



The prevention of extraction site incisional hernia after robotic-assisted radical prostatectomy

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Abstract

Extraction site incisional hernia (IH) has been recognized as an important complication in minimally invasive procedures but has not been as well characterized following robotic-assisted laparoscopic prostatectomy (RALP). Approximately 29% of IH required surgical repair. A number of techniques have been utilized to reduce the rates of IH following minimally invasive procedures. First, off-midline extraction was investigated, this did not demonstrate a reduction in incisional hernia rates. Recently, supra-umbilical transverse incisions have been utilized to extract prostate specimen and this method decreased the extraction site IH rate compared to the vertical midline incision. In addition, the choice of fascial closure technique and choice of the suture may influence the incidence of extraction site IH. For example, studies showed that abdominal fascial closure using a nonabsorbable suture and a continuous running suture technique decreased IH rate from 32 to 17%. Finally, “the small bites technique” has been recommended to reduce hernia incidence after midline fascial closure following a randomized controlled trial (RCT) which demonstrated the superiority of the small-bite technique. In summary, a supra-umbilical transverse incision to extract the specimen was shown to decrease the rate of extraction site IH. In vertical midline incisional closure, the small bites technique with slowly- or non-absorbable suture, such as #0 or 2–0 PDS II with SH or CT-2 needle (26 mm arch length), reduces the IH rate. Urologists should consider this data to reduce the risk of IH following RALP.

Keywords Robotic-assisted laparoscopic prostatectomy (RALP) · Extraction site · Incisional hernia (IH) · Small bites technique

Since Binder and Kramer performed the first robotic-assisted laparoscopic prostatectomy (RALP) in 2001, the approach has disseminated widely and has become the dominant surgical approach with 80–90% of cases now done robotically [1]. Whereas radical retropubic prostatectomy is performed extraperitoneally and hernia is rare, RALP is typically a transperitoneal approach and hernia is reported in 0.2–4.8%, which may underestimate its actual incidence [2–4]. Extraction site incisional hernia (IH) has been recognized as an important complication in other minimally

invasive procedures [5] but has not been as well characterized in RALP.

Extraction site IH after RALP is uncommon compared to other post-RALP complications but can be serious. Although many hernias are asymptomatic and can be managed electively, once it progresses to other severe complications (i.e. strangulation, bowel obstruction, or perforation), it requires emergency surgical intervention [5]. Prior studies showed that approximately 29% of IH required surgical repair and it has been reported that the secondary incisional hernia repair failure rate is as high as 45% [6]. There are a number of reasons these hernias may occur.

First, most urological surgeons elect to extend the midline incision vertically to extract prostate specimen, an incision that may be prone to hernia development [2, 3, 5]. To reduce hernia incidence, some urologists have tried alternate extraction sites. Seveso et al. tried using off-midline extraction sites (lateral trocar site) and showed that the extraction site IH rate for the midline extraction site is similar when

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compared with the off-midline extraction site [5]. Recently, supra-umbilical transverse incisions have been utilized to extract prostate specimens and this method decreased the extraction site IH rate from 5.3% to 0.6% compared to the vertical midline incision [4]. This study also showed that some factors significantly increased the risk of hernia development such as a greater body mass index (BMI) and larger prostate size [4]. Although supra-umbilical transverse incision decreased the risk of IH compared to vertical incision, all urological surgeons in our facility still extend the midline incision vertically to extract the specimen. In part this is because the midline incision can be extended to convert to open laparotomy in case intra-operative complications occur such as bowel and large vessel injury.

Next, the choice of fascial closure technique and choice of suture may influence the incidence of extraction site IH. For example, there is a debate on closing the supra-umbilical incision in an interrupted suturing technique versus a continuous running suture technique. A study showed that interrupted figure of eight suture closure can prevent wound dehiscence and incisional hernia as compared to continuous running suture closure [7]. In contrast, other studies recommended using the continuous running suture closure technique and to avoid using rapidly absorbable sutures [8, 9]. The suture type for abdominal midline incision closure varies based on each individual surgeon's preference. Hodgson et al. found that fascial closure using a nonabsorbable suture and a continuous running suture technique decreased IH rate from 32 to 17% [8].

Recently, "the small bites technique" has been recommended to reduce hernia incidence after midline fascial closure following a randomized controlled trial (RCT) which demonstrated the superiority of the small-bite technique [10]. A systematic review by Fortelny [9], which included a meta-analysis of the Deerenberg [10] and another RCT study [11] concluded that the small bites technique after midline laparotomies significantly reduced the IH rate. Those studies showed that using slowly- or non-absorbable suture reduced the risk of IH [8, 9], because the lateral tension in vertical incisions tended to pull the incision apart leading to dehiscence and hernia if the closing suture absorbed too soon. The small bites technique reduces the distance between the stitches and the edge of the wound to 5–8 mm and 5 mm from stitch to stitch, as well as utilization of slowly absorbable sutures, such as the size 0 or 2–0 PDS[®] II (polydioxanone) Suture (PDS II) (Ethicon, Somerville, NJ, USA) with an 31 mm arch length. The combination of small bites and slowly absorbable suture is associated with a decrease in the IH rate from (5.6–13% vs. 18–21%) as well as a significant decrease in infection rate (5.2 vs 10.2%) compared to the "long stitch" group [9].

In conclusion, a supra-umbilical transverse incision to extract the specimen was shown to decrease the rate of

extraction site IH. In vertical midline incisional closure, the small bites technique with slowly- or non-absorbable suture, such as #0 or 2–0 PDS II with SH or CT-2 needle (26 mm arch length), reduces the IH rate as well. Going forward, urologic surgeons should consider utilizing these techniques to reduce the occurrence of extraction site incisional hernias following robot-assisted radical prostatectomy.

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Compliance with ethical standards

Conflict of interest David P. Feng, Amy N. Luckenbaugh, Zuliang Feng, Sam S. Chang, Joseph A. Smith, David F. Penson, Daniel A. Barocas declare that they have no conflict of interest.

Human rights and welfare of animals This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent For this type of study informed consent is not required.

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