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REVIEW ARTICLE

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Literature review, surgical decision making algorithm, and AGREE II-S comparison of national and international recommendations and guidelines in pelvic organ prolapse surgery

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Abstract

The average lifespan has increased over time due to improvements in quality of life, leading to an aging population that stays healthy for longer. Pelvic organ prolapse (POP), whether uterine or vaginal, is a problem that severely impairs quality of life and imposes significant restrictions. The present study provides the reader with a summary of the many surgical techniques used in POP surgery, comparing international guidelines, offering an algorithm that is simple to understand, and allows the reader to quickly choose the table that includes the best surgical therapy for each individual. Using relevant keywords, the writers searched the PubMed and Scopus databases for relevant publications from 2000 to April 2023. Studies with cases of oncologic disorders or prior hysterectomy performed for another reason were not included in the analysis. Ten distinct international guidelines are highlighted and examined in the present study. We used the Appraisal of Guidelines for Research and Evaluation II-S (AGREE II-S) method to assess their quality, and incorporated the results into the conclusion. Worldwide, anterior colporrhaphy is the preferred method of treating anterior compartment abnormalities, and mesh is virtually always used when recurrence occurs (which happens in about half of the cases). Worldwide, posterior colporrhaphy is commonly used to repair posterior compartment abnormalities. Only a few national guidelines (the Iranian guideline, *Acta Obstetricia et Gynecologica Scandinavica* [AOGS], and the German-speaking countries) permit the use of mesh or xenograft in cases of recurrence. There is agreement on the abdominal approach (sacrocolpopexy) with mesh for treating apical deformities. Sacrospinous-hysteropexy is the standard method used to guide the vaginal approach; mesh is typically used to aid in this process. There are just three recommendations that do not include vaginal operations: HSE, AOGS, and Iran. Of obliteration techniques, colpocleisis is unquestionably the

Abbreviations: AGREE, Appraisal of Guidelines for Research and Evaluation; CPGs, clinical practice guidelines; FSH, follicle-stimulating hormone; LSCP, laparoscopic sacrocolpopexy; POP, pelvic organ prolapse; POP-Q, pelvic organ prolapse quantification system; RHN, right hypogastric nerve; TAH, total abdominal hysterectomy; TLH, total laparoscopic hysterectomy.

best. In conclusion, our analysis highlights the significance of customized methods in POP surgery, taking into account the requirements and preferences of each patient. To choose the best surgical therapy, criteria and patient features must be carefully considered.

KEYWORDS
laparoscopic surgery, mesh, pelvic organ prolapses, rectocele, sacropexy, vaginal hysterectomy, vaginal surgery

1 | INTRODUCTION

Pelvic organ prolapse (POP) is one of the most common pelvic pathologies in menopausal patients, leading to over 200 000 surgical procedures per year in the USA, with 30% recurrence requiring further surgery. In fact, the lifetime risk of uterine prolapse, as reported in the literature, ranges from 31.8%[1] to 50%[2] and approximately one-third of affected women need to undergo corrective POP surgery (19%).[3] This makes it clear how the turnover can be very costly for public health, with a business exceeding one billion dollars.[4] The classical, old-fashioned, pelvic floor correction surgery, in cases of uterine prolapse, started with a hysterectomy and a consequent pelvic floor treatment.[3] In the UK is recorded an hysterectomy rate, in cases of POP, of 82%,[5] in Australia and New Zealand of 79%.[6] The first question that confronts anyone entering the field of POP surgery is what medical specialty treats POP? Since 1990, this question has been debated worldwide in conferences and meetings on pelvic floor diseases. Three medical specializations vie for the paternity of POP surgery for women: urologists, gynecologists and proctologists. An unsuccessful attempt was made to propose an anatomica-topographical separation to determine who should treat patients based on the localization of the defect. However, the classic statement from Wall and DeLancey, "Gee, that was close; an inch in that way and it would have been out of my specialty," sums up the conundrum.[7] After 30 years, this jurisdictional-topographical boundary is no longer a significant issue. Modern pelvic floor surgery is conducted in specialized centers where patients can access a diverse range of surgical alternatives. Urologists, proctologists, gynecologists, and urogynecologists collaborate to tailor treatments to individual patients, ensuring a comprehensive improvement in lifestyle. Abdominal and laparoscopic sacro-colpopexy, following a previous hysterectomy (total or cervix sparing), stands out as the gold standard surgery for symptomatic apical POP.[8] Based on the current scientific literature, we have attempted to answer the following questions: Are we obligated to perform a preventive hysterectomy in an appropriate prolapse surgery? Is the vaginal approach more advantageous, or does the abdominal approach, whether open, laparoscopic or robotic, yield better results? Are we still allowed to use mesh? As first-line treatment? In young patients with an active sexual life? Alternative to them? Nowadays are obliterative procedures still performed?

2 | MATERIALS AND METHODS

We conducted a comprehensive review of the Scopus and PubMed databases from 1990 to April 2023 to identify available data on the optimal surgical approach for POP and the necessity of hysterectomy in such cases. Our search utilized a combination of keywords, including "pelvic organ prolapse," "POP," "surgery," "microinvasive surgery," "endoscopy," "gynecology," "hysteropexy," "cervicopexy," "colpopexy," and "intraoperative complications." Only peer-reviewed articles involving human subjects were included, and additional articles were identified through cross-referencing. We excluded papers where hysterectomy had a medical indication, treating it as a separate surgical procedure. Our focus was on studies examining various surgical approaches for POP treatment, comparing the traditional approach of initiating surgery with a hysterectomy to the contemporary trend of hysteropexy. All reviewed papers concentrated on patients aged between 18 and 90 years, primarily in a postmenopausal state. We traced 10 international guidelines in the literature, the contents of which are extensively compared in Table 1. Additionally, we attempted to weigh the value of each guideline established in the guideline, questioning its quality, applicability, and the possibility of being used on a large scale using the Appraisal of Guidelines for Research and Evaluation-S (AGREE-S) tool (Table 2). The mechanism of operation of the tool will be better explained in the following chapter.

3 | EVALUATION CRITERIA AND SCORING SYSTEM OF AGREE II AND AGREE II-S FOR ASSESSMENT OF GUIDELINE QUALITY

The AGREE II is a tool for assessing clinical practice guidelines, developed to evaluate the quality and reliability of guidelines. It provides a set of criteria and questions to assess various aspects of guidelines, including the development process, clarity of recommendations, and practical applicability. The six main questions of AGREE II cover the following aspects:

1. Scope and purpose: Does the guideline have clear and specific objectives?
2. Stakeholder involvement: Have stakeholders' opinions been involved in guideline development?

TABLE 1 Diagrammatic illustration of the results of the different recommendations. The country of reference and the publication date are reported.

Guideline (reference)	Cystocele first-line treatment	Cystocele recurrence	Rectocele first-line treatment	Rectocele recurrence	Uterus sparing vaginal approaches	Uterus sparing abdominal approaches	Vaginal vault approaches	Biological solutions	Obliterative procedures
SICCR (Italy 2017)[75]	CRa Recurrence 50%	SPM	CRp Recurrence 20%	ND	**MESH** Sacrospinous hysteropexy (success at 12 months 82%) **NO MESH** TVU-SLS (98% success at 25 months), Manchester Repair (no childbearing)	**MESH** Sacrohysteropexy Success rate 78% to 100% **NO MESH** Suture cervix to both sacral ligaments 88% success 12 months	**MESH** sacrocolpopexy, sacrospinous-colpopexy success at 12 months 85% **NO MESH** C-SSLS 95% success at 24 months, suture vaginal vault to both sacral ligaments 88% success 12 months	Xenografts (porcine or bovine), allografts (cadaveric fascia)	Colpocleisis
SOGC (Canada 2021)[76]	ND	ND	ND	ND	**MESH** Sacrospinous hysteropexy **NO MESH:** ND	**MESH** Sacrohysteropexy **NO MESH** ND	**MESH** Sacrocolpopexy failure rate 12.3% **NO MESH** Uterosacral, sacrospinous iliococcygeus, McCall's colposuspension	ND	Colpocleisis
ICI (International 2022)[77]	CRa	SPM	CRp	ND	**MESH** Sacrospinous hysteropexy **NO MESH** ND	**MESH** Sacrohysteropexy **NO MESH** ND	**MESH** Sacrocolpopexy, Sacrospinous colpopexy **NO MESH** ND	ND	Colpocleisis
SASOG, NICE (SA, UK 2019)[78]	CRa	ND	CRp	ND	**MESH** Sacrospinous hysteropexy **NO MESH** Sacrospinous hysteropexy with suture, Manchester repair (no childbearing)	**MESH** ND **NO MESH** ND	**MESH** Sacrocolpopexy **NO MESH** ND	ND	Colpocleisis
HAS (France 2021)[79]	CRa	SPM	CRp + perneorrhaphy	ND	**MESH** Sacrospinous hysteropexy **NO MESH** Sacrospinous hysteropexy with suture	**MESH** Sacrohysteropexy **NO MESH** Uterosacral ligament suspension	**MESH** Sacrocolpopexy **NO MESH** ND	ND	Colpocleisis

TABLE 1 (Continued)

Guideline (reference)	Cystocele first-line treatment	Cystocele recurrence	Rectocele first-line treatment	Rectocele recurrence	Uterus sparing vaginal approaches	Uterus sparing abdominal approaches	Vaginal vault approaches	Biological solutions	Obliterative procedures
DGGG, SGGG, OEGGG (GAS 2016)[20]	CRa Recurrence 52%	ND	CRp Recurrence 14%	Re-CRp (xenograft no benefit, mesh ND)	**MESH** Sacrospinous hysteropexy **NO MESH** sacrospinous-hysteropexy Sacrospinous hysteropexy (success rate 96%), uterosacral ligament fixation/McCall technique/ Shull technique	**MESH** Sacrohysteropexy **NO MESH** Uterosacral ligament suspension, vaginal high levator myorrhaphy and vaginal fixation of the vaginal vault to the iliococcygeus fascia	**MESH** Sacrocolpopexy (success rate 95.6%), sacrospinous colpopexy **NO MESH** ND	ND	Colpocleisis
HSE (Ireland 2022)[80]	CRa	ND	CRp ± perineorrhaphy	ND	**MESH** ND **NO MESH** ND-	**MESH** Sacrohysteropexy **NO MESH** ND	**MESH** Sacrocolpopexy sacrospinous colpopexy **NO MESH** ND	ND	Lefort colpocleisis
AOGS (Scandinavia 2019)[21]	CRa	SPM	CRp	SPM	**MESH** ND **NO MESH** Manchester repair	**MESH** ND **NO MESH** ND	**MESH** ND **NO MESH** ND	ND	Colpocleisis
Iranian Guideline (Iran 2018)[22]	CRa	SPM, levatorplasty, modified sacropexy	CRp	SPM	**MESH** ND **NO MESH:** ND	**MESH** ND **NO MESH:** Uterosacral, sacrospinous ligament suspension	**MESH** Sacrocolpopexy sacrospinous colpopexy **NO MESH** McCall's colpoplasty, Sacrospinous colpopexy	ND	Colpocleisis
AUGS (USA 2019)[81]	CRa	SPM, biological graft	CRp	No benefit from the treatment	**MESH** Sacrospinous hysteropexy (MESH) **NO MESH** Sacrospinous hysteropexy	**MESH** Sacrohysteropexy (MESH or graft) **NO MESH** Uterosacral ligaments shortening	**MESH** Sacrocolpopexy **NO MESH** ND	ND	Colpocleisis

Abbreviations: CRa/p, colporraphy anterior/posterior; C-SSLS, colpo-sacrospinal ligament suspension (vaginal vault to the sacrospinal ligament monolateral or bilateral, possible a posterior or an anterior approach); ND, no data; SPM, synthetic polypropylene mesh; TVU-SLS, transvaginal uterosacral ligament suspension (passage of sutures through the intraperitoneal middle third of the uterosacral ligament on both sides, and threading each end of these sutures through the proximal transverse edge of the pubocervical and rectovaginal fasciae; this process effectively reconstructs the pericervical ring).

3. Methodological rigor: Was the guideline development process rigorous and transparent?
4. Clarity and presentation: Are the guideline recommendations clear and easily accessible?
5. Applicability: Does the guideline provide practical advice and measures to facilitate the implementation of recommendations?
6. Editorial independence: Was the guideline drafted independently of commercial or political influences?

The "S" variant of the AGREE tool introduces some significant modifications:

1. Addition of new evaluation criteria: The S variant includes new evaluation criteria focusing on fairness in access to care, adequacy of economic impact, and inclusion of end users in development phases.
2. More detailed approach to applicability: The S variant places greater emphasis on the applicability of guidelines, providing more specific criteria to assess the practicality of recommendations and the presence of tools for practical implementation.
3. More detailed evaluation structure: The S variant provides a more detailed structure for guideline evaluation, allowing users to assess each aspect more thoroughly and systematically.

In summary, the S variant of the AGREE tool extends and enriches the evaluation of guidelines, offering users greater precision and a better understanding of the quality and applicability of clinical recommendations. The AGREE II instrument and its subsequent versions, including the "S" variant, consist of 23 items in total for evaluation. Each item is scored on a scale from 1 to 7, where 1 represents the lowest level of quality and 7 represents the highest level of quality.[9] Therefore, the maximum possible score for the AGREE II tool, including the "S" variant, is 161 (23 items × 7 points/item). This score reflects the highest level of quality across all aspects evaluated by the tool.

3.1 | Anterior compartment defect

Cystocele is another name for an anterior vaginal wall defect. Depending on whether a prolapse defect with a median herniation can be discovered (pulsion cystocele), or if it exhibits a lateral defect without anatomical modifications, but rather functional ones (traction cystocele), the cystocele is technically split into two kinds.[10]

In this paragraph, we only discuss the pulsion form of cystocele, or just cystocele. On the repair of defects in the anterior wall, there is a large consensus among experts in the literature. The recommended first-line surgical intervention, as suggested by all examined guidelines, is represented by anterior colporrhaphy.[11] The essence of colporrhaphy lies in an initial medial colpotomy and consequent folding of the vesicovaginal fascia along the midline to strengthen the inherent barrier between the vagina and bladder.[12] The transvaginal approach appears to be logical concerning anterior colporrhaphy; however, in the literature, numerous manuscripts describe the laparoscopic variant.[13,14] The laparoscopic colporrhaphy, also known as outside-in intraperitoneal colporrhaphy, is a valid option compared to the classic transvaginal access in patients who undergo laparoscopic POP surgery. The typical example is the patient who undergoes laparoscopic cervicopexy, which also simultaneously presents a laxity of the vaginal tissue. This helps to avoid repositioning the patient, which could lead to prolonged operating times, increased infection risks, and the formation of new scars.[15] Unfortunately, anterior colporrhaphy has a high recurrence rate, which can occur in up to 52% of patients. Comparative studies revealing advantages concerning operating times, intraoperative blood loss, and recurrence rates between the classic variant and the outside-in variant were not detected in literature. Considering the high recurrence rate, many national and international guidelines accept and contemplate the use of mesh and graft. Regarding comparative studies with or without mesh, a manuscript by Wong et al. retrospectively compared patients treated by simple colporrhaphy, to those treated by colporrhaphy and the addition of mesh, for increased stabilization. The statistically significant advantage in using mesh is particularly evident in patients with levator avulsion. The recurrence rate of cystocele (Stage II) in women without avulsion differed between the mesh and non-mesh groups, with rates of 35% (22/65) and 43% (23/54), respectively. In contrast, among women with avulsion, the recurrence rates were 31% (11/35) for the mesh group and significantly higher at 79% (23/29) for the non-mesh group ($P = 0.003$). Another aspect to consider, in addition to the restoration of anatomical integrity, is the level of patient satisfaction, which reaches 82% in patients with mesh compared to 65% in patients who underwent isolated colporrhaphy.[16] Another comparative study, also including the graft methods, was conducted by menefee et al. They led a 2-year follow-up on patients with second degree cystocele, dividing them into three treatment groups: (1) classical colporrhaphy without the use of implants, (2) colporrhaphy with the addition of polypropylene mesh and (3) paravaginal repair with porcine dermis. The group that utilized mesh exhibited a markedly lower anatomical failure rate at 18%, in stark contrast to both the porcine group (46%, $P = 0.015$) and the colporrhaphy group (58%, $P = 0.002$). Despite statistically similar reductions in prolapse and urinary symptom subscale scores across all groups, there was no significant difference in composite failure rates: 13% for colporrhaphy, 12% for porcine, and 4% for mesh. However, it is worth noting that two reoperations for anterior prolapse occurred in the porcine group. Additionally, mesh erosion rates were observed to be 14% in the mesh group.[17] Interesting results are also reached with the pectopexy, in which are also long term co-repaired the lateral defect of the anterior wall.[18]

3.2 | Posterior compartment defect

The defect of the posterior compartment could be divided in two big families, according to the bowel tract which prolapse in recto or enterocele.[19] The gold standard for treating posterior defects is

TABLE 2 Based on the AGREE-S assessment methodology, a comparative assessment is shown. Based on the total score attained, each guideline is rated and classified as either recommended, not recommended, or in need of improvement. This assessment facilitates comprehension of the recommendations' suitability and relevance in clinical contexts.

Guideline	Scope and purpose	Stakeholder involvement	Evidence synthesis	Development of recommendations	Editorial independence	Implementation and update	Total	Mean (X ± SD)	Median score (IQR, %)	Dev. Std.	Range	% Max Score	Overall recommendation
SIRC[75]	16	17.5	15.5	40	11	23.5	123.5	20.58 ± 8.34	20	7.86	29	55.86	Improvement needed
SOGC[76]	16	18	19.5	41.5	11	25	131	21.83 ± 8.49	20	7.07	30.5	60.83	Recommended
ICI[77]	18	16.5	15	39.5	12.5	23	124.5	20.75 ± 8.02	20	6.85	27	51.25	Improvement needed
SASOG, NICE[78]	19.5	17	22	46	11	26	141.5	23.58 ± 8.86	23.5	8.71	35	70	Recommended
HAS[79]	12	18	14	44	11	26	125	20.83 ± 9.25	20	8.08	32	62.5	Improvement needed
DGGG, SGGG and OEGGG[20]	20.5	19.5	16	46	11	29	142	23.67 ± 7.81	23	7.05	24.5	47.33	Recommended
HSE[82]	17.5	16	18	48.5	12	31	143	23.83 ± 8.88	24	8.52	34.5	59.17	Recommended
AOGS[21]	16	15	14.5	32.5	9.5	18.5	106	17.67 ± 6.61	16.75	5.15	27	44.67	Not recommended
Iranian guideline[22]	17	12	16.5	36	13.5	16	111	18.5 ± 8.03	17.75	7.71	24.5	37.5	Not recommended
AUGS[81]	14	15.5	17.5	43.5	11	25.5	127	21.17 ± 10.01	19.5	8.44	29	53.83	Improvement needed

undoubtedly represented by posterior colporrhaphy. With a recurrence rate of 20%, it is significantly lower, making meshes an alternative often used as a last resort and still recommended, or rather permitted, by very few guidelines such as those of the German Society of Gynecology and Obstetrics (DGGG), the Swiss Society of Gynecology and Obstetrics (SGGG) and the Austrian Society of Gynecology and Obstetrics (OEGGG) united guidelines of German-speaking countries (Austria, Germany, and Switzerland), *Acta Obstetricia et Gynecologica Scandinavica* (AOGS) (Scandinavia), and Iran.[20-22] A noteworthy randomized controlled trial was conducted by Paraiso et al., comparing three types of repairs for posterior wall defects. A total of 106 patients were divided into three groups, with 37 undergoing classic posterior colporrhaphy, another 37 undergoing site-specific rectocele repair, and 32 undergoing site-specific rectocele repair, augmented with a porcine small intestinal submucosa graft. One year later, individuals who underwent graft augmentation experienced a noticeably higher anatomical failure rate (12 out of 26; 46%) compared to those who had site-specific repair alone (6 out of 27; 22%) or classic posterior colporrhaphy (4 out of 28; 14%), with a statistically significant difference ($P = 0.02$). The findings of the study summarized that similar anatomical and functional results are obtained from site-specific rectocele repair and posterior colporrhaphy. The addition of a transplant taken from pigs does not improve the anatomical outcomes, but rather worsens them. However, all three methods of rectocele repair lead to substantial improvements in symptoms, quality of life, and sexual function.[23]

3.3 | Apical compartment defect

Apical descent with the prolapse of the uterus, cervix, and/or vagina characterizes the third compartment defect. Rarely is this deficiency solitary; it frequently affects one or both of the previously described elements. A complicated surgical intervention is necessary to address the apical defect, and laparotomic, laparoscopic, transvaginal, and mesh-free approaches are among the ways in which this intervention can be carried out in accordance with national or international guidelines. These factors inevitably result in differing anatomical restoration outcomes, surgical times, intraoperative blood loss, and a range of consequences.[24] Sacropexy represents the gold standard in the management of vaginal sump or uterine prolapse[25] but, as explained in the next paragraph, this statement can be generalizing and misleading.

3.4 | Sacropexy over all

Over time, the history of POP surgery has changed. The first careful approaches to POP surgery were based on native tissue procedures, such as transvaginal hysterectomy with anterior and posterior colporrhaphy, Manchester surgery, and colpocleisis. However, the need for improvement is necessary because of the significant recurrence rate, ranging from 10% to 40%.[26,27] After then, the vaginal

mesh-supported technique came into being. Even that age had its share of setbacks, displaying a variety of severe postoperative problems over all mesh exposition and erosion despite the extremely low recurrence rate.[28] The latest revolution in POP surgery is still valid to this day. According to Kotani et al., laparoscopic sacrocolpopexy (LSCP), which has been the most common procedure over the past three eras, has a lower recurrence rate (3.7%) than transvaginal hysterectomy (4.8%), Manchester (8.8%), and colpocleisis (18.2%).[26] The LSCP is currently the most worldwide used procedure for uterine apical prolapse (Table 1).[29] POP surgery is a type of intervention aimed at improving the quality of life, and the most important aspect of this type of surgery is to prevent recurrences. According to Ganatra et al., the LSCP have a recurrence rate from 8% and reoperation are reported in 1.6% of the cases.[30] Furthermore, according to Bacle et al., the incidence of recurrence average about 11.5% with reoperation of about 1.0%.[31] Mesh sacrocolpopexy can be executed by fixing mesh to either just the anterior or both vaginal walls, it can also be performed with uterine preservation, or total or partial removal of the uterus. The generalization of the technique may lead to various biases because it lacks standardization. A very recent comparative retrospective study from Yan et al. compared three of the most commonly used variants of LSCP, aiming to determine which is associated with the best outcomes. A total of 483 patients with POP of grade higher than the third, were included in the study, and patient pools were grouped according to the treatment received. Group 1 underwent laparoscopic sacrohysteropexy (LSH), group 2 underwent laparoscopic supracervical hysterectomy (SHE) with concomitant laparoscopic sacrocervicopexy (LSCH + LSC), and group 3 underwent total laparoscopic hysterectomy with concomitant LSC (TLH + LSC).[32] In the study, demographic information and POP quantification scores were taken into consideration. The LSH procedures exhibited significantly reduced blood loss, shorter postoperative hospital stays, and catheterization days, all with $P < 0.001$. Over a median follow-up period of 32 months (ranging from 13 to 117 months), all groups showed substantial anatomical correction based on POP quantification measurements ($P < 0.001$), and there was no significant difference in the anatomical cure rate among the three groups ($P = 0.273$). No statistically significant differences were found in prolapse recurrence ($P = 0.171$) and functional improvements among the groups. While intraoperative injuries ($P = 0.098$) and total postoperative complications ($P = 0.218$) did not differ significantly, the TLH + LSC group had a notably higher rate of severe postoperative complications, including mesh exposure ($P < 0.001$ and $P = 0.004$, respectively), compared to the other groups. In summary, the study from Yan et al., showed that LSH is the best option in patients with a healthy uterus and cervix. In patients with benign lesions such as fibroids, adenomyosis and so on, but with a normal cervix, the LSCH + LSC is a valid option with favorable anatomical outcomes and patient satisfaction, LSH appears to be a comparable choice to TLH with concomitant laparoscopic sacrocervicopexy (TLH + LSC). LSH may be the preferred option for patients with cervical and uterine lesions.[32] The manuscript by Yan et al. describes the a priori ineffectiveness of hysterectomy in the treatment of uterine prolapse, procedure anything but free of risks, as reported in the dedicated chapter.

3.5 | Hysterectomy in case of benign indication: A matter of complications

The question about the necessity of a hysterectomy, as the first step in the surgical treatment of the pelvic floor, partially addressed in previous paragraphs, might receive a definitive answer by the American College of Obstetricians and Gynecologists (ACOG), who consider it mandatory that the uterine sparring options are discussed and supported during informed consent.[33] Moreover, many surveys have highlighted women's preference for conservative surgical options, expressing a reluctance to simply accept hysterectomy.[34-36]

A retrospective study by Husby et al., which examined more than 800 000 women, identified hysterectomy as one of the most significant risk factors for POP. An over two-decade-old study asserted that uterine prolapse is a consequence of pelvic floor laxity and not directly caused by the uterus itself.[37] Hysterectomy increases the risk of POP by nulliparous by 60%.[37-39] In the study by Ridgeway, the citation of Dr Mehmet Oz is pragmatic, who defined hysterectomy the number one surgery women do not need.[40] This radical statement naturally needs to be considered in a context where the uterus itself does not show any pathologic aspect. Referring to statistics from the USA, 430 000 hysterectomies are performed annually, and among these, 74 000 are indicated due to uterovaginal prolapse.[41] The goal of hysterectomy in urogynecology is usually to reach the ligaments and different structures for the apical suspension, but that involves longer surgical time, more complications and a higher blood loss.[40,42,43]

Complications can be broadly categorized into two main groups: short-term and long-term complications. While there is ample information available on short-term complications in literature, the long-term ones remain relatively unexplored. The nature of complications is dependent on the surgical approach. Among the short-term complications, pelvic abscess is notable for both TLH and total abdominal hysterectomy (TAH) ($P = 0.002$). Additional typical complications, specifically in cases of TLH, involve vaginal cuff issues, including infection and suture dehiscence ($P = 0.015$). Regardless of the surgical method, there are numerous instances of ileus and bowel obstructions.[44] However, if hysterectomy is to be considered, according to the literature, the vaginal approach is deemed the safest, with the least blood loss and the quickest procedure.[45-47] Regarding late complications, Madueke-Laveaux et al. demonstrated a potential association between hysterectomy and various health issues. These include cardiovascular disease, lower urinary tract infection, hypertension, stroke, urinary tract cancer, thyroid cancer, incontinence, pelvic prolapse, pelvic organ fistula, ovarian failure, and premature menopause. These conditions are also associated with linked concerns such as decreased bone mineral density, vasomotor disturbances, depression, and a decline in cognitive function.[48] It has been demonstrated that premenopausal women who undergo a hysterectomy

experience an earlier onset of menopause, with a two-fold increase, even when both ovaries are preserved, compared to women with an intact uterus. Menopause was defined using a cutoff of 40 IU/L or higher for follicle-stimulating hormone (FSH).[41,49,50] The removal of the uterus involves a uterosacral-cardinal ligamentectomy (performed through the cervical endopelvic fascia), resulting in pelvic floor instability and subsequent weakness.[41]

3.6 | Comparative studies: Hysterectomy versus uterus preservation

Meriwether et al. conducted a thorough systematic evaluation of 4467 abstracts from various comparison trials, supporting the benefits of pelvic floor reconstruction with uterine preservation over POP with hysterectomy. The risk of mesh exposure and erosion, surgical time, hemorrhage, and recurrence are all reduced with uterine preservation.[51] The erosion risk is even decreased to one fifth in cases of sacropexy with uterine preservation (OR 1.46, 95% CI: 1.03–2.07). Obviously with the risk of mesh exposure and erosion, the risk of reoperation and bowel disturbs are higher.[52,53] Kudish et al. also underlined a higher rate of urinary incontinence after hysterectomy,[54] even though there are divergent opinions in the literature.[55,56] Additionally, what has to be kept in mind is that a hysterectomy involves the dissection of the uterosacral-cardinal ligament complex (pericervical endopelvic fascia).[40] The patient's preferences must also be disclosed. According to Frick et al., 60% of women would choose an organ-sparing procedure if the outcome was just as effective,[36] while Korbly et al. reported 36%.[35] Concerning sexual satisfaction and reaching orgasm, the loss of uterine contraction, shortening of the vagina, and nerve damage could negatively influence the patient's sexual life.[57] With regard to the pregnancy outcome after POP surgery, Barba et al. showed an overall adverse result of around 4.6%.[58] The native surgery with the higher rate of complication is the Manchester procedure. This procedure is not highly recommended in women who decide to conceive, as it reportedly increases the obstetrical complication rate to 42.9%. Among them, the most common adverse event is preterm premature rupture of membranes (P-PROM), with an increase reported from 3% to 28.6%.[58] Reasonably, the cervix amputation is the most logic explanation for this massive rate increase, reducing the lower uterine segment (LUS), causing cervical insufficiency, preterm delivery and P-PROM.[59] Furthermore, if excluding this sort of native surgery, the native procedures are preferable to the mesh alternatives.[58] When comparing patients who underwent total hysterectomy to those who had uterine preservation and hysteropexy, the mesh revealed that exposure to such conditions and the ensuing degradation of the mesh were still 3.5 times higher in the former group (7.2% vs 2.2%, $P<0.0001$; 19 studies, $n=1149$ hysterectomy, $n=1661$ hysteropexy).

Hysterectomy with cervical preservation showed better results compared to the radical operation (0.7%, $n=541$).[60] Furthermore, mesh in case of previous hysterectomy showed a significant decrease of mesh folding at 3 months check-up (94.7% vs 80.0%, $P=0.004$), at 12 months (93.8% vs 82.1%, $P=0.021$), and perfect placement of the mesh after 12 months (81.7% vs 67.6%, $P=0.006$), at sonographic control. According to the study by Gagyor et al., the surgery length and the blood loss were not significally higher in the uterine sparing surgery, especially in cases of LASH and cervicosacropexy, which is among the alternatives with hysterectomy, and the one recommended by the authors. The anatomic results, mostly on the anterior department, are optimal.[8] One of the points to consider is the risk of carcinoma. A preserved uterus is a uterus which could develop a cancer over time. The literature reports a few articles concerning cervical cancer after SHE, including a part of an abstract, dated 1978, describing a risk below 0.3%, if the patient regularly undergoes screening examination.[61] Nowadays with the improved screening methods and HPV vaccine, the risk is certainly lower. Concerning endometrial cancer, we found several studies in the literature. Renganathan et al. evaluated 517 uteri after hysterectomy for uterine prolapse and revealed a rate of endometrial cancer of 0.8%,[62] Frick et al. also led a similar study and in the 681 patients in their study detected a uterine a range of 2.6% premalignant or malignant findings (0.3% low-grade cervical dysplasia, 0.8% simple hyperplasia, 0.5% complex hyperplasia, 1.1% hyperplasia with atypia, 0.3% endometrial carcinoma).[63]

3.7 | Abdominal versus vaginal approach

Another significant dilemma in POP surgery involves the approach. Are the best results achieved by transvaginal or transabdominal approach? Many studies in the literature present opinions of expert surgeons, who express their and from the patients' level of satisfaction during follow-up visits 1 year after surgery.[64,65] Nguyen et al. conducted a survey to determine the level of patient satisfaction 1 year after prolapse surgery, using both transvaginal and transabdominal approaches. Out of the 222 women surveyed, 147 underwent transvaginal treatment, while 75 underwent transabdominal treatment. Patients who underwent transvaginal treatment were found to be older, with the age of the patients being the only significant variation in treatment choice. According to the study, one patient out of every four requires extra therapy in the first year following surgery, regardless of the surgical method. The prolapse grade is also found to be a more significant distinguishing factor after a year.[65]

3.8 | Meshes in urogynecology: Geographical distinctions in the path to extinction

It all began with the safety update issued by the Food and Drug Administration (FDA) in 2011, alerting the public that significant complications associated with the use of synthetic mesh for POP were not uncommon.[28] Around that time, a number of patient narratives describing the negative consequences of transvaginal mesh implantation that were posted on online social media platforms

attracted a lot of attention. These events led to significant changes in treatment guidelines regarding the use of synthetic mesh to treat POP in some parts of the world. Moreover, a multitude of class-action lawsuits filed against mesh manufacturers in the USA further intensified negative publicity surrounding the routine utilization of synthetic mesh.[66] Many countries already seem to have a strong position about the use of mesh by urogynecology (mostly regarding the transvaginal synthetic mesh). The urogynecological associations of Australia and New Zealand (Royal Australian and New Zealand College of Obstetricians and Gynecologists [RANZCOG]) conducted an extensive inquiry into complications reported by women with mesh implants. Their findings prompted recommendations asserting that synthetic mesh offers no advantages over traditional repair methods. Consequently, the use of synthetic mesh for POP was effectively prohibited in both countries.[67,68] The European Urology Association and the European Urogynecological Association have also taken a firm stance on the issue. According to their statement, recommend the use of synthetic meshes solely in complex cases of recurrent prolapse. They advocate restricting their use to surgeons with adequate training and specialized multidisciplinary referral centers.[69] The same action was taken in Scotland and across the UK, where the government delegated the decision making authority to the National Institute for Health and Care Excellence (NICE). They initiated at least a "PAUSE" in the use of synthetic mesh.[70,71] The International Federation of Gynecology and Obstetrics (FIGO) has sought to compile emerging statements from guidelines or boards representing various global associations. In order to gather a comprehensive collection of international guidelines, a request was sent out to all members of the FIGO committees and the leadership of the International Urogynecological Association (IUGA), including the International Advisory Board. All publications containing position statements on the use of mesh for pelvic POP and stress urinary incontinence (SUI) were meticulously examined.[66] We will just focus on the POP findings (topic of the review).

- In most cases, POP can be treated successfully without mesh, thus avoiding the risk of mesh-related complications. This sentiment is echoed by the American Urogynecological Society (AUGS), the American Urological Association (AUA), the Canadian Urological Association (CUA), RANZCOG, the Urogynecological Society of Australasia (UGSA), the Scottish review, Canadian Government, Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR), Food and Drug Administration (FDA), the American College of Obstetricians and Gynecologists (ACOG), Federaçao Brasileira das Associações de Ginecologia e Obstetricia (FEBRASGO), European Association of Urology (EAU), and European Urogynecological Association (EUA).
- Based on the current state of knowledge, transvaginal operations (with mesh) for POP should be used only under carefully controlled circumstances, as suggested by the Royal College of Obstetricians and Gynecologists (RCOG), National Institute for Health and Care Excellence (NICE), EAU, and EUA.
- Limiting the amount of mesh used for all procedures where possible is advocated by SCENIHR, EAU, and EUA.
- Transvaginal polypropylene mesh is not recommended as the first-line treatment for any vaginal prolapse, according to RANZCOG, EAU, and EUA.
- It is crucial to distinguish between the surgical treatment of POP and SUI when considering the use of vaginal mesh, as emphasized by AUA, EAU, and EUA.
- The FDA noted that serious complications associated with surgical mesh for transvaginal repair of POP were not rare.
- Comprehensive outcome reporting for POP surgical techniques is recommended by the Scottish review, RCOG, Canadian Government, FDA, ACOG, JSOG, JUA, JFPFM, JPOPS, and NAFC. This included clearly defining success both objectively and subjectively and reporting complications and total reoperation rates as outcomes.
- Factors to consider before using surgical mesh included its permanence, risk of additional surgeries, and potential complications, as outlined by the FDA, ACOG, CUA, RANZCOG, UGSA, Canadian Government, AUGS, and RCOG.
- Patient selection criteria for POP vaginal mesh repair should be reserved for high-risk individuals in whom the benefit of mesh placement may justify the risk. This is recommended by AUA, the Scottish review, SCENIHR, FDA, ACOG, the International Urogynecological Association (IUGA), EAU, EUA, CUA, SCENIHR, EAU, EUA, AUGS, IUGA, AUGS, FEBRASGO, RANZCOG, Japan Society of Obstetrics and Gynecology (JSOG), the Japanese Urological Association (JUA), the Japanese Society of Female Pelvic Floor Medicine (JFPFM), and the Japanese Society of Pelvic Organ Prolapse Surgery (JPOPS).
- Informed consent should include informing patients about the benefits and risks of various treatment options, as well as the likely success of these alternatives versus transvaginal mesh surgery, according to AUGS, AUA, CUA, RANZCOG, UGSA, the Scottish review, RCOG, Government of Canada, SCENIHR, FDA, ACOG, National Association for Continence (NAFC), NICE, EAU, and EUA.
- Surgeons should undergo training specific to each device, have experience with reconstructive surgical procedures, and possess a thorough understanding of pelvic anatomy, as recommended by AUGS, AUA, CUA, RANZCOG, UGSA, the Scottish review, RCOG, the Government of Canada, SCENIHR, FDA, ACOG, JSOG, JUA, JFPFM, JPOPS, NAFC, NICE, Society of Gynecologic Surgeons (SGS), EAU, and EUA. Surgeons should also be able to demonstrate experience and competence in non-mesh vaginal repair of prolapse, including anterior colporrhaphy, posterior colporrhaphy, and vaginal colpopexy before training in and performing vaginal mesh surgery, as suggested by RANZCOG and UGSA. Surgeons should demonstrate experience and expertise in performing intraoperative cystoscopy to evaluate bladder and ureteral integrity, according to RANZCOG and UGSA.

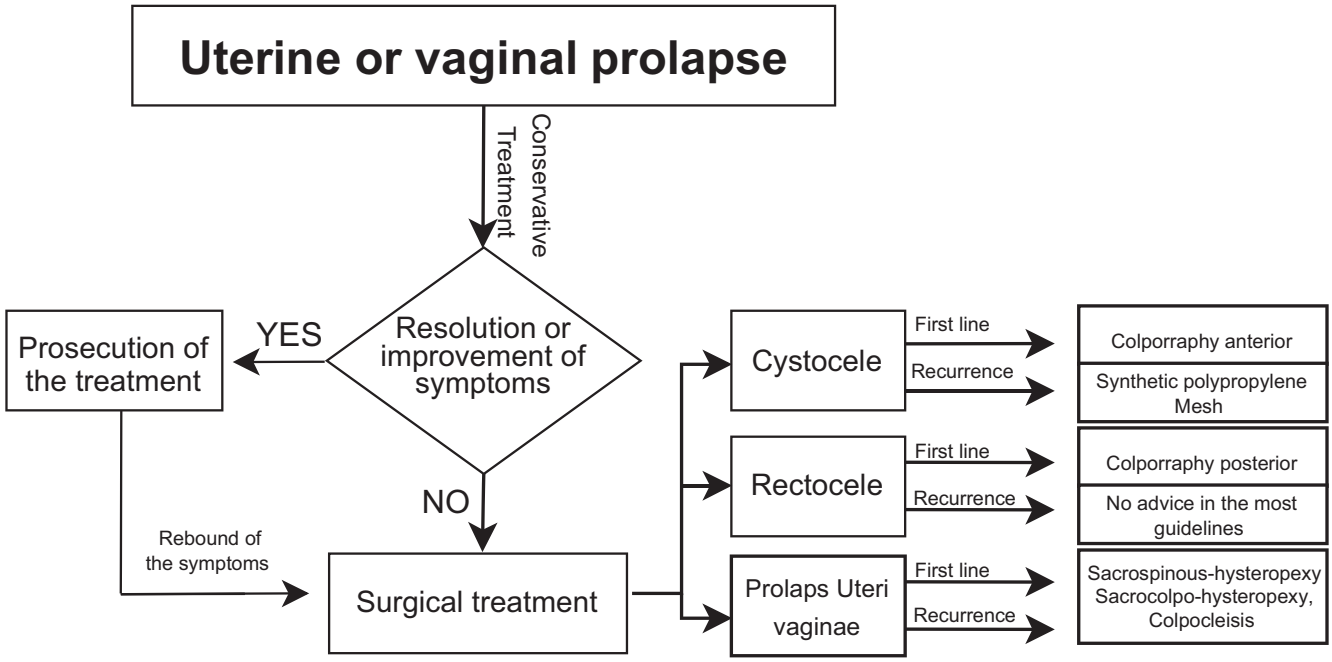

FIGURE 1 The proposed algorithm aims to facilitate the decision making process for the urogynecologic surgeon, emphasizing the importance of conservative therapy as a first-line attempt and summarizing the surgical recommendations derived from the highlighted 10 guidelines.

Future considerations include rigorous comparative effectiveness trials of synthetic mesh and native tissue repair, as well as long-term follow-up, as advocated by ACOG, NICE, RANZCOG, UGSA, the Scottish review, RCOG, NICE, RANZCOG, UGSA, the Scottish review, SCENIHR, SGS, ACOG, EAU, and EUA.[66]

3.9 | A look into the future: Surgical "meshless" alternatives

Aleksandrov et al. described a variant of sacropexy that does not involve the use of mesh. In contrast to the technique that utilizes mesh, this technique does not require extensive preparation of the pararectal space, and there are no implants that need to be reperitonealized and covered. The rest does not differ from the classical technique, but following the SHE, promontorium-fixation is performed with a single left-hand stitch in the anterior longitudinal ligament. The length of the stitch should be around 1 cm to ensure stability, and it should not penetrate too deeply to prevent damage to the intervertebral disk.[72]

Another Mesh-free technique is the "LONG" laparoscopic organopexy with non-genital mesh. A play on words was created with the first descriptor of the technique, namely Long, who as early as 2018 described a method that did not involve the use of meshes but yielded surprisingly positive results. This surgical option essentially involves fixing the uterus to the abdominal wall. Surgical steps include the deperitonealization of the anterior abdominal wall corresponding to the uterus and the insertion of a Prolene 1.0 thread 2 cm above the pubic symphysis. This thread is used laparoscopically to encircle the uterus in its abdominal portion, passing through the right broad ligament, embracing the posterior wall of the uterus, then through the left broad ligament, and again through the abdominal wall. By doing all of this, the uterus becomes adhered to the abdominal wall and can be secured with three points using a V-Loc thread. The two ends of the Prolene 1.0 thread are knotted together on a gauze folded as a cushion, which is placed 2 cm above the pubic symphysis to secure the entire structure. After 2 weeks, this suture can be removed on an outpatient basis. Following a follow-up period ranging from 12 to 30 months, the anatomical cure rate reached 85% (34 out of 40), with success rates of 95% (38 out of 40) for apical prolapse, 85% (34 out of 40) for anterior prolapse, and 97.5% (39 out of 40) for posterior prolapse.[73]

The third method described in the literature that does not involve the use of mesh is outlined by Paolo et al.[74] This research details a study involving 46 women who underwent a mesh-less cervicopexy. The Bologna mesh-less cervicopexy entails an initial SHE with fixation through a continuous suture of the cervix to the longitudinal ligament of the promontory by using a continuous suture (non-absorbable monofilament), folding the right uterosacral ligament. Incision of the peritoneum is performed at the sacral promontory level, creating the presacral space. A first stitch is placed on the longitudinal ligament of the sacral promontory, and craniocaudal plication is carried out with transfixion of the right uterosacral ligament, involving its intermediate and distal (proximal to the cervix) segments. The posterior cervix is suspended at the insertion level of the uterosacral ligaments, and the pericervical fascia is restored. Retrograde transfixion of the right uterosacral ligament to the sacral promontory is then done, and the suture is tension-free bound to

the first stitch, with the cervix approximated to the sacrum, under moderate tension to achieve adequate elevation, at least 8 to 10 cm above the level of the vaginal introitus. The parietal peritoneum is closed to prevent internal herniation. During the follow-up period, the objective success rates for central compartment prolapse and for all compartments were 93.5% and 89.1%, respectively. None of the women experienced dyspareunia at follow-up. Of the participants, 84.8% reported very high satisfaction related to surgery, and 13% reported moderate satisfaction. Overall female sexual function index, Knowles-Eccersley-Scott symptom, and Bristol female lower urinary tract scores showed significant improvement after surgery, except for the incontinence score domain.

4 | CONCLUSIONS

When it comes to the anterior compartment, anterior colporrhaphy is the gold standard for primary therapy. However, it carries a high recurrence rate, estimated by Italian guidelines (AGREE-S score 123.5) and the German-speaking group, which includes Austria, Germany, and Switzerland, at 50%–52% (AGREE-S score 142). The use of mesh in cases of recurrence is almost universally tolerated on a global scale. The only surgical procedure for which there is widespread consensus in nearly every nation examined in this comparative analysis of guidelines is the posterior compartment surgery. Although it is a crucial component of the posterior colporrhaphy, there are several subtle differences that clearly show perineorrhaphy. Iran (AGREE-S score 111) and Scandinavia (AGREE-S score 106) are the two nations allowing the use of mesh. Treatment of apical anomalies is becoming a more challenging issue. Although the use of meshes are still included in the recommendations, it appears that their use are moving away from existing practices. However, this is just theoretical at this point. Consequently, our review offers excellent alternatives that do not require meshes. The gold standard at the moment is the sacrocolpopexy, a notion that appears destined to change in the next guidelines to become sacropexy, giving the operator the option of selecting which anatomical portion to suspend to the promontorium (cervix, cervical stump, or vaginal stump). A recent investigation demonstrated similar outcomes in uterine preservation instances, with several preventable side effects in hysterectomy cases. The conclusions are summarized in the proposed decision making algorithm (Figure 1).

AUTHOR CONTRIBUTIONS

Design of the study: Giovanni Pecorella and Andrea Morciano. Data collection and planning: Giovanni Pecorella. Data analysis: Andrea Morciano and Radmila Sparic. Methodology and data curation: Andrea Morciano and Radmila Sparic. Writing the manuscript: Giovanni Pecorella and Andrea Morciano. Manuscript revision: Andrea Tinelli and Radmila Sparic. Supervision: Andrea Tinelli.

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The authors have no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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