

Simple method for preventing inguinal hernias after radical retropubic prostatectomy

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Purpose: Inguinal hernias often occur after radical retropubic prostatectomy (RRP). We present a novel and simple technique for preventing inguinal hernias after RRP, which any surgeon can complete within a few minutes.

Methods: A total of 230 Japanese prostate cancer patients underwent RRP between January 2007 and September 2011. From July 2009, 115 patients underwent inguinal hernia prevention procedures at the same time as RRP. In this procedure, we released approximately 5 cm of the bilateral vas deferens and spermatic vessels from the peritoneum. In cases in which the processus vaginalis had spread into the abdomen, we ligated it close to the peritoneal cavity and then transected it. The remaining 115 patients who underwent RRP but did not undergo the hernia prevention procedure were used as the control group. The incidence rate of postoperative inguinal hernia was compared between the 2 groups.

Results: Inguinal hernias developed during the postoperative follow-up period in 18 of the 115 control patients (15.7%) (median duration, 50 months). The hernia-free survival rate of this group was 89.6% and 84.1% at 1 and 2 postoperative years, respectively. In contrast, only 1 of the 115 patients (0.87%) who underwent the hernia prevention procedure developed an inguinal hernia during the follow-up period (median duration, 27 months). The hernia-free survival rate of this group was 100% at both 1 and 2 postoperative years ($P < 0.0001$).

Conclusions: We developed a simple method for preventing post-RRP inguinal hernias. The procedure is easy to perform and produces excellent outcomes.

Keywords: Inguinal hernia, Control and prevention, Prostate neoplasms, Prostatectomy

INTRODUCTION

The high incidence of inguinal hernia (IH) after radical retropubic prostatectomy (RRP) has attracted increasing concern since the pioneering study by Regan et al. [1] that first highlighted the issue. Subsequent studies have found that the incidence of IH after RRP ranges from 15% to 20% [1-5]. In a recent study involving randomized and nonrandomized treatment groups, Stranne et al. [6] reported that RRP is associated with an increased risk of IH. However, the etiology of IH after RRP is still not fully understood. A history of previous IH [2,7,8], the presence of subclinical IH [9,10], wound-related

problems [11], the length of abdominal incisions [12,13], a body mass index of < 23 [7], lower abdominal incisions [14], and postoperative anastomotic stricture [15] have been proposed as risk factors for IH after RRP. However, no surgical method for preventing this condition has yet been established.

Here, we present a novel and simple technique for preventing IH after RRP.

MATERIALS AND METHODS

A total of 230 Japanese prostate cancer patients underwent

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RRP between January 2007 and September 2011. Of these patients, 17.8% underwent nerve-sparing surgery, and all of them underwent bilateral pelvic lymph node dissection, which was limited to the obturator region. From July 2009, 115 patients underwent our IH prevention procedure at the same time as RRP. In this procedure, we opened the spermatic sheath, and then released approximately 5 cm of the bilateral vas deferens and spermatic vessels from the peritoneum. Finally, we removed the thin strips of tissue separating the vas deferens, spermatic vessels, and the peritoneum. In cases in which the processus vaginalis had spread towards the internal inguinal ring, we ligated it close to the peritoneal cavity and then transected it. The distal part of the processus vaginalis was left undisturbed. The morphology of the processus vaginalis varied among the patients. Many patients only had a thin tissue cord, whereas others had a thin but protruding processus vaginalis. Only a few patients had thick processus vaginales that protruded into the abdominal cavity, which was considered to be suggestive of a subclinical or even clinical IH. Basically, we first performed the same procedure regardless of the appearance of the processus vaginalis. However, when the processus vaginalis was thick and protruded into the abdominal cavity, the protruding section was carefully returned to the peritoneal cavity before the processus vaginalis was ligated (Fig. 1). The remaining 115 patients who underwent RRP but not the hernia prevention procedure were used as the control group. The incidence rates of postoperative IH

were then compared between the 2 groups. To assess IH after RRP, the patients were subjected to follow-up examinations at about 3-month intervals, during which they were asked whether they were experiencing any bulging around the groin and a physical examination was performed. The differences between the patient characteristics of the two groups were compared using the Mann-Whitney *U* test and/or the Student *t*-test. We assessed the cumulative IH incidence on the intervention side over time and compared it with that on the control side using Kaplan-Meier survival analysis and Kaplan-Meier plots. The significance of the difference between the sides was analyzed using the log rank (Mantel-Cox) test.

RESULTS

Table 1 shows the characteristics of the patients. IH developed postoperatively in 18 of the 115 control patients (15.7%) during the follow-up period (median duration, 50 months). The hernia-free survival rate of this group was 89.6% and 84.1% at 1 and 2 postoperative years, respectively. In contrast, only 1 of the 115 patients (0.87%) who underwent the hernia prevention procedure developed an IH during the follow-up period (median duration, 27 months). The hernia-free survival rate of this group was 100% at both 1 and 2 postoperative years ($P < 0.0001$) (Fig. 2). The hernia prevention procedure was not associated with any significant complications and only added a few minutes to the procedure time.

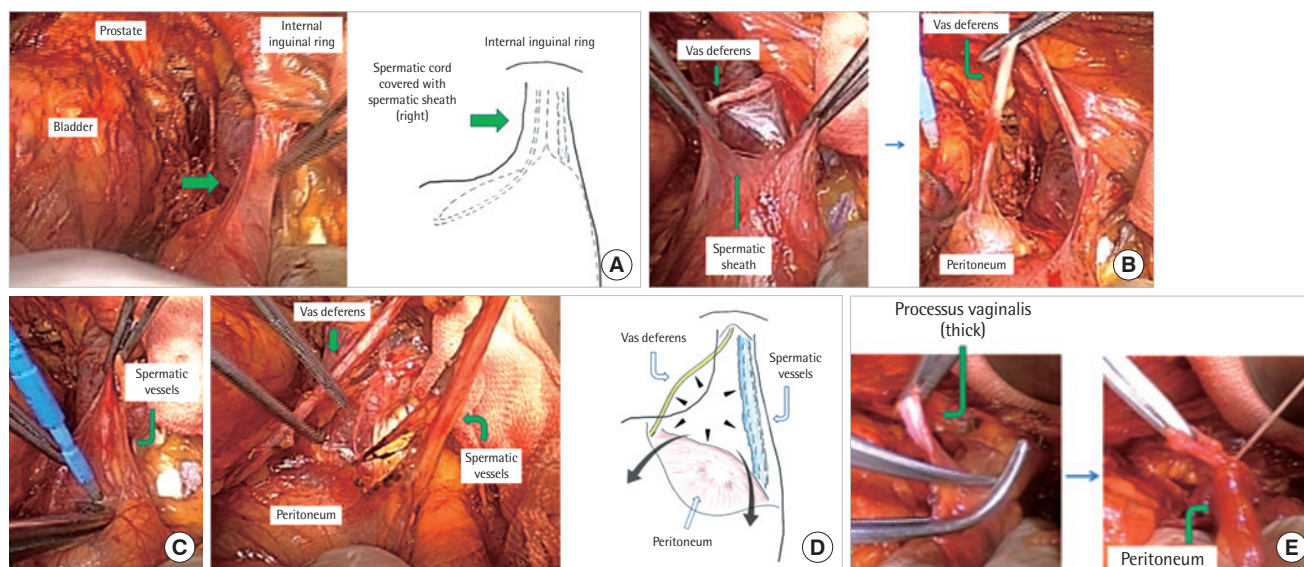


Fig. 1. Our hernia prevention technique. (A) The right spermatic cord covered with the spermatic sheath. (B) The spermatic sheath is opened, and then approximately 5 cm of the vas deferens is released from the peritoneum. (C) Next, approximately 5 cm of the spermatic vessels are released from the peritoneum. (D) The thin section of tissue between the vas deferens and the spermatic vessels is removed. (E) In cases involving a thick processus vaginalis (or a processus vaginalis that protrudes into the abdomen), we ligate the processus vaginalis close to the peritoneal cavity and then transect it.

Table 1. Patient characteristics

Characteristic	Hernia prevention	Control	P-value
Age at operation (yr)	63.6±5.6	62.8±7.5	NS
Follow-up period (mo)	26.0±7.6	46.2±17.6	<0.0001
Initial PSA level (ng/mL)	8.1±5.8	7.4±4.7	NS
Clinical stage			
T1	44	60	
T2	68	55	
T3	2	1	NS
Gleason score			
<7	4	15	
7	78	75	
>7	33	25	NS
Neoadjuvant hormonal therapy	43/115 (37.4)	35/115 (30.4)	NS
Nerve sparing	22/115 (19.1)	19/115 (16.5)	NS

Values are presented as mean ± standard deviation or number (%). PSA, prostate specific antigen; NS, not significant.

DISCUSSION

In a recent study involving randomized and nonrandomized treatment groups, it was reported that RRP for prostate cancer is associated with an increased risk of IH [6]. IH causes suffering and has economic consequences for society due to the cost of surgery and patients having to take sick leave; thus, it is necessary to prevent post-RRP IH. However, because the actual mechanism of post-RRP IH remains obscure, no surgical method for preventing this condition has been established.

Choi et al. [16] subsequently reported the outcomes of 70 hernias that occurred in 48 of 575 patients that underwent RRP. Of these hernias, 35 were repaired with mesh, and none of these 35 patients suffered recurrence, whereas 5 of the 35 hernias that were repaired without mesh subsequently recurred. Although the use of prosthetic mesh was reported to be safe and effective for such repairs, the possibility of the mesh becoming infected due to urinary contamination during or after RRP is at least a theoretical concern. The preperitoneal installation of mesh can also lead to adhesion and foreign-body reactions, making subsequent pelvic surgery difficult. Therefore, it seems that hernia repair methods that do not involve the use of mesh are optimal.

Nielsen and Walsh [10] described a consecutive series of 430 men who underwent open RRP and were examined preoperatively and intraoperatively for IH. IH were observed in 4.4% of the men preoperatively and in 142 of the men (33%) during surgery. Of these hernias, 34% were direct hernias and 66% were indirect hernias. All of the IH were repaired during

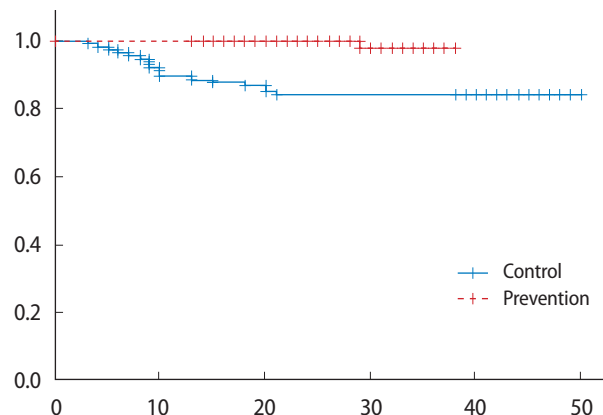


Fig. 2. The Kaplan-Meier inguinal hernia-free rates after RRP of patients who did (prevention) or did not (control) undergo our hernia prevention procedure. The numbers on the curves indicate the number of patients at risk. Log-rank test of 2 samples ($P < 0.001$).

RRP. Direct hernias were repaired with mesh patches, and indirect hernias were repaired by suturing the region from the iliopubic tract to the transverse arch with 2-0 Prolene figure-of-eight sutures (Ethicon Inc., Somerville, NJ, USA). New hernias developed after surgery in 5.3% of these cases. In a recent prospective randomized trial, Stranne et al. [17] reported that placing nonresorbable figure-of-8 sutures lateral to the internal ring of the inguinal canal and the spermatic cord during RRP decreased the risk of postoperative IH. In the latter study, 86% of the patients (254/294) showed up for the final examination, and the cumulative incidence of IH was 3.5% on the intervention side and 9.1% on the control side (log-rank Mantel-Cox $P = 0.011$). This figure-of-8 suturing procedure is simple and effective; however, in this study, we tried to develop a simpler method that does not involve the use of mesh or suturing.

Fujii et al. [18] speculated that the processus vaginalis is a key target for preventing post-RRP indirect IH. They dissected and ligated the processus vaginalis as a hernia prevention procedure in 138 patients. Two patients (1.4%) who underwent their hernia prevention procedure developed IH during a median follow-up period of 24 months. Fujii et al. [18] stated that they could not precisely evaluate the appearance of the processus vaginalis until the spermatic cord had been opened and the processus vaginalis had been dissected. On the other hand, Taguchi et al. [19] released the bilateral spermatic cords from the peritoneum and manually separated at least 5 cm of the peritoneum from the abdominal wall as a hernia prevention procedure in 101 patients. None of the patients who underwent this procedure developed IH during a mean follow-up period of 11.6 months. Taguchi et al. [19]

identified the vaginal process of the peritoneum, but did not use any ligatures. This procedure was supposed to prevent the intestinal tract inside the peritoneum from protruding through the internal inguinal tract. However, in our study, a few patients had thick processus vaginales that had protruded into the abdominal cavity, which was suggestive of subclinical or even clinical IH. So, we modified the abovementioned procedures; i.e., we released the spermatic cord from its covering spermatic sheath to evaluate the appearance of any subclinical IH, released not only the bilateral vas deferens but also spermatic vessels from the peritoneum as much as possible, and ligated the processus vaginalis close to the peritoneal cavity and transected it in cases in which it had spread towards the abdominal cavity. In other words, we treated subclinical and clinical IH and prevented indirect hernias by ensuring that the intestinal tract inside the peritoneum could not push through the internal inguinal tract along the spermatic cord and spermatic vessels. Indirect hernias are much more common than direct hernias after RRP [2,3,10]. In fact, all of the IH that developed after RRP in the patients who did not undergo the hernia prevention procedure were indirect hernias. So, we consider our procedure for preventing IH to be effective.

Although the follow-up periods of the patients that underwent hernia prevention were a little short, the hernia-free rates of the 2 groups were significantly different ($P < 0.001$). Regan et al. [1] noted that IH almost always occurred within 6 months after RRP, while most other groups have reported that IH developed within 2 years [2-4,15,20]. We consider that our hernia prevention procedure is effective at preventing post-RRP IH, assuming that most IH develop within 2 years after RRP.

In conclusion, we have developed a simple method for preventing post-RRP IH. This method is easy to perform and produces excellent outcomes.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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