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(CASE REPORT)

Combined Interposition of a Pedicled Greater Omentum Flap and a Rectus Abdominis Muscle Flap for Reconstruction of Adult Bladder Exstrophy: A Multidisciplinary Approach, A Case Report

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Abstract

Bladder exstrophy is a rare congenital malformation that is usually treated during the neonatal period. Management in adulthood becomes particularly challenging in the setting of multiple prior reconstructions and combined vesical and parietal complications. We report the case of a 26-year-old woman followed for bladder exstrophy, complicated by a vesico-parietal tissue defect with urinary leakage in the context of stone formation in an augmented bladder. She underwent reconstruction using the combined interposition of a pedicled greater omentum flap and a rectus abdominis muscle flap. The postoperative course was favorable, with resolution of the leak, complete healing at three months, and satisfactory functional outcome. This case highlights the value of this reconstructive strategy in complex forms of adult bladder exstrophy.

Keywords: Bladder Exstrophy; Abdominal Wall Reconstruction; Omental Flap; Rectus Abdominis Flap

1. Introduction

Bladder exstrophy is a rare congenital malformation belonging to the exstrophy-epispadias spectrum, characterized by failure of closure of the anterior abdominal wall and bladder, thereby exposing the bladder mucosa [1]. Its incidence is estimated at between 1 in 30,000 and 1 in 50,000 live births, with a male predominance [2]. Although management is usually undertaken during the neonatal period, some patients reach adulthood with sequelae or after multiple reconstructive attempts, making management particularly complex because of tissue remodeling and the high risk of complications [3]. In this context, mobilization of several flaps, such as the greater omentum flap and the rectus abdominis muscle flap, is an attractive option to achieve watertight closure, reinforce bladder reconstruction, and improve healing by providing richly vascularized tissues[4,5].

We report a case of reconstruction for complicated bladder exstrophy in an adult patient using two combined flaps - a rectus abdominis muscle flap and a greater omentum flap - illustrating the value of a multidisciplinary approach involving both urologists and plastic surgeons.

2. Patient and observation

This was a 26-year-old woman followed for bladder exstrophy who had undergone coverage on day 25 of life, then an augmentation enterocystoplasty combined with a continent cutaneous diversion of the Mitrofanoff type. In her recent

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urological history, 17 months earlier she had undergone flexible ureteroscopy through an antegrade approach with laser lithotripsy for a stone at the right ureterovesical junction, with placement of a right nephrostomy tube, in the setting of a solitary functioning right kidney. Eight months before admission, she then underwent mini-cystotomy with removal of a large 8-cm bladder stone, together with placement of a right double-J stent, followed secondarily by nephrostomy removal. The postoperative course was marked by delayed healing and infection of the abdominal wall, complicated by dehiscence and partial exteriorization of the bladder mucosa through the surgical wound, with urinary leakage through the previous incision **(Figure 1)**.

Figure 1 Image showing partial exteriorization of the bladder mucosa through the operative wound in our patient

Figure 2 Axial abdominopelvic CT scan showing a vesical wall defect involving the anteroinferior bladder wall

In view of this presentation, a right nephrostomy was performed to dry out the wound. The patient was admitted to our department for management of this postoperative complication. Clinical examination and imaging demonstrated a vesical and parietal tissue defect involving the anteroinferior bladder wall, with migration of the distal segment of the

double-J stent into an extravesical position in the hypogastric region, as well as persistent stasis stones within the right pyelocaliceal cavities **(Figure 2).**

Figure 3 Intraoperative view of the pedicled greater omentum flap after harvesting

Figure 4 Intraoperative view of the vesico-parietal reconstruction field after dissection and preparation of the planes

Figure 5 Intraoperative view of the reconstruction after interposition of the greater omentum flap and transposition of the rectus abdominis muscle flap

Figure 6 Intraoperative appearance after double vesico-parietal coverage using a greater omentum flap and a rectus muscle flap

Figure 7 Postoperative image showing the quality of abdominal wall closure

Figure 8 Image showing the postoperative result at 3 months with complete healing

After multidisciplinary discussion, repeat surgery with vesico-parietal reconstruction was decided. The procedure was performed under general anesthesia, with the patient in the supine position. Reopening of the previous infraumbilical midline incision allowed access to the bladder. After layer-by-layer opening, difficult dissection of the bladder walls was carried out, followed by freshening of the wound edges. Bladder closure was performed in two layers using absorbable sutures. However, a small distal keratinized area remained unsuturable, leaving a pinpoint orifice whose watertightness was considered satisfactory on intraoperative testing.After creating a sufficiently large opening in the abdominal aponeurosis, the greater omentum was identified and carefully dissected. The greater omentum flap was then raised in the standard fashion, while preserving sufficient length to ensure good bladder coverage and reinforce the sutures initially placed on the bladder. The flap was spread over the entire bladder surface **(Figure 3)**. After confirming on CT angiography that the inferior deep epigastric arteries were patent, and verifying by handheld Doppler that perforators were present, a left rectus abdominis muscle flap was raised while preserving the anterior sheath. Preservation of the

anterior sheath made it possible to maintain good abdominal wall tone despite the absence of the muscle. The muscle flap was turned over on itself, as shown in **Figures 4-6**, thereby providing a second richly vascularized tissue and maximizing the patient's chances of healing while reducing the risk of recurrence.In summary, the combined reconstruction was based on double coverage: the bladder was first covered with the omentum, fixed with interrupted sutures, and this assembly was then reinforced with the purely muscular rectus abdominis flap, which was also fixed in place, ensuring solid and well-vascularized bladder coverage. Double drainage (prevesical and aponeurotic) was placed. A suprapubic bladder catheter and a urethral catheter were left in place. The anterior aponeurosis was sutured to the posterior sheath with a running slowly absorbable monofilament suture to avoid ventral hernia. Abdominal wall closure was performed in three layers **(Figure 7)**. The immediate postoperative course was uneventful, allowing discharge on postoperative day 5. Clinical and biological evolution was favorable, with normal renal function. Secondary removal of the prevesical and subaponeurotic drains was performed without complication. At three months of follow-up, there was no recurrence of bladder mucosal exteriorization and no urinary leakage. With good abdominal wall tone, the functional result was satisfactory, and the patient reported clinical satisfaction; healing was complete, with the midline incision almost invisible and leaving a fine white scar **(Figure 8)**. Flexible ureteroscopy with laser lithotripsy of the residual stones in the right pyelocaliceal cavities was scheduled secondarily.

3. Discussion

Bladder exstrophy is a rare congenital malformation of the exstrophy-epispadias complex, usually managed during the neonatal period [1,2]. The occurrence of a complex situation in adulthood remains uncommon, but poses particular difficulties related to prior reconstructions, scar-related tissue remodeling, and the high risk of vesico-parietal complications [3]. Our case illustrates this problem in a patient who had already undergone multiple operations, in an associated context of urinary stone disease and a solitary functioning kidney.In such patients, the difficulty is not limited to the initial malformation alone, but also to the cumulative burden of tissue injury. In our case, neonatal closure, augmentation enterocystoplasty, the Mitrofanoff conduit, endourological procedures, and surgery for bladder stones resulted in profoundly altered anatomy, with abdominal wall infection, mucosal exteriorization, and cutaneous urinary leakage. Recent data from Harris et al.[6] are particularly informative in this regard: in classic exstrophy, an increasing number of mucosal violations - that is, repeated openings and closures of the bladder mucosa - is associated with a marked increase in fistula risk, with an odds ratio of 5.1 per violation on multivariable analysis. Although our patient did not strictly fall within the bladder neck closure scenario studied in that series, the biological principle appears transposable: a bladder that has already been opened, augmented, and reoperated on should be regarded as high-risk tissue for dehiscence and failure of simple closure.The lithiasic context was not merely an associated feature, but rather one of the markers of the complexity of the reconstructive field. Patients with an augmented bladder or a continent diversion accumulate several factors favoring stasis, infection, mucus production, and stone formation. In a cohort of 107 patients with augmented bladders, Szymanski et al.[7] showed stone recurrence in nearly half of cases, with particularly high risk during the first few years. In our patient, the succession of stone episodes, together with a solitary functioning right kidney, reinforced the need for a cautious strategy aimed primarily at controlling urinary leakage and securing the reconstruction.In this setting, the objective was not only to obtain an intraoperatively watertight suture, but above all to create the best possible conditions for solid and durable healing. This is precisely the value of well-vascularized interposition tissues. The greater omentum offers several advantages that are useful in complex reconstructive urological surgery: it is pliable, richly vascularized, helps obliterate dead space, and effectively separates the urinary plane from the abdominal wall plane [5,8]. For its part, the rectus abdominis muscle flap has already demonstrated its usefulness within the exstrophy spectrum, particularly in situations at high risk of dehiscence or recurrent fistula [4,9]. More recently, Harris et al.[6,9] showed that the rectus flap was particularly suitable for preventing and repairing fistulas after bladder neck closure, with a success rate of 97.1% in their cohort. The authors emphasize that the rectus muscle can cover the anteroinferior axis of the bladder and the pelvic floor, which is particularly relevant where the risk of fistula recurrence is high. Again, this is a technical setting different from ours, but the demonstration remains instructive: when tissue viability is compromised, a pedicled muscle transfer can make the reconstruction safer and more durable.The main advantage of this approach lies in its complementarity: the omentum provides pliable and well-vascularized interposition in direct contact with the bladder, whereas the rectus abdominis muscle flap strengthens abdominal wall coverage and provides additional tissue support. Although published data on this combination in adults remain limited, this strategy appears logical in reoperative settings involving scarred, infected, or fistulized tissue. In our case, the postoperative course was favorable, with disappearance of urinary leakage, complete healing at three months, and satisfactory functional outcome. This observation suggests that combined interposition of greater omentum and rectus abdominis muscle flaps may represent a useful option in the management of complicated forms of adult bladder exstrophy. Nevertheless, this is an isolated case, and longer follow-up together with additional reports will be necessary to better define the place of this technique in routine practice.

4. Conclusion

Complicated bladder exstrophy in adults represents a major reconstructive challenge. The combination of a greater omentum flap and a rectus abdominis muscle flap, integrated into a multidisciplinary approach, may constitute an attractive option in selected situations.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

Contributions of authors

All authors contributed to the preparation of the manuscript and read and approved the final version.

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