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# Classification and evaluation of prolapse

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Pelvic organ prolapse is prevalent among older women. Milder stages of prolapse, cranial to the hymen, are common and usually symptomless. A specific symptom is a bulge outside the vagina. Functional symptoms from the bladder, bowel and sexual life frequently coexist without a known cause/effect relationship to prolapse. Prolapse should be measured by the validated internationally approved pelvic organ prolapse quantification (POPQ) system that can measure prolapse in the three compartments and three levels of the vagina. We should work on a common classification system and agreement in which symptoms should be recorded as related to prolapse and expected to improve by prolapse surgery.

**Keywords:** pelvic organ prolapse; urinary incontinence; faecal incontinence; sexual problems.

'Without the names your knowledge about things disappears' (Carl Von Linné), and without a common classification system communication and learning become difficult. Pelvic organ prolapse (POP), urinary incontinence (UI) and faecal incontinence (FI) are common symptoms in the general female population. These symptoms appear to be associated, and all types often coexist in the same individual.<sup>1–9</sup>

Pelvic floor dysfunction, especially the end stage of POP, is found in postmenopausal older women. This section of the population is growing in industrialized countries.<sup>10</sup> Growth in demand for services to care for female pelvic floor disorders will also generate a demand for exactness in diagnosis and treatment options, as well as in scientific discussions, making communication even more important.

Classification of POP ought to be in accordance with anatomy and symptoms and ought to be easy to perform, teach and learn, as well as sensitive and specific to relevant changes in anatomy.

Evaluation of symptoms can be done by validated questionnaires. For epidemiological studies it is important that there is concordance between symptoms and anatomical findings, especially when symptoms associated with POP are so widespread in the older female population.

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## PREVALENCE OF PELVIC ORGAN PROLAPSE

The prevalence and incidence of POP depends on the definition and study population.

POP is defined anatomically as the descent of a pelvic organ into or beyond the vagina, perineum or anal canal.<sup>11</sup> This definition may include up to half of the female population.<sup>12,13</sup> When POP is defined as a lump protruding outside the introitus, the prevalence declines to 2–12%<sup>1,4,12–14</sup>, increasing with age. When functional symptoms from the lower urinary tract (LUTS), bowels, and sexual life are included, the relationship with anatomically defined POP is not so clearcut, and the chance of curing these symptoms by prolapse surgery is less promising.

The incidence of prolapse and incontinence surgery was reported in a retrospective cohort study. Lifetime risk of undergoing at least one surgery was 11.1%, and in two-third the indication for surgery was POP. The most discouraging finding in this study was that one-third of the women needed repeat surgery.<sup>9</sup>

The 'natural history' of POP anatomy was studied during a 2–8-year period. The annual incidence of cystocele, rectocele, and uterine prolapse was 9.3, 5.7, and 1.5 cases per 100 women-years<sup>15,16</sup>, and the annual rates of regression were 23.5, 22, and 48, respectively. It was concluded that pelvic organ prolapse is not always chronic and progressive, as traditionally thought.<sup>16</sup> Studies of pregnant women also revealed that POP in younger women could be a dynamic, asymptomatic, partly reversible adaptation to pregnancy and delivery.<sup>17,18</sup>

## AETIOLOGY

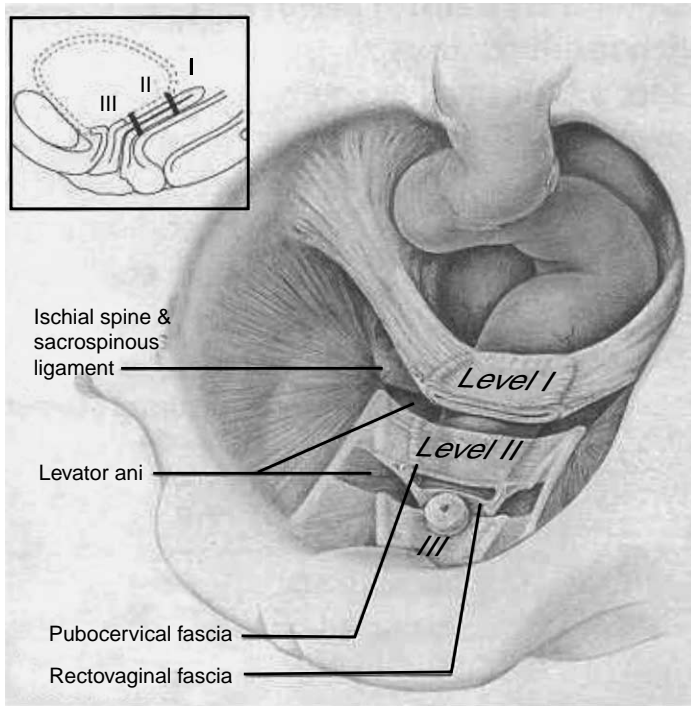
From epidemiological studies, there is grade III–IV evidence that development and recurrence of POP are related to previous prolapse surgery<sup>9</sup>, previous colposuspension<sup>19,20</sup>, hysterectomy<sup>12,15,21,22</sup>, obesity<sup>15</sup>, old age<sup>1,15,21</sup>, constipation and chronic straining during defaecation<sup>23</sup>, a weak pelvic floor muscle function<sup>13</sup>, parity (especially multiparity and complicated vaginal deliveries)<sup>21,23</sup>, heavy lifting at work<sup>24</sup>, large diameter of the bony pelvis<sup>25,26</sup>, collagen abnormalities<sup>23,27</sup>, and probably the menopause and decreased oestrogen level.<sup>28,29</sup>

The aetiology of POP is multifactorial. Some surgical risk factors may be prevented by surgical techniques that do not change vaginal contour and suspending ligaments.<sup>20,30,31</sup>

## ANATOMY

Any classification system—whether designed for clinical examination or imaging—should describe anatomy. The present concept of the female pelvic support divides it into three compartments: the *anterior compartment* with the urethra and bladder, the *posterior compartment* with the anus and rectum, and the *middle* containing the vagina and uterus or vault in hysterectomized women. The suspension system can be divided into three levels (Figure 1).

- *Level I*: the cranial part of the vagina and uterus or vault is suspended by the sacrouterine and cardinal ligaments.<sup>32,33</sup> Prolapse of Level I is therefore either uterine or vault prolapse.



**Figure 1.** The vagina can be divided into three levels. Reprinted from DeLancey (1992, *American Journal of Obstetrics and Gynecology* **166**:1717–1728) with permission.

- **Level II:** the middle part of the vagina is attached to arcus tendineus fasciae pelvis and the levator ani muscles and covered by the pubocervical fascia anteriorly and the rectovaginal fascia posteriorly. POP at this level can be described as a central hernia through the pubocervical fascia—i.e. a cystocele and/or an enterocele or rectocele—when herniation is occurring through the rectovaginal fascia in the upper or middle part. Typical sites for tears in the pubocervical and rectovaginal fascia have been described.<sup>34,35</sup> The nature and importance of the vaginal fasciae have been debated. The fraction of smooth muscle in the muscularis of the vaginal wall is significantly decreased in women with a cystocele and rectocele<sup>36,37</sup>, corresponding to the absence of vaginal rugae covering the central (coele) formations. It is not possible to say whether this is the cause or effect of POP. The vagina is attached to the arcus tendineus.<sup>38</sup> Tears in this attachment are described as lateral defects and may require a different surgical technique compared to the central cystocele.<sup>39–41</sup>
- **Level III:** the caudal part of the vagina, including the perineal body posteriorly and the urethra anteriorly. Level II and III supports are continuous with one another. POP at this level includes distal rectoceles. The size and integrity of the perineal body is rarely studied, but is probably important for faecal continence and sexual function.<sup>33,42</sup>

The importance of the pelvic floor muscles for support of the pelvic organs has been studied. The normal vagina lies horizontally over the pelvic floor muscles and does not

put any tension on the suspending ligaments during abdominal pressure increases. Relaxation or damage to the pelvic floor muscles results in opening of the genital hiatus, and the pelvic organs are no longer supported by the muscles but solely held in place by ligaments. Chronic stretching of the connective tissue may result in POP.<sup>13,43–46</sup>

Magnetic resonance imaging (MRI) is a promising technique for anatomical studies. Soft tissue such as muscles and ligaments can be visualized. The method is expensive and is not widely available, and the patient has to be examined in a static supine position. The relation of MRI findings to symptoms and clinical findings is still under evaluation.<sup>45,47–50</sup>

### Practice points

- asymptomatic POP is common
- patient history should include suspected aetiological factors, since they may also predispose to recurrence of POP
- vaginal suspension is divided in three compartments and three levels
- surgical techniques should aim to recreate vaginal anatomy

### Research agenda

- importance of the vaginal fascia and pelvic floor muscles for POP development
- evaluation of specific risk factors at vaginal deliveries
- relation of symptoms to anatomy and imaging
- randomized studies of which surgical technique prevents POP after hysterectomy, incontinence and prolapse surgery
- role of menopause and oestrogen treatment (local and systemic)
- genetic aspects of POP
- the 'natural history' of POP

## CLINICAL EVALUATION OF POP: SYMPTOMS

Evaluation of patients referred with POP should include mechanical/local symptoms and functional symptoms from the lower urinary tract, bowels, sexual life, and their effect on quality of life.<sup>51</sup> Functional symptoms cannot consistently be attributed to the size or site of POP, but in spite of that patients often expect relief of all symptoms and not only 'cure' of the vaginal bulge.

Various disease-specific, quality-of-life questionnaires and bother scores have been validated for use in women with POP before and after treatment.<sup>2,52–56</sup> Most patients feel POP affects their quality of life when they experience symptoms more than once per week.<sup>2,55</sup>

## Mechanical symptoms

Three surveys give quite consistent rates of mechanical symptoms of around 8% among community-dwelling older women.<sup>57–59</sup> Mechanical symptoms are often reported when the leading edge of the prolapse is at or outside the hymen.<sup>1,55,56</sup>

A questionnaire with 13 questions<sup>59</sup> has been validated. Five of the questions are relevant for POP. A confirming answer to these questions had a positive and negative predictive value of 74 and 82%, respectively, for stage II prolapse. Swift et al<sup>56</sup> used seven questions to define grade II–III POP. Mechanical symptoms caused severe bother and effect on quality of life in more than 80% of patients with symptoms of a lump outside the introitus at least once a week.<sup>55,56</sup> Patients' report of a bulge seems the most valuable screening tool for POP. Symptoms such as heaviness in the lower abdomen and low back pain are non-specific to POP.<sup>59</sup>

### Practice points

Important questions to ask<sup>56,59</sup>:

- do you feel tissue protrusion/vaginal bulge?
- is it worsened by heavy lifting?
- do you have to manually reduce the bulge to urinate?
- do you have to manually reduce the bulge to defaecate?
- do you feel vaginal pain/discomfort?

## Lower urinary tract symptoms (LUTS)

Women with POP often have incontinence and voiding problems (Table 1).<sup>55,60–65</sup> Voiding problems with the need to manually reduce the prolapse to urinate correlates with more severe stages of anterior wall prolapse.<sup>60,64,65</sup> A more vague feeling of bladder-emptying problems (Table 1) may be reported by 30–50% of patients without specific relation to the prolapsed compartment.

**Table 1.** Lower urinary tract symptoms in patients with pelvic organ prolapse ( $\leq$  Stage 2).

Reference	Number of patients	% Stress incontinence	% Urge/mixed incontinence	% Voiding problems
Mouritsen and Prien-Larsen (2003) <sup>55</sup>	105	27	21	36
Bai et al (2001) <sup>61</sup>	67	63	–	–
Ellerkmann et al (2001) <sup>62</sup>	237	13	73	50
Yalcin et al (2001) <sup>63</sup>	60	28	33	50
Romanzi et al (1999) <sup>64</sup>	60	72	20	4
	58% $\leq$ Stage 2	36	52	58
	42% $\geq$ Stage 3			
Gardy et al (1991) <sup>65</sup>	62			
	47% $\leq$ Stage 2	83	48	28
	53% $\geq$ Stage 3	66	72	55

**Table 2.** Frequency of functional symptoms related to prolapsed compartment in % of 105 patients with  $\geq$  Stage 2 prolapse.<sup>55</sup>

POP site	Stress incontinence	Urge incontinence	Voiding problems	Digitalation to defaecate	Flatus incontinence	Liquid stool incontinence	Solid stool incontinence
Anterior	39	21	39	6	30	9	6
Posterior	32	32	25	36*	39	18	18
Anterior + posterior	14*	14	41	25*	30	14	9

\*Statistically significant relation to prolapsed site.

In the studies referred to in Table 1, 13–83% of patients with POP also complained of stress incontinence, and 21–73% of urge incontinence. In population studies, 15–20% of women in this age group complain of incontinence.<sup>2</sup> Incontinence and POP often coexist without a strict relation to the prolapsed compartment (Table 2). There is a tendency for UI to improve with more severe POP stages, while voiding problems are aggravated.

Prolapse repair can improve or cure both voiding problems and stress and urge incontinence in more than half of the cases<sup>65,66</sup>; the challenge is to find which patients.

Urodynamics, Q-tip test, fluoroscopy, ultrasonography, and reduction of the prolapse with pessary and speculum tests have been recommended to evaluate coexisting or occult incontinence in women with prolapse.<sup>67–73</sup> Masked incontinence may be 'demasked' when kinking and compression from the prolapse is reduced after vaginal repair and is reported in 15–22% of patients.<sup>70,73,74</sup> In most studies, the consequence of a 'demasking' test was taken, and the 'expected' incontinence operated at the time of POP surgery without validating the efficacy of the test. In the study by Weil et al<sup>70</sup>, the pessary test was falsely positive in 72% and falsely negative in 10% of 40 patients. Most tests overestimate the risk of incontinence by a factor of 2–3.

Urodynamic tests with and without prolapse reduction cannot predict the outcome of overactive detrusor function or of anti-incontinence surgery done simultaneous by vaginal repair.<sup>66,72</sup> Measuring residual urine and pressure-flow studies are important to disclose borderline detrusor function in patients who would be at risk of developing obstruction if a suburethral sling is planned at the same time as the vaginal repair.

Symptoms of urinary incontinence before and after POP surgery can be evaluated by a validated short-form questionnaire.<sup>75</sup>

### Practice points

Important questions to ask<sup>75</sup>:

- how often do you leak urine?
- how much urine do you usually leak?
- how does leaking interfere with your daily life?
- when does urine leak?

### Research agenda

- relation of bladder function and POP
- reliability of tests for demasking incontinence
- should POP and incontinence surgery be done in the same procedure?

### Bowel symptoms

There is grade III–IV evidence from several observational studies that FI, UI and POP have common causes. Damage to the pelvic support system and nerves caused by childbirth, previous operations and old age are the most commonly cited risk factors.<sup>71,72</sup>

There is no internationally accepted definition of faecal incontinence or constipation. The difference in number of POP patients complaining of constipation (Table 3)<sup>55,62,76–79</sup> refers to the variation in definitions, from as strict as bowel emptying twice or less per week to patient-defined definitions. It is debateable whether constipation is a cause or effect of weakness in the posterior rectovaginal fascia or a coexisting neuromuscular factor.<sup>23</sup>

Faecal incontinence for liquid or solid stool is reported by 10–30% of patients with POP (Table 3). It is not significantly related to the prolapsed compartment (Table 2). For comparison, the prevalence of faecal incontinence in the general female population of 60-year-olds was 8% for liquid and 1.7% for solid stool; in the same population 19% complained of flatus incontinence.<sup>22</sup> Patients with the same stage of POP may suffer from different bowel symptoms dependent on stool consistency and underlying bowel diseases.

FI quality-of-life scales have been developed, but not validated in a POP population.<sup>80</sup> A simple grading system of FI is widely used.<sup>42,55,81</sup>

Defaecography is in use to improve clinical evaluation of abnormal defaecation. A diagnostic criterion for a rectocele is based on size of rectal protrusion into the vagina and trapping of contrast.<sup>82</sup> None of these criteria are specific or consistently related to symptoms in the average patient with rectocele.<sup>83,84</sup> Defaecography may be useful in evaluation of selected patients with recurrent defaecation symptoms that cannot be explained by clinical findings, e.g. intussusception of the rectal wall and recurrent enterocele.

### Practice points

Grading of faecal incontinence<sup>81</sup>:

- grade 1: complete continence
- grade 2: incontinence of flatus
- grade 3: incontinence of flatus and liquid stools
- grade 4: incontinence of flatus, liquid and solid stools

### Research agenda

- standardization of classification of bowel symptoms
- population studies of bowel symptoms and relation to POP
- effect of conservative treatment of bowel symptoms on POP

**Table 3.** Frequency of bowel symptoms in patients with pelvic organ prolapse ( $\geq$  Stage 2).

Reference	Number of patients	% Faecal incontinence	% Digitation	% Constipation
Mouritsen and Prien-Larsen (2003) <sup>55</sup>	105	10	6–36	6
Meshia et al (2002) <sup>77</sup>	339	12	–	–
Ellerkmann et al (2001) <sup>62</sup>	237	31	24	67
Kenton et al (1999) <sup>78</sup>	66	30	30	41
Weber et al (1998) <sup>79</sup>	143	16	31	8

### Sexual symptoms

Treatment of POP and UI usually focuses more on anatomy and cure of UI than sexual function. Most studies are retrospective<sup>85,86</sup> and focus on dyspareunia and 'general sexual wellbeing' as the key aspects of female sexual function (Table 4). Dyspareunia is a multifactorial and common symptom among older women, often related to the feeling of vaginal dryness, atrophy, low oestrogen levels, and old age.<sup>85–88</sup> Surveys report sexual dysfunction in 10–40% and dyspareunia in 25% of older women.<sup>89,90</sup>

The frequency of sexual activity did not differ in a group with UI or POP compared to controls. Decreased sexual satisfaction because of urine leakage during intercourse, embarrassment, dyspareunia, and vaginal dryness were significantly more common in the group with UI or POP compared to controls.<sup>89</sup> In another study<sup>90</sup>, subanalysis revealed that most sexual problems were in the group with UI and were associated with low libido, vaginal dryness and dyspareunia, while POP was not associated with sexual problems in this study.

A specific questionnaire<sup>91,92</sup> in both a long- and a short-form with 12 questions covers broader aspects of female sex life, and has been validated for use in patients with pelvic floor dysfunction (PISQ-12).

**Table 4.** Frequency of sexual symptoms in patients with pelvic organ prolapse ( $\geq$  Stage 2).

Reference	Number of patients	% with sexual activity	% with dyspareunia	% with sex problem
Mouritsen and Prien-Larsen (2003) <sup>55</sup>	105	45	35	57
Ellerkmann et al (2001) <sup>62</sup>	237	44	69	–
Weber et al (2000) <sup>87</sup>	165	49	8	18
Rogers et al (2001) <sup>89</sup>	83 patients 56 controls	100 100	42 24	33 9

The relation of sexual function to cure of UI and objective vaginal dimensions before and after treatment for POP is weak.<sup>55,62,86</sup> Deterioration of emotional aspects of sexual life in spite of physical improvement after POP and UI surgery was found in a study using PISQ-12.<sup>93</sup> The sexual outcome was independent of age, type of surgery, oestrogen status, and cure or not of incontinence symptoms. Other studies found that vaginal operations, especially posterior colporrhaphy, vaginal atrophy, old age and partner's medical and sexual problems, are risk factors for sexual dysfunction and dyspareunia in women.<sup>85-87</sup>

Sexual complaints in women can be due to physical problems: e.g. urine leakage during intercourse, dyspareunia from the feeling of a narrow or short vagina, vaginal dryness, scar tissue and mucosal bridges from prior vaginal tears or surgery, and/or due to emotional impact of menopause, pelvic floor dysfunction, and partner relationship and function. Clinicians need more information on these factors to be able to counsel patients and adjust surgical techniques.

### Practice points

Patient history should include questions about<sup>92</sup>:

- frequency of sexual activity
- sexual desire and ability to perceive orgasm
- dyspareunia and vaginal dryness
- incontinence/prolapse or fear of this during intercourse
- partner's sexual and medical problems
- importance of sex life for the woman and the relationship

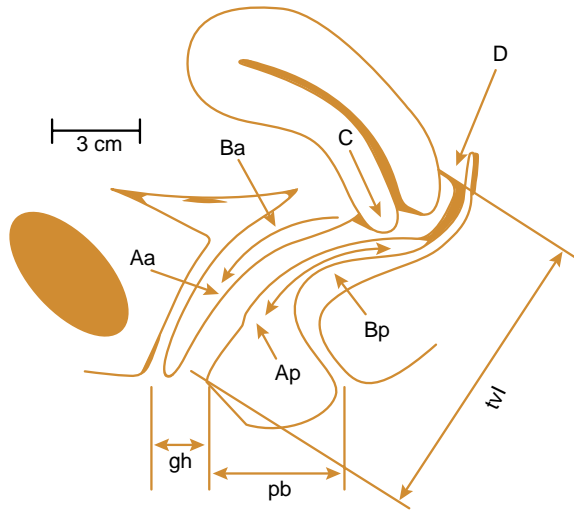
### Research agenda

- prospective studies of sexual life and effect of POP surgery
- relationship of sexual problems to anatomical findings
- relationship of sexual problems to surgical technique

## CLASSIFICATION OF PROLAPSE: POPQ

Before the internationally approved POPQ system became available in 1996<sup>11</sup>, scientific reports described POP by terms that were undefined and unclear, e.g. mild cystocele<sup>94</sup> or even descriptions from the 'fruit' department.

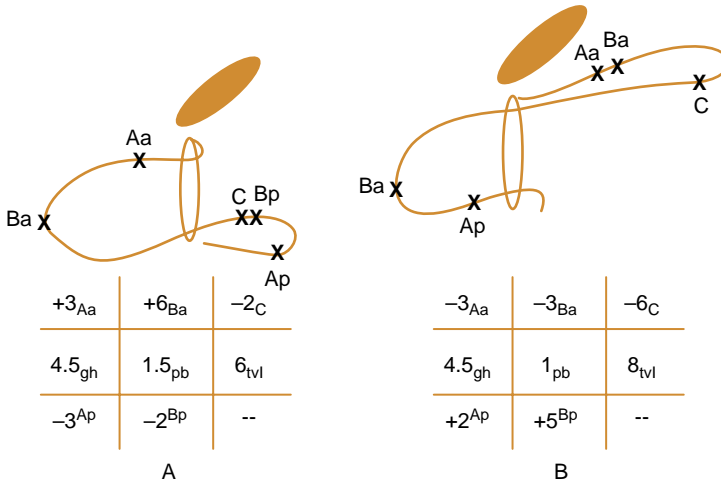
By the POPQ the maximal protrusion of two points (Aa and Ba) is measured in the anterior vaginal wall, two points (Ap and Bp) in the posterior wall, and C at the cervix and D at the posterior fornix in the middle compartment (Figure 2). All measurements can be done with a ruler in centimetres. The hymen is used as reference point (0). Measurements cranial to the hymen are negative, and measurements outside the hymen



**Figure 2.** The nine pelvic organ prolapse quantification (POPQ) measuring points. gh, genital hiatus; pb, perineal body; tvl, total vaginal length. Reprinted from Bump et al (1996, *American Journal of Obstetrics and Gynecology* 175:10–17) with permission.

positive (Figure 3). These six measurements and the length of the perineal body (pb), from hymen to anus, and the genital hiatus (gh) from hymen to the urethral opening are done while the patient is doing maximum Valsalva. The total vaginal length is measured without Valsalva.

The nine measurements can be written in a grid (Figure 3), and for simplification and description of populations translated into an ordinal stage from 0 to 4 (Table 5).



**Figure 3.** Grids with (A) anterior, and (B) posterior prolapse. gh, genital hiatus; pb, perineal body; tvl, total vaginal length. Reprinted from Bump et al (1996, *American Journal of Obstetrics and Gynecology* 175:10–17) with permission.

**Table 5.** International Continence Society (ICS) staging system, based on pelvic organ prolapse quantification (POPQ).

	Leading edge of POP in relation to hymen
Stage 0	$< -3$ cm
Stage 1	$< -1$ cm
Stage 2	$\leq +1$ and $\geq -1$ cm
Stage 3	$> +1$ cm
Stage 4	$\geq$ total vaginal length $-2$ cm

The staging system is not as sensitive as the POPQ for description and follow-up of individual patients. The POPQ system has been validated and is highly reproducible and robust to minor modifications.<sup>95-97</sup>

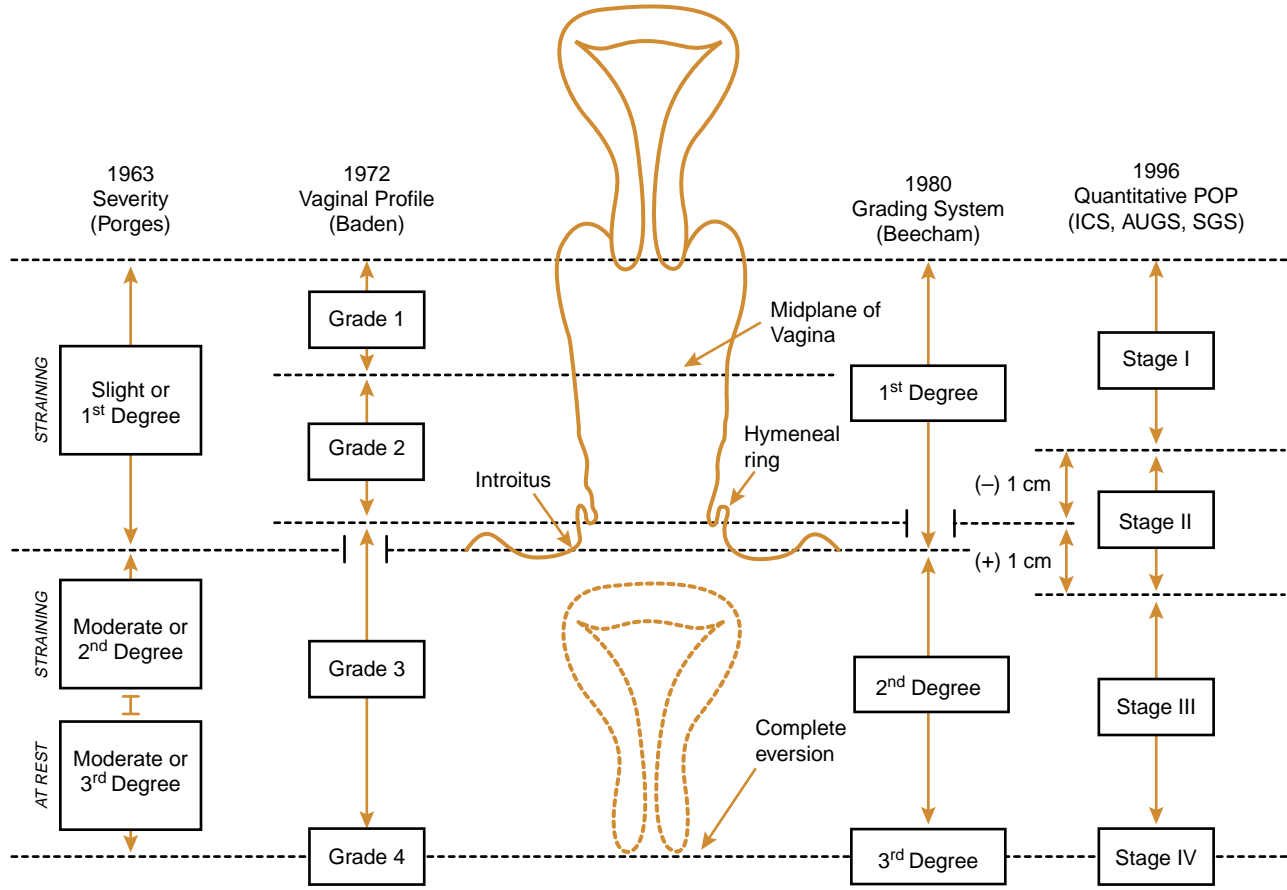
Ten years after its introduction, POPQ is used routinely by only 40% of urogynaecologists, and is not yet adopted as a standard in peer-reviewed literature.<sup>98,99</sup> The POPQ was used as the staging system in 13% of articles in 1999 and 28% in 2002, with 54% still using non-standardized staging systems!

Critics of the POPQ system claimed the system to be time-consuming and difficult to learn. The facts are that experienced examiners can measure the nine points in less than 3 minutes, and the system is easy to teach and learn.<sup>98,96,100</sup> These reservations about the POPQ system started research for a less demanding system.<sup>101</sup> A system measuring the most protruding part of the anterior, middle, and posterior vagina and the vaginal length has been proposed and validated, but not accepted as a standard.

Comparison of the most commonly used POP grading systems (Figure 4) reveals important differences. Using a reference line at the hymen versus the introitus overlaps stages II and III POP in the different systems, and stage II is often chosen as the indication for POP surgery and as the definition of recurrent POP. Furthermore, in some systems POP is graded during Valsalva or pull on the cervix and in others without any manoeuvres.

POPQ measures the position and size of specific points on the surface of the vagina and perineum, which only partly describes vaginal topography. 'Site-specific' defects, lateral versus central defects and pelvic floor muscle function, all considered important for treatment and prognosis, are not included in POPQ and have to be described separately.

Prolapse of the anterior vaginal wall can be divided into (1) central fascial defects, usually described without vaginal rugae, and not reduced by lifting the lateral vaginal fornices by ring forceps; and (2) lateral or paravaginal defects, which are reduced by replacing the lateral support by ring forceps, and the vaginal wall has rugae. The prevalence of lateral defects varies from 38 to 75%. Recent studies<sup>39-41</sup> have questioned this division as the basis for selection of type of surgery, since the reproducibility and correlation to surgical anatomy is low. The clinical judgement included reduction of the prolapse with ring forceps and description of rugae in the vaginal wall. Rugae were present in 25% of the central defects and absent in 50% of the lateral defects.<sup>40</sup>



**Figure 4.** Comparison of commonly used grading systems.

### Practice points

- various classification systems overlap at clinically important stages
- POPQ is the only validated, internationally approved classification system
- POPQ does not include description of surgical anatomy

### Research agenda

- which symptoms are valid for the diagnosis of POP?
- which cut-off point is valid in the anatomical evaluation of POP?
- development of a simpler classification system for clinical use
- development of a classification system describing surgical anatomy

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