Gabra et al. Gynecological Surgery (2021) 18:15
https://doi.org/10.1186/s10397-021-01098-3

Gynecological Surgery

ORIGINAL ARTICLE Open Access

Laparoscopic uterosacral ligament suspension versus sacrospinous ligament fixation for apical prolapse: perioperative outcomes

Martina G. Gabra[1*], Veronica Winget[1], Mohammad T. Torabi[2], Ilana Addis[1], Kenneth Hatch[1] and John Heusinkveld[1]

Abstract

Background: Pelvic organ prolapse can be repaired vaginally or laparoscopically. Studies comparing vaginal repair with sacrospinous ligament fixation (SSLF) or uterosacral ligament suspension (V-USLS) have found no difference in functional or adverse outcomes. Laparoscopic USLS (L-USLS) is becoming a popular treatment for pelvic organ prolapse because it has a low rate of ureteral compromise. To date, no studies have compared perioperative outcomes between L-USLS and SSLF. The objective of this study is to compare the rates of perioperative complications between these two methods.

Methods: This was a retrospective chart review of 243 consecutive patients who underwent L-USLS or SSLF at one institution between March 2017 and August 2019 for apical pelvic organ prolapse. Descriptive data was analyzed as appropriate with Student's t tests and chi-square. Univariable logistic regression analysis was performed to assess predictors of perioperative complications.

Results: Preoperative Pelvic Organ Prolapse Quantification Stage (POP-Q) was similar between the two cohorts ($p = 0.23$). After adjusting for confounding factors, L-USLS was associated with a longer operative time (118 vs 142 min, $p < 0.01$) and shorter length of hospitalization (0.68 vs 1.06 days, $p < 0.01$). The estimated blood loss between the procedures was not statistically significant after adjusting for confounding factors. There was no difference in perioperative complication rates between L-USLS and SSLF (5% vs 7%, $p = 0.55$). No clinical risk factors were significantly associated with perioperative complications.

Conclusion: We did not find a difference in complications between L-USLS and SSLF.

Keywords: Laparoscopic uterosacral ligament suspension, Perioperative complications, Sacrospinous ligament fixation

* Correspondence: mgabra@arizona.edu
[1]Department of Obstetrics and Gynecology, University of Arizona, Tucson, USA
Full list of author information is available at the end of the article

Background

Pelvic organ prolapse can affect quality of life by leading to urinary retention, constipation, discomfort with intercourse, or vaginal erosion and infection. Up to 13% of women will undergo surgery for pelvic organ prolapse in their lifetime [1]. Surgical repairs are performed with native tissue or synthetic mesh. Due to concerns regarding mesh complications, more patients are choosing to avoid the use of synthetic mesh for pelvic organ prolapse repair [2]. Vaginal uterosacral ligament suspension (V-USLS) and sacrospinous ligament fixation (SSLF) are methods of native tissue treatment of apical pelvic organ prolapse. Barber et al. found no difference in anatomic, functional, or adverse event outcomes at 2-year follow-up between V-USLS and SSLF [3]. The laparoscopic approach to USLS (L-USLS) is gaining more widespread use because it allows full visualization of the uterosacral ligament, allowing suspension at a higher point along the uterosacral ligament. Studies comparing L-USLS to V-USLS showed a lower risk of ureteral compromise compared to V-USLS [4–6]. In addition, Turner et al. found no significant difference in prolapse recurrence between L-USLS and V-USLS [7]. To date, there are no studies comparing perioperative complications and surgical outcomes between L-USLS and SSLF to guide patient counseling. The primary objective of this study was to determine the rate of perioperative complications between L-USLS and SSLF.

Methods

A retrospective chart review was performed on 243 consecutive patients who underwent L-USLS or SSLF from 1 March 2017 to 31 August 2019. All surgeries were performed at Banner-University Medical Center Tucson, an academic hospital system associated with the University of Arizona. There are three faculties that perform the majority of urogynecologic procedures (JH, KH, IA). University of Arizona and Banner Hospital Institutional Review Board exemption was granted for this study.

All patients were evaluated in clinic by an attending physician preoperatively. They were assessed for Pelvic Organ Prolapse Quantification (POP-Q) Stage [8]. Patients were evaluated for occult stress urinary incontinence at the discretion of their physician. Leading edge information was translated to POP-Q Stage. Demographic, surgical and medical history, intraoperative course, postoperative complications, and postoperative follow-up data were collected from the electronic medical record. Pertinent medical history was defined as any diagnoses from the Charlson Comorbidity Index because it has been shown to be an independent predictor of surgical mortality as well as long-term survival [9]. These diagnoses include history of myocardial infarction, congestive heart failure, peripheral vascular disease, transient ischemic attack, dementia, chronic obstructive pulmonary disease, connective tissue disease, peptic ulcer disease, liver disease, diabetes mellitus, chronic kidney disease, hemiplegia, or current cancer.

L-USLS was performed bilaterally, except in one case where unilateral suspension was performed due to adhesions. L-USLS was performed by plicating the bilateral uterosacral ligaments with 2-0 polyethylene terephthalate suture. SSLF was performed bilaterally in all but 10 cases and involved suspending the vaginal apex to the sacrospinous ligaments with the Capio suture-capturing device and 0-polydioxanone suture. Resident physicians participated in all surgical cases. The majority of patients underwent concomitant procedures including posterior colporrhaphy, anterior colporrhaphy, midurethral sling, or salpingo-oophorectomy.

The primary objective of this study was to evaluate the overall rate of perioperative complications. Overall perioperative complication rate was assessed to allow better detection of differences between the two surgical approaches. Perioperative complications include both intraoperative and postoperative complications within 30 days of surgery. Complications were defined as conversion to laparotomy, cystotomy, ureteral injury/kinking/need for suture release, bowel injury, take back to the operating room, blood transfusion, deep vein thrombosis (DVT), pulmonary emboli (PE), ileus or small bowel obstruction (SBO), wound infection, hernia formation, pelvic abscess, and hospital re-admission. Other outcome data that was collected included new buttock pain or new pelvic pain after discharge from the hospital, urinary tract infection, and urinary retention. Urinary tract infection was defined as patient report of urinary symptoms and a positive urine culture. Urinary retention was defined as inability to spontaneously void postoperatively requiring discharge to home with a catheter.

P values were calculated from Student's t tests for continuous variables and chi-square for categorical variables. Univariable logistic regression analysis was performed to assess predictors of perioperative complications. A p value < 0.05 was considered statistically significant. Statistical analysis was performed using SPSS Statistical software, v.27.0 Armonk, NY, IBM Inc.

Results

Between March 2017 and August 2019, 243 patients underwent L-USLS or SSLF. One patient in the L-USLS cohort was excluded due to planned concomitant bowel resection and 10 patients in the SSLF cohort were excluded (7 due to vaginal mesh use, 1 due to vaginal mesh excision, 1 due to concomitant umbilical hernia repair, and 1 due to sphincteroplasty). A total of 113 women in the L-USLS and 109 women in the SSLF cohort were included in the analysis. Overall, baseline characteristics

were similar between the two groups (Table 1). Women in the SSLF cohort were older than those in the L-USLS cohort (63 vs 59, $p = 0.02$). In addition, women who underwent SSLF were more likely to be post-menopausal, have a prior hysterectomy, and have a prior surgery for pelvic organ prolapse (all with $p < 0.05$). There were no differences in POP-Q measurements between groups, $p = 0.86$.

Concomitant procedures and intraoperative data are presented in Table 2. Hysterectomy was performed in 87% of patients in the L-USLS cohort and 54% of patients in the SSLF cohort ($p < 0.01$). Uterine sparing hysteropexy was performed in 9 patients; 2 in the L-USLS group, and 7 in the SSLF group. Fewer anterior and posterior vaginal repairs were required for L-USLS compared to SSLF (4% vs 61% and 45% vs 71% respectively, both $p < 0.01$). Total operative time was longer for the L-USLS cohort (140 vs 118 minutes, $p < 0.01$). In addition, average blood loss was lower in the L-USLS cohort (120 vs 152 mL, $p = 0.02$) and length of admission was shorter in the L-USLS cohort (0.68 vs 1.06 days, $p = < 0.01$). After adjusted for age, comorbidities, and concurrent procedures (hysterectomy, anterior repair, posterior repair, BSO, and MUS), the length of admission and operative time remained statistically significant, but blood loss was no longer statistically significant.

There was a similar rate of perioperative complications in both groups (5% vs 7%, $p = 0.55$) (Table 3). Using the Clavien-Dindo grading scale, in the L-USLS cohort, there were 2 grade one complications, 5 grade two complications, and 2 grade three complications. In the SSLF cohort, there were 2 grade one complications, 4 grade two

Table 1 Clinical characteristics of study cohort

	USLS ($N = 113$)	SSLF ($N = 109$)	p value
Age (mean) [a]	59 (± 13)	63 (± 12)	**0.03**
BMI [a]	28 (± 5)	28 (± 6)	0.88
Obesity (BMI ≥ 30) [b]	36 (32)	34 (32)	0.95
Ethnicity [b]			0.39
Hispanic	33 (29)	26 (24)	
Non-Hispanic	80 (71)	82 (76)	
Race [b]			0.42
Black	1 (1)	1 (1)	
White	102 (94)	94 (86)	
Other	6 (6)	11 (10)	
Medical problems [b,c]	23 (20)	28 (26)	0.35
Smoking history [b]			0.23
Never	70 (62)	79 (72)	
Current	12 (11)	7 (6)	
Former	31 (27)	23 (21)	
Parity [b]			0.53
0	6 (5)	1 (1)	
1	14 (12)	11 (10)	
2	31 (27)	37 (34)	
3+	62 (55)	56 (51)	
Post-menopausal [b]	85 (75)	94 (86)	**0.04**
Prior hysterectomy [b]	13 (12)	44 (40)	**< 0.01**
Prior surgery for pelvic organ prolapse [b]	9 (8)	22 (20)	**0.01**
Baseline POP-Q stage [b]			0.19
Stage 2	63 (55)	52 (48)	
Stage 3	47 (42)	48 (44)	
Stage 4	3 (3)	9 (8)	

BMI body mass index, *POP-Q* pelvic organ prolapse quantification
[a]Data expressed as mean ± standard deviation for continuous variables
[b]Data expressed as N (%) for categorical variables
[c]Medical comorbidities is defined as 1 or more disorder on the Charlson Comorbidity Index

Table 2 Intra-operative characteristics

	L-USLS	SSLF	*p* value
Concomitant surgery [a]			
Hysterectomy	98 (87)	58 (53)	**< 0.01**
Uterine sparing/hysteropexy	2 (2)	7 (6)	0.10
Trachelectomy	2 (2)	1 (1)	0.54
Anterior repair	4 (4)	66 (61)	**< 0.01**
Posterior repair	51 (45)	77 (71)	**< 0.01**
MUS	14 (12)	32 (29)	**< 0.01**
BSO	8 (7)	14 (13)	0.15
Operative time (min) [b]	142 (± 31)	118 (± 42)	**< 0.01**
EBL (mL) [b]	120 (± 119)	153 (± 89)	**0.02**
Length of admission (days) [b]	0.68 (± 0.57)	1.06 (± 0.6)	**< 0.01**
0 days [a]	42 (38)	12 (11)	
1 day[a]	65 (60)	82 (77)	
2 days[a]	6 (5)	11 (10)	
3 days[a]	0 (0)	4 (4)	

MUS midurethral sling, *BSO* bilateral salpingo-oophorectomy, *EBL* estimated blood loss
[a]Data expressed as n (%) for categorical variables
[b]Data expressed as mean ± standard deviation for continuous variables

complication, and 3 grade three complications. There was one cystotomy in both the L-USLS and SSLF cohorts, and one bowel injury in the SSLF cohort. All were recognized intraoperatively and repaired without postoperative sequelae. One patient in the SSLF cohort was taken back to the OR due to bleeding at the vaginal cuff that was identified in the postoperative care unit. One patient in the L-USLS group experienced a small bowel obstruction which required bowel resection. This patient had a complex surgical history with resulting dense abdominal adhesions. There were two readmissions in each group; two for pneumonia, one for enterocolitis, and one for vaginal bleeding which did not require any intervention.

Univariable logistic regression comparing outcomes between the two groups did not identify risk factors for complications (Table 4). Multivariable logistic regression was not performed due to the small number of complications identified.

Postoperative urinary retention was common; it affected 24% of women in the L-USLS cohort and 15% of women in the SSLF cohort (p = 0.08). Two women in the L-USLS cohort experienced persistent urinary retention after sling placement and required sling release. Urinary retention resolved in all women in the SSLF cohort. Urinary tract infection occurred in 5% of women in the L-USLS cohort and 9% of women in the SSLF cohort (p = 0.27). Ten women in the SSLF cohort experienced gluteal pain postoperatively; 9 had resolution of pain within 3 months, and 1 required removal of sutures 4 months postoperatively due to persistent pain. Two women in the L-USLS cohort and one woman in the SSLF cohort experienced new pelvic pain postoperatively. In the L-USLS cohort, one woman required local analgesic injection and the other required PT due to

Table 3 Perioperative complications

	L-USLS, N (%)	SSLF, N (%)	*p* value
Major complications overall	6 (5)	8 (7)	0.53
Conversion to open	0 (0)	0 (0)	NA
Cystotomy	1 (1)	1 (1)	0.99
Ureteral injury	0 (0)	0 (0)	NA
Enterotomy	0 (0)	1 (1)	0.31
Take back to the OR [a]	0 (0)	1 (1)	0.31
DVT or PE	0 (0)	0 (0)	NA
Ileus or small bowel obstruction	1 (1)	0 (0)	0.32
Wound infection	2 (2)	2 (2)	0.98
Blood transfusion	2 (2)	0 (0)	0.16
Pelvic abscess	1 (1)	2 (2)	0.55
Re-admission within 30 days	2 (2)	2 (2)	0.98
Urinary retention [b]	27 (24)	16 (15)	0.08
Urinary tract infection	6 (5)	10 (9)	0.27
Pelvic pain	2 (2)	1 (1)	0.58
Gluteal pain	0 (0)	10 (9)	**< 0.01**
Suture removal	0 (0)	1 (1)	0.31

DVT deep vein thrombosis, *PE* pulmonary embolism
[a] Re-operation during same admission for surgical complication, does not include re-operation for recurrent pelvic organ prolapse
[b]Urinary retention was defined as inability to spontaneously void requiring discharge to home with a foley catheter

Table 4 Univariable logistic regression analysis for predictors of perioperative complications

Predictors	Unadjusted OR	95% CI	*p* value
Route (L-USLS vs SSLF)	1.86	0.99–3.49	0.06
Age	1.01	0.99–1.04	0.43
BMI	0.98	0.93–1.04	0.45
Obesity (BMI ≥ 30)	0.82	0.42–1.61	0.56
Medical comorbidities [a]	1.13	0.55–2.33	0.74
Current or former smoking	1.20	0.63–2.29	0.58
Parity	0.96	0.78–1.18	0.71
Prior surgery for pelvic organ prolapse	1.14	0.48–2.72	0.77
Concomitant hysterectomy	1.63	0.80–3.35	0.18
Anterior or Posterior repair	0.75	0.40–1.42	0.37
EBL	0.99	1.00–1.00	0.44
Operating time	1.0	0.99–1.01	0.58
Length of admission	0.81	0.48–1.36	0.42

OR odds ratio, *CI* confidence interval, *BMI* body mass index, *EBL* estimated blood loss
[a]Medical comorbidities is defined as 1 or more disorder on the Charlson Comorbidity Index

pain. Both patients had resolution of pain at last follow-up. In the SSLF cohort, the patient experienced pelvic pain related to mesh used for the midurethral sling and underwent sling excision. The patient had resolution of pain following that procedure.

The median follow-up in this cohort was 7 weeks (IQR 5.4–22.2 weeks), defined as date of surgery to last office appointment. Postoperative POP-Q information was available for 89% of patients in the L-USLS cohort and 91% of patients in the SSLF cohort. At last clinic follow-up, approximately 82% of patients in both groups had stage 0 or stage 1 prolapse (p = 0.76). In patients with follow-up beyond 3 months, we aimed to characterize the short-term rate of recurrent prolapse (Table 5). Prolapse recurrence was defined as prolapse of any compartment (anterior, apical, or posterior) beyond the hymen or retreatment for prolapse by either surgery or pessary. Recurrent pelvic organ prolapse occurred in 8 patients in the L-USLS cohort and 9 patients in the SSLF cohort (7% vs 7%, p = 0.43). Apical prolapse occurred in five patients in the L-USLS cohort, four underwent laparoscopic sacrocolpopexy, and one underwent SSLF. Two patients in the SSLF cohort had apical prolapse, one underwent repeat SSLF, and one elected for conservative management with physical therapy.

Table 5 Postoperative characteristics and recurrence

Characteristic	L-USLS, N (%)	SSLF, N (%)	*p* value
Postoperative POP-Q Stage [a]			0.76
Stage 0	81 (72)	76 (70)	
Stage 1	12 (11)	13 (12)	
Stage 2	8 (7)	8 (7)	
Stage 3	0 (0)	1 (1)	
Stage 4	0 (0)	0 (0)	
Recurrent symptomatic prolapse	8 (7)	9 (7)	0.74
POP-Q Stage 2	8 (7)	8 (7)	
POP-Q Stage 3	0 (0)	1 (1)	
POP-Q Stage 4	0 (0)	0 (0)	

POP-Q pelvic organ prolapse quantification
[a]Postoperative POP-Q data was missing for 23 patients

Discussion

There was no statistically significant difference in perioperative complications between L-USLS and SSLF in this study. Compared to the SSLF cohort, those in the L-USLS cohort had a lower EBL and length of hospital admission but longer operative time. However, after adjusting for confounding variables (including age, concurrent hysterectomy, anterior repair, posterior repair, and MUS), the difference in EBL was no longer significant. Of note, the length of hospital admission in the SSLF group was likely confounded by physician practice to admit patients who have undergone extensive vaginal repairs or vaginal hysterectomy for overnight observation.

Operative time for L-USLS in this study was similar to that reported by Barber et al. for V-USLS (140 min vs 146 min, respectively) [3]. The length of hospital admission in the L-USLS group was shorter than that reported for V-USLS (0.7 vs 2.4 days). This shortened length of admission was notable because 87% of patients underwent hysterectomy; however, 38% were discharged on postoperative day 0 and 60% were discharged on postoperative day 1. In addition, there was no ureteral injury or compromise in the L-USLS cohort, which is consistent with prior studies that report a 0% rate of ureteral compromise [6, 10–12]. The low rate of ureteral injury is postulated to be due to the

laparoscopic approach allowing visualization of the ureter course to avoid ureter injury or kinking. This is a potential advantage over V-USLS as it has been associated with a 3–8% incidence of ureteral compromise [3, 13].

Strengths of this study include well defined intraoperative and postoperative complications. Complications would be identified intra-operatively or during the inpatient postoperative period. This study is limited by its retrospective nature; data collected was limited to that documented in the chart. In addition, there were some patients with limited long-term clinical follow-up. Patients were referred for treatment by their primary gynecologists and resumed care with the referring physician after they were judged to be fully recovered from surgery. It is therefore possible that some postoperative complications or recurrences were treated at an outside facility. In addition, all L-USLS and SSLF procedures were included, regardless of whether a concomitant hysterectomy or hysteropexy was performed, which may alter the recurrence rate. Finally, there is a potential for selection bias—the factors that led a surgeon and patient to choose L-USLS or SSLF were not formally assessed.

Conclusion

In conclusion, there was not a statistically significant difference in perioperative complications between L-USLS and SSLF. A post hoc power analysis was performed, and 2200 subjects per arm would be needed to detect a difference in perioperative complications with 80% power and alpha 0.05. Given these unattainable sample sizes, the outcomes of this study are likely clinically similar. Randomized controlled trials comparing L-USLS and SSLF are needed to determine long-term prolapse recurrence rates.

Abbreviations

L-USLS: Laparoscopic uterosacral ligament suspension; V-USLS: Vaginal uterosacral ligament suspension; SSLF: Sacrospinous ligament fixation; POP-Q: Pelvic Organ Prolapse Quantification Stage; BMI: Body mass index; DVT: Deep vein thrombosis; PE: Pulmonary emboli; SBO: Small bowel obstruction; EBL: Estimated blood loss; MUS: Midurethral sling; BSO: Bilateral salpingo-oophorectomy

Acknowledgements

We would like to acknowledge Dr. Kenneth Hatch for his contribution to this manuscript.

Authors' contributions

M.G: project development, data collection, manuscript writing. V.W: manuscript writing. M.T: statistical analysis, manuscript writing. I.A: project development, manuscript writing. K.H: manuscript writing. J.H: project development, manuscript writing. All authors read and approved the final manuscript.

Funding

This research was not supported by external funds.

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to restrictions from the Institutional Review Board of the University of Arizona and Banner University Medical Center.

Declarations

Ethics approval and consent to participate

This retrospective study received an exemption from the Institutional Review Board of the University of Arizona and Banner University Medical Center.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

Author details

[1]Department of Obstetrics and Gynecology, University of Arizona, Tucson, USA. [2]Research Computing in the Information Technology Services Department, University of Arizona, Tucson, USA.

Received: 3 February 2021 Accepted: 7 June 2021
Published online: 14 June 2021

References

1. Wu JM, Matthews CA, Conover MM, Pate V, Jonsson FM (2014) Lifetime risk of stress urinary incontinence or pelvic organ prolapse surgery. Obstet Gynecol 123(6):1201–1206. https://doi.org/10.1097/AOG.0000000000000286
2. Skoczylas LC, Turner LC, Wang L, Winger DG, Shepherd JP (2014) Changes in prolapse surgery trends relative to FDA notifications regarding vaginal mesh. Int Urogynecol J 25(4):471–477. https://doi.org/10.1007/s00192-013-2231-7
3. Barber MD, Brubaker L, Burgio KL et al (2014) Comparison of 2 transvaginal surgical approaches and perioperative behavioral therapy for apical vaginal prolapse: the OPTIMAL randomized trial. JAMA. 311(10):1023–1034. https://doi.org/10.1001/jama.2014.1719
4. Sze EH, Karram MM (1997) Transvaginal repair of vault prolapse: a review. Obstet Gynecol 89(3):466–475. https://doi.org/10.1016/S0029-7844(96)00337-7
5. Diwan A, Rardin CR, Strohsnitter WC, Weld A, Rosenblatt P, Kohli N (2006) Laparoscopic uterosacral ligament uterine suspension compared with vaginal hysterectomy with vaginal vault suspension for uterovaginal prolapse. Int Urogynecol J Pelvic Floor Dysfunct 17(1):79–83. https://doi.org/10.1007/s00192-005-1346-x
6. Barbier HM, Smith MZ, Eto CU et al (2015) Ureteral compromise in laparoscopic versus vaginal uterosacral ligament suspension: a retrospective cohort. Female Pelvic Med Reconstr Surg 21(6):363–368. https://doi.org/10.1097/SPV.0000000000000202
7. Turner LC, Lavelle ES, Shepherd JP (2016) Comparison of complications and prolapse recurrence between laparoscopic and vaginal uterosacral ligament suspension for the treatment of vaginal prolapse. Int Urogynecol J 27(5):797–803. https://doi.org/10.1007/s00192-015-2897-0
8. Bump RC, Mattiasson A, Bø K et al (1996) The standardization of terminology of female pelvic organ prolapse and pelvic floor dysfunction. Am J Obstet Gynecol 175(1):10–17. https://doi.org/10.1016/s0002-9378(96)70243-0
9. Charlson ME, Pompei P, Ales KL, MacKenzie CR (1987) A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis 40(5):373–383. https://doi.org/10.1016/0021-9681(87)90171-8
10. Rardin CR, Erekson EA, Sung VW, Ward RM, Myers DL (2009) Uterosacral colpopexy at the time of vaginal hysterectomy: comparison of laparoscopic and vaginal approaches. J Reprod Med 54(5):273–280
11. Filmar GA, Fisher HW, Aranda E, Lotze PM (2014) Laparoscopic uterosacral ligament suspension and sacral colpopexy: results and complications. Int Urogynecol J 25(12):1645–1653. https://doi.org/10.1007/s00192-014-2407-9
12. Lin LL, Phelps JY, Liu CY (2005) Laparoscopic vaginal vault suspension using uterosacral ligaments: a review of 133 cases. J Minim Invasive Gynecol 12(3):216–220. https://doi.org/10.1016/j.jmig.2005.03.014
13. Barber MD, Visco AG, Weidner AC, Amundsen CL, Bump RC (2000) Bilateral uterosacral ligament vaginal vault suspension with site-specific endopelvic fascia defect repair for treatment of pelvic organ prolapse. Am J Obstet Gynecol 183(6):1402–1410; discussion 1410-1. https://doi.org/10.1067/mob.2000.111298

Publisher's Note