Surgical management of pelvic organ prolapse: abdominal and vaginal approaches

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Abstract

Pelvic organ prolapse (POP) is a common condition, affecting women of all ages.

Epidemiological studies suggest a lifetime risk of prolapse or incontinence surgery of between 7 - 19%. [1,2] There are many approaches to the surgical correction of POP which frequently reflect the nature and anatomic site of the defective support, but essentially the surgeon has to decide whether to perform this surgery vaginally or via the abdomen as an open or laparoscopic procedure. If performed vaginally, further decisions regarding the use of synthetic or biological graft to reinforce the repair need to be made.

This topic paper will briefly cover anatomical considerations, outline the most commonly utilised surgical techniques for POP and their evidence base, and then discuss the factors surgeons need to consider prior to embarking on surgical correction of POP.

Keywords: pelvic organ prolapse; vaginal prolapse surgery; abdominal prolapse surgery

Introduction

Pelvic organ prolapse (POP) is a common condition, affecting women of all ages. Epidemiological studies suggest a lifetime risk of prolapse or incontinence surgery of between 7 - 19%.[1,2] In an aging population the incidence of these surgeries would only be expected to increase, although the increasing Caesarean Section rates and smaller family size in recent years will have a negative impact on the prevalence of these conditions. There are many approaches to the surgical correction of POP which frequently reflect the nature and anatomic site of the defective support, but essentially the surgeon has to decide whether to perform this surgery vaginally or via the abdomen as an open or laparoscopic procedure. If performed vaginally, further decisions regarding the use of synthetic or biological graft to reinforce the repair need to be made.

This topic paper will briefly cover anatomical considerations, outline the most commonly utilised surgical techniques for POP and their evidence base, and then discuss the factors surgeons need to consider prior to embarking on surgical correction of POP.

Anatomical Considerations

Pelvic organ prolapse has been likened to a hernia, with the bladder, rectum, vagina, and/or uterus/vault prolapsing through the urogenital hiatus formed by the muscles of the pelvic floor. Defects in the pelvic floor musculature or its nerve supply, and defective endopelvic fascia have been implicated in the pathophysiology of POP.

DeLancey has popularised the concept of the 3 levels of endopelvic fascial support.[3] Level 1 support pertains to the support provided to the uterus and cervix by the uterosacral-cardinal ligament complex. This complex is often utilised in repairs of the apical prolapse defects seen with uterine or post-hysterectomy vault prolapse. Level 2 support is provided to the bladder, rectum and proximal vagina via the pubocervical and rectovaginal endopelvic fasciae which envelope the pelvic organs and insert proximally into the pericervical ring and laterally into the arcus tendineous fascia pelvis (ATFP, or “white line”). Distally, Level 3 support is provided by the perineal body and perineal membrane to support the distal vagina. Although described as distinct levels, it is important to conceptualise the endopelvic fascia as one continuous sheet of connective tissue extending from the sacrum as the uterosacral ligament, all the way down to the perineal body and perineal membrane. When viewed in this manner, it becomes clear that

defects in one isolated compartment are uncommon, and that recreating apical support is of utmost importance in reducing the risk of recurrent prolapse.

Assessment of POP involves consideration of the 3 vaginal compartments - anterior, apical and posterior. When determining the site of the defect(s), the Pelvic Organ Prolapse Quantification system (POP-Q) is a standardised method of objectively recording the site and degree of prolapse.[4] It provides intra- and inter-observer reliability when comparing pre- and post-operative pelvic floor examinations. It is very important to examine patients carefully to identify the exact site of loss of support in order to determine what needs to be repaired and how best to achieve this.

Surgical procedures for Pelvic Organ Prolapse

A survey of urogynaecologists, gynaecologists with a special interest in urogynaecology and general gynaecologists in the United Kingdom (UK) was recently published, and compared to the same survey administered 5 years earlier.[5,6] The survey provided insight into the common procedures performed for 4 different clinical scenarios. The anterior colporrhaphy was still the most common procedure for anterior compartment prolapse with or without the use of synthetic graft; vaginal hysterectomy with uterosacral suspension was performed for uterine prolapse; posterior native tissue colporrhaphy was the most common for posterior compartment prolapse and post-hysterectomy apical prolapse was repaired with abdominal sacrocolpopexy in 44%. The differences between the results of the 2 surveys over the 5 year period were not great. The main difference was in the increasing uptake of use of synthetic graft material, particularly in recurrent anterior compartment prolapse.

The same survey was administered to Australian and New Zealand (ANZ) generalist gynaecologists and subspecialists in 2007.[7] Interestingly, for the same clinical scenarios, the ANZ group were more likely to use synthetic mesh in both anterior and posterior compartments and favoured the vaginal approach for apical prolapse repair, with sacrospinous fixation and repair (37%) or vaginal mesh repair (33%), over sacrocolpopexy (11%).

The following discussion outlines the common vaginal and abdominal surgical procedures for POP repair according to the defective compartment, with quoted success rates based on anatomical criteria.

Anterior compartment

Anterior native tissue colporrhaphy involves the midline plication of the attenuated pubocervical fascia. Studies have shown high recurrence rates, up to 50%.[8] However recurrence rates with midline fascial plication can be minimized by the use of interrupted delayed absorption sutures and attention to apical loss of support which is increasingly acknowledged as the cause of many anterior vaginal wall prolapse. The paravaginal repair is a site-specific repair which re-approximates the detached pubocervical fascia to its attachment along the ATRP. Both abdominal and vaginal approaches have been studied. Current evidence does not clearly support this approach to anterior compartment repair.[9,10,11,12]

Further attempts at decreasing the high failure rates in the anterior compartment have led to the use of graft material. Graft use in the surgical management of prolapse aims to create a scaffold upon which native tissue ingrowth can occur, theoretically providing a stronger and more durable repair. The graft material most commonly in use is synthetic polypropylene mesh, a monofilament macroporous Amid Type 1 material, which has been shown to have a decreased risk of mesh infection and exposure, compared with the other Amid types.[13] The mesh can be laid freehand over a fascial repair, anchored, or be part of a commercial mesh delivery system. Although polypropylene mesh augmentation has been shown to strengthen the repair and decrease recurrence rates, the incidence of poor vaginal healing with mesh exposure is high at around 10%.[8]

Mesh delivery systems (Perigee, American Medical Systems, Minnetonka, MN; Avaulta, C.R. Bard, Covington, GA; anterior Gynecare Prolift, Ethicon Women's Health and Urology, Somerville, NJ) utilise 2-4 transobturator trocars to anchor the mesh into the ATRP, providing high Level 2 support for the anterior compartment. Studies have shown success rates around 81-95% at 1-3 years followup.[14,15,16] These success rates are offset by the complications directly related to the placement of the mesh, with mesh extrusion of 7.1-11.7% and de novo vaginal pain up to 4.4%.[14,15,16] In most cases these complications require further minor surgery which tends to negate the benefit of lower recurrent symptomatic prolapse; the risk/benefit of transvaginal mesh is still being debated.

Posterior Compartment

The posterior compartment is more successfully repaired with native tissue colporrhaphy than the anterior compartment, with cure rates in the order of 80%.[17] Traditional midline fascial plication compares favourably with site-specific repair.[18] The use of graft in the posterior compartment for primary prolapse is not supported by current evidence.[19]

Apical Compartment

The apex consists of the uterus and cervix, or vault in the post-hysterectomy patient, and the upper vagina. Apical prolapse rarely occurs in isolation, and repair of the apex is often combined with repair of one or both of the other compartments. Apical prolapse repairs can be performed vaginally or abdominally, with or without the uterus in situ.

Vaginal approach

As shown by the UK and ANZ prolapse surveys, patients with uterovaginal prolapse most commonly undergo vaginal hysterectomy and vaginal repair. At the time of hysterectomy, efforts to re-establish Level 1 support using the uterosacral ligaments are crucial in decreasing the risk of post-hysterectomy vault prolapse.

1. Transvaginal uterosacral ligament suspension (USLS)

Uterosacral ligament suspension can be performed either as an intra-peritoneal or extra-peritoneal vaginal procedure; or abdominally.

The vaginal intra-peritoneal approach involves placing 1-3 permanent and/or delayed absorbable sutures into the intra-peritoneal middle third of the uterosacral ligament bilaterally and passing each end of these sutures through the proximal transverse edge of the pubocervical and rectovaginal fasciae, thereby recreating the peri-cervical ring and Level 1 support.[20] (Figure 1) This can be performed either concomitantly with a vaginal hysterectomy or for post-hysterectomy vault prolapse, after entry into the peritoneal cavity.

A meta-analysis of transvaginal uterosacral ligament suspension reported successful apical outcome in 98%, with median follow-up of 25 months.[21] Success in the anterior and posterior compartments were 81% and 87%, respectively. Care must be taken to avoid ureteric injury/kinking, reported to be as high as 11%.[22] This can be mitigated by placing the sutures in the infero-medial portion of the uterosacral ligament at the level of the ischial spine, which has been shown in anatomical studies to be the position furthest

from the ureter and vascular structures.[23] Intra-operative cystoscopy with visualisation of ureteric efflux is recommended to confirm ureteral patency following suture placement.

Extraperitoneal USLS is a useful approach for post-hysterectomy vault prolapse as it does not require entry into the peritoneal cavity and has less risk of ureteric injury than intraperitoneal USLS.[24] It can be performed through an anterior or posterior approach. Two delayed-absorbable sutures are placed into each uterosacral-cardinal ligament complex after dissection of the endopelvic fascia from the vaginal mucosa and identification of the remnants of the ligament complex and ischial spines. The ends of the sutures are passed out through the full thickness of the vaginal mucosa at the level of the new vault. Success for the vaginal cuff is reported at 95% at 2 years, with recurrent anterior compartment prolapse in 9.2%.[25]

The McCall culdoplasty is performed at the time of vaginal hysterectomy and involves the placement of 1-3 'internal' (intraperitoneal) sutures from one uterosacral ligament to the other incorporating the peritoneum of the culdesac, the aim of which is to obliterate the culdesac to prevent formation of an enterocoele. A further series of 'external' sutures anchors the distal uterosacral ligament pedicles to the vaginal vault to provide level 1 support.[26] A small randomised trial showed that the McCall culdoplasty resulted in fewer recurrent prolapses at 2 years than simple culdesac peritoneal plication.[27]

2. Sacrospinous ligament suspension (SSLS)

Sacrospinous ligament vault suspension can be performed at the time of vaginal hysterectomy or for post-hysterectomy vault prolapse. Unilateral or bilateral sutures are placed into the sacrospinous ligament and attached to the vaginal vault.[28] In order to avoid vascular and nerve structures the sutures are placed 2 centimetres medial to the ischial spine. The sacrospinous ligament can be accessed via an anterior or posterior approach, with similar reported anatomical success.[29] SSLS results in an exaggerated posterior vaginal axis, with an increased risk of recurrent or de novo anterior compartment prolapse in the order of 25-30%.[30,31]

Colombo and Milani, in a case control study of VH and McCall culdoplasty versus VH and SSLS, found that the the sacrospinous hysterectomy group had significantly more blood loss, longer operating time and a higher prolapse recurrence rate (27% vs 15%) particularly of cystocele.[32] Our experience is the vaginal hysterectomy and McCall is an

excellent operation even for POP-Q stage 4 prolapse, although the uterosacral ligaments need to be ligated more proximally prior to attachment to the vaginal vault.

If the prolapse is predominantly apical with the uterus in situ, a discussion with the patient regarding the options of uterine-sparing prolapse repair versus hysterectomy and vault suspension is required. The decision to retain the uterus is made in the absence of uterine or cervical pathology. If future fertility is not an issue, the Manchester repair with cervical amputation, shortening of the uterosacral ligament with reattachment to the anterior cervix is also an option. If future pregnancies are desired, then the abdominal approach with attachment of polypropylene mesh between vagina, cervix and anterior sacrum (abdominosacrohysteropexy) or vaginally with a sacrospinous hysteropexy (VSH) can be performed.

A randomised trial of vaginal sacrospinous hysteropexy versus vaginal hysterectomy and SSLS (VH/SSLs) with follow-up at 1 year, showed greater anatomical apical cure in the VH/SSLs group, but similar functional and quality of life outcomes.[33]

3. Apical transvaginal mesh delivery systems

The mesh delivery systems for apical prolapse repair (posterior or total Gynecare Prolift, Ethicon Women's Health and Urology, Somerville, NJ; Pinnacle and Uphold, Boston Scientific, Natick, MA; Elevate, American Medical Systems, Minnetonka, MN) involve fixation of the mesh to the sacrospinous ligament using a variety of kit-specific techniques, and can be used with or without uterine preservation. Peer-reviewed studies are limited to posterior and total Gynecare Prolift, with success rates at 1 year reported at 82 and 86% respectively.[34]

4. Colpocleisis

Colpocleisis is an obliterative vaginal prolapse procedure traditionally performed on non-sexually active women with existing medical co-morbidities which preclude them from having more extensive prolapse surgery. The procedure can be partial (uterus in-situ) or complete (for vault prolapse) and involves denudation of the anterior and posterior vaginal walls, with imbrication of the fascia and suturing of the distal edges of the anterior and posterior mucosal edges together. It is often performed with an aggressive perinorrhaphy to provide extra support. If required, an anti-incontinence procedure can be performed at the same time.[35]

Abdominal approach

1. Abdominal sacrocolpopexy

Abdominal sacrocolpopexy can be performed open, laparoscopically or with the aid of a robotic device. Following careful dissection of the vesicovaginal and rectovaginal spaces, a graft (most commonly polypropylene mesh) is sutured to the exposed endopelvic fascia and the free end fixed to the anterior longitudinal ligament of the sacrum at the level of the sacral promontory. (Figure 2) This approach provides good durable repairs and maintains adequate vaginal length and sexual function.. Reported success rates for all compartments are 78-100%, with mesh exposure occurring in 3.4%. [36] In our experience the mesh exposure rate is less (2%) with polypropylene mesh and occurs mainly when a concomitant total hysterectomy is performed or if the vagina is inadvertently opened. [37]

Abdominal sacrohysteropexy (ASH) versus total abdominal hysterectomy and abdominal sacrocolpopexy (TAH/ASC) has been studied in a retrospective cohort study. [38] Overall anatomical cure rates, as defined by POP-Q points Aa/Ba or Ap/Bp ≤ -2 , were low (ASH 39%, TAH/ASC 63%), with no apical failures and most recurrences confined to the anterior compartment. Subjective cure for both groups was high (ASH 83%, TAH/ASC 100%). Mesh exposure occurred in 1/3 of the TAH/ASC group. There have been no studies directly comparing VSH and ASH.

2. Abdominal uterosacral ligament suspension (AUSS)

AUSS re-attaches the USL to the vaginal vault or cervix. A number of different techniques have been described, but all involve the passage of sutures through the middle third of the USLs which are then attached to the vault or cervix. [39] Whilst short-term results are encouraging with 88% success at 1 year, no long term data regarding durability are available.

Abdominal versus vaginal - which approach?

In repairing POP, the pelvic surgeon strives to restore anatomy whilst maintaining normal genito-urinary function and incorporating the treatment goals of the patient. The route of repair, abdominal or vaginal, is dependent on a multitude of patient (age, primary or recurrent prolapse, presence of uterus, site of prolapse, individualised risk for recurrence,

pre-existing co-morbidities) and surgeon (experience and preference for surgical technique) factors. Unfortunately there are very few studies providing high level evidence regarding the optimal surgical approach, as highlighted by the recent Cochrane review of surgical management of POP.[40]

The site of defective support will largely determine the route of repair. Primary POP predominantly involving the anterior and/or posterior compartment is best served by a vaginal approach, with its inherently less invasive nature, fewer complications and quicker recovery time. A failed anterior colporrhyphy may require fascial reinforcement by way of graft to increase the durability of the repair. However many fail also because the apical supports have not been previously addressed.

A post-hysterectomy vault prolapse can be repaired using suture vault suspension, transvaginal mesh delivery system or abdominal sacrocolpopexy. A retrospective study assessing these 3 techniques (USLS, Posterior Gynecare Prolift, ASC) at 3-6 months follow-up, showed that apical success rates were comparable between the 3 groups (>98%) however there was a statistically significant reduction in total vaginal length in the vaginal mesh group.[41]

A randomised trial of ASC versus SSLS with mean 2 year follow-up showed that subjective (94% vs 91%, respectively) and objective (76% vs 69%, respectively) success rates were comparable, however the authors noted that the study was under-powered for these outcomes.[42] Both techniques resulted in significant improvement in quality of life parameters, however ASC was associated with greater operating time, longer recovery and higher cost.

A randomised trial of total vaginal mesh (TVM) (Gynecare Prolift) and laparoscopic ASC with mean 2 year follow-up concluded that laparoscopic ASC resulted in significantly improved patient satisfaction.[43] Objective cure was also significantly greater in the laparoscopic ASC group (77%) compared with TVM (43%). TVL was shorter in TVM (7.81cm vs 8.83 cm) and the re-operation rate higher (22% vs 5%), mainly due to mesh complications.

Surgical morbidity and re-operation

As well as anatomical cure, the route of prolapse surgery needs to take into account the morbidity of the procedure, both immediate and in the long-term.

A recent meta-analysis of complications and re-operation rates in patients undergoing apical prolapse repair compared traditional vaginal procedures (suture vault suspensions), vaginal mesh delivery systems and abdominal sacrocolpopexy.[44] The traditional vaginal surgery group had the longest follow-up time of 32 months, compared to ASC 26 months and vaginal mesh 17 months. Although the complication rates of traditional vaginal surgery and ASC were the highest (15.3% and 17.1% respectively) most of these were managed conservatively. In contrast, the vaginal mesh group complication rate was 14.5% but the majority of these required surgical intervention under general anaesthetic; mesh erosion or infection was the most common complication (5.8%). Reoperation rates for recurrent prolapse were 3.9%, 2.3% and 1.3% respectively, bringing total reoperation rates to 5.8%, 7.1% and 8.5% respectively. However not all complications are equal. Serious complication such as bowel injury and major haemorrhage are more common with the abdominal approach than the transvaginal approach and patients need to be adequately informed of all risks as well as benefits.

Final choice regarding abdominal or vaginal route for marked apical prolapse comes down to personal choice usually based on training and experience. We have a preference for the vaginal route where possible for its lower morbidity especially in the elderly or medically compromised. Mesh re-reinforcement with the vaginal approach lessens the risk of recurrence but must be balanced against the risk of mesh exposure. We use polypropylene mesh for anterior compartment prolapse where the risk of failure is high, such as in recurrent prolapse, obese patients and those who have high impact lifestyles. The abdominal sacrocolpopexy is our preferred procedure when vaginal capacity is reduced and ongoing sexual function is important. Also when fertility and future pregnancies are desired, we would perform an abdominal sacrohysteropexy.

Conclusion

POP is a complex condition requiring individualised patient care. The pelvic surgeon needs to be proficient in a number of different prolapse surgical techniques in order to provide the best care to his/her patient. The unique patient characteristics and treatment goals need to be considered when deciding on route of surgery.

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Figure Legend

Figure 1 Transvaginal uterosacral ligament suspension. The uterosacral ligaments are re-attached to the vaginal vault using 0 PDS sutures.

Figure 2 Abdominal sacrocolpopexy. Polypropylene mesh is placed over the anterior and posterior vaginal walls and then sutured to the anterior sacrum. The pelvic peritoneum is closed over the mesh.