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Eroded tape: the case for an early vesicoscopy rather than laser melting

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Abstract

Objective: To report our experience on vesicoscopic excision of eroded foreign material in the bladder.

Materials and Methods: The use of xenografts in female urology is becoming more prevalent and so are their complications. Erosion of foreign material into the bladder often goes unrecognized for a long time and patients are troubled by irritative urinary symptoms, recurrent infections and stone formation. The treatment of such erosions is traditionally reported through the transurethral route using LASER or electrocautery to cut the foreign material. Such methods have a high rate of incomplete material removal and as a result a high recurrence rate. Leaving a urothelial defect results in prolonged time to symptoms resolution. Between 2012 and 2015, 5 patients were referred for tertiary care to King's College Hospital and Polyclinic Ygia with eroded tapes; all patients had undergone a variety of endoscopic, vaginal and/or open attempts for mesh removal that failed. We offered vesicoscopic excision of the eroded portion of the tape.

Results: We here report 5 cases referred to our team with tape erosions that were treated with vesicoscopic excision of the material and primary closure of the urothelial defect. The foreign material was completely removed in all cases and there is no recurrence at a median follow-up of 30 months.

Conclusion: Vesicoscopic excision of bladder eroded foreign material is feasible and efficient. We recommend this technique to be considered as primary approach to tapes eroding into the bladder.

Introduction

The use of xenografts for the repair of pelvic organ prolapse and stress urinary incontinence is becoming more and more popular.¹ Complications of these procedures are therefore becoming more prevalent. One such complication is the exposure of the mesh material into the urethra and urinary bladder, which occurs in about 1-5% of cases and poses a challenge to the surgical profession.^{2,3} The challenge relates to the often delayed recognition of the mesh exposure/erosion which can occur many years after tape insertion by which time the mesh is truly adherent to native tissues; also there is a need for complete material removal maintaining integrity of the urinary tract and hopefully continence.^{3,4} Various surgical techniques have been reported for mesh removal.³⁻⁶ The most widely reported is the transurethral approach either using electrocautery for division/resection of the tape^{7,8} or Holmium Laser⁹⁻¹². This approach although minimally invasive has a high rate of incomplete mesh removal and recurrence of mesh exposure and symptoms.⁹ We, here, report and propose our technique with vesicostomy as the preferred procedure for removing eroded bladder mesh and we review the available literature.

Material and methods

Between 2012 and 2015, 5 patients were referred for tertiary care to King's College Hospital and Polyclinic Ygia with eroded tapes; all patients had undergone a variety of endoscopic, vaginal and/or open attempts for mesh removal that failed. We offered vesicostomy excision of the eroded portion of the tape.

The vesicoscopic technique

We have described a similar technique for the repair of vesicovaginal fistulae.¹³ The patient is positioned supine with the legs in the Lloyd Davies position to allow transurethral and vaginal access if required. General anaesthesia with intravenous antibiotic cover is provided. The bladder is insufflated with carbon dioxide via a 16ch urethral catheter. The initial insufflation pressure is set at over 15mmHg to make sure the bladder is well distended and tense to allow safe placement of the ports. The initial port is placed 2cm above the symphysis pubis in the midline and below any existing scars. A transparent 5mm port with blunt optic trocar is used to allow safe insertion under direct vision. The other two 5mm ports are inserted on either side of the midline port also under direct vision (Figure 1a). A 5mm laparoscope is inserted into the right hand port and controlled by a robotic camera holder- Freehand™ (Figure 1a). The left and midline ports are used by the surgeon sitting on the left side of the patient. The narrow but sufficient triangulation allows the use of standard laparoscopic instrumentation. The bladder is suspended on the anterior abdominal wall with monofilament suture using an endoclose device. The urethra can be used by an assistant as a fourth 'natural orifice' port if required (figure 1c). This fourth instrument facilitates bladder suspension at the beginning of the procedure but also for tape traction during tape dissection and excision and even bladder suturing with a laparoscopic needle holder. Bladder wall and tape dissection is performed until closure of the urothelium permits exclusion of any foreign material/tape from the bladder lumen. The specimen can be retrieved through the urethra. Excision of tape and bladder edge

mobilization are carried out using a harmonic scalpel; the bladder urothelial defect is closed with 2/0 or 3/0 monofilament absorbable suture on a 22 mm half-circle round-bodied needle using the Mignot-Grange extracorporeal knotting technique. A 14Fr suprapubic and urethral Foley catheters are inserted at the end of the procedure.

Results

Five female patients were identified. The median age was 61 years old (range 48-72 years). Four patients had tape erosion after tension-free vaginal tape (TVT) and one patient had synthetic sling erosion after an open suprapubic procedure. All patients had at least one previous failed attempt of transurethral mesh removal. The time from the original prosthetic surgery to the vesicoscopic successful mesh removal varied from 36 to 60 months (median 44 months). The visible eroded tape was unilateral in all cases; in one case there was a contralateral bladder mucosal inflammation and no visible tape. The synthetic sling following the open procedure eroded into the urethra as well. The median operating time was 140 mins. The estimated blood loss was reported as minimal in all cases. The median hospital stay was 2 days. The urethral catheter was removed when the haematuria had resolved and the suprapubic catheter was left in situ for 10-14 days.

The visible mesh was removed completely in all patients. One patient required a second procedure to remove a suburothelial but not visible mesh that caused inflammation and resulted in persistence of storage symptoms. There were no post-operative

complications. Resolution of symptoms without recurrence of incontinence was reported by all patients at 6 weeks, apart from the patient requiring a second procedure but she was symptom free following that second operation. At a median follow-up of 30 months all patients were symptom free and on flexible cystoscopy there was no recurrent tape erosion.

Discussion

Mesh eroding into the bladder and the urethra following incontinence and pelvic organ prolapse surgery is a well-recognized complication. The etiology is unclear but there may be host factors such as local tissue atrophy from menopause, previous operations or radiotherapy and technical factors such as direct injury and perforation with the tape applicators or excessive tension of the mesh resulting in cheese wiring through tissues.³ Despite its wide recognition and increasing prevalence, diagnosis is often delayed and patients suffer storage symptoms, haematuria and pain for a long time. The interval between initial surgery and diagnosis is reported to be from 3 months to as long as 11 years.³ The diagnosis, however, is simple and the gold standard diagnostic test is flexible cystoscopy.^{1,3} Cystoscopy will demonstrate a mesh/tape visible under an intact urothelium, moderate to severe inflammation, superficial encrustations, proper stones or even a clearly exposed foreign material.

The first reported case of an eroded TVT tape in the bladder was by Koelbl et al. in 2001.¹ Since then, many small series and various techniques for removal of the mesh

have been reported and described with varying success. The most widely reported technique involves the transurethral route (Table 1). Some report the use of a resectoscope to cut and resect the mesh with the submucosal tissue. Jo et al.² reported on 16 such cases with a 94% complete removal of the mesh and a 6% recurrent erosion at 2 months. Equally good results using the same or similar technique are reported by Sergouritis et al.⁷ They reported nine cases of eroded tape with an 88% complete mesh removal. One of the limiting factor of the transurethral techniques is the lack of a second instrument to apply manual traction on the mesh and facilitate cutting it and removing it completely. The latter group reported an interesting technical tip that allowed them to apply transurethral traction on the mesh using a monofilament suture. The monofilament suture was inserted at the beginning of the procedure with a cystoscope through a 5Fr ureteric open ended catheter to pass it through the interstices of the mesh. Cormio et al.⁴ reported on the use of an extra suprapubic access using an Amplatz sheath to allow traction on the mesh during transurethral mesh incision/excision using a resectoscope and Collins' knife.

A more widely reported and popular technique involves again the transurethral route but using the Holmium Laser to cut the mesh (TEEH). This was first reported in 2004 by Hodroff et al.¹⁰ It is another minimally invasive technique with rapid recovery but the reported success of complete mesh removal in some series is low and there seems to be a high recurrence rate (Table 1). Davis et al.¹² reported on 12 patients which is the largest series. Four patients (33%) required a second endoscopic procedure for residual mesh removal and one required an open procedure. They reported no

recurrence of erosion at a median follow-up of 65 months. Others have reported a residual mesh rate of 0-71% and a recurrence rate of 0-67%.⁹ The series reporting 0% recurrence are the smaller series with a cohort of less than 5 patients and a short follow-up of less than 3 months.^{3,6,8,10} Ogle and colleagues⁶ report a significantly higher recurrent erosion rate with urethral erosions (67%) than with bladder erosions (20%) at sufficiently long median follow-up of 27 months. Another interesting argument is the use of Holmium LASER outside the approved CE and FDA intended use. It is quite possible that there may be serious complications associated with melting polypropylene and this could affect the bladder wall. In addition there could even be long-term concerns regarding carcinogenesis. We could find no published data on the safety of any byproducts when using LASER for cutting/melting mesh/tape material.

We have all seen cases where one incomplete endoscopic removal is followed by another and then by an open procedure and even eventually followed by loss of renal units when the ureter is involved. We, believe, that the vesicoscopic approach offers an alternative minimally invasive approach with certain advantages; the biggest advantage being the ability to completely remove the mesh at one procedure. The use of multiple instruments allows for tape traction at the time of the excision and hence enables for a higher rate of complete mesh removal. It also allows for better visualization of the eroded material; erosion often occurs at the bladder neck which is difficult to visualize and access with rigid endoscopes inserted transurethrally. The multi-instrumental nature of vesicoscopy also allows for closure of the defect created by the mesh removal. This should reduce the risk of re-erosion because the cut ends of the mesh are covered by

healthy urothelium. Closing the defect also results in quicker recovery from symptoms and reduces post-operative haematuria. These are all important practical and not only theoretical advantages that make vesicoscopy a superior technique to the other published techniques. It is however an underutilized and underreported technique; may be because urologists are more familiar with the transurethral route and transurethral instruments. The first reported series of vesicoscopic removal of eroded bladder material was by Al-Badr and Fouda in 2005.¹⁴ Since then, there have been a few small series amounting up to a total of 16 cases.^{5,15-17} The mesh was removed completely in all reported cases with a recurrent erosion rate of 5% (Table 2). The only recurrence reported is by the largest reported series in the literature with 9 cases.⁵ Within this series single port vesicoscopy was used. Our series is the second largest vesicoscopic series reported in the literature with 5 cases that brings up the total number of literature reported cases to 21. Our results are consistent with the other reported series, showing outstanding results with complete mesh removal in all cases and no recurrence at a median follow-up of 30 months. In our practice we now consider vesicoscopy as the primary approach for bladder eroded mesh/tape.

Conclusion

It is evident from the literature that transurethral excision of eroded synthetic material in the bladder and urethra has limitations and results in high rates of incomplete removal of the material and high rate of recurrent erosions. We report vesicoscopy, in tertiary referred patients, with previous failed transurethral attempts of mesh removal, to be safe and effective as a single procedure. We, therefore, recommend that vesicoscopy is

considered as a primary attempt to remove foreign material eroding into the lower urinary tract in order to avoid multiple procedures and unnecessary stress for the patients whilst maintaining the faster recovery of minimally invasive techniques.

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Figure 1. (A) Position of the ports for vesicoscopic removal of an eroded mesh. (B) The mesh was visible on initial vesicoscopy, with the foreign material clearly visible, penetrating the urothelium into the bladder cavity (arrows). (C) Excision of the foreign material with traction using an instrument through the urethral. (D) The mesh is carefully released from all attachments in depth (arrow). (E) Following excision, the bladder defect (arrow) is inspected for any residual mesh material. (F) Closure is achieved by absorbable sutures. In the above case, a JJ stent was placed to ensure patency of the ureter due to its proximity to the excision site.

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Table 1: Published series on transurethral removal of eroded mesh using electrocautery or Holmium Laser. TUR-E: transurethral removal using electrocautery. TEEH: transurethral endoscopic excision using the Holmium laser.

AUTHORSHIP	TECHNIQUE	COHORT (N)	RESIDUAL MESH RATE (%)	RECURRENT EROSION RATE (%)	FOLLOW-UP (MONTHS)
Sergouniotis et al. (7)	TUR-E	9	12%	---	---
Frenkl et al. (8)	TUR-E	7	50%	---	---
Jo et al. (2)	TUR-E	16	6%	6%	2
Jo et al. (2)	TEEH	7	71%	29%	2
Doumouchtsis et al. (9)	TEEH	6	0%	67%	12-36
Velemir et al. (3)	TEEH	4	25%	25%	6-24
Frenkl et al. (8)	TEEH	4	50%	---	---
Hodroff et al. (10)	TEEH	3	0%	0%	1
Giri et al. (11)	TEEH	3	0%	0%	3-12
Ogle et al. (6)	TEEH	10	---	37%	14-32
Davis et al. (12)	TEEH	12	33%	0%	6-134
TOTAL		81	0-71%	0-67%	1-134

Table 2: Published series on vesicoscopic removal of bladder eroded mesh

AUTHORSHIP	TECHNIQUE	COHORT (N)	RESIDUAL MESH RATE (%)	RECURRENT EROSION RATE (%)	FOLLOW-UP (MONTHS)
Kim <i>et al.</i> (15)	Vesicoscopy (3x5mm ports)	3	0%	0%	5-9
Al-Badr and Fouda (14)	Vesicoscopy	1	0%	0%	6
Ingber <i>et al.</i> (16)	Vesicoscopy (Single-port)	1	0%	0%	3
Yoshizawa <i>et al.</i> (17)	Vesicoscopy	2	0%	0%	18
Roslan <i>et al.</i> (5)	Vesicoscopy (Single-port)	9	0%	11%	19
Grange <i>et al.</i> (current series)	Vesicoscopy	5	0%	0%	30
TOTAL		21	0%	4.7%	3-30

Editorial Comment: Eroded Tape: The Case for an Early Vesicoscopy Rather Than Laser Melting

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The authors present a small series of 5 patients with mesh erosions into the bladder following midurethral sling surgery. As this is a common procedure performed by the urologic surgeon, one should be familiar with the complications that may arise from this minimally invasive technique. Vaginal erosions are more commonly seen and are typically diagnosed rather early in the post operative period. However, intravesical exposure of the mesh tape is far less common and not as easily diagnosed. One must have a high index of suspicion, despite a negative cystoscopic examination at the time of sling placement, as a tape may erode into the bladder well beyond the normal post operative period. As the authors have identified, intravesical erosions may occur within months to years after placement.

There are a variety of techniques to remove intravesical mesh, from transurethral resection to holmium laser excision (TEEH)¹. However, this approach generally allows for a single instrument to be used through the urethral. Some have advocated placing a second instrument through a suprapubic access site utilizing either a laparoscopic trocar or Amplatz sheath². This allows the manipulation of the mesh for more extensive removal. The authors present an alternative method utilizing a transvesical approach with multiple instruments. This can either be done by standard laparoscopy or utilizing a robotic assisted approach.

The authors suggest that a transurethral approach with a holmium laser may limit the amount of mesh that can be removed from the submucosal plane. Additionally, it does not allow for direct immediate closure of the urothelial tissue by suture. Hence, the recurrence rate may be higher with by TEEH. The

literature reports recurrence rates between 0 and 67%, while the intravesical approach is considerably lower at 4.75% with a followup of up to 30 months in the present series.

It would appear that a transurethral approach (TEEH) would seem reasonable if there is limited amount of mesh to remove, as well as there are no other technical considerations such as location to the ureteral orifices, bladder neck, or urethra. However, as in the present series with prior TEEH failure, it would seem with large volume of mesh, a transvesical approach is technically feasible with limited risk and a low rate of complications. The median length of hospitalization was 2 days and all had the catheter removed by 2 weeks. This is presently the approach we utilize at our institution when faced with intravesical mesh. This allows for a multi-instrument procedure with primary closure of the urothelium under direct vision. In addition, it allows for a complete examination of the bladder and any unanticipated anatomical concerns.

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