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Full length article

Evaluation of the effectiveness of laparoscopic pectopexy in advanced stage apical prolapse

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ABSTRACT

Objective: We aimed to investigate the effectiveness of the laparoscopic pectopexy procedure in women who want to preserve their uterus for stage III or IV apical prolapse.
Study design: 132 women who underwent laparoscopic pectopexy due to stage III or IV apical pelvic organ prolapse (POP) were included in this study. Demographic data of the patients, duration of surgery, blood loss, hospitalisation, intraoperative and postoperative complications, recurrence rate were searched from the hospital file archive. Pelvic organ prolapse quantification (POP-Q) system was used at postoperative control visits. The patients' quality of life was evaluated by comparing the results of the pelvic organ quality of life (P-QOL) questionnaire which they filled out at the preoperative and 6th months later.
Results: The patients' mean age was 60(52–66)years. The average duration of the surgery was 110(90–150) minutes. Average blood loss was 150(75–220) ml. No intraoperative or postoperative complications were noted. The average hospitalisation was 2(1–3) days. The average follow-up period was 19 (13–26) months. Apical prolapse recurrence was observed in 3 (2.2 %) patients and laparoscopic sacrohysteropexy was performed. There was a significant improvement in the POP-Q scores of the patients in the postoperative period ($p < 0.0001$). A significant improvement was detected in the P-QOL total score and all each paramaters after surgery ($p < 0.0001$).
Conclusion: Laparoscopic pectopexy seems to be a reliable and efficient method for patients in advanced stages apical prolapse whom wants to preservation of the uterus. With all the advantages of minimally invasive surgery, it increases the patients' quality of life.

Introduction

Pelvic organ prolapse (POP) affects 3 out of every 10 women over the age of 50 years who have given birth at least once [1,2]. Initial treatment is mostly conservative, however in advanced stages surgery is inevitable [1].

The support of the pelvic organs is provided by the levator ani muscle at the base, the arcus tendineus fascia pelvis (ATFP) on the sides, the pubocervical fascia in the front and the uterosacral ligaments in the back. These structures are in relationship with each other and attach to the pericervical ring at the apical level. Therefore, the uterus is the cornerstone of the apical support of the pelvic organs. So that, the interest in uterus-preserving approaches in prolapse surgery is increasing day by day. Sacrocolpopexy (SCP) is considered the gold standard procedure for apical prolapse correction [3]. However, in SCP, there is a risk of damage to the sigmoid colon, hypogastric nerve in the presacral region and the right ureter. Additionally, SCP narrows the posterior pelvic cavity which may causes defecation problems [4]. Technically, SCP is a difficult technique to apply in patients who are obese or have intestinal adhesions [5]. For this reason, alternative techniques that will facilitate the repair of apical prolapse have been sought and Pectopexy, which eliminates the difficulties mentioned above, has been presented as an alternative to SCP [6].

Many studies in the literature have documented that Laparoscopic Pectopexy is effective in the treatment of apical pelvic organ prolapse [7–9]. However, studies evaluating its effectiveness especially in

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advanced stage apical prolapse are limited. In this study, we aimed to investigate the effectiveness of the Laparoscopic Pectopexy procedure performed by preserving the uterus in cases with POP-Q stage III or IV apical prolapse.

Methods

The medical records of women who requested uterine-preserving surgery due to symptomatic advanced stage apical prolapse and who underwent Laparoscopic Pectopexy procedure in two university hospitals between June 2021 and December 2023 were retrospectively searched from hospital files. This study was conducted in accordance with the principles stated in the Declaration of Helsinki. For this study, ethics committee approval was received from the Kütahya Health Sciences University Ethics Committee (E-41997688–050.99–93979).

Inclusion criteria were as follows: (1) patients with symptomatic POP-Q stage III or IV apical prolapse who wanted uterine-sparing surgery; (2) patients who accepted laparoscopic pectopexy procedure; (3) patients with no obvious surgical contraindications. Exclusion criteria were as follows: (1) Patients who had previous surgical treatment for pelvic floor dysfunction; (2) patients who could not tolerate laparoscopic surgery at preoperative evaluation; (3) patients with acute or chronic inflammation of the reproductive tract, ulcers, or urinary tract infection; (4) patients with pelvic organ malignant tumors (5) patients with blood clotting disorders; (6) pregnant or breastfeeding women.

The stage of prolapse was determined using the POP-Q system [10]. Physical examination was performed in the lithotomy position and with the valsalva maneuver. Patients were examined in both standing and sitting positions. All women underwent a prolapse reduction cough stress test for preoperative evaluation for occult stress urinary incontinence (SUI). Urodynamic studies were performed on women with complicated stress urinary incontinence.

Postoperative examination were made 1 week and 6 weeks later to check in terms of anatomical and functional results. In order to evaluate the patients'quality of life, the Prolapse Quality of Life Questionnaire (P-QOL) was used [11]. The validity and reliability of this test was conducted in Turkish population [12]. A high P-QOL score represents low quality of life.

Operation technique

Preparations before surgery

There was no need for a special diet or bowel preparation. Antiembolic compression stockings were routinely applied to all patients in the preoperative period. Antithrombotic prophylaxis with low molecular weight heparin was administered to patients at risk. A single dose of antibiotics (cefuroxime 1.5 g intravenously) was routinely administered 30 min before the operation. All patients were advised to apply low-dose vaginal estriol cream 6 weeks before surgery. It also recommended regular pelvic floor exercise for up to 8 weeks after surgery.

Operation procedure

In accordance with ethical rules, all patients were informed about the proposed benefits and possible complications of this procedure. All of them agreed to undergo surgery with the new method. The Laparoscopic Pectopexy procedure was performed as previously described in the literature [6].

Step one: Patient preparation

The patient's left arm was placed in the dorsal lithotomy position, adjacent to the patient's body. A 16-F Foley catheter with a 10-ml balloon tip was inserted into the bladder and connected to a continuous drainage system. The operation was performed under general anesthesia. During the surgery, the surgeon was on the patient's left, the first assistant was on the patient's right, and the second assistant was between the patient's legs.

Step two: Inserting the endoscope

A 1 cm incision was routinely made into the umbilicus. Then, a veress needle was placed. CO_2 insufflation was performed until the abdominal pressure reached 12 mmHg. A 10 mm main trocar was placed into the umbilical incision to insert the laparoscope. In addition to the main trocar, two 5 mm auxiliary trocars were placed on the medial and superior sides of the anterior superior iliac on both sides, and one 5 mm auxiliary trocar was placed 2 cm medial to the midclavicular line on the left side at the umbilicus level. Under laparascopic visualisation, a RUMI© uterine manipulator with Koh CupTM colpotomizer (Cooper Surgical; Trumbull, Connecticut, USA) was placed in the uterus.

Third step: Intraperitoneal exploration and preparation of iliopectineal ligaments

After insufflation and intra-abdominal inspection, the uterus was placed in the retroverted position with the help of the Rumi II manipulator. The peritoneum of the cervix was dissected and mesh fixation was prepared. The projection of the obliterated umbilical artery on the anterior abdominal wall was found on the right and left sides, and an incision was made in the peritoneum lateral to the ligament at the level of the pubic bone. An approximately 3 cm long area was dissected on the pectineal ligament on both sides, just medial to the external iliac vessels. After the dissections were completed, a type 1 monofilament polypropylene mesh (15 cm long, 2 cm wide, with a middle part of 4x4 cm) was placed in the abdominal cavity. The uterus was elevated by the manipulator to the natural position without excessive tension. The middle part of the mesh was fixed to the anterior cervix with 2–0 Ethibond suture (Ethicon, Somerville, NJ, USA) with 4 separate sutures. The ends of the mesh were fixed to both iliopectineal ligaments with 4 ProTack (Covidien, Mansfield, MA) tucker on each side. After mesh placement, the visceral peritoneum was closed with 3–0 an absorbable suture.

If needed, additional procedures were performed at the same session. Laparascopic Burch colposuspension was performed for stress urinary incontinance cases after Pectopexy procedure. Colpography anterior /posterior procedures were performed vaginally after finishing laparascopic step for symptomatic cystocele/rectocele or cystorectole.

Statistical methods

IBM SPSS 24.0 (IBM Corp., Armonk, NY, USA) package program was used for statistical analysis. Normal distribution was evaluated with the Kolmogorov-Smirnov test. Numerical variables with normal distribution were presented as mean ± standard deviation, numerical variables without normal distribution were presented as median [25p-75p], and categorical variables were presented as frequency (percentage). In dependent samples, the T test was examined, and in cases where the normal distribution assumption was not met, the Wilcoxon T test was used. Spearman test was used in correlation analysis. A significance level of $p<0.05$ was considered sufficient for testing two-way hypotheses.

Results

Totally, 132 women underwent Laparoscopic Pectopexy procedure for symptomatic POP-Q stageIII- IV apical prolapse. As detailed demographic data of the patients are shown in the Table 1**,** the mean age of 132 patients included in this study was 58.52 ± 11.1 years. In Table 1, which also shows the additional surgeries performed in the same session. We see that Laparoscopic Burch colposuspension was performed in 8% (11/132) of the cases due to stress urinary incontinence.

Table 1
Demographic datas of the patients.

Age (years)	60 [52–66]	
BMI (kg/m^2)	28.12 [25.95–31.20]	
Gravidity	4 [2–5]	
Parity	3 [2–4]	
Vaginal delivery	3 [2–4]	
Follow-up (months)	19 [13–26]	
Additional surgery (n/%)		
	Cystorectocele	36 (27.3 %)
	Cystocele	42 (16.7 %)
	Rectocele	22 (16.7 %)
	Burch Colposuspension	11 (8.3 %)
	Laparoscopic Pectopexy solely	28 (20.1 %)

Datas are expressed as mean[25p-75p].
BMI: body mass index.

Anterior colporrhaphy was performed vaginally in 42 cases(31.8%) for POPQ stage III cystocele, posterior colporrhaphy performed vaginally in 22 cases(16%) for POPQ stage III rectocele, anterior and posterior colporrhaphy was performed vaginally in 26 cases(19.6%) for POPQ stage II symptomatic cystorectocele respectively. The mean duration of the total procedure was 110 (90–150) minutes. The mean duration of the solely Laparascopic Pectopexy procedure was 42 (38–59) minutes Average blood loss for total procedures was 150 (75–220) ml, for solely Laparascopic Pectopexy was 110(30–150)ml. No intraoperative or postoperative complications were noted. The average hospitalisation was 2 (1–3) days. Our average follow-up period was 19(13–26) months.

The recurrence rate was found to be 2.2% (3/132) during an average 19 months follow-up period. Recürrences occurred within the first 6 months after surgery. The ages of these patients were respectively; 66, 63, 69 years and Laparascopic Sacrocolpopexy was performed due to symptomatic stage IV apical prolapse. During Sacrocolpopexy, it was observed that the cause of recürrence was the separation of the mesh from the cervix in the middle. For the rest, there was a significant improvement in the POP-Q scores at 6th months controls ($p<0.0001$) (Table 2). Also, a significant correlation was detected between Ba point and C point of the cases in the preoperative period (r: 0.830, $p<0.0001$) (Table 2).

In Table 3, where the preoperative and postoperative results of the P-QOL scale, there is a statistically significant improvement after surgery ($p<0.0001$) (Table 3). The improvement in the total score as well as in all sub-scores are shown in Table 3.

Discussion

Pectopexy was first applied by Banerjee & NOE [6]. Sacrocolpopexy is the gold standard method for apical POP correction [4,5,13]. Subsequent studies have shown that laparoscopic pectopexy has similar success rates to sacrocolpopexy [7,8,14]. Moreover, some studies demonstrated that it has a shorter operation time [14–16], fewer de novo cystocele cases development rates than Sacrocolpopexy [7,15]. Unlike Sacrocolpopexy, mesh erosion due to synthetic mesh has not been reported in Pectopexy [14–16]. In our study, no mesh erosion was observed too.

Table 2
Pre- and postoperative pelvic organ prolapse quantification (POP-Q) (n = 132).

POP-Q variables	Preoperative	Postoperative	p
Aa	1.71 ± 1.54 2 [1–3]	(−1.46) ± 1.65 (−2) [(−3)-(−1)]	<0.0001[a]
Ba	3.51 ± 3.27 5 [3–6]	(−2.60) ± 2.88 (−3) [(−5)-(−2)]	<0.0001[a]
Ap	0.85 ± 1.64 1 [-1–2]	(−2.14) ± 1.51 (−3) [(−3)-(−2)]	<0.0001[a]
Bp	2.06 ± 3.28 3 [-1–4]	(−3.73) ± 2.06 (−4) [(−6)-(−3)]	<0.0001[a]
C	4.31 ± 2.66 5 [2–6]	(−3.93) ± 3.41 (−5) [(−6)-(−4)]	<0.0001[a]
D	3.34 ± 2.87 4 [1–5.5]	(−5.80) ± 1.99 (−6) [(−7)-(−5)]	<0.0001[a]

POP-Q: pelvic organ prolapse quantification.
[a] : Wilcoxon test.

Table 3
Scores of Prolapse Quality of Life Questionnaire (n = 132).

Dimension	Preoperative	Postoperative	*p*
General Health	42.71 ± 14.19	31.38 ± 11.01	<0.0001[a]
POP symptoms	56.21 ± 23.30	26.59 ± 12.28	<0.0001[a]
Physical limitations	55.68 ± 22.49	25.98 ± 10.10	<0.0001[a]
Social Limitations	51.59 ± 24.05	24.89 ± 10.70	<0.0001[a]
Personal limitations	43.55 ± 22.85	25.31 ± 11.75	<0.0001[a]
Emotions	54.65 ± 22.16	26.97 ± 12.01	<0.0001[a]
Sleep/Energy	38.18 ± 19.41	23.79 ± 8.52	<0.0001[a]
Severity of symptoms	47.99 ± 18.57	24.47 ± 7.87	<0.0001[a]
Total score	48.61 ± 11.89	27.90 ± 7.58	<0.0001[a]

POP: pelvic organ prolapse.
The results presented as mean ± SD.
[a] : Wilcoxon test.

In the literature, Laparoscopic Pectopexy was performed on patients for uterine prolapse and vaginal vault prolapse [7,8,14–16]. There are a few studies that Laparoscopic Pectopexy was performed on cases with preserved uterus [16,17]. In these studies, the recürrence rate was reported as 2.9% and 5% [16,17]. However, the success rates of Laparoscopic Pectopexy have not been demonstrated for stage III-IV apical prolapse yet. In this study, the recurrence rate after Laparoscopic Pectopexy in stage III- IV apical POP cases with preserving uterus was found to be 2.2% (3/132). Biler et al. did not report any recurrence in their study in which they evaluated a total of 28 cases, 12 of them underwent laparoscopic pectopexy for POP-Q stage >II uterine prolapse [14]. Tahaoglu et al. observed no recurrence in a total of 22 cases in which they preserved the uterus at laparascopic pectopexy session for POPQ stage ≥II apical POP(18). However, it was not stated in these studies that how many of the cases were stage IV apical POP [14,18]. Peng et al. reported results of 170 cases with a POP-Q stage ≥II apical prolapse, they applied Laparoscopic Pectopexy alone to 23, Laparoscopic Pectopexy with hysterectomy to 78 cases, and laparoscopic high uterosacral ligament suspension to 69 cases [21]. Only 1 (4.4%) of a total of 170 cases was reported as grade IV POP, and 15 (65.2%) as grade III POP. As a result of the study, it was observed that Laparoscopic Pectopexy was better than laparoscopic high uterosacral ligament suspension in anatomical recovery, the complication rate was lower in the postoperative period, and sexual functions were better [21].

Robotic method is another option as a minimal invasive technique for pelvic floor reconstruction. The robotic technique for pectopexy capitalizes on the advantages of robotic surgery as compared to conventional laparoscopy since it allows for anatomical preparation and simplification of applying sutures and mesh material, reducing operating time and minimizing surgical trauma [22]. Bolovis et al. have translated the Laparoscopic Pectopexy into a robotic procedure [22]. The charts of the first 30 consecutive patients who underwent robotic pectopexy at the department for robotic and pelvic floor surgery were reviewed. They reported any intraoperative complications and no need to conversion to laparascopy. Treatment success according to the primary composite endpoint was achieved in 30 (100%) patients [22].

De novo cystocele development may be seen after apical POP correction. The rate of de novo cystocele was reported as 4.5% after sacrospinous hysteropexy [19]. No de novo cystoceles were found after pectopexy like us, whereas 12.5% were found after sacrohysteropexy [20]. On the other side, coexistence of apical prolapse and cystocele is common in POP cases [23]. Summers et al. reported that 53–77% of anterior wall defects could be explained by an apical defect [3]. In our study, a positive correlation was detected between Ba and C points in the

preoperative examination of the cases1. In women with loss of apical or cervical support, simply folding on the fibromuscular tissue from side to side during anterior colporrhaphy is not sufficient to achieve elevation of the upper third of the anterior vaginal wall [24]. Wong et al. showed in their study that laparoscopic sacrocolpopexy was quite effective in terms of apical support, but cystocele recurrence was common (62%) despite anterior mesh extension [25]. In addition, although the vaginal axis is displaced posteriorly in sacrocolpopexy, rectocele recurrence is observed at a rate of 44% [25]. In the systematic *meta*-analysis, attention was drawn to the de novo cystocele and rectocele after sacrocolpopexy [26]. Unlikely, pectopexy operation is strengthening the pubocervical fascia, increasing ATFP support and correcting the lateral anterior compartment defect; It has a protective effect on the anterior compartment prolapse [7,9]. Considering the relationship between cystocele and apical prolapse, laparoscopic pectopexy, which pulls the upper 1/3 axis of the vagina anteriorly, seems to be a logical option in cases of apical prolapse. It is obvious that POP negatively affects the quality of life of women. The advantage of preserving the uterus in POP surgery is to preserve the pelvic anatomy, reduce hysterectomy-related complications, reduce intraoperative blood loss, shorten the surgery time and hospital stay, reduce the mesh erosion rate, increase patients' self-confidence, and provide physical and psychological benefits to women [27,28]. It is documanted in many studies that, after laparoscopic pectopexy, the quality of life of patients increases [15–18,29]. In our study, a significant improvement was documented in their P-QOL scale scores too.

The strengths of this study are large numbers of case from 2 centres and performed by 2 surgeons. Also postoperative examinations were performed face to face with same surgeons. Anatomical outcomes were assessed with POP-Q system.Our limitations are retrospective, non-comperative design, mid term follow up period. An important longterm complication as mesh exposure and de nova prolapse did not documented due to follow up of less than five years.In addition, we did not evaluated effect of procedure on patients sexual life.

Conclusions

Laparoscopic Pectopexy appears to be a reliable surgical method with low complication rates and a high success rate that improves the quality of life of stage III-IV apical prolapsed cases. Multicenter, prospective randomized controlled comparative studies should be conducted in advanced stage prolapse who want to preservation of the uterus will determine the gold standard technique.

Informed consent statement

A detailed informed consent was obtained from all patients.

Ethics statement

All procedures performed in studies involving human participants were accordance with the ethical standards of institutional and/or national research committees and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Ethical approval for this study was obtained from the Ethical Committee of Kütahya Health Sciences University Ethics Committee (Approval number:E-41997688–050.99–93979).

CRediT authorship contribution statement

Ismail Bıyık: Writing – original draft, Resources, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Sener Gezer:** Supervision, Methodology, Data curation, Conceptualization. **Adeviye Elci Atılgan:** Writing – review & editing, Visualization, Supervision. **Asiye Uzun:** Methodology, Formal analysis, Conceptualization. **Tugce Sarı:** Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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