Enterocutaneous fistula: Successful treatment of two cases with urinary bladder matrix xenograft

Kent C. Sasse, David L. Warner

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Case Series: The cases were treated with a procedure involving curettage of the tract, followed by injection of a MatriStem slurry, and insertion of a rolled MatriStem graft. In both cases, the ECF ceased to drain bilious fluid. After a week, both patients began a liquid diet, and no recurrent fistula occurred after six months of follow-up.

Conclusion: In this study, treatment of ECF using MatriStem resulted in successful clinical healing of the ECF. The use of biologically derived materials for ECF is a relatively new concept. There is precedent for using biological plugs with some reported examples of success, but use of porcine urinary bladder matrix is novel for this purpose.

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Keywords: Cancer, Enterocutaneous fistula, Minimally invasive procedures, Xenograft, Urinary bladder matrix

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INTRODUCTION

Enterocutaneous fistula (ECF) remains among the most challenging clinical conditions in general and colorectal surgery. ECF is a source of significant morbidity for patients and frequently results in the need for costly and morbid interventions in an attempt to resolve the condition, particularly when associated with additional risk factors such as cancer, immunosuppression, irradiated tissue, tobacco abuse, Crohn's disease, diabetes, and obesity [1–4]. Treatment of routinely includes invasive surgery, total parenteral nutrition (TPN), expensive medical therapies, personnel time, and imaging procedures, often without predictable closure of the ECF [5].

MatriStem (ACell Inc., Columbia, MD, USA) is a regenerative extracellular matrix (ECM) material derived from porcine urinary bladder that has been demonstrated to facilitate regeneration of host tissues in many anatomical regions and organ systems in mammals [6]; it has since been proven effective in the treatment of complex wounds, esophageal repair, and muscle injury applications [7–12]. However, the use of ECM materials for ECF is a relatively new practice. A recent report of seven cases of ECF managed conservatively with an acellular ECF product derived from porcine intestinal submucosa suggests that ECM scaffolds are a promising new approach managing ECF in complex patients [13]. The aim of this report is to contribute to the growing evidence of biological

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materials for the treatment of ECF. Advantages of the use of xenograft in this application of fistula treatment would include that the material is completely biodegraded and will leave no permanent remnant to cause abscess, fistula, granuloma, or other foreign body responses. The potential advantages are that the remodeling response seen histologically with UBM material in preclinical and clinical studies would translate to successful closure of the fistula. Disadvantages would be the potential for failure and recurrence or persistence of the fistula, and potential for adverse reactions, although scarce reactions to acellular porcine urinary bladder matrix material have been reported. The potential disadvantage of plugging a tract could be the development of abscess due to a loss of a channel for drainage. In this report, two patients with ECF were treated with a conservative procedure that involved curettage of the ECF tract, filling with a suspension of MatriStem MicroMatrix® powder, and insertion of a rolled MatriStem Surgical Matrix RS graft using a standardized technique.

CASE SERIES

In Case 1, a 69-year-old female presented with a history of chronic obstructive pulmonary disease, diverticulitis and a prior surgical colectomy complicated by anastomotic leak and multiple reoperations at an outside facility. In late 2013, she underwent ileostomy takedown, extensive adhesiolysis and ileorectal anastomosis, complicated by a late postoperative enterocutaneous fistula measuring 6 cm in length. Despite bowel rest and TPN, the fistula drained 200 cc per day of bilious succus entericus. The patient did report passage of flatus and stool per rectum. Clean radiographs showed no bowel dilatation, and passage of flatus and bowel movements indicated that no downstream obstruction was present. Clinical assessment of lack of distention and vomiting also supported that conclusion. Contrast studies downstream would serve as further confirmation, but were not felt to be mandatory at that point in time, and an effort was made to minimize the tests and procedures that the patients was undergoing. Major surgery was inadvisable due to extensive multiple previous operations and high risk of further bowel injury, and additional complications if laparotomy were undertaken; thus, a less invasive solution was sought.

In Case 2, a 67-year-old female with stage IV colorectal cancer and intra-abdominal recurrence presented with a chronic enterocutaneous fistula. She had undergone a bowel resection procedure in 2012 to alleviate obstructive symptoms and was found to have extensive tumor in the abdomen. She recovered from surgery but continued to experience persistent drainage from two separate, unconnected sinus tracts in the abdominal midline. The more superior sinus drained 15 cc per day of serous fluid, but the lower tract drained 150 cc per day of bilious succus entericus despite bowel rest and administration of TPN. The length of the ECF tract measured 4 cm in length. The

patient did pass stool per rectum intermittently. For the same reasons as mentioned in Case 1, major surgery was considered inadvisable, and a less invasive solution was sought.

Each patient was taken to the operating room for management of the fistula using a standardized technique. First, the fistula tract was debrided and curetted (Figure 1A). The fistula tract was then filled with a thick suspension of 200 mg of MicroMatrix powder in 4 cc of saline delivered via an 18 g syringe (Figure 1B). Next, a MatriStem Surgical Matrix RS device was hydrated in saline per the instructions for use and rolled (Figure 1C) for insertion into the fistula tract (Figure 1D and Figure 2). The rolled MatriStem device was finally sutured to the skin (Figure 1E).

In both cases, the enterocutaneous fistula ceased to drain bilious fluid immediately. After a week, both patients were started on a liquid diet, which was then advanced as tolerated. No recurrent fistula has occurred after more than six months of follow-up. In Case 2, the untreated superior tract resumed drainage of 10–15 cc per day of non-bilious serous fluid.

Figure 1: (A) Curettage of fistula tract, (B) MicroMatrix slurry injection, (C) Rolled MatriStem RS graft, (D) Insertion of MatriStem into fistula, and (E) Inserted graft is sutured to skin.

Figure 2: Case 2 after debridement of lower sinus tract, inserting rolled RS MatriStem graft.

DISCUSSION

In this study, treatment of two enterocutaneous fistulae using MatriStem application resulted in successful clinical healing of the enterocutaneous fistula without complications, re-infection, or reoperation. In both cases, the clinical assessment was that there was no downstream intestinal obstruction and that reoperation was clinically inadvisable. The application of MatriStem was performed with a minimally invasive technique of curettage, injection of a suspension of MatriStem MicroMatrix powder, and insertion of a rolled MatriStem Surgical Matrix RS graft. In both of the cases presented here, the fistula closed with a single application of the standard treatment method. However, it stands to reason that repeated treatments with MatriStem might be required to achieve successful closure of some fistulae with little additional risk to the patient. Lyon et al. report treatment of six patients with ECF utilizing a porcine small intestinal submucosa xenograft; two patients achieved closure with no recurrence beyond two years, but also reported two deaths [11]. Piduru et al. also describe treatment of ECF using small intestine submucosa, and report a clinical benefit of 42%, and a complete closure rate of 21% [13].

MatriStem (ACell Inc.) has proven effective in achieving constructive tissue remodeling and wound healing across an array of complex clinical situations [12–14]. The mechanism by which MatriStem facilitates the body's ability to heal wounds is not completely understood, but it is thought that the presence of an intact epithelial basement membrane plays an important role [15]. Epithelial basement membrane is known to support the regenerative capacity of numerous anatomical regions and organs, such as the thoracic wall, the esophagus, the liver and bone [8, 16]. It has also been shown that the immune response to MatriStem includes a more prominent role for the M2 macrophage phenotype [17]. Further studies are required to further elucidate the body's response to this material [15, 18].

Management of ECF can be an arduous and expensive process; many conservative treatments have high recurrence rates, while more efficacious procedures tend to be quite invasive [1–3]. Additionally, ECF frequently presents in patients with comorbid conditions such as cancer, diabetes, irradiated tissue, immunosuppression, and Crohn's disease, which impair the healing process [1, 4]. MatriStem has been effective in facilitating healing of surgically repaired soft tissues and wounds across a diverse spectrum of anatomical settings [8–11, 13, 18].

CONCLUSION

This report establishes a novel application of MatriStem in the minimally invasive management of enterocutaneous fistula (ECF) in patients with complex medical problems. The evidence provided in these cases

suggests that the application of MatriStem may meet the need for a conservative, practical, and cost-effective technique for managing some cases of ECF.

Author Contributions

Kent C. Sasse – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

David L. Warner – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Dr. Sasse receives speaking honoraria from ACell organization outside the submitted work, and also serves as a consultant to ACell. Warner has no conflicts of interest to disclose.

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REFERENCES

1. Orangio GR. Enterocutaneous Fistula: Enterocutaneous fistula: medical and surgical management including patients with Crohn's disease. Clin Colon Rectal Surg 2010 Sep;23(3):169–75.
2. Redden MH, Ramsay P, Humphries T, Fuhrman GM. The etiology of enterocutaneous fistula predicts outcome. Ochsner J 2013 Winter;13(4):507–11.
3. Draus JM Jr, Huss SA, Harty NJ, Cheadle WG, Larson GM. Enterocutaneous fistula: are treatments improving? Surgery 2006 Oct;140(4):570–6; discussion 576–8.
4. Hu D, Ren J, Wang G, et al. Persistent inflammation-immunosuppression catabolism syndrome, a common manifestation of patients with enterocutaneous fistula in intensive care unit. J Trauma Acute Care Surg 2014 Mar;76(3):725–9.
5. Skovgaard R, Keiding H. A cost-effectiveness analysis of fistula treatment in the abdominal region using a new integrated fistula and wound management system. J Wound Ostomy Continence Nurs 2008 Nov-Dec;35(6):592–5.

6. Badylak SF. Xenogeneic extracellular matrix as a scaffold for tissue reconstruction. *Transpl Immunol* 2004 Apr;12(3-4):367–77.
7. Agrawal V, Johnson SA, Reing J, et al. Epimorphic regeneration approach to tissue replacement in adult mammals. *Proc Natl Acad Sci U S A* 2010 Feb 23;107(8):3351–5.
8. Gilbert TW, Nieponice A, Spievack AR, Holcomb J, Gilbert S, Badylak SF. Repair of the thoracic wall with an extracellular matrix scaffold in a canine model. *J Surg Res* 2008 Jun 1;147(1):61–7.
9. Sasse KC, Brandt J, Lim DC, Ackerman E. Accelerated healing of complex open pilonidal wounds using MatriStem extracellular matrix xenograft: nine cases. *J Surg Case Rep* 2013 Apr 15;2013(4). pii: rjto25.
10. Brennan EP, Reing J, Chew D, Myers-Irvin JM, Young EJ, Badylak SF. Antibacterial activity within degradation products of biological scaffolds composed of extracellular matrix. *Tissue Eng* 2006 Oct;12(10):2949–55.
11. Lyon JW, Hodde JP, Hucks D, Changkuon DI. First experience with the use of a collagen fistula plug to treat enterocutaneous fistulas. *J Vasc Interv Radiol* 2013 Oct;24(10):1559–65.
12. Sicari BM, Johnson SA, Siu BF, et al. The effect of source animal age upon the in vivo remodeling characteristics of an extracellular matrix scaffold. *Biomaterials* 2012 Aug;33(22):5524–33.
13. Piduru SM, Yamada K, Morales AF. Enterocutaneous fistula closure with porcine submucosa derived fistula plug: a novel minimally invasive closure technique. *J Vasc Interv Radiol* 2013;24(4):S145–6.
14. Sasse KC, Ackerman EM, Brandt JR. Complex wounds treated with MatriStem xenograft material: case series and cost analysis. *OA Surgery* 2013;1(1):1–7.
15. Brown B, Lindberg K, Reing J, Stolz DB, Badylak SF. The basement membrane component of biologic scaffolds derived from extracellular matrix. *Tissue Eng* 2006 Mar;12(3):519–26.
16. Vracko R. Basal lamina scaffold-anatomy and significance for maintenance of orderly tissue structure. *Am J Pathol* 1974 Nov;77(2):314–46.
17. Brown BN, Londono R, Tottey S, et al. Macrophage phenotype as a predictor of constructive remodeling following the implantation of biologically derived surgical mesh materials. *Acta Biomater* 2012 Mar;8(3):978–87.
18. Schultz GS, Ladwig G, Wysocki A. Extracellular matrix: review of its roles in acute and chronic wounds. *World Wide Wounds*. 2005. [Available at: <http://www.worldwidewounds.com/2005/august/Schultz/Extrace-Matric-Acute-Chronic-Wounds.html>]

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