Published in final edited form as:

J Urol. 2008 June ; 179(6): 2111–2118. doi:10.1016/j.juro.2008.01.089.

Prolapse and Incontinence Surgery in the Older Woman

Kimberly A. Gerten, MD¹, Alayne D. Markland, DO, MSc^{2,3}, L. Keith Lloyd, MD⁴, and Holly E. Richter, PhD, MD¹

¹Department of Obstetrics and Gynecology, Division of Women's Pelvic Medicine and Reconstructive Surgery, University of Alabama at Birmingham, Birmingham, AL

²Birmingham/Atlanta Geriatric Research, Education, and Clinical Center (GRECC), Department of Veterans Affairs Medical Center, Birmingham, AL

³Department of Medicine, Division of Gerontology and Geriatric Medicine, University of Alabama at Birmingham, Birmingham, AL

⁴Department of Surgery, Division of Urology, University of Alabama at Birmingham, Birmingham, AL

Abstract

Purpose—Pelvic floor disorders including urinary incontinence, pelvic organ prolapse and fecal incontinence are common problems encountered by the older woman. With the increasing population of older American women, urologists and gynecologists can expect to provide evaluation and treatment of these conditions with increasing frequency. These conditions are amenable to both medical and surgical therapies.

Materials and Methods—Contemporary published articles (year 2003 to present) that included older women undergoing urogynecologic surgical procedures were included in this review. Current data on morbidity, mortality and/or surgical outcomes are presented along with evidence-based pre, intra and post-operative surgical management strategies.

Results—The older woman can expect similar operative risks as well as subjective and objective anatomic and quality-of-life outcomes as that of younger women undergoing pelvic floor surgery.

Conclusion—The decision for surgical intervention for the treatment of pelvic floor disorders should not be based on chronologic age alone. Prior to selection of a specific surgical procedure, all existing pelvic floor defects should be evaluated. Further research is required to understand the impact that surgery for pelvic floor disorders has on anatomic, physiologic, and functional outcomes in older women.

Keywords

geriatrics; pelvic floor surgery; pelvic organ prolapse; urogynecology; incontinence

The aging American population and the prevalence of pelvic floor disorders

Background

Aging America—The United States is experiencing a rapid growth in the geriatric age demographic. From the 2000 census data, there were 35 million individuals 65 years and older, representing 12.4% of the population. ¹ Women aged 75 years and older comprised

51% of this group. The projected population for the year 2030 of those aged 65 and older is 71.5 million, representing 20% of the population.¹ Furthermore, adults aged 85 and older, are one of the fastest growing segments of the older population.

Surgical Demand—Over 200,000 inpatient and outpatient surgeries are performed yearly for the treatment of urinary incontinence (UI) and pelvic organ prolapse (POP) in women.² The demand for care of pelvic floor disorders has been projected to increase significantly in the coming years.

The lifetime risk of having surgery for either POP or UI up to the age of 80 years is 11.1%.³ Women who have undergone a procedure for UI or POP are at risk for recurrence. Clark and colleagues showed that women who underwent primary surgery for POP or UI had a 12% re-operation rate, whereas women who had had previous pelvic floor surgery experienced a re-operation rate of 17% over a 5 year follow-up period.⁴

Pelvic Floor Conditions—Common pelvic floor disorders affecting the older woman include urinary incontinence (UI), pelvic organ prolapse (POP), and fecal incontinence (FI).

Urinary incontinence is a common condition in the older woman. Prevalence rates vary depending upon the definition. Liberal definitions of UI including “ever, any, or at least once in the past 12 months” show prevalence rates in women over 65 years to be 10–59%. When a stricter definition of “daily” UI is used, the prevalence rates are 4–14% in the older woman.² The impact of UI on quality of life in the older woman should not be underestimated.

The etiology of incontinence may be due to stress, urge, and overflow leakage, or mixed incontinence. Behavioral therapy with pelvic floor rehabilitation is an effective treatment for both stress and urge incontinence. Pessaries are also used for managing stress incontinence in older women. Surgery to improve stress urinary incontinence has been found to be safe and effective and will be discussed later. Treatment of overflow incontinence is based on the etiology of the incomplete bladder emptying, such as obstruction or neurologic compromise.

The prevalence of POP defined as stage II prolapse or greater using the Pelvic Organ Prolapse Quantification (POPQ)⁵ examination in the general population was reported to be 37%; prevalence in an older population of women with a mean age of 68 years was 64.8%.⁶ Pelvic organ prolapse can be associated with urinary as well as bowel dysfunction. The etiology of POP is complex, involving potential injury to the many ligaments, muscles, connective tissue and innervation of the pelvis. POP is associated with several risk factors including age, parity, abdominal circumference and body mass index. Vaginal support defects as defined by DeLancey include Level I apical support defects (the cardinal-uterosacral ligament complex), Level II defects including cystocele, rectocele or paravaginal defects (a defect in vaginal support at the level of the arcus tendineous fascia pelvis), or a Level III defect, detachment of the perineal body (see Figure 1).⁷

Fecal incontinence is defined by involuntary loss of mucous, liquid or solid stool that is considered a social or hygienic problem.⁸ The prevalence of FI in community dwelling women over age 60 varies from 12 to 33% and is dependent on the definition used.⁸ Risk factors in women include chronic diarrhea, parity, UI, high body mass index, and previous anorectal surgery.

It is common for women to be affected by more than one pelvic floor condition. Many older women have both UI and POP. Women with advanced POP may experience voiding dysfunction, which may be caused by urethral obstruction. Finally, older women are at risk

for coexisting urinary and fecal incontinence. A thorough history will elucidate these associated symptoms.

Materials and Methods

Peer-reviewed journal articles published from the year 2003 to present were identified by searching Pubmed, as well as reviewing article reference lists. This review includes articles on urogynecologic surgical procedures, focusing on morbidity, mortality and/or surgical outcomes data in older women. Additionally, evidence-based pre, intra and post-operative surgical management strategies are presented.

Surgical approach to pelvic floor surgery

Is reconstructive pelvic floor surgery safe in the older woman?—Older women undergoing elective pelvic floor surgery face risks similar to all patients undergoing elective general surgery. Pelvic floor surgery is considered an intermediate risk procedure with a perioperative mortality rate < 5%. Review of recent studies that examine outcomes of the older woman undergoing pelvic floor surgery show mortality rates from 0.0 to 4.1% and complication rates from 15.5 to 33.0% (see Table 1). Complication rates vary and may be due to the heterogeneous definitions of complications throughout the studies. However, the majority of complications were related to urinary tract infections, febrile morbidity, and blood loss requiring transfusion.

Surgery for Pelvic Organ Prolapse—Non-surgical modalities exist for the treatment of POP and UI, however, patients not satisfied with more conservative treatments may seek surgical correction as an option. The ideal procedure in the older woman would robustly repair symptomatic pelvic floor defects, be performed efficiently, allow for rapid postoperative recovery including return to baseline or improved functional status, and conform with the sexual activity desires of the patient. Although many studies have included older women when examining outcomes after pelvic floor surgery, most studies have not specifically addressed POP surgery outcomes in the older woman.

Surgery to correct POP should address the specific pelvic floor defects that are present including the anterior vaginal wall, posterior vaginal wall, lateral vaginal wall and apical vaginal support defects.

Surgical techniques to address anterior defects are the anterior colporrhaphy and paravaginal repair. Unfortunately, repair of the anterior wall is associated with the highest long-term failure rates of all the vaginal wall defect repairs (37% to 100% success depending on the definition and follow-up period).¹⁸ Biologic graft augmentation has not been shown to improve long-term outcomes.¹⁹ The efficacy and safety of vaginally placed synthetic grafts have yet to be addressed in long-term studies.

Carey and colleagues compared symptomatic anterior wall prolapse repair outcomes at a 21 month average (12 month minimum) follow-up between 31 patients aged 80 years or more compared to 234 younger patients. They demonstrated similar rates of symptomatic failure between the groups, 6% versus 5% respectively. Recurrence of any vaginal support defect in the older group was 10%.¹⁵

The most efficacious technique to repair posterior defects is the traditional midline colporrhaphy.²⁰ Perineorrhaphy should be performed when there is separation of the perineal muscles. The posterior rectovaginal connective tissue should be reattached to the perineal body if separated. However, careful attention should be paid to avoid excessive vaginal narrowing (unless desired) as postoperative dyspareunia is a common complication.

Anatomic success is high with this procedure, however functional success rates may be considerably lower regardless of age.

Surgical techniques to address apical vaginal defects include the abdominal sacrocolpopexy (ASC), uterosacral ligament suspension (USS), ileococcygeus fixation, and sacrospinous fixation.

The ASC employs graft material to suspend the anterior and posterior walls of the vagina to the anterior longitudinal ligament of the sacrum. Published ASC apical cure rates range from 78–100%.²⁰ Based on level I data, the ASC has superior anatomic outcomes compared to vaginal approach apical procedures. However, this surgery requires a laparotomy, has a longer operative time, a longer recovery period and higher postoperative complications when compared to vaginal approach surgeries. Patient satisfaction rates have been shown to be similar when comparing vaginal and abdominal procedures.²¹ A recent RCT demonstrated similar perioperative complication rates as well as subjective and objective outcomes in women aged 70 years and older compared to a younger group undergoing ASC.¹⁰ ASC may be safely performed laparoscopically, even in the older woman, however this requires significant surgical skills. Furthermore, there are few studies and no randomized trials looking at outcomes between the open versus laparoscopic approaches, especially in the older woman.

The USS is an intraperitoneal technique that attaches the vaginal vault to the uterosacral ligaments near the ischial spine bilaterally. A culdoplasty may be performed at the same time. Published anatomic cure rates range from 65% to 98% depending on the definition of cure and the length of follow-up in an unselected patient population.²² Vetere and colleagues report on outcomes of prolapse surgery in women aged 65 and older (mean 75 years), the majority receiving McCall's culdoplasty (a variation of the USS). Twelve-month follow-up demonstrated 6% prolapse recurrence.¹⁷ Intraoperative cystoscopy is recommended to verify ureteral patency due to the proximity of the ureter to the uterosacral ligament.

Sacrospinous fixation and ileococcygeus fixation are extraperitoneal techniques that attach the vaginal vault to the sacrospinous ligament or coccygeus muscle respectively. Anatomic success for the sacrospinous fixation range from 29% to 98% and 53% to 96% for the ileococcygeus fixation, depending on the definition of success and the length of follow-up in an unselected patient population.²⁰

Colpocleisis or colpectomy (narrowing or closure of the vaginal tissue and introitus) may be offered to the older woman who has no desire for vaginal function. These obliterative procedures have been shown to have shorter operative times and have fewer perioperative complications as compared to reconstructive repair.¹¹ Postoperative regret is low and patient satisfaction is high.²³ Prolapse recurrence is rare. DeLancey et al. demonstrated only 1 anatomic failure in 33 cases with 3 year follow-up.²⁴ Preoperative assessment and operative treatment for occult stress incontinence may help avoid this unwanted postoperative complication.

Little information is available to guide us about which procedure should be considered in the older woman versus the younger woman. Morbidity and mortality information as well as selected outcomes of pelvic floor surgery in the older woman are presented in Table 1. The ultimate decision on which approach and which procedure to employ in the treatment of POP in the older woman should take into consideration the patient's overall health and physical activity status, her specific pelvic floor defects and her future sexual activity desires, as well as the surgeon's training, skills and preference.

Surgery for Urinary Incontinence—The ideal surgery to correct SUI in the older woman would be minimally invasive, have short operative time and have good cure rates with a low incidence of perioperative complications. Common approaches to the surgical treatment of SUI include the midurethral sling (retropubic or transobturator), colposuspension, and the pubovaginal sling (autologous, synthetic or allograft).

Success rates vary by the method of measurement (subjective, objective, and follow-up period), however the older woman undergoing incontinence surgery can expect continence rates that favorably compare to those of younger women. Incontinence surgery outcome data specific to the older woman undergoing tension-free vaginal tape (TVT) are presented in Table 2. The choice of incontinence surgery will depend upon surgeon experience as well as patient history and whether other concomitant procedures will be performed. Similar favorable short and long-term outcomes have been demonstrated using the midurethral sling, colposuspension and pubovaginal sling in the older woman.

Gordon and colleagues compared TVT outcomes between 123 women aged 70 years and older (mean 74.8) versus 208 younger women (mean 57.2) with a mean follow-up of 30 months (minimum 12). Persistent SUI was found in 7% versus 6%, respectively and postoperative complications were similar between groups.²⁸ Review of current literature demonstrates SUI cure rates in older women who underwent midurethral slings (TVT) range from 45–93% compared to 73–95% in younger cohorts of women in the same studies (see Table 2).

Tamussino and colleagues demonstrated similar objective cure rates between older versus younger woman undergoing Burch colposuspension on 5 year follow-up (78% versus 80%).³⁵ Carr and colleagues compared outcomes in 19 women aged 70 and older to 77 younger controls undergoing pubovaginal sling. Mean follow-up was 22 months. Stress incontinence cure was 100% versus 97%, respectively. Short-term postoperative voiding dysfunction was similar between groups (10% versus 6%).³⁶ Although each of these procedures has been found to be effective in the older woman, no studies directly compare outcomes between methods in the older woman.

Periurethral bulking injections have been employed in the treatment of SUI in the older woman.² Regardless of the agent, cure and improvement rates are poor and appear to decline with time. However, given that the risk of the procedure is low and requires no specific anesthesia, this may be a reasonable option in the medically compromised patient or in the patient who has failed other approaches. Anterior colporrhaphy, periurethral plication and needle procedures universally demonstrate poor long-term efficacy for the treatment of SUI in the older woman.

Aging is associated with decreased detrusor contractility and decreased urinary flow rates, which may explain the slightly increased incidence of postoperative voiding dysfunction, irritative urinary symptoms and UTI's seen in some studies. However, older women who have preoperative irritative lower urinary symptoms demonstrate decreased rates of these symptoms after surgery.¹²

Surgery for fecal incontinence—Treatment of FI in the older woman should include evaluation for possible functional, anatomic and neurologic deficiencies in the lower gastrointestinal tract. Behavioral therapies that include diet modification with fluid and fiber balance as well as pelvic floor muscle rehabilitation should be considered. If an anatomic defect such as a sphincter disruption is identified, anal sphincter repair should be considered. No specific studies address the efficacy of this approach in the older woman, however “good” short-term outcomes in all age ranges are achieved in approximately 70% of

patients.³⁷ Unfortunately, long-term results may not be as robust, with one study reporting only 23% of patients with “good” results at 10 years follow-up.³⁷ Other surgical approaches to consider for the treatment of refractory FI include stimulated muscle transposition, artificial anal sphincter implant, sacral nerve neuromodulation, and colostomy.

Pre-surgical evaluation of the older woman undergoing pelvic floor surgery

Physiology of aging—Aging is associated with several physiologic changes. After age 60, the functional reserve of most organ systems begins to decline. (see figure 2)

Cardiovascular changes include increased vessel intimal thickness and increased ventricular wall thickness. This results in increased systolic and pulse pressure. The older person is more dependent on diastolic filling and stroke volume to maintain cardiac output. Sympathetic stimulation response slows causing decreased heart rate and myocardial contractility and reduced vaso-reactivity. The combination of these cardiovascular changes increases the risk for fluid overload, symptomatic episodes during arrhythmias and hypothermia, especially during the stresses of surgery.

Peak respiratory performance is demonstrated at age 30, then declines thereafter. Age related pulmonary changes include decreased vital capacity, maximum voluntary ventilation and respiratory compliance. PO₂ declines with age and the response to hypoxia and hypercapnia are diminished. Cough effort is less vigorous and mucociliary clearance is reduced thus elevating risk for perioperative pulmonary complications.³⁸

Renal mass, blood flow and glomerular filtration rate decrease with age. The creatinine level, however, remains stable in the aging person due to decreased protein catabolism. Renin activity decreases and atrial natriuretic peptide increases making for impaired excretion of water and sodium loads.

Hepatic changes include a decrease in liver mass and blood flow. Oxidative drug metabolism slows with aging, but metabolism by glucuronidation is maintained.³⁸

Cerebral weight decreases with aging, however cognitive loss and dementia are not normal consequences of aging.

Preoperative testing—There is a notable difference between chronologic and physiologic age. The most accurate predictor of postoperative outcome in the older woman undergoing surgery is preexisting medical co-morbidity. Optimizing the preoperative condition of the older woman considering surgery is key and evaluation should include several dimensions, including physical health, mental/cognitive health, and functional assessment.

Pre-operative laboratory assessment should be selected based on the patient’s medical history and planned surgical intervention. Suggested preoperative screening tests in women aged 65 years and older include a hematocrit, creatinine/BUN and ECG. Women aged 74 years and older should have a glucose value and chest x-ray in addition to the above tests.³⁹ Additional testing based on age alone has not been shown to decrease perioperative morbidity and adds economic burden.³⁹

Coronary artery disease is more prevalent in the older patient. The cardiovascular risk factors most strongly associated with post-operative complications include a history of coronary artery disease, peripheral vascular disease and congestive heart failure. The American College of Cardiology/American Heart Association Task Force for Perioperative

Evaluation recommend performing a clinical history, evaluating surgical risk as well as assessing exercise tolerance.⁴⁰

Consideration should be given to cognitive impairments, depression, and functional assessment prior to surgery. It is important to identify cognitive impairment, as these women are at the highest risk for developing postoperative delirium and prolonged recovery time.⁴¹

A recent study evaluated the potential benefit of a formal geriatric assessment that included the instrumental activities of daily living (IADL's), activities of daily living (ADL's), Get Up and Go, Draw a Clock Test, Mini Nutritional Assessment, Geriatric Depression Scale, and Social Support Scale for a surgical cohort of women undergoing pelvic floor surgery. This formal assessment did not improve postoperative outcomes as compared to those patients who underwent the usual preoperative assessment. This finding was attributed to the good general health status of the geriatric women considered for pelvic floor surgery in that study.⁴² The need for a formal evaluation of cognition, depression, and functional status should be individualized. It is important to consider preoperative functional status along with caregiver support that may impact the role of elective surgery in improving or worsening baseline functional status.

Intra-operative Considerations

Choice of anesthesia, any evidence?—The theoretical risks of general anesthesia in the geriatric patient undergoing surgery have been thought to be potential cognitive decline associated with cerebral ischemia due to focal or global hypoperfusion as well as exacerbation of underlying medical conditions. However, in a large randomized controlled trial evaluating the outcomes associated with the choice of anesthesia, regional or general, in the older adult undergoing primary total knee replacement, no significant differences were seen in cognitive function, cardiac complications, postoperative delirium or length of hospital stay based on type of anesthesia employed, either immediately postoperatively or on six month follow up. The majority of patients studied were women and the median age was 69 years.⁴³

Segal et. al. recently performed a RCT comparing local anesthesia with sedation versus general anesthesia for women undergoing vaginal approach pelvic floor surgery. There were no differences in operative times, pain scores, anti-emetic use or length of hospital stay between groups. The mean age of subjects was 58 +/- 13 years.⁴⁴ Ultimately, the choice of anesthesia should be based on the patient's history and physical exam findings as well as surgeon, anesthesiologist and patient preference.

Prevention of Intraoperative and Postoperative Complications—Intraoperative issues relevant to all women undergoing pelvic floor surgery include proper patient positioning to avoid nerve injury, maintaining normothermia to prevent wound and cardiac complications,⁴⁵ and appropriate antibiotic prophylaxis to decrease wound infection risk.⁴⁶ However, of heightened concern in the older woman are thrombosis prevention and perioperative cardiac protection. Suggested clinical management strategies are presented in Table 3.

The incidence of DVT in an unselected gynecologic surgery population without prophylaxis is 16%. The risk of DVT in high risk surgical patients is estimated at 20–40%, and the risk of clinically evident pulmonary embolism is 2–4%.⁴⁷ All older women undergoing pelvic floor surgery are classified as high risk for thrombotic complications due to age greater than 60 as well as performance of major surgery. Older women may have additional risk for thrombotic events secondary to medical co-morbidities including previous thromboembolic events, immobility, cancer, obesity, varicose veins, and thrombophilias.⁴⁷ Recommended

thromboembolism prophylaxis include the use of intermittent compression stockings and administration of low dose unfractionated heparin or low molecular weight heparin (LMWH). Postoperative administration of LMWH has been shown to be equally efficacious as preoperative administration.⁴⁷ Early postoperative ambulation has been demonstrated to reduce postoperative embolic events.

The perioperative use of a beta blocker has been shown to reduce myocardial ischemia as well as reduce the risk of perioperative MI and death in the high risk cardiac patient. A patient with several minor or intermediate risk factors can also benefit from perioperative beta blocker administration. The medication should be administered preoperatively with a goal resting heart rate of 50–60 beats per minute (bpm) and continued into the postoperative period with a goal to maintain heart rate less than 80 bpm.⁴⁸

Surgery in the older patient is well tolerated, however complications are not. Manku et al. demonstrated that patients aged 70 and older who sustained a perioperative complication (cardiac, neurologic, pulmonary, infectious, or renal) had more than double the risk of discharge to a care facility.⁴⁹ The most common serious postoperative complications in older women undergoing surgery include delirium, pneumonia, cardiac events, and embolic events. Serious postoperative complications are predictive of poorer recovery and longer time to recovery. Specific to pelvic floor surgery, slightly increased incidence of postoperative voiding dysfunction, irritative urinary symptoms, and UTI's have been seen in some studies. Clinical recommendations for prevention and treatment of these complications are presented in Table 3.

Research involving the older woman

Given the growing geriatric population along with the high prevalence of pelvic floor disorders, there is a pressing need for information on the outcomes of surgical treatment in this unique population of women. There is a relative paucity of literature that addresses the older woman and the treatment of pelvic floor disorders. In fact, older women have been excluded from many of the trials that have examined the outcomes of pelvic floor surgery. A systematic review found the median percentage of women aged 70 or older who participated in surgical trials for SUI was 3.8%, while the number of surgeries for SUI performed on this population of women is estimated at 16%.⁵⁰ As the outcomes of surgery may be different in this population, the older woman should be encouraged to participate in clinical studies.

Conclusion

Older women are at high risk for developing conditions of the pelvic floor that require intervention. Overall, pelvic floor surgery in older women is safe and effective. Prior to undergoing surgery, the older woman requires a thorough history and physical examination and appropriate pre-operative testing. Consideration of conservative treatment modalities is recommended, however, surgery should not be avoided based on age alone. The choice of surgical procedure should address the patient's specific pelvic floor disorders and conform with the sexual activity desires of the patient. Many common postoperative complications can be avoided with special attention to preoperative, intraoperative and postoperative management. Thoughtful perioperative management of this unique population should allow for complete recovery (and possibly improvement) of baseline functional status along with restored lower urinary and pelvic floor function.

References

1. Federal Interagency Forum on Aging-Related Statistics. Older Americans 2004: Key Indicators of Well-Being. Federal Interagency Forum on Age-Related Statistics. Washington, DC: U.S. Government Printing Office; 2004 November.
2. Nygaard, I.; Thom, DH.; Calhoun, EA. Chapter 3 Urinary Incontinence in Women. In: Litwin, MS.; Saigal, CS., editors. Urologic Diseases in America. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases. Washington, DC: US Government Printing Office; 2007. p. 71-103. NIH Publication No. 07-5512
3. Olsen AL, Smith VJ, Bergstrom JO, Colling JC, Clark AL. Epidemiology of surgically managed pelvic organ prolapse and urinary incontinence. *Obstet Gynecol.* 1997; 89:501–506. [PubMed: 9083302]
4. Clark AL, Gregory T, Smith VJ, Edwards R. Epidemiologic evaluation of reoperation for surgically treated pelvic organ prolapse and urinary incontinence. *Am J Obstet Gynecol.* 2003; 189:1261–1267. [PubMed: 14634551]
5. Bump RC, Mattiasson A, Bo K, Brubaker LP, DeLancey JOL, Klarskov P, et al. The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. *Am J Obstet Gynecol.* 1996; 175(1):10–17. [PubMed: 8694033]
6. Nygaard I, Bradley C, Brandt D. Pelvic organ prolapse in older women: prevalence and risk factors. *Obstet Gynecol.* 2004; 104:489–497. [PubMed: 15339758]
7. De Lancey JO. Anatomic aspects of vaginal eversion after hysterectomy. *Am J Obstet Gynecol.* 1992; 166:1717–1724. [PubMed: 1615980]
8. Norton, C.; Whitehead, WE.; Bliss, DZ.; Metsole, P.; Tries, J. Conservative and Pharmacologic Management of Fecal Incontinence in Adults. In: Abrams, P.; Cardozo, L.; Khoury, S.; Wein, A., editors. Incontinence, 3rd International Consultation on Incontinence. Paris, France: Health Publications Ltd; 2005. p. 1521-1564.
9. 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.* 2007; 18:799–806.
10. Richter HE, Goode PS, Kenton K, Brown MB, Burgio KL, Kreder K, et al. The effect of age on short-term outcomes after abdominal surgery for pelvic organ prolapse. *JAGS.* 2007; 55:857–863.
11. 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; 194:1411–1417. [PubMed: 16647926]
12. Friedman WH, Gallup DG, Burke JJ, Meister EA, Hoskins WJ. Outcomes of octogenarians and nonagenarians in elective major gynecologic surgery. *Am J Obstet Gynecol.* 2006; 195:547–553. [PubMed: 16890555]
13. Stepp KJ, Barber MD, Eun-Hee Y, Whiteside JL, Paraiso MFR, Walters MD. Incidence of perioperative complications of urogynecologic surgery in elderly women. *Am J Obstet Gynecol.* 2005; 192:1630–1636. [PubMed: 15902169]
14. Schweitzer KJ, Vierhout ME, Milani AL. Surgery for pelvic organ prolapse in women 80 years of age or older. *Acta Obstet Gynecol Scand.* 2005; 84:286–289. [PubMed: 15715538]
15. Carey JM, Leach GE. Transvaginal surgery in the octogenarian using cadaveric fascia for pelvic prolapse and stress incontinence: minimal one year results compared to younger patients. *Urology.* 2003; 63:665–670. [PubMed: 15072875]
16. Moore RD, Miklos JR. Colpocleisis and tension-free vaginal tape sling for severe uterine and vaginal prolapse and stress urinary incontinence under local anesthesia. *J Am Assoc Gynecol Laparosc.* 2003; 10(2):276–280. [PubMed: 12732784]
17. Vetere PF, Putterman S, Kesselman E. Major reconstructive surgery for pelvic organ prolapse in elderly women, including the medically compromised. *J Reprod Med.* 2003; 48:417–421. [PubMed: 12856511]
18. Brubaker, L. Surgery for pelvic organ prolapse. In: Abrams, P., editor. Incontinence. France: Health Publications Ltd; 2005. p. 1371-1402.

19. Wheeler TL 2nd, Richter HE, Duke AG, Burgio KL, Redden DT, Varner RE. Outcomes with porcine graft placement in the anterior vaginal compartment in patients who undergo high vaginal uterosacral suspension and cystocele repair. *Am J Obstet Gynecol.* 2006; 194:1486–1491. [PubMed: 16647932]
20. Weber AM, Richter HE. Pelvic organ prolapse. *Obstet Gynecol.* 2005; 106:615–634. [PubMed: 16135597]
21. Maher CF, Qatawneh AM, Dwyer PL, Carey MP, Cornish A, Schluter P. Abdominal sacral colpopexy or vaginal sacrospinous colpopexy for vaginal vault prolapse: a prospective randomized study. *Am J Obstet Gynecol.* 2004; 190:20–26. [PubMed: 14749629]
22. Silva WA, Pauls RN, Segal JL, Rooney CM, Kleeman SD, Karram MM. Uterosacral ligament vault suspension: five year outcomes. *Obstet Gynecol.* 2006; 108(2):255–263. [PubMed: 16880293]
23. Wheeler TL 2nd, Richter HE, Burgio KL, Redden DT, Chen CCG, Goode PS, et al. Regret, satisfaction, and symptom improvement: analysis of the impact of partial colpocleisis for the management of severe pelvic organ prolapse. *Am J Obstet Gynecol.* 2005; 193:2067–2070. [PubMed: 16325617]
24. DeLancey JOL, Morley GW. Total colpoceisis for vaginal eversion. *Am J Obstet Gynecol.* 1997; 176:1228. [PubMed: 9215178]
25. Hellberg D, Holmgren C, Lanner L, Nilsson S. The very obese and the very old woman: tension-free vaginal tape for the treatment of stress urinary incontinence. *Int Urogynecol J.* 2007; 18:423–429.
26. Touloupidis S, Papatsoris AG, Thanopoulos C, Charalambous S, Giannakopoulos S, Rombis V. Tension-free vaginal tape for the treatment of stress urinary incontinence in geriatric patients. *Gerontology.* 2007; 53(3):125–127. [PubMed: 17159349]
27. Liapis A, Panagiotis B, Giner M, Creatsas G. Tension-free vaginal tape versus tension-free vaginal tape obturator in women with stress urinary incontinence. *Gynecol Obstet Invest.* 2006; 62:160–164. [PubMed: 16707901]
28. Gordon G, Gold R, Pauzner D, Lessing JB, Groutz A. Tension-free vaginal tape in the elderly: is it a safe procedure? *Urology.* 2005; 65:479–482. [PubMed: 15780359]
29. Pugsley H, Barbrook C, Mayne CJ, Tincello DG. Morbidity of incontinence surgery in women over 70 years old: a retrospective cohort study. *BJOG.* 2005; 112:786–790. [PubMed: 15924538]
30. Allahdin S, McKinley CA, Mahmood TA. Tension free vaginal tape: a procedure for all ages. *Acta Obstet Gynecol Scand.* 2004; 83:937–940. [PubMed: 15453889]
31. Walsh K, Generao SE, White MJ, Katz D, Stone AR. The influence of age on quality of life outcome in women following a tension-free vaginal tape procedure. *Urology.* 2004; 171:1185–1188.
32. Karantanis E, Fynes M, Stanton S. The tension-free vaginal tape in older women. *BJOG.* 2004; 111:837–841. [PubMed: 15270933]
33. Centinel B, Oktay D, Bulent O, Akkus E, Alan C, Can G. Are there any factors predicting the cure and complication rates of tension-free vaginal tape? *Int Urogynecol J.* 2004; 15:188–193.
34. Sevestre S, Ciofu C, Deval B, Traxer O, Amerenco G, Haab F. Results of tension-free vaginal tape technique in the elderly. *European Urol.* 2003; 44:128–131.
35. Tamussino K, et al. Five year results after anti-incontinence operations. *Am J Obstet Gynecol.* 1999; 181:1347–1352. [PubMed: 10601911]
36. Carr LK, Walsh PJ, Abraham VE, Webster GD. Favorable outcome of pubovaginal slings for geriatric women with stress incontinence. *J Urol.* 1997; 157:125–128. [PubMed: 8976232]
37. Madoff, RD. Surgery for fecal incontinence in women. In: Abrams, P., editor. *Incontinence.* France: Health Publications Ltd; 2005. p. 1565-1588.
38. Katz, PR.; Grossberg, GT.; Potter, JF.; Potter, JF.; Solomon, DH. *Geriatrics Syllabus for Specialists.* New York: American Geriatrics Society; 2002.
39. Roizen, M.; Cohn, S. Preoperative evaluation for elective surgery: What laboratory tests are needed?. In: Stoelting, R., editor. *Advances in Anesthesia.* Vol. vol 10. Chicago: Mosby-Year Book; 1993. p. 25-43.

40. Eagle KA, Berger PB, Calkins H, Chaitman BR, Ewy A, Fleischmann KE, et al. ACC/AHA guideline update for perioperative cardiovascular evaluation for noncardiac surgery: executive summary : a report of the American College of Cardiology/American Heart Association Task force on practice guidelines (Committee to update the 1996 guidelines on perioperative cardiovascular evaluation for noncardiac surgery). *Circulation*. 2002; 105:1257–1267. [PubMed: 11889023]
41. Bitondo Dyer C, Ashton CM, Teasdale TA. Postoperative delirium. *Arch Intern Med*. 1995; 155:461–465. [PubMed: 7864702]
42. Richter HE, Redden DT, Duxbury AS, Granieri EC, Halli AD, Goode PS. Pelvic floor surgery in the older woman: enhanced compared with usual preoperative assessment. *Obstet Gynecol*. 2005; 105:800–807. [PubMed: 15802408]
43. Williams-Russo P, Sharrock NE, Mattis S, Szatrowski TP, Charlson ME. Cognitive effects after epidural vs general anesthesia in older adults. *JAMA*. 1995; 274:44–50. [PubMed: 7791257]
44. Segal JL, Owens G, Silva WA, Kleeman SD, Pauls R, Karram MM. A randomized trial of local anesthesia with intravenous sedation vs general anesthesia for the vaginal correction of pelvic organ prolapse. *Int Urogynecol J*. 2007; 18:807–882.
45. Kurz A, Sessler DI, Lenhardt R. Perioperative normothermia to reduce the incidence of surgical-wound infection and shorten hospitalization. *N Engl J Med*. 1996; 334:1209–1212. [PubMed: 8606715]
46. ACOG Practice Bulletin No. 74 Antibiotic Prophylaxis for Gynecologic Procedures. *Obstet Gynecol*. 2006; 108:225. [PubMed: 16816087]
47. Bombeli T, Spahn DR. Updates in perioperative coagulation: physiology and management of thromboembolism and haemorrhage. *Br J Anaesth*. 2004; 93:275–287.
48. Fleisher LA, Beckman JA, Brown KA, Calkins H, Chaikof E, Fleischmann KE, et al. ACC/AHA 2006 Guideline update on perioperative cardiovascular evaluation for noncardiac surgery: focused update on perioperative beta-blocker therapy: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing committee to update the 2002 guidelines on perioperative cardiovascular evaluation for noncardiac surgery). *Circulation*. 2006; 113:2662–2674. [PubMed: 16754815]
49. Manku K, Bacchetti P, Leung JM. Prognostic significance of postoperative in-hospital complications in elderly patients. Long term survival. *Anest Analg*. 2003; 96:586–589.
50. Morse AN, Labin LC, Young SB, Aronson MP, Gurwitz JH. Exclusion of elderly women from published randomized trials of stress incontinence surgery. *Obstet Gynecol*. 2004; 104:498–503. [PubMed: 15339759]

Figure 1.
Anatomical vaginal support levels. Reprinted with permission.

Figure 2. Physiological functional reserve as function of aging. Reprinted from Muravchick S: Anesthesia for the elderly. In: Anesthesia, 5th ed. Edited by RF Cucchiara, ED Miller Jr, JG Reves, MF Roizen and JJ Savarese. Philadelphia: Churchill Livingstone 2000; p 2140.

Table 1

Pelvic floor surgery outcomes in the older woman

References	Study Details	Morbidity + Mortality/Outcomes	Comments
Barber et al ⁹	Quality of life analysis of 79 pts 65 yrs or older, obliterative vs reconstructive pelvic surgery, prospective	Significant improvement in quality of life scales as well as anatomical variables, periop complications similar between groups, no reported mortality	No difference in subjective outcomes between groups, longer operating room time for reconstructive surgery (180 vs 150 mins)
Richter et al ¹⁰	Effect of age on periop complications in 322 pts, sacrocolpopexy, prospective RCT	Mortality rate 0.0%, no difference in complications based on age	Longer hospital stay in pts 70 yrs or older (3.1 vs 2.7 days), no difference in anatomical or subjective outcomes based on age
Sung et al ¹¹	Effect of age on morbidity and mortality in 264,340 pts, urogynecological surgery	Mortality increased with pt age, mortality risk 2.8/1,000 pts 80 years or older, periop complications increased with pt age older than 80 yrs	Obliterative procedures had fewer periop complications than reconstructive procedure
Friedman et al ¹²	120 Pts 80 yrs or older vs 1,497 pts 50 to 70 yrs, major gynecological surgery (benign, urogynecological and gynecological oncology), retrospective	Mortality rate 0.83% vs 0.47% (not significant), complication rate 44.4% vs 36.6% (not significant)	Higher postop UTI, sepsis, psychiatric disorder and cardiopulmonary complication rates, higher baseline comorbidities and increased LOS in older group
Stepp et al ¹³	267 Pts 75 yrs or older, urogynecological surgery, review of periop complications	Mortality rate 0.7%, intraop complication rate 5.2%, periop complication rate 25.8%	Risk factors for increased periop complications were length of surgery, CAD and PVD
Schweitzer et al ¹⁴	87 Pts 80 yrs or older, prolapse surgery outcomes, chart review and questionnaire	1 postop death, 1 CVA, 13 postop mental changes, 21 transfusions, 18 UTIs	Satisfaction rate 88%, no symptomatic failures at 28 mo mean followup, mean hospital stay 10 days
Carey and Leach ¹⁵	31 Pts 80 yrs or older vs 234 controls younger than 80 yrs, urogynecological surgery, prospective	No mortality, no periop complications reported	Subjective prolapse cure 90% at 21 mo mean followup, POP and UI outcomes not different between age groups, persistent urgency more common in older group
Moore and Miklos ¹⁶	30 Pts 65 yrs or older, colpocleisis and TVT, retrospective	No mortality, 1 postop MI, 1 urinary retention requiring urethrolisis	Mean age 79.2 yrs, mean followup 19 mos, SUI cure rate 94%, prolapse failure rate 10%, intravenous sedation and local anesthesia
Vetere et al ¹⁷	34 Pts 65 yrs or older, prolapse surgery in older pts, retrospective	No mortality, 17/34 febrile, 1 wound infection, 2 transfusions, 1 cardiac event	Mean age 75 yrs, mean followup 12 mos, prolapse failure rate 6%, general anesthesia, mean LOS 5.2 days

Table 2

TVT outcomes in the older woman

References	Study Details	Outcomes	Comments
Hellberg et al ²⁵	113 Pts 75 yrs or older vs younger cohort, TVT, retrospective	Mean followup 5.7 yrs, cure rate 55.7% vs 79.7% in older vs younger cohort, respectively	Mixed UI, UTI and previous surgery not related to outcomes
Touloupidis et al ²⁶	51 Pts 65 yrs or older, TVT, retrospective	SUI cure rate 96%, followup 35.6 mos (range 14–60), mailed questionnaire	9.8% De novo urgency, max urine flow rate unchanged before vs after surgery
Liapis et al ²⁷	51 Pts 65 yrs or older, TVT	Objective followup, greater than 12 mos, 76% dry	Better outcome with preop hypermobile urethra
Gordon et al ²⁸	123 Pts 70 yrs or older vs 208 younger than 70 (control group), TVT, prospective	Objective followup, mean $\pm$ SD followup 26 $\pm$ 13 mos, persistent SUI 7% in older group vs 6% in younger group	De novo postop urge UI more common in older group (18% vs 4%), older group with 2 cases of pulmonary thromboembolism, 1 DVT, 2 cardiac arrhythmia and 1 pneumonia
Pugsley et al ²⁹	34 Pts 70 yrs or older vs 192 younger controls, colposuspension vs TVT, retrospective	Subjective measure, 3 mo postop cure or improvement for TVT was 77.3% vs 89.3% and for colposuspension was 81.8% vs 89.4% in older vs younger pts, respectively	Post op voiding dysfunction, UTI and irritative symptoms more common in older group with either surgery
Allahdin et al ³⁰	179 Pts, 3 age cohorts of 30–49, 50–69 and 70–90 yrs, TVT for SUI, prospective	1 yr subjective cure rate 84.9%, 81.3% and 85.3% in each respective cohort	Higher incidence of postop urgency in older cohort (9.5%)
Walsh et al ³¹	21 Pts 70 yrs or older vs 46 younger than 70 yrs (control group), prospective	Significant improvement of SUI, urge UI, frequency and urgency in both groups on King's Health Questionnaire, mean followup 9–12 mos	Younger cohort had better improvement scores, older cohort had more previous surgery for SUI
Karantanis et al ³²	34 Pts 65 yrs or older vs younger group, case control	Followup 6–23 mos, subjective continence cure rate 45% vs 73% and satisfaction rate 90% vs 100% in older vs younger pts, respectively	Older group had lower outcome satisfaction, equivalent postop urge symptoms
Cetinel et al ³³	75 Pts, median age 51.2 yrs (range 33–69), predictors for continence after TVT, prospective	Subjective and objective outcome measures, mean followup 21.6 mos, cure rate 95.9% vs 76.9% in pts younger vs older than 55 yrs, respectively	Only statistically significant parameter affecting cure rate was age greater than 55 yrs
Sevestre et al ³⁴	76 Pts 70 yrs or older	Subjective and objective measures, mean followup 24.6 mos, 67% cured, 82% satisfied	De novo urgency rate 21%, preop urgency cured in 46%