Surgical Management of Complications After Urogynaecological Surgery

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Learning Objectives

- To give an overview of complications of urogynaecological surgery
- To provide a reference guide on the management of most commonly encountered complications

86.1 Introduction

Complications are defined as the deviation of the normal perioperative process or the occurrence of an event that is not an essential part of the surgery [1].

86.1.1 Classification

Complications in urogynaecology can be classified chronologically or in relation to the index surgery [2]. Chronologically these fall into four categories:

- Intraoperative complication (within 24 h)
- Post-operative complications (24 h to 30 days)
- Long-term complications >30 days
- Mortality up to 90 days

A more complex classification tool was produced jointly by the International Urogynecological Association/International Continence Society for the classification of complications related directly to the insertion of prostheses and grafts in female pelvic floor surgery and for complications related to native tissue repairs [3]. The aim was to describe possible complications with numbers and letters which together form a code containing comprehensive information about the complication. It is hoped that this will make the reporting of complications more uniform and thus help inform management options. This system consists of three components—category (C), time (T) and site (S). Category describes the affected organ, system or severity of complication; site—area where complication has been noted; and time distinguishing the time period of occurrence.

Post-operative complications can be graded with the use of the Clavien-Dindo classification. It is still to be validated in urogynaecology although it is a standardised approach for grading and reporting in general surgery and urology [4]. We feel that this is a useful way of producing standardised outcome data, allowing more accurate comparison with other procedures and thus allowing a more precise comparison of complications in the literature.

The management of complications in urogynaecological surgery is not just limited to the surgeon. Careful pre-operative preparation will contribute to a reduction in post-operative complications. The inclusion of the World Health Association (WHO) checklist will reduce complications by as much as 48% [5]. Fastidious application of an anticoagulation policy will reduce the morbidity associated with thrombosis while an intraoperative policy of administration of Tranexamic acid for those at risk of bleeding will reduce the incidence of bleeding complications. For more complex patients, the provision of appropriate high care facilities is essential as a means of further reducing post-operative complications.

For the more complex procedures, consideration should be given to centralisation of care. A policy of subspecialisation by surgeons and the maintenance of a high-volume practice will further improve outcomes [6].

Electronic Supplementary Material The online version of this chapter (https://doi.org/10.1007/978-3-030-40862-6_86) contains supplementary material, which is available to authorized users.

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G. A. Santoro et al. (eds.), *Pelvic Floor Disorders*, https://doi.org/10.1007/978-3-030-40862-6_86

86.2 Complications Following Incontinence Surgery

86.2.1 Introduction

Numerous operations exist for the treatment of stress urinary incontinence (SUI). Suprapubic or combined vaginal/suprapubic operations have been popular since the 1980s. Excellent results can be obtained with success rates of >90% described.

86.2.2 Mid-urethral Tape Operations

Mid-urethral tape operations were developed as minimally access operations (MAS) with the aim of achieving the same or better success rates with lower morbidity than that associated with traditional procedures such as the Burch Colposuspension and Autologous Fascial Sling (AFS). They all employ a variety of tapes (mesh) or biological prostheses. A multitude of operations was introduced, but for practical purposes, they can all be classified into three broad categories:

- Retropubic route (RPR), e.g. tension-free vaginal tape (TVT)
- Trans-obturator route (TOR), e.g. transobturator tape
- Single incision, e.g. TVT Secur

Complications common to all incontinence procedures include:

- Failure
- Bladder injury
- Bowel injury
- Vascular injury
- Problems with voiding
- Development of new symptoms (e.g. overactive bladder)
- Development of chronic pain

86.2.2.1 Intraoperative Injuries

Urinary Tract Injury

Injury to the lower urinary tract can occur at the time of the trocar placement for sling insertion or during the dissection of the pubocervical fascia.

Risk factors include previous continence or anterior compartment prolapse surgery or surgery to the retropubic space.

A review of the British Society of Urogynaecology (BSUG) database of nearly 19,000 patients who underwent a retropubic tape procedure reported an overall bladder perforation rate of 3.5% [7]. In comparison, the 2017 Cochrane Review of mid-urethral sling operations reported an average lower urinary tract perforation rate of 2.5%, ranging from 2.7 to 3.9% for the RPR and 0.4% for TOR (RR 0.13, 95% CI 0.08 to 0.20) [8]. The BSUG review also found that bladder perforation rates were operator dependent with trainees having a higher incidence (8.9% for specialty trainees; 5.4% for subspecialty trainees) unlike consultants and associate specialists who had the lowest rates of 2.2% and 1.6%, respectively. This confirms that increased experience is associated with a reduction in complications [9, 10].

Urethral injury is much less common with a published frequency of around 0.1% of cases. However, its identification remains highly important due to the long-term complications of a urethral injury [7, 11].

Lower urinary tract injury at the time of incontinence surgery is diagnosed by undertaking a cystoscopic examination of the bladder and urethra [12]. This should be done in a systematic way preferably with the use of 0 and 70° cystoscopes, allowing a thorough visualisation of the bladder in its entirety. This can be performed either following each trocar placement (advisable with less experienced operators) or at the end of procedure. If a bladder injury is identified, this is addressed by the removal and re-positioning of the trocar, away from the bladder wall. There is paucity of data regarding the necessity for catheterisation after bladder injury following mid-urethral sling placement but as it is an extraperitoneal injury probably does not require catheterisation for more than 24 h [13, 14].

Failure to identify lower urinary tract perforation however predisposes to mesh exposure and bladder stone formation, resulting in recurrent urinary tract infections (UTIs) and voiding dysfunction.

Bowel Injury

Intestinal perforation remains a life-threatening complication. It is mostly a complication of the retropubic approach. It has a low incidence (around 0.007%) based on limited data from the manufacturer and case reports [15–17]. Because most mid-urethral tapes are performed on a day case basis, the signs and symptoms are only likely to show after discharge from the hospital. This raises the risk of a delay in the diagnosis with serious consequences. As a result, the patients should be warned of the risk and of the likely symptoms that may occur. They should be encouraged to report any untoward symptoms to the surgical team. Early diagnosis will reduce the risks of severe complications.

Risk factors include previous pelvic surgery and/or pelvic radiotherapy. Some feel that these may be a contraindication to the performance of a blind retropubic procedure such as the TVT.

Vascular Injury

Vascular injuries are usually minor but serious vascular injuries can also occur. These are more common with the retropubic approach. Complications range from a clinically insignificant haematoma to a life-threatening bleed. The routine performance of a suprapubic ultrasound visualised asymptomatic haematomas measuring >5 cm in 16% patients undergoing RPR sling procedure [18]. Data from a national registry of 5578 TVT operations noted 151 (2.7%) bleeding complications with 45 (0.8%) requiring conversion or re-operation including laparotomy, evacuation of vaginal haematoma and revision of vaginal incision. Vascular injuries were arterial in 12% (including 1 external iliac artery injury and 1 obturator artery injury), venous or unknown origin in 88% [19]. The diagnosis of a major vascular injury is by clinical presentation or aided by interventional radiology. The resolution of the problem may be aided by support from the interventional radiologists or may require an open repair with the help of a vascular surgeon.

86.2.2.2 Post-operative Complications

Immediate

Voiding Dysfunction, Retention

Post-operative voiding dysfunction (POVD) occurs commonly after continence procedures. The exact cause is often difficult to know but can be due to undiagnosed pre-existing voiding problems or as a result of too much tension on the tape. Ultrasound studies have shown true mid-urethral positioning of the sling in 86% of cases; however, the variation in tape placement is thought to have little effect on symptoms. POVD is less frequent when the TOR is employed and in this group occurs more in the medial-to-lateral approach compared to the lateral-to-medial one [8]. The majority of cases of POVD are transient, of short duration and without significant sequalae. Management is usually conservative with POVD resolving with a limited period of catheterisation (3–7 days) or the use of clean intermittent self-catheterisation (CISC). Persistent voiding dysfunction or urinary retention is uncommon, with 2% requiring revision surgical intervention [20, 21]. The timing of surgical approach is important and should be reserved for those who have significant retention at 7 days. Tape release should not be delayed beyond 7 days when conservative measures fail. A clear post-operative protocol is essential to identify the problem early and before there is permanent damage to the bladder. Examination under anaesthesia (EUA) and sling release by stretching or cutting (vaginal tape urethrolysis) by day 7 will usually improve symptoms but carries the risk of recurrence of incontinence [22, 23].

Infections

Urinary Tract Infections (UTIs)

Culture-proven urinary tract infections range between 4.1 and 12% with 3.5% of patients experiencing recurrent UTI [11, 24]. This is higher in the cases of post-operative urinary retention and the need for bladder drainage. In those cases, clean intermittent self- catheterisation is preferable over indwelling catheter due to the lower risk of developing symptomatic bacteriuria [25].

Management is with broad spectrum antibiotics as per local antimicrobial guidelines and after obtaining a urine culture specimen.

Surgical Site Infections

Superficial infection at the exit points on the skin (suprapubic or groin) occurs in less than 1% of cases (0.8%) [11]. Treatment is conservative and usually only requires antibiotics. Infections in wounds this size seldom require hospitalisation or return to the operating theatre.

Deep tissue infections (cellulitis; necrotising fasciitis; abscess formation) are less common but with significant morbidity.

Groin/obturator fossa abscess, albeit rare, is a recognised complication of the TOR and if associated with an inappropriate mesh (microporous, multifilament) can occur years following the index surgery (Figs. 86.1 and 86.2). Management involves drainage of the abscess, removal of the tape often with additional reconstructive surgery and broad-spectrum antibiotic therapy [26, 27] (Figs. 86.3 and 86.4).

When patients present with infections following a sling procedure, specific causes of urgency need to be ruled such

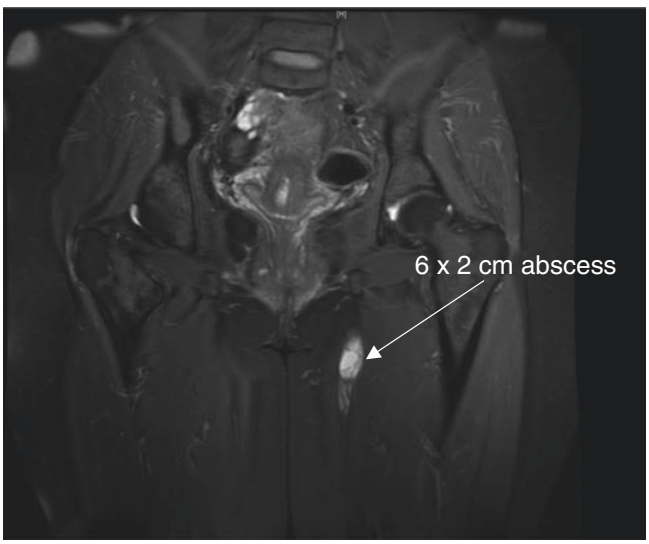

Fig. 86.1 MRI image of thigh abscess secondary to trans-obturator route tape procedure

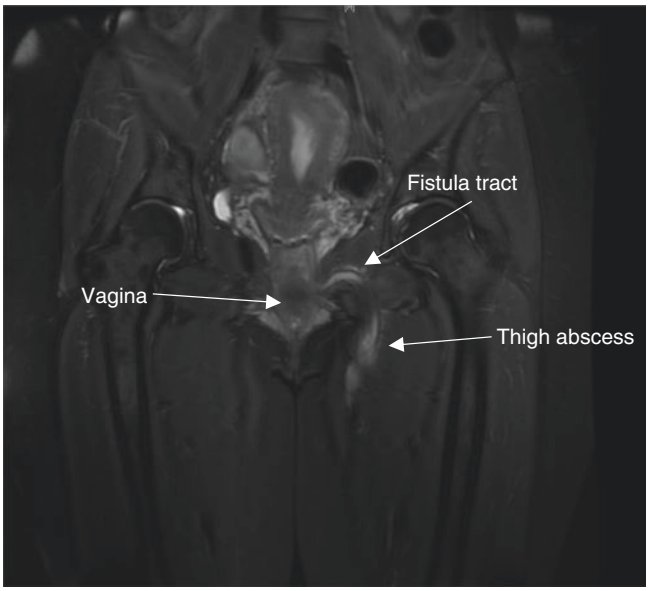

Fig. 86.2 MRI image of fistula track between thigh abscess and vagina

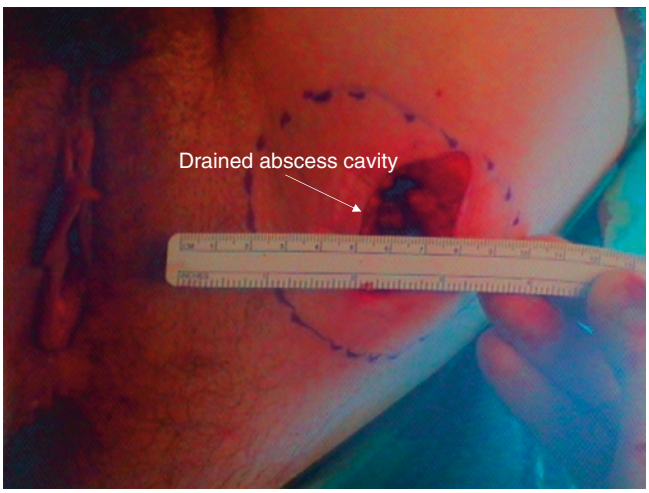

Fig. 86.3 Thigh approach to mesh excision and drainage of abscess cavity secondary to TOR tape

as urethral or intravesical mesh erosion/exposure, urinary retention or recurrent urinary tract infections. Urinalysis, flow cystometry, urodynamics and cystoscopy are the investigations to be considered in the first place.

Remote Complications

Mesh-Related Complications

The material of the sling is a significant determinant for mesh-related complications [3]. Generally, meshes are classified according to their pore size, porosity, fiber type, weave and weight. The likelihood of morbidity and behaviour in the body is determined by these characteristics [28, 29]. The preferred prosthetic materials currently in use in incontinence surgery are monofilament, large pore open

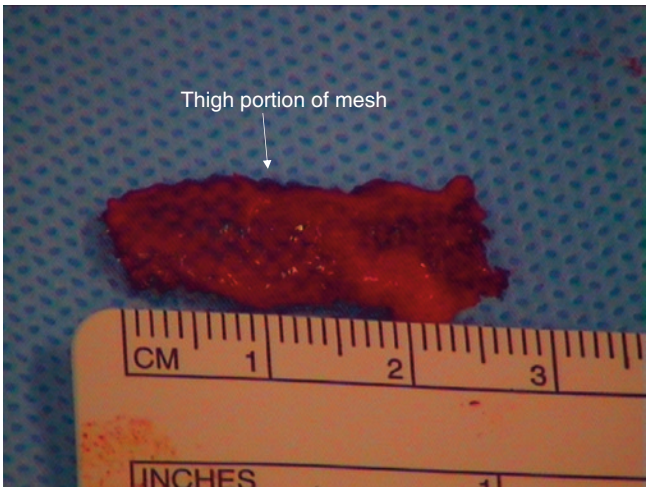

Fig. 86.4 Excised thigh portion of the TOR mesh

weave materials made out of polypropylene as they carry a lower risk of complications (0.4–1.5%). A review of thirty-one trials (4743 women) found no significant difference in vaginal mesh extrusion rates associated with the retropubic or transobturator routes [8]. Although most mesh erosions (66%) are associated with symptoms, 35% of vaginal erosions are asymptomatic and incidentally diagnosed at a routine follow-up [30].

The most significant risk factor for mesh erosion/exposure is smoking while obesity despite not having a direct correlation is associated with technical difficulties [8, 31]. Caution should be exercised when considering the placement of mesh materials in diabetics or patients on immunosuppressant therapy.

Management of mesh erosion can be conservative or surgical and is based on the size of exposure, site, proximity to other structures, type of mesh and the patient's status.

Small vaginal erosion (<1 cm) of polypropylene mesh can be managed with a course of vaginal estrogens. This promotes re-epithelisation and spontaneous tissue healing. Even if this fails to achieve complete coverage, it still prepares the vaginal tissues for further surgery. Some recommend regular follow-up at a three-month interval to see if the mesh will be covered spontaneously [32]. This seems an overly cautious approach for minor degrees of exposure especially as trimming and estrogen therapy rarely leads to complete symptoms resolution. Ideally therefore formal excision of the exposed area with undercutting of the epithelial edges, removal of the mesh beneath the scar and re-suturing is advised [23].

Mesh exposure of other type of materials such as polyester or silicone should always be treated surgically as re-epithelisation over these materials is less likely to occur [33].

Surgical approach may either be by partial excision of the exposed part of the mesh or complete graft explantation.

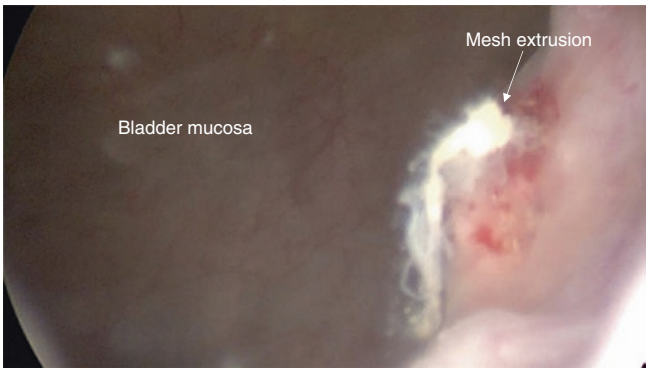

Fig. 86.5 Cystoscopy. Mesh extrusion into bladder

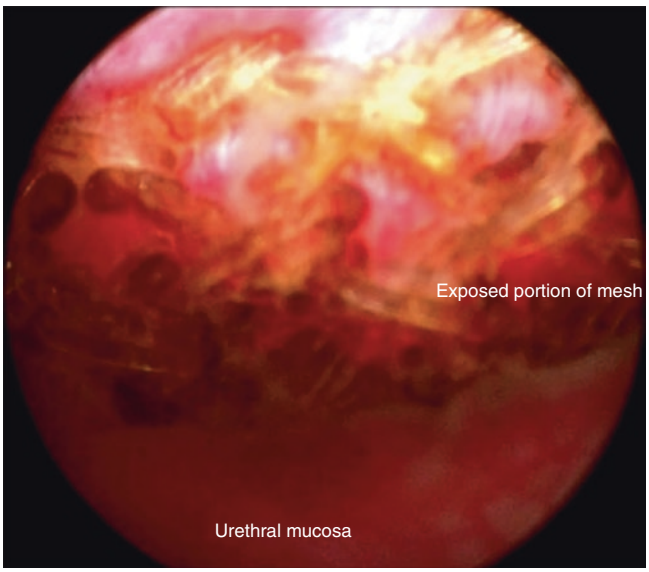

Fig. 86.6 Cystoscopy. Mesh exposure within urethra after TOR tape

Complete mesh removal is recommended in the cases of erosions to the lower urinary tract (bladder, urethra) where conservative measures are unlikely to improve symptoms and are associated with recurrent urinary tract infections, haematuria and stone formation [34, 35] (Figs. 86.5 and 86.6).

Systematic examination of the lower urinary tract is required for diagnosis. The use of a 0° cystoscope should be performed for the assessment of the urethra and 30 or 70° cystoscope for the bladder (Video 86.1). The most common sites of mesh erosion in the bladder following sling procedures are at 10 and 11 o'clock position or close to the bladder neck.

The surgical approach to mesh excision can be via the transurethral route, open or endoscopic (laparoscopic/robotic mesh excision following cystotomy) or excision of the exposed part of the mesh with the use of laser. Holmium laser (500 μm fibre) can be used over the eroded mesh until complete retraction and the absence of visible mesh fibres. A urinary catheter should be placed for 72 h post procedure. Repeat cystoscopy is required in 4–6 weeks for re-evaluation, and repeat laser procedure may be necessary in up to 20% of cases and can be performed at the time of repeat cystoscopy [36, 37].

Patients should be counselled regarding the risk of recurrent urinary incontinence, lower success rates of repeat continence surgery and lack of consensus on best surgical approach.

Chronic Pain

The occurrence of chronic pain following continence procedure may offset the benefit associated with the resolution of incontinence. The pain is most commonly in the following anatomical regions:

- Groin pain (TOR)
- Suprapubic pain (RPR)

Rates of chronic groin pain are higher in the TOR group and occurs in 6.4% vs. 1.3% in the RPR. The RPR also carries a risk of suprapubic pain in 2.9% of cases. This, however, seems to be of short duration and resolves with conservative measures [8, 38].

In the cases of persistent chronic pain, a thorough history and examination should be undertaken. Further an assessment with a EUA, diagnostic cystoscopy and advanced imaging techniques (MRI or CT with contrast in the presence of contraindications) are necessary to try and identify the role of the mesh in the genesis of the pain. The appearance of inflammation or serous fluid around the mesh will help with the confirmation of pathology. These methods will also identify more serious complication like abscess formation.

In the absence of an organic cause of pain, management is initially conservative. Referral to a pain management team should be advised ahead of any surgical intervention.

Injections of local anaesthetic and steroid solutions may provide relief in some cases and can be used as a diagnostic aid [39]. The improvement of pain following the injection of local anaesthetic may identify patients likely to benefit from complete mesh removal although such an approach does not rule out a placebo response.

Pelvic floor physiotherapy is also advocated as part of the treatment algorithm in the presence of pelvic floor contracture.

Management of Chronic Pain with Surgery

Laparoscopic or open exploration of the cave of Retzius is necessary for the complete retropubic sling removal. In the cases of transobturator tape, in addition to vaginal dissection for the removal of vaginal portion of the tape, groin exploration may be necessary to allow complete removal of the sling. This is performed in specialist tertiary units and in multidisciplinary setting. The exploration of the groin should

employ the services of an onco-plastic surgeon familiar with the anatomy in the region.

Patients need to be aware that even with complete removal of the mesh there is no guarantee of the resolution of the pain [40]. It is therefore essential that patients receive careful counselling ahead of what can be technically difficult surgery.

86.2.3 Para-urethral Bulking

86.2.3.1 Introduction

The treatment of stress urinary incontinence with intramural injections was first reported in 1938 by Murless, who described the application of sclerosing agent to anterior vaginal wall with 60% success rate [41]. This procedure failed to become established but led to the exploration of other materials for the achievement of continence. It involves injection of particles either transurethrally or paraurethrally into the submucosa of the proximal urethra, just beneath the bladder neck.

The ideal particles used should be non-immunogenic, biocompatible, causing minimal inflammation or fibrosis. They should be of a diameter of >80 μm to avoid material migration.

Different products have been used, including silicone particles, calcium hydroxyapatite, ethylene vinyl alcohol, carbon spheres, polyacrylamide hydrogel and a dextranomer hyaluronic acid combination.

Para-urethral bulking agents are not without risks or complications. Materials such as paraffin, polytetrafluroethylene, autologous fat, and, most recently, ethylene vinyl alcohol (Tegress®) and hyaluronic acid/dextranomer copolymer (Zuidex®) have been abandoned because of safety issues. Zuidex®-treated patients have been reported to have significantly higher rates of injection site complications (16% with the hyaluronic acid compound versus none with collagen; RR 37.78, 95% CI 2.34 to 610) and is also no longer commercially available (Figs. 86.7 and 86.8) [42]. Paraurethral abscess formation in up to 22%, stone accumulation and urethrovaginal fistula are reported complications of the latter. Multiple surgical procedures are usually required for the complete resolution of problems. Abscess drainage is required by either vaginal or transurethral approach [43–45]. Laser fragmentation may be necessary for the removal of accumulated stone formation.

Polyacrylamide hydrogel (Bulkamid®) has shown encouraging early results. Complications associated with the procedure tended to be generic rather than procedure specific. These included cases of UTI and haematuria. A number also presented with complications directly attributable to the procedure. These included postprocedural pain, urinary retention requiring transurethral catheterisation, aggravated incontinence, de novo urge incontinence and injection-site rupture. Most of these resolved spontaneously [46].

Fig. 86.7 MRI image of a 10 mm intermediate signal intensity urethral nodule

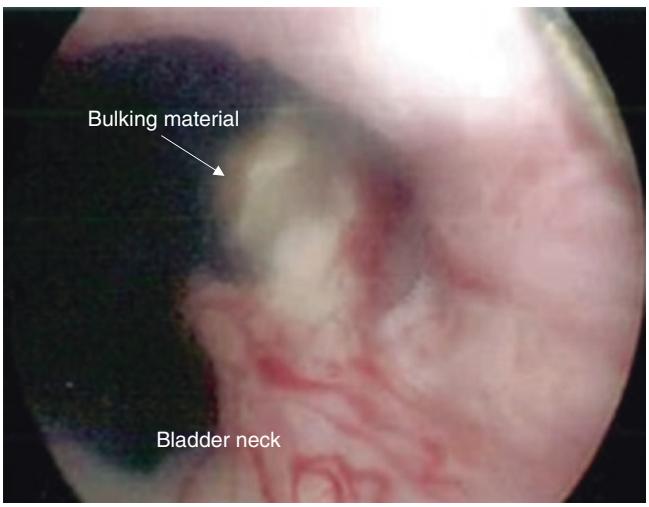

Fig. 86.8 Cystoscopy. Extrusion of paraurethral bulking material (Zuidex®) at bladder neck

86.2.4 Burch Colposuspension: Open and Laparoscopic

86.2.4.1 Introduction

In the current climate of mesh controversy, retropubic colposuspension is again becoming popular with many women opting for a mesh-free option for the treatment of their stress incontinence. The Burch colposuspension involves

the placement of sutures onto the pubocervical fascia periurethrally and attaching it to the ileopectineal ligaments on either side.

Although colposuspension does not utilise the use of mesh, it is not devoid of complications. A Burch colposuspension can be performed via the open or minimal access (laparoscopic or robotically assisted) routes. There is level 1 evidence that clinical outcomes via the laparoscopic route are similar to the open approach with no difference in reported subjective cure rates in the short- and medium-term follow-up [47, 48]. There are, however, trends towards a lower perioperative complication rate, less postoperative pain, shorter hospital stay, quicker return to normal activities and shorter duration of catheterisation following laparoscopic compared to open colposuspension [48].

86.2.4.2 Intraoperative Injury at the Time of Surgery

Urinary Tract Injury

Injury to the lower urinary tract is a recognised complication of the colposuspension procedure. Risk factors include previous surgery to the bladder, pelvic radiation or prior continence procedures involving the retropubic space. The laparoscopic approach has also been associated with a higher rate of bladder injury (3% vs. 0.6% RR 0.22; 95% CI 0.06 to 0.87). Bladder, urethral or ureteric injury can occur during the dissection of the cave of Retzius for the exposure of the pubocervical fascia or during the application of sutures paraurethrally. An inadvertent cystotomy or urethrotomy is repaired in layers with absorbable sutures, and continuous drainage of the bladder is usually required for 7 days. In the cases of a bladder injury, proximity to ureteric orifices needs to be evaluated prior to repair with the use of an intraoperative cystoscopy. Bilateral retrograde pyelogram is also recommended to exclude ureteric involvement.

The value of routine intraoperative cystoscopy has been studied and allows the diagnosis and primary management of unsuspected lower urinary tract injuries in up to 88% of major gynaecological or urogynaecological cases [49]. Inadvertent suture placement through the bladder can be identified at routine cystoscopic evaluation. Identification at the time of surgery allows repositioning of the suture without any added morbidity. Failure to identify transvesical suture placement is associated with stone formation, leading to recurrent UTIs, detrusor overactivity and lower urinary tract symptoms [50] . The use of non-absorbable sutures (Ethibond or polypropylene sutures) will influence the severity of the complications. An alternative is the use of delayed absorbable materials (PDS), but the long-term outcomes of the procedure using these materials is less well understood than with non-absorbable materials.

Ureteric injury is uncommon following colposuspension (0.02%–3.3%) [51]. Presentation in the initial 24–48 h can be with postoperative pyrexia, flank pain, haematuria, oliguria, anuria, ileus, abdominal distention, nausea and/or vomiting although patients can be remarkably asymptomatic. A full clinical examination, urinalysis and laboratory investigations including full blood count, serum creatinine and urea are undertaken. Imaging techniques such as renal ultrasound or CT urogram will be needed to confirm the diagnosis. If an injury is identified, percutaneous nephrostomies are sited until the acute inflammatory response has settled. In the presence of a partial obstruction, consideration can be given to the release of the suspending sutures on the affected side or a cystoscopy and retrograde pyelogram with the placement of a ureteric stent can be used. Delayed presentation of ureteric injury is managed similarly with percutaneous nephrostomies for the protection of renal function and consideration of surgical repair in 3–6 months after diagnosis and drainage [52].

Bowel Injury (Laparoscopic Route)

The minimal access approach to the retropubic space for the performance of a colposuspension can be extra- or transperitoneal. Laparoscopic surgery with entry into the abdominal cavity (transperitoneal approach) in itself carries a risk of visceral and vascular complications. Their incidence varies significantly in reports from 1/1000 to 12.5/1000, depending on the experience of the surgeon and the complexity of the case [53, 54]. The overall risk of intestinal complications at laparoscopic surgery is low (0.6/1000). The Majority of injuries usually occur at the time of abdominal access, port placement, during insufflation, dissection or adhesiolysis. These complications are not unique to incontinence procedures and will be managed by standard surgical techniques [55–57].

Vascular Injury

The pubocervical fascia has a rich blood supply readily visible with the naked eye. In can be difficult to avoid these vessels during the placement of the sutures. Excessive intraoperative blood loss and haematoma formation have been described with this procedure with some older studies reporting the need for blood transfusion in 30% of cases and significant blood loss (mean of 285 mL) [58]. The high transfusion rate probably reflects a more liberal attitude to transfusion rather than a clinical need. There is an increased risk of bleeding in patients undergoing repeat surgery in the retropubic space with

deviation from the correct plane of dissection with injury to paravaginal veins.

Bleeding at the time of suture placement to the pubocervical fascia can be avoided by decreasing slightly the tension or the elevation vaginally to allow re-fill of the veins, their correct visualisation allowing precise placement of the needle tip. Such bleeding can be controlled by tying the suture placed in the periurethral connective tissue, by applying diathermy coagulation, ligature clips or compression. The intravenous administration of tranexamic acid can also be considered.

The other site for potential vascular injury is the pubic ramus and the pectineal ligament with the external iliac vein, aberrant obturator artery or vein present and at risk in 25% of cases [59]. The risk of bleeding and injury to these can be avoided by careful surgery and dissection, which is achieved by good training. Previously, the placement of a drain to the Cave of Retzius used to be a standard of treatment. Currently, there seems to be less place for this as surgeons should not close the abdominal incision before achieving adequate haemostasis.

86.2.4.3 Post-operative Complications

Immediate

Wound Complications

Haematoma

Rectus sheath haematoma can occur in around 3.4% of cases [60]. Most respond to conservative management with analgesia and antibiotics depending on their size. Ultrasound or CT-guided aspiration or surgical evacuation may be needed in the presence of larger haematomas. In the absence of an expanding haematoma, a conservative approach is always advocated.

Infection

Surgical site infections (SSIs) constitute a huge burden on the healthcare systems worldwide. A SSI can double the length of the hospital stay (LOS) with a significant increase in cost per patient (from $44 727 to $79134) [61].The rate of post-operative wound infection following transverse suprapubic incision is in the region of 9%. Surgical hand asepsis, perioperative antibiotics prophylaxis and wound care are associated with their reduction.

Voiding Dysfunction

Post-operative voiding dysfunction and de novo detrusor overactivity have been reported following colposuspension with a mean frequency of occurrence of 12% (ranging from 3 to 32%) and 10% (ranging from 4 to 18%), respectively [62].

Multiple factors have been associated with the occurrence of voiding dysfunction—the patient's age, pre-existing detrusor dysfunction or intraoperative factors such as the amount of bladder neck elevation, the degree of urethral compression and retropubic haematoma [63].

Excessive elevation of the bladder neck should be avoided, and the vaginal wall should be only minimally elevated leving a suture bridge between the pubocervical fascia and the pectineal ligament.

Post-operative retention may require short- or long-term need for catheterisation. It is important to remember that the there is no correlation between the time required to void spontaneously and the success of incontinence surgery [64]. Women with long-term voiding dysfunction should be taught clean intermittent self-catheterisation or be considered for suture release. Permanent self-catheterisation has been recorded in some series as high as in 1–2% of cases but generally this high a rate is uncommon [58, 60].

Remote Complications

Posterior Compartment Prolapse

The development of pelvic organ prolapse following Burch colposuspension is thought to be due to the fixation of the bladder neck, elevation of the anterior vaginal wall and change of the vaginal axis predisposing to posterior compartment weakness. Retrospective studies show variability in occurrence with Burch originally reporting rates of the enterocele formation of 7.6%, further studies reporting frequency of around 13.6–27% [62, 65, 66]. It is difficult to know if this occurs with the same frequency in more recent practice. In the early years of the Burch colposuspension, the technique involved approximation of the pubocervical fascia onto the ilio-pectineal (IP) ligament. Over time this evolved to suspending the anterior wall but leaving it a few centimetres from the IP ligament. Consequently, there was less anterior wall elevation and perhaps follow-up studies will find a lower incidence of posterior wall prolapse.

Primary posterior compartment prolapse in isolation is repaired trans-vaginally, utilising native tissues with the plication of the rectovaginal fascia. Additional vault descent can be addressed simultaneously by performing a sacrospinous fixation with posterior approach to the sacrospinous ligament.

Chronic Pain

Suprapubic transverse incision (Pfannensteil incision) can be associated with chronic scar pain. At 2 years postoperatively, 7–9% of women experience moderate to severe pain. Non-

neuropathic pain is predominantly described as diffuse scar pain, musculotendinous, associated with keloid formation or abdominal wall atrophy [67]. On the other hand, neuropathic pain is predominantly due to the entrapment of the ilioinguinal or iliohypogastric nerves (3.7%). The ilioinguinal and the iliohypogastric nerves originate from T12-L1, and both have sensory function only. Neuropathy to these nerves presents with sharp, burning pain over the incision site, radiating to the mons pubis, labia, thigh with paresthesia over the areas of nerve distribution. The majority of neuropathies resolve spontaneously. The ones that persist may respond to nerve blocks. When performing an open colposuspension, care must be taken to avoid extending the Pfannenstiel incision beyond the lateral margin of the rectus abdominis muscle where the iliohypogastric and ilioinguinal nerves traverse.

Bladder Dysfunction

De novo urgency and subsequent urge urinary incontinence may occur in 1 in 5 patients and can offset the positive effects of the colposuspension. For many patients urgency and urge incontinence are far more debilitating than SUI. Urinalysis and urine culture should be sent to exclude the presence of a urinary infection. Post-void residuals should also be checked to exclude overflow incontinence. Check cystoscopy will rule out suture placement or migration into bladder or urethra, causing irritative symptoms. Urodynamics (conventional or video) studies may be helpful in confirming the presence of detrusor overactivity. This is managed with physiotherapy, bladder training, anticholinergics, $ß_3$ agonist or intravesical administration of botulinum toxin.

86.2.5 Autologous Fascial Sling (AFS)

86.2.5.1 Introduction

The autologous fascial sling can be used for the primary treatment of stress urinary incontinence but also for recurrent SUI, after previous surgery. It can also be performed where mesh-based procedures are contraindicated such as prior mesh exposure or removal, vesico-vaginal fistula repair, urethral diverticulectomy or prior pelvic radiation.

The AFS is a more challenging procedure associated with a higher risk of complications particularly when utilised as a non-primary approach. It requires both abdominal and transvaginal dissection [68]. Harvesting of the 2 × 8 cm rectus sheath graft requires a suprapubic transverse incision, followed by transvaginal incision (vertical or horse-shoe) and a combination of blunt and sharp dissection for access through the pubocervical fascia and into the retropubic space for the safe placement and tensioning of the graft suburethrally. These multiple steps require constant consideration of neighbouring structures to decrease risks of vascular or visceral injuries. An alternative approach is to harvest the fascia from the Fascia Lata. Fascia lata harvesting requires patient repositioning during the surgery to allow access to the leg and a leg incision. It is also associated with symptomatic herniation at the donor site.

The SISTEr trial comparing the AFS to Burch colposuspension procedure found that although the AFS was more effective for the treatment of SUI, it had a higher rate of subsequent urinary tract infection, voiding dysfunction and urge incontinence [69].

86.2.5.2 Intraoperative Complications

Visceral and Vascular Injuries

Both lower urinary tract and vascular injuries can occur during the transvaginal dissection or at the time of placement of the sling retropubically. Higher risk exists with previous incontinence surgery or operations in the retropubic space. These can be minimised by careful but also adequate dissection allowing entry into the cave of Retzius transvaginally. This allows precise placement of the sling, away from neighbouring structures, which is ensured with direct control of the tip of the guiding needle onto the surgeon's fingers. Maintaining close proximity of the needle to the posterior surface of the pubic bone is also important to avoid entry into the bladder or abdominal cavity.

The identification and management of visceral and vascular injuries are similar to the ones discussed following colposuspension (see above Sects. "Urinary Tract Injury, Bowel Injury (Laparoscopic Route) and Vascular Injury").

86.2.5.3 Postoperative Complications

Voiding Dysfunction

AFS is associated with higher risk of post-operative retention with the need for revision surgery in 6% of cases [69]. A period of short-term indwelling catheterisation may be required (5–7 days). If this fails to improve symptoms, clean intermittent self-catheterisation may be adopted. In the cases of persistent urinary retention, surgical division of the pubovaginal sling may be undertaken. This relieves symptoms in 84% of cases with a 17% recurrence of stress urinary incontinence [70].

Bladder Dysfunction

New-onset urinary urgency is noted in 19% of patients. Standard management will apply. This includes all the management options for OAB.

86.3 Complications Following Prolapse Surgery

86.3.1 Introduction

Multiple different surgical approaches exist for the management of urogenital prolapse. These can be divided into vaginal and transabdominal. A further subdivision is with the utilisation of synthetic sling materials for the repair. A natural tissue pelvic floor repair is still the standard of care and the most commonly performed procedure used to manage cases of pelvic organ prolapse that needs surgery.

86.3.2 Anterior Colporrhaphy

86.3.2.1 Introduction

This is still one of the most commonly performed procedures in urogynaecology. It requires anterior dissection between the bladder and vagina to allow the plication of the pubocervical fascia with the use of interrupted absorbable sutures [71].

86.3.2.2 Intraoperative Complications

This procedure is generally associated with a low risk of intraoperative complications particularly in primary surgery. Prior surgery and recurrence in the operated compartment are risk factors for bladder or urethral injury. In most cases, accidental cystotomy is repaired in layers transvaginally. Diagnostic cystoscopy should be performed to establish the proximity of the ureteric orifices to the site of injury and to assess the need for ureteric stenting. Retrograde pyelography may be considered to ensure the absence of ureteric involvement. Catheterisation for 7–10 days is usually required to allow healing of the repaired injury.

Ureteric injury remains uncommon (0–2%) and are usually associated with large, stage 4 prolapse repairs. It is easy to place one of the plication sutures into the lumen of the bladder or urethra. This can be easily identified by the use of diagnostic cystoscopy at the end of the procedure. Identification at this stage allows the suture to be cut and removed at the time of surgery.

86.3.2.3 Post-operative Complications

Voiding dysfunction and the need for short-term catheterisation is common after an anterior repair (9%). This is usually transient with spontaneous resolution up to 6 weeks.

De novo stress urinary incontinence after native tissue anterior repair is around 8% and de novo detrusor overactivity rates of 12%. Further continence surgery is performed in 4% of cases [72]. Patients need to be aware of these statistics ahead of surgery.

86.3.3 Posterior Colporrhaphy

86.3.3.1 Introduction

The transvaginal approach to posterior repair provides better clinical outcomes than the transanal route. It is speculated that the transvaginal approach is however associated with a higher blood loss and subsequent haematoma formation. However, the incidence remains very low and intervention for the problem extremely uncommon.

86.3.3.2 Intraoperative Complications

Major complications are generally rare and more likely after repeat surgery, radiation or congenital abnormalities to the area. In the cases of rectal injury, colorectal team involvement is recommended. Management is with primary repair in the majority of iatrogenic injuries or faecal diversion depending on the size of defect and quality of tissues.

86.3.3.3 Post-operative Complications

In most studies there is an increase in the rate of postoperative dyspareunia. This remains an area common to all forms of prolapse repairs that require closer attention.

86.3.4 Sacrospinous Colopopexy/Hysteropexy

86.3.4.1 Introduction

Knowledge of pararectal anatomy and of the sacrospinous ligament complex is essential for the safe performance of sacrospinous colpopexy. The procedure involves suspending the vaginal apex or uterine cervix to the sacrospinous ligament with the use of delayed absorbable sutures. There are a range of devices for the placement of the sutures through the sacrospinous ligament, aiming at reducing the complexity and increasing safety. None has been found to be superior to the other, but some may offer a greater ease of use to the less experienced surgeon.

There are two main approaches for sacrospinous colpopexy—one with direct visualization of the SS ligament or with the use of palpation only. It is thought that direct visualisation is safer, but this requires extra dissection and need for the placement of long retractors that can be associated with increased morbidity [73].

86.3.4.2 Intraoperative Complications

Nerve Damage

The pudendal nerve (S2–S4) runs behind the lateral aspect of the sacrospinous ligament and the ischial spine alongside the internal pudendal artery. Pudendal nerve entrapment can cause significant morbidity and presents with immediate postoperative gluteal, perineal and vulval pain. Management strategies include conservative measures, nerve injection, neuromodulation and decompression [74]. Severe pain that does not respond to conservative measures requires the removal of the sacrospinous fixation stitch under general anaesthetic, which will clearly compromise the outcome of the procedure.

Vascular Damage

Vascular injuries at the time of surgery are well described. Venous oozing can occur from the pararectal tissues and during the dissection of the aponeurosis off the ligament. These are usually easy to manage. The employment of Liga® multiple clip applier can be very useful in controlling small bleeders. Adequate lighting in the form of a head lamp is essential.

More dangerous bleeding can result from an injury to the pudendal artery or inferior gluteal artery. To avoid injury to the neurovascular complex, care should be taken to maintain distance from the ischial spine and ensure that the sutures are placed into the body of the ligament rather than around and behind it.

In the case of an acute injury, packing should be employed to get immediate control of the bleeding. The employment of interventional radiology will be useful in the case of an arterial bleed but will be of little use in a venous injury. In such a case the deployment of a Rusch® Hydrostatic Pressure balloon has been described. This is left in place for 24 h with the patient monitored on the high-dependency unit. The patient should be returned to theatre for the removal of the balloon the following day.

Visceral Damage

Damage to the rectum has been well described during the dissection towards the sacrospinous ligament. This is often a through and through injury with significant injury to the rectum. It is usually a reflection of inexperience so may be easily missed. It is therefore essential to perform a per rectal (PR) examination at the end of the procedure. The detection of blood on the glove would then prompt a more thorough examination, including a proctoscopy and sigmoidoscopy. Repair would then be performed by a colorectal surgeon. Such an injury would dictate that the sacrospinous sutures be removed and a defunctioning colostomy performed.

Ureteral kinking or damage is rare and may be difficult to spot at the time of surgery. The use of postoperative cystoscopy may aid in the diagnosis. The majority of injuries will be picked up in this fashion but not 100%. Failure to see a jet of urine from the ureteric orifice should indicate the need for a retrograde pyelogram. In many cases of injury, the passage of an indwelling ureteric stent may be possible at the time of surgery, which will reduce the long-term morbidity. More serious injuries such as a complete transection would require a ureteric reimplantation.

86.3.4.3 Post-operative Complications

Dyspareunia

Pelvic floor surgery is associated with pain with intercourse. While there is often a reduction in post-operative vaginal dimensions after surgery, this has not been found to predispose to sexual dysfunction. Overall body image and satisfaction with sexual function are improved [75]. Dyspareunia following posterior colporrhaphy is more notable in the presence of a vaginal bridge. This is amenable to surgical exploration with the division of the band. Careful counselling is necessary as this may not improve the pain and can be associated with further scarring.

Prolapse Recurrence

Cystocele formation is the most common long-term complication following SSF (6–29%) [76]. It is thought that this may be as a result of the exaggeration of the vaginal axis or to the inherent anterior wall weakness. A meta-analysis by Morgan et al. found an overall failure rate at any site of 28.8% with the failure of the anterior segment seen in 21.3%, apical segment in 7.2% (95% CI 4.0–10.4%) and posterior segment in 6.3% (95% CI 4.2–8.4%). They also reported on subjective outcomes and Qol where 10% of patient's failed to achieve relief of prolapse symptoms and 13% were dissatisfied with their operation [77].

Voiding Dysfunction

Short-term voiding dysfunction or urinary retention following pelvic floor repair occurs in 16–27% with higher likelihood after an anterior colporrhaphy. It commonly requires a short period of re-catheterisation (3–7 days) following which spontaneous voiding resumes in the majority of cases [78, 79]. Persistent high post-void residuals (>150 mL) requires further assessment with flow studies, urodynamics and the introduction of clean intermittent self-catheterisation.

Bladder Dysfunction

New-onset overactivity of the bladder (OAB) occurs in around 12% of cases, and pre-existing OAB may resolve in 40% of cases following pelvic organ prolapse surgery [80].

86.3.5 Vaginal Mesh Surgery

86.3.5.1 Introduction

Since the successful publication of the use of vaginal mesh for urinary incontinence in 1996, there has been an exponential growth in the commercially available kits for the management of pelvic organ prolapse [72]. The success of the incontinence procedures accompanied by concern about high recurrence rates with standard pelvic organ prolapse surgery and the perception of higher success rates with mesh surgery led to a significant increase in the utilisation of mesh procedures for the treatment of POP [81, 82]. Many of these procedures were associated with complications attributed to the use of mesh. This led to the FDA releasing statements in 2008 and 2011 warning surgeons on the frequency of complications associated with the use of transvaginal mesh [83]. The Scottish Independent Review of the use, safety, and efficacy of transvaginal mesh implants in the treatment of stress urinary incontinence and pelvic organ prolapse in women in 2017 highlighted the need for long-term date, governance and reporting of complications and encouraged the development of algorithms for their management [84].

There is little objective evidence-based data to support the management of mesh-related complications. An evidence-informed algorithm for treating pelvic floor mesh complications by Cundiff et al. was published in March 2018 [23]. Hopefully this will provide a framework to guide future management strategies.

The incidence of mesh-related complications following the vaginal placement of mesh (20%) is reported to be considerably higher than if it is placed abdominally (sacrocolpopexy) where the incidence is in the region of 3–4% [72, 85]. It has also been shown that there are many other factors that contribute to complications associated with mesh. These include smoking, obesity, previous surgery and the type and volume of mesh used. Additional confounders include the method of fixation in the pelvis.

86.3.5.2 Post-operative Complications

Symptoms and signs cited as attributable to vaginal mesh can include chronic pain, exposure, abnormal vaginal discharge, dyspareunia, sexual disfunction or fistula formation.

86.3.5.3 Management of Complications

A detailed history and thorough physical examination are essential for the diagnosis and planning of management. To achieve this, an examination under anaesthesia may be required as part of preoperative assessment in order to establish the location and extent of mesh placement or the degree of exposure. A proctoscopy or/and cystoscopy may be necessary to rule out the presence of fistulation or visceral extrusion in neighbouring organs. Imaging modalities that can help with the diagnosis include MRI or ultrasound [86].

Equally important is the assessment of the expectations of the patient. An understanding of the initial symptomatology and the indication for the primary surgery is essential. The psychological burden associated with the presentation must be taken into consideration and where indicated addressed.

The treatment strategy for vaginal mesh exposure depends on the degree of exposure and the presence or absence of bothersome symptoms. Some believe that asymptomatic mesh exposure can be managed expectantly and may not require treatment if the patient is not sexually active [87]. Given the anxiety associated with mesh complications, this is probably not sensible. Small exposures have been managed with trimming or local estrogen therapy, but this does not relieve symptoms or provide definitive treatment. Partial or complete mesh removal is usually required for patients with symptomatic mesh exposures, including those with pelvic pain or dyspareunia. This however may fail to improve all symptoms and reoperation can be necessary in as many as 15% of cases.

Even after mesh removal, pain may persist in up to half of operated patients. Vaginal mesh kits utilising fixation into the obturator membrane or attachment to the sacrospinous ligaments may cause entrapment of the obturator or pudendal nerve, leading to chronic neuralgia. Both surgical and non-surgical approaches with pelvic floor rehabilitation are recommended in such cases [23]. Surgical strategies require either partial or complete mesh removal.

Partial removal of the mesh is performed by mobilising the epithelial edges, excision of the exposed portion of the mesh and closure of the epithelium. Complete excision requires a similar approach but with further dissection to the pelvic sidewalls allowing complete removal of the mesh. The risk-benefit ratio of the various approaches has yet to be established [88].

Mesh extrusion into neighbouring organs such as urethra, bladder or rectum requires more extensive surgery in a multidisciplinary setting. Urethrotomy or cystotomy allowing complete mesh excision rather than endoscopic treatment may be more efficacious in providing symptom control [89]. Similarly, in the cases of rectovaginal fistulas, excision of the mesh and closure is required. This is associated with high cure rates but 40% of patient requiring temporary or permanent diversion procedure [90].

86.3.6 Abdominal Prolapse Surgery

A variety of procedures exist for the abdominal management of prolapse. These include sacrocolpopexy, sacrohysteropexy and uterosacral ligament plication. Many of the complications are similar to other prolapse operations and are covered earlier in the text. We will concentrate on those complications specific to the procedures.

86.3.6.1 Mesh Complications

The risk of mesh-related complications following abdominal sacrocolpopexy is between 3 and 6% in the medium term with on-going cumulative risk estimated to be around 10.5% at 7 years [91]. Presenting symptoms differ and depend on the site of exposure or extrusion. Vaginal exposure manifests with offensive discharge or vaginal spotting. Transvaginal excision of the exposed portion of the mesh with partial colpocleisis is the recommended primary approach, resulting in symptom resolution in 50% of the patients [92]. If this approach is not acceptable to the patient or in the presence of recurrent vaginal mesh exposure, then a transabdominal approach is necessary for the complete excision of the mesh and closure of the vaginal vault. This can be performed via either the open or minimal access surgical route depending on the patient's characteristics and the experience of the surgeon (Video 86.2).

Extrusion of mesh into other organs requires a multidisciplinary approach as described in Sect. 3.5.1 to 3.5.3 [90].

86.3.6.2 Vascular Injuries

As with any other abdominal or laparoscopic surgery, vascular injuries can occur, which needs rapid assistance from the vascular team. It is always worth remembering that immediate control can usually be achieved with packing, which should give time for the vascular surgeons to attend theatre.

An injury specific to sacrocolpopexy is damage to the presacral veins. This can be particularly troublesome as the veins retract into the sacral foramina, making control difficult. Prolonged packing will often control the bleed but will require a return to theatre to remove the pack. To prevent this, careful attention should be taken to the placement of the cranial sutures. They are best attached through the sacral (anterior longitudinal) ligament just below the sacral promontory since placement lower on the sacrum, at the S3 to S4 level, is more likely to result in presacral haemorrhage.

Reconstructive surgeons should be able to manage presacral haemorrhage and must have bone wax, concave thumbtacks and haemostatic patches to facilitate immediate management.

86.3.6.3 Spondylodiscitis

Spondylodiscitis is an extremely rare but serious complication of sacrocolpopexy and can present sometime after the initial surgery. In cases where conservative drug therapy fails to improve symptoms, debridement and laminectomy may be required [93, 94]. Fastidious attention to surgical technique (including placement of sutures) will prevent this complication. The cranial sutures should be attached to the anterior longitudinal ligament rather than the periosteum.

86.3.6.4 Ureteric Injury

The risk of ureteric injury associated with sacrocolpopexy and sacrohysteropexy is not much different from any other open or minimal access pelvic procedures.

The uterosacral ligament plication, however, is associated with an above-average risk of ureteric injury. Cystoscopy should be done routinely at the completion of each case to prevent delayed recognition of ureteral injury. Ureteral kinking from the uterosacral suture is found during routine intraoperative cystoscopy in up to 11% of cases. Identification at the time of surgery will allow the surgeon to release the most lateral suture (usually unilateral is sufficient, but bilateral may be necessary) to restore urine flow [95, 96].

86.3.6.5 De Novo Stress Urinary Incontinence

The development of new-onset stress urinary incontinence after abdominal prolapse surgery can occur in as many as 15% of cases. Whether this is new-onset incontinence occurring as a result of the previous surgery or the masking of underlying incontinence (occult) is unknown. A carefully taken medical history can identify possible cases more prone to occult incontinence. These include a history of incontinence that improved or resolved as prolapse worsened, the need to reduce the prolapse in order to void and the worsening of incontinence with the use of a pessary. A variety of tests (manual, swab, speculum, forceps, pessary) have been employed to try and identify occult incontinence. The sensitivity is very low (17–39%) and can overdiagnose the condition. As the predictive value of prolapse reduction testing is limited and the employment of an anti-incontinence procedure at the time of sacrocolpopexy will not remove the risk of de novo SUI, it is fruitless to try and identify this subgroup of patients. In addition, a significant number of patients who develop SUI after prolapse surgery will resolve spontaneously by 6 months.

Consequently, we believe that it is best to warn the patients about the possibility of SUI and reserve the additional surgery for the small subset who still have incontinence at 6 months.

86.4 Conclusion

All surgical procedures are associated with complications. These can range from minor problems to life-changing or life-threatening complications.

It is important therefore to exhaust all evidence-based conservative options before embarking on surgery. In addition, it must be made clear to the patient that complications can and do occur, what they are and what the consequences will include. The patient must also be informed of the possible solutions for these complications and the risks associated with them.

The patients must also be informed of all the available surgical options as well as the risk-benefit ratio of the procedures. Careful documentation of these discussions will go a long way to reduce the dissatisfaction so often experienced after prolapse and incontinence surgery.

Concentration of surgical management in centres of excellence will contribute to a reduction in complications. Whether the benefit is realised because the centre or the surgeon being of high volume are hotly disputed, but it is clear that the opposite does not apply. Common sense would suggest that the management of complications in a high-volume centre would be better managed as the personnel would have seen more of them than in low-volume centres [6].

Take-Home Messages

- Surgery is 'an indivisible, indispensable part of healthcare'
- However its complications are as costly to the global health economy 'as the failure to provide childhood immunisation and mosquito nets'. Currently, complications constitute the third largest cause of death in the US [97].
- There is an urgent need to understand the complications associated with surgery so that steps can be taken to address them and so reduce the burden of disease associated with them.
- Both incontinence and prolapse surgery have seen a shift towards non-mesh procedures due to the short- and long-term consequences associated with the use of permanent implantable materials. It is necessary to remember that despite not utilising mesh, native tissue operations are still associated with risks and have the potential for long-term morbidity offsetting the benefits that quality of life surgery provides.
- In dealing with mesh-related complications, an assessment of the expectations of the patient is very important. An understanding of the initial symptomatology and the indication for the primary surgery is essential. The psychological burden associated with the presentation must be taken into consideration and where indicated addressed.
- The treatment strategy for vaginal mesh exposure depends on the degree of exposure and the presence or absence of bothersome symptoms. Management should be in specialist centres with multidisciplinary expertise.

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