The role of levatorplasty procedure in improving genital hiatus area and symptoms in pelvic organ prolapse with ballooning in Indonesia

Anggrainy Dwifitriana Kouwagam, Fernandi Moegni, Budi Iman Santoso, Suskhan Djusad, Surahman Hakim, Tyas Priyatini, Alfa Putri Meutia

Reconstructive Esthetic Urogynecology Division, Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Indonesia/Dr. Cipto Mangunkusumo National General Hospital, Jakarta, Indonesia

Correspondence: Fernandi Moegni, Reconstructive Esthetic Urogynecology Division, Department of Obstetrics and Gynecology, Faculty of Medicine, Universitas Indonesia, Jalan Salemba Raya No. 6, 10430, Jakarta, Indonesia.
E-mail: fernandi71@ui.ac.id

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Abstract

Levatorplasty procedures can be performed in cases of pelvic organ prolapse (POP) with hiatal ballooning to reduce the risk of prolapse recurrence. At Dr. Cipto Mangunkusumo Hospital Jakarta, POP patients with hiatal ballooning during pre-operative ultrasound examination were planned for an additional levatorplasty procedure. However, there was no objective assessment such as the ballooning condition postoperatively. The objective of this paired comparative analytic study was to determine the improvement of ballooning after levatorplasty by assessing anteroposterior (AP) hiatal length and maximal levator hiatal (LH_{max}) on ultrasound Pelvic Organ Prolapse Quantification System, and the Pelvic Floor Distress Inventory (PFDI) Questionnaire-20. The data of 32 women were taken retrospectively and prospectively during 2021-2022 and statistically analyzed using SPSS 24.0. There was a reduced degree of ballooning measured by LH_{max} area in 28 patients (87.5%), AP hiatal length in 26 patients (81.25%), and genital hiatus + perineal body length in 25 patients (78.1%) and decreased median value of PFDI to 31.2 ($p = 0.009$) after levatorplasty. The levatorplasty procedure has proven beneficial in improving the objective and subjective outcomes of POP patients with evidence of ballooning on ultrasonography.

Introduction

Pelvic organ prolapse (POP) is a herniation of the pelvic organ that can affect a woman's life physically, socially, psychologically, and even economically. The classification of POP can be classified into uterine prolapse, vaginal apex prolapses, anterior vaginal cystocele or prolapse, and rectocele or posterior vaginal prolapse.[1,2] The prevalence of POP worldwide is reported to reach 9%, with prevalence in low-income countries reaching up to 20%.[3] Research at Dr. RSUPN Cipto Mangunkusumo, Jakarta, showed that the prevalence of POP in January-April 2016 reached 26.4% of the total patients with pelvic organ dysfunction (33%).[4]

Defects in the supporting structures of the pelvic floor can be caused by a traumatic process that widens the genital hiatus (GH), known as ballooning. Several studies have shown a positive relationship between ballooning and the incidence of POP grade 2 and above.[1] The incidence of ballooning and POP has a reciprocal relationship in which ballooning is a risk factor for POP, and POP can exacerbate the degree of distension of the ballooning.[1,5] The process of mechanical trauma, especially during labor, stretches the puborectalis muscle, which causes permanent overdistention of the levator hiatus.[6]

The management of POP consists of conservative and surgical management and can be adjusted based on the characteristics of each patient. Surgical reconstruction can be performed through an abdominal approach, a perineal approach, or even both.[7] One of the procedures that can be done is levatorplasty, which exposes the two postero-lateral sides of the puborectalis and pubococcygeus muscles, followed by the placement of interrupted sutures with polyglycolic acid suture no.1 for medial approximation in the purpose of narrowing the wide area from the levator ani muscle. This procedure is said to help prevent the recurrence of prolapse and repair the ballooning of the genital hiatal.[8,9] However, there is currently no post-levatorplasty evaluation to help evaluate ballooning repair. This triggered us to examine the evaluation of post-levatorplasty in POP patients with ballooning.

Materials and Methods

A paired comparative analytic study with retrospective and prospective cohort design was used in this study. The purpose was to find out the role of levatorplasty in repairing ballooning, as measured by assessment of the wide area and anteroposterior (AP) length from maximal levator hiatal (LH_{max}) during Valsalva using pelvic floor ultrasound examination, assessment of GH + perineal body (Pb) length using the Pelvic Organ Prolapse Quantification (POP-Q) system, as well as assessing clinical complaints of pelvic floor dysfunction using the Pelvic Floor Distress Inventory (PFDI) Questionnaire-20 (PFDI-20). Patients who were unable to perform the Valsalva maneuver, patients with a history of old perineal rupture, patients with levator ani avulsion, and patients with surgical wound complications (infection, open sutures) were excluded from this study. The assessment of LH_{max}, POP-Q, and PFDI-20 assessments was performed pre- and post-operatively. Subjects recruited prospectively were examined 3 months postoperatively, and subjects recruited retrospectively were examined at 3, 6, 9, or 12 months postoperatively.

Results

The research took place at the Obstetrics and Gynecology Outpatient Clinic, Reconstructive Esthetic Urogynecology Division, Department of Obstetrics and Gynecology, Dr. Cipto Mangunkusumo Hospital, Jakarta. Levatorplasty procedure data was collected retrospectively from October 2021 to April 2022, with prospective data from October 2021 to January 2022. The study sample collected as many as 22 subjects for retrospective evaluation and 10 subjects for levatorplasty and prospective evaluation (Table 1).

From 32 subjects, 16 subjects (50%) had POP grade 4, 23 subjects (71.9%) had cystocele grade 3, 8 subjects (25%) had cystocele grade 4, and 15 subjects (46.9%) had rectocele grade 3. Types of surgery performed for POP reconstruction in the subjects of this study include total vaginal hysterectomy (TVH), sacrospinous ligament fixation (SSF), anterior colporaphy, posterior colpoperineorafi, Kelly plication, uterosacral ligament suspension, sacrospinous hysteropexy (SSH), transobturator tape, and colpocleisis. All of these procedures were accompanied by levatorplasty for ballooning repair.

There was a general decrease in the number of subjects experiencing ballooning after levatorplasty was performed (Table 2). The decrease was assessed based on indicators, such as LH_{max} wide area, and hiatal AP length from ultrasound measurements, Gh + Pb length, from POP-Q. The mean values of the three parameters were statistically significantly decreased after levatorplasty (LH_{max} area 33.3±7.3 to 26.0±6.8; hiatal AP length 7.0±0.8 to 6.1±0.9; Gh + Pb length 8.7±1.0 to 6.7±1.2; p=0.000 for all three indicators). The

Table 1. Subjects' characteristics (n=32).

Characteristics	Frequency	Percentage
Age		
36-60	12	37.5
61-75	20	62.5
Age, mean ± SD	61.3	±8.1
Physical activity		
Gentle	27	84.4
Moderate	4	12.5
Vigorous	1	3.1
BMI		
Normo-weight	4	12.5
Overweight	11	34.4
Obesity grade 1	12	37.5
Obesity grade 2	5	15.6
BMI, mean ± SD	25.7	±2.9
Menopausal status		
Yes	28	87.5
No	4	12.5
Parity		
Primi	11	34.4
Multi	21	65.6
Delivery		
Spontaneous	30	93,8
Cesarean section	2	6,2
Birthweight, mean ± SD	3543.8	±500.9

SD, standard deviation; BMI, body mass index.

Table 2. Gynecological status before and after surgery.

Gynecological status	Levatorplasty	
	Before Freq (%)	After Freq (%)
Ballooning from LH_{max}		
None	0 (0)	19 (59.4)
Mild	13 (40.6)	6 (18.8)
Moderate	8 (25.0)	3 (9.4)
Marked	9 (28.1)	2 (6.3)
Severe	2 (6.3)	2 (6.3)
Ballooning from AP hiatal		
None	0 (0)	17 (53.1)
Mild	9 (28.1)	6 (18.8)
Moderate	9 (28.1)	4 (12.5)
Marked	6 (18.8)	2 (6.3)
Severe	8 (25.0)	3 (9.4)
The length of GH + Pb		
5	0 (0)	7 (21.9)
6	0 (0)	6 (18.8)
7	3 (9.4)	10 (31.3)
8	11 (34.4)	7 (21.9)
9	14 (43.8)	2 (6.3)
10	2 (6.3)	0 (0)
11	2 (6.3)	0 (0)
Ballooning from POP-Q		
None	0 (0)	13 (40.6)
Mild	3 (9.4)	10 (31.3)
Moderate	11 (34.4)	7 (21.9)
Marked	14 (43.8)	2 (6.3)
Severe	4 (12.5)	0 (0)

LH_{max}, maximal levator hiatal; AP, anteroposterior; GH, genital hiatus; Pb, perineal body; POP-Q, Pelvic Organ Prolapse Quantification.

most significant decrease occurred in the marked and severe ballooning groups (Table 3).

In the PFDI-20 assessment of 10 prospective subjects, there was a significant improvement in the PFDI-20 value after levatorplasty (p = 0.009), with a decrease in the median PFDI-20 value reaching 31.2. For each subsection, there was a significant decrease in the median value of Pelvic Organ Prolapse Distress Inventory-6 (POPDI-6) (20.8 to 0.0; p=0.009), a decrease in the median Colorectal Anal Distress Inventory-8 (CRADI-8) (12.5 to 6.3; p=0.096), and a decrease in the median Urogenital Distress Inventory-6 (UDI-6) (12.5 to 2.1; p=0.360) (Table 4).

Discussion

This study found that the success rate of levatorplasty in POP patients with ballooning occurred in the three assessed indicators, namely LH_{max} in 87.5% of cases, hiatal AP length in 81.25% of cases, and Gh + Pb length in 78.1% of cases. Wong stated that the reconstruction of the puborectalis and pubococcygeus muscles carried out by levatorplasty provides a more supportive effect on the pelvic floor structure, thereby reducing the extensive distensibility that occurs. One pilot study mentioned puborectal sling surgery was able to reduce distension of the levator hiatus area by up to 30%, which persisted for up to 2 years without complications.[6] The similarity of puborectal sling surgery with levatorplasty is the goal of both procedures, which is to strengthen the pelvic floor structures to prevent prolapse.

Although ballooning is said to be closely related to the recurrence of POP and is considered an independent risk factor,[10,11] to date, there have been no studies that have directly assessed the incidence or risk factors for ballooning after levatorplasty correction. This study found five subjects who had failed levatorplasty with increased postoperative ballooning. The characteristics of these subjects tend to vary, with three subjects undergoing a suspension procedure and one subject undergoing an obliterative procedure. These three patients are included in the group of body mass index (BMI)>25 kg/m^2 category. POP cases with normal BMI tend to have a more significant improvement. However, BMI is not always inversely proportional to the strength of the pelvic floor muscles because this can be influenced by other factors such as sports activities, which can vary between patients.[12,13] In addition, menopause factors can also be considered. As many as three out of four patients who failed to repair ballooning had already experienced menopause. The decrease in estrogen levels during menopause affects the strength of the connective tissue in the pelvic floor due to a decrease in metabolism and collagen synthesis.[14,15] Patients with POP grade III and above also tend to have a higher risk of recurrence.

A study by the International Urogynecological Association Research and Development Committee showed procedural factors could be one of the causes of POP recurrence. This is associated with failure to identify and correct all defects in the pelvic floor. SSF is the most common procedure that causes anterior compartment prolapse.[16] The TVH procedure with SSF also carries a risk of recurrence. In this study, three out of five patients who failed to have any improvements underwent SSF or SSH procedures. These failures can generally be caused by subject or tissue quality factors as well as intraoperative factors such as surgical technique and suture quality. Several medical conditions, such as vaginal atrophy, tobacco use, obesity, and diabetes, can affect the tissue quality of the subjects.[17] The operator difference factor is one of the factors causing surgery failure in this study.

In this study, there was a significant decrease in aspects of POPDI-6 (uterine prolapse symptoms) and overall PFDI-20 value, but there was no improvement in the values of CRADI-8 (gastrointestinal symptoms) and UDI-6 (urinary symptoms). This may be due to differences in the initial degree of uterine prolapse, cystocele, and rectocele. Given that the PDFI-20 is a numerical assessment, there is a minimal change in value that can be considered significant. The greatest clinical improvement occurred in patients with low preoperative POP severity (grades I-II), normal BMI, and who had not yet entered menopause. Jakus-Waldman *et al.* stated that a low preoperative PFDI-20 component would increase the risk of postoperative deterioration. This can result in the fact that although surgery improves the ballooning rate and degree of an anatomic problem objectively, the subjective improvement in the symptoms the patient perceives is not directly proportional. This study uses a small number of samples, so further assessment is needed with a larger sample size.[18]

Table 3. Subjects' characteristics (n=32).

Characteristics	Frequency	Percentage
LH_{max} area		
Decreased	28	87.5
Stable	2	6.25
Increased	2	6.25
AP hiatal length		
Decreased	26	81.25
Stable	2	6.25
Increased	4	12.5
GH + Pb length		
Decreased	25	78.1
Stable	6	18.8
Increased	1	3.1

AP, anteroposterior; GH, genital hiatus; Pb, perineal body.

Table 4. Median Pelvic Floor Distress Inventory scores before and after surgery.

PFDI	Before surgery		After surgery		p
	Median	Range	Median	Range	
POPDI-6	20.8	8.3-79.2	0.0	0.0-16.6	0.009
CRADI-8	12.5	0.0-28.1	6.3	0.0-15.6	0.096
UDI-6	12.5	0.0-66.6	2.1	0.0-20.8	0.360
Total	45.8	20.8-141.6	14.6	3.1-46.8	0.009

POPDI-6, Pelvic Organ Prolapse Distress Inventory-6; CRADI-8, Colorectal Anal Distress Inventory-8; UDI-6, Urogenital Distress Inventory-6;

Conclusions

The levatorplasty procedure is proven to repair the ballooning conditions in POP patients as assessed by improvements in the area and length of the AP diameter of the levator hiatus, clinical improvement objectively (as assessed by the POP-Q examination), and subjectively (as assessed by the PFDI-20 questionnaire). The results of this study are expected to be evidence for the application of the levatorplasty procedure to be performed on POP patients accompanied by ballooning in many clinical practices throughout Indonesia.

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