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PELVIC MESH INSERTION PRIOR TO RADIOTHERAPY FOR PROSTATE CANCER: A SURGICAL CASE SERIES

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ABSTRACT

Objective: The presence of small bowel within the radiation field remains a common challenge in pelvic radiotherapy for prostate cancer.[1] Despite advances in radiotherapy planning, the proximity of bowel loops limits the safe delivery of therapeutic doses and increases the risk of gastrointestinal toxicity. Surgical bowel displacement using an absorbable mesh offers a practical solution in selected patients. **Methods:** We describe three cases of patients with prostate cancer who underwent laparoscopic Vicryl mesh insertion to displace the small bowel from the pelvis prior to external beam radiotherapy. The aim was to create a safer anatomical space for radiation delivery while avoiding long-term complications. **Results:** All patients demonstrated effective displacement of bowel loops on post-operative imaging and proceeded to complete planned radiotherapy without interruption. One patient required laparoscopic adhesiolysis for early small bowel obstruction. None of the patients experienced clinically significant gastrointestinal toxicity during or after radiotherapy. **Conclusion:** In this case review series, laparoscopic Vicryl mesh insertion proved to be a safe and feasible adjunct to modern radiotherapy planning. This technique enables better bowel protection and supports uninterrupted treatment in patients undergoing curative-intent pelvic radiotherapy for prostate cancer.

KEYWORDS: Prostate radiotherapy, pelvic mesh insertion, radiation-induced enteritis.

INTRODUCTION

External beam radiotherapy (EBRT) is a conventional method for managing localized and locally advanced prostate cancer.[1] As the number of patients increases and survival rates improve, chronic radiation enteritis has become a growing concern, affecting more than 20% of individuals.[1] The potential radiation dose is a critical determinant of treatment success, while the surrounding healthy tissue imposes limitations on this dose. Consequently, the exclusion of radiation-sensitive structures becomes the key factor in controlling therapy and defining its success. Injuries to the small bowel caused by radiotherapy may manifest as malabsorption syndromes, fistulas, strictures, or even perforations.[2,3] The likelihood of complications associated with the small intestine is linked to the amount of small bowel exposed. Despite the recent advancements in highly conformal radiation therapy methods, including intensity-modulated radiation therapy, the small intestine continues to be the organ that limits the dose of radiation that can be safely delivered. This poses challenges to both the standard delivery of radiation doses and the potential for dose escalation.

We present a case review series on the minimally invasive laparoscopic technique for the insertion of Vicryl mesh to close the pelvic floor and to displace loops of bowel, thereby facilitating the delivery of radiotherapy in patients with advanced prostate cancer.

CASE PRESENTATIONS

Case 1

A 67-year-old male with ischemic heart disease, hypertension, and a recent diagnosis of deep vein thrombosis in the lower limb (on apixaban) was diagnosed with high-risk prostate adenocarcinoma (Gleason score 3+4=7, PSA level 29.3 ng/mL, cT3bN0M0). Radiotherapy was planned as the main course of treatment. Imaging prior to radiotherapy demonstrated small bowel loops situated deep in the pelvis, presenting a risk of high-dose exposure. A laparoscopic mesh placement was performed with Vicryl mesh, which was fastened to the pelvic walls and peritoneum using an absorbable tacker and an absorbable barbed suture. Radiotherapy commenced 7 weeks post-surgery, delivering 68 Gy in 25 fractions to the prostate and seminal vesicles, while applying 45 Gy to the elective pelvic lymph nodes using a simultaneous integrated boost (SIB) approach.

A week after the surgery, the patient indicated experiencing abdominal bloating and pain in the right

iliac fossa. A CT scan revealed inflamed loops of the small intestine and initial indications of obstruction. Diagnostic laparoscopy confirmed the attachment of the distal ileum and appendix to the mesh. Adhesiolysis and appendicectomy were performed.

Pre-radiation CT verified adequate displacement of the bowel. The patient subsequently completed the radiotherapy without issues and did not encounter any gastrointestinal adverse effects.

Case 2

An 80-year-old man with no significant medical history was diagnosed with intermediate-risk prostate cancer (Gleason score 3+4=7, PSA level 10.7 ng/mL, cT2cN0M0). A planning CT scan showed small bowel loops located within the radiation field. A laparoscopic pelvic mesh procedure was performed using Vicryl mesh, which was secured to the pelvic peritoneum (figures 1 and 2). During the operation, the appendix was discovered to be attached to the pelvic rim, requiring an appendicectomy. Radiotherapy (60 Gy in 20 sessions) began four weeks post-surgery. CT simulation verified effective displacement of the bowel loops. Following the radiotherapy, the patient suffered from grade 1 gastrointestinal toxicity (mild diarrhea) but did not experience any surgical complications.

Case 3

A 63-year-old male, who had an open appendectomy in the past and recently underwent a robotic assisted prostatectomy (Gleason score 4+5=9, PSA 3.4 ng/mL, pT3aN0M0), was sent for adjuvant radiotherapy. Imaging revealed that the small intestine was located near the prostate bed. A Vicryl mesh was inserted laparoscopically and secured using an absorbable tacker and absorbable V lock barbed sutures. Radiotherapy began two weeks later, delivering 46 Gy in 23 fractions to the prostate bed and lymph nodes, then a boost of 20 Gy in 10 fractions. No complications were reported during or after the operation. No gastrointestinal toxicity was observed.

Table 1: Summary of Clinical and Surgical Data.

Case	Age	Clinical Stage	Gleason Score	PSA (ng/mL)	RT Indication	Mesh Type	Surgical Approach	Bowel Displaced?	GI Toxicity	Complications
1	67	T3bN0M0	3+4=7	29.3	Primary	Vicryl	Laparoscopic	Yes	None	SBO requiring adhesiolysis
2	80	T2cN0M0	3+4=7	10.7	Primary	Vicryl	Laparoscopic	Yes	Grade 1	Appendectomy (intraop finding)
3	63	pT3aN0M0	4+5=9	3.4	Adjuvant	Vicryl	Laparoscopic	Yes	None	None

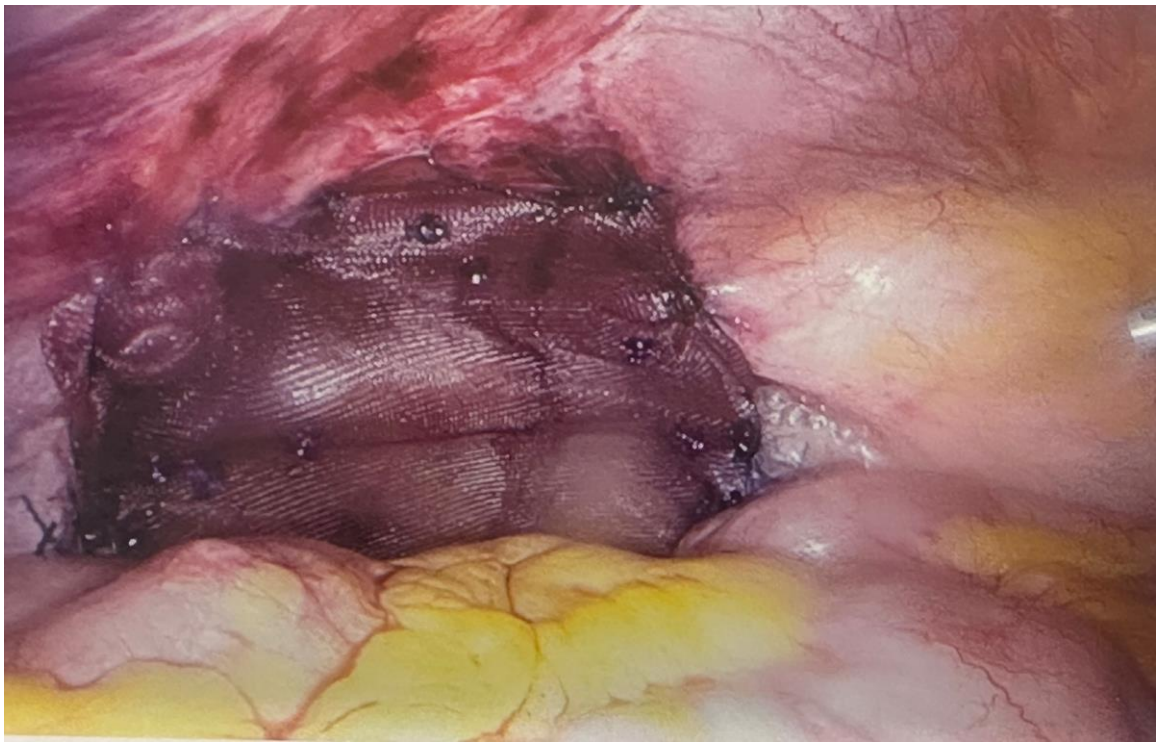

Figure 1: Intra-operative Image demonstrating the displaced small bowel and the Vicryl mesh secured around the pelvic brim.

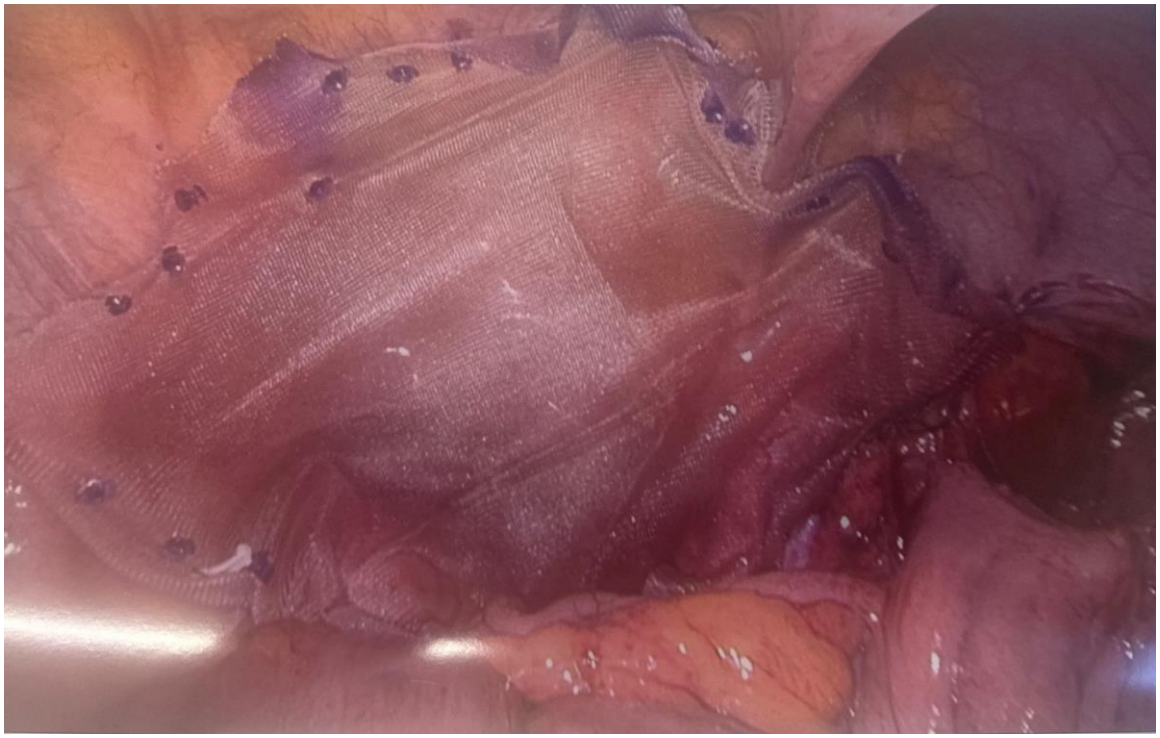

Figure 2: Intra-operative Surgical Image demonstrating the Vicryl mesh secured around the pelvic brim.

DISCUSSION

The placement of pelvic mesh to displace small bowel loops prior to pelvic radiotherapy is a rarely utilized approach to reduce radiation-related gastrointestinal toxicity in patients receiving radiation treatment for prostate cancer. The cases described illustrate the usefulness and difficulties of this method in practical application, emphasizing both the success in bowel displacement and the risk of complications after surgery.

Radiotherapy continues to be fundamental in treating both intermediate- and high-risk prostate cancer. Nevertheless, pelvic radiation especially with contemporary dose escalation methods like the simultaneous integrated boost (SIB) presents considerable dangers to surrounding organs at risk (OARs), particularly the small intestine. Radiation-induced enteritis and the resulting chronic gastrointestinal issues have been observed in as many as 10–20% of patients, varying based on dosage and volume parameters.[4] To address this, mechanical displacement of the small bowel using absorbable mesh has emerged as a promising intervention.[5,6]

Our experience with three patients receiving prophylactic laparoscopic Vicryl mesh insertion before radiotherapy demonstrates both the usefulness and variability of this method. In every instance, postoperative imaging verified effective cranial movement of bowel loops, allowing for the secure administration of radiotherapy to the prostate or prostate bed and pelvic lymph nodes.

Remarkably, one patient experienced early postoperative small bowel obstruction caused by the adhesion of the ileum and appendix to the mesh, requiring adhesiolysis and appendicectomy. A comparable intra-operative observation occurred in another patient, in which the appendix was attached to the pelvic wall and was removed as a precaution. These findings align with existing research indicating a risk of mesh-related adhesions, specifically with absorbable materials such as Vicryl, which, despite being favored for their biodegradability, might still elicit an inflammatory response.[7,8]

Despite this, all patients completed radiotherapy. Gastrointestinal toxicity was low (just one instance of Grade 1 diarrhea), indicating that pre-radiation mesh insertion can significantly lower radiation exposure to the bowel without causing unacceptable morbidity. This corresponds with results from additional small series and case studies indicating that laparoscopic mesh implantation is a safe and effective option for certain patients receiving pelvic radiotherapy.[9,10]

A key factor to consider is the ideal timing for radiotherapy after mesh implantation. In our cases, radiotherapy started between 2 and 7 weeks after surgery, permitting adequate recovery and preventing treatment postponements. Although there is no general agreement, the available published studies suggest commencing radiotherapy 3–6 weeks after surgery post mesh placement.[11]

Moreover, patient selection is essential. In our series, the method was evaluated in patients with low-lying bowel seen on simulation imaging and with a potentially curative intention of radiotherapy. Prior abdominal

surgery, as in Case 3, was not a contra-indication to the procedure.

The increasing combination of advanced imaging, accurate radiotherapy planning, and minimally invasive surgical support provides a multidisciplinary approach to lessen toxicity and enhance results in prostate cancer treatment. Nevertheless, large prospective studies are required to more accurately demonstrate the indications, ideal methods, and long-term results of pelvic mesh placement prior to radiotherapy.

When compared to conventional laparoscopy, the robotic platform allows for more precise dissection and suturing, especially in anatomically challenging cases involving prior surgery, previous radiotherapy or adhesions. A case has been published that demonstrated the feasibility of brachytherapy following the placement of a mesh to elevate and secure the bowel away from the radiation field using a robotic-assisted approach. This approach gave good technical outcomes and no post-procedure bowel complications.[12] Although such reports remain limited, early experiences indicate that robotic-assisted techniques may offer a technically improved and more controlled method for pelvic mesh placement in selected radiotherapy candidates.[12]

CONCLUSION

The placement of Vicryl mesh effectively displaces the small intestine from the areas exposed to pelvic radiotherapy. The ability to reduce radiation injury to the small intestines in pelvic cancers permits increased radiation doses and therefore an increased chance of successfully treating the prostate cancer. This technique is effective in displacing and preventing small bowel from returning to the pelvis but the ergonomics make suturing the mesh in place complex, a difficulty that could be overcome by performing this procedure with a robotic-assisted approach.

Grant
None.

CONFLICTS OF INTEREST

We the authors of this case report have no conflicts of interest to declare.

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