

Abdominal wall closure in adult patients with untreated exstrophy of bladder

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ABSTRACT

Introduction: Bladder exstrophy is an anomaly, which if not treated early in the age, poses a surgical challenge in providing an adequate abdominal wall closure. We report our experience in patients with untreated exstrophy of the bladder, who underwent cystectomy, ileal conduit, and abdominal reconstruction using the anterior rectus sheath turnover flap and paired inguinal skin flaps.

Materials and Methods: Ten previously unoperated adult patients with exstrophy with epispadias, who underwent surgery at our institute from January 2010 till January 2021, were included in this study to evaluate the adequacy of abdominal wall closure with our technique of retrograde turnover anterior rectus sheath flap with paired inguinal flap, and to document immediate and delayed complications, especially incisional hernia.


Results: The mean follow-up period of the study was 16.5 months. We found that our technique provided adequate local tissue for a sturdy two-layered closure of the lower abdominal wall defect. Out of the ten patients, only one required an additional flap for abdominal wound closure. There were no stoma-related complications or incisional hernia.

Conclusion: Abdominal wall reconstruction, for skin and fascial defects, in such complex cases can be performed by local skin and fascia using a relatively simple, safe, easy, and affordable technique as we have described. Our technique avoids the use of synthetic mesh, thereby reducing the chances of infection in such chronic open wounds.

INTRODUCTION

The exstrophy–epispadias complex (EEC) is a rare congenital abnormality affecting the genitourinary system, anterior abdominal wall, and the pelvis. EEC ranges in severity from simple epispadias to bladder exstrophy to exstrophy of the cloaca.^[1] Among the three types, bladder exstrophy is the most common. Surgical repair of the bladder exstrophy begins in the neonatal period. Untreated exstrophy in adults is rarely seen in the developed countries, however, it is still seen in the developing countries because of the lack of specialized facilities, poor parental knowledge, and lack of motivation to seek timely treatment.^[2,3]

Surgical intervention for an untreated exstrophy with epispadias in the adulthood has two major problems: the first being the chances of malignancy in the bladder and the second, a strong abdominal wall closure. The ideal treatment of the bladder in an untreated exstrophy is controversial. Strong abdominal wall closure requires a good fascial closure and a tension-free skin repair. Various techniques are described for the fascial closure such as the tensor fascia lata strips,^[4] the rectus muscle with fascia,^[5] the crossover rectus abdominis muscle,^[6,7] the anterior rectus sheath turnover flap,^[8] and biological mesh (acellular dermis)^[9] or synthetic mesh.^[10] For the skin closure, many flaps are used such as the expanded thoracoepigastric flap,^[11] paired inguinal skin flap,^[12] M-plasty,^[13] and the anterolateral thigh flap with tensor

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fascia lata fascia.^[14] We report a series of adult patients with epispadias and exstrophy, treated with retrograde turndown anterior rectus sheath flap with paired inguinal flap.

MATERIALS AND METHODS

Between 2010 and 2021, ten adult patients with previously unoperated exstrophy with epispadias, who underwent surgery at our institute, were included in the study. The Institutional Review Board approved the study (IRB Min No. 13506). Informed consent was obtained from all the individual participants included in the study. The primary objective of the study was to evaluate the adequacy of the two-layered abdominal wall closure using our technique and to document immediate and delayed complications associated with it.

In view of the small, constricted bladder at the presentation and the high risk of metaplasia, dysplasia, and adenocarcinoma, a decision for cystectomy and creation of a urinary diversion was made by the urology team, after explaining all the possible treatment options to the patients.

The urology team performed the initial cystectomy and ileal conduit creation which was followed by the closure of the fascial defect and the skin closure by the plastic surgeons. Anterior abdominal wall closure was performed in two layers: underlying fascia using the bilateral retrograde turndown anterior rectus sheath flaps and the paired inguinal skin flaps for the skin closure. Osteotomy was not performed in any of the patients to reduce the associated blood loss and also to avoid the overall morbidity associated with it. Epispadias repair was planned at a later stage.

Surgical technique

If required, the initial midline laparotomy skin incision made by the urologists was extended cranially. The skin and the subcutaneous flap was raised from the subcostal region superiorly to the level of the anterior superior iliac spine (ASIS) inferiorly. The lateral extension of the undermining was up to the outer edge of the rectus abdominis muscle, immediately superficial to the anterior rectus sheath. Similarly, the underlying anterior rectus sheath was identified and carefully separated from the tendinous intersection and the rectus abdominis muscle starting from the xiphoid process up to 3 or 4 cm above the ASIS. Further, inferior elevation of the anterior rectus sheath was avoided to facilitate stoma creation in the lower part of rectus muscle. Then, a transverse incision was made over the anterior rectus sheath approximately at the level of the xiphoid process. The lateral edge of rectus abdominis muscle was reconfirmed through the transverse incision, and a parasagittal incision was made over the anterior rectus sheath along the lateral edge of rectus abdominis muscle. Next, a retrograde turndown of the elevated rectus

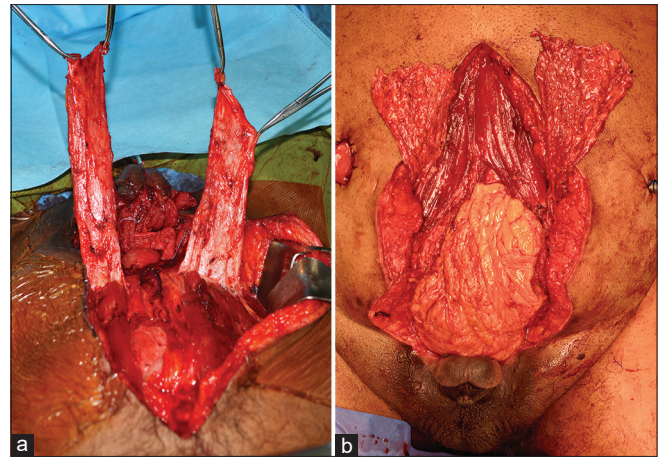


Figure 1: Images of two different patients showing the elevated anterior rectus sheath flaps; (a) Image taken from cranial side, (b) Image taken from caudal side

sheath was performed. The same steps were repeated on the contralateral side to raise the contralateral anterior rectus sheath flap [Figure 1a and b]. The first turndown sheath flap was sutured to the pubic symphyseal diastasis region inferiorly and to the edge of rectus abdominis muscle and the posterior rectus sheath laterally, with the interrupted 1-0 prolene sutures, to close the fascial defect. The second turndown sheath flap was sutured over the first, using a double-breasting technique [Figure 2a and b].

After the two-layered closure of the fascial defect, skin closure was achieved by a paired inguinal flap as described by Horton.^[12] A W-shaped flap was marked, with its most lateral part just below and lateral to the ASIS. A line was then marked from this point to a point lower than the penile base, through the inguinal crease, including a part of the scrotal skin in the tip of flap. The marking was then continued to the superior penile border. A mirror image of the same marking was created on the other side. Paired inguinal skin flaps were raised up to the subcutaneous tissue, superficial to the external oblique muscle. The tip of the flap donor sites were closed by V to Y flap closure technique. The flaps were sutured medially, the tip of flap was sutured in the midline just superior to the base of the penis [Figure 3a-d].

RESULTS

The average age at presentation among the ten patients was 30.4 years, minimum being 17 years and maximum being 47 years. The mean follow-up period was 16.5 months. Seven out of the ten patients did not have local wound complications; the remaining three patients had mild-to-moderate wound issues, as mentioned in Table 1. We found that our technique provided adequate resilient local tissue for the closure of the lower abdominal wall in multiple layers. None of the patients developed stoma-related complications. None of the patients reported any lower abdominal wall hernia until the latest follow-up in 2021 by telephonic conversation.

| Table 1: Profile of patients included in this study | | | |
|---|---|--|---|
| Age at presentation (years) | Postoperative follow-up period (months) | Complications | Secondary procedures, if needed |
| 18 | 47 | Minimal suture line dehiscence | None |
| 38 | 65 | None | None |
| 22 | 16 | None | None |
| 45 | 4 | None | None |
| 27 | 3 | None | None |
| 19 | 5 | None | None |
| 26 | 3 | None | None |
| 17 | 5 | Marginal necrosis of T-junction | Secondary suturing |
| 45 | 9 | Necrosis of one skin flap and underlying rectus sheath | Debridement and ipsilateral inferiorly based rectus muscle flap |
| 47 | 8 | None | None |

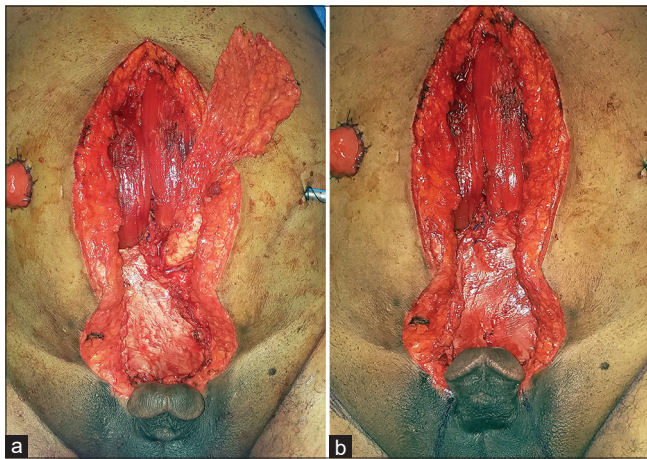


Figure 2: (a) Inset of one of anterior rectus sheath flap, followed by (b) double-breasting with the opposite anterior rectus sheath flap

DISCUSSION

Management of bladder exstrophy is best undertaken during the childhood. The surgical treatment of bladder exstrophy in children involves multiple complex and staged procedures. However, not every patient gets treatment at the ideal age. Some patients present in their adulthood. This delay in presentation may be due to the lack of facilities, financial constraints, parental illiteracy, unmotivated parents, or the lack of awareness. Management of such previously untreated adult patients is difficult and is not extensively published in the literature.

The role of plastic surgeons in these patients is mainly to provide a layered closure and reconstruction of the abdominal wall. The abdominal wall in patients with exstrophy of the bladder is deficient in the lower part of abdomen and requires a reconstruction of the skin and fascia. Fascial reconstruction is complex because of the wide pubis and the lateralized recti muscles. This distorted anatomy prevents a tension-free primary closure of the fascia and the muscle and is always prone to dehiscence. Different techniques for closure of the fascial defect have been described using alloplastic materials versus autologous tissues.

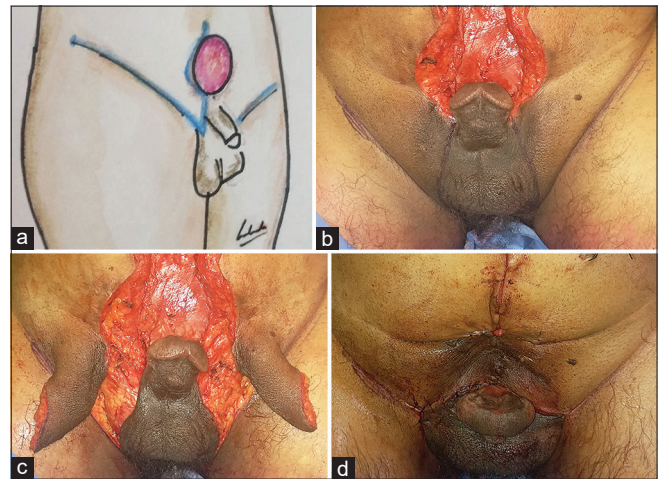


Figure 3: (a) A schematic representation of the paired inguinal skin flaps, (b) Marking of bilateral inguinal skin flaps, (c) Elevated inguinal skin flaps on both sides, (d) After inseting of the inguinal flaps bilaterally providing skin over the lower abdomen

Both synthetic^[9,10] and biological^[9] meshes are used in the reconstruction of exstrophy defects. However, a synthetic mesh is more prone to infection in the presence of contamination,^[15] which is always present in exstrophy. In comparison to the synthetic mesh, a biological mesh is relatively safe, but the associated cost is a limiting factor and is associated with higher hernia rates.

Autologous tissue has been used by various surgeons in different techniques. Pathak *et al.* published their early outcomes of bladder preservation in four adults with bladder exstrophy in 2001.^[16] They performed the abdominal closure using a crossed rectus flap (1 case), rectus sheath flap (1 case), and superficial epigastric artery fasciocutaneous flap and skin grafting (2 cases). Nerli *et al.* reported a series of 7 adult patients,^[7] five of them underwent cystectomy followed by a Mainz pouch and primary closure of the abdominal wall and two patients underwent bladder reconstruction and required crossed rectus flaps and rectus sheath flaps for the closure of the abdominal wall. Mansour *et al.*,^[6] in 2010, published their results of five adults with exstrophy of the bladder. Out of the five patients, in two of them, they were able to close the abdominal wall defect by transposing the

recti muscles, and in the other three cases, they preserved the vesical plate along with the detrusor muscle and covered it with rectus sheath, after releasing the sheaths laterally. They did not perform osteotomy in any of their patients. In 2013, Shoukry and Shoukry^[13] reported a series of five adult patients with bladder exstrophy where they achieved abdominal wall closure by fasciocutaneous M-plasty based on the superficial epigastric artery.

Primary closure of the recti muscles after detaching them from the lateral pubic region is not a desirable option as they cannot be fixed in the midline on a strong bony structure because of the pubic diastasis.^[8] Furthermore, the crossed rectus muscle closure technique^[6,7,16] is always under higher tension. Rectus sheath turnover flaps^[6-8,16] are raised from the muscles on both the sides and are sutured to the edge of the opposite rectus muscle. Because of the lateralization of the rectus muscle and a narrow caudal end, sometimes double-breasting is not possible. Further, the anterior rectus sheath turnover flap from the lower half can cause abdominal wall weakness because the posterior rectus sheath is deficient below the arcuate line. However, a single-layer closure of fascial layer is considered safe and effective in preventing a ventral hernia.^[17]

In our technique of retrograde anterior rectus sheath turndown flap, the axial pattern of blood supply is maintained. We stop elevating the rectus sheath 3–4 cm above the ASIS as maximum perforators are in the paraumbilical region. This flap maintains the integrity of the anterior rectus sheath below the arcuate line which is important and provides a two-layered fascial closure in the central part thus reducing the chances of a ventral hernia. Furthermore, since the anterior rectus sheath in the lower abdomen stays untouched, the stoma of the ileal conduit can be created satisfactorily.

After fascial closure, one needs to provide skin cover. Apart from primary closure, there are various techniques described for skin cover like primary closure and flaps like rotation

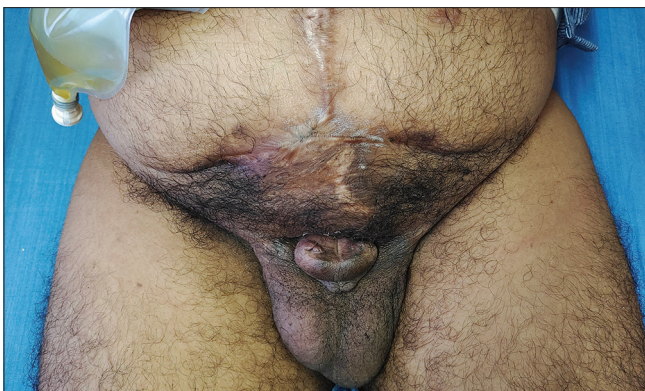


Figure 4: Well-settled inguinal flaps at 8-month follow-up providing hair-bearing skin over the lower abdomen

flap,^[4] expanded flap,^[11] bilateral paired skin flap,^[12] and M-plasty.^[13] We have utilized a bilateral paired inguinal flap for the closure because of the ease of the technique with added advantage of bringing hair-bearing skin just superior to the root of the penis [Figure 4].

Our study is limited by the short follow-up, except for two patients. This limits us from assessing the chances of postoperative hernia with our technique. In addition, our series is a retrospective analysis, however, in such rare scenarios, prospective analysis would be difficult because of the limited sample size.

CONCLUSION

Retrograde or inferiorly based turndown of the anterior rectus sheath gives multiple advantages while reconstructing the deficient lower abdominal wall in patients with exstrophy of the bladder. First, being autologous, it prevents the complications of a synthetic mesh. Second, it keeps the lower abdominal rectus sheath and muscle architecture intact, which is important for securing the stoma in place. Next, it is a relatively simple technique with a short learning curve. Furthermore, it provides a double-layered closure, on top of which, the local skin flaps provide the final cover. We feel our technique is easily reproducible, affordable and the utilization of a local skin flap saves the other potential flaps for future use in the event of an unforeseen complication.

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