

Optimizing pelvic organ prolapse research

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Abstract For many years, researchers on this field have suffered from the lack of an efficient method for describing pelvic organ prolapse. Struggling to solve this problem, the International Continence Society has proposed a pelvic organ prolapse quantification (POP-Q) system [Bump RC, Mattiasson A, Bo K, Brubaker LP, DeLancey JO, Klarskov P, Shull B, Smith ARB, *Am J Obstet Gynecol*, 175 (1):1956–1962, 1996], which was validated as a precise and reproducible technique for describing pelvic organ position. However, even though very precise at describing pelvic organ position, our critic to this system is its limited ability to quantify the prolapse itself, since it still classifies prolapse into four grades, almost the same way as Baden and Walker did in 1972. As a result, the same grade can include a wide prolapse intensity range. The objective of this paper is to propose a method that makes POP research more efficient by directly measuring prolapse as a continuous variable that requires lesser number of subjects in order to achieve statistical significance.

Keywords Pelvic organ prolapse · Classification · Quantitative · POP-Q · POP-Q-I

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Pelvic floor disorders can be considered a growing hidden epidemics [1]. In developed countries, this entity is responsible for as much as 20% of major gynecologic surgery [2], and about one third of these are reoperations [3].

Due to these numbers and the progressive aging of world's population, great improvements on prevention and treatment of pelvic floor dysfunction must be achieved. Otherwise, these disorders will end up unaffordable [1].

For many years, researchers on this field have suffered from the lack of an efficient method for describing pelvic organ prolapse, and that has impaired the quality of research and hindered technical progress.

Struggling to solve this problem, the International Continence Society has proposed a pelvic organ prolapse quantification (POP-Q) system [4], which was validated as a precise and reproducible technique for describing pelvic organ position. This classification represented a great evolution and has shown researchers the direction to follow in order to effectively compare results between clinical trials.

However, even though very precise at describing pelvic organ position, our critic to this system is its limited ability to quantify the prolapse itself, since it still classifies prolapse into four grades, almost the same way as Baden and Walker [5] did in 1972. As a result, the same grade can include a wide prolapse intensity range.

Moreover, this staging system makes data analysis difficult since prolapse is treated as a categorical variable that demands larger sample sizes in order to achieve significance.

Seeking to solve this problem, many authors have assumed the reference-points scores as a continuous variable and have made statistical calculations over these values' average and standard deviation. This conceptual mistake

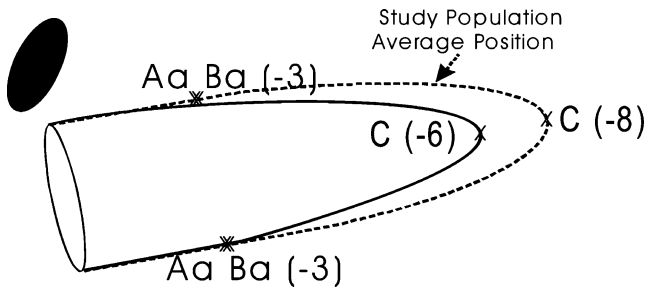


Fig. 1 If one study population’s average TVL was 8 cm and a woman with no descent had a TVL of 6 cm, she would mathematically have a 2-cm prolapse

leads to statistical errors, such as the following situation (Fig. 1): If one study population’s average total vaginal length (TVL) was 8 cm and a woman with no descent had a TVL of 6 cm, she would mathematically have a 2 cm prolapse!

To solve this mathematical problem, we propose the complementation of the POP-Q system with the pelvic organ prolapse quantification index (POP-Q-I), which directly quantifies prolapse and describes it as a continuous variable, which, due to its statistical power, delivers lower *p* values with the same sample size.

POP-Q-I is composed of two values: The first (direct POP-Q-I) is given by the distance in centimeters at which a determined POP-Q point lies from its anatomic position (i.e. one point actual position score minus its anatomic position score), and the second is the first value divided by its maximum possible direct POP-Q-I score and is expressed as a proportion (proportional POP-Q-I).

For example, let us suppose a woman with a grade I vault prolapse whose TVL is 8 cm and point C lies at -2 cm (Fig. 2). Direct POP-Q-I for point C is given its actual position score (i.e. -2) minus its anatomic position score (i.e. -8). Thus:

$$\text{Direct POP - Q - I} = -2 \text{ cm} - (-8 \text{ cm}) = 6 \text{ cm}$$

Fig. 3 Proportional POP-Q-I is the first value divided by its maximum direct POP-Q-I score and is expressed as a proportion

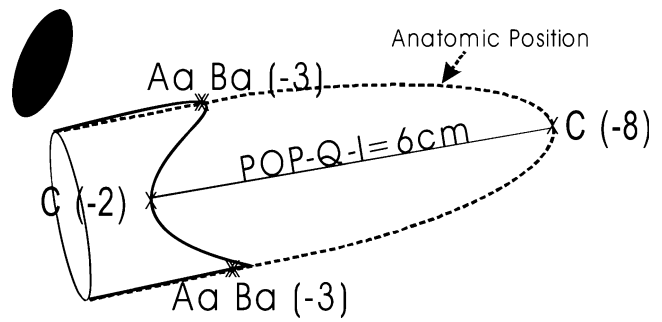
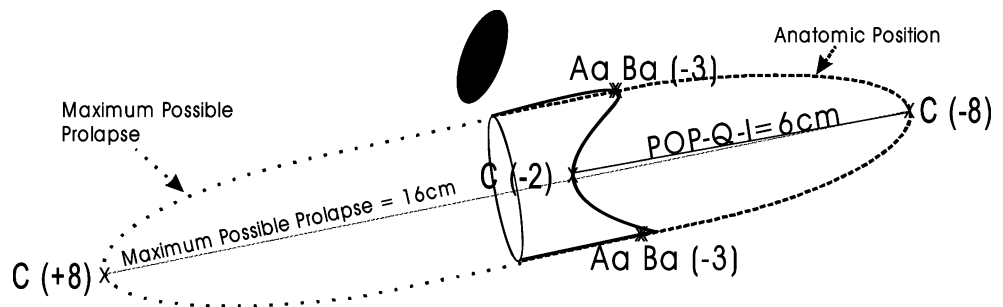


Fig. 2 Direct POP-Q-I is given by the distance in centimeters at which a determined POP-Q point lies from its anatomic position

Relative POP-Q-I is the result of the division of one point direct POP-Q-I (i.e. 6 cm) by its maximum possible POP-Q-I [i.e. 8-(-8)]. Thus (Fig. 3):

$$\text{Relative POP - Q - I} = 6 \text{ cm} / 16 \text{ cm} = 0.375 = 37.5\%$$

This same method can be applied to any POP-Q point more easily, as follows:

1. Anatomic score for points Aa, Ba, Ap and Bp is always -3.
2. The most advanced possible prolapse for points Aa and Ap is 6 cm, since their maximal prolapse will, by definition, always be +3 [so, 3-(-3)=6].
3. The most advanced possible prolapse for points Ba and Bp will always be TVL - (-3).

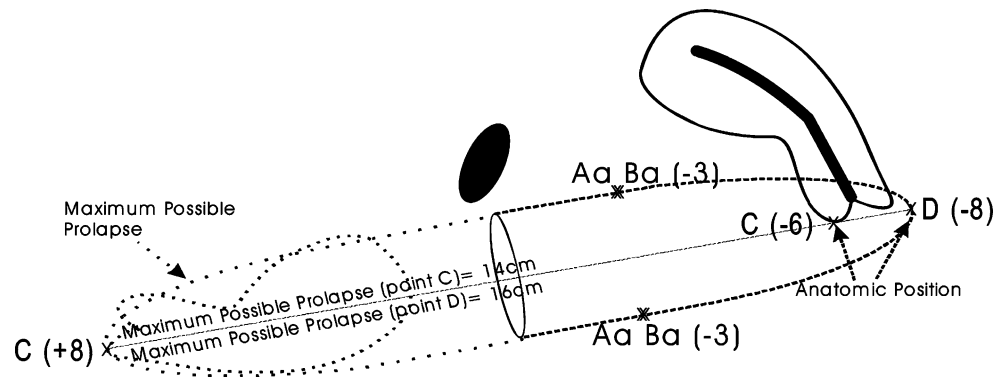
Some situations should be highlighted in order to prevent misunderstandings. The patient on the example we used had a previous hysterectomy. Thus, the maximum possible prolapse for point C would be two times TVL. On the other way, if she still had her uterus, the most proximal position for point C would be:

$$-(\text{TVL} - 2) = -6$$

although the most prolapsed position for point C would still be +8 (Fig. 4).

The advantage of using this method on clinical research is that anatomical outcomes will actually be measured by prolapse average and standard deviation, in

Fig. 4 The same example, but now with uterus



centimeters, for each single reference point, before and after treatment, and not by the proportion of patients who fit in each prolapse category before and after treatment. This provides us the statistical power of continuous variables and the *t* test, which delivers lower *p* values than *chi*-square-based tests and categorical variables with the same sample size.

Summarizing, our proposed method makes POP research more efficient by directly measuring prolapse as a continuous variable that requires lesser subjects in order to achieve statistical significance. More efficient research methods mean lower costs and more agility to improve the available treatment options and make Dr. DeLancey's [1] 25/25 goal less difficult to achieve.

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