



Assessment of degree of trauma and levator ani muscle contraction function after pelvic floor reconstruction and traditional surgical treatment of pelvic organ prolapse

Chun-Hua Zhu^{1✉}, Yu-Fei Ni²

¹Department of Gynecology and Obstetrics, Rudong County Hospital of Traditional Chinese Medicine of Jiangsu Province, Rudong County, Jiangsu Province, 226400, China

²Health Care Department, Nantong Maternity and Child Health Care Institute of Jiangsu Province, Nantong City, Jiangsu Province, 226000, China

ARTICLE INFO

Article history:

Received

Received in revised form

Accepted

Available online

Keywords:

Pelvic organ prolapsed

Pelvic floor reconstruction

Vaginal hysterectomy

Urodynamics

Levator ani muscle

ABSTRACT

Objective: To study the degree of trauma and levator ani muscle contraction function after pelvic floor reconstruction and traditional surgical treatment of pelvic organ prolapse.

Methods: Patients with III-IV pelvic organ prolapse who received surgical treatment in our hospital between May 2011 and October 2015 were randomly divided into observation group who received vaginal hysterectomy combined with pelvic floor reconstruction and control group who received vaginal hysterectomy combined with colporrhaphy, and then the degree of trauma, urodynamics and levator ani muscle contraction function were compared between two groups of patients. **Results:** Operating time, intraoperative blood loss as well as serum CRP, IL-1 β , TNF- α , Ins, NE and E content were not significantly different between two groups ($P>0.05$); 2 weeks after operation, maximum bladder volume and QMax of observation group were significantly higher than those of control group, PdetQMax, PdetMax and PVR were significantly lower than those of control group ($P<0.05$), LAT and LHS under resting state were not significantly different from those of control group ($P>0.05$), LAT under Valsalva maneuver was significantly more than that of control group while LHS under Valsalva maneuver was significantly less than that of control group ($P<0.05$). **Conclusions:** Pelvic floor reconstruction treatment of pelvic organ prolapse has equivalent degree of surgical trauma to traditional surgery, and has better effect on improving the urination function and levator ani muscle contraction function than traditional surgery.

1. Introduction

Pelvic organ prolapse (POP) is the downward ectopia of female reproductive organ and adjacent viscera caused by decreased pelvic tissue support function, and the pelvic floor muscle fascia and uterine ligament damage or degradation are the common causes of weakened pelvic support function. POP is common in middle-aged and elderly women, there is POP in more than 50% of multipara,

and if not treated in time, it can cause serious impact on the quality of life[1,2]. Conservative treatment effect is not good for severe POP, and surgical treatment is needed to reconstruct pelvic floor structure and recover pelvic support function. Vaginal hysterectomy combined with posterior colporrhaphy is the traditional way of POP surgery, its advantage lies in relatively simple operation, but it will destroy the integrity of local tissue structure, causes bigger overall level of trauma, and is also with higher postoperative recurrence rate[3,4]. Pelvic floor reconstruction is a POP surgery developed on the basis of the integral theory in recent years, which uses non-absorbable meshes to replace pelvic support tissue and strengthen pelvic support function for viscera in pelvic cavity[5]. In the following study, the degree of trauma and levator ani muscle contraction function after pelvic floor reconstruction and traditional

✉Corresponding author: Chun-Hua Zhu, Department of Gynecology and Obstetrics, Rudong County Hospital of Traditional Chinese Medicine, No. 50, Jianghai Middle Road, Juegang Town, Rudong County, Nantong City, Jiangsu Province, 226400, China.

Tel: 051384119664; 13862786999

Fund project: Preventive Medicine Fund Project of Jiangsu Provincial Health Department No: Y2013028.

Operating time and intraoperative blood loss of observation group were not significantly different from those of control group ($P>0.05$); serum CRP, IL-1 β , TNF- α , Ins, NE and E content of both groups after operation were significantly higher than those before operation ($P<0.05$) and CRP, IL-1 β , TNF- α , Ins, NE and E content were not significantly different between two groups ($P>0.05$), shown in Table 1 and Table 2.

3.2. Assessment results of urodynamics

Maximum bladder volume and QMax of observation group were significantly higher than those of control group, PdetQMax, PdetMax and PVR were significantly lower than those of control group ($P<0.05$), shown in Table 3.

3.3. Assessment results of levator ani muscle contraction function

LAT and LHS under resting state were not significantly different between two groups ($P>0.05$); LAT under Valsalva maneuver of observation group was significantly more than that of control group, LHS under Valsalva maneuver was significantly less than that of control group ($P<0.05$) (Table 4).

4. Discussion

POP is a common disease in the multipara as well as middle-aged and elderly women after menopause, and the pelvic support structure injury caused by childbirth and the pelvic support structure degradation caused by decreased postmenopausal estrogen levels

are the common causes of POP. POP can cause the descending of viscera in pelvic cavity along the vaginal longitudinal axis, severe cases may prolapse from the vaginal mouth, the bladder and urethra mainly protrude through the anterior vaginal wall, the rectum and small intestine mainly protrude through posterior vaginal wall, and the patients' daily life will be severely affected. Patients with moderate to severe POP mostly cannot obtain ideal curative effect by conservative treatment, and need to accept surgery[6,7]. Vaginal hysterectomy combined with anterior and posterior colporrhaphy is a traditional way of surgery, the operation is relatively simple, but the postoperative recurrence rate is high. As the surgery just sutures the self tissue to reinforce the pelvic support structure, the repaired pelvic floor is still with weak support and easy to tear; what's more, patients with severe POP are mostly with combined defects of multiple parts within the pelvic cavity, the operation method ignores the repair of vaginal side[8]. Together, the above factors cause higher recurrence rate and unsatisfactory curative effect after vaginal hysterectomy combined with anterior and posterior colporrhaphy treatment of POP[9,10].

Pelvic floor reconstruction uses non-absorbable meshes to replace pelvic support tissue, strengthen the pelvic floor tissue support function and make pelvic organs fixed in the normal anatomic positions[11]. In order to specify the clinical value of pelvic floor reconstruction treatment of POP, the intraoperative situation of the two surgical methods was compared at first in the study, and the operating time and intraoperative blood loss of observation group were not significantly different from those of control group. It means that using patch for pelvic floor reconstruction on the basis of vaginal hysterectomy will not increase the trauma from operation, and the two operation methods are with equivalent operating time and intraoperative blood loss. Surgical trauma is not only

Table 2
Comparison of serum Ins, NE and E content between two groups.

Groups	Case No.	Before operation			After operation		
		Ins (IU/mL)	NE (ng/mL)	E (ng/mL)	Ins (IU/mL)	NE (ng/mL)	E (ng/mL)
Observation group	38	6.95±0.84	35.65±5.62	23.14±3.79	17.95±2.25	79.14±9.33	57.56±7.81
Control group	39	7.14±0.88	34.64±4.59	22.68±4.04	18.19±2.73	80.42±9.14	58.14±9.32
<i>t</i>		0.237	0.562	0.379	0.104	0.659	0.457
<i>P</i>		>0.05	>0.05	>0.05	>0.05	>0.05	>0.05

Table 3
Comparison of urodynamic indexes between two groups after treatment.

Groups	Case No.	Maximum bladder volume (mL)	Qmax(mL/s)	PdetQMax(cmH ₂ O)	PdetMax(cmH ₂ O)	PVR(mL)
Observation group	38	478.21±69.14	18.32±2.52	14.28±1.85	22.49±3.95	39.49±5.59
Control group	39	422.19±58.29	12.14±1.94	18.95±2.68	26.63±4.18	58.64±7.97
<i>t</i>		6.982	7.658	7.092	6.183	8.581
<i>P</i>		<0.05	<0.05	<0.05	<0.05	<0.05

Table 4
Comparison of LAT and LHS under resting state and Valsalva maneuver between two groups.

Groups	Case No.	Resting state		Valsalva maneuver	
		LAT(mm)	LHS(cm ²)	LAT(mm)	LHS(cm ²)
Observation group	38	8.12±0.81	13.24±1.85	10.12±1.85	15.59±2.28
Control group	39	8.05±1.02	13.09±1.77	8.84±1.09	20.31±3.89
<i>t</i>		0.192	0.227	7.182	7.914
<i>P</i>		>0.05	>0.05	<0.05	<0.05

characterized by the change of the operating time and intraoperative blood loss, but can also cause the change of the internal environment and the increased generation of a variety of cytokines and hormones. CRP is a kind of non-specific acute phase protein, and when the body is stimulated by trauma, surgical trauma and other factors, the liver will synthesize large amounts of CRP and secrete them into the blood; IL-1 β and TNF- α are the massive secreted inflammatory mediators after traumatic reaction; insulin is the significantly increased endocrine hormone along with the surgical trauma-induced insulin resistance; NE and E are the products of the sympathetic nervous excitement and are secreted by the adrenal medulla, and surgical trauma will cause sympathetic activation and lead to increased secretion of NE and E. In the study, the analysis of internal environment-related molecules between the two groups of patients showed that serum CRP, IL-1 β , TNF- α , Ins, NE and E content of observation group were not significantly different from those of control group. The above analysis confirms that pelvic floor reconstruction and traditional surgical treatment of POP are with equivalent degree of trauma.

Weakened pelvic floor support function in patients with POP will cause oppressed urethra or excessive urethral ectopia. The abdominal external pressure of normal female can transmit through the posterior ligament of urethral pubic symphysis, fascia within pelvic cavity and other support structures, acts on the proximal urethra and posterior bladder neck wall and controls the urination[12,13]. After pelvic floor support is weakened and pelvic cavity viscera are displaced, the micturition function in patients with POP will be affected, characterized by urinary retention or incontinence[14]. Good pelvic repair and pelvic floor reconstruction can improve the urination function in patients with POP[15], and the analysis of urodynamics in the study confirmed that maximum bladder volume and QMax of observation group were significantly higher than those of control group while PdetQMax, PdetMax and PVR were significantly lower than those of control group ($P < 0.05$). Among the many pelvic support structures, levator ani muscle support for pelvic viscera is the most important[16], and levator ani muscle contraction can shrink the levator ani muscle hiatus, resist the increase of intra-abdominal pressure and stabilize pelvic viscera[17,18]. In the study, the analysis of levator ani muscle function after two operation showed that LAT and LHS under resting state were not significantly different between two groups, and LAT under Valsalva maneuver of observation group was significantly more than that of control group while LHS under Valsalva maneuver was significantly less than that of control group. This means that after pelvic floor reconstruction, the levator ani muscle contraction function is more ideal when intra-abdominal pressure increases, and pelvic floor reconstruction has better effect on improving levator ani muscle contraction function than traditional surgery.

To sum up, pelvic floor reconstruction treatment of pelvic organ prolapse has equivalent degree of surgical trauma to traditional surgery, and has better effect on improving the urination function and levator ani muscle contraction function than traditional surgery.

References

- [1] Pizarro-Berdichevsky J, Clifton MM, Goldman HB. evaluation and management of pelvic organ prolapse in elderly women. *Clin Geriatr Med* 2015; **31**(4): 507-521.
- [2] Khavari R, Tokaz MC, Stewart JN, et al. Pelvic organ prolapse in female patients presenting to transitional urology care clinic. *J Urol* 2015; **194**(6): 1654-1658.
- [3] Maldonado PA, Wai CY. Pelvic organ prolapse: New concepts in pelvic floor anatomy. *Obstet Gynecol Clin North Am* 2016; **43**(1): 15-26.
- [4] Ko ci ski T, Friebe Z, Stadnik H, et al. Anatomical and functional results of a modified sacral perineocolporectopexy for extreme forms of complex pelvic organs prolapse--own experience. *Ginekol Pol* 2015; **86**(6): 429-433.
- [5] Guan Z, Li HF, Yang X, et al. Pelvic reconstruction improves pelvic floor strength in pelvic organ prolapse patients. *Taiwan J Obstet Gynecol* 2015; **54**(5): 519-521.
- [6] Mannella P, Giannini A, Russo E, et al. Personalizing pelvic floor reconstructive surgery in aging women. *Maturitas* 2015; **82**(1): 109-115.
- [7] Alas AN, Anger JT. Management of apical pelvic organ prolapse. *Curr Urol Rep* 2015; **16**(5): 33.
- [8] Krlin RM, Soules KA, Winters JC. Surgical repair of pelvic organ prolapse in elderly patients. *Curr Opin Urol* 2016; **26**(2): 193-200.
- [9] Fang ZY, Wu WY. Clinical curative effect comparison between pelvic floor reconstruction and traditional surgical treatment of pelvic organ prolapse. *Maternal & Child Health Care China* 2015; **30**(12): 1957-1959.
- [10] Younger A, Rac G, Clemens JQ, et al. Pelvic organ prolapse surgery in academic female pelvic medicine and reconstructive surgery urology practice in the setting of the Food And Drug Administration public health notifications. *Urology* 2016; **91**: 46-51.
- [11] Mannella P, Giannini A, Russo E, et al. Personalizing pelvic floor reconstructive surgery in aging women. *Maturitas* 2015; **82**(1): 109-115.
- [12] He JF, Xu HY, Hu HB. Study on the urodynamics of individualized pelvic bio-feedback and electric stimulation treatment of pelvic organ prolapse. *Maternal & Child Health Care China* 2015; **30**(10): 1620-1622.
- [13] Vecchioli-Scaldazza C, Morosetti C, Ferrara V. The degree of satisfaction of women undergoing surgical repair of prolapse, compared with clinical and urodynamic findings. *Arch Ital Urol Androl* 2016; **88**(1): 23-27.
- [14] Huang L, He L, Wu SL, et al. Impact of preoperative urodynamic testing for urinary incontinence and pelvic organ prolapse on clinical management in Chinese women. *J Obstet Gynaecol Res* 2016; **42**(1): 72-76.
- [15] Chang TC, Hsiao SM, Chen CH, et al. Clinical outcomes and urodynamic effects of tailored transvaginal mesh surgery for pelvic organ prolapse. *Biomed Res Int* 2015; **2015**: 191258.
- [16] Wyman AM, Rodrigues AA Jr, Hahn L, et al. Estimated levator ani subtended volume: a novel assay for predicting surgical failure after uterosacral ligament suspension. *Am J Obstet Gynecol* 2016; **214**(5): 611.e1-6.
- [17] Rostaminia G, Peck JD, Quiroz LH, et al. Characteristics associated with pelvic organ prolapse in women with significant levator ani muscle deficiency. *Int Urogynecol J* 2016; **27**(2): 261-267.
- [18] Chojnacki M, Borowski D, Wielgo M, et al. Postpartum levator ani muscle injuries. Diagnosis and treatment. *Ginekol Pol* 2015; **86**(1): 67-71.