Cellular and Molecular Biology
E-ISSN : 1165-158X / P-ISSN : 0145-5680
www.cellmolbiol.org

Influence of postoperative serum inflammatory factors, stress indicators, urination function, sexual function and clinical efficacy of laparoscopic pelvic floor reconstruction without mesh implantation in the treatment of pelvic Oorgan prolapse

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ARTICLE INFO

Original paper

Article history:
Received: April 01, 2022
Accepted: July 14, 2022
Published: July 31, 2022

Keywords:

organ prolapse, pelvic floor reconstruction, non-mesh implant, urination function.

ABSTRACT

Pelvic organ prolapse is seriously harmful to women's health and daily activities, and the incidence rate increases with age, which is more common among middle-aged and elderly women. Common treatment schemes are prone to relapse or complications. The purpose of this article was to study the clinical effect of laparoscopic pelvic floor reconstruction without mesh implantation in the treatment of pelvic organ prolapse and the influence of postoperative serum inflammatory factors, stress indicators, urination function and sexual function. The clinical curative effect of the operation plan was evaluated by the determination of POP-Q value and objective cure rate. The enzyme-linked immunosorbent assay determined the serum inflammatory factors and stress indexes before and after the operation. Urination function was detected by a urodynamics detector, and sexual function was investigated by a PISQ-12 questionnaire. The results show that laparoscopic pelvic floor reconstruction without mesh implantation has good clinical efficacy in the treatment of pelvic organ prolapse, with less stimulation to patients and less inflammation. After the operation, the patient's maximum urine flow rate exceeded 18mL/s, the sexual function score exceeded 45 points, and the urination function and sexual function were effectively improved.

Doi: http://dx.doi.org/10.14715/cmb/2022.68.7.27

Introduction

Pelvic organ prolapse is a common female disease, and with the increase of age, the possibility of the disease will continue to increase. Although this disease is not fatal in most cases, the pain it brings to patients is great and affects all aspects of patients for a long time. Some traditional surgical methods are more harmful to women, and the recurrence rate after treatment is also higher. With the development of medicine, imitating hernia repair surgery, pelvic organ prolapse surgery has the use of mesh to strengthen the vaginal wall. Most of the time, this method has achieved good results, but there are also some potential problems, and serious surgical complications may occur (1-3).

Pelvic organ prolapse seriously affects women's daily life, so it is of great practical significance to explore good treatment methods. Chapple's study found that although the failure rate of treating pelvic organ prolapse with non-degradable synthetic mesh is relatively low, it is prone to complications such as infection and erosion, especially when it is chronically affected by gravity and intermittent repetitive strain. However, biomaterials have a lower incidence of complications (1). Shuquan et al used exon sequencing to study the effect of the gene on pelvic organ prolapse and found a new pelvic organ prolapse susceptibility gene WNK 1, which expanded the pathogenic spectrum of POP (2). Barenberg and Quiroz introduced the anatomy of pelvic floor muscles, explained the basic principles of pelvic floor biomechanics, clarified the mechanism of pelvic floor labor injury, discussed the recovery of pelvic floor muscles and sequelae of labor injury, reviewed the methods of preventing labor injury, and pointed out the research direction of pelvic floor injury related to labor in the future (3). Hagen and Thakar introduced conservative methods for female pelvic organ prolapse, including lifestyle recommendations, pelvic floor muscle training and vaginal patch, which can be used to help patients who wish to give birth and those waiting for surgery (4). Volløyhaug et al studied the influence of birth methods on pelvic organ prolapse, and studies showed that caesarean section and multiple deliveries increase the risk of pelvic organ prolapse (5). To sum up, there are many researches on pelvic organ prolapse at present but few researches on laparoscopic non-mesh implantation.

Pelvic floor reconstruction is an operation that has arisen in recent years. It combines the theoretical knowledge of gynecologic urology and has attracted the attention of many scholars. Kaartinen et al introduced several methods

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for the pelvic floor and vagina reconstruction and found that the TMG flap is a reasonable flap selection, which will not lead to functional defect, a complication of abdominal ostomy or weakening of the abdominal wall. Compared with the abdominal flap, the operation time is shortened (6). Wang et al studied the incidence and risk factors of stress urinary incontinence after pelvic floor reconstruction. The study found that preoperative LUT in POP patients is a high-risk factor for stress urinary incontinence (7). Cibula et al study found that patients undergoing pelvic floor reconstruction by MRAM after pelvic expansion surgery can significantly reduce postoperative complications, which may be related to empty pelvic syndrome (8). Wu et al studied the effects of total pelvic floor reconstruction and incomplete pelvic floor reconstruction on the short-term and long-term postoperative urinary incontinence rates. The study showed that total pelvic floor reconstruction is beneficial in reducing the urinary incontinence rate (9). Belyaev et al evaluated the randomized clinical study of pelvic floor reconstruction after rectovalgus resection and analyzed the advantages and disadvantages of pelvic floor reconstruction schemes (10). Ge et al discussed the safety and clinical significance of pelvic floor reconstruction in extra-abdominal surgery for advanced low rectal cancer. The results show that reconstruction of the pelvic floor with biological mesh may reduce the incidence of perineal complications (11). It can be seen that pelvic floor reconstruction is widely used and can be improved in most therapeutic schemes.

This article mainly studies the clinical effect of laparoscopic pelvic floor reconstruction without mesh implantation in the treatment of pelvic organ prolapse and the influence of postoperative serum inflammatory factors, stress indicators, urination function and sexual function. The clinical curative effect of the operation plan was evaluated through the determination of POP-Q value and objective cure rate. The serum inflammatory factors and stress indexes before and after the operation were determined by the kit. Urination function was detected by a urodynamics detector and sexual function was investigated by a PISQ-12 questionnaire. The results show that laparoscopic pelvic floor reconstruction without mesh implantation has good clinical efficacy in the treatment of pelvic organ prolapse, with less stimulation to patients and less inflammation. After the operation, the patient's maximum urine flow rate exceeded 18mL/s, the sexual function score exceeded 45, and the urination function and sexual function were effectively improved. The innovation of this article lies in the use of a laparoscope to operate on patients. Laparoscopy can transmit images, and doctors can operate according to images. The operation wound is small and the safety is high. In surgery, the method of mesh is usually used, but the method without mesh is selected in this paper. In most studies, the urination function has not been measured. In this paper, the urination function has been accurately measured by the urodynamic tester.

Pelvic organ prolapse refers to the abnormal position and function of organs caused by the decline or displacement of pelvic organs due to defects or relaxation of the pelvic floor supporting tissues (12). It is the weak pelvic floor support caused by various etiologies, which leads to the displacement of pelvic organs, and interlocking causes the position and function abnormalities of other pelvic organs (13). As shown in Figure. 1, the entire pelvic floor has three chambers (bladder, uterus, rectum) and three ports (urethral orifice, vagina, anus) in turn when discharged outward. Considering the interior of the pelvic cavity as a whole, no matter which chamber protrudes outward, the corresponding organ may prolapse (14). Pelvic organ prolapse includes genital tract prolapse and cystocele, rectocele or rectal hernia. Reproductive tract prolapse includes uterine prolapse and anterior and posterior vaginal wall prolapse (15). Uterine prolapse refers to the descent of the uterus from the normal position along the vagina, with the cervical external orifice reaching below the level of the ischial spines, even with the uterus completely out of the vaginal orifice, often accompanied by prolapse of the anterior and posterior walls of the vagina (16).

With the continuous development of society, women's emphasis on health has gradually increased, and female pelvic floor studies have also achieved greater development (17). Many theories have been proposed continuously, among which the most important ones are the hammock hypothesis, three-level theory of vaginal support structure and overall theory (18). The hammock hypothesis holds that the urethra is located on the supporting structure composed of pelvic fascia and anterior vaginal wall. When hammock function is in question, high activity of proximal urethra or anterior vaginal wall bulge may occur (19). The three-level theory holds that the connective tissues such as fascia and ligament of the uterus and vagina can be divided into upper, middle and lower levels (20). The whole theory holds that different chambers and different levels of vaginal support axes form an anatomical and functional whole (21). Pelvic organ prolapse is affected by many factors, such as chronic cough, obesity, childbirth, long-term constipation, nerve injury, and lung diseases (22). The most common type is pelvic floor support weakness caused by vaginal injury and increased abdominal pressure. According to the structural defects of different parts of the pelvic cavity, there are many different surgical methods for pelvic reconstruction (23). Traditional stress urinary incontinence surgery mainly includes laparotomy MMK surgery and bladder neck suspension surgery. Reconstruction of pelvic floor organ prolapse includes anterior and posterior vaginal wall repair, retrocecal fascia surgery (24). In addition, there is sacral uterus fixation via laparotomy, etc. However, vaginal closure surgery is rarely used because patients cannot maintain normal sexual life after surgery (25).

In this study, the influence of postoperative serum inflammatory factors, stress indicators, urination function, sexual function and clinical efficacy of laparoscopic pelvic floor reconstruction without mesh implantation in the treatment of pelvic organ prolapse have been investigated.

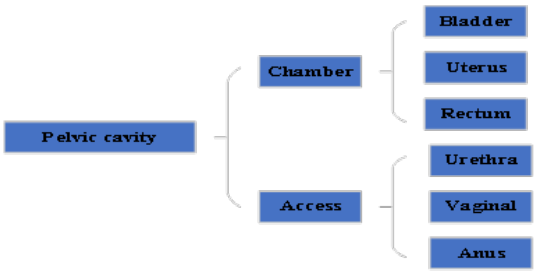

Figure 1. Pelvic structure.

Materials and Methods

Research object and grouping

The selected cases in this study were mainly anterior vaginal wall prolapse. The operation time was March 2016 to August 2019, and the age distribution was 42 to 58 years old, totaling 100 cases. The inclusion criteria of the study subjects were no serious cardiovascular and cerebrovascular diseases and normal liver and kidney functions. The lungs were relatively healthy, and smoking and drinking were not allowed. The research object can actively cooperate with observation and follow-up during the treatment process without deliberately concealing the situation. The participants and their families needed to understand the contents of the research survey and sign an informed consent form after understanding it.

Exclusion criteria: patients with immune deficiency, diabetic patients, having serious reproductive system diseases, hypertension patients with grade 2 or above, patients with a history of hormone therapy, patients who do not cooperate with treatment and deliberately hide their illness.

Group A: 50 cases of vaginal hysterectomy combined with vaginal wall repair, ranging from 43 to 57 years old, with an average age of 52 years old.

Group B: 50 cases of pelvic floor reconstruction with laparoscopic non-mesh implantation, ranging from 42 to 58 years old, with an average age of 51 years old.

Experimental material

The main equipment used in this experimental research institute: vaginal speculum, introducer, medical refrigerator, disposable blood sampler, EP tube, blood centrifuge, urodynamic detector, ultrasonic instrument, etc. This experiment also required a large number of kits. The testing contents and manufacturers of the kits are shown in Table 1.

Content and method of detection index

In order to have an objective evaluation index for clinical efficacy, we selected the POP-Q value to evaluate pelvic organ prolapse. POP-Q is an objective site-specific system for the description and staging of female POP. Through quantitative measurement of various points representing the anterior wall, the apex and the posterior wall of the prolapsed vagina, the topographic map of the vagina was drawn, and these anatomical points were used to determine the severity of prolapse. Take the examination of uterine prolapse as an example: the patient was in a squatting position or hip and knee flexion position and tried to relax. The evaluator's finger entered through the vagina and found point c, touching the cervix, allowing the patient to cough hard. At this time, the uterus will push the finger and calculate the farthest distance the finger is pushed out. If the distance obtained by subtracting TVL is greater than 2cm, then uterine prolapse was indicated.

The indexes of serum inflammatory factors were HS-CRP, IL-1p3, TNF-a, and the stress indexes were NE, E, INS. Blood samples were taken first for the detection of serum factors and stress indicators, and the blood was taken from 8 am to 9 am. After obtaining the blood sample, the blood centrifuge is used for separation, and the last clear liquid is collected into an EP tube and put into a medical refrigerator for storage.

Urodynamic index: detrusor maximum pressure (PDETAX); Detrusor pressure corresponding to QMAX (PDE-1qmax); Maximum urine flow rate (QMAX); Residual urine volume (PVR). The data were analyzed and processed by SPSS22.0 statistical software.

The sexual function evaluation adopts the method of questionnaire combined with subjective feeling evaluation. The selected questionnaire is PISQ-12, which is commonly used for sexual function evaluation after pelvic organ prolapse treatment.

Results

POP-Q value detection results

A large number of studies have proved that the clinical efficacy of laparoscopic pelvic floor reconstruction with non-mesh implantation is better than vaginal hysterectomy combined with vaginal wall repair. POP-Q value detection has not been conducted in a control experiment, and only the clinical efficacy of laparoscopic pelvic floor reconstruction with non-mesh implantation is analyzed. Because its clinical effect is more worthy of attention. The detection results of POP-Q value in the treatment group of laparoscopic pelvic floor reconstruction without mesh implantation are shown in Table 2.

Table 1. Types and sources of kits.

Test content	Detection method	Kit source
HS-CRP	Latex enhanced immune transmission method	Shanghai Fosun Long March Medical Company
IL-1p3	Enzyme-linked immunosorbent assay	Shanghai Chaoyan Biotechnology Co., Ltd.
TNF-a	Radioimmunoassay	Shanghai Hengyuan Biology Company
NE	Enzyme-linked immunosorbent assay	Shanghai Yanjin Biotechnology Co., Ltd.
E	Enzyme-linked immunosorbent assay	Shanghai Yanjin Biotechnology Co., Ltd.
Ins	Enzyme-linked immunosorbent assay	Shanghai Yanjin Biotechnology Co., Ltd.

Table 2. Point of indication POP-Q value.

Time	Aa (cm)	Ba (cm)	D (cm)	TVL (cm)
Before surgery	1.7	2.5	-2.7	6.3
Six months after the operation	-2.9	-2.8	-6.4	6.5
Twelve months after the operation	-2.8	-2.8	-6.3	6.5

Clinical effect analysis

The analysis index of clinical curative effect is POP-Q value, Aa and Ba are two points of the anterior vaginal wall, D is the top point, and TVL was the total length. Draw the POP-Q value of the indicator point as a bar graph, as shown in Figure 2. As can be seen from Figure 2, after laparoscopic pelvic floor reconstruction with non-mesh implantation, the prolapse of the patient has been better improved, and there is basically no sign of relapse after 12 months. We investigated and counted the objective cure rate of the two groups within 12 months. The objective cure rate of group A was 88%, and that of group B was 100%. Therefore, laparoscopic pelvic floor reconstruction without mesh implantation has a good clinical effect in treating pelvic organ prolapse.

Serum inflammatory factors and stress indexes were also one of the criteria for judging the advantages and disadvantages of clinical surgery. Hs-CRP was 6.12mg/L, IL-1p3 was 38.24ng/mL, TNF-a was 27.32ng/mL, NE was 34.86ng/mL, E was 23.97ng/mL, Ins was 6.27 IU/mL measured before operation. Hs-CRP, IL-1p3, TNF-a, NE, e and INS in group b were 6.21mg/L, 38.35ng/mL, 27.62ng/mL, 34.82ng/mL, 24.05ng/mL and 6.24 IU/mL respectively. Before the operation, there was little difference between inflammatory factors and stress indexes in patients' serum. Hs-CRP, IL-1p3, TNF-a, NE, e, Ins in group a were 11.53mg/L, 68.41ng/mL, 51.76ng/mL, 70.65ng/mL, 57.28ng/mL and 16.96IU/mL respectively. Hs-CRP, IL-1p3, TNF-a, NE, e and INS in group b were 8.14mg/L, 48.27ng/mL, 40.68ng/mL, 52.96ng/mL, 38.93ng/mL and 11.24IU/mL. For visual comparison, we plotted the growth rate of index content as a bar graph, as shown in Figure 3. As can be seen from the figure, the growth rate of serum inflammatory factors and stress index content in group A was significantly higher than that in group B, which indicates that the operation mode in group B has less stimulation for patients and causes less inflammation.

Analysis of the influence of urination function and sexual function

Pelvic organ prolapse often affects micturition function. We measured the micturition function of the two groups of patients. Six months after the operation, the urodynamic indexes of the patients in Group B were better than those in Group A, and the difference in the maximum urine flow rate was the most obvious. We plotted the maximum urine flow rate within 3 months into a line chart, as shown in Figure 4. As can be seen from the figure, after 3 months, the maximum urine flow rate of group b patients exceeded 18mL/s, which was far greater than that of group a. Laparoscopic pelvic floor reconstruction without mesh implantation for pelvic organ prolapse can effectively improve urination function.

There are many schemes for treating pelvic organ prolapse, but many of them ignore the effect on sexual function. In this study, due to the older age of some patients, they had no sexual life long ago, so these patients were sacrificed in the evaluation process. 20 patients from each group of the rest patients were selected for evaluation, and PISQ-12 scores were obtained. The results are shown in Figure 5. The sexual function score of group B patients exceeded 45 points, far higher than that of group A, proving that laparoscopic pelvic floor reconstruction without mesh implantation can effectively improve sexual function.

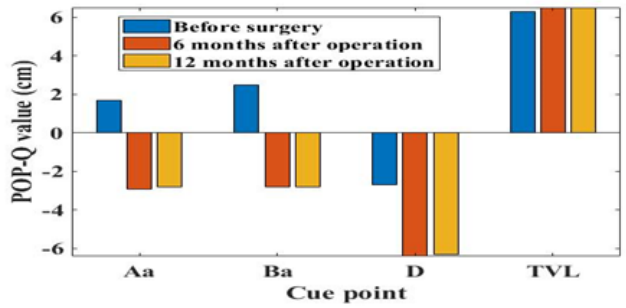

Figure 2. Point of indication POP-Q value.

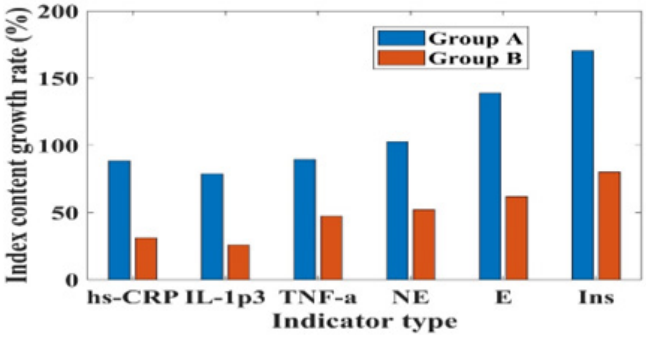

Figure 3. The growth rate of serum inflammatory factors and stress indicators.

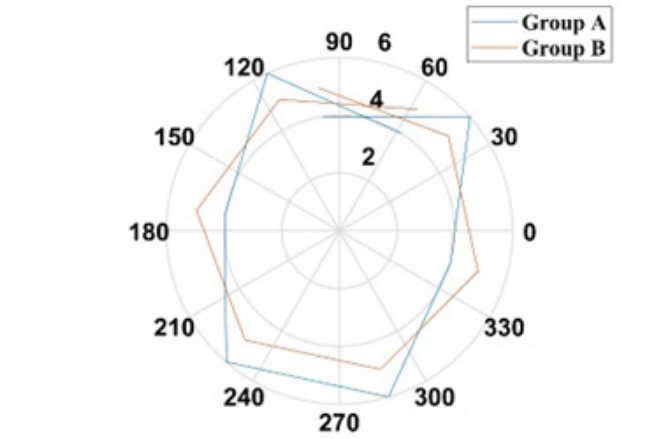

Figure 4. Maximum urine flow rate.

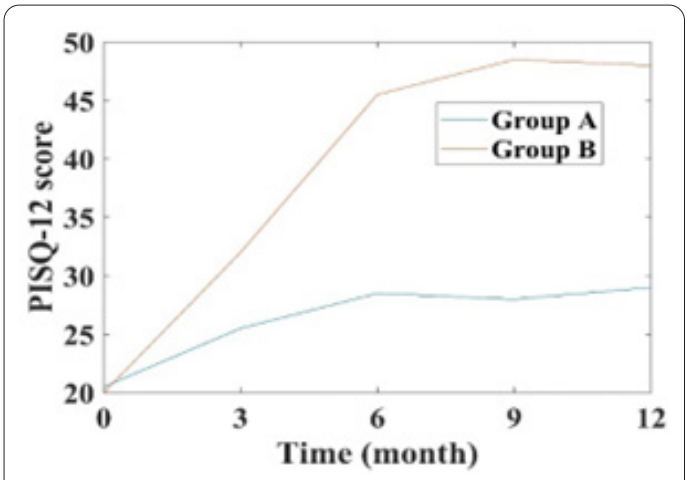

Figure 5. Sexual function score.

Discussion

Pelvic organ prolapse is seriously harmful to women's health and daily activities, and the incidence rate increases with age, which is more common among middle-aged and elderly women. Currently, there are many treatment schemes for pelvic organ prolapse, most of which are mainly based on surgery. Many of them will produce complications during and after surgery. If the complications are serious, they may have a serious impact on the life and health of patients. Therefore, it is very important to reduce the complications during and after the operation (26). This article adopts the method of laparoscopy, which can effectively reduce the wound, blood loss and infection risk. Because of the high probability of complications in mesh surgery, we chose not to use mesh in this experiment. The selected experimental control group adopted vaginal hysterectomy combined with vaginal wall repair.

The clinical curative effect of the operation plan was evaluated through the determination of POP-Q value and objective cure rate. Enzyme-linked immunosorbent assay, latex enhanced immune transmission assay and radioimmunoassay were used to measure serum inflammatory factors and stress indexes before and after the operation. Urination function was detected by a urodynamics detector and sexual function was investigated by a PISQ-12 questionnaire. The results show that laparoscopic pelvic floor reconstruction without mesh implantation has a good clinical effect in the treatment of pelvic organ prolapse, and there is no sign of recurrence after 12 months. Within 12 months, the objective cure rate of group A was 88%, and that of group B was 100%. Hs-CRP, IL-1p3, TNF-a, NE, e, Ins in group a were 11.53mg/L, 68.41ng/mL, 51.76ng/mL, 70.65ng/mL, 57.28ng/mL and 16.96IU/mL respectively. Hs-CRP, IL-1p3, TNF-a, NE, e and INS in group b were 8.14mg/L, 48.27ng/mL, 40.68ng/mL, 52.96ng/mL, 38.93ng/mL and 11.24IU/mL. The growth rate of serum inflammatory factors and stress indexes in group A was significantly higher than that in group B, indicating that laparoscopic pelvic floor reconstruction without mesh implantation has less stimulation for patients and causes less inflammation. After the operation, the patient's maximum urine flow rate exceeded 18mL/s, the sexual function score exceeded 45 points, and the urination function and sexual function were effectively improved.

Acknowledgments
Not applicable.

Interest conflict
The authors declare that they have no conflict of interest.

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