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Impact of Frailty on the Treatment of Pelvic Floor Disorders

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Abstract

Purpose of Review Frailty is highly prevalent with increasing age and contributes to adverse health outcomes. Prior to medical and surgical intervention for the treatment of pelvic floor disorders (PFD), a comprehensive evaluation is necessary to evaluate frailty. Beyond a standard assessment, the care of frail patients requires consideration of additional factors including functional ability, cognitive impairment, and the role of caregivers. In this article, we review the current literature on PFD, specifically urinary and fecal incontinence and pelvic organ prolapse, in frail individuals and highlight the risks and benefits of various treatment options.

Recent Findings Multiple tools are available to screen and assess for frailty in the general population. Growing evidence demonstrates that the development of functional limitations is the initial manifestation of frailty and may further translate to an increased risk of surgical complications.

Summary No standardized method for screening and measurement of frailty currently exists. Independent of the individual assessment metric to measure frailty, there is an associated increased risk of adverse events related to treatments. Management of PFD in the frail population requires a tailored approach and necessitates consideration beyond objective data to the subjective, cognitive, and quality of life implications of treatment.

Keywords Pelvic floor disorders · Frailty · Urinary incontinence · Fecal incontinence · Pelvic organ prolapse · Surgical outcomes

Introduction

Frailty is a multidimensional syndrome manifested by a reduced ability to perform activities of daily living and diminished reserves to recover from acute, physical, psychological, and socio-economic stressors [1]. The prevalence of frailty increases with age and contributes to adverse health outcomes. It is estimated that an average of 10.7% of community-dwelling adults over 65 years of age are frail, and this increases to 26.1% for adults 85 years or older [2]. Two main definitions of frailty exist in the literature: one focusing on the physical phenotype of frailty versus a second expanded definition including additional components and often regarded as the multidomain phenotype. The physical phenotype was conceived by Fried and colleagues in 2001, with the identification of specific measurable frailty-defining characteristics [3]. The physical phenotype of frailty predicted poor clinical outcomes including falls, hospitalization, development of disability, and mortality. Furthermore, frailty influences surgical outcomes, specifically increasing the risk of postoperative complications, length of hospital stay, and probability of discharge to an institutional setting [4].

The relationship between aging and pelvic floor disorders such as urinary and fecal incontinence and pelvic organ prolapse is well documented with over a third of women older than 60 years diagnosed with a PFD [5]. The impact of frailty on PFD is poorly understood, and the effects of treatments are even less appreciated. However, urinary and fecal incontinence are common reasons for nursing home placement, and so, forgoing treatment of these PFD may also have severe consequences. Navigating this delicate balance requires a thoughtful and thorough understanding of the patient's condition, co-morbidities, degree of bother, and goals of care. Often times, these issues need to be considered not only on behalf of the patient but also through the lens of caregivers. This review discusses the

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available data on various treatment options for PFD in frail individuals.

Screening and Assessment of Frailty

There is currently no standard method for screening and measurement of frailty. This is attributed to the large array of definitions and criteria proposed to define frailty. Importantly, the clinical impression of frailty did not correlate with formal assessment (using the Fried Frailty Index) in a group of patients with PFD, indicating that a more structured evaluation of frailty is necessary for accuracy [6]. As such, many tools are available to screen and assess for frailty in the general population. We have highlighted a few of the more commonly used frailty assessment tools along with their strengths and weaknesses in the context of pelvic floor disorders.

Fried's Frailty Phenotype

The Fried Frailty Index (FFI) is a validated assessment of 5 domains: gait speed, hand grip strength, fatigue, weight loss, and low energy expenditure. FFI is based off the physical phenotype definition of frailty and has shown to be predictive of adverse clinical outcomes.

There is growing evidence that the development of functional limitations is the initial manifestation of frailty, and mobility is important to evaluate in the context of PFD as patients with bladder and bowel incontinence may be limited by their ability to mobilize to a toilet. Recently published research focusing on physical performance and its association with frailty demonstrated that diminished gait speed is strongly associated with poor clinical outcomes in different populations [7]. The Timed Up and Go (TUG) test, which is the time in seconds to stand from a chair and walk 10 ft at usual pace, suggests that a time of > 16 s is highly specific for frailty with > 10 s suggested as a frailty screening tool [8].

Similarly, hand grip strength is a powerful predictor of disability, morbidity, and mortality and has been increasingly utilized as a single assessment tool for frailty. Patients with reduced grip strength were 6 times more likely to be frail, and additional studies demonstrated that grip strength is a powerful marker of self-perceived fatigue, disability, morbidity, and mortality [9–11]. Assessment of grip strength may be additionally important in instances where straight catheterization is a possible strategy for incontinence treatment.

Fatigue has been explored as a single assessment tool for frailty, though its ability as a reliable predictor is limited due to the subjectivity of this criterion. Lastly, weight loss and low physical activity level can indicate frailty. With the FFI, unintentional weight loss ≥ 10 pounds in the previous year or ≥ 5% body weight satisfies the criteria for "shrinking" [3].

The frailty index can be used by clinicians and researchers, both in the hospital and community settings, but it is labor-intensive and requires specialized instruments (e.g., a dynamometer to measure grip strength) which can be cumbersome. For this reason, some have proposed a frailty screening tool to identify at-risk persons. The International Association of Nutrition and Aging proposed the frailty scale, and the Vulnerable Elders Survey are relatively simple screening tools that can be self-administered and therefore completed without direct provider evaluation [12, 13].

9-Point Clinical Frailty Scale

The 9-point Clinical Frailty Scale (CFS-9) assesses patients rapidly on a scale from 1 (very fit) to 9 (terminally ill). In one study of older patients undergoing surgery for PFD, the CFS-9 was a reliable predictor of frailty in the population of patients with PFD [14•].

Treatment Considerations of Frail Women with Pelvic Floor Disorders

Particularly with quality of life conditions, it is important to weigh the risks of treatment for patients on an individual basis, and thus, several specific factors need to be recognized for the care of frail adults with PFD. The psychosocial impact of PFD is always important to consider when evaluating a treatment but may play an even larger role in frailty as depression and social isolation can contribute to the frailty phenotype through low energy and physical activity. Input from caregivers can be invaluable in discussions about available resources and quality of life.

Additionally, clinical trials often exclude patients with comorbidities; thus, frail adults are often not included in study populations resulting in minimal evidence-based data for this population. Surgical intervention should be approached only after thoughtful discussion and with the understanding that frailty increases the risk of postoperative complications. When discussing surgical interventions, the short and long-term effects of anesthetic type on postoperative cognition are another consideration.

Urinary Incontinence

Incontinence is associated with frailty, but the dilemma remains whether incontinence leads to frailty (i.e., limiting physical activity due to incontinence) or that frailty promotes incontinence (i.e., poor mobility prohibiting the use of toilet). This concept may seem circular, but if the end goal is improvement in quality of life, then any progress towards continence is a success for both domains. Furthermore, assessment of frailty in patients with urinary incontinence is critical to evaluate why this condition has been associated with mortality [15].

Urgency urinary incontinence (UUI) is the most common type of urinary incontinence in older women. The first-line treatment of UUI includes lifestyle modifications and behavioral therapies [16]. Fluid management, prevention of constipation, avoidance of bladder irritants (e.g., caffeine), and timed or prompted voiding are relatively small changes with a potentially large impact. If mobility is identified as a barrier to continence, then the use of a mobility aid (e.g., cane or walker) or use of a bedside commode can be helpful to reduce urinary incontinence and mitigate the risk of falls. In those patients able to participate, pelvic floor physical therapy can also be valuable.

Medical therapy may be employed either in conjunction with behavioral therapies or as a second-line treatment. General considerations when prescribing medications in this population are polypharmacy with risks of drug interactions and age-related pharmacokinetic changes, such as rates of absorption, distribution, and metabolism. Currently available medical therapy for UUI includes anticholinergic or β3 adrenergic receptor agonist medications. The association of anticholinergic medications with dementia and higher rates of adverse effects in the elderly makes these medications an unsatisfactory option for frail individuals; however, the cost of β3 agonists often prohibits the use, despite fewer central nervous system side effects [17•] [18].

Few studies have evaluated the outcomes of third-line treatment options for UUI in frail elderly patients. In a secondary analysis of the Refractory Overactive Bladder: Sacral Neuromodulation versus Botulinum Toxin Assessment (ROSETTA) trial comparing women aged < 65 and ≥ 65, both groups experienced significant reductions in UUI episodes and improved quality of life following treatment with either onabotulinumtoxinA or sacral neuromodulations. Both groups had similar rates of adverse events [19]. In another study including frail versus non-frail patients stratified by TUGT, outcomes of onaboutlinumtoxinA versus sacral neuromodulation did not differ and both groups demonstrated improvements in symptom scores [20]. Of note, another study found that after 100 units of onabotulinumtoxinA intravesical injection, older (> 65) frail patients were more likely to have an elevated post-void residual and poorer long-term success rates compared to the older non-frail and younger groups [21].

Prior to sacral neuromodulation implantation, assessment of surgical risk and cognitive ability to effectively use the programmer should be determined. Although there are no specific studies of posterior tibial nerve stimulation (PTNS) in a frail population, this minimally invasive treatment appears a promising compromise for those patients whose risk of complications is higher.

For stress urinary incontinence, pelvic floor physical therapy in motivated and capable individuals is an excellent option. Urethral bulking is a minimally invasive treatment that is well tolerated and can be performed in the office, thereby eliminating the risks of general anesthesia, although not specifically studied in frail individuals. Following mid-urethral sling, frailty was a predictor of 30-day readmission in a national database [22]. The most common reason for readmission was urinary tract infection. The use of an indwelling catheter should be reserved as a last option for those patients who may have poor mobility and skin wounds as a result of their urinary incontinence.

Fecal Incontinence

Fecal incontinence (FI) has been reported in up to 14% of community-dwelling adults over age 60 and has been associated with frailty [5, 23]. Initial management relies upon identifying the underlying causes such as severe constipation, diarrhea, medications (e.g., frequent antibiotics, laxatives), neurologic disorders such as autonomic neuropathy or stroke, anal sphincter weakness, and rectal prolapse. Similar to urinary incontinence, the initial treatment of FI consists of multicomponent behavioral therapies such as dietary modifications, regular toileting, and pelvic floor physical therapy. Stool bulking with fiber can reduce FI, and in cases of diarrhea, antimotility medications can be beneficial. In instances of FI resulting in skin changes, the use of barrier creams may be appropriate.

If anatomic abnormalities, such as rectal prolapse or sphincteric defect, are found on workup, there may be benefits to surgical repair after a thorough discussion with the patient about the risks and benefits. Sacral neuromodulation is another option for FI with good efficacy, but the considerations mentioned above of surgical appropriateness are essential. PTNS is not approved for use in the treatment of FI but may be beneficial in select patients [24].

Pelvic Organ Prolapse

As many as 50% of parous women are affected by pelvic organ prolapse (POP), with women over the age of 60 years representing the majority of the patients seeking management for this condition [25, 26]. While frailty has been found to be prevalent in older women seeking treatment for PFD, POP may be an independent risk factor for frailty. Treatment of older women with POP is not as straightforward when compared to their younger counterparts and additional variables including frailty must be considered as a part of the evaluation.

Non-surgical management of POP with a pessary is often preferred over surgical treatment in older women. Pessary use has been demonstrated as a safe option with successful improvement in prolapse as well as both bladder and bowel symptoms [27]. Whether women opt for pessary or surgical management of their prolapse, optimization of their genitourinary syndrome of menopause, or atrophic vaginitis, is critical to reduce the risk of complications with the pessary and promote healing after surgery. Management should be tailored to

the individual patient with many options now available including estrogen therapy (transvaginal estrogen formulations are most commonly used) and non-pharmacologic options such as laser therapies.

In those women intolerant of a pessary or who desire surgical repair, surgical approaches include reconstructive procedures, such as abdominal, vaginal, and laparoscopic or robotic colpopexy and obliterative procedures like colpocleisis. Obliterative surgery is often favored in women who are older and more frail with the advantages of shorter operative times, lower blood loss, and faster recovery compared to reconstructive surgery [28, 29]. The outcomes for obliterative versus reconstructive surgery are comparable in elderly women with high-grade prolapse [30, 31]. This was supported by a prospective study by Barber et al. in a similar patient population, where no significant differences were found in objective or subjective outcomes between obliterative and reconstructive approaches [32]. Studies have also shown that obliterative surgeries carry a lower risk of complications compared to reconstructive surgeries, though there is little data specifically addressing how the very elderly or frail population fare. In a retrospective study of 264,340 women undergoing prolapse repair, Sung et al. found that women above 80 years had a 17% risk of complications for obliterative procedures compared to 24.7% risk for reconstructive procedures [33]. Those undergoing obliterative procedures also had a lower rate of mortality, but this was not statistically significant. Overall, it is generally recognized that following appropriate counseling, colpocleisis is a safe and effective surgical method in the treatment of POP.

When a reconstructive approach is desired, vaginal, as opposed to abdominal, surgery is typically favored in the elderly frail population as it is quicker, safer, and more thoroughly evaluated in this population [5, 34]. Although long-term success rates are not as high as abdominal sacrocolpopexy, many believe that lower complication risks in vaginal surgery counterbalance the lower efficacy [35]. Several studies have demonstrated that vaginal repair is a safe option for the elderly. In a retrospective review of women undergoing vaginal POP repair and anti-incontinence procedures, Moore et al. found no statistical difference in perioperative complications among three groups of women divided into ages ≤ 55, 56–69, and ≥ 70 years [36]. While the risk of complications is low in transvaginal surgery, severe complications can still occur. In a review of 25 women over age 80 undergoing sacrospinous ligament fixation for POP, four patients (16%) suffered cardiovascular complications, including myocardial infarction following hemorrhage and pulmonary embolism [37]. Of note, all affected women had baseline vascular disease. Thus, while vaginal approach appears to provide good results with an acceptable safety profile, elderly patients should be counseled that their age and frailty may put them at higher risk for postoperative complications, including death.

Robotic-assisted sacrocolpopexy (RASC) is an attractive alternative to the traditional open approach due to less blood loss and shorter postoperative hospital stay [38]. Long-term outcomes appear comparable between the robotic and open approach [39]. As such, while age plays a role in the shared decision-making process, operative intervention should not be chosen based on age alone. Frailty appears to have a higher association of increased risk for postoperative complications, and studies have shown that frailty evaluation added predictive power to more commonly used preoperative risk assessment markers such as ASA status [4]. While small series have shown comparable outcomes between open and robotic surgeries in geriatric patients, further research is needed to determine if this translates to elective POP repair in frail patients.

Conclusion

As the population ages, emphasis on risk stratification is paramount. Independent of the assessment method for frailty, there is an associated increased risk of adverse events related to treatments. There are vast data supporting the associations between PFD and frailty, but it can be difficult to determine if correcting one improves the other (i.e., improving incontinence allows frail individuals to be less socially isolated). Comprehensive management of PFD in the context of frailty requires a thoughtful and individualized approach. We must recognize that subjective, cognitive, and quality of life data are arguably just as important as objective outcomes in the frail population as we continue to explore the effects of frailty on outcomes.

Compliance with Ethical Standards

References

Papers of particular interest, published recently, have been highlighted as:
• Of importance

1. Brown I, Renwick R, Raphael D. Frailty: constructing a common meaning, definition, and conceptual framework. Int J Rehabil Res. 1995;18(2):93–102.

2. Collard R, Boter H, Schoevers R, Oude VR. Prevalence of frailty in community-dwelling older persons: a systematic review. J Am Geriatr Soc. 2012;60(8):1487–92.

3. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci. 2001;56(3):M146–56.

4. Makary MA, Segev DL, Pronovost PJ, Syin D, Bandeen-Roche K, Patel P, et al. Frailty as a predictor of surgical outcomes in older patients. J Am Coll Surg. 2010;210(6):901–8.

5. Nygaard I, Barber MD, Burgio KL, Kenton K, Meikle S, Schaffer J, et al. Prevalence of symptomatic pelvic floor disorders in US women. JAMA. 2008;300(11):1311–6.

6. Shinnick JK, Raker CA, Sung V. Provider miscategorization of frailty in an outpatient urogynecologic population. Int Urogynecol J [Internet]. 2019; [cited 2020 Apr 1]; Available from: http://link.springer.com/10.1007/s00192-019-04095-5.

7. Abellan van Kan G, Rolland Y, Andrieu S, Bauer J, Beauchet O, Bonnefoy M, et al. Gait speed at usual pace as a predictor of adverse outcomes in community-dwelling older people an International Academy on Nutrition and Aging (IANA) Task Force. J Nutr Health Aging. 2009;13(10):881–9.

8. Savva GM, Donoghue OA, Horgan F, O'Regan C, Cronin H, Kenny RA. Using timed up-and-go to identify frail members of the older population. J Gerontol Ser A Biol Med Sci. 2013;68(4):441–6.

9. Abellan van Kan G, Rolland Y, Houles M, Gillette-Guyonnet S, Soto M, Vellas B. The assessment of frailty in older adults. Clin Geriatr Med. 2010;26(2):275–86.

10. Bautmans I, Gorus E, Njemini R, Mets T. Handgrip performance in relation to self-perceived fatigue, physical functioning and circulating IL-6 in elderly persons without inflammation. BMC Geriatr. 2007;7:5.

11. Syddall H, Cooper C, Martin F, Briggs R, Aihie SA. Is grip strength a useful single marker of frailty? Age Ageing. 2003;32(6):650–6.

12. Abellan van Kan G, Rolland YM, Morley JE, Vellas B. Frailty: toward a clinical definition. J Am Med Dir Assoc. 2008;9(2):71–2.

13. Saliba D, Elliott M, Rubenstein LZ, Solomon DH, Young RT, Kamberg CJ, et al. The vulnerable elders survey: a tool for identifying vulnerable older people in the community. J Am Geriatr Soc. 2001;49(12):1691–9.

14.• Amin KA, Lee W, Moskowitz D, Kobashi KC, Lucioni A, Reed MJ, et al. A Rapid Method to Preoperatively Assess Frailty for Older Patients with Pelvic Floor Conditions. J Urol. 2020 Jan 2;1172–7. **Most frailty assessment tools are often too cumbersome to perform in the clinical setting. This study demonstrates that CFS-9 is an excellent predictor of frailty compared to the Fried Frailty Index for patients with pelvic floor conditions and is easily administered.**

15. Rano M, Hird AE, Refik S, Radomski SB, Lesley C, Kodama RT, et al. Is there an association between urinary incontinence and mortality? A retrospective cohort study. J Urol. 2020;203(3):591–7.

16. Overactive bladder (OAB) guideline - American Urological Association [Internet]. [cited 2020 Mar 30]. Available from: https://www.auanet.org/guidelines/overactive-bladder-(oab)-guideline

17.• Coupland CAC, Hill T, Dening T, Morriss R, Moore M, Hippisley-Cox J. Anticholinergic Drug Exposure and the Risk of Dementia: A Nested Case-Control Study. JAMA Intern Med. 2019 Jun 24;(8):1084–93. **Pharmacologic management with anticholinergics is the second-line treatment for patients with urge urinary incontinence. While anticholinergics have short-term cognitive side effects, this study observed an association between dementia and exposure to several anticholinergic medications, suggesting that these drugs should be prescribed with caution in older, frail adults.**

18. Usmani SA, Reckenberg K, Johnson O, Stranges PM, Teshome BF, Kebodeaux CD, et al. Relative risk of adverse events and treatment discontinuations between older and non-older adults treated with antimuscarinics for overactive bladder: a systematic review and meta-analysis. Drugs Aging. 2019;36(7):639–45.

19. Richter H, Amundsen C, Erickson S, Jelovsek J, Komesu Y, Chermansky C, et al. Characteristics associated with treatment response in women undergoing onabotulinumtoxinA and sacral neuromodulation for refractory urgency urinary incontinence. J Urol. 2017;198(4):890–6.

20. Suskind AM, Kowalik C, Quanstrom K, Boscardin J, Zhao S, Reynolds WS, et al. The impact of frailty on treatment for overactive bladder in older adults. Neurourol Urodyn. 2019;38(7):1915–23.

21. Liao C-H, Hann-Chorng K. Increased risk of large post-void residual urine and decreased long-term success rate after Intravesical onabotulinumtoxinA injection for refractory idiopathic detrusor overactivity. J Urol. 2013;189(5):1804–10.

22. Cohen AJ, Packiam VT, Nottingham CU, Alberts BD, Faris SF, Bales GT. 30-day morbidity and reoperation following midurethral sling: analysis of 8772 cases using a national prospective database. Urology. 2016;95:72–9.

23. Saga S, Vinsnes AG, Mørkved S, Norton C, Seim A. Prevalence and correlates of fecal incontinence among nursing home residents: a population-based cross-sectional study. BMC Geriatr. 2013;13:87.

24. Solon JG, Waudby P, O'Grady H. Percutaneous tibial nerve stimulation can improve symptoms and quality of life in selected patients with faecal incontinence – a single-centre 5-year clinical experience. The Surgeon [Internet]. 2019; [cited 2020 Apr 1]; Available from: http://www.sciencedirect.com/science/article/pii/S1479666X19301088.

25. Luber KM, Boero S, Choe JY. The demographics of pelvic floor disorders: current observations and future projections. Am J Obstet Gynecol. 2001;184(7):1496–501 discussion 1501-1503.

26. Maher C, Feiner B, Baessler K, Schmid C. Surgical management of pelvic organ prolapse in women. Cochrane Database Syst Rev. 2013;4:CD004014.

27. Bodner-Adler B, Bodner K, Stinglmeier A, Kimberger O, Halpern K, Koelbl H, et al. Prolapse surgery versus vaginal pessary in women with symptomatic pelvic organ prolapse: which factors influence the choice of treatment? Arch Gynecol Obstet. 2019;299(3):773–7.

28. Catanzarite T, Rambachan A, Mueller MG, Pilecki MA, Kim JYS, Kenton K. Risk factors for 30-day perioperative complications after Le Fort colpocleisis. J Urol. 2014;192(3):788–92.

29. Suskind AM, Jin C, Walter LC, Finlayson E. Frailty and the role of obliterative versus reconstructive surgery for pelvic organ prolapse; a national study. J Urol. 2017;197(6):1502–6.

30. Narins H, Danforth TL. Management of pelvic organ prolapse in the elderly - is there a role for robotic-assisted sacrocolpopexy? [Internet]. Vol. 3, Robotic Surgery: Research and Reviews. Dove Press; 2016 [cited 2020 Mar 25]. p. 65–73. Available from: https://www.dovepress.com/management-of-pelvic-organ-prolapse-in-the-elderly-ndash-is-there-a-ro-peer-reviewed-fulltext-article-RSRR

31. Murphy M, Sternschuss G, Haff R, van Raalte H, Saltz S, Lucente V. Quality of life and surgical satisfaction after vaginal reconstructive vs obliterative surgery for the treatment of advanced pelvic organ prolapse. Am J Obstet Gynecol. 2008;198(5):573.e1–7.

32. Barber MD, Amundsen CL, Paraiso MFR, Weidner AC, Romero A, Walters MD. Quality of life after surgery for genital prolapse in elderly women: obliterative and reconstructive surgery. Int Urogynecol J Pelvic Floor Dysfunct. 2007;18(7):799–806.

33. Sung VW, Weitzen S, Sokol ER, Rardin CR, Myers DL. Effect of patient age on increasing morbidity and mortality following urogynecologic surgery. Am J Obstet Gynecol. 2006;194(5):1411–7.

34. Pizarro-Berdichevsky J, Clifton MM, Goldman HB. Evaluation and management of pelvic organ prolapse in elderly women. Clin Geriatr Med. 2015;31(4):507–21.

35. Krlin RM, Soules KA, Winters JC. Surgical repair of pelvic organ prolapse in elderly patients. Curr Opin Urol. 2016;26(2):193–200.

36. Moore T, Tubman I, Levy G, Brooke G. Age as a risk factor for perioperative complications in women undergoing pelvic reconstructive surgery. Female Pelvic Med Reconstr Surg. 2010;16(5): 290–5.

37. Nieminen K, Heinonen PK. Sacrospinous ligament fixation for massive genital prolapse in women aged over 80 years. BJOG. 2001;108(8):817–21.

38. Geller EJ, Siddiqui NY, Wu JM, Visco AG. Short-term outcomes of robotic sacrocolpopexy compared with abdominal sacrocolpopexy. Obstet Gynecol. 2008;112(6):1201–6.

39. Geller EJ, Parnell BA, Dunivan GC. Robotic vs abdominal sacrocolpopexy: 44-month pelvic floor outcomes. Urology. 2012;79(3):532–6.