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ORIGINAL

Treatment of postoperative complications of anti-incontinence sling surgery

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ABSTRACT

TREATMENT OF POSTOPERATIVE COMPLICATIONS OF ANTI-INCONTINENCE SLING SURGERY

Reports on postoperative complications of anti-incontinence surgery have begun to be published in parallel to the proportional increase in the use of the sling procedure for stress urinary incontinence. In this paper, we describe the most frequent complications, such as obstruction, pelvic hematoma, bladder and urethral injuries, to facilitate the management of these complications.

Keywords: Anti-incontinence surgery. Complications. Slings.

The use of slings for the treatment of stress urinary incontinence was proposed in the first half of the 20th century, but it did not gain popularity until recently, starting in the decade of the 70s. This was directly related to progress in knowledge of the pathophysiology of stress urinary incontinence and, in particular, the urodynamic study. Although the classic indication of slings was related to cases of intrinsic sphincter deficiency, their indication in women with urethral hypermobility is became increasingly common owing to the excellent results obtained with this technique after prolonged follow-up, and even more so when compared with other techniques such as abdominal colposuspension, endoscopic bladder neck suspension and vaginal colpoperineoplasty.

Meanwhile, the growing case mix resulted in a directly proportional increase in reports on sling-related morbidity, where bladder dysfunctions and bladder outlet obstruction were the most frequent complications. Another possible determining factor in this morbidity is the large variety of materials proposed for construction of the slings, with very diverse biological behavior.

HISTORICAL OUTLINE

Historically, different materials were used, such as body tissues (fascia lata 34, anterior rectus fascia 35), for the purpose of reducing erosions; however, dissection of the tissues increased surgical time and morbidity and consequently tissue-based slings have gradually fallen into disuse.

Different nonabsorbable synthetic materials were used for the treatment of stress urinary incontinence such as Marlex, Mersilene, Teflon, Silastic, Prolene, Nylon, and Gore-Tex. Dissimilar results were obtained depending on the material used since some were not well tolerated and had higher rates of vaginal and vesicourethral infections and erosions.

From the late 70s to the early 90s, use of string procedures was restricted to cases of recurrent incontinence since, in spite of a cure rate of 91%, they were considered techniques with a high risk of erosion and postoperative urinary obstruction.

In 1995 Ulmsten proposed a new technique called “tension-free vaginal tape”. This technique was based on a tension free procedure, which reduced the risk of sling erosion and the rates of urinary retention and difficulty in the postoperative period.

Another important factor was the choice of the mid- or distal urethral instead of the bladder neck for placement of the sling, together with the use of macropore monofilament polypropylene meshes, as this is a material that generates low rates of erosion, infection and rejection.

As for complications of the two most used surgical techniques, transobturator sling (TOT) and retropubic midurethral sling (TVT), a significant reduction in postoperative urinary retentions and de novo urgency incontinence was observed with TOT. These retentions appear to be related to the type of sling used and the postoperative technique.

In the study of Deng et al. (2007) in a total of 11,806 patients and which compared the TVT and TOT approaches and their complications, complications were reported in 7.8% of patients (928 patients) involving 700 TVT, 66 SPARC, 1 TVT-O, 149 ObTape y 12 Monarch slings, thus demonstrating that the transobturator technique has fewer postoperative complications.

BLADDER OUTLET OBSTRUCTION

Pathophysiology

Bladder outlet obstruction after sling surgery can occur through two basic mechanisms which may eventually coexist in the same patient: (a) excessive tension applied to the urethra and (b) underestimation of associated urogenital prolapses in the preoperative period.

Between the detrusor and bladder mucosa, there is a separate layer of smooth muscle and elastin that extends from the trigone, called trigonal ring, which is considered to be the principal determinant of bladder neck closure during filling[10]. Conversely, during voiding, the coordinated contraction of the trigonal ring results in narrowing of the bladder neck, facilitating emptying. This mechanism is basically mediated by alpha-adrenergic nerve fibers that stem from thoracolumbar spinal cord centers (T11 to L2) and whose impulses are conducted through the hypogastric nerve[32]. The classic pubovaginal slings, applied in the region of the bladder neck, hinder this process, usually leading to a significant increase in detrusor pressure during voiding. Thus, small differences in the tension applied to the sling can alter this equilibrium of pressures, which is expressed in the form of urinary retention or, more frequently, through irritative urinary symptoms[15].

Anatomical support of the urethra, the bladder neck and the posterior wall of the bladder comes primarily from the fascia of the levator ani muscle, which inserts laterally into the arcus tendineus next to the ischiopubic ramus. Around the urethra, condensations of this fascia, give rise to the urethropelvic and pubourethral ligaments[25]. Posteriorly, the fascia of the levator ani muscle extends over the posterior bladder wall to the uterine cervix, being designated as the pubocervical fascia, which is responsible for support of these structures and also of the anterior vaginal wall (Fig. 1). Maintenance of the vesicourethral axis, determined by the pubocervical fascia, is fundamental for normal voiding. When there is a disruption in bladder support, either from central laceration of the pubocervical fascia or from a defect in its lateral insertion into the arcus tendineus, creation alone of a sling with adequate tension may intensify bladder rotation during the increase in abdominal pressure around the fixed urethra (Fig. 2), leading to bladder outlet obstruction[23]. The incidence of obstruction is directed related to the degree of prolapse, and an incidence of up to 72% has been estimated in cases of grade 3 and 4 cystocele[2]. Patients with clinical symptoms of bladder outlet obstruction following sling surgery should therefore be carefully evaluated with regard to the presence of genital dystopias because they may be directly related to this clinical condition.

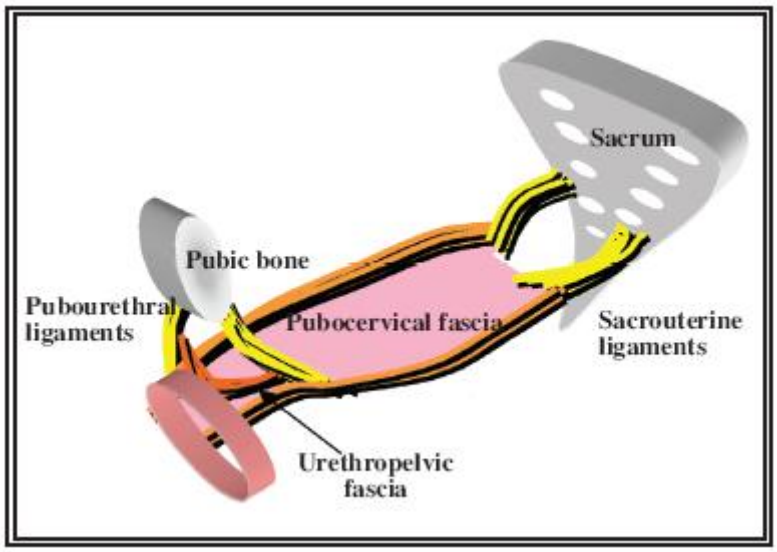

FIGURE 1. Bladder support, provided by the pubocervical fascia, should be carefully evaluated before performing the sling procedure to prevent bladder outlet obstruction.

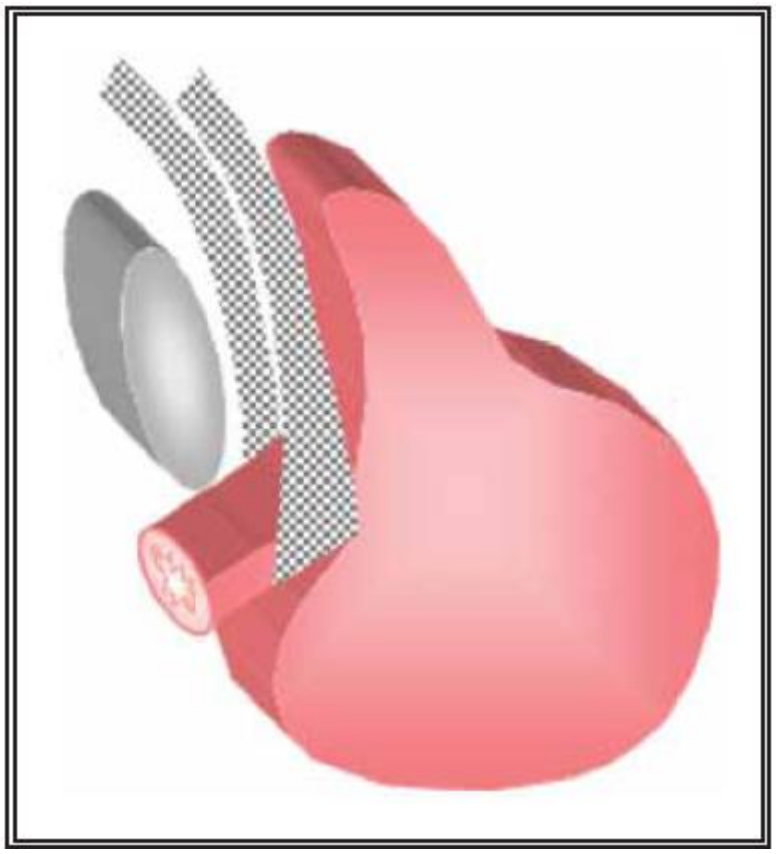

FIGURE 2. Bladder outlet obstruction following sling surgery, with moderate cystocele not corrected simultaneously

True urethral stricture is not present in the situations described above, although the obstructive process may rarely result in narrowing of the urethral lumen secondary to a sutures applied close to the urethra, local urinary loss or injury by the urethral catheter. Urethral stricture is particularly more frequent with heterologous biological and synthetic slings because of the higher incidence of infectious complications and urethral erosion[14-24].

Diagnosis

Several studies have shown a significant increase in the diagnosis of bladder outlet obstruction in women, but the diagnostic criteria have still not been fully clarified. The classic symptoms of weak intermittent stream and difficulty to initiate urination are reported by women in hardly 40% of cases[17]. In contrast, irritative symptoms, including dysuria, frequency, urgency and urgency incontinence are reported by 75% of patients with this condition[7]. The medical history should investigate the need for the patient to adopt a certain decubitus position or to reduce digitally their genital prolapse to facilitate bladder emptying[12].

The general physical examination should verify the presence of a palpable vesical globus. The gynecological examination should be performed carefully and include bimanual palpation and mirror examination. The presence of cystocele should be verified, if necessary with the patient in a semi-orthostatic position. In cases of hypercorrection, it is common to observe and an excessive urethral angle with respect to bladder body, and in some cases, retraction of the urethral meatus toward the vaginal introitus.

As most patients do not have true urethral stricture, use of urethroscopy for its diagnosis is unnecessary and generally not recommended. Although voiding urethrocystography in an orthostatic position may document the point of obstruction, it consists of a static examination, which often reduces its sensitivity to a large extent in comparison to fluoroscopy.

Up to now, there is no consensus on the urodynamic parameters that should be used to establish this diagnosis[3]. Several authors proposed the definition of obstruction based on exclusively urodynamic criteria (pressure-flow study), in general by correlating peak urinary flow and detrusor pressure at peak flow[11]. On the other hand, because of the great diversity of the female voiding pattern considered normal, establishing urodynamic parameters that can characterize the diagnosis of bladder outlet obstruction in women is not a simple task[4]. Despite these difficulties, a nomogram for evaluating patients with suspected bladder outlet obstruction was recently proposed by Blaivas & Groutz (Fig. 3), which uses as parameters maximum detrusor pressure during voiding and maximum flow obtained prior to urethral catheterization. In spite of its statistical rigor and coherence with pathophysiology, its value is still undetermined[3]. The use of videourodynamics allows urodynamic parameters to be associated with fluoroscopy, and appears to be the most sensitive method for diagnosis to date as well as permitting demonstration of the exact point of obstruction. Videourodynamic studies also allow precise evaluation of the influence of urogenital prolapses on the bladder outlet obstruction through simulation of voiding after its correction by means of the insertion of a vaginal pessary before the voiding phase[9-18].

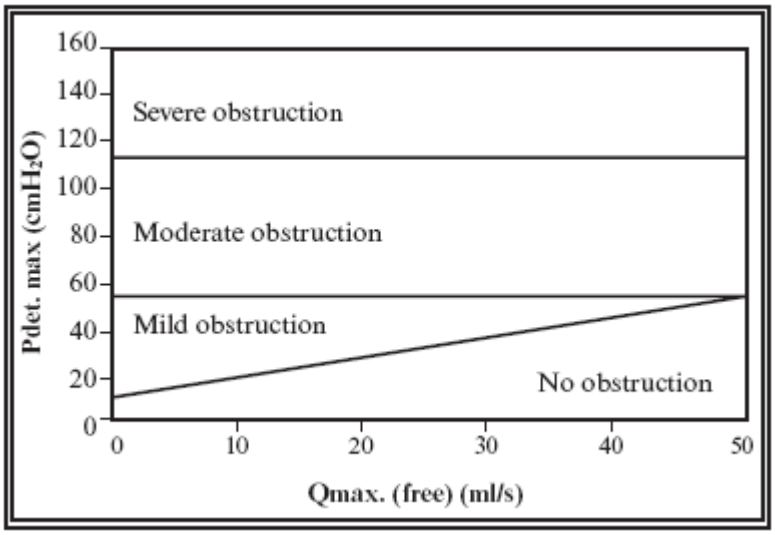

FIGURE 3. Blaivas & Groutz nomogram for diagnosis of bladder outlet obstruction in women.

Treatment

As there is still no consensus on diagnosis in spite of the attempts at standardization based on objective urodynamic criteria, any critical analysis of the results obtained with different forms of treatment for bladder outlet obstruction in women has limitations. The therapeutic approach will differ depending on the time between sling placement and the suspicion of obstruction.

The occurrence of voiding dysfunction or temporary urinary retention after pubovaginal slings is relatively common[16-29]. The initial approach should be conservative until the first two months after the procedure. After disappearance of pain and reduction of local edema, these symptoms resolve spontaneously on most occasions without the need for operation[28]. Significant urinary retention should be managed with self-catheterization during this period. Those cases in which symptomatology persists should be evaluated carefully. The diagnosis of bladder instability is not significant from the therapeutic point of view due to the fact that these women do not respond to the use of anticholinergics or other conservative approaches[16]. The classic treatment of bladder outlet obstruction following sling surgery is urethrolysis. Various techniques of urethrolysis were proposed, with either abdominal or vaginal access (suprameatal or transvaginal). Irrespective of the approach used, this procedure has the purpose of dissecting all possible periurethral adherences, particularly those existing between the urethra and the inferior aspect of the symphysis pubis (Fig. 4)[33]. Success rates for the different techniques of urethrolysis are similar, and range from 70 to 80%[5-19,20-22]. Transvaginal urethrolysis has the advantage of less morbidity over the retropubic approach[19], without the risk of bleeding involved in suprameatal access due to the venous plexus of the clitoris. Transvaginal urethrolysis seems to be more successful in obstruction secondary to needle suspension (71%) and retropubic urethropexy (63%), when compared to that secondary to pubovaginal sling (50%)[19]. In cases with significant periurethral fibrosis or failed prior urethrolysis, interposition of a Martius labial fat pad flap, pediculated on the external pudendal artery between the urethra and the symphysis pubis, is indicated (Fig. 5a and 5b). This maneuver represents an important resource to prevent the scarring process from causing new urethral adherences to the inferior aspect of the symphysis pubis and which may be postponed in the first approach to the patient[20]. Even though some authors routinely recommend the combination of a new sling at the time of urethrolysis, the likelihood of incontinence after this procedure is rare, occurring in less than 5% of cases[30].

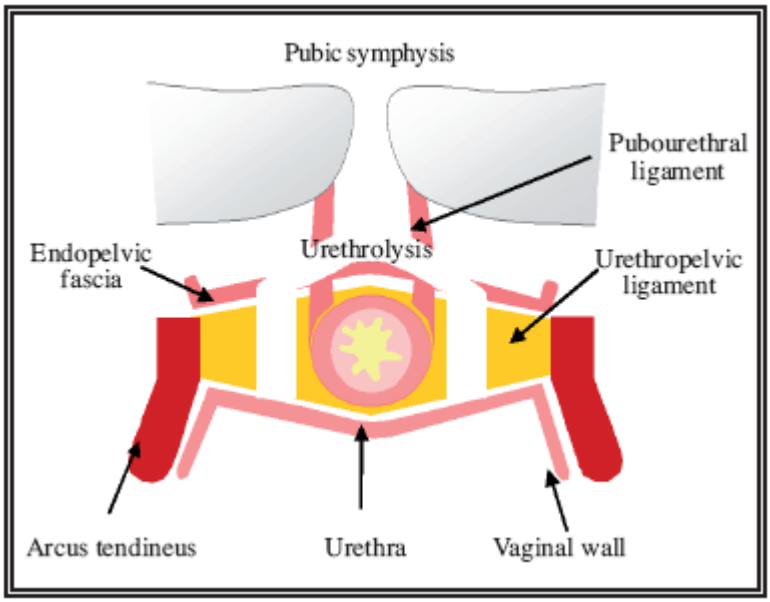

FIGURE 4. In transvaginal urethrolysis, dissection of adherences existing between the urethra and/or pubic bone is performed.

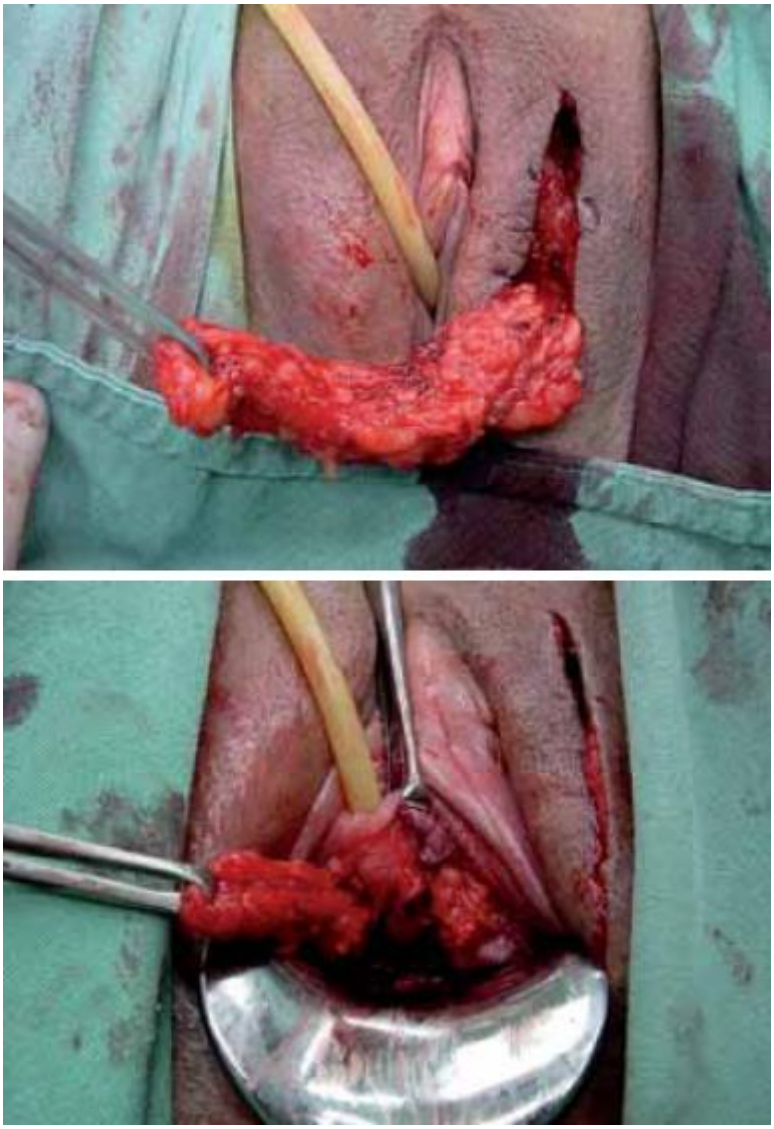

FIGURE 5 A AND B: A Martius fibrofatty flap may be interposed between the urethra and the pubic symphysis to prevent recurrent obstruction after transvaginal urethrolysis.

Eventually, the possibility of permanent clean intermittent catheterization should be considered as a more appropriate therapeutic option in selected patients, such as those with significant bladder hypocontractility subsequent to repeated failed prior urethrolysis or patients with significant comorbidities precluding any surgical procedure.

PELVIC HEMATOMA

Any surgical procedure may be accompanied by significant bleeding caused by the particular conditions of the patient, such as the use of platelet antiaggregants, or by particularities of the surgical procedure itself. In anti-incontinence surgery with placement of a sling, the moment most prone to bleeding is during perforation of the endopelvic fascia by the needle that will be used to suspend the ends of the sling. The surgeon should be prepared to control intraoperative bleeding at all times.

A meticulous surgical technique and knowledge of the anatomy are key principles to prevent

heavy bleeding.

In some situations, such as in the presence of significant arterial or venous bleeding, more vigorous hemostasis becomes necessary, otherwise, more conservative measures are sufficient. Katske and Raz described the insertion of an intravaginal Foley catheter and inflated the balloon with 30-90 ml of water to control significant bleeding (Fig. 6)[13]. In other situations, such as bleeding from the retropubic space, temporary insertion of gauze plug in this site, which frequently provided adequate tamponade. Simple sutures are necessary in the presence of bleeding in difficult to clot bleeding points in the vaginal and urethral wall.

FIGURE 6. Intravaginal Foley catheter to tamponade bleeding.

Significant bleeding, with the formation of hematomas capable of displacing pelvic structures, may occur very rarely. In these cases, drainage is generally done through transvaginal access (Fig. 7 a and b).

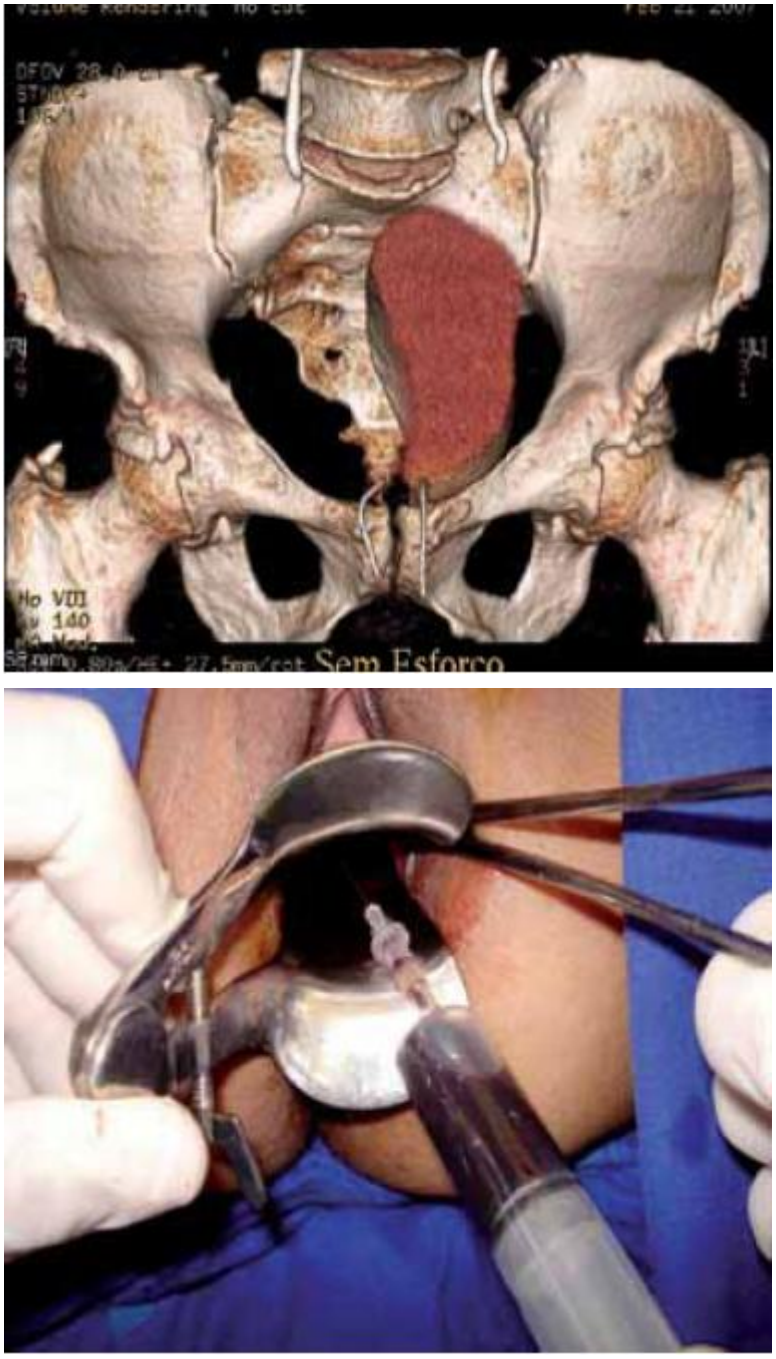

FIGURE 7 A AND B: a) 3D reconstruction of pelvic hematoma displacing the bladder following sling surgery. b) Drainage of hematoma by the transvaginal route.

EROSION

A number of synthetic materials have been used for constructing slings. The objective of the use of these materials is to reduce the use of autologous material, thus reducing postoperative pain, and the use of cadaveric fascia, theoretically reducing the transmission of infections.

Postoperative complications such as infection and erosion occur more commonly when synthetic materials are used (Fig. 8) and normally they are associated with difficulties in incorporation of

the material in the subepithelial tissue. The literature reports erosion rates of up to 23% for synthetic slings in postoperative periods of up to 2 years. Recently, high rates of infection and erosion were reported with the use of bovine pericardium.

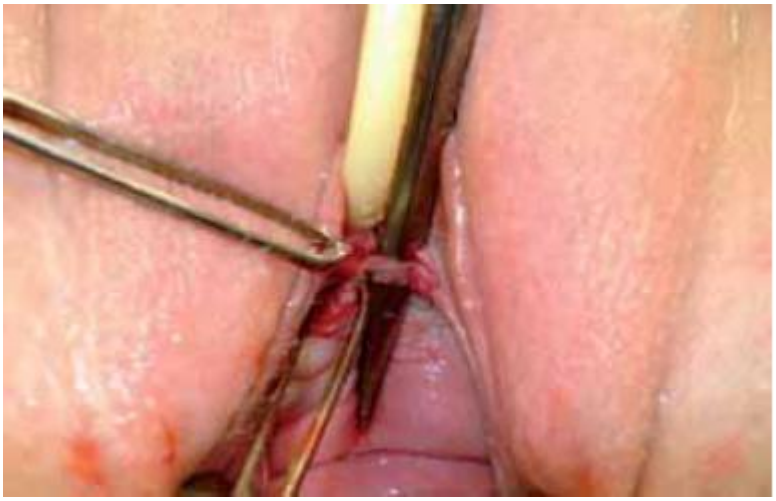

FIGURE 8. Erosion of the bovine pericardium sling through the vaginal wall is visible.

The exact etiology of these erosions is not known. Some theories suggest a poor quality and inadequate vascularization of the tissue surrounding the implanted material, triggering postoperative infection and excessive tension in the suture points in the vaginal wall.

Patients with vaginal or urethral erosion from the sling frequently present with complaints of dyspareunia, bloody urethral discharge and voiding urgency. When erosion occurs a the level of the bladder, the most reported complaints are irritative and infectious urinary symptoms. In addition, it may be misdiagnosed as postoperative instability or obstruction. In cases where there is exposure of the material through the vaginal or urethral wall, they are normally identified during a careful physical examination. Bladder injuries have a normal pelvic examination, which can lead to delay in their diagnosis. Chai and Sklar demonstrated the use of the flexible cystoscope as a vaginoscope to aid in the diagnosis of small erosions. Urethrocystoscopy is indicated as a diagnostic method in suspected urethral and bladder erosions[6].

Erosion after pubovaginal sling surgery typically results in long-standing symptoms before correct diagnosis. Clemens *et al.* suggest that patients who present with nonspecific pelvic pain, vaginal discharge and irritative voiding symptoms with no apparent cause and a history of sling surgery should be investigated through a careful physical examination and urethrocystoscopy[8].

Treatment of this complication, once diagnosed, should be immediate, with removal of the synthetic material, including sutures. In urethral erosions, it should be attempted to identify the urethral mucosa, to perform reconstruction with absorbable sutures and to maintain urethral catheterization for no less than 7 days. The risks involved by sling removal are bladder injury, hemorrhage and recurrence of incontinence. Bent *et al.* reported a 26% incontinence rate in these patients[1]. Contrarily, Summit *et al.* did not detect any case of recurrence in the group in which the material was removed[26]. Clemens *et al.* underlined that patients with vaginal and urethral erosions are at high risk of recurrence of urinary incontinence[8]. These authors suggest performance of an anti-incontinence procedure at the same time as sling removal in those cases where the local inflammatory reaction is not intense and the patient reports losses.

Timmons and Addison reported on conservative treatment in 16 patients who had synthetic sling erosion (Mersilene). The surgical approach involved extraction of the eroded fragment and coverage of the exposed area with a vaginal wall segment. These authors confirmed a success

rate of around 56%[27]. A similar approach was described by Myers *et al.* who obtained success in 75% of patients[21]. Conservative treatment can be adopted, although it is necessary that no local infection is present. Special care should be taken with the introduction of antibiotic therapy and abundant washing of the vaginal wall in order to reduce the bacterial concentration as much as possible, in addition to meticulous hemostasis and the use of tension-free sutures with separate stitches.

In the presence of intravesical erosion, Clemens *et al.* performed sling extraction via the urethra, sectioning it inside the bladder and later exteriorizing it[8].

To minimize episodes of infection and erosion with synthetic slings, we performed careful antisepsis of the vaginal cavity in the immediate preoperative period and in the surgery room we soaked the synthetic material in antibiotic solution fro 15 minutes and used well-vascularized vaginal wall segments to cover the implanted sling.

Algorithm for diagnosis and management of genitourinary tract erosions (modified from Clemens JQ et al, Urology, 2000)[8]

CLINICAL PRESENTATION

– Tenderness of vagina and/or urethra

– Vaginal discharge and bleeding

– Recurrent urinary infection

– Irritative voiding symptoms

↓

EVALUATION

– Pelvic examination: investigate the presence of anterior vaginal wall tenderness, presence of foreign material in the vaginal wall

– Cystoscopy: evaluate the presence of inflammatory reaction and foreign body

– Vaginoscopy: aid in the diagnosis of small vaginal erosions

↓

MANAGEMENT

BLADDER EROSION	VAGINAL EROSION	URETHRAL EROSION
– Removal of intravesical material via the urethra	– Vaginal approach – Removal of all synthetic material – Urethral catheter for 1-2 days	– Vaginal approach – Removal of all synthetic material – If possible close urethra using absorbable sutures – Urethral catheter should remain for at least 7 days

BLADDER AND URETHRAL INJURIES

– Bladder

Bladder injuries during anti-incontinence surgery occur more frequently at the bladder base, whereas the classic injuries from passage of the suprapubic suspension needle are anterolateral perforations.

Taking care to empty the bladder immediately before passage of the needle can reduce the likelihood of organ injury. The use of a urine-collecting recipient connected to a Foley catheter can demonstrate the presence of hematuria, suggesting bladder injury. Intraoperative cystoscopy will determine the site and extent of the injury.

When intravesical sutures are observed due to inadvertent passage of the suspension needle, these should be immediately removed, and a bladder catheter placed for a period of 7 days. Bladder injuries not identified in the intraoperative period may result in postoperative detrusor instability, recurrent urinary tract infection or stone formation.

More extensive injuries should be treated through sutures of the bladder wall in two planes using absorbable threads.

Urethra

Urethral injuries should be repaired in the same surgical procedure to avoid postoperative sequelae such as diverticula or fistula formation[31]. In superficial injuries without opening of the urethral mucosa, simple suture in a single plane with absorbable thread can be performed. In the presence of more complex injuries, suture in two planes and approximation of the periurethral fascia can be performed using a Martius flap for neourethra construction.

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