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ORIGINAL CONTRIBUTION

Ventral Rectopexy: An International Expert Panel Consensus and Review of Contemporary Literature

Running Head: A ventral rectopexy consensus

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ABSTRACT

BACKGROUND: Ventral rectopexy has become increasingly utilized in the surgical management of rectal prolapse. There is a need for a contemporary evaluation of the role of the procedure and description of its use in clinical practice.

OBJECTIVE: To create an international consensus on ventral rectopexy.

DESIGN: An expert panel undertook a scoping review of the literature to identify subject domains of interest. Literature reviews were completed for each domain with subsequent development of evidence-based and practice-based statements. These were compiled and reviewed by the group over a total of nine meetings. Once statements were confirmed, supportive text was finalized, and an anonymous vote was completed using REDCap to record consensus.

SETTING: An international expert panel comprising colorectal surgeons who perform ventral rectopexy in a high-volume center.

MAIN OUTCOME MEASURES: Statements and associated expert consensus.

RESULTS: Eleven experts identified ten domains for review: indications, contraindications, assessment and planning, consent, operative details, prostheses, complications, follow-up, recurrence and reoperative surgery and specific considerations. After round-table review, there were 17 resultant statements for consideration. Experts agreed unanimously with the thirteen of the statements and their accompanying text, with different experts disagreeing each with four statements (91% consensus each).

LIMITATIONS: Paucity of high-quality data.

CONCLUSION: This international group developed 17 statements with high consensus. These statements provide an up-to-date summary of the literature, identify key areas for research development and a reference point for colon and rectal surgeons who undertake ventral rectopexy as part of their practice. See **Video Abstract**.

RECTOPEXIA VENTRAL: CONSENSO DE UN PANEL INTERNACIONAL DE EXPERTOS Y REVISIÓN DE LA LITERATURA CONTEMPORÁNEA

ANTECEDENTES: La rectopexia ventral se ha utilizado cada vez más en el tratamiento quirúrgico del prolapso rectal. Es necesario realizar una evaluación contemporánea del papel del procedimiento y una descripción de su uso en la práctica clínica.

OBJETIVO: Crear un consenso internacional sobre la rectopexia ventral.

DISEÑO: Un panel de expertos realizó una revisión exhaustiva de la literatura para identificar los dominios temáticos de interés. Se completaron revisiones de la literatura para cada dominio con el desarrollo posterior de declaraciones basadas en la evidencia y la práctica. Estas fueron compiladas y revisadas por el grupo en un total de nueve reuniones. Una vez que se confirmaron las declaraciones, se finalizó el texto de apoyo y se completó una votación anónima utilizando REDCap para registrar el consenso.

ESCENARIO: Internacional.

PRINCIPALES MEDIDAS DE RESULTADOS: Declaraciones y consenso de expertos asociado.

RESULTADOS: Once expertos identificaron diez dominios para su revisión: indicaciones, contraindicaciones, evaluación y planificación, consentimiento, detalles operatorios, prótesis, complicaciones, seguimiento, recurrencia y cirugía reoperatoria y consideraciones específicas. Después de la revisión en mesa redonda, hubo 17 declaraciones resultantes para su

consideración. Los expertos estuvieron de acuerdo unánimemente con trece de las declaraciones y su texto acompañante, y diferentes expertos estuvieron en desacuerdo con cuatro declaraciones (91% de consenso cada una).

LIMITACIONES: Escasez de datos de alta calidad.

CONCLUSIÓN: Este grupo internacional desarrolló 17 declaraciones con alto consenso. Estas declaraciones proporcionan un resumen actualizado de la literatura, identifican áreas clave para el desarrollo de la investigación y un punto de referencia para los cirujanos de colon y recto que realizan rectopexia ventral como parte de su práctica. *(Pre-proofed version)*

KEY WORDS: Consensus; Minimally invasive surgery; Intussusception; Pelvic floor; Prosthesis; Rectal prolapse.

INTRODUCTION

The surgical management of rectal prolapse continues to evolve. With an increasing investment in minimally invasive surgery and a philosophical shift away from resection, ventral rectopexy has become more widespread with promise of lower recurrence rates and risk of de novo symptoms. There have, however, been some geographic regions that have moved away from the procedure because of a concern for prosthesis related complications.

Since the procedure's dissemination in 2004,[1] there has been a surge in research with over 80% of the published literature appearing in the past decade. As more surgeons have adopted the technique, there have been variation in indications and numerous procedural adjustments. Some of this adaptation has been productive, however this global variation has made outcome assessment challenging. There is thus a need for a contemporary evaluation of the role of ventral rectopexy and description of its use in clinical practice.

The Ventral Rectopexy Working Group was established to develop a consensus on ventral rectopexy in the management of posterior compartment prolapse. The objectives were to provide an up-to-date summary of the literature, identify key areas for research development and a reference point for colon and rectal surgeons who undertake ventral rectopexy as part of their practice.

MATERIALS AND METHODS

The senior author (LB) convened an expert panel comprising colorectal surgeons who perform ventral rectopexy in a high-volume center. Participants were selected because of their academic reputation as experts in rectal prolapse and pelvic floor disorders who have all formally trained or had trained others in ventral rectopexy, undertook a minimum of 20 prolapse procedures per year, of which some were ventral but not to the exclusion of alternative procedures. Effort was

made to represent all Tripartite colorectal societies (The Association of Coloproctology of Great Britain and Ireland, The Section of Coloproctology Royal Society of Medicine, the Royal Australasian College of Surgeons Colon and Rectal Surgery Section, Colorectal Surgical Society of Australia and New Zealand, the European Society of Coloproctology, and the American Society of Colon and Rectal Surgeons) in a balanced distribution. A scoping review of the literature was undertaken to identify subject domains of interest, which were ultimately selected by consensus among experts. Domains were selected to encompass perioperative and intraoperative management and any topic specific to ventral rectopexy. Experts were then assigned a domain on which to complete a literature review and produce both evidence-based and practice-based statements. These were subsequently compiled and reviewed by the group as part of a round table review with iterative modifications as required over a total of 9 in-person online or hybrid meetings for which quorum was set at 50%. Meetings were chaired by the first and senior authors (WP, IB). Those unable to attend the meetings had the opportunity to review the discussion and make alterations to the statements offline. Once statements were compiled, a final hybrid meeting was held to finalize each statement and agree to their accompanying text. All experts then voted anonymously as to whether they agreed or disagreed with each statement (binary). Responses were collected and managed using REDCap electronic data capture tools hosted at Mayo Clinic (UL1TR002377).[2,3] The survey was IRB exempt.

RESULTS

Eleven experts were selected, who collectively identified 10 domains for review: indications, contraindications, assessment and planning, consent, operative details, prostheses, complications, follow-up, recurrence and reoperative surgery and specific considerations. After roundtable review, there were 17 resultant statements for consideration. Experts agreed unanimously with

the thirteen of the statements and their accompanying text, with different experts disagreeing each with statements 4, 5, 9, and 15 (10/11, 91% consensus each). In general, the quality of evidence in this field was found to be poor with predominantly retrospective case series being the primary source of data. There was significant heterogeneity in outcome reporting and outcome definitions between studies. The final statements, presented per domain, are as follows:

Indications

Statement 1: Ventral rectopexy is indicated for patients with full thickness external rectal prolapse and for selected patients with high grade intussusception with symptoms of fecal incontinence and/or obstructed defecation who fail to respond to non-operative therapy (100% consensus). The role for ventral rectopexy is well documented for full thickness external rectal prolapse,[1,4–7] and is suitable for all who can tolerate general anesthesia and pneumoperitoneum.[8,9] Further, there is a role for those with symptoms of fecal incontinence and high-grade intussusception (Oxford Grade III/IV[10] – Table 1)[11] who fail to respond to medical management.[7,12] Fecal incontinence associated with intussusception tends to be urge incontinence,[13] and worsens with increasing grade.[14] Similarly, there is a role for those with symptoms of obstructed defecation and Oxford Grade IV intussusception or Oxford Grade III intussusception with high takeoff, enterocele, sigmoidocele and/or solitary rectal ulcer syndrome who fail to respond to medical management. Obstructed defecation is a subset of functional constipation or irritable bowel syndrome with constipation associated with impaired evacuation during repeated attempts.[15]

Failure to respond to nonoperative therapy differs between institutions, however, acknowledges a coordinated trial of bowel optimization, habit training and pelvic floor physical therapy ideally in coordination with biofeedback. Ultimately, treatment for high grade intussusception is institution

specific and the collection of further data will continue to guide patient-specific management recommendations. Moreover, a concerted effort should be made to identify those less likely to benefit from ventral rectopexy including those with a primary disorder of gut brain interaction, for whom a review with gastroenterology is recommended.

Statement 2: Ventral rectopexy is suitable when there are findings of multicompartment prolapse (100% consensus). When patients are symptomatic with multicompartment prolapse, placement of a ventral prosthesis can provide additional support to the middle compartment. When there is significant middle or anterior compartment prolapse, involvement of urogynecology to choose the best procedure for middle and anterior compartment support is warranted. Numerous studies have published on the success of combined procedures, and it is suggested that a focus on single compartment prolapse when multicompartment prolapse exists, will lead to suboptimal outcomes.[16–20]

Contraindications

Statement 3: Ventral rectopexy may not be appropriate for patients with certain disease processes, including: active pelvic malignancy, pregnancy, fistulizing rectovaginal disease and pelvic sepsis; and case by case consideration is required (100% consensus). Contraindications include active pelvic malignancy, pregnancy, fistulizing rectovaginal disease and pelvic sepsis. Relative contraindications include proctitis or inflammatory bowel disease, significant pelvic endometriosis and chronic pelvic pain. For each relative indication, there are specific circumstances in which ventral rectopexy may still be utilized and it is imperative that such cases are discussed in a multidisciplinary meeting and with the patient. Additional consideration should be given to those with a prior Altemeier (perineal proctosigmoidectomy), male patients,

fistulizing perineal disease, obesity, slow transit constipation and plans for a future pregnancy, all of which are best managed in a specialty center.

Assessment and planning

Statement 4: Initial evaluation must include a history, physical examination and use of a patient-reported outcome measure (91% consensus). It is imperative to obtain a full detailed history that includes duration and characteristics of presentation, bowel function, urinary function, vaginal symptoms, sexual function, and past surgical, medical and obstetric history. As part of this, it is recommended to utilize a patient-reported outcomes measure that can be utilized as part of any scheduled follow-up to track change in symptoms, their severity and impact. Such tools include: Cleveland Clinic Fecal Incontinence Severity Scoring,[21] St. Marks Fecal Incontinence Score,[22] Colorectal Anal Distress Inventory-8,[23] Constipation Severity Instrument,[24] Patient Assessment of Constipation Symptoms[25], which can be utilized by adopting the amalgamated IMPACT short form developed by the Pelvic Floor Consortium.[26] Additional useful PROs include the Altomare Obstructed Defecation Score,[27] EQ-5D[28] and MyMOP.[29]

Examination should involve perianal inspection for any deviation from the midline; presence or absence of perineal descent, digital rectal examination to assess sphincter integrity, sphincter tone, sphincter squeeze, and coordination; presence of a rectocele and to exclude other pathology. Anoscopy is recommended alongside evaluation of prolapse whether on the examination table or commode. Vaginal examination should be performed to assure there is no concomitant posterior or anterior vaginal prolapse to the introitus, or patients should be examined by a urogynecologist.

This should all be undertaken in the context of *trauma informed care* in acknowledgement that many patients within this population do indeed have a history of trauma and that examinations are sensitive.[30] Adopting such a practice can improve engagement, treatment, and outcomes.

Statement 5: Consideration should be given to dynamic defecatory imaging, anorectal function testing, endoscopic evaluation, and a formal multidisciplinary review (91% consensus). Most patients should undergo dynamic defecatory imaging and endoscopic evaluation. In addition, anorectal function testing may be helpful to guide nonoperative management. Further, it is recommended that a multidisciplinary review be undertaken prior to surgery.

Dynamic imaging in the form of perineal echodefecography, fluoroscopic defecography or MRI defecography is recommended to help assess the biomechanics of the prolapse with the goal of informing operative technique. Fluoroscopic imaging and MRI are the most frequently utilized modalities. Fluoroscopic imaging is in a seated position which may more accurately reflect defecatory biomechanics, however anterior compartment assessment can be limited. Defecatory MRIs likely under call findings as they are performed in supine positioning, however they do provide higher definition imaging of all pelvic compartments. Further, an MRI can readily ascertain a high versus low take-off prolapse, depth of the pouch of Douglas, presence or absence of a -cele, and posterior dominance among other anatomical findings.[31] MRI is also helpful when patients present with vaginal, urinary or non-descript pelvic symptoms. Imaging is also imperative in reoperative surgery to understand anatomy and delineate potential cause for any recurrent prolapse. The role of imaging for patients with irreducible rectal prolapse or clinically visible multicompartment prolapse is of limited utility.

Anorectal function testing includes anorectal manometry, rectal sensory testing and balloon expulsion testing. This can help delineate those who would benefit from pelvic floor physical therapy, biofeedback and other nonoperative strategies. It also provides a comparative baseline for operative patients.

Endoscopic evaluation has the ability to assess for solitary rectal ulcer syndrome while also excluding colorectal malignancy, inflammatory bowel disease or other pathology.

Given the often-complex nature of presentations and multicompartment involvement, multidisciplinary review is recommended. This may include specialists in colorectal surgery, urogynecology, radiology, gastroenterology, and pelvic floor physical therapy.

Consent

Statement 6: Consent process should include a discussion of the goals of ventral rectopexy with additional disclosure of risks, benefits and alternatives alongside expected outcomes (100% consensus). Consent should be obtained in a timely manner with opportunities to review shared decision making. Where possible, provision of written information is recommended. The process should include a discussion of the goals of ventral rectopexy. Broadly speaking, these are to correct anatomical prolapse with the intent to improve bowel function and quality of life, while minimizing complications and de novo symptoms. Consent should specifically address: the use of a permanent prosthesis versus a biologic prosthesis alongside associated risks; the risk for incomplete correction of bowel function; the risk of incomplete or lack of improvement to quality of life, and the risk of developing de novo symptoms including change in bowel function and pain.

Given the paucity of convincing data as to what a gold standard approach to rectal prolapse may be, the choice of ventral rectopexy should be made in a collaborative conversation with the patient, who should have a clear understanding that other alternatives also exist, each with their own risks and benefits. Numerous alternative approaches to the treatment of rectal prolapse have been described and to date, randomized controlled trials and large observational studies have failed to show clear superiority of any surgical approach.[32–35]

Operative details

Statement 7: VR should be performed as a minimally invasive procedure and can be done so as a day-case with an enhanced recovery after surgery (ERAS) program (100% consensus).

Whenever technically feasible, a minimally invasive approach, either laparoscopically or robotically, should be performed. In comparison to open surgery, minimally invasive rectopexy is safer and results in less pain and faster convalescence.[36] Robotic VR has the same safety profile[37,38]; and recovery of bowel function is claimed to be better after robotic VR.[37,39] VR can be performed as a day case procedure within an enhanced recovery after surgery (ERAS) program.[40,41]

The time it takes to learn the skill of laparoscopic ventral rectopexy, known as the learning curve, varies from 25-88 procedures per surgeon with fewer cases to achieve skill acquisition in a proctored environment. Adequate performance was previously estimated to be 50 procedures for LVR.[5] Learning curve for robotic procedures is reported between 36-55 procedures in two surgeons with LVR experience but naive to robotics.[42] Ultimately, this consensus defines competence as the ability to not only perform the operation but also to deal with any complications that may result from VMR.

Statement 8: Key operative steps include identification of the anterior longitudinal ligament over the sacral promontory, opening the peritoneum in the right pararectal space with autonomic nerve preservation, opening the rectovaginal septum down to the level of the anorectal ring, appropriately securing a prosthesis to the anterior rectum and sacral promontory, and peritonealization over the prosthesis. When multicompartment prolapse has been identified pre-operatively, a multidisciplinary operative approach should be considered. (100% consensus).

This description applies to the stereotypical female patient. Approach to the male pelvis is different – refer to the section titled "Special Considerations".

Anterior longitudinal ligament

The first step of VR provides the identification of the anterior longitudinal ligament over the sacral promontory; this step is similar in both females and male. In this area, important structures (hypogastric plexus and right hypogastric nerve, left common iliac vein, middle sacral artery, and right ureter) should be identified and carefully preserved to safely reach the anterior longitudinal ligament.

Peritoneal flap

The peritoneum is opened along the right side of the rectum and a peritoneal flap is created down to the pouch of Douglas. Attention should be paid in avoiding both a too lateral dissection and an excessively close dissection to the right rectal edge: the former can impede the fixation of the mid-rectum if necessary and the latter risks the neurovascular supply of the rectum and the right uterosacral ligament.[4,43]

Rectovaginal septum and pouch of Douglas

The original description of VR describes a peritoneal incision in the distal pouch of Douglas, completing an "inversed J" shape to the left side of the rectum. The rectovaginal septum is then dissected and opened down to the anorectal junction, the distal limit of which can be confirmed by a combined digital anovaginal examination. In male patients, dissection past the prostate's apex can be limited depending on the morphology of the prolapse. In a modified VR,[44] a retroperitoneal tunnel along the right side of rectum has been proposed allowing to connect two peritoneal mini-incisions at the pouch of Douglas and sacral promontory, aimed to avoid any injury on both lateral and utero-sacral ligaments.

This group now recommends formal excision of the pouch of Douglas to remove excess anterior rectal tissue, aid exposure of the rectum, provide a suitable landing zone for the prosthesis and elevate the cul-de-sac to address symptoms resulting from an enterocele/sigmoidocele. This step involves a peritoneal incision over the posterior upper vaginal vault, dissecting the peritoneum free and reflecting it back off the rectum before excising. Dissection should be kept relatively narrow, in line with the anterior rectal wall. The rectovaginal space can be opened thereafter as described above.

Securement of prosthesis

The synthetic or biological prosthesis is measured and tailored according to the anatomy. This should be placed on the ventral rectum and fixated with absorbable sutures. The use of a permanent suture is not recommended: this has been associated with prosthesis complications.[45–48] Approximately 6 partial thickness sutures can be placed for synthetic prostheses; however, more may be required for biological prostheses (9-12). The fixation of the prosthesis at and above the site of intussusception is important, particularly in high takeoff prolapse as opposed to

low takeoff prolapse.[49] This concept is put forward as a possible explanation for technical failure and early recurrence of symptoms. Some surgeons use a biological glue to reduce potential risk of suture fixation and assist in the prosthesis remaining flat into the rectovaginal septum[50]: such alternatives are not routinely used or currently supported in the literature.

Some case series document securing the prosthesis to the muscles of the pelvic floor.[37,51] This should be avoided: firstly, it is unnecessary to achieve prolapse reduction; secondly, it potentially immobilizes what should be a dynamic structure that assists in defecation and continence; and thirdly, there is a purported risk of pain.

The prosthesis can be sutured to the posterior vagina with absorbable suture to close the rectovaginal space and provide additional support. However, if middle compartment prolapse is identified, operative approach should be coordinated with a urogynecologist.

In the rare instance of bowel or vaginal perforation, or indeed loss of integrity of either organ, avoidance of a synthetic prosthesis is recommended, or alternative prolapse repair strategies should be considered.

Tensioning

Following a full reduction of the prolapse, holding the rectum in a normative position, the prosthesis is secured to the anterior longitudinal ligament over the sacral promontory avoiding the intervertebral disc, using absorbable or permanent sutures. Discitis has been described as a postoperative complication of all forms of -pexy procedures to the sacral promontory, likely the result of the fixation technique being placed too deep.[52–54] The disc and right hypogastric nerve should be avoided.[54] Tension on the prosthesis is difficult to judge but should be adequate, counterbalancing the pressure of the pneumoperitoneum and fixing the rectum in its natural/anatomical situation in the pelvis, preventing further internal or external rectal prolapse

and rectocele herniation. Conversely, prosthesis fixation should avoid excessive tension and undue traction to the rectum.

Re-peritonealization

Once the prosthesis is in place, meticulous re-peritonalization is to be undertaken to avoid adhesion/obstruction and reduce the risk of recurrence and/or symptomatic enterocele. This is regardless of prosthesis type used: it is important to cover biological prostheses to enhance tissue in-growth, while synthetic to avoid adhesion/obstruction.

Prosthesis

Statement 9: A biologic graft or a synthetic mesh can be utilized as the prosthesis for ventral rectopexy utilizing and absorbable suture to attach it to the rectum (91% consensus). The quality of evidence regarding choice of prosthesis is generally poor with retrospective case series or syntheses thereof being the predominant source of data. There is also significant heterogeneity in outcome reporting and outcome definitions between studies. Additionally, periods of follow-up in many studies are too short to detect all prosthesis related complications and to truly reflect the effectiveness of each prosthesis.

This statement is not intended to exclude the use of fascia lata in urogynecology, but there is currently limited expert experience or evidence to guide its use in ventral rectopexy.

Efficacy

When using synthetic mesh, utilization of lightweight, macroporous polypropylene mesh appears to be most favorable. Polyester mesh does not appear to be as favorable in terms of efficacy and safety and is not recommended.[55] Overall, there does not appear to be a difference in terms of recurrent rectal prolapse or symptoms between patients undergoing VR using a biologic graft or synthetic mesh.[56] There does, however, appear to be considerable differences in performance

between the various biologic grafts: for example, the reported recurrence using small intestinal submucosa-derived collagen is 1.54%[57] while the recurrence rate using a dermal based collagen graft may be as high as 14%.[58]

Safety

Historically, a wide variety of prostheses have been used in ventral rectopexy. These include synthetic meshes; polypropylene,[1] titanium coated polypropylene,[55] composite polypropylene,[59] polyester,[60] polyvinylidene fluoride (PVDF),[61] expanded polytetrafluoroethylene (ePTFE)[62] and biological grafts; porcine dermal collagen[58] (Permacol, Pelvicol, and Cellis) and porcine small intestinal submucosa (Biodesign).[57,63,64]

There is a low incidence of complications related to the use of synthetic and biologic prostheses in ventral rectopexy, which are distinctly different from those associated with transvaginal placement of prostheses.[65] Whilst no prosthesis related complication has been described with the use of PVDF or porcine small intestinal submucosa-derived collagen, the event rate of complications such as erosion, pain and fistulation are very low making it difficult to accurately state.[45,56]

A multicenter collaborative study to evaluate the safety of ventral rectopexy examined prosthesis type and complication rates for various synthetic (n = 1764) and biologic(n = 439) prostheses implanted in 2203 patients.[45] The synthetic meshes compared were polypropylene, polyester and titanium-coated polypropylene. The synthetic erosion rate was 2.4% (mean follow-up, 38 months). The biologic grafts were porcine dermis or porcine intestinal submucosa, and the erosion rate was 0.7% (mean follow-up 26 months). Kaplan–Meier estimates of erosion probability at 1, 2 and 5 years for synthetic mesh were 0.4%, 1.1% and 2.3%. For biologic, they were 0.5%, 0.7% and 0.7%. There was no statistical difference between synthetics or biologics.

Polyester mesh was associated with a statistically significant increased risk of erosion compared to the other mesh types.

Suture

Two out of the three reported incidents of biologic prosthesis (using Permacol) erosion have been associated with the use of braided polyester (Ethibond) sutures to secure the graft to the anterior rectum and this should be avoided.[45] A retrospective series examining the use of different suture material to secure synthetic mesh in sacrocolpopexy demonstrated an erosion rate of 3.7% (6/161) when a braided polyester suture was used vs 0% (0/254) with the use of polydioxanone sulfate sutures.[46] Similarly, a retrospectives series of 495 ventral rectopexies found an erosion rate of 2% in those who had non-absorbable sutures used to secure the mesh to the rectum and 0% in those who had absorbable suture used.[48] The same center saw no erosions after a switch to absorbable suture.[47]

Complications

Statement 10: Postoperative complications after ventral rectopexy include prosthesis erosion, prosthesis infection, and de novo symptoms (100% consensus). Concerns over the sequelae of placing foreign material in the pelvis has been under debate for several decades. Prosthesis related complications include erosion into the rectum, vagina, and/or perineum causing infection, bleeding, pain, sepsis and/or rectal vaginal fistula. In actuality, reported prosthesis complication rates by experienced surgeons are low ranging from 0.7% - 2.4% using biologic prosthesis or synthetic prosthesis respectively.[45] Infection at the proximal fixation point where the prosthesis is fixed to the anterior longitudinal ligament can result in discitis and is reported in 2% of ventral rectopexy procedures.[52] De novo symptoms of pain is reported in 12- 31% of individuals

undergoing VMR when obstructed defecation was the indication, age less than 50, and revisional surgery.[66]

Statement 11: Prosthesis-related complications should be managed by experienced surgeons at specialty centers (100% consensus). Acute complications specific to VR that usually occur within the 30-day period are rare and may be intraabdominal fluid collections or abscess or mesh related complications. Chronic complications that persist beyond 30 days may be related to prosthesis complications, de novo bowel symptoms or pain.

Experienced surgeons are considered those who are beyond their learning curve for pelvic floor procedures. Fellowship training and proctoring can augment the learning process and facilitate skill acquisition.

Ultimately, specialty pelvic health centers should have the resources needed to evaluate, test and provide lifestyle recommendations, non-operative and surgical management for multicompartment prolapse and bowel and bladder dysfunction. Further, a multidisciplinary team (MDT) is helpful to review clinical and radiologic findings, optimize non-operative therapies and create a surgical plan. In some centers, all patients undergoing placement of prosthetic material are discussed as part of an MDT. The role of MDT is particularly important to review complications or when considering re-operative surgery.

Re-operative surgery for mesh-related complications is challenging and uncommon.[67] It is strongly recommended that revisional surgery for complications is undertaken at a specialist unit with appropriate multispecialty team review and experience with re-operative pelvic surgery. These units should be identified as the preferred referral center in their region.

Follow-up

Statement 12: Optimal long-term follow-up after Ventral Rectopexy has not been determined but should be patient-specific (100% consensus). At least a 30-day post-surgical visit and up to 1-year short-term follow-up is suggested after VR. If de novo symptoms or functional difficulties persist more frequent follow-up may be prudent. Five-year follow-up is recommended by expert consensus for outcomes reporting albeit challenging to have patients respond to surveys or in person follow-up when they have minimal symptoms. Prosthesis erosions have been reported even after 5 years with permanent prosthesis and primary care education should be provided for patients who have their follow-up with their medical provider.[68] Red flag symptoms include: pain, fever, increasing vaginal discharge, and/or rectal/vaginal bleeding. Initiatives that support patient education and engagement to facilitate outcomes collection can improve rectal prolapse knowledge.

Recurrence and reoperative surgery

Statement 13: Recurrences after VR may occur and should be categorized by causation and extent. Revisional surgery is possible and can include redo VR (100% consensus). A recent systematic review reported a prolapse recurrence of 0%-18.8% following VR,[69] however the true incidence remains uncertain. Predictors for recurrence are patient factors such as gender (male sex), obesity, old age, known connective tissue disease, and surgically-remediable prosthesis failure such as mesh detachment for the sacral promontory or detachment from the rectum.[70–73] Recurrence can be mucosal or full-thickness.[68] It is important to distinguish between a full-thickness recurrence and what can be rectal mucosal prolapse only, since this will affect the treatment strategy. Further, the majority of recurrence of functional bowel symptoms may not be

associated with anatomic abnormalities or failure of suspension and need to be reassessed and re-evaluated in a systematic manner.

Suspicion of anatomical re-prolapse should be verified with clinical examination and imaging. The latter can provide deeper insights into the most likely cause of the recurrence. This could be imaging with defecography or dynamic MRI of the pelvis. In addition, examination under general anesthesia can also help distinguish between a full-thickness prolapse recurrence or a rectal mucosal prolapse only. Diagnostic laparoscopy can be helpful in aiding diagnosis and operative planning.

Ultimately, peri-operative and intra-operative assessment of the most likely cause of recurrence should inform the reconstructive approach. Types of recurrence can be subtyped, one way of which doing so is provided in Table 2.[74] In one series, the most frequent cause of recurrence has been suggested to be detachment from the sacral promontory (30.2%), followed by detachment from the rectum (23.3%), and then too proximal fixation of the mesh (20.9%).[75] In another, the most frequent cause of recurrence was suboptimal distal mesh positioning in 54 cases (71%).[67] In a multivariate analysis of 132 prospective VR case, strong predictors for recurrence were male sex (hazards ratio, 11.3; 95% confidence interval, 3.0-43.0) and age >80 years (hazards ratio, 10.7; 95% confidence interval, 1.3-86.3).[71]

In a recent multicenter study of 461 patients, 89 (19.3%) underwent redo rectal prolapse repair. Recurrence rates for redo repairs were similar to those undergoing de novo repair. Patients undergoing redo procedures rarely had the same operation as their index procedure.[76] The 6 patients with VR as index procedure were all treated with re-do VR. In general, a redo-rectopexy is a safe approach for revision surgery after any prior repair, however additional adjuncts

including pouch of Douglas excision, posterior dissection and suture rectopexy, and concomitant urogynecology surgery should be considered.

Specific considerations: pregnancy

Statement 14: Patients considering pregnancy require special consideration with a selective surgical approach (100% consensus). Pregnancy and vaginal delivery are leading risk factors for the development of pelvic organ prolapse (POP). High quality data relating pregnancy and delivery exclusively to rectal prolapse risk are lacking and are largely extrapolated from broader POP data.

Mode of delivery has the greatest influence on POP, with first vaginal and forceps delivery being associated with the highest risk.[77] Caesarean section is considered protective for the future development of pelvic organ prolapse, when compared with vaginal delivery.[77] A surprising omission in the current literature however is the lack of distinction between the effect of emergency versus planned Caesarean section.[78]

The conditions which promote POP are mostly established with the first pregnancy and vaginal delivery – stretch of soft tissues and supportive ligaments, levator muscle tears and avulsions, denervation (such as pudendal and levator ani neuropathy) and consequent widening of the genital hiatus.[77] These features can worsen (albeit to a lesser extent) after the second and subsequent deliveries.[79] Encouraging a patient with internal intussusception to complete their family first allows the pelvic tissues to establish their post-partum steady state, before a decision is made on severity of rectal prolapse and mode of repair.

A relative exception to this is external rectal prolapse which by its very nature causes more significant symptoms than its internal counterpart, relating to fecal incontinence, constipation, rectal bleeding, mucus leakage, pain and palpable rectal protrusion. These can have a significant

effect on quality of life on a daily basis, interfering with personal life, work, and physical and mental health.[80] Given the immediacy of these symptoms and the likelihood that they will worsen in pregnancy, repair can be considered prior to a patient's attempts to conceive, and/or before they have competed their family.

There are no published data which explore the fertility implications of a pelvic mesh procedure, either VR or the similar sacrohysteropexy. Conclusions are sometimes extrapolated from other colorectal pelvic surgeries that women of child-bearing age may undergo, such as restorative proctocolectomy (RPC) for ulcerative colitis. This surgery may increase in the relative risk of an individual's infertility 4-fold from baseline.[81] This comparison is probably not valid however, as the limited and localized pelvic dissection and deliberate re-peritonealization in a VR is a significantly lower pelvic insult than an RPC.

Statement 15: Full term pregnancy is likely safe after VR with synthetic mesh, with both vaginal and Caesarean delivery reported without mesh complications however alternative strategies, including biologic and non-prosthesis based abdominal repairs should be considered in those who are in childbearing years (91% consensus). Pregnancy in a woman who has had a previous VR may prompt a discussion around mode of delivery with their clinician given the concern for increased risk of recurrence with vaginal delivery.

One published cohort study has directly examined this.[82] This was a 10-year single-center retrospective review of 954 ventral rectopexies with a synthetic mesh. Of these patients, 225 were women under the age of 45 years. Eight (4%) of these patients became pregnant after rectopexy. Between a gestational range of 36-39 weeks, 6 delivered by elective caesarean section and 2 by spontaneous vaginal delivery (SVD - both in advance of planned Caesarean section). Median postpartum follow-up was 31 months (range, 1-42). The babies were discharged with

their mother; no admission to a special care unit was needed. For both mothers who underwent SVD it was their second baby, and neither suffered obstetric trauma. There were no reports of adverse outcomes related to the mesh.

Similarly, a paucity of data exists in the gynecological literature around pregnancy and delivery after sacrohysteropexy (SHP), a procedure with surgical similarities to VR. A recent systematic review examined POP recurrence after pregnancy following various techniques of uterine-sparing prolapse repair.[83] Of the 218 pregnancies reported on, 22 occurred in women who had had a previous SHP. Of these 22 women, only one (elective termination at 8 weeks) did not deliver by planned Caesarean section. No perinatal complications were reported. No significant trend to postpartum worsening/recurrence of POP symptoms was seen in these patients.

The above data would suggest that full term pregnancy is safe in the presence of a previous VR. Data on the safety of vaginal delivery are lacking, although as reported in the Oxford study above, there is always the possibility of a spontaneous labor and vaginal delivery, whatever the proposed birth plan is.

Synthetic surgical mesh in the rectovaginal septum following VR will inherently reduce rectal and vaginal compliance, an essential component of safe vaginal delivery. A biologic graft may confer a greater degree of compliance in this regard, due to the inherent remodeling that is reported. There are no gynecological data to guide us in this regard either. A recent guidance document from the American Urogynecologic Society identified only one published case of pregnancy after transvaginal mesh repair for POP (a reasonable surrogate for the rectovaginal component of a VR), and this patient delivered by Caesarean section, with no reported adverse sequelae.[83]

Therefore, in the situation that a rectal prolapse repair is deemed clinically necessary in a female patient who is in child-bearing years, a biologic VR or non-prosthesis-based abdominal repair (e.g. sutured posterior rectopexy) is recommended.

Specific considerations: connective tissue disorder

Statement 16: In those who have a connective tissue disorder, comprehensive non-operative strategies should be maximized and optimized prior to any operative intervention and more rigorous evaluation for multicompartment prolapse must be undertaken (100% consensus). POP is disproportionately common in patients with joint hypermobility disorders[84,85] and disorders of collagen metabolism, and may explain some of the prolapse occurrences in male and nulliparous patients.[86] The Hypermobility Spectrum Disorders (HSDs) were formerly known as Benign Joint Hypermobility Syndrome (BJHS), and are a group of disorders where joint hypermobility (JH) is a cardinal sign, but without a molecular diagnosis of a connective tissue disorder (CTD). Within the recognized collagen CTDs there are the distinct Ehlers-Danlos Syndrome (EDS) subtypes, and the hypermobile subtype of EDS (hEDS), where a genetic marker has not yet been identified.[87] Marfan syndrome, while affecting fibrillin production, a different connective tissue component to the above, can also be included under the CTDs for the purposes of this discussion. An important observation with HSDs, EDS and hEDS is that extra-articular manifestations are common. While patients with HSDs have the expected subluxations, scoliosis and valgus deformities, there are also associations with chronic pain, possibly as a result of pain sensitization, and reduced proprioception, with limitation of activities. Within the EDS subtypes, this goes further to include mood disturbances, chronic fatigue, functional gastrointestinal disorders and dysautonomia. These can presage the development of chronic (pain) central sensitivity syndromes (CSS). Patients with CSS are thought to have less favorable subjective

outcomes from POP surgery, in terms of persistence of symptoms, pain and overall satisfaction.[88] Pre-empting the presence of CSS and related conditions such as fibromyalgia is vital, as it may dictate the threshold for surgery, the choice of the operation, and allow for a prospective discussion of realistic postoperative outcomes.[88]

The influence of HSDs and CTDs has been little studied in rectal prolapse. One study from Oxford directly addressed this in consecutive patients with rectal prolapse grade 4-5 who underwent a laparoscopic ventral mesh rectopexy with a polypropylene mesh.[89] Patients had a preoperative Beighton score to stratify them as either HSD or 'normal'. Patients with HSD (or BJHS in this paper) were younger, and had a significantly higher reintervention rate over one year of postoperative follow up than the normal group (31% versus 8%). The reinterventions were usually to deal persisting posterior rectal prolapse and led to a modification of the operative technique to include posterior rectal mobilization at the index operation. No difference in perioperative complication rates was seen between the groups.

The expectation of the need for reinterventions over time for recurrent prolapse is central to initial management. Strategies that are generally important in these patients are weight optimization and participation in regular exercise.[87] Pelvic floor physiotherapy, preferably with a physiotherapist familiar with HSDs, should be routine. Multidisciplinary assessment is encouraged, to quantitate any concurrent middle or anterior compartment prolapse. Patients should be counselled that several prolapse repairs may be required sequentially over their lifetime. Whether this means an initial ventral abdominal approach to their rectal prolapse, or another abdominal or perineal repair, will be influenced by the patient's wishes and also their stage of life, as the aforementioned fertility and pregnancy considerations may need to be factored in.

Specific considerations: male

Statement 17: VR can be considered as an option for surgical repair of rectal prolapse in male patients if the anatomical conditions support this approach (100% consensus). External rectal prolapse in males represents a small proportion of rectal prolapse presentations. Abdominal repair in male patients has historically been discouraged, due to considerations around the narrow android pelvic dimensions, and proximity to pelvic nerve structures, particularly those relating to sexual function. However, the functional outcomes of VR for both ERP and high-grade IRP have led to the uptake of this approach, in both male and female patients.

Pelvic neural structures are at risk during an abdominal approach to rectal dissection in male patients. The hypogastric (sympathetic) nerves (HN) may be injured along the sacral promontory/presacral region. Its fibers meet with parasympathetic splanchnic nerves in the inferior hypogastric plexus (IHP or 'pelvic plexus'), close to the lateral rectal wall, midway down the rectum. From here, organ-specific, mixed sympathetic and parasympathetic nerves supply rectal, prostatic and cavernous branches.[90] The prostatic branches coalesce as the periprostatic bundles found at the 10 and 2 o'clock positions from the perspective of the abdominal operator,[91] beginning at the level of the seminal vesicles. The periprostatic nerve (PPN) bundles are most densely arranged at the upper part of the prostate (base) and diminish towards the lower part (apex).[92] In general, sympathetic denervation can result in retrograde ejaculation, whereas injuries to the parasympathetic nerves can result in erectile dysfunction. Careful dissection and a knowledge of the anatomy means the HN can usually be easily located and avoided at the sacral promontory. Similarly, the IHP can usually be displayed and avoided by rectal mobilization on the fascia propria. Rectal branches of the IHP should be avoided in a VR, as the dissection at this level is superficial (just through the peritoneum) and unilateral only.

The deep pouch of Douglas or peritoneocele sac has been recognized as a feature of pelvic prolapse anatomy for over 100 years.[93,94] There are no published data describing the rectovesical pouch (RVP) depth in male rectal prolapse, but a deep RVP is a consistent feature recognized by this expert group. Specifically, one of the cardinal features of rectal prolapse in male patients is the RV peritoneal reflection lying at or below the level of the base of the prostate. This means that careful anterior rectal dissection on the surface of the mesorectal fascia will usually commence below the level of PPN bundles, thereby avoiding these structures. The absence therefore of the deep RVP should give the abdominal operator pause, not only to consider the veracity of the diagnosis, but also the optimal approach to repair.

A 2023 systematic literature review specifically examined outcomes for men undergoing all forms of surgery for external rectal prolapse.[95] Most studies are case series, and numbers are too small to make direct comparison between techniques. Two papers contained male-only data. Four out of the 28 included papers reported on VR, with one paper reporting exclusively on male VR, in 52 subjects.[96] There was a 17% recurrence rate and persistence of anal mucosal prolapse symptoms in 21% of patients. No preoperative questionnaires were completed, but postop functional questionnaires were sent out, with a response rate of 64% at a mean follow-up time of 4.7 years (range, 1.9 – 10.7). On direct questioning, no significant sexual or urinary dysfunction was reported in the under 40 years age group. Over 40 years, patients were more likely to report sexual and urinary changes, but possibly in line with a population mean for this cohort. 'Most' patients were satisfied with the treatment. There were no mesh-related complications.

A previous VR consensus statement identified internal rectal prolapse (IRP) in male patients as a relative contraindication to VR, based on perceived greater operative difficulty and surgical risks.[5] One published series subsequently examined a combination of exclusively male IRP

(73%) and ERP (27%) patients treated with VR.[97] The IRP patients variously presented with fecal incontinence, obstructed defecation and pelvic pain. Median follow up was 42 months. Eighty two percent of patients reported being asymptomatic at last follow up. There was no new-onset impotence and one transitory case of retrograde ejaculation. The response rate to the patient-reported outcome questionnaires was 77%.

In conclusion, the above discussion underscores that there is a lack of high quality data in the setting of male patients undergoing VR. On balance, there does not appear to be significant morbidity associated with the procedure, and new-onset functional symptoms relating to bowel and sexual/urinary function appear uncommon. There may be a high re-intervention rate, for reasons which may be specific to male patients. There are however recognized functional advantages to performing a VR as opposed to other rectal prolapse procedures for both male and female patients. In the hands of an experienced operator, it is reasonable to consider VR for male patients with either ERP or high-grade IRP, but it is acknowledged that high quality long term data are still required in this area.

DISCUSSION

This international expert consensus group developed 17 statements covering indications, contraindications, assessment and planning, consent, operative details, prostheses, complications, follow-up, recurrence and reoperative surgery and specific considerations for ventral rectopexy. The statements provide a contemporary summary of the literature and provide a reference point for colon & rectal surgeons who undertake ventral rectopexy as part of their practice.

Consensus was high throughout the group with 13 of the 17 statements receiving unanimous support. Statements 4, 5, 9, and 15 had 91% consensus each. The nature of the survey was such

that responses were anonymous so the reasons for dissent are unknown; individual experts were asked not to speak to the rationale for dissent to maintain anonymity.

Statement 4 recommended a history, examination and use of a patient reported outcome measure during initial assessment. It was acknowledged that patient reported outcome measures could arguably be less relevant for someone with grade 5 prolapse: the outcome metric of primary concern is of correction of the prolapse and post-operative functional symptoms may be hard to ascribe to the baseline, prolapse or intervention. Further, not all institutions have the ability to follow patients and track outcomes, though the majority felt this should be the gold standard.

Statement 5 stated that consideration should be given to dynamic defecatory imaging, anorectal function testing, endoscopic evaluation, and a formal multidisciplinary review. Expert discussion focused on the utility of investigations pre-operatively and multidisciplinary review. It is acknowledged that not all institutions can offer the array of investigations or multidisciplinary review, and that this procedure need not necessarily be restricted to those who can, but again this statement was included as the majority felt these preoperative evaluations should at least be considered with reasons for each outlined in the results section.

Statement 9 referred to the use of synthetic and biologic prostheses. The debate during round table discussion centered around the long-term efficacy of biologic prostheses, so it is likely that this was the contentious component of the statement for one expert.

Statement 15 referred to the ventral rectopexy and pregnancy. This was a controversial topic for review given the paucity of data to guide recommendations. The group were conscious that both pregnancy and mode of delivery are outside their area of expertise and training. Further, this is an area which is very individualized and requires conscious shared decision-making with the

patient and obstetric providers. Ultimately, it was hoped that any statement highlights the challenges of this aspect of practice.

The quality of evidence in this field was found to be poor, with predominantly retrospective case series being the primary source of data. Further, there was significant heterogeneity in outcome reporting and outcome definitions between studies. To address the paucity of data, there is a need for increased standardization of technique and reporting. These statements help set a baseline standard for Ventral Rectopexy and will support future research efforts. Further, one must acknowledge that no two posterior compartment prolapses are the same. Accordingly, institutions must work towards better understanding the spectrum of causation and biomechanics of posterior compartment prolapse to then establish comparable groups to better study intervention and outcomes. It is only then that a more targeted approach to care can be implemented.

This review specifically highlighted the need for a better understanding of indications particularly for grades 3 and 4 prolapse when there is an overlay of functional disorder. There is also an opportunity to research and better understand connective tissue disorders among the other identified specialty considerations. Further, there is an impetus to understand the contemporary risk of prosthesis, both synthetic and biologic as they relate to complications and recurrence. The former is particularly pertinent given the informal moratorium of Ventral Rectopexy in the United Kingdom for concern around mesh. Much of this controversy stemmed from transvaginal mesh placement[65] and use of ventral rectopexy mesh outside the guidance of modern indications. It should be highlighted that there is a suggestion that the synthetic mesh itself has not been the problem, but rather the use of permanent braided suture on the rectum causing erosion and the like. Accordingly, statement 9 highlights the need to use an absorbable suture.

The first international consensus in 2013[45] was criticized for its methodology and selecting proponents of Ventral Rectopexy as authors. The former concern was addressed in this iteration with a more robust process, requiring an extensive literature review on each subject domain and anonymous voting to record true consensus. It is difficult to avoid the perception that such statements are driven by the procedure's proponents. However, all experts on the panel offer ventral rectopexy as part of their practice, but not exclusively so. This consensus paper does not portend to claim superiority of this technique over another: the literature is sparse in this matter. In fact, each statement was written specifically to acknowledge that alternative approaches may be comparable or even better choices in some situations. An alternative methodology, such as an international Delphi, would likely capture widespread variation from a heterogenous group of surgeons and would likely become dilute in its recommendations limiting the utility of such work. The group acknowledges that internationally there are high volume surgeons that did not partake in this body of work. The next step is for these statements to be reviewed by a wider group of stakeholders and involve the appropriate specialty societies.

Ultimately, this document provides a common standard from which to work. Evolution is inevitable with advancing research. It will undoubtedly continue to advance our field. Given the complexity of this patient cohort, the decision making and operative technique, evolution of this technique should be undertaken with an enhanced consent process and in the context of research with well-defined inclusion and exclusion criteria and robust follow-up.

CONCLUSION

Ventral rectopexy is a safe procedure and a useful technique in the surgical management of rectal prolapse. A variation in functional outcomes is acknowledged, and further investment must be made in better identifying those who would benefit from this approach verse an alternative.

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Table 1. Oxford rectal prolapse radiological grading system

Extent of prolapse	Grade	Characteristics
Internal		
Recto-rectal Intussusception/Low-grade Intususception	I (high rectal)	Descends no lower than proximal limit of the rectocele
	II (low rectal)	Descends to the level of the rectocele, but not onto sphincter/anal canal
Recto-anal Intussusception/High-grade Intususception	III (high anal)	Descends onto sphincter/anal canal
	IV (low anal)	Descends into sphincter/anal canal
External		
External rectal prolapse	V (overt rectal prolapse)	Protrudes from anus

Table 2. Classification of ventral rectopexy surgical failure.

Type	Description
Type 1	Detachment of the prosthesis from the sacral promontory
Type 2	Detachment of the prosthesis from the rectum
Type 3	Inadequate mid-rectal support from the prosthesis
Type 4	Too proximal fixation of the prosthesis onto the rectum
Type 5	Prosthesis too loose
Type 6	Posterior rectal prolapse
Type 7	No evidence of the prosthesis