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Abdominoplasty in prune belly syndrome: Modifications in Monfort technique to address variable patterns of abdominal wall weakness

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Summary

Introduction
Abdominoplasty is an important component of the management of children with prune belly syndrome (PBS). While there are features of the abdominal defect in PBS which are common to all patients, there will be differences unique to each patient that should be taken into consideration in surgical planning. Specifically, we have come to realize that although the Monfort procedure assumes a symmetric pattern of abdominal wall laxity, this symmetry is rarely present.

Objective
The aim of this report is to describe our modifications and review our outcomes for the Monfort procedure which more completely address correction of the abdominal wall laxity including both common and uncommon features while positioning the umbilicus to a more anatomically correct position (Figure).

Study design
Sixteen male patients with PBS and one female pseudoprune belly syndrome patient, aged 2–9 years, were treated at our institution between 2003 and 2014. Modifications incorporated into the abdominoplasty procedure for PBS applied to this study group included: 1) use of diagnostic laparoscopy to define the topography of the abdominal wall defect, 2) initial midline rather than elliptical skin incision to defer retailoring of the skin coverage until the final step of the procedure, 3) varying the width of the central plate to correct side to side asymmetry in redundancy, 4) plication of the central plate to reduce vertical redundancy and reposition the umbilicus, and 5) plication of focal areas of fascial weakness, most often in the flank region.

Results
All patients have improved abdominal wall contour with a more uniform correction of areas of weakness at a mean follow-up of 5.5 years (range 18 months–11.5 years). All patients and parents indicate that they are very satisfied with the outcome of their procedures without any revisions being performed. This study is descriptive in nature and retrospective, with the patient population treated in a relatively uniform fashion that does not allow direct comparison with other techniques.

Conclusions
The modified Monfort procedure recognizes the pattern of abdominal muscular deficiency unique to each patient and incorporates this information into the surgical design.

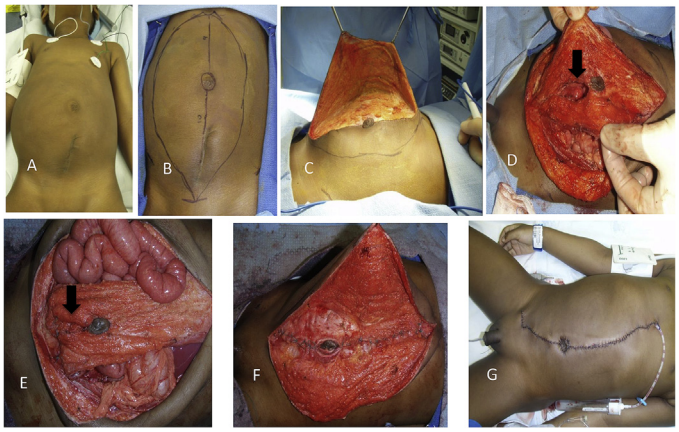

Figure (A) Asymmetric laxity right > left. (B) Midline incision and extent of subcutaneous dissection delineated. (C) Full thickness flaps raised from fascial surface. (D) Central plate developed, right aspect of central plate is wider. Midline infraumbilical incision is formed. (E) Closure of infraumbilical incision shifts umbilicus inferiorly. (F, G) Excess skin removed, skin flaps brought back together in midline completes procedure.

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Introduction

Abdominal wall laxity is one of the three primary components of prune belly syndrome (PBS), which also includes undescended testes and dilation of the urinary tract. We have previously reported our considerable experience with abdominoplasty in the prune belly patient [1,2]. Over time, we have come to realize that although the Monfort procedure assumes a symmetric pattern of abdominal wall laxity, this symmetry is rarely present. Most often the musculature of the upper and lateral areas of the abdominal wall is better preserved and the infraumbilical region is most affected [3,4]. As a consequence of the laxity and elongation of the infraumbilical fascia, the umbilicus tends to be displaced to an abnormally superior position. In addition to these constant findings, each patient will display unique features with regard to the variation of the severity and pattern of the abdominal wall laxity. For example, the fascial laxity may be asymmetric between sides, regionally more pronounced (especially in the flank region), or oddly focal in a particular area [5]. Traditionally, three surgical procedures have been described to correct the abdominal wall defect in PBS. These include the Randolph procedure that advocates excision of a portion of the lower abdominal wall to correct the problem of vertical fascial redundancy, and the Monfort and Ehrlich procedures that not only correct the lateral redundancy but also promote strengthening of the abdominal wall by vertical overlapping of the fascia [3,6,7]. A laparoscopic approach to abdominoplasty in children with PBS has recently been described. It has been beneficial in both assisting with reconstruction, and in delineating the topography of the muscular deficiency [8].

Although the basis for the abdominoplasty technique in our patient series was the Monfort technique, we believe that there is reason to appreciate the conceptual elements of each procedure. The defect of the abdominal wall is more thoroughly corrected if all features of the abdominal defect are recognized and incorporated into the repair, rather than exclusively applying a vertically oriented or horizontally oriented repair. The aim of this study is to describe the details of our modifications and to review our outcomes of the Monfort procedure, which more completely address correction of the abdominal wall laxity, including both common and individual features while appropriately positioning the umbilicus to a more anatomically correct inferior location.

Materials and methods

Following institutional review board approval, we conducted a retrospective review of our experience with abdominoplasty in prune belly patients at our institution from 2003 through 2014. Data collected included patient age at time of procedure, intraoperative features of the abdominal wall defect, type of repair and concomitant procedures, postoperative complications, follow-up interval, and outcomes. Modifications incorporated into our abdominoplasty procedure for PBS include: 1) use of diagnostic laparoscopy to define the topography of the abdominal wall defect, 2) initial midline rather than elliptical skin incision to defer retailoring of the skin coverage until the final step of the procedure when it can be more precisely completed, 3) varying the width of the central plate to correct side to side asymmetry in redundancy, 4) plication of the central plate to reduce vertical redundancy and reposition the umbilicus, and 5) plication of focal areas of fascial weakness, most often in the flank region.

Surgical technique

All cases were based on the Monfort abdominoplasty procedure. Laparoscopy was performed through access at the inferior aspect of the umbilicus in the last four cases. Pneumoperitoneum results in distension of the abdominal cavity and outward stretching of the abdominal wall so that areas of greater laxity protrude to a greater degree and laparoscopy defines the course of the superior and inferior epigastric vessels as they enter the rectus fascia (referred to as the central fascial plate in the Monfort procedure) (Fig. 1).

A surgical marking pen was used to map regional and focal areas of greater laxity especially demarcating areas for correction extending laterally to the flank region. We

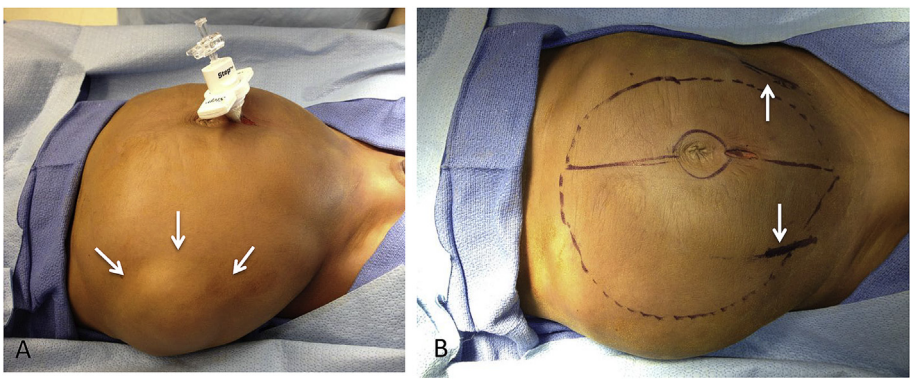

Figure 1 (A) Pneumoperitoneum is performed to assess topography of abdominal wall defect with a focal area of weakness detected on right flank (arrows). (B) The midline incision is delineated and the extent of lateral dissection skin flaps is marked by ellipse. Note that the extent of planned lateral dissection is also greater on the right side in this patient to address the relatively greater laxity on the right. A greater degree of fascial overlap on the right will correct this asymmetry. The course of the inferior epigastric vessels exposed during laparoscopy is marked (arrows).

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