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Pelvik Organ Prolapsusu Cerrahi Onarımında Nüks Oranlarımız

Our Recurrence Ratios in Pelvic Organ Prolapse Surgical Repair

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ÖZ

GİRİŞ ve AMAÇ: *Bu çalışmanın amacı, pelvik organ prolapsusu cerrahi onarımının nüks oranlarını değerlendirmektir.*

YÖNTEM ve GEREÇLER: *Haziran 2012 ile Mayıs 2017 tarihleri arasında rastgele seçilen 126 kadına pelvik organ prolapsusu cerrahi onarımı yapıldı. Evreleme için POP-Q Sistemini kullandık. Hastalar dört gruba ayrıldı; ön onarım grubu (n = 64), arka onarım grubu (n = 29), ön-arka onarım grubu (n = 13) ve vajen kubbe prolapsusu grubu (n = 20).*

BULGULAR: *126 hastanın yaş ortalaması 58.5 ± 10.8 yıl (en az 42, en fazla 75), ortalama ağırlık 70 ± 12.7 kg (en az 48 kg, en fazla 92 kg) ve ortalama parite 3 (en az 0, en fazla 6) idi. Nüks oranlarımız ön onarım grubunda 8 (%12.5), arka onarım grubunda 7 (%24.1), ön-arka onarım grubunda 1 (%7.6), vajen kubbe prolapsusu grubunda hiçbir hasta yok şeklinde idi. Tüm durumlarda, genel nüks oranı %12.69 idi.*

TARTIŞMA ve SONUÇ: *Menopoz ile POP nüksü arasında anlamlı ilişki tespit edilmiştir. Ayrıca cerrahi teknik ile nükssüz olgular arasında da anlamlı bir ilişki bulunmuştur.*

Anahtar Kelimeler: *Pelvik organ prolapsusu, cerrahi onarım, menopoz, nüks, ön-arka onarım*

ABSTRACT

INTRODUCTION: *The objective of this study was to assess the recurrence ratios of pelvic organ prolapse surgical repair.*

METHODS: *Between June 2012 and May 2017, 126 non-randomly selected women underwent pelvic organ prolapse surgical repair. We used POP-Q System for staging. The patients were divided into four groups as follows; anterior repair group (n=64), posterior repair group (n=29), anterior-posterior repair group (n=13), and vaginal cuff prolapse group (n=20).*

RESULTS: *Mean age of the 126 patients was 58.5 ± 10.8 years (min. 42, max. 75), while mean weight was 70 ±12.7 kg (min. 48 kg, max. 92 kg) and mean parity was 3 (min. 0, max. 6). Our recurrence ratios were 8 patients (12.5%) in anterior repair group, 7 patients (24.1%) in posterior repair group, 1 patient (7.6%) in anterior-posterior repair group, and no patients in vaginal cuff prolapse group. In all cases, the overall recurrence ratio was 12.69%.*

DISCUSSION and CONCLUSION: *A significant relationship between menopause and POP recurrence was determined. A significant relationship between surgical technique and recurrence free cases was also detected.*

Keywords: *Pelvic organ prolapse, surgical repair, menopause, recurrence, anterior-posterior repair*

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INTRODUCTION

Pelvic organ prolapse (POP) is one of the most common complaints in advanced ages (1). It may be associated with genetic background, vaginal birth, aging, menopause, previous surgeries, weakening of pelvic connective tissues and high intraabdominal pressure (2).

In postmenopausal period, POP develops due to atonicity of pelvic floor tissues. Vaginal birth also causes injury in pelvic tissues (1).

Pelvic floor weakening causes prolapse of pelvic organs; uterus, urethra, bladder, small bowels and rectum (2). There has been no sagging seen at vaginal walls due to straining. In POP, hernias of organs are seen at vaginal walls due to straining. Sometimes the whole uterus prolapse may be seen especially due to menopause or multiparity (1).

Quantification of prolapse is lately described by the International Continence Society in an objective and site-specific approach. The hymen is taken as a fixed point (O). Six reference points are measured using scaled spatula, and those points are tabulated in a grid. The points above the hymen and below the hymen are defined as minus and plus, respectively. The POP-Q system classifies the stages of pelvic prolapse as no demonstrable prolapse (stage 0), all points < -1 (stage 1), lowest point within 1 cm of hymen (stage 2), lowest point >1 cm below hymen but not complete prolapse (stage 3), and complete prolapse with lowest point equal to TVL-2 (stage 4) (3).

POP repair risk for women is 11.1% (4). Approximately 30% of patients with POP repair need repair again. Recurrences are probably associated with changes in connective tissues in postmenopausal period (1).

The reasons for failure to cure prolapse include an ill-chosen operation, poor surgical technique, omission to diagnose an enterocele, shortening of the anterior vaginal wall, defects of pelvic supports, and repeated pregnancy after the operation (4). POP recurrence is multifactorial, symptoms of POP is variable, and definition of surgical success is not clear because of no correlation between POP grade and existing symptoms. Depending on the definition, the success rates of the treatment range from 19.2% to 97.2% (5). For subjective success, however, the most important point is the lack of vaginal cuff prolapse symptoms; patient satisfaction gets lower when prolapse level passes hymen postoperatively (6).The aim of this study was to assess post operative recurrence ratios of pelvic organ prolapse surgical repairs, in the same location.

MATERIALS and METHODS

This is a retrospective study of non-randomly selected 126 women who underwent POP surgical repair between June 2012 and May 2017 in the Sukgen Gynecology and Obstetrics Clinic.

The study included women with POP symptoms according to the POPQ classification (3). Women were classified as non-urinary incontinence group, anterior repair group, posterior repair group, anterior + posterior repair group, POP and urinary incontinence group, and hysterectomized vaginal cuff prolapse group. Patients who had undergone previous POP surgery (7 patients) were excluded from the study to eliminate extrinsic risk factors. All patients underwent POP surgery were evaluated preoperatively with history, pelvic-vaginal examination, urine antibiogram, ultrasound of upper urinary system and cystometric studies. Pevic examinations were conducted in dorsal lithotomy position after emptying bladder during maximum straining (Valsalva Maneuvre). After evaluating external genital and local features prolapse mass was reduced into vagina, stress test was performed and the defects were noted. POP-Q staging system is used for categorizing the patients (3). Of 126 patients with incontinence suffering, 84 were diagnosed with incontinence in stress tests, and they underwent additional incontinence surgery.

RESULTS

1. Demographic and Clinical Features of the Patients

Non-randomly selected 126 women had a mean age of 58.5 (ranging from 42 to 75). Demographic and clinical features of patients and their distributions are shown in Tables 1, 2, and 3.

Table 1. Demographic and clinical features of the patients	
Age (years)	58.5 ± 10.8 (min. 42 max. 75)
Number of Vaginal Births	3 (0-6)
Body Weight (kg)	70 ± 12.7 (min. 48 - max. 92
Menopause	91
Underwent POP Surgery	0
Underwent Other Surgeries	11
Chronic Pulmonary Disease	13
Steroid Use	6
Diabetes Mellitus	13
Hormonal Treatment	35
High Blood Pressure	22

Patients underwent POP surgical repair evaluated in 4 groups as anterior repair, posterior repair, anterior + posterior repair and vaginal cuff prolapse (operated). The age and body weight of the patients ranged from 40 to 80 and 45 kg to 85 kg, respectively (Table 2).

Table 2. Mean age and body weight of the patients		
Age (year)	**Average**	**Number of Patients**
40-50	44 ± 12.8	15
51-60	56 ± 10.9	50
61-70	64 ± 7.6	46
71-80	73 ± 8.5	15
Body Weight (kg)		
45-55	51 ± 9.7	38
56-65	62 ± 10.3	32
66-75	69 ± 11.7	23
76-85	78 ± 10.4	18
86-95	90 ± 11.6	15

The number of vaginal births ranged from 1 to 58. The highest number of prolapse location was determined as anterior wall (64) while the lowest number (7) was detected for apical wall (Table 3).

Table 3. Number of vaginal births and prolapse location of the patients	
Number of Vaginal Births	**Number of Patients**
0	2
1	10
2	58
3	39
4	11
5	5
6	1
Prolapse Location	
Anterior Wall	64
Apical Wall	8
Posterior Wall	29
Anterior + Apical Walls	12
Anterior + Posterior Walls	13

The most often conducted operations were for the anterior repair for 64 patients of which 36 were supported with mesh. The age of the patients ranged from 42 to 67 (Table 4). The lowest number of patients (5) was recorded anterior + sling operation and their age varied from 55 to 75, while in the sacral operations, only 4 patients underwent to sacrocolpopexy, and their age ranged from 61 to 65 (Table 4).

Table 4. Details of the operations and the average age of the patients		
Operations(s)	**Number of Patients**	**Age (years)**
Anterior repair	64 (36 supported with mesh)	42-67
Posterior repair	29	49-71
Anterior + posterior repair **Anterior + hysterectomy + SSF** **Anterior + sling**	13 7 6	55-75
Sacrospinous fixation-SSF (10 patients) **Uterosacral fixation-USF (6 patients)** **Sacrocolpopexy (4 patients)**	20 (12 with anterior + apical repair, 8 with apical repair)	61-65

The recurrences were recorded for anterior repair group (7), posterior repair group (6), and anterior + posterior repair group (1), while no recurrence was recorded for the vaginal cuff prolapse group.

2. Anterior Repair Group

64 patients (of 36 supported with mesh) with ages between 42 and 67 underwent anterior repair, and as additional operation; 19 urethral slings, 9 hysterectomy + SSF + urethral sling, 5 hysterectomy + SSF + TOT and 4 TOT were conducted. After these operations, recurrence occurred in 8 patients (Table 5).

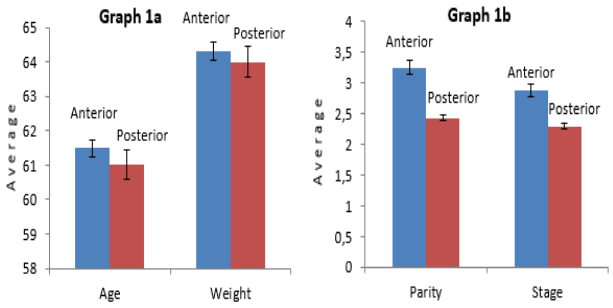
Table 5. Recurrences in anterior and posterior repair groups

Patient	Age (years)		Weight (kg)		Parity		Stage	
	Anterior	Posterior	Anterior	Posterior	Anterior	Posterior	Anterior	Posterior
1	52	53	92	55	3	2	3	2
2	54	57	50	67	5	2	3	2
3	56	62	61	56	3	3	2	2
4	57	67	56	53	2	3	4	3
5	72	55	89	80	4	3	3	2
6	65	57	55	86	3	2	3	2
7	65	75	59	51	4	2	2	3
8	71		52		2		3	
Average	61.5	60.9	64.3	64.0	3.3	2.4	2.9	2.3

Of the patients performed anterior and additional procedures, the oldest patient was 72 years old. Two patients had obesity, 2 patients were with vaginal birth, 1 patient was with 5 parities, 5 patients were with stage 3 and 1 patient was with stage 4. Patients with recurrences in anterior repair group were without mesh support.

3. Posterior Repair Group

In posterior repair group, the oldest patient was 75 years old, and 2 had obesity. Vaginal births varied between 2 and 3. Just 2 patients were in high stage (stage 3) (Table 5). The average values for parity and stage displayed a difference with respect to anterior and posterior repairs while the average age and average weight values were very close to one another (Graph 1).



Graph 1. Average values of age, weight (Graph 1a), parity and stage (Graph 1b) of the patients. Standard error was less than 5% in all cases.

4. Anterior-Posterior Repair Group

Of 13 patients anterior + posterior repair was performed, 7 patients got hysterectomy + SSF, and 6 patients got urethral sling procedure additionally. Recurrence in anterior - posterior repair group was observed in one patient who was 60 years old in stage 3 with 54 kg weight and 2 parities.

5. Vaginal Cuff Prolapse Group

Patients underwent surgery due to vaginal cuff prolapse were in menopause and with hysterectomy. Of the vaginal cuff prolapse group's patients, sacrospinous fixation performed to 10, uterosacral fixation to 6 and sacrocolpopexy to 4 patients. 12 of all patients had anterior + apical repair, and 8 had just apical repair. In postoperative follow-ups, no recurrence was seen.

DISCUSSION

This study was done to determine the ratios of POP recurrence in the same anatomic location after POP repair. The results revealed an overall recurrence raito of 12.69% along with a significant relationship between menopause and POP recurrence. A significant relationship between surgical technique and recurrence rate was also detected. According to the previous studies, major risk factors for POP recurrence are vaginal birth, parity, age, increased intraabdominal pressure and obesity (8).

In our study, mean age was 58.5 ± 10.8 which is a relatively high age level. In two studies, younger patients were compared with 60 years or older ones, and younger age was seen as a significant risk factor for POP recurrence after surgery (9-10). In other studies in which age was arranged as older than 70 years or variable, no significant association were found (11-12).

Prolapse recurrence may be due to failed surgery as well. There is a lack of both surgical success and surgical failure in POP repair. It may also be due to pelvic floor's weakening of endopelvic connective tissues.

Anterior repair or anterior colporrhaphy is used for surgical treatment of cystocele and mild or moderate severity cases of stress incontinence. Anterior colporrhaphy includes plication of fibromusculer layer (pubocervical facia) in midline (13). Repairing of thinning or torn endopelvic facia in midline is possible, and anterior colporrhaphy i.e. cyctocele repair is the most common surgical procedure applied for POP repair. From 30% up to a high rate of 70% recurrence ratios of conventional anterior colporraphy have been reported (14-16).

To improve results of cyctocele repair, several modifications have been developed. By developing synthetic meshes, the technical differences of surgery have been left behind. The causes of cyctocele recurrence haven't been identified yet, and the studies comparing different surgical procedures are not sufficient. Many studies have reported that the results of surgical repairs with meshes are more successful than that of conventional surgeries. However, the meshes have been routinely used because of their complications (17-18).

In a study by Weber et al., women with POP recurrence and without recurrence are compared, and they haven't determined significant effects of age, parity and menopause in follow up (16,19). However, stage 3 prolapse might be the only significant risk for which recurrence was mentioned. In all of our cases with recurrence, using no meshes was technically likely to trigger recurrence. Six patients of anterior group were with high stage. Also Weber at al. reported high risk of POP recurrence after repair in a study of patients with stage 3 and with higher stages (16,19). In our study, in 36 of 64 patients with anterior repair and additional procedures, mesh support was used. In 8 patients (%12,5), recurrence occurred and were repaired without meshes.

Rectocele, enterocele, sigmoidocele, perineocele or combined forms may be seen due to rectovaginal facia (Denonvillier facia) defect. Rectocele is known as protruding upper wall of rectum into vagina, while enterocele is known as herniating of small intestines into vaginal lumen in Douglas space, both of which are evaluated together as posterior compartment prolapse (20). Posterior prolapse repair is achieved with posterior colporraphy through vagina. The goal of posterior colporraphy is to narrow vaginal tube and genital hiatus and to form a new supported floor (21).

In posterior repair group no mesh was used for support. Of 29 patients who underwent posterior repair, 7 recurrences (%24,1) were recorded. More than 50% of posterior defects were with anterior and apical defects. Isolated rectocel was rare. Of patients underwent anterior + posterior repair, 1 rectocel recurrence (%7,6) was observed. There were more tendencies to recurrence in posterior repairs.

Apical pelvic organ prolapse is protruding of structures nearby vaginal apex downward. Birth trauma, aging and/or postmenopausal period are major factors for genital prolapse (22). Sacrospinous and sacrocolpopexy operations are the most commonly applied procedures with reported high success rates (23). There are some improved data reported about synthetic mesh used for apical supporting through abdomen in POP repair; abdominal sacral colpopexy is reported as gold standard for surgical repair of vaginal cuff prolapse (24). Through this method, anterior and posterior walls of the vault are hung from sacrum with mesh. POP repair is done by two different ways as through abdomen or vagina. Success rates range from 78% to 100% in transabdominal approach while higher rates of success when compared with transvaginal techniques have been reported (25). Sacrocolpopexy is another transabdominal technique through which apical vaginal wall is fixed to sacral promontorium with a material functioning as a bridge (26).

Major approaches advised for vaginal cuff prolapse are sacrospinous vault suspension through vagina, and abdominal or laparoscopic sacrocolpopexy. Uterosacral ligament suspension is

also another method like sacrospinous ligament vault suspension with vaginal approach, and prevents recurrent prolapse of other vaginal segments (especially anterior segment), because uterosacral ligament fixation protects vaginal axis in its natural position (27-28).

Anatomic success ratios of sacrospinous fixation in all vaginal sides range from 8% to 100% while for apical support, this range is 79%-100%. In a study including 61 patients who underwent abdominal sacrocolpopexy, 91% success ratio, 90% cure ratio and 15% complication rate were reported for a follow up of 26 months (28-29).

In all of our cases, we found a recurrence ratio of 12.69% which is lower than those reported in previous studies.

Selecting recurrent cases just in the same anatomic location, however, is limitation for our study. When recurrence occurs in a location we have to question the surgical technique and experience of the surgeon but definitions are not very clear about successful and failed surgeries. All of our patients with recurrence were in postmenopausal period. There was no recurrence seen in patients with vaginal cuff prolapse and the applied procedures were reported as successful. There may be a condition as an underlying reason (age, obesity, vaginal birth, POP stage, menopause etc.) for recurrence in all patients who underwent surgical repair.

Recurrences in conventional surgeries have been lower thanks to the newly developed procedures. We did not use supporting material in anterior, posterior and anterior-posterior groups, which may be considered a shortcoming of our study. However, reported local complications due to such materials are the reasons for why we haven't preferred them. Likewise, the use of supporting materials is not recommended in previous reports (30). Therefore, the risk of recurrence needs to be discussed when counseling patient, and more information about surgical procedures should be provided as an appropriate approach against recurrences.

REFERENCES

1. Beckmann CRB, Ling FW, Barzansky BM, Herbert WNP, Laube DW, Smith RP. Obstetrics and gynecology. 6th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2010. Pelvic support defects, urinary incontinence, and urinary tract infection; 259- 67.

2. Padubidri VG, Daftary SN. Shaw's textbook of gynecology. 16th ed. Haryana, India: Reed Elsevier India Private Limited; 2015. Genital prolapse; 349-64.

3. Persu C, Chapple CR, Cauni V, Gutue S, Geavlete P. Pelvic Organ Prolapse Quantification System (POP-Q) - A New Era in Pelvic Prolapse Staging. J Med Life 2011; 4 (1): 75-81.

4. Olsen AL, Smith VJ, Bergstrom JO, Colling JC, Clark AL. Epidemiology of Surgically Managed Pelvic Organ Prolapse and Urinary Incontinence. Obstet Gynecol 1997; 89 (4): 501–6. doi:10.1016/s0029- 7844(97)00058-6

5. Barber MD, Brubaker L, Nygaard I, Wheeler TL 2nd, Schaffer J, Chen Z, et al. Defining Success after Surgery for Pelvic Organ Prolapse. Obstet Gynecol 2009; 114 (3): 600-9.

6. Moore RD, Miklos JR. Vaginal Mesh Kits for Pelvic Organ Prolapse, Friend or Foe: A Comprehensive Review. The Scientific World Journal 2009; 9: 163- 189.

7. Vergeldt TFM, Weemhoff M, IntHout J. Kluivers KB. Risk Factors for Pelvic Organ Prolapse and its Recurrence: A Systemic Review. Int Urogynecol J. 2015; 26 (11): 1559–1573. doi: 10.1007/s00192-015-2695-8.

8. Kim CM, Jeon MJ, Chung DJ, Kim SK, Kim JW, Bai SW. Risk Factors for Pelvic Organ Prolapse. Int J Gynaecol Obstet. 2007; 98 (3): 248-51.

9. Whiteside JL, Weber AM, Meyn LA. Walters MD. Risk Factors for Prolapse Recurrence after Vaginal Repair. Am J Obstet Gynecol. 2004; 191 (5): 1533-8

10. Diez-Itza I, Aizpitarte I, Becerro A. Risk Factors for the Recurrence of Pelvic Organ Prolapse after Vaginal Surgery: A Review at 5 Years after Surgery. Int Urogynecol J Pelvic Floor Dysfunct. 2007; 18 (11): 1317-24.

11. Vergeldt TF, Weemhoff M, IntHout J, Kluivers KB. Risk Factors for Pelvic Organ Prolapse and its Recurrence: A Systematic Review. Int Urogynecol J 2015; 26 (11): 1559-73

12. Vergeldt TFM, Notten KJB, Kluivers KB, Weemhoff M. Recurrence Risk is Associated with Preoperatively Advanced Prolapse Stage: Is There a Difference Between Women with Stage 2 and Those with Stage 3 or 4 Cystocele? Int Urogynecol J. 2017; 28 (7): 983-7.

13. Halpern-Elenskaia K, Umek W, Bodner-Adler B, Hanzal E. Anterior Colporrhaphy: A Standard Operation? Systematic Review of the Technical Aspects of a Common Procedure in Randomized Controlled Trials. Int Urogynecol J. 2018; 29: 781-8. doi: 10.1007/s00192-017-3510-5.

14. Olsen AL, Smith VJ, Bergstrom JO, Colling JC, Clark AL. Epidemiology of Surgically Managed Pelvic Organ Prolapse and Urinary Incontinence. Obstet Gynecol 1997; 89 (4): 501-6.

15. Sand PK, Koduri S, Lobel RW, Winkler HA, Tomezsko J, Culligan PJ, et al. Prospective Randomized Trial of Polyglactin 910 Mesh to Prevent Recurrence of Cystoceles and Rectoceles. Am J Obstet Gynecol 2001; 184 (7): 1357-62.

16. Weber AM, Walters MD, Piedmonte MR, Ballard LA. Anterior Colporrhaphy: a Randomized Trial of three Surgical Techniques. Am J Obstet Gynecol 2001; 185 (6): 1299-304.

17. McCulloch P, Altman DG, Campbell WB, Flum DR, Glasziou P, Marshall JC, et al. No surgical Innovation without Evaluation: The Ideal Recommendations. Lancet 2009; 374 (9695): 1105-12. doi: 10.1016/S0140-6736(09)61116-8.

18. Foon R, Toozs-Hobson P, Latthe PM. Adjuvant Materials in Anterior Vaginal Wall Prolapse Surgery: A Systematic Review of Effectiveness and Complications. Int Urogynecol J Pelvic Floor Dysfunct 2008; 19 (12): 1697-706. doi: 10.1007/s00192-008-0668-x.

19. Whiteside JL, Weber AM, Meyn LA, Walters MD. Risk Factors for Prolapse Recurrence after Vaginal Repair. Am J Obstet Gynecol 2004; 191 (5): 1533-8.

20. Lefevre R, Davila GW. Functional Disorders: Rectocele. Clin Colon Rectal Surg. 2008; 21 (2): 129-37. doi: 10.1055/s-2008-1075862.

21. Töz E, Özcan A, Apaydın N, Uyar İ, Kocakaya B, Okay G. Outcomes of Vaginal Hysterectomy and Constricting Colporrhaphy with Concurrent Levator Myorrhaphy and High Perineorrhaphy in Women Older than 75 Years of Age. Clin Interv Aging. 2015; 10: 1009-15. doi: 10.2147/CIA.S85960.

22. DeLancey JOL. Anatomy and Biomechanics of Genital Prolapse. Clin Obstet Gynecol 1993; 36: 897- 909.

23. Uzoma A, Farag KA. Vaginal Vault Prolapse. Obstet Gynecol Int 2009; 275621. doi: 10.1155/2009/275621.

24. Maher C, Feiner B, Baessler K, Schmid C. Surgical Management of Pelvic Organ Prolapse in Women. 2010; 30 (4):CD004014. doi: 10.1002/14651858.CD004014.pub5.

25. Choi KH, Hong JY. Management of Pelvic Organ Prolapse. Korean J Urol. 2014; 55 (11): 693-702. 10.4111/kju.2014.55.11.693.

26. Kong MK, Bai SW. Surgical Treatments for Vaginal Apical Prolapse. Obstet Gynecol Sci. 2016; 59: 253-260. doi: 10.5468/ogs.2016.59.4.253.

27. Webb MJ, Aronson MP, Ferguson LK, Lee RA. Posthysterectomy Vaginal Vault Prolapse: Primary Repair in 693 Patients. Obstet Gynecol 1998; 92 (2): 281-5.

28. Sze EH, Karram MM. Transvaginal Repair of Vault Prolapse: A Review. Obstet Gynecol 1997; 89 (3): 466- 75. doi: 10.1016/S0029-7844(96)00337-7.

29. Limb J, Wood K, Weinberger M, Miyazaki F, Aboseif S. Sacral Colpopexy Using Mersilene Mesh in the Treatment of Vaginal Vault Prolapse. World J Urol 2005; 23 (1): 55-60. doi: 10.1007/s00345-004-0457-1.

30. Food and Drug Administration. Obstetrical and Gynecological Devices; Reclassification of Surgical Mesh for Transvaginal Pelvic Organ Prolapse Repair; Final Order. Fed Regist 2016; 81 (2): 353-61.