SCIENTIFIC PAPER JSLS

Laparoscopic Rectopexy with Urinary Bladder Xenograft Reinforcement

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ABSTRACT

Background and Objectives: Rectal prolapse is often repaired laparoscopically, frequently with the use of reinforcement material. Both synthetic and biologically derived materials reduce recurrence rate compared to primary suture repair. Synthetic mesh introduces potential complications such as mesh erosion, fibrosis, and infection. Urinary bladder matrix (UBM) represents a biologically derived material for reinforcement of rectal prolapse repair with the potential to improve durability without risks of synthetic materials. The objective of the study is to evaluate the effectiveness, durability, and functional result of laparoscopic rectopexy using urinary bladder matrix xenograft reinforcement at three years follow up.

Methods: The 20 cases presented describe rectal prolapse repair by means of laparoscopic rectopexy with presacral UBM reinforcement. Patients were followed up for an average of 3 years and assessed with interviews, physical examination, manometry, and the fecal incontinence severity index (FISI).

Results: Each repair was completed laparoscopically. UBM exhibited favorable handling characteristics when sutured to the sacrum and the lateral rectal walls. One patient underwent laparoscopic drainage of a postoperative abscess; no other complications occurred. In 3 years of follow-up, there have been no full-thickness recurrences, erosions, reoperations, or long-term complications. Two patients exhibited a small degree of mucosal prolapse on follow-up physical examination that did not require surgery. Three-year FISI scores averaged 8 (range, 0–33 of a possible 61), indicating low fecal incontinence symptomatology. Follow-up anorectal manometry was performed in 9 patients, showing mixed results.

Conclusion: Surgeons may safely use laparoscopic rectopexy with UBM reinforcement for repair of rectal prolapses. In this series, repairs with UBM grafts have been durable at 3-year follow-up and may be an alternative to synthetic mesh reinforcement of rectal prolapse repairs. Future studies may compare the advantages and cost-effectiveness of reinforcement materials for rectal prolapse repair.

Key Words: Laparoscopic rectopexy, Rectal prolapse, Urinary bladder matrix.

INTRODUCTION

Rectal prolapse results in a severe adverse impact on the patient's quality of life and is often accompanied by fecal incontinence and a need to manually reduce the prolapse.[1] Repair techniques have a high rate of recurrence and a mixed record of resolving the symptoms of fecal incontinence that often accompany the prolapse.[2,3] Both synthetic and biologically derived materials reduce the recurrence rate compared with primary suture repair[4]; however, synthetic mesh introduces potential complications, such as mesh erosion, fibrosis, and infection.[2,4–11] Although several repair techniques are used today, laparoscopic rectopexy with either suture alone or graft reinforcement and with or without sigmoidectomy, is a commonly performed surgical repair technique.[2,12–14] Although there is no clear consensus, increasing concerns have been raised in the literature with respect to the complications of synthetic mesh repairs.[2,4–11] Rectal wall mesh erosion requiring major surgery has been reported in both posterior and anterior rectopexy with synthetic mesh.[4–11] Biologically derived materials, proposed as an alternative to minimize mesh-related complications of erosion, pain, and infection, are increasingly used for rectal prolapse repairs.[13] However, it is not known whether the use of biologically derived materials in rectopexy repairs provides a safe and durable repair.[11,13] UBM consists of the epithelial basement membrane and lamina propria of the porcine urinary bladder. After decellularization, it retains biochemical diversity, an architecture that is similar to the normal tissue, and strong mechanical behavior.[14,15] UBM

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Disclosures: Dr. Sasse receives speaking honoraria from ACell, Columbia, Maryland, USA. The remaining authors report no disclosures.

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DOI: 10.4293/JSLS.2016.00106.

has shown effectiveness in animal studies and human clinical use for management of complex wounds and reinforcement of surgically repaired soft tissue with connective tissue remodeling in anatomic settings as diverse as esophageal, hiatal hernia, urinary bladder, pelvic floor, and body wall repair.[16–20] Use of UBM has been documented in pelvic organ prolapse.[19,20]

METHODS

Twenty cases of rectal prolapse repair with rectopexy and UBM graft reinforcement, without sigmoidectomy, were performed between 2010 and 2016. Increased prolapse requiring manual reduction and symptoms including pain, bleeding, and fecal incontinence were the indications for surgical repair, and all patients experienced severe, circumferential, full-thickness grade V rectal prolapse, per the Oxford rectal prolapse grading system.[21] Nineteen female and 1 male patient, with an average age of 64 years and an average BMI of 25, underwent surgery. Patient information is presented in **Table 1**. Laparoscopic repair was performed in all 20 cases, with full pelvic rectal mobilization followed by UBM device placement (MatriStem Surgical Matrix PSMX; ACell, Inc., Columbia, Maryland, USA) in the presacral position and rectopexy. In each case, the rectum was elevated laparoscopically from its attachments in the pelvis, with division of the lateral stalks below the pelvic floor (**Figures 1** and **2**). The UBM 10 × 15-cm graft was hydrated in normal saline for 20 minutes and then positioned in the presacral position and secured to the sacral periosteum using 0 Ethibond sutures (Ethicon, Somerville, New Jersey, USA) and to the lateral rectal wall with absorbable sutures (**Figure 3**).

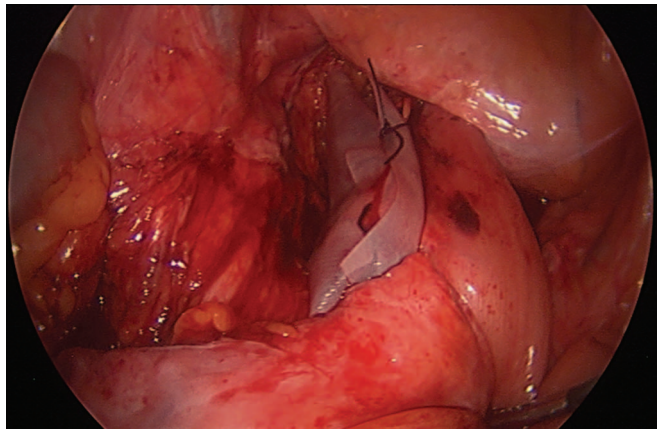

Figure 1. Large rectal prolapse elevated, securing left side of rectal wall.

After an average of 3 years, 17 patients completed the fecal incontinence severity index (FISI) survey regarding repair durability and fecal continence via telephone or in-person interview, with institutional review board approval. Nine of the patients underwent manometry evaluations of the anorectal sphincter.

RESULTS

A total of 20 patients underwent a laparoscopic rectopexy, of which 1 was lost to follow-up. The remaining 19 patients were evaluated with follow-up office examination, and 17 completed a survey that included an assessment of continence. Each repair was successful, with no patients requiring further surgery for repair of the prolapse. The handling properties of the UBM material were favorable,

Table 1.
Patient and Procedure Information

Patient and Surgery Characteristics	Data
N	20
Mean age, years (range)	64 (35–91)
Female/male, n	19/1
Mean BMI (range)	25 (18–45)
Mean length of stay, days (range)	1.9 (1.0–5.5)
Mean operative time, minutes (range)	68 (42–148)
Complication	1 (abscess, drained laparoscopically)
Follow-up, months (range)	36 (9–72)
Recurrence	0 full thickness; 2 mucosal prolapse not requiring surgery
3-Year FISI score (median)	8 ±12 (0–33 out of possible 61)

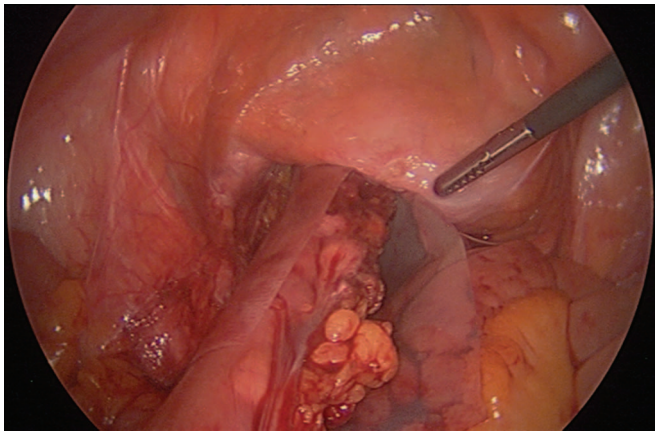

Figure 2. Securing UBM graft in presacral position.

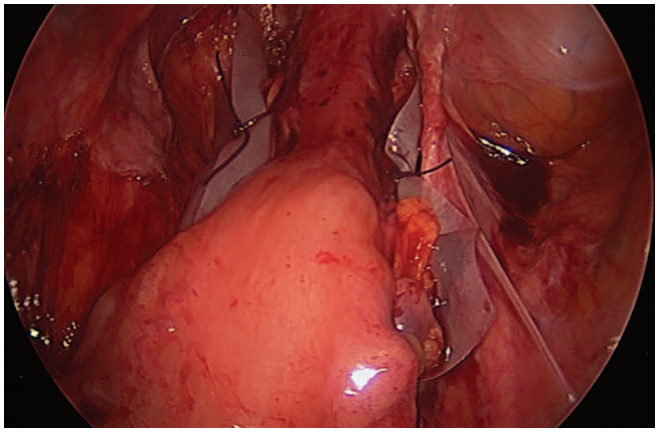

Figure 3. Completing reinforcement of repair with UBM graft.

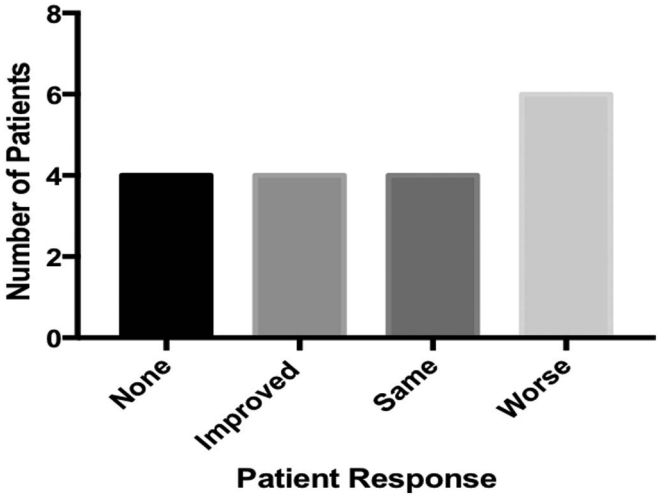

Figure 4. Patient-reported postoperative change in constipation.

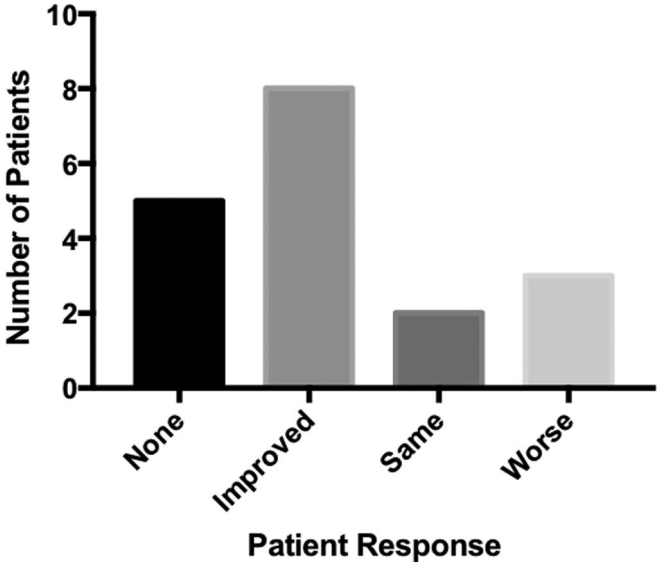

Figure 5. Patient-reported postoperative change in incontinence.

including ease of inserting via a 12-mm trocar, maneuvering into position, and suturing to the sacral periosteum and rectal wall. Two patients had a small mucosal prolapse on physical examination that did not require surgery. One patient developed an early postoperative pelvic fluid collection—serous in quality, but with light growth of gram-positive cocci—that required laparoscopic drainage and resolved without graft explantation. No other complications occurred. Each patient has an intact repair at a median of 36 months of follow-up (range, 9–72 months), and no erosions, infections, or late strictures have occurred. FISI scores in 17 patients ranged from 0 to 33, with 8 patients reporting a score of 0. The median FISI score was 8 ± 12 indicating generally good bowel control. Subjective measures of continence are reported in **Figures 4–7**. Manometry studies in 9 patients indicated a range of results with resting pressures from 18 to 85 mm Hg, and squeeze pressures from 34 to 165 mm Hg, indicating a wide range of sphincter dysfunction, stemming from long-standing prolapse.

DISCUSSION

Rectal prolapse is a common problem that can result in significant symptoms and risk if untreated. A portion of such cases progress to involve increasing pain, need for manual reduction, hemorrhage, and fecal incontinence, and a few require urgent surgical repair. Recurrence of rectal prolapse after surgical repair is not uncommon. Short-term recurrence rates of 27 and 3% for suture repair and mesh repair, respec-

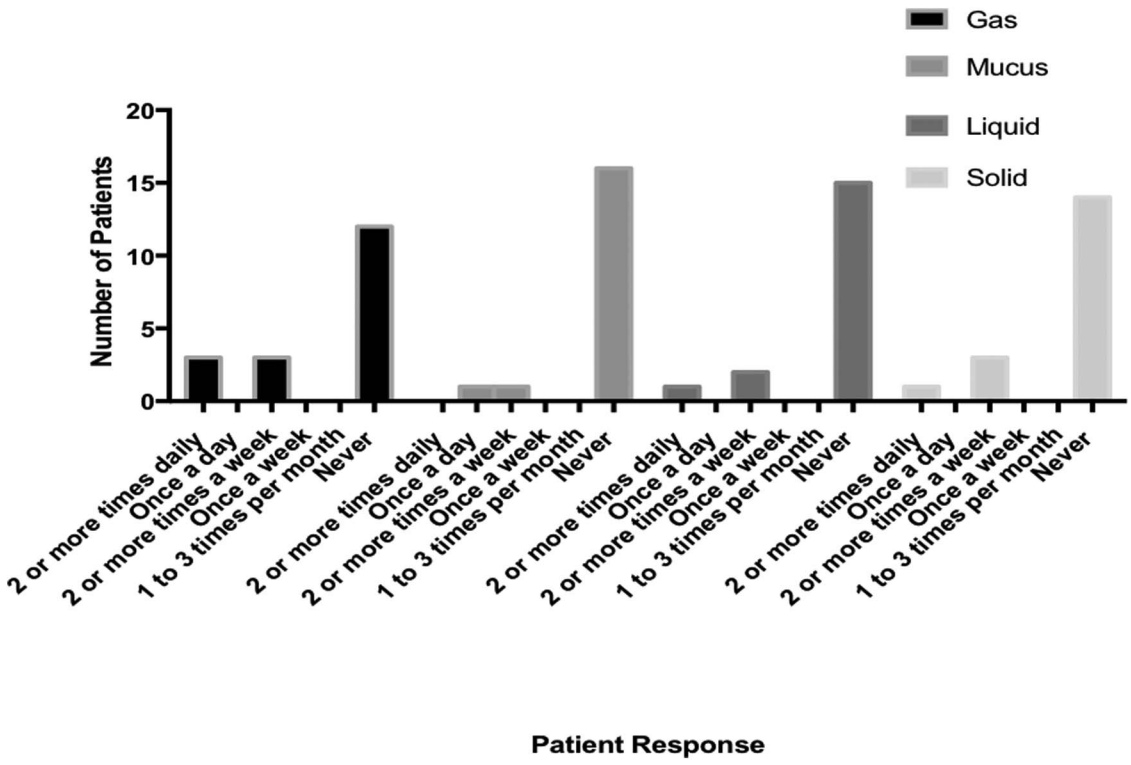

Figure 6. Patient-reported postoperative FISI survey responses.

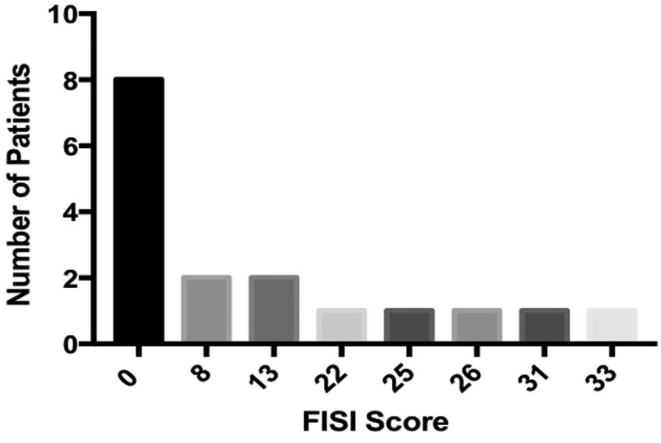

Figure 7. Patient-reported postoperative summary FISI scores.

tively, were reported in reviews of cases of rectal prolapse repair.[3,22–24] There is no consensus on a single best method for rectal prolapse repair.[1,2,12] The cases presented in this series represent successful treatment of rectal prolapse with biologically derived graft reinforcement with UBM material, with satisfactory repairs and durability beyond 3 years.

Rectal wall mesh erosion requiring major surgery has been reported in both posterior and anterior rectopexy with synthetic mesh.[4–11] Review of the existing literature regarding synthetic mesh erosion in rectopexy reports a median of 24 postoperative months until presentation of erosion, summarized in **Table 2**.[4–11] Biologically derived materials have been used for pelvic organ prolapse repairs, without erosion.[2,11] The series presented here would be expected to uncover any occurrence of erosion or graft complication both because of the 3-year follow-up and the nature of the UBM graft, which is fully biodegraded and replaced with host connective tissue within 2 years.[25]

Repair of pelvic organ prolapse with biologically derived mesh material appears to lower recurrence rates when compared to native tissue repair alone.[26] Recent analysis of sacrocolpopexy with UBM reinforcement in primates demonstrates preservation of vaginal tissue quality and remodeling into robust fibrous connective tissue.[27] Reoperations and repairs of recurrent rectal prolapses are challenging cases, with higher potential for complications. Mesh erosion or infection remain late complications in rectal prolapse repair, as well as hiatal hernia repair with synthetic mesh, including polytetrafluoroethylene.[2,11,28] Synthetic mesh repair has been found to offer lower rates of recurrence in pelvic organ prolapse when compared to

Table 2.
Summary of Literature Documenting Time to Presentation of Mesh Erosion

Study	Number of Mesh Erosions	Follow-up Period (months)	Time to Mesh Erosion (months)
Borie[9]	7	24–120	Mean 31 (range, 3–62)
Adeyemo[6]	1	24	24
Mathew[7]	1	24	24
Tranchart[10]	6	87	Mean 50 (4–124)
Randall[11]	7	1–196 (median, 73)	Not reported
Wong[12]	1	4–59 (median, 29)	1
Van den Esschert[8]	1	38 (mean)	1

primary sutured repair, but has not been measured against biologically derived graft repairs.[26] Improvement of continence after laparoscopic rectopexy is an endpoint that has been tested,[1] but the performance of synthetic mesh versus biologic grafts have not been directly compared. In studies that have measured FISI score after laparoscopic rectopexy, postoperative scores are comparable to those obtained in this study.[28,29] In addition, the durability of UBM has not been compared to that of synthetic mesh, so it is unknown whether a lower potential graft erosion risk and infection rate of the UBM would be realized and whether a corresponding higher rate of recurrence may result from the widespread use of UBM to reinforce rectal prolapse repairs. The UBM grafts handle favorably in the laparoscopic surgical environment and prove easier to suture than some grafts.

A rationale for using biologically derived grafts is the potentially lower rate of mesh erosion and mesh infection.[2,4–11] Few complications are believed to occur with biologically derived mesh repairs, although one complication of a sterile abscess after hiatal hernia repair was reported, related to a non-UBM material requiring surgery to resolve.[27] In addition, granulation tissue formation has been documented with biological graft use in pelvic organ prolapse repair.[30] UBM devices include an intact epithelial basement membrane on one surface and a lamina propria layer on the opposite surface; contain multiple types of carbohydrates, collagens, proteins, and other components; and are gradually resorbed after implantation.[16,18] UBM has been shown to facilitate a constructive remodeling process in numerous areas of the body that reduces scarring and facilitates the restoration of normal site-appropriate tissue.[15,18,19] For these reasons, UBM was considered to be potentially advantageous in the reinforcement of the repair of large rectal prolapses. Although these features of UBM were likely contributing factors to the outcomes presented, larger studies directly comparing UBM to other synthetic and biologic materials are needed to further delineate the ideal reinforcement material for use rectal prolapse surgery.

CONCLUSIONS

At 3 years of follow-up after rectal prolapse repair with UBM reinforcement, there have been no recurrences requiring surgery, stenoses, pain syndromes, fistulization, or erosions. Handling characteristics of the UBM material suggest it will serve as an attractive candidate graft for anterior rectopexy repairs, as well as the posterior repairs described herein. Future investigation and long-term follow-up will determine which devices will offer the most cost-effective rectal prolapse repair reinforcement that reduces the risk of erosion, stenosis, pain, and graft infection while providing a durable repair.

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