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Combined submuscular tissue expansion and anterior component separation technique for abdominal wall reconstruction: Long-term outcome analysis

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KEYWORDS

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Summary *Background:* We report the long-term outcome analysis of 12 patients who underwent two-stage abdominal wall reconstruction using combined submuscular tissue expansion and anterior components separation (CS) technique.

Methods: Outcome measures were (1) the patients were assessed for the presence or absence of recurrence; (2) patient-reported outcomes on physical functioning in relation with the abdominal wall reconstruction were evaluated using the SF 36-item health survey.

Results: The mean age, average expansion volume, and mean time expansion were 37.5 years, 1250 cc, and 9.5 weeks, respectively. The average soft tissue deficiency size was 15.5 (width) × 19.5 (length) cm². The average fascial defect was 17 (width) × 21.5 (length) cm². No mesh-assisted technique was required. Primary closure was obtained in all. The average follow-up was 39.6 months. Hernia recurrence was noted in one patient (8.3%). All 12 patients completed the SF 36-item health survey. Moreover, 75% of the patients reported 100%, indicating “Not limited in vigorous activities,” and 25% indicated “limited a little.” All patients reported 100% “not limited at all” in lifting or carrying groceries, climbing several flights of stairs, climbing one flight of stairs, bending, kneeling, stooping, walking more than a mile, walking several blocks, walking one block, bathing, or dressing.

Conclusions: Parietal laxity obtained with tissue expansion increases the possibility of direct closure of the fascial layer, skin, and subcutaneous tissue components. Combined use of tissue

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expansion and CS may result in favorable long-term outcomes as evidenced by patient-reported physical functioning data and low rate of hernia recurrence.

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Introduction

The anterior components separation (CS) technique described by Ramirez entails a series of fascial incisions that are used for maximal tissue advancement with the preservation of the continuity of the internal oblique fascia.¹ According to the initial report, using bilateral relaxing incisions and release, a total of 10, 18, and 6–10 cm of advancement can be obtained in the upper, middle, and lower thirds of the abdomen, respectively. Nguyen and Shestak² reported that each ipsilateral complex could be advanced toward midline 4 cm in the upper abdomen, 8 cm at the waist, and 3 cm in the lower abdomen.

While the numeric guidelines were provided when the technique was first introduced, the amount of advancement may be difficult to estimate preoperatively until actual release incisions and dissections are performed intraoperatively. In addition to the size of the abdominal wall defect, abdominal wall compliance and/or the presence of scar tissue and obesity should be evaluated when the CS technique is planned. Another complicating factor is the presence of stoma as closing the fascial defect during colostomy reversal would place some tension on the ipsilateral fascia of the abdominal wall. All these components individually or collectively may hinder adequate advancement using the CS technique.

Our experience using the CS technique over the past decade has shown that in certain patients undergoing CS, the integrity of the musculofascial layer cannot be restored, and additional bridging procedures using a mesh or biologic material are required with a potential risk of complications.

According to the senior author's experience, the abdominal wall compliance could be improved to aid in the advancement of musculofascial structures and the skin through an expansion process, which would then allow a primary closure of the musculofascial structures, overlying skin, and subcutaneous tissue. Although the technique is not new, case series and reports of long-term outcomes are scarce. In this article, we report the long-term outcome analysis of 12 patients who underwent two-stage abdominal wall reconstruction using combined submuscular tissue expansion and the CS technique. To the best of our knowledge, this is the largest case series and the one with the longest follow-up published to date.

Patients and methods

Twelve consecutive patients undergoing two-stage abdominal wall reconstruction using a tissue expander (TE) and the CS technique were included in this report. The patients

were operated on by the senior author (R.G.) during his practice at Denver Health Medical Center between 2006 and 2013. All the patients presented with midline abdominal defects with unstable soft tissue, which were believed not amenable for reconstruction using only the CS technique because of extensive scar and/or size of the abdominal defect. A preoperative abdominal CT scan was obtained in all patients for the evaluation of the presence or absence of the rectus muscle complex. Patients with loss of domain were excluded.

The data were collected from the prospectively maintained database. Patient demographics, BMI, smoking status, medical and surgical history, size of abdominal defect, surgical details, duration of hospital stay, follow-up time, and postoperative complications were obtained.

Two outcome measures were used: (1) the patients were assessed at the outpatient clinic at regular intervals postoperatively, and a clinical exam was performed by the senior author to detect the presence or absence of recurrence; (2) Patient-reported outcomes as they relate to the physical functioning and role limitations due to physical health problems in relation with the abdominal wall reconstruction were evaluated using the Short form (SF) 36-item health survey.^{3,4} The surveys were filled out by the patients during a clinic visit once they completed a minimum of 18 months of follow-up. In this survey, 14 questions are directly related to physical functioning. All items are scored so that a high score defines a more favorable state. Each item is scored on a 0–100 range; the lowest and highest possible scores are set at 0 and 100, respectively. Scores represent the percentage of total possible score achieved.

Surgical technique

The first stage entails the placement of two TEs in the plane between the external and internal oblique muscles lateral to the rectus abdominis muscles. TEs are introduced through a skin incision placed over the lower chest, one on each side. The external oblique muscle is minimally transected along its lateral border to enter the relatively avascular plane between the external and internal oblique muscles. A sufficient pocket is dissected from the proximal to the distal direction lateral to the linea semilunaris until the inguinal ligament using a lighted retractor and a blunt dissector. A completely deflated rectangle expander (Softspan TE, #BTE1200; length: 20.0, width: 8.5 cm, projection: 8.5–10.4 cm, suggested fill volume: 1200–1400 cc, Specialty Surgical Products, Inc., Victor, MT, USA) is inserted between the external and the internal oblique muscles. The injection port of the expander is positioned in the subcostal area toward the midline over the ribs and secured

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