.2 in group 2, $P = 0.05$).

The results of the post-discharge telephone consultation are summarised in Table 2. The follow-up consultations were performed a mean of 111.7 days (median 95 days, range 51–228 days) postoperatively for group 1 and 149.9 days (median 128 days, range 86–301 days) postoperatively for group 2 ($P = 0.05$). There was a 100% response rate for group 1 and 85% in group 2. Of the 37 responders, 9 (24.3%) reported continuing, intermittent postoperative pain. The two sites in which pain was reported were in association with the umbilical port and the right lateral port (site of AirSeal). There was no significant difference between the two groups with regards to having any pain. There was 1 of the 20 patients who had right port site pain in group 1 and 5 of 17 in group 2 ($P = 0.04$). No significant difference was seen in the incidence of umbilical port pain (two in group 1 and one in group 2, $P = 0.65$). For those who had pain, the overall pain scores tended to be slightly higher for the right port site for group 2 (median pain score 3 vs 1) and similar for the umbilical port site (median scores 2 and 2.5).

Discussion

The level of pain following robotically assisted laparoscopic prostatectomy in all patients is quite low, and most make an uneventful, fast and relatively pain-free recovery. Although we did not find a statistically significant difference with respect to any pain (3 vs 6, $P = 0.15$) or umbilical port pain (2 vs 1, $P = 0.65$), our audit of this new two-

Table 1 Baseline demographics and immediate postoperative follow-up.

	Endoclose	Roboclose	P-value
Patients (*n*)	20	20	
Age (years), mean (median)	63.5 (63)	59.5 (59)	0.12
Surgery time (minutes), mean ± SD	201.3 ± 38.9	197.5 ± 35.2	0.75
Length of stay (days):			
mean ± SD	1.9 ± 0.8	1.5 ± 0.6	0.04
median (range)	2 (1–3)	1 (1–3)	0.04
Mean pain score:			
Day 1 ± SD	1.1 ± 0.93	0.73 ± 0.97	0.10
Day 2 ± SD	1.9 ± 2.2	0.44 ± 0.97	0.05

Table 2 Telephone consultation follow-up post-discharge.

	Endoclose	Roboclose	P-value
N	20	20	
Complete data (%)	85	100	
Mean, median days postoperative phone consultation (range)	149.9, 128 (86–301)	111.7, 95 (51–228)	0.05
Any pain (*n*)	6	3	0.15
Right port pain (*n*)	5	1	0.04
Umbilical port pain (*n*)	1	2	0.65
Median pain score right port (range)	3 (2–5)	1	n/a
Median pain score umbilical port (range)	2	2.5 (2–3)	n/a

layer closure technique showed significant improvement in the long-term pain associated with the AirSeal port compared with full-thickness EndoClose (1 vs 5, $P = 0.04$). Moreover, pain scores for this port site tended to be higher in the EndoClose group, but the number of patients for comparison is too low to be statically significant. Indeed, we had several patients who had full-thickness closure, in whom the pain intermittently persisted for almost one year postoperatively (the longest in this study was 301 days; this patient relayed a pain score of 4). The one patient who had right port site pain in group 1 reported a pain score of 1 at 105 days post-surgery. In contrast, the five patients who had right port site pain in group 2 reported pain scores between 2 and 5 (median score = 3) with follow-up ranging from 88 to 301 days. We believe that this is a clinically significant difference. Additionally, there was no significant difference in operative time after adopting this technique.

An explanation for the difference in pain related to this port is probably because the port is closed in two layers, so it does not cause ischaemia and constriction of the full-thickness musculature of the lateral abdominal wall. Furthermore, when a non-absorbable stitch was used it could have caused further tearing of the muscle if the patient strained many months postoperatively. We believe that the strength of the closure would be similar, as there would be limited strength provided by compressed muscle layers and the majority of this would be performed by the external oblique sheath stitch. We believe that the inner stitch provides extra security in the immediate postoperative period.

It is difficult to ascertain why the length of stay was shorter in the group with the two-layer closure as the pain scores did not differ significantly, but this is probably not related to the closure technique. It may be related to heightened interest in the patients who had undergone closure with the new technique, thus leading to more proactive management and an earlier discharge. There were, however, slightly higher pain levels in group 2 on postoperative day 2 (1.9 vs 0.4, $P = 0.05$), potentially implying that those who stayed in for more days did so because of pain.

Given that there are currently no publications about closure techniques and complications specifically related to the AirSeal port, we would require longer-term follow-up of this technique to assess for complications such as port site hernias. Additionally, as this is a retrospective comparative study, the perceived superiority of the new closure technique over the older one would need to be tested more rigorously in a randomised controlled trial.

Conclusions

Our novel technique to close the AirSeal port in two separate layers appears to improve postoperative pain related to this port site without compromising operative time. We have changed our practice to close this port in this manner for all our robotically assisted laparoscopic prostatectomy and cystoprostatectomy procedures.

References

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