Endoscopic Deployment of MatriStem for Treatment of a Colorectal Anastomotic Leak

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ABSTRACT

Introduction: Endoscopic therapy is a potentially valuable tool for treating colorectal anastomotic leaks and avoids the complications associated with reoperation.

Case Description: This brief report concerns the endoscopic application of an extracellular matrix graft for the treatment of a patient with a complicated anastomotic leak. The patient was successfully treated with no procedure-associated complications and with complete healing of the anastomosis, no stricture development, and normal bowel function.

Discussion: We describe a technique and device for treating colorectal anastomotic leaks.

Key Words: Anastomotic leak, Rectal, Extracellular matrix.

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INTRODUCTION

Anastomotic leaks are one of the most feared complications of colorectal surgery because of high morbidity and mortality rates.[1] Early sepsis after an anastomotic leak may lead to death, whereas subsequent formation of a pelvic abscess may result in pelvic fibrosis and stricture formation, resulting in poor bowel function and subsequent need for a permanent stoma. Salvage surgery, when required to restore normal bowel anatomy and function, is often unsuccessful and may result in serious life-threatening complications and death. To avoid the hazards of reoperation, minimally invasive endoscopic techniques have been recently proposed as an alternative for salvaging colorectal anastomotic leaks.[2–4]

One such extracellular matrix scaffold is urinary bladder matrix (UBM), which is composed of the epithelial basement membrane and tunica propria of the porcine urinary bladder and is decellularized, disinfected, dried, and sterilized. It is commercially available under the trade name MatriStem (ACell, Columbia, Maryland). UBM has been reported to improve the quality of healing in esophageal anastomosis in canine models. MatriStem has Food and Drug Administration clearance for reinforcement of soft-tissue repair in the gastroenterological anatomy and has recently been shown to improve clinical outcomes in patch esophagoplasty. We present our initial technique and results using MatriStem for the treatment of a contained anastomotic leak associated with a large defect of the rectum.

CASE REPORT

In a 57-year-old obese man, an anastomotic leak developed 5 days after reversal of a Hartmann procedure that was initially performed for a diverticular abscess. The Hartmann reversal was performed by use of the double-stapled technique with the rectum divided initially with a linear staple line and a circular anastomosis performed with the EEA stapler (Covidien, Minneapolis, Minnesota) connecting the proximal colon in an end-to-end fashion with the rectum. The anastomotic leak was treated with pelvic drainage, a diverting ileostomy, and intravenous antibiotics. Three weeks later, the patient underwent an outpatient procedure for closure of

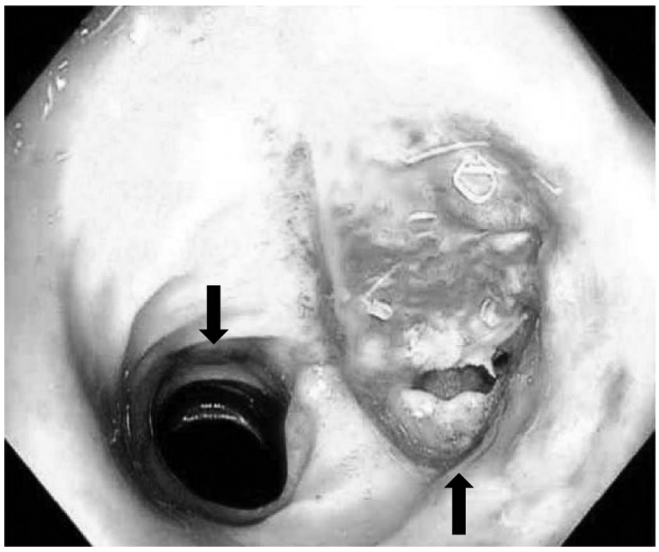


Figure 1. Endoscopic view of colorectal anastomosis. The downward-facing arrow points to the circular intact portion of the anastomosis created with the EEA stapler. The upward-facing arrow points to the friable anastomotic defect resulting from dehiscence of the linear staple line on the rectum.

the fistula. The anastomotic leak was first identified with a colonoscope. A 1.5-cm defect was identified involving the linear staple line on the rectum, whereas the circular EEA staple line was intact (**Figure 1**). The colonoscope was withdrawn, and a sheet of MatriStem (Surgical Matrix PSMX, 3-layer multilaminate UBM) was introduced into the rectum via a rigid proctoscope because the device is too large to be deployed via the biopsy channel of a standard colonoscope. The colonoscope was reintroduced into the rectum, and the MatriStem sheet was oriented so that the basement membrane side was in apposition to the intestinal mucosa. The MatriStem device was then gently inserted into the defect with a biopsy forceps (**Figure 2**). An endoscopic clip (Resolution Clip, Boston Scientific, Boston, Massachusetts) was used to secure the MatriStem to the rectum just distal to the treatment site (**Figure 3**).

The patient was evaluated as an outpatient 14 days after the therapeutic colonoscopy and reported no complications from the procedure. Healing of the anastomotic leak was confirmed by computed tomography scan 4 weeks after MatriStem treatment (**Figure 4**). Direct visualization by colonoscopy showed unequivocally that the anastomotic leak was filled with newly deposited host tissue with gross evidence of vascularization and no clinical evidence of scarring or stricture (**Figure 5**). The patient underwent reversal of the ileostomy, and he had normal

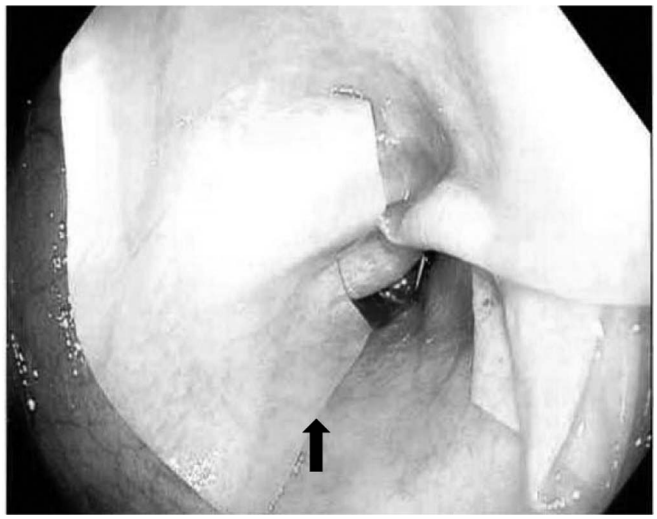


Figure 2. Endoscopic view of MatriStem (arrow) being deployed endoscopically into anastomotic defect.

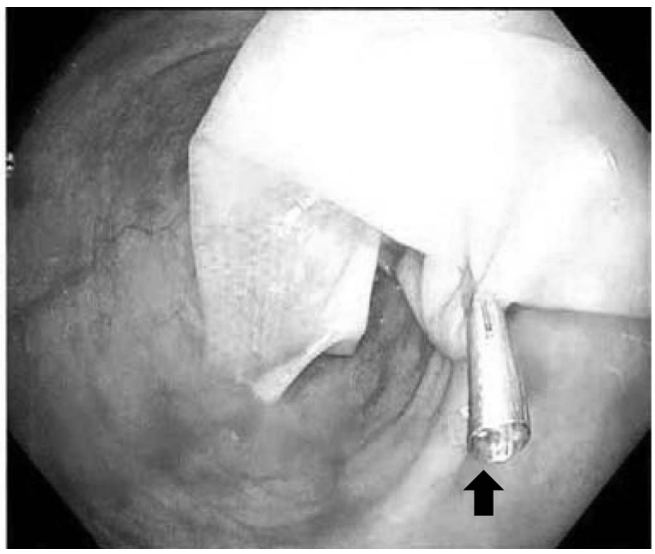
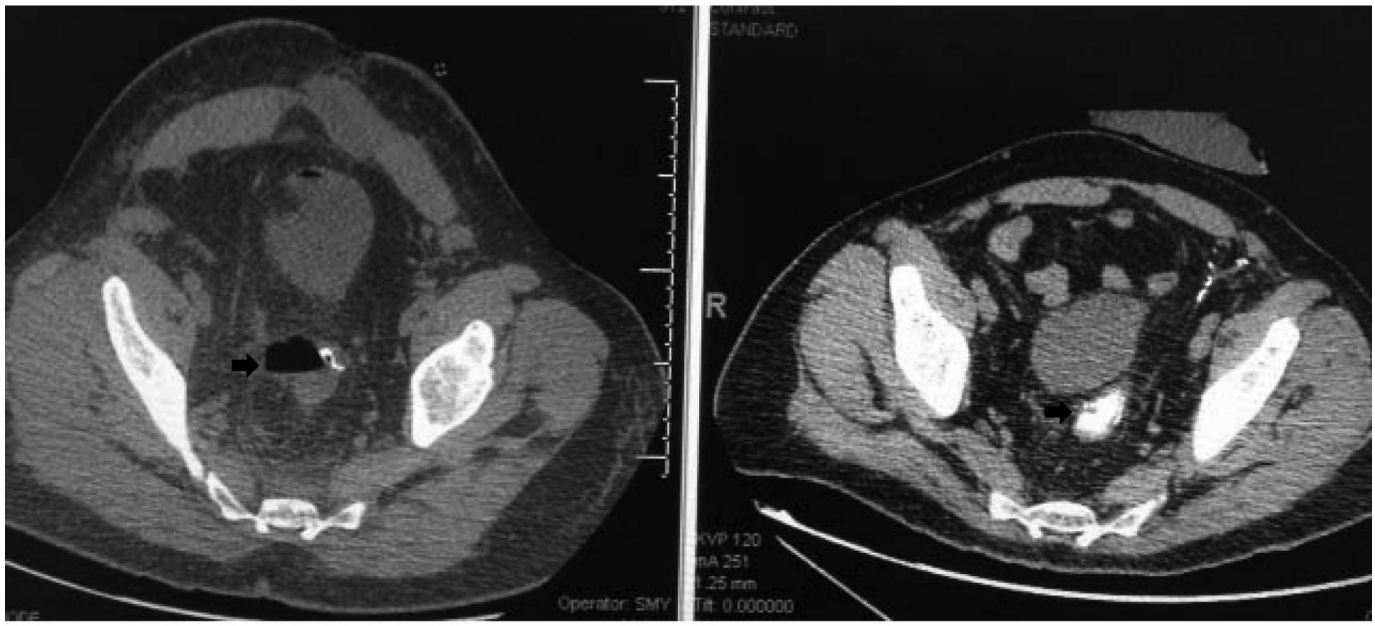


Figure 3. Endoscopic view of MatriStem secured to rectum via endoscopic clip (arrow) after it has been deployed into anastomotic defect.

bowel function and continence at his last follow-up visit 2 months after stoma reversal.

DISCUSSION

This report describes the successful closure of a large anastomotic leak with MatriStem Surgical Matrix PSMX under endoscopic deployment with no postoperative complications. Complete closure of the anastomotic leak was confirmed 4 weeks after treatment, which is signifi-



A B

Figure 4. A, Computed tomography scan of pelvis showing truncal obesity and a colorectal anastomotic leak (arrow) with air visualized outside of anastomotic staple line defect. B, Repeat computed tomography scan of pelvis with rectal contrast 4 weeks after MatriStem treatment. Rectal contrast passes through the anastomosis with no evidence of extravasation (arrow).

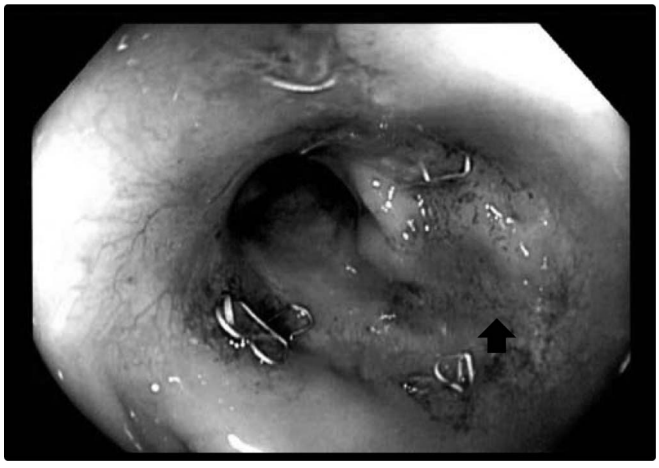


Figure 5. Endoscopic view of anastomosis after MatriStem treatment. The anastomotic defect is completely healed, with vascularized new tissue present and no evidence of stricture (arrow).

cantly faster than the anticipated healing time with diversion alone. The leak was filled with newly deposited host tissue and did not appear to close by stricture of the wound. The patient was able to undergo an ileostomy reversal despite a 32% risk of not being able to restore bowel continuity in patients with contained anastomotic leaks treated with a stoma.[5] In addition, the patient was able to avoid the morbidity associated with a major corrective operation.

Several investigators have recently advocated early endoscopic techniques to assist in closure of anastomotic leaks associated with large tissue defects to avoid the often inevitable major reoperation or permanent stoma. Successful treatment of 2 patients with 7-mm colorectal anastomotic leaks was reported using an Over-the-Scope Clip device (Ovesco, Tübingen, Germany).[2] For more complicated anastomotic leaks (<1.5 cm) associated with an abscess cavity, Verlaan et al[3] introduced a novel method using a sponge-like device connected to suction to reduce the size of the anastomotic defect and associated abscess cavity. After treatment with the device, called an "endosponge," the residual defect was closed with sutures via a transanal approach or an Over-the-Scope Clip device. Among 6 patients with colorectal anastomotic leaks treated with a median of 3 endosponge treatments, closure of the anastomotic defect was successful in 5 patients. Whereas endoscopic closure with clips appears to be a promising alternative for treating anastomotic defects, there are several limi-

tations with this new technology, including an inability to safely close large anastomotic defects or defects associated with edema or inflammation. In addition, long-term stricture rates and overall bowel function and continence have yet to be evaluated in patients undergoing endoscopic clip closure.

MatriStem has the potential to reduce or eliminate some of the complications associated with the new technology described in this report. MatriStem facilitated host tissue remodeling in various studies, including those in the gastrointestinal system, showing site-appropriate tissue deposition.[5,6] The mechanisms of action are not fully understood, but site-appropriate remodeling is hypothesized to be a consequence of immune modulation, promotion of angiogenesis, and recruitment of progenitor cells. Despite a high risk of poor healing and a permanent stoma associated with the magnitude of this anastomotic defect,[2,3,5] it appears that the salutary properties of MatriStem[7,8,9] enabled successful healing of this anastomotic defect. The defect healed rapidly and was associated with healthy vascularized tissue with no evidence of scarring or stricture that typically occurs after an anastomotic leak. Primary treatment with an endoscopic clip was not a viable treatment alternative because the defect was large and friable.

To our knowledge, this is the first published clinical case report of using an extracellular matrix graft deployed endoscopically to heal a colorectal anastomotic leak, and the results suggest that this may be a promising new treatment modality. On the basis of the salutary effects of MatriStem in this initial case study, larger case series evaluating the efficacy of MatriStem for treatment of colorectal anastomotic defects are warranted.

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