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Pelvic Organ Prolapse: Current Challenges and Future Perspectives

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Abstract: Pelvic organ prolapse (POP) remains a predominant gynecological pathology that significantly impairs quality of life and sexual function, with prevalence rates rising proportionally with age. Despite extensive research, treatment efficacy is often compromised by high recurrence rates of up to 33.3%, and the pathogenesis of vaginal cuff and cervical stump prolapse following hysterectomy remains insufficiently addressed in current literature. This review analyzes the etiology, classification, and management of POP, focusing on the impact of connective tissue dysplasia, hypoestrogenism, and anatomical distortion on surgical outcomes. The findings indicate that the loss of the natural suspensory and anchoring ligamentous apparatus during hysterectomy is a critical driver of secondary prolapse, exacerbated by collagen defects and metabolic disturbances. Consequently, improving clinical outcomes requires an individualized surgical approach that prioritizes the restoration of all weakened ligamentous components during the primary intervention to mitigate the risk of recurrence and functional disability.

Keywords: Pelvic organ prolapse, hysterectomy, connective tissue dysplasia, recurrence, POP-Q system, reconstructive surgery, vaginal cuff prolapse.

Descent and prolapse of the internal genital organs (DPIGO) continue to occupy one of the leading positions in the structure of gynecological morbidity. Severe forms of prolapse can be regarded, to a certain extent, as a disabling condition that significantly impairs a woman's quality of life (1,3). Surgical treatment, which allows for full rehabilitation of such patients, has not only medical but also social significance (2,4). Descent and prolapse of the internal genital organs are among the most common gynecological disorders and have an adverse impact on the general condition of patients, leading to reduced work capacity and sexual activity. According to various authors, the prevalence of this pathology among gynecological diseases ranges from 28% to 38.9% (5).

Pelvic organ prolapse (POP) is defined as a disorder of the anatomical relationships between the cervix and/or uterine body and the vaginal walls, accompanied by descent of these anatomical structures to the level of the vaginal introitus or beyond it, and represents a variant of pelvic floor hernia [1,2]. In most cases, pelvic organ prolapse is combined in nature: adjacent pelvic organs (the urinary bladder, rectum, and intestinal loops) are involved in the pathological process, resulting in cystocele, rectocele, and/or enterocele. Epidemiological studies indicate that prolapse of the anterior vaginal wall occurs twice as often as prolapse of the posterior wall and three times more frequently than apical prolapse. It has been reported that approximately two-thirds of women observed for pelvic organ prolapse have combined descent of both the anterior and posterior vaginal walls along with apical prolapse of varying severity [5]. The prevalence of pelvic organ prolapse shows no tendency to decrease. In Russia, this condition affects up to 30% of women, while in Brazil it reaches 27%, in Denmark up to 43%, in the United States up to 23.7%, in China up to 40%, and in Ethiopia approximately 21% [6].

The prevalence of pelvic organ prolapse, as well as the frequency of surgical interventions aimed at correcting this pathology, demonstrates a direct positive correlation with patient age. Women aged 50–60 years account for more than 30% of the total population of patients with pelvic organ prolapse, while women aged 80 years and older account for more than 50% [7]. The frequency of surgical

interventions also increases proportionally with age [7,8]. In the United States, the annual rate of surgeries for pelvic organ prolapse is 2–3.5 per 1,000 women, with the highest rates observed among patients aged 60–70 years [9]. To ensure an objective assessment of the severity of pelvic organ prolapse, several classification systems have been proposed. According to the classification by M.S. Malinovsky, three degrees are distinguished: Grade I — descent of the vaginal walls to the level of the vaginal introitus; Grade II — prolapse of the cervix beyond the vaginal opening with the uterine body remaining above the vaginal entrance; Grade III — complete prolapse of both the cervix and uterine body as part of a hernial sac [13].

Currently, the most widely used system is the **Pelvic Organ Prolapse Quantification (POP-Q) system** [10], which is recommended for routine clinical practice by both gynecologists and urologists [16,17]. According to this classification, the severity of prolapse is graded based on quantitative assessment of vaginal wall descent by measuring nine parameters in the sagittal plane, with the patient in the supine or semi-recumbent position at maximal prolapse (during the Valsalva maneuver). All points and parameters are described relative to the plane of the hymenal ring. Six points (Aa, Ba, Ap, Bp, C, D) are measured as positive or negative values depending on their position relative to the hymen, while three parameters (TVL, GH, PB) are recorded as absolute values.

There is a direct proportional relationship between the onset of menopause and an increased risk of pelvic organ prolapse, independent of age and parity. Numerous studies confirm that hypoestrogenism leads to defects in collagen structures and disrupts the morphology of the connective tissue of the pelvic diaphragm [2,5]. A genetic predisposition to pelvic organ prolapse has also been identified, associated with collagen defects as a key component of connective tissue, including the fasciae and ligaments of the pelvic floor. The type of collagen and the body’s ability to repair damaged collagen structures play a decisive role [6].

Several studies indicate that patients with connective tissue dysplasia—manifested by heart valve defects, joint hypermobility, abdominal or inguinal hernias, varicose veins, and other classic features—are more prone to the development of pelvic organ prolapse [7–9].

Morphological examination of the ligamentous apparatus in women with genital prolapse reveals fibrosis and fragmentation of elastin, diffuse atrophy, hyaline or mucinous degeneration of smooth muscle tissue, and edema of the extracellular matrix. Disorganization of connective tissue is manifested by reduced expression of type I collagen and elastin. Weakening of the elastic framework leads to excessive extensibility of the round and uterosacral ligaments, contributing to impaired microcirculation and ischemia of the connective tissue of the uterine ligamentous apparatus. An imbalance between type I and type III collagen, with predominance of the less durable type III collagen, has also been identified. These stereotypical structural changes allow prediction of the risk of development and recurrence of genital prolapse.

In patients with a family history of pelvic organ prolapse, the incidence is nearly three times higher compared to the general population [30]. Additional contributing factors include occupations associated with heavy physical labor, smoking leading to chronic cough, prolonged chronic constipation with increased intra-abdominal pressure, and extragenital connective tissue disorders [8,11].

The most common symptoms of pelvic organ prolapse include a sensation of heaviness and a foreign body in or protruding from the vagina. Involvement of adjacent organs results in specific symptoms. Severe cystocele may cause urinary frequency, urinary incontinence, or difficulty in voiding, sometimes requiring manual reduction of the hernial sac to initiate urination [12]. Similarly, pronounced rectocele may lead to defecatory dysfunction with frequent but ineffective urges and difficulty during defecation [13]. According to published data, involvement of adjacent organs with stress urinary incontinence occurs in 30–60% of cases, while gas and fecal incontinence is observed in 5–50% of patients [4–6]. Between 20% and 38% of women report difficulty with defecation, a sensation of incomplete evacuation, and the need for manual assistance [7].

The relevance of various aspects of genital prolapse has remained high for decades despite extensive research into its etiology, pathogenesis, and treatment. This is due to the high prevalence of the condition, insufficient treatment efficacy resulting in recurrence rates of up to 33.3%, and a recent trend toward younger age at onset, with an increasing proportion of severe forms involving adjacent organs and functional impairment. These factors necessitate new approaches to surgical management and optimization of operative techniques to minimize recurrence rates (1,3,5).

Correction of prolapse following hysterectomy represents a particular challenge, as this condition is almost always associated with cystocele, rectocele, or enterocele, as well as cicatricial changes in tissues and ligamentous structures (1,3,4,5).

Descent and prolapse of the genital organs lead to functional insufficiency of multiple organs and systems, significantly affecting reproductive functions and work capacity (2,4).

Due to the common embryological origin of the urinary and genital systems, estrogen deficiency in postmenopause results in simultaneous pathological changes in the urethra, bladder, genital mucosa, pelvic floor muscles, and pelvic ligaments, promoting progression of pelvic organ prolapse and the development of urinary incontinence and dysuria [5,11].

As preoperative preparation or as an alternative to surgery, pessary use may be considered in patients with pelvic organ prolapse [6,7]. Two main groups of pessaries exist, differing in shape and size. Support pessaries (ring-shaped, such as Gehrung and Hodge) are recommended for stage I–II prolapse, whereas space-occupying pessaries (cube-shaped and donut types such as Gellhorn) are indicated for stage III–IV prolapse.

However, patients should be informed that in approximately 40% of cases, pessary fitting may unmask occult urinary incontinence or cause pain [9]. In rare cases, pressure from the pessary may lead to vaginal erosion, pressure ulcers, or fistula formation in 2–9% of patients. Management involves pessary removal for 2–4 weeks and local estrogen therapy [7,12].

Before determining the extent of surgical intervention for pelvic organ prolapse, the risk of occult stress urinary incontinence should be assessed. Anatomical distortion associated with anterior or apical prolapse may obstruct the urethra, masking sphincter insufficiency. Restoration of normal anatomy through conservative or surgical treatment may unmask stress urinary incontinence. Despite limited predictive value, the cough stress test helps identify patients requiring concomitant anti-incontinence procedures.

Numerous surgical techniques have been proposed for the correction of genital prolapse. However, selection of the optimal surgical approach remains challenging, particularly in women of reproductive age and in cases of combined pathology (1,3,5).

Currently, reconstructive and obliterative procedures are used for pelvic organ prolapse, with vaginal hysterectomy considered a separate category. Reconstructive surgery includes native tissue repair and mesh-based techniques, such as sacrospinous fixation, extraperitoneal colpopexy, and sacrovaginopexy.

Unfortunately, insufficient attention has been paid in the literature to the pathogenesis of vaginal cuff and cervical stump prolapse following subtotal and total hysterectomy.

Understanding the factors that maintain normal anatomical positioning of pelvic organs is essential for identifying deviations leading to pathological displacement. The structures maintaining uterine position are traditionally divided into the supporting, suspensory, and anchoring systems [5].

The supporting apparatus consists of the muscles and fasciae of the pelvic floor, including the pelvic diaphragm, urogenital diaphragm, and associated striated muscles. The suspensory apparatus includes the round ligaments, broad ligaments with infundibulopelvic components, and ovarian ligaments. The anchoring apparatus comprises the cardinal, uterosacral, and pubovesical ligaments.

During subtotal hysterectomy performed using classical techniques, the cervical stump is deprived of its natural suspensory support, particularly the round and partially the broad ligaments [3].

Therefore, when performing hysterectomy for any indication, the surgeon should restore all weakened components of the ligamentous and muscular apparatus, even if they appear clinically insignificant, to prevent future prolapse.

Management strategy and surgical volume for patients with pelvic organ prolapse should be individualized, taking into account the stage of prolapse, presence of concomitant gynecological and extragenital diseases, degree of compensation, patient age, and sexual activity.

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