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PELVIC ORGAN PROLAPSE (M WEINSTEIN, SECTION EDITOR)

Epidemiology of Pelvic Organ Prolapse

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Abstract Understanding and applying the epidemiology of pelvic organ prolapse (POP) is necessary to provide quality patient care to a growing and aging female population. As the elderly population is expected to almost double from 2012 to 2050, POP will become more prevalent, placing greater demands on our health care system and specialty-trained providers. In this review, we will evaluate and summarize recent literature and also highlight older studies of clinical significance that contribute to an overall understanding of the topic. While prevalence rates vary, the proportion of women with bothersome POP symptoms is approximately 3–6 % of women. POP is associated with decreased quality of life and a variety of bowel, bladder, and sexual dysfunction symptoms. Treatment options include expectant management, nonsurgical options, and surgery. For this review, we will review the prevalence of POP, trends in the management of POP, and future care needs with regard to POP.

Keywords Epidemiological trends · Pelvic organ prolapse · Pelvic floor disorders · Management of pelvic organ prolapse · Future care needs

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Introduction

Pelvic organ prolapse (POP) is the descent of female pelvic organs, including the uterus or post-hysterectomy vaginal cuff, bladder, and/or bowel that results in a protrusion from the vagina. Pelvic organ prolapse, urinary incontinence (UI), and fecal incontinence (FI) are known collectively as pelvic floor disorders (PFDs) and are prevalent and important medical conditions estimated to affect one in four women [1]. As a subset of pelvic floor disorders, symptomatic POP affects 3–6 % of women, although this number can vary greatly based on how POP is defined [1, 2••, 3]. Although generally not life-threatening, POP is associated with decreased quality of life and contributes to a variety of bowel, bladder, and sexual dysfunction symptoms. By understanding the epidemiology of POP, health care providers are better able to screen for this disorder and provide treatment to those who are affected, thereby improving patients' quality of life and decreasing the economic burden to individuals and our health care system. In this article, we aim to provide a comprehensive review of a recent literature on the epidemiology of POP, including prevalence and natural history of the disease, trends in conservative and surgical management, and estimates of future care needs. Even though POP is prevalent and an important women's health issue, recent epidemiological studies are limited; therefore, we will also include older studies that remain of clinical significance and contribute to an overall understanding of the topic.

Epidemiology of POP

One of the biggest challenges in evaluating the epidemiology of POP is that prevalence rates can vary widely, from 2.9 to nearly 75 %, depending on the criteria that are used. There is

no clear consensus on the degree of POP that represents normal variation of female pelvic support and what represents a true disorder. Currently, the most commonly used system, especially among subspecialists, is the Pelvic Organ Prolapse Quantification (POP-Q) system. Using six defined measurements of anterior, posterior, and apical support measured in reference to the hymen, this system provides an objective, standardized method for staging POP 0 to IV. POP-Q system allows for accurate documentation, comparison, and communication with proven inter-observer and intra-observer reliability [4]. In a multicenter observational study of 1004 women aged 18 to 83 who presented for annual gynecological exam the prevalence of POP-Q stages was 24 % with stage 0, 38 % with stage I, 35 % with stage II, and 2 % with stage III; thus, 75 % of women had some degree of POP based on the POP-Q system [5]. Similarly, in a review article published as part of the Fifth International Collaboration on Incontinence, Barber et al. found that POP based on vaginal examination was present in up to 50 % of women [3]. In the Women's Health Initiative (WHI), 41 % of women age 50–79 years showed some amount of POP [6].

One of the biggest limitations of the POP-Q system is that symptoms associated with POP can be nonspecific and do not always correlate with POP stage or the anatomical site. Therefore, it is important to assess patients' degree of bothersome symptoms. Based on the National Health and Nutrition Examination Survey (NHANES) data from 2005 to 2010, POP, defined as seeing or feeling a bulge, was estimated to affect 2.9 % of women aged 20 and older and peaked at 5.1 % in women aged 60–69 [1, 2••]. A slightly higher prevalence was noted in a recent study from the UK. Among 1832 women from a single general medical practice, 8.4 % reported a vaginal bulge/lump and 4.9 % reported a bulge or lump outside the vagina based on the validated International Consultation on Incontinence Questionnaire for vaginal symptoms (ICIQ-VS) [7]. In a study of 237 women with symptoms, only 11 % had no demonstrable POP and 10 % had stage I POP. Conversely, 79 % of these symptomatic women had stage II or greater prolapse (51 % stage II, 19 % stage III, and 9 % stage IV) suggesting that patient symptoms often correlate with presence of disease [8]. Of note, it is estimated that only about 10–20 % of symptomatic women seek medical help [7, 9], highlighting the importance of raising awareness about this important and often neglected women's health issue.

To aid in consistency for research and evaluation of clinical outcomes, there has been an effort to develop an approach that is both objective and standardized, but also better distinguishes variations in anatomy from clinically significant or symptomatic POP. One option is to consider more bothersome POP as POP that is present at or beyond the hymen. In 2003, Swift et al. recruited 477 women to complete a POP symptom questionnaire and also undergo standardized prolapse assessment using POP-Q system. The majority of subjects had stage II or III POP, but based on staging alone, there was no statistically significant correlation with symptoms. The average number of symptoms that were reported per subject increased from <1 to >1 when the leading edge of the POP extended beyond the hymen, and this trend was statistically significant [10]. Similarly, in 2008, Gutman et al. found that a threshold of 0.5 cm distal to the hymen was associated with 69 % sensitivity and 97 % specificity for bulging/protrusion symptoms; however, there was poor correlation with other symptoms, such as urinary and bowel complaints [11]. This research emphasizes the importance of evaluating patients' perception of the degree of bother from their POP symptoms versus focusing solely on the presence of POP on physical examination.

In addition to overall prevalence, an important component of the diagnosis and management for POP is understanding the incidence and natural history of the disease. Among WHI women, Bradley et al. followed 259 post-menopausal women with a uterus enrolled at one clinical site who completed at least two annual POP-Q examinations; 1- and 3-year incidence rates for prolapse were calculated, defined as vaginal descent to or beyond the hymen, as well as estimated progression and regression rates. Incidence rates at 1 and 3 years were 26 % (95 % CI 20–33 %) and 40 % (95 % CI 26–56 %); however, conversely, 1- and 3-year POP resolution rates were 21 % (95 % CI 11–33 %) and 19 % (95 % CI 7–39 %). Over 3 years, the maximal vaginal descent increased by at least 2 cm in only 11.0 % (95 % CI 4.9–20.5 %) [12]. Similarly, Gilchrist et al. found that 78 % of women who elected for expectant management of their symptomatic POP had no change in the leading edge value over median follow-up of 16 months; 19 % had progression and 3 % demonstrated regression. Of all women who initially elected for observation, only one third eventually chose intervention with pessary or surgery [13•]. Notably, this was not statistically related to POP-Q progression and instead appeared related to the progression of bothersome symptoms. Reassuring patients that POP is not a universally progressive disease is crucial to adequate counseling and empowering patients to make better decisions about when treatment is indicated.

Lastly, when screening potential patients and considering treatment options, it is important to consider POP in the larger context of pelvic floor disorders, including urinary incontinence and fecal incontinence. In a landmark study, Nygaard and colleagues used NHANES data from 2005 to 2006 and found that 23.7 % of US women had at least one pelvic floor disorder [1]. This was confirmed in our subsequent study utilizing NHANES data from 2005 to 2010 in which the prevalence of one or more PFDs was 25.0 % (95 % CI 23.6–26.3). Other studies have found a high rate of co-existence of PFDs. For example, in a recent survey of 5236 primiparous women 20 years after a vaginal or cesarean delivery, Gyhagen and

colleagues found that 31.7 % had at least one symptomatic PFD and nearly half of those, 14.8 %, had two or more [14]. In one study that looked at the relationship between POP and UI, 63.3 % of patient with SUI had co-existing POP and conversely 62.7 % of women with POP had co-existing SUI [15]. One explanation for co-existing PFD, such as POP and SUI, is that they have shared risk factors, which would thereby increase the risk of both of these conditions.

Trends in Management of POP

Conservative management of POP includes expectant management, pelvic floor muscle training (PFMT), and pessaries. There is limited data comparing various conservative options, as well as comparing conservative management to surgical management. For example, in a 2011 Cochrane review of conservative prevention and management of POP, only six randomized and quasi-randomized trials were included; of these, four were small with less than 25 participants per arm and two had moderate to high risk of bias. After pooling data, the authors concluded that PFMT increased the chance of an improvement in POP stage by 17 % compared to no PFMT [16]. More recently in 2014, in a randomized controlled trial of 287 women aged 55 years or over with symptomatic mild POP defined as leading edge above the hymen (POPPS 1 trial), participants in the PFMT group improved by an average of nine points on the PFDI-20 questionnaire (95 % CI 2.8 to 15.4), and 57 % reported an improvement in symptoms compared to only 13 % in the control group ($P < 0.001$) [17].

Limited data exist on the utilization and efficacy of pessaries. Using diagnostic and procedural codes from a random 5 % national sample of beneficiaries from the US Centers for Medicare and Medicaid Services database from 1999 to 2000, 34,782 women were identified with POP; 11.6 % of these women elected for treatment with a pessary. These women were then followed longitudinally for 9 years; 12 % underwent surgery for POP within 1 year and 24 % within the 9-year period [18]. The second phase of the previously mentioned POPPS trial completed recruitment in December 2012 and will compare women with advanced POP who receive either PFMT or pessary [19].

The rates of surgical intervention for POP are relatively high given the prevalence of POP in conjunction with the fact that surgery is an effective treatment option. In fact, POP is one of the most common indications for gynecologic surgery [20]. More recently, using a nationwide US claims database, our group assessed over 10 million women followed for almost 25 million person-years and found the lifetime risk for POP surgery to be 12.6 % (95 % CI 12.4–12.7) [21•]. In other countries, POP surgery rates may differ; for example, the lifetime risk of POP surgery in Western Australia was reported at 19 % [22]. Similarly, in a recent population-based registry study in Denmark from 1977 to 2008, the lifetime risk for POP surgery was estimated at 18.7 %; notably, this was an overall decrease from 26.9 % in 1978. Additionally, the age distribution shifted during this period, with more elderly and less young women having surgery in 2008 compared to 1978 [23].

When counseling patients on surgical intervention as an option for POP, a critical review of recurrence and re-operation rates is important. In a review of 1-year outcome results of 699 women following native tissue repair at a single institution from 2002 to 2005, 94 % were satisfied, and 84 % had stage 0–I prolapse [24••]. Similarly, a lower than previously quoted re-operation rate was reported from our study in which only 5.9 % of women with employer-based insurance in the USA underwent re-operation within 5 years after an initial POP procedure [25]. These are both much lower than the previously reported rates as high as 29.2 % [26].

Lastly, when discussing trends in the management of POP, one must consider the impact of the Food and Drug Administration's (FDA) 2008 safety notification and 2011 update. Following these notices, several studies aimed to assess trends in the use of mesh for POP repair. In an analysis of hospital discharge data of 275,000 women who underwent POP surgery from 2000 to 2010, there was an increase in the proportion of procedures which utilized mesh from 7.9 % in 2000 to a peak of 32.15 % in 2006, followed by a slight decline to 27.5 % in 2010 [27]. Using health care claims data and current procedural terminology codes for vaginal, abdominal sacrocolpopexy, and minimally invasive sacrocolpopexy mesh prolapse procedures from 2005 to 2010, Jonsson Funk et al. identified 60,152 mesh prolapse procedures; this rate increased over the 5-year period, with an overwhelming majority of these (74.9 %) being vaginal mesh procedures [28]. However, local, regional, and/or international trends can vary widely. For example, at a single academic medical center, vaginal mesh procedures decreased from 27 % of all POP surgeries in early 2008 to only 2 % at the end of 2011 [29]. Conversely, vaginal mesh use has increased in Portugal from 2000 to 2012. In fact, only 27 % of surgeons reported having changed their practice after the FDA 2011 safety communication [30].

Future Care Needs

By 2050, the USA will experience a significant growth in its older population, with projections that the number of people aged 65 and older will nearly double to 83.7 million and comprise 20.9 % of the total US population. Even more dramatically, those 85 and older are projected to more than double to 18 million people by 2050 and account for almost 5 % of the US population; the majority of these will be female [31]. Given that the prevalence of POP increases with age, our

group used US Census and NHANES data to forecast the rise in the number of women affected by symptomatic POP. We estimated the number of women with POP will increase 47 % from 3.3 to 4.9 million by 2050, and annual procedure rates will increase from 166,000 to 245,970 [32].

The higher number of women with POP is likely to have a significant impact on workforce needs and cost. Recently, a Kaiser Permanente Urogynecology clinic reported a 116 % annual increase in new patients for PFDs when compared to 2000. The authors also estimated that the demand for care for PFDs would increase by 35 % from 2010 to 2030 [33]. In response to this greater health care burden, research has begun to assess the provider workforce trained, and needed, to provide care for these women. In a survey of general gynecologists regarding comfort in managing pelvic floor disorders, Yune and colleagues found that although most respondents felt comfortable managing SUI and POP, younger gynecologists offered less treatment options [34]. Similarly, Casiano and colleagues found that although younger gynecologists were comfortable diagnosing POP and urinary incontinence, few were performing urogynecology procedures in practice, except for simpler procedures such as mid-urethral sling, anterior and posterior colporrhaphy, and cystoscopy [35]. Thus, the burden for providing comprehensive treatment for POP will increasingly fall on subspecialty trained providers.

Conclusion

Pelvic organ prolapse is a significant public health issue that affects the lives of millions of adult women. Symptomatic POP is present in at least 3–6 % of women. Although POP is rarely life-threatening, it is associated with a variety of pelvic, bowel, bladder and sexual dysfunction symptoms, and a decreased quality of life. Therefore, providers should routinely assess for POP, especially in women with co-existing PFDs and in older women. Treatment may include conservative management with pelvic floor muscle training or pessary. Many women elect to undergo surgery, and this is an effective treatment for POP. Satisfaction rates are high, and recently updated recurrence rates may be as low as 5.9 % over 5 years. Although the FDA issued a safety warning regarding the use of transvaginal mesh in 2006 with an update in 2011, mesh remains a common adjunct in POP surgery. As the US population ages over the next 30–40 years, the prevalence of POP will increase, thereby increasing the number of ambulatory visits and surgical procedures. This increased demand for POP care in the future will lead to a greater need for providers properly trained to manage this important women's health issue.

Compliance with Ethical Standards

Conflict of Interest Maggie. F. Wilkins declares no conflict of interest.

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Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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