Original Article

Correlation Between Apical, Anterior, and Posterior Vaginal Wall Prolapse With Voiding Dysfunction: A Single Center Retrospective Cohort Study

Zinat Ghanbari; M.D.[1], Fatemeh Asadi; M.D.[1], Shahrzad Amirlatifi; M.D.[1], Mamak Shariat; M.D.[2], Tahereh Eftekhar; M.D.[3], Maryam Deldar; M.D.[3], Razieh Vahdani; M.D.[4]

1 Vali-E-Asr Reproductive Health Research Center, Family Health Research Institute, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran
2 Maternal, Fetal & Neonatal, Research Center, Family Health Research Institute, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran
3 Department of Obstetrics and Gynecology, Vali-E-Asr Hospital, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran
4 Maternal-fetal Medicine Research Center, Shiraz University of Medical Sciences, Shiraz, Iran

Received February 2024; Revised and accepted June 2024

Abstract

Objective: Voiding Dysfunction (VD) is one of the most common disorders among women, which is characterized by a disorder in urination. Pelvic organ prolapse is one of the factors that can affect VD. In this study, the relationship between prolapse in the anterior, posterior, and apical areas and VD has been evaluated.

Materials and methods: This is a cohort retrospective study. The participants in this study were women with VD, who referred to the pelvic floor disorders clinic of Imam Khomeini Hospital in Tehran in 2018-2020. Clinical information was obtained retrospectively from the hospital's electronic data system, also symptoms (intermittent stream, incomplete voiding, poor flow, post void dribble, straining to void, stage anterior, posterior and apical) and urodynamic parameters (including EMG, PVR100, Qmax12, and pdet20) were evaluated, which included detailed questionnaires (Urinary Distress Inventory 6 (UDI-6) and Incontinence Impact Questionnaire-7 (IIQ-7)), pelvic examination, and complete urodynamic evaluation.

Results: There was a direct relationship between the age of the patients and the stage of prolapse ($p<0.001$). So that, the stage increased with age. In addition, it was found that the severity of urinary symptoms is related to the stage of prolapse in the apical area ($p=0.001$). Also, the results showed that intermittent stream symptoms and the symptoms of staining to void had a significant relationship with the stage of prolapse (III and IV) in the apical and anterior areas. Also, it was shown that only PVR > 100 had a significant relationship with the stage of prolapse in the apical area ($p=0.001$).

Conclusion: Intermittent stream and straining to void were related to the stages of prolapse in the apical and anterior regions. It was also concluded that the greater the prolapse, the higher the value of PVR > 100.

Keywords: Voiding Dysfunction; Pelvic Organ Prolapse; Vaginal Wall; Urodynamic Parameters

Introduction

Voiding Dysfunction (VD) is one of the most common disorders among women, which is characterized by a disorder in genitourinary system (1). It is separate from a neurological disease and may occur at any age. Therefore, its clinical symptoms are different in adults (1, 2).

Correspondence:
Dr. Shahrzad Amirlatifi
Email: shahrzad.amirlatifi@gmail.com

So far, the pathogenesis of VD has not been fully determined, however, it has been shown that cystocele or prolapsed can be one of the main causes of VD (3). Cystocele of the vaginal wall can lead to an increase in the resistance of the urinary tract and impaired urination. On the other hand, some other evidences have shown that patients suffering from prolapse of the anterior wall of the vagina are accompanied by urinary incontinence (4).

A few studies selected a sample size of more than 100 patients using a multi-channel urodynamic test; they have investigated the effect of prolapse of the anterior wall of the vagina on urinary disorders (5). In addition, much of the previous works have been done before the standardization of prolapse corrections and is difficult to interpret (5, 6). On the other hand, in previous studies, only the anterior wall has been examined and the posterior wall has not evaluated. Therefore, in this study, we evaluated the relationship between anterior, posterior, and apical vaginal wall prolapse and VD.

Materials and methods

This cohort retrospective study was approved by the Ethics Committee of Tehran University of Medical Sciences (IR.TUMS.IKHC.REC.1402-294). The participants in this study were women with VD, who referred to the pelvic floor disorders clinic of Imam Khomeini Hospital in Tehran between March 2018 and February 2020.

Inclusion criteria included all women over the age of 18 years with VD. Exclusion criteria included previous surgery for urinary incontinence, neurological disease (such as multiple sclerosis and spinal cord injury), uncontrolled diabetes, discopathy, congenital anomalies of the urinary tract, urogenital fistula, and urethral stricture.

Demographical information and clinical information was obtained retrospectively from the hospital's electronic data system, which included detailed questionnaires (UDI-6 and IIQ-7). There are two types of forms that are used to identify patients with urinary incontinence (UI). In addition, they can be used to evaluate the impact of UI on the quality of patients), pelvic examination, and complete urodynamic evaluation. VD symptoms include the presence of at least one of the following symptoms, hesitancy, straining to void, poor flow, intermittent stream, post voiding dribbling, and incomplete voiding. The amount of prolapse was checked based on the POP-Q (It is a diagnostic tool to evaluate the amount, stage and location of prolapse in the vaginal area of women) examination including points (Aa, Ap, Ba, Bp, C, D, GH, Pb), which was performed by the relevant specialist and registered in the system.

Aa: point 3 cm proximal to external urinary meatus (corresponding to urethrovesical junction) (-3 to +3)

Ap: point on posterior vaginal wall 3 cm above hymen (-3 to +3)

Ba: The most exposed part of the anterior wall of the vagina (-3 to TVL)

Bp: The most exposed part of the posterior wall of the vagina (-3 to TVL)

C: Cervix to hymen distance or vaginal cuff (±TVL)

D: Posterior fornix to hymen (±TVL)

GH: The distance between the mid urethra and the posterior fourchette (no limit)

Pb: Posterior fourchette to mid anus (no limit)

Urodynamic evaluation includes two-channel cystometry study and pressure flow study, which were performed in patients referred with VD symptoms. Then the patients were divided into three groups based on the prolapse of the anterior, posterior, and apical vaginal walls. Since there is no formal definition for voiding problems in women, urodynamic evidence of impaired bladder emptying is defined as a peak flow (Q-MAX) of less than 12 mL/s (if at least 100 cc has been voided); due to the fact that the numbers related to urodynamic parameters are various in different references and articles, it is considered based on the protocol of the pelvic floor department of Imam Khomeini Hospital. Residual urine volume greater than 100 cc, detrusor pressure during urination less than 20 mmHg, or pelvic floor muscle contraction during urination. The flowchart related to the selection of patients is shown in Figure 1.

Statistical analysis: The collected data were recorded and analyzed using the SPSS version 23 database; the significance level was considered less than 0.05 (p-value<0.05). Furthermore, absolute frequency and relative frequency of qualitative-mean data and standard deviation of quantitative data of groups were expressed as descriptive statistics.

Analytical statistics include a quantitative comparison of data between the groups. Before comparing the quantitative variables between the categories, we must determine whether the data distribution follows the pattern of normality or not. Kolmogorov-Smirnov test showed that all variables have nonparametric distribution, so, we used the Kruskal-Wallis tests to compare the groups.

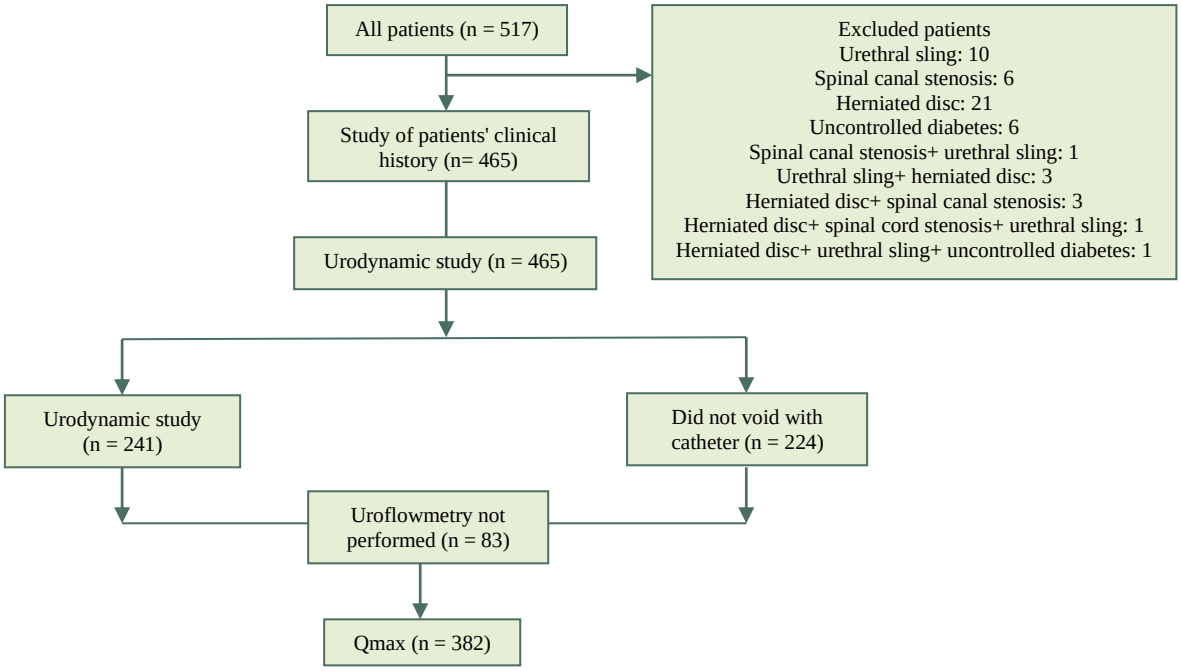

Figure 1: Flowchart of patient's selection

Quantitative comparison of data was done using Chi-square. For some of the variables analyzed which derived from ordinal scales in which the numbers represent rank orders, correlation analysis was performed with Kendall's tau-b, a non-parametric measure of associationn.

Results

In the present study, 382 patients (82%) had a history of vaginal delivery. Also, 5 people (1.1%) had a history of instrumental delivery. The average severity (according to the visual analogue scale (VAS score)) of urinary symptoms and TVL were 7.02 ± 1.76 and 9.09 ± 1.51, respectively. Other demographic information of the patients is mentioned in the Table 1.

Descriptive statistics of patients' symptoms and complaints and urodynamic parameters: Among studied individuals, 247 (53.1%) patients had intermittent stream symptoms, 362 (70.3%) had symptoms of incomplete emptying of urine, and 265 patients (57%) had post voiding dribbling symptoms.

In terms of electromyography (EMG), 99 people (21.3%) were active and 318 cases (68.4%) were inactive. Also, based on PVR100, 413 patients (92.7%) were <100 and 15 patients (2.2%) were >100. Based on Qmax12, 304 patients (65.4%) were >12 and 78 patients (16.8%) were < 12. Based on detrusor pressure (pdet20), 157 patients (33.8%) were >20 and 84 patients (18.1%) were < 20 (Table 2).

Evaluation of relation between the age parameter and the stage of Prolapse of different areas of the vagina: Statistical analyses showed that the older the age, the higher the prolapse stage in the anterior, posterior, and apical areas.

Table 1: Characteristic of the participants

Variables	(Mean ± SD)/ n (%)
Age	52.61 ± 12.44
BMI	27.69 ± 3.83
Gravid	4.18 ± 2.37
Delivery type	
NVD	394 (84.6)
C/S	28 (6)
NVD/CS	43 (9.2)
Instrumental delivery	
Yes	5 (1.1)
No	460 (98.9)
Elongation CX	
Yes	121 (26)
No	288 (61.7)
Hysterectomy	56 (12)
Severity of voiding dysfunction	7.02 ± 1.76
TVL	9.09 ± 1.51
Atrophy	
Yes	165 (35.5)
No	300 (64.5)
Hypertension	
Yes	101 (21.7)
No	364 (78.3)

BMI: Body mass Index, TVL: Total Vaginal Length, CX: Cervix

Table 2: Summary of symptoms and urodynamic parameters in the participants

Symptoms	n (%)
Hesitancy	
Yes	103 (22.2)
No	362 (77.8)
Incomplete voiding	
Yes	327 (70.3)
No	138 (29.7)
Intermittent Stream	
Yes	247 (53.1)
No	218 (46.9)
Poor Flow	
Yes	67 (14.4)
No	398 (85.6)
Post Void Dribble	
Yes	265 (57)
No	200 (43)
Straining To Void	
Yes	134 (28.8)
No	331 (71.2)
Stage anterior	
1	44 (9.5)
2	259 (55.7)
3, 4	162 (32.7)
Stage posterior	
1	68 (14.6)
2	326 (70.1)
3, 4	71.2 (15.1)
Stage apical	
0	2 (0.4)
1	237 (51)
2	92 (19.8)
3, 4	134 (28.8)
Urodynamic parameters	
EMG	
Active	99 (21.3)
Inactive	318 (68.4)
PVR100	
> 100	15 (2.2)
< 100	431 (92.7)
Qmax12	
>12	304 (65.4)
<12	78 (16.8)
Pdet20	
> 20	157 (33.8)
< 20	84 (18.1)

PVR 100: Post-void residual 100, EMG: electromyography, pdet20: detrusor pressure 20, Qmax12: maximum flow rate

In other words, it was found that the older the patients, the higher the percentage of stage III and IV (p=0.001 for apical, p=0.002 for posterior, and p<0.001 for anterior).

Evaluation of relation between severity of urinary symptoms and the stage of prolapse of different areas of vagina: Based on the results, it was shown that the higher the stage of prolapse in three regions, anterior, posterior, and apical, the more severe the symptoms in patients. Based on this, it was determined that only the severity of urinary symptoms was related to the stage of prolapse in the apical region (p=0.001), and no significant relationship was observed with the anterior and posterior regions (p>0.05).

Evaluation of relation between urinary symptoms and the stage of prolapse of different areas of the vagina: Based on the table below, the results revealed that intermittent stream symptoms had a significant relationship with stage III and IV of prolapse in the Apical and anterior regions (p=0.02 for apical and p=0.006 for anterior). In addition, it was shown that the symptoms of straining to void were also significantly related to the stage (III and IV) of prolapse in the apical and anterior regions (p<0.001) (Table 3).

Evaluation of relation between urodynamic parameters and the stage of prolapse in different areas of the vagina: Based on the results, only PVR>100 had a significant relationship with the stage of prolapse (III and IV) in the apical area (p=0.001), while there was no significant relationship between other parameters with the stage of prolapse in different vaginal areas (p>0.05) (Table 4).

Discussion

In this study, the relationship between urodynamic parameters and the symptoms of VD with the stage of prolapse in three regions of anterior, posterior, and apical has been evaluated. The results of the present study showed that intermittent stream symptoms had a significant relationship with the stage of prolapse in the apical and anterior areas. In addition, the symptoms of staining to void were also significantly related to the stage of prolapse in the apical and anterior regions.

In the study of Ellerkmann et al (7), the presence of some symptoms such as urinary hesitancy and intermittent flow increased the severity of anterior and apical prolapse. And the same in our study, intermittent stream was associated with increased anterior and apical prolapse.

Table 3: Correlation between urinary symptoms and stage of prolapse

Variables		Apical			Posterior			Anterior		
		I	II	III, IV	I	II	III, IV	I	II	III, IV
Hesitancy	Yes	45 (44.1)	23 (22.5)	34 (33.3)	18 (17.5)	70 (68)	15 (14.6)	10 (9.7)	53 (51.5)	40 (38.8)
	No	192 (53.2)	69 (19.1)	100 (27.7)	50 (13.8)	256 (70.7)	56 (15.5)	34 (9.4)	206 (56.9)	122 (33.7)
P-value			0.12			0.46			0.44	
Incomplete voiding	Yes	170 (52.3)	67 (20.6)	88 (27.1)	51 (15.6)	99 (71.7)	49 (15)	36 (11)	177 (54.1)	114 (34.9)
	No	67 (48.6)	25 (18.1)	46 (33.3)	17 (12.3)	227 (69.4)	22 (15.9)	8 (5.8)	82 (59.4)	48 (34.8)
P-value			0.29			0.43			0.50	
Intermittent Stream	Yes	113 (45.9)	55 (22.4)	78 (31.7)	30 (12.1)	175 (70.9)	42 (17)	24 (9.7)	120 (48.60	103 (41.7)
	No	124 (57.1)	37 (17.1)	56 (25.8)	38 (17.4)	151 (69.3)	29 (13.3)	20 (9.2)	139 (63.8)	59 (27.1)
P-value			0.02			0.07			0.006	
Poor flow	Yes	39 (58.2)	11 (16.4)	17 (25.4)	11 (16.4)	46 (68.7)	10 (14.9)	6 (9)	36 (53.7)	25 (37.3)
	No	198 (50)	81 (20.5)	117 (29.5)	57 (14.3)	280 (70.4)	61 (15.3)	38 (9.5)	223 (56)	137 (34.4)
P-value			0.25			0.73			0.65	
Post voiding dribble	Yes	140 (53.2)	47 (17.9)	76 (28.9)	35 (13.2)	187 (70.6)	43 (16.2)	18 (6.8)	156 (58.9)	91 (34.3)
	No	97 (48.5)	45 (22.5)	58 (29)	33 (16.5)	139 (69.5)	28 (14)	26 (13)	103 (51.5)	71 (35.5)
P-value			0.48			0.28			0.53	
Straining to void	Yes	52 (38.8)	28 (20.9)	54 (40.3)	20 (14.9)	90 (67.2)	24 (17.9)	8 (6)	62 (46.3)	64 (47.8)
	No	185 (56.2)	64 (19.5)	80 (24.3)	48 (14.5)	236 (71.3)	47 (14.2)	36 (10.9)	197 (59.5)	98 (29.6)
P-value			<0.001			0.56			<0.001	

Table 4: Relation between urodynamic parameters and stage of prolapse

Variables		Apical			Posterior			Anterior		
		I	II	III, IV	I	II	III, IV	I	II	III, IV
Qmax12	> 12	155 (51.2)	60 (19.8)	88 (29)	48 (15.8)	211 (69.4)	45 (14.8)	27 (8.9)	173 (56.9)	104 (34.2)
	< 12	38 (48.7)	17 (21.8)	23 (29.5)	9 (11.5)	57 (73.1)	12 (15.4)	10 (12.8)	41 (52.6)	27 (34.6)
P-value			0.90			0.64			0.54	
Pdet 20	> 20	84 (53.8)	29 (18.6)	43 (27.6)	22 (14)	106 (67.5)	29 (18.5)	18 (11.5)	87 (55.4)	52 (33.1)
	< 20	40 (47.6)	11 (13.1)	33 (39.3)	14 (16.7)	59 (70.2)	11 (13.1)	7 (8.3)	44 (52.4)	33 (39.3)
P-value			0.15			0.53			0.54	
PVR100	> 100	1 (6.7)	4 (26.7)	10 (66.7)	2 (13.3)	10 (66.7)	3 (20)	0(0)	7 (46.7)	8 (53.3)
	< 100	226 (53.3)	82 (19.3)	116 (27.4)	61 (14.3)	302 (70.9)	63 (14.8)	42 (9.9)	236 (55.4)	148 (34.7)
P-value			0.001			0.85			0.21	

In the study of Liao et al., anterior prolapse (stage I) increased the over active bladder symptoms, while posterior prolapse (stage I-III) decreased cited symptoms. Stress urinary incontinence and voiding symptoms did not correlate with any compartments of POPs. In this study, the relationship between the stage of prolapse and voiding symptoms was compared in people with and without pelvic organ prolapse, which could be the reason for the contradiction between the results of the two studies (8, 9).

In study of Nanthini Saravanan et al (10), 120 post-menopausal women scheduled for vaginal hysterectomy and pelvic floor repair. The prevalence of voiding dysfunction was 78%. Higher stage of prolapse had significant correlation with voiding dysfunction (p=0.028). Women with posterior compartment defect had more voiding dysfunction (p=0.04), but women with anterior compartment prolapse had voiding dysfunction with the odds ratio of 3.72 (p=0.338). The results of this study were not consistent with our study. The reason for this lack of alignment can be due to the fact that in this study, in addition to the posterior and anterior location, prolapse in the apical area was also evaluated.

Chae et al. (11) reported the POP-Q stage especially the anterior compartment prolapses had a greater incidence of VD compared to posterior and apical compartments (p=0.018). In the present study, there was a significant relationship between VD (Intermittent stream and strain to void) and the stage of apical and anterior prolapse; also, PVR >100 was significant with apical stage**.**

In the study of Serife Esra Cetinkaya et al (12), 388 women attending the urogynecology unit with LUTS and/or bulging were grouped according to the POP quantification (POPQ); the results of evaluation showed, PVR volumes were significantly higher in patients with stage ≥2 (p=0.047), but women with prolapse in multiple compartments were assigned to the stage of the most dependent compartment. In the present study based on the results, it was shown that PVR>100 had a significant relationship with the stage (III and IV) of prolapse in the apical area (p=0.001).

Schimpf et al, (13) reported no significant relationship between voiding symptoms and the urodynamic parameters, including Qmax, PVR, and detrusor over activity with pelvic prolapse in different stages; it was inconsistent with the present study. This discrepancy can be due to the number of patients investigated in the two studies. In the present study, there was a significant relationship between VD (Intermittent stream and strain to void) and the stage of apical and anterior prolapse; also, PVR >100 was significantly related to the apical stage.

In the present study, the results showed that the symptoms of Post Void Dribble, Intermittent Stream, and incomplete voiding were more compared to the other symptoms in patients. Also, we found a direct relationship between the patient's age and the stage of prolapse. So, the stage increases with age. In addition, it was found that the severity of urinary symptoms was related to the stage of prolapse in the apical area (p<0.05).

In the study of Mancarella et al. (14), patients who had straining to void had an increased probability of prolapse after surgery in the anterior area. Straining to void can be considered a risk factor in the occurrence of prolapse. Also, in other studies, there was a significant relationship between the age of patients and the stage of prolapse (9).

According to our knowledge, none of the studies have investigated the relationship between each of the symptoms of VD and the stage of compartment separately; but our study, for the first time, separately examined each of the symptoms of VD. We also evaluated the findings of urodynamics with the stage of prolapse in three regions. One of the strengths of our study is the number of studied subjects, all of whom had referred to the pelvic floor clinic with a complaint of VD, and all of them were examined by a urogynecologist. Considering that only PVR was associated with apical prolapse, one of the limitations of the study was that complete UDS, which was performed only in 241 patients, and 224 patients could not perform it; so, the measurement of pdet20 could not be evaluated.

In general, it can be said that clinical symptoms related to the pelvic organ prolapse are different among patients. On the other hand, the occurrence of prolapse in different anatomical areas of the vagina can contribute to the variety of clinical symptoms in patients. Also, the presence of prolapse in different stages can be a reason for the variety of symptoms. These factors can cause differences in the amount of urodynamic parameters, which require appropriate strategies.

In this study, a survey was conducted on a low statistical population. Therefore, it is better to conduct more statistical studies on the population in future studies. On the other hand, the relationship between the stage of prolapse and the response to treatment should be done better. Also, the comparison

of clinical symptoms with areas related to prolapse should be evaluated separately.

Conclusion

The two symptoms of intermittent stream and straining to void were related to the stages of prolapse in the apical and anterior regions. In addition, among urodynamic parameters, only PVR>100 was related to the stage of prolapse in the apical region.

According to some articles and references, cystocele can be associated with an increase in PVR, and voiding dysfunction can be a risk factor for an increase in PVR. Considering that the sample size in our study was acceptable and all the cases were VD patients, only 15 out of 465 cases had PVR >100; the high PVR was significantly related to the apical stage and had no statistically significant relationship with cystocele. Therefore, further investigations in a larger number of patients with high PVR recommended determining a more accurate relationship.

Conflict of Interests

Authors declare no conflict of interests.

Acknowledgments

We wish thank you of all our colleague in Tehran University of Medical Science.

References

1. Sinha S. Dysfunctional voiding: A review of the terminology, presentation, evaluation and management in children and adults. Indian J Urol. 2011;27(4):437-47.
2. van Geen FJ, van de Wetering EHM, Nieuwhof-Leppink AJ, Klijn AJ, de Kort LMO. Dysfunctional Voiding: Exploring Disease Transition From Childhood to Adulthood. Urology. 2023;177:60-64.
3. Loo Z-X, Chen H-S, Tang F-H, Lin K-L, Liu Y-Y, Wu M-P, et al. Predictors of voiding dysfunction following Uphold™ mesh repair for the treatment of pelvic organ prolapse. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2020;255:34-9.
4. Frigerio M, Manodoro S, Cola A, Palmieri S, Spelzini F, Milani R. Detrusor underactivity in pelvic organ prolapse. Int Urogynecol J. 2018;29(8):1111-1116.
5. Nager CW, Grimes CL, Nolen TL, Wai CY, Brubaker L, Jeppson PC, et al. Concomitant anterior repair, preoperative prolapse severity, and anatomic prolapse outcomes after vaginal apical procedures. Female Pelvic Med Reconstr Surg. 2019;25(1):22-8.
6. Cardozo L, Staskin D (Eds.). Anterior vaginal wall prolapse. Textbook of Female Urology and Urogynecology. CRC Press.2010:798-807.
7. Ellerkmann RM, Cundiff GW, Melick CF, Nihira MA, Leffler K, Bent AE. Correlation of symptoms with location and severity of pelvic organ prolapse. Am J Obstet Gynecol. 2001;185(6):1332-7; discussion 1337-8.
8. Liao YH, Ng SC, Chen GD. Correlation of severity of pelvic organ prolapse with lower urinary tract symptoms. Taiwan J Obstet Gynecol. 2021;60(1):90-94.
9. Espuña-Pons M, Fillol M, Pascual MA, Rebollo P, Mora AM, Group FPFDR. Pelvic floor symptoms and severity of pelvic organ prolapse in women seeking care for pelvic floor problems. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2014;177:141-5.
10. Saravanan N, Ebenezer E D, Londhe V, arghese L, Kekre A N, eyaseelan V, et al. Prevalence of voiding and defecatory dysfunction in postmenopausal women with pelvic organ prolapse: a prospective observational study. June 2018 Volume 7 Issue 6 Page 2230International Journal of Reproduction, Contraception, Obstetrics and Gynecology. 2018;7(6):2230-2234
11. Yun Chae J, Young Park G, Heon Kim J, Jee Kim H, Hyun Bae J, Gu Lee J,et al. Points Aa and Ba are factors associated with preoperative voiding dysfunction in patients with cystocele, European Journal of Obstetrics & Gynecology and Reproductive Biology.2014; 174:146-9.
12. Cetinkaya SE, Dokmeci F, Dai O. Correlation of pelvic organ prolapse staging with lower urinary tract symptoms, sexual dysfunction, and quality of life. Int Urogynecol J. 2013;24(10):1645-50.
13. Schimpf MO, O'Sullivan DM, LaSala CA, Tulikangas PK. Anterior vaginal wall prolapse and voiding dysfunction in urogynecology patients. Int Urogynecol J Pelvic Floor Dysfunct. 2007;18(7):721-5.
14. Mancarella M, Testa F, Chiadò Piat F, Novara L, Biglia N, Sgro LG. Fixation of uterosacral ligaments to anterior vaginal wall during modified McCall culdoplasty after vaginal hysterectomy. Eur J Obstet Gynecol Reprod Biol. 2022;270:221-226.

Citation: Ghanbari Z, Asadi F, Amirlatifi S, Shariat M, Eftekhar T, Deldar M, et al. **Correlation Between Apical, Anterior, and Posterior Vaginal Wall Prolapse With Voiding Dysfunction: A Single Center Retrospective Cohort Study.** J Family Reprod Health 2024; 18(2): 115-21.