Laparoscopic cervicopexy: a novel minimally invasive fertility conservative procedure for stages III and IV uterine prolapse – case series

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Abstract
Objective: To evaluate the safety and efficacy of laparoscopic anterior abdominal wall cervicopexy (LAWC), a novel minimally invasive procedure for management of stages III and IV uterine prolapse.
Subjects and methods: The procedure was performed on 39 cases with symptomatic uterine prolapse during the period from June 2012 to January 2015. The procedure was started with obliteration of the pouch of Douglas through the approximation of the uterosacral ligaments with non-absorbable suture. Then, the procedure completed through anchoring the supravaginal cervix to the anterior abdominal wall by two non-absorbable sutures taken in good bites in the dense stroma of the supravaginal cervix.
Results: Uterine prolapse was diagnosed as stage III in 36 (92.3%) women and stage IV in three cases. The procedure was conducted safely without any intraoperative complications. At 3 month follow-up, there was a statistically significant reduction in the extent of prolapse at all pelvic organ prolapse quantification (POP-Q) points as compared with preoperative assessment (p = 0.000). Only five cases (12.8%) were found to have stage I uterine prolapse on evaluation by the POP-Q system after one year.
Conclusion: LAWC is a minimally invasive, simple, and highly effective procedure to treat marked uterine prolapse and seems not to compromise fertility.

Keywords
Anterior abdominal wall cervicopexy, uterine prolapse, laparoscopy, uterine descent

Introduction
Uterine prolapse is a common problem for which several treatment options have been developed, which are the subject of ceaseless refinement.¹–⁷ Salem et al. described the original anterior abdominal wall cervicopexy (AWC) as an effective uterine conservation approach for stages III and IV uterovaginal prolapse.¹

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The AWC technique was very simple and could be performed by residents and young gynecologists with success rates of 90%. The original AWC procedure was performed via conventional laparotomy and required direct manipulations nearby the tubes and ovaries during obliteration of the pouch of Douglas. Pelvic adhesions were reported in those young women who chose AWC to keep their reproductive potential. The costs, operative time, technical requirements, and complications of AWC are incomparably lower than other procedures.

Consequently, El-saman et al. reintroduced the AWC procedure in a less invasive way for low-resources areas through maximum vaginal repair and a 3–4 cm mini-laparotomy. This avoids the direct manipulation of the pelvic organs and subsequent formation of adhesions. The present report represents the latest refinement for the reintroduction of AWC in a less invasive and safer way.

The aims of the present study were to evaluate the safety and efficacy regarding the anatomical and functional outcomes of laparoscopic anterior abdominal wall cervicopexy (LAWC), a novel minimally invasive procedure for women with stage III and IV uterine prolapse.

**Materials and methods**

During the period from June 2012 to January 2015, after obtaining ethical and institutional review board approvals, 39 cases with symptomatic uterine prolapse were recruited and considered eligible for the present study. The study was conducted in Assiut Women’s Health Hospital, Egypt.

We only included cases with stage III or IV uterine prolapse according to the pelvic organ prolapse quantification (POP-Q) evaluation system with a desire to retain their fertility potential after signing a written consent. Women who had associated tubal or ovarian pathology, previous failed surgery for prolapse, or had completed their families were excluded. Those who refused to participate in the study were also excluded.

All cases were interviewed by a gynecologist in the urogynecology clinic. A full history had been taken from each participant and body mass index (BMI) was estimated. Gynecological examination and evaluation of the prolapse stage with the POP-Q system were performed. The distance of each point was measured and recorded preoperatively. Hemoglobin level was estimated for all cases in the preoperative day.

**Surgical procedure**

All cases were performed under general anesthesia in the dorsal lithotomy position to facilitate access to both perineum and anterior abdominal wall. Operative time was defined from the beginning of skin incision to completion of skin closure.

Three ports were used to perform the LAWC procedure. One 10 mm reusable trocar was inserted through the umbilicus to hold the optic camera, and the other two 5 mm ports were inserted suprapubic in the abdominal crease 2–3 cm above the pubic bone, 5–7 cm apart from each other. All ancillary instruments including atraumatic graspers and scissors (Karl Storz Endoskope, Tuttingen, Germany) were reusable.

The first step in the LAWC procedure was the obliteration of the pouch of Douglas through an approximation of the uterosacral ligaments with non-absorbable No. 1 monofilament polypropylene blue suture (Prodek; Sutures Ltd, Ruabon, Wales, UK). This step was done while the uterus was in the anteversion position by uterine manipulator, as shown in the diagram in Figure 1.

The second step was to expose the supravaginal cervix through downward dissection of the bladder. A set of two non-absorbable No. 1 monofilament polypropylene blue sutures was taken in good bites in the dense stroma of the supravaginal cervix. The first and second sutures were 1 cm apart. Then extraction of the supporting sutures was done (Figure 2).

A conventional atraumatic laparoscopic grasper was introduced through a right suprapubic ancillary port to grasp and extract the right ends of the sutures. The same was done for the left ends but through the left suprapubic port. By the end of this step, the two supporting sutures were extracted through two ancillary ports and were ready for crossing and tying. Each of the two sutures is like the letter U with one of its arms being extracted out of one of the suprapubic ports and its bottom is passing through the supravaginal cervix.

To fasten these U-shaped sutures it is necessary to cross one of its arms from its suprapubic port to the other suprapubic port. This was done by tunneling the right arm of the first suture under the skin from the right port to be extracted from the left port (Figures 2 and 3). Tunneling was done via a conventional long curved needle after attenuation of its curve. It could also be done via a straight
needle or an artery forceps (Figure 3). This was followed by tunneling the left arm of the second suture under the skin from the left port to be extracted from the right port. After crossing the sutures’ arms, the first suture is now ready for fastening at the left port and the second suture is ready for fastening at the right port.

The third step was to fasten the right arm of the upper suture (first suture) with its corresponding left arm (Figure 3). The same was done with the lower suture (second suture). Adjusted tying was accomplished by the surgeon and an assistant. The surgeon elevates the sutures from the abdominal side and the assistant monitors the uterus while it is being pulled up until the cervix is at or just above the level of the ischial spines (Figure 4). It is important to tie the sutures with care to avoid overcorrection because of the slippery and sliding nature of the monofilament suture knots. The knots were pushed medially by an artery forceps to be buried under the intact skin and subcutaneous tissue within the tunnel between the two suprapubic ports (Figure 5).

After recovery from the anesthesia, patients were transferred to the postoperative ward for follow-up. Hemoglobin assessment was performed 12 hours after the operation. The length of hospital stay was counted from the first postoperative day. Any postoperative complications were recorded and managed accordingly. The patients were discharged after asking them to abstain sexual intercourse for at least 8 weeks after surgery.

Follow-up

Patients were invited to the follow-up visits every 3 months at the urogynecology clinic. At the first follow-up visit, 3 months postoperatively, gynecological examination and POP-Q evaluation with measurement of the distance of each point and evaluation of persistence, recurrence or development of new urinary symptoms.

At each subsequent visit, gynecological examination was done with prolapse staging using the POP-Q system.

Figure 2. (a) One of each arms of the first suture is extracted from a suprapubic port. (b) The left arm is tunneled to the right port.

Figure 3. (a) Both arms of the first suture are ready for traction and adjusted fastening at the right suprapubic port. (b) Adjusted fastening of the first suture was completed.

Figure 4. (a) Excess arms of the first suture were cut short and the knot was grasped by small artery forceps. (b) The knot was pushed under the intact skin (away from the port opening).

Figure 5. The same steps were done for the second suture.
The procedure was considered to have been successful if there were no recurrence of complaints confirmed by gynecological examination with the POP-Q system. Any case got pregnant during follow-up was recorded and followed up till delivery. A trial of vaginal delivery was allowed unless there was an obstetric indication for cesarean section (CS). Any case of post-delivery recurrence was documented.

The data were collected and analyzed using SPSS software, version 20 (SPSS Inc, Chicago, IL). Qualitative variables are expressed as frequency and percentage. Chi-square test was used to examine the relation between qualitative variables. Quantitative variables are presented in terms of mean and standard deviation or median and range. Wilcoxon test was used to compare the pre- and postoperative data. For analysis, \( p < 0.05 \) was considered to be significant.

### Results

The mean age of the study participants was 25.17±3 years and the mean BMI was 28.1±3.19 kg/m². All women were married; nine of them were nulliparas and 30 multiparas. Uterine prolapse was diagnosed as stage III in 36 (92.3%) women and stage IV in three cases. The mean duration of prolapse was 9.75±3.28 months. Table 1 shows the demographic characteristics of the patients.

The mean time of the procedure was 50.42±6.27 min (range 42–65 min). The procedure was conducted safely without any intraoperative complications. The postoperative course was complicated by febrile morbidity in only one woman. There were two women suffered from urinary retention relieved by fixing a Foley’s catheter for 4 days. No statistically significant difference was observed in the hemoglobin level postoperatively (\( p = 0.075 \)), as shown in Table 1.

At 3 month follow-up, all women were normal when evaluated by the POP-Q system. There was a statistically significant reduction in the extent of prolapse at all POP-Q points as compared with preoperative assessment (\( p = 0.000 \)), as shown in Table 2.

Table 3 shows the postoperative quantification of urinary symptoms at 3-month follow-up visit. There was a significant improvement of all urinary symptoms.Only three cases (7.7%) continued to suffer from the symptoms of overactive bladder (OAB) without urge incontinence and frequency of micturition.

Table 4 shows the results of long-term follow-up of the women. All cases had no prolapse related complaints during the first year. Women with persistent postoperative urinary symptoms were also improved. Only five cases (12.8%) were found to have stage I uterine prolapse on evaluation by the POP-Q system after one year. During the period of follow-up, 16 women (41%) became pregnant; eight of them were delivered by CS, five of them were delivered vaginally, and the last three currently have ongoing pregnancy.

In the eight cases where CS was carried out in our hospital, the abdominal incision was carefully planned to avoid cutting the supporting sutures. On opening the peritoneal cavity, 1–2 cm of the supporting sutures were seen passing beneath the visceral peritoneal crossing to the anterior abdominal wall. Follow-up assessment of these cases at 6–12 weeks postpartum confirmed maintained success.

### Discussion

The management of uterine prolapse in young women who need fertility conservation is a great challenge for reconstructive pelvic surgeons. No ideal procedure has been described in the literature so far. In the present case series, we introduced a novel procedure via a minimally invasive route for the management of stage III and IV uterine prolapse with fertility conservation. LAWC is a more advantageous procedure if compared with previously reported AWC procedures.

Originally, the traditional AWC was introduced via a standard laparotomy that made the procedure a form of...
major open surgery. Pelvic adhesions were reported in some cases during follow-up in spite of adherence to the principles of microsurgical techniques.1 We initially refined the AWC procedure by shifting from a standard laparotomy to a mini-laparotomy without uterine manipulations or intestinal packing during abdominal obliteration of the Douglas pouch. Instead, the Douglas pouch was obliterated via vaginal approximation of the uterosacral ligaments. In addition, the supravaginal cervix was exposed vaginally and the supporting sutures were placed vaginally and extracted through a mini-laparotomy.14

The present modification entailed laparoscopic obliteration of the Douglas pouch via approximation of the uterosacral ligaments, a step that augments the obliteration of the posterior compartment, supports the vaginal apex posteriorly, and prevents the development of iatrogenic enterocele.

In the present cases series, LAWC continues to hold the whole advantages presented before for the original AWC and modified AWC. Besides that, the novel procedure has its own merits.

Firstly, the entire procedure is performed via laparoscopy, a form of minimal invasive surgery, without any direct intra peritoneal manipulations. This avoids the risk of pelvic adhesions reported before. Secondly, there are neither big abdominal nor vaginal incisions in the LAWC procedure; this is definitely associated with less blood loss and early postoperative recovery with a short hospital stay. No significant difference was found in the hemoglobin

\[
\begin{array}{|c|c|c|c|c|}
\hline
\text{Points} & \text{Preoperative} & \text{Postoperative} & \text{p-value} & \text{Mean difference} \\
\hline
\text{Aa} & 2.1 (1–3) & -2 (-1 to -3) & 0.000* & 4.1 (2–6) \\
\text{Ba} & 2.7 (1.5–4) & -2.4 (-1 to -3) & 0.000* & 5.1 (2.5–7) \\
\text{C} & 5.6 (4 to 7.5) & -5.4 (-4 to -7) & 0.000* & 11.7 (8–14.5) \\
\text{D} & 5.1 (4.5 to 8) & -7.1 (-6 to -8.5) & 0.000* & 13.2 (10.5–16.5) \\
\text{Ap} & 0.9 (0 to 2) & -2.2 (-1.5 to -3) & 0.000* & 3.1 (1.5–5) \\
\text{Bp} & 0.7 (0 to 1.5) & -2.5 (-1.5 to -3) & 0.000* & 3.2 (1.5–4.5) \\
\hline
\end{array}
\]

POP-Q, pelvic organ prolapse quantification points measured in cm in relation to the position of the genital hiatus; Aa, a point located in the midline of the anterior vaginal wall, 3 cm proximal to the external urethral meatus; Ba, the most distal/dependent point on the anterior vaginal wall from point Aa to the anterior vaginal fornix; C, the most distal/dependent edge of the cervix or vaginal cuff (a measure of uterine descent); D, the position of the posterior fornix; Ap, a point located in the midline of the posterior vaginal wall, 3 cm proximal to the hymen; Bp, the most distal/dependent point on the posterior vaginal wall above point Ap.

- Data are presented as mean (range).
- \( p \)-value was measured by Wilcoxon test,
- *Statistical significant difference.

**Table 2.** Pre- and postoperative quantification of the prolapse by POP-Q measurements \((n = 39)\).

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Variables} & \text{Preoperative} & \text{Postoperative} & \text{p-value} \\
\hline
\text{OAB-dry, \( n \) (%)} & 9 (23.1) & 3 (7.7) & 0.002* \\
\text{OAB-wet, \( n \) (%)} & 8 (20.5) & 0 & ---- \\
\text{SUI, \( n \) (%)} & 4 (10.3) & 0 & ---- \\
\text{Frequency of micturition, \( n \) (%)} & 14 (35.9) & 2 (5.1) & 0.002* \\
\text{Nocturia, \( n \) (%)} & 3 (7.7) & 0 & ---- \\
\hline
\end{array}
\]

\( OAB \), overactive bladder; SUI, stress urinary incontinence.
- \( p \)-value was measured by Wilcoxon test,
- *Statistical significant difference.

**Table 3.** Pre- and postoperative quantification of urinary symptoms \((n = 39)\).
level when compared pre- and postoperatively ($p = 0.075$). The mean duration of postoperative hospital stay was 2.5 days versus 3 days that previously reported with original AWC.1

Thirdly; the procedure is technically easier with short operative time if compared with the original AWC and the modified AWC (60±12.4 and 55.9±9.5 min, respectively versus 50.42±6.27 min in LAWC). Lastly, the previous observation that early postoperative urinary retention and frequency of micturition were the most frequently reported consequences of AWC. These early urinary symptoms could be attributed to variable degrees of minor overcorrection. Only two women suffered from intermittent urinary retention and discharged on the fourth day with complete cure.

Compared with other laparoscopic procedures for uterine conservation and prolapse correction, LAWC is much simpler, less costly, and not associated with the reported complications of the other procedures, especially those related to the mesh insertion.17–19

In sacrohysteropexy, the uterus with the vaginal axis is moved to a backward position consequently making the development of iatrogenic stress urinary incontinence (SUI) more likely.20 Suspension of the uterus to the anterior abdominal wall is not static as the uterus is anchored to the dynamic anterior abdominal wall but anchoring the uterus to the sacral promontory or ischial spines represents a fixed nondynamic suspension. Our experience with 95 pregnancies after original AWC and modified AWC provided some proof for this, since the course of pregnancy and that of labor were not compromised with the procedure. In this case series, pregnancy was also achieved in 16/39 (41%) cases within the first year postoperatively; 13 of them have delivered with no postpartum recurrence of prolapse.

Laparoscopic ventrosuspension entails suturing both round ligaments of the uterus to the rectus sheath. The procedure was reported to be associated with a poor success rate in a case series of nine women; eight of them suffered from recurrence within 3 months postoperatively.21

Although no conclusive evidence could be obtained from our current observational study, we are most encouraged by its findings that LAWC is a feasible procedure in treatment of stage III and IV uterine prolapse. These initial findings need to be confirmed in a well-designed randomized controlled trial with a longer period of follow-up. The present refinement represents a continuation of the authors’ efforts to reintroduce the AWC procedure in a minimally invasive way.

### Conclusions

In conclusion, LAWC is a safe, effective, and feasible procedure in the management of stage III and IV uterine prolapse in women who wish for fertility conservation. The preliminary results are encouraging, showing favorable anatomical and functional outcomes.

### Conflicting interests

The authors declare that there is no conflict of interest.

### Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

### Ethical approval

The Assiut Faculty of Medicine ethics committee approved this study (REC number: IRB00006161).

### Informed consent

Written informed consent was obtained from the patients for their anonymized information to be published in this article.

### Guarantor

AME.

### Contributorship

AME: Protocol development, performing surgery, manuscript writing. AMA: Data management, assist in surgery and follow-up, manuscript writing. AFA: Performing surgery, manuscript editing. ANF: Data management, assist in surgery and follow-up, manuscript writing. MB: Assist in surgery and follow-up, manuscript editing. MNS: Assist in surgery and follow-up, manuscript editing. HTS: Protocol development, performing surgery, manuscript

### Table 4. Results of long-term follow-up of the study participants ($n = 39$).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of follow-up (months), median (range)</td>
<td>18 (12–24)</td>
</tr>
<tr>
<td>Loss of follow-up after 1 year, $n$ (%)</td>
<td>0</td>
</tr>
<tr>
<td>POP-Q stage of prolapse (stage 0/stage 1), $n$</td>
<td>36/3</td>
</tr>
<tr>
<td>After 6 months</td>
<td>34/5</td>
</tr>
<tr>
<td>Pregnancy, $n$ (%)</td>
<td>16/39 (41)</td>
</tr>
<tr>
<td>Mode of delivery, $n$ (%)</td>
<td>5/16 (31.25)</td>
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<tr>
<td>Vaginal</td>
<td>8/16 (50)</td>
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<td>Cesarean section</td>
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<tr>
<td>Post-delivery recurrence</td>
<td>0</td>
</tr>
<tr>
<td>Repeat surgery, $n$ (%)</td>
<td>0</td>
</tr>
</tbody>
</table>

POP-Q, pelvic organ prolapse quantification.
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editing. All authors reviewed and edited the manuscript and approved the final version of the manuscript.

Acknowledgements

None.

References


