The American Journal of Surgery 214 (2017) 479–482

Contents lists available at ScienceDirect

The American Journal of Surgery

journal homepage: www.americanjournalofsurgery.com

The biological prosthesis is a viable option for abdominal wall reconstruction in pediatric high risk defects

Osnat Zmora*, Shannon L. Castle, Stephanie Papillon, James E. Stein

Department of Pediatric Surgery, Children's Hospital Los Angeles, Los Angeles, CA, USA

ARTICLE INFO

Article history:
Received 29 April 2016
Received in revised form
2 January 2017
Accepted 5 January 2017

Keywords:
Biological prosthesis
Reconstruction
Pediatric
Children
Abdominal wall

ABSTRACT

Background: Our aim was to explore the indications for and outcome of biological prostheses to repair high risk abdominal wall defects in children.
Methods: A retrospective chart review was performed of all cases of abdominal wall reconstruction in a single institution between 2007 and 2015. Demographic and clinical variables, technique and complications were described and compared between prosthesis types.
Results: A total of 23 patients underwent abdominal wall reconstruction using a biological prosthesis including 17 neonates. The main indication was gastroschisis (17 patients) followed by ruptured omphalocele and miscellaneous conditions. Alloderm™ was most commonly used followed by Surgisis™, Strattice™, Flex-HD™ and Permacol™. In 22 cases wounds were contaminated or infected. Open bowel/stomas were present in 9 cases. Skin was not closed in 11 cases. Post-operative complication rate was 30% and hernia recurrence rate was 17% after a mean follow-up time of 16 months.
Conclusions: The use of a biological prosthesis may offer advantages over a synthetic mesh in pediatric high risk abdominal wall defects. The surgeon should be ready to consider its use in selected cases.

1. Introduction

Bioprostheticpatches are derived from human or animal tissue processed to decellularize the tissue. They are purported to form a durable body wall and to resist infection through ingrowth of the patient's own tissue into the decellularized matrix. Biological prostheses have been increasingly used since the mid-2000s in the adult population with good outcomes.[1] The main indication to use a bio prosthesis is abdominal wall reconstruction in high risk abdominal wall defects, especially contaminated wounds.[1–5] The advantages for the bio prosthesis over the less expensive synthetic mesh are: significantly higher endurance through infection when used in open and infected wounds with a lower risk of long term/chronic infection, and lower rates of post-operative adhesions and fistulae formation.[2,3] Although, some studies reporthigher rates of hernia recurrence with the bio prosthesis.[4]

The biological prosthesis is potentially an important tool for the pediatric surgeon. In the pediatric population, there are some unique conditions with need for body wall reconstruction. Some of these are characterized by inherently open wounds with a high incidence of infected wounds, such as gastroschisis and ruptured omphalocele. In addition, the immunocompromised state of newborns, which makes them more susceptible to infection, and the rapid growth of body walls in children make the pediatric population in general, and the newborns in particular, suitable candidates for reconstruction using a biological prosthesis. To date, there are only eight peer review publications reporting the use of biological prostheses in pediatric patients. The total number of patients who underwent abdominal wall reconstruction in all of these series is 89, of whom in only 42 patients a contaminated wound was present. Three types of prostheses are reported: Strattice™,[6,7] Surgisis™,[8–12] and Alloderm™.[12,13] Our aim in this study was to present our experience with bio prosthesesfor the use of abdominal wall reconstruction in a large series with high risk abdominal wall defects, and to study the indications, surgical technique and outcome of bio prostheses in children. Thus, we hope to provide more substantial data to support the efficacy and safety of the bio prosthesis over a spectrum of conditions in pediatric patients.

2. Materials and methods

After IRB approval, a retrospective chart review was conducted

* Corresponding author. Present address: Department of Pediatric Surgery, Sheba Medical Center, Tel Hashomer, Israel.
E-mail address: Zmora.osnat@gmail.com (O. Zmora).

http://dx.doi.org/10.1016/j.amjsurg.2017.01.004
0002-9610/

of all cases at our institution with a diagnosis of an abdominal wall defect repaired with a bio prosthesis between January 2007–February 2015. Data collected included demographic and clinical variables: primary diagnosis, age, gender and weight; technical aspects of repair: type of mesh, and whether skin was closed; wound care in cases that required the mesh to be left exposes; complications including skin separation, infection, delayed wound healing, sloughing of mesh, reoperation for other reasons, and hernia recurrence.

Statistical analysis was performed to compare rates of post-operative complications and hernia recurrence between different mesh types using student's t test.

3. Results

There were 23 patients with implanted bio prosthetic mesh used to bridge an abdominal fascial defect during the study period. The clinical conditions for which a mesh was used were: Gastroschisis (11), with one case that also presented with perforated bowel and another with simultaneous intestinal atresia; ruptured omphalocele (6); miscellaneous cases of intraabdominal infection with an open abdomen and loss of domain (5); and congenital diaphragmatic hernia (CDH) with loss of abdominal domain unsuitable for primary repair after silo application (1). The cases of intraabdominal infection were: bowel obstruction in a patient with Hodgkin's lymphoma complicated by enterotomies requiring stoma formation (1), necrotizing enterocolitis (NEC) requiringostomy creationcomplicated by abdominal compartment syndrome (1), ileal atresia complicated by anastomotic leak and abdominal compartment syndrome (1), amebic colitis with subsequent stoma creation (1), and perforated appendicitis with abdominal compartment syndrome (1). All cases with intra-abdominal infection resulted in an open abdomen. In 22/23 cases wounds were considered at least contaminated prior to mesh closure. In 9 cases open bowel and/or an ostomy were present. Only one case was a clean case, where the mesh was used to repair a ventral hernia 2 years after closing skin only for gastroschisis. There were 17 neonates with an age range between 0 and 28 days (median: 11 days). The age range for non neonates was 6 weeks–19 years. Average weight at operation was 2.5 kg (range: 1.1 kg–4.2 kg) in infants and 34 kg in children over 1 year old.

Types of meshes used varied. The type of bioprosthesis was selected based on the available types present in the operating room at a certain time in addition to surgeon's preference. Alloderm™ was used in 10 cases, Surgisis™ in 5, Strattice™ in 4, Flex-HD™ in 3, and Permacol™ was used in one case. Skin was closed on top of mesh in 11 cases, and there was no skin coverage in 11 cases (no clear documentation regarding skin closure was found in one case). Most cases in which skin was not closed were among patients with gastroschisis (3/11) and omphalocele (6/6).Wound care regimens for the patients in whom the mesh was left exposed included combinations of application of xeroform (7 cases), VAC (4 cases), silvadene (2 cases), wet-to-dry dressing (2 cases), and biogel (1 case).

Fig. 1 demonstrates different stages in the treatment of patient #16, who was born with a ruptured omphalocele. In this patient, silo was first used but gradually sloughed. We replaced silo with alloderm. An entero-mesh fistula later developed but the mesh was intact and gradually granulated.

3.1. Outcome

There were 7 (30%) documented post-operative complications apart from hernia formation. Skin separation over the mesh or subcutaneous infection occurred in 3 patients out of 11 with primary skin closure. All of these patients had gastroschisis. There was

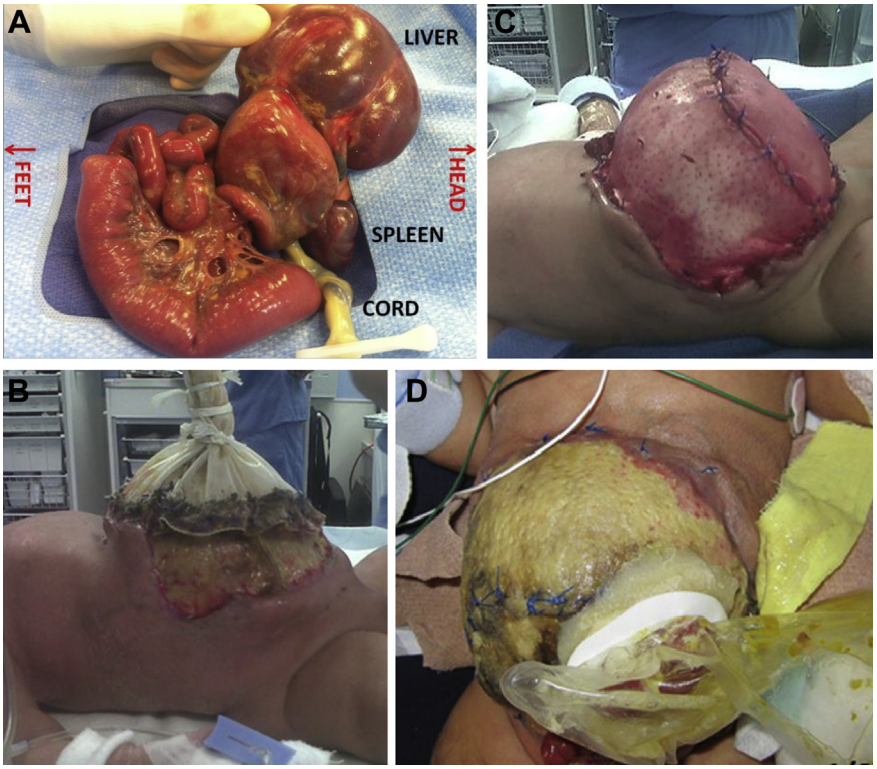

Fig. 1. Patient #16, who was born with a ruptured omphalocele. **A**-uncovered organs upon birth. **B**-sloughing silo. **C**-Alloderm patch. **D**-Alloderm with a stoma bag covering an entero-mesh fistula. Peripheral granulation is present.