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Vaginally-Assisted Laparoscopic Hysterosacropexy for Advanced Utero-Vaginal Prolapse: A Series of 32 Cases

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ABSTRACT
Advanced utero-vaginal prolapse is a frequent condition in the aging female population and several strategies aimed at its treatment have been developed. In order to demonstrate the importance of using the vaginal route in assistance to laparoscopic hysterosacropexy, a retrospective case series was designed, comparing thirty-two patients diagnosed with stage III-IV utero-vaginal prolapse according to the POP-Q system. The patients were treated between 2006-2011 using one of two methods of hysterosacropexy: vaginally assisted laparoscopic hysterosacropexy (VALHS) in 18 cases and total laparoscopic hysterosacropexy (LHS) in 14 cases. The choice of method was based on the primary mechanism of central compartment prolapse. The total operative time, the time required for mesh fixation at the cervix and sacrum, the cure rate of prolapse and the rate of re-operation for prolapse were statistically analyzed for both LHS and VALHS and compared between these two procedures by Student T-Test. The main outcome parameters were related to the operative method. The total operative time proved to be equal for both procedures, although the time necessary to attach the mesh to the cervical ring was shorter in VALHS. Therefore, the combination of the vaginal and laparoscopic routes yields a minimally invasive variant of sacropexy with as short an operative time as possible. The vaginal route offers a safe alternative for suturing the mesh and treating concurrent vaginal wall prolapse, while laparoscopy reduces the inherent risks of open abdominal surgery.

Keywords: hysterosacropexy, utero-vaginal prolapse, vaginal assistance

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Introduction

Despite recent advances in urogynecology, the surgical management of advanced uterine prolapse remains challenging. Uterine sacropexy, done by an open or laparoscopic route, represents a valuable alternative for the treatment of utero-vaginal prolapse in women who desire preservation of copulative function and an intact body image. The classical route carries all the risks of open surgery, while the laparoscopic alternative requires advanced surgical skills and is more time-consuming [1], especially when attaching the mesh to the cervical ring or the vaginal walls. The reappearance of prolapse at another compartment after apical correction is also discouraging, as the condition persists despite treating its cause. In this study, we used the "cervix

first, cervix last" concept to appreciate the primary mechanism involved in advanced uterovaginal prolapse and planned our operative strategy based on this finding. We hypothesized that these outcomes might be improved without increasing operative time or diminishing the quality of the suture by adding a transvaginal procedure to uterine sacropexy. The operative time and postoperative anatomical and functional outcome of each case were evaluated.

Materials and methods

This retrospective cohort study includes 32 patients with utero-vaginal prolapse, POP-Q stages three and four, on whom hysterosacropexy was performed after obtaining appropriate informed consent. The two groups of patients were matched according to their general characteristics, as illustrated by Table I.

Table I - General and demographic characteristics of the patients

	LHS (n=14)	VALHS (n=18)
Age (years)	59 (37-70) ± 10.1	57 (42-68) ± 8.1
BMI (kg/m2)	35	38
Median parity	2	2
Vaginal delivery (%)	78.5	66.6
Caesarean delivery (%)	21.4	33.3
Menstrual status (%)		
Premenopausal	57.14	33.3
Menopausal	42.85	66.6

The patients were treated between 2006-2011 at the same hospital and by the same surgical team. They were screened preoperatively for existing cervical and uterine pathology by Papanicolau smear and transvaginal ultrasound. Cervical elongation was identified in six cases by ultrasound measurement (i.e. length of cervix greater than length of uterine body or cervix longer than 4.5 cm). Each patient was examined clinically, focusing on pelvic organ prolapse quantification at maximum strain effort (POP-Q SYSTEM), as well as on urinary and prolapse-specific symptoms. The latter were quantified using the short form of the pelvic floor distress inventory (PFDI-20). Urinary stress incontinence was identified by the clinical cough test on a full bladder after manually reducing and maintaining the prolapse intravaginally.

The patients were divided into two groups based on the level of the initial injury that determined the primary mechanism of prolapse. This level was determined by inviting the patient to strain after reducing the prolapse. If the cervix appeared at the introitus before the vaginal walls (henceforth termed "cervix-first" type), the mechanism of prolapse involved the first level of suspension [2]. In these cases, restoration of the anatomy solely required the suspension of the vaginal apex by laparoscopic hysterosacropexy (LHS) without the further need to repair the fascial support of the vaginal walls. Conversely, if the cervix appeared after the vaginal walls bulged at the introitus (termed "cervix-last" type), the initial injury was considered to be located at the second or third level of vaginal suspension. In these cases, restoration of the fascial support of the vaginal walls was necessary, and was done in conjunction with hysterosacropexy by vaginally-assisted laparoscopic hysterosacropexy (VALHS).

Follow-up took place at one month, three months and then yearly. Results were quantified anatomically and functionally. The short form of the questionnaire PFDI-20 was used to evaluate the symptoms and the POP-Q system was used to quantify the anatomical results (no prolapse beyond the hymen for the anterior and posterior walls and cervix above the level of the mid vagina: $C < TVL / 2$).

The main outcomes related to operative time (total operative time, time required for mesh fixation to the uterus and total time for mesh fixation) were statistically analyzed for both LHS and VALHS and compared between these two procedures by Student T-Test ($\alpha=0.05$). The clinical method that assesses the primary mechanism of prolapse (and thus, indirectly, the choice between the two aforementioned surgical

procedures) was analyzed according to the cure rate of prolapse and the rate of re-operation.

Description of the operative technique of VALHS

After proper placement, cleansing and draping of the patient, the operation begins vaginally with the fixation of the mesh to the cervical ring and the restoration of the support of the anterior and posterior vaginal walls.

An anterior colpoceliotomy is carried out, anteverting the uterus in Döderlein manner and exposing the broad ligaments at the level of the isthmus (Figure 1).

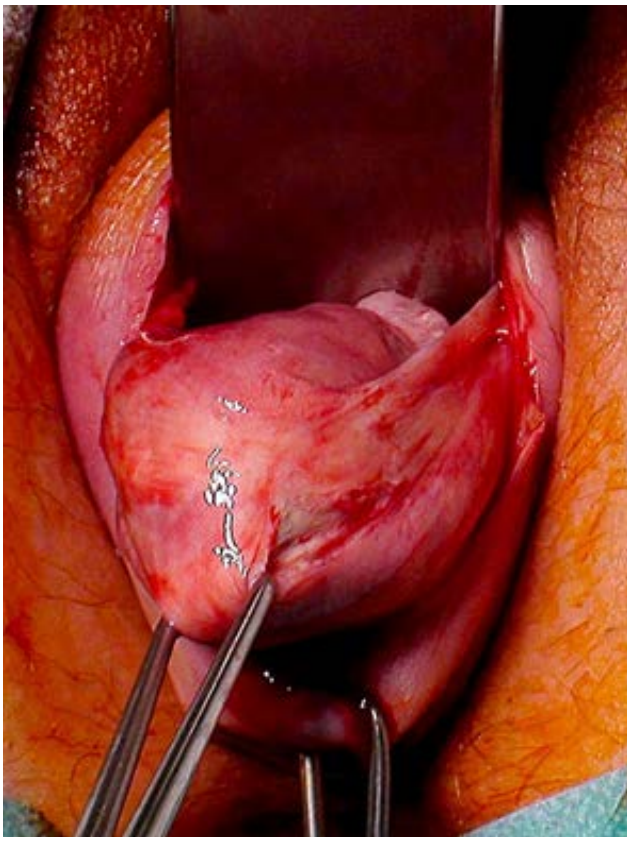

Figure 1 - Anteversion of the Uterus in Döderlein Manner

A soft polypropillene mesh with a macroporous structure (pore size > 70 μm) is tailored in "tuning fork" fashion, with long arms measuring 12 centimeters, short arms measuring six centimeters and a distance of five centimeters between the arms (Figure 2).

Figure 2 - Tailored Polypropillene Mesh

The broad ligaments are perforated bilaterally and the short arms of the mesh are introduced from the posterior to the anterior aspect (Figures 3 & 4) and subsequently fixed posteriorly to the sacrouterine ligaments near their insertion in the uterus and anteriorly to the uterine isthmus by no. 0 polypropillene suture (Ethicon, Johnson&Johnson) (Figure 5).

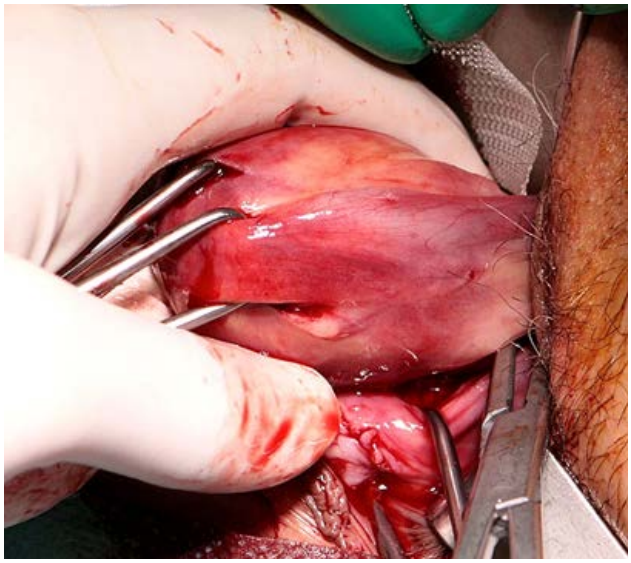

Figure 3 - Posterior Insertion of the Mesh

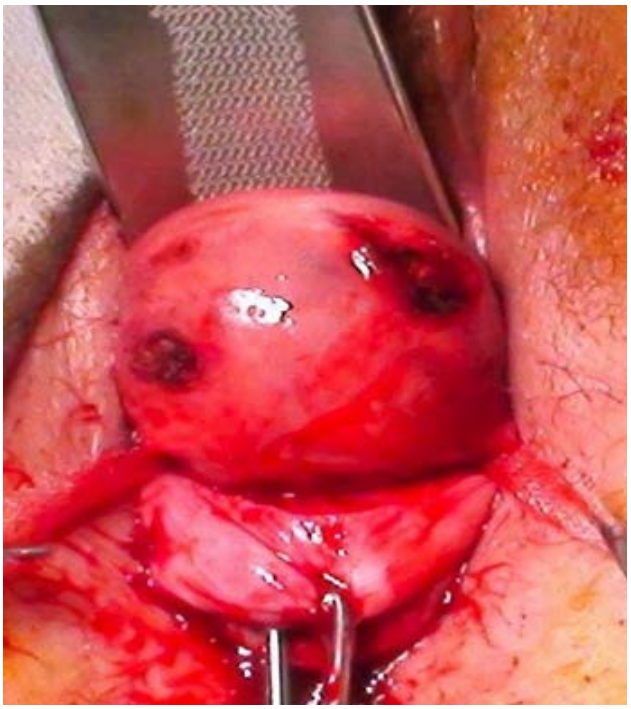

Figure 4 - Completely Inserted Mesh

The uterus and mesh are then reintroduced into the peritoneal cavity and the colpoceliotomy is closed with one layer of absorbable sutures, leaving the short arms of the mesh extraperitoneally. The correction of large cystoceles could also be done at this time before closing the colpoceliotomy by a separate vertical incision at the level of the anterior vaginal wall. In this case series, the anterior transobturator mesh with four arms (A.T.O.M.) was routinely used after reducing the cystoceles by in situ vaginoplasty. The correction of large rectoceles was done using the "posterior bridge procedure" and perineoplasties were also done where necessary.

Figure 5 - Anterior Fixation of the Mesh

The second (laparoscopic) stage of the procedure begins with the creation of four ports: one transumbilical port (vision), two lateral ports at the level of the iliac spines and and one median port at half the distance between the pubic symphysis and umbilicus. Dissection of the presacral space at level L5-S1 is then carried out, thus creating a peritoneal tunnel to the right side of the sigmoid colon between the first sacral vertebra and the pouch of Douglas. The mesh is passed though the tunnel and fixed to the anterior longitudinal ligament of the spine by two polypropillene no.0 sutures (Ethicon, Johnson & Johnson). In seven cases, the mesh was left unburied inside the peritoneal cavity in order to reduce the laparoscopic operative time and the complications related to the retroperitonealization of the mesh (Figure 6).

Figure 6 - Intraperitoneal Mesh at 6 Months Postoperatively

Results

Symptomatic stress urinary incontinence was present in seven patients (21,8%) from both groups – three (21.4%) of the LHS group and four (22.2%) of the VALHS group. The symptoms of these patients are detailed in Table II and compared between the two study groups.

Table II - Associated symptoms - The associated symptoms were evaluated using the PFDI-20 questionnaire in both groups: laparoscopic hysterosacropexy (LHS) versus vaginally-assisted laparoscopic hysterosacropexy (VALHS)

Symptoms (n %)	LHS (n=14)	VALHS (n=18)
Bulge	12 (85.7)	14 (77.7)
Pressure	10 (71.4)	12 (66.6)
Urinary urgency	2 (14.2)	11 (61.1)
Urinary incontinence	3 (21.4)	4 (22.2)
Difficult defecation	1 (7.14)	12 (66.6)

Of the 32 patients included in this study, eight cases (25%) had had previous surgeries for uterovaginal prolapse: eight anterior colporraphies, four posterior colporrahies and two McCall procedures were noted.

Clinical examination revealed third-degree prolapse in 20 cases (62.5%) and fourth-degree prolapse in 12 cases (37.5%). Of these, there were 14 cases (43.7%) of "cervix first" prolapse and 18 cases (56.2%) of "cervix last" prolapse. Cervical elongation associated with "cervix first" prolapse was identified via ultrasound measurement in six cases (33.3%).

The 14 cases (43.7%) with "cervix first" prolapse were treated with LHS, while the 18 cases (56.2%) with "cervix last" prolapse were treated with VALHS. In most of these cases, an additional vaginal procedure was performed alongside hysterosacropexy (Table III).

Table III - Type of hysterosacropexy based on primary mechanism of prolapse and additional surgical procedures

	LHS ("cervix first" prolapse) (n = 14)	VALHS ("cervix last" prolapse) (n = 18)
Stage III (n = 20)	12	8
Stage IV (n = 12)	2	10
Trachelectomy	6	-
ATOM	-	8
TOT	3	4
PB	-	8
PP	5	11

Abbreviations: LHS = laparoscopic hysterosacropexy; VALHS = vaginally assisted laparoscopic hysterosacropexy; ATOM = anterior transobturator mesh; PB = posterior "bridge" procedure; TOT = transobturator midurethral tape; PP = perineal plasty.

The total operative time did not reflect an advantage of VALHS over other procedures, as the additional procedures performed vaginally are more time consuming than those performed with LHS. There was no difference between the total operative time of VALHS versus LHS (Table IV).

The vaginal operative time of VALHS can be divided into the time necessary to fix the mesh to the

Table IV - Operative time description for VALHS and LHS

Operative time (min)	VALHS (mean ± SD, range)	LHS(mean ± SD, range)	Mean difference	p
Time for mesh fixation to cervical ring	34.11 ± 6.5 (24 - 45)	60.38 ± 8.3 (45 - 73)	- 26.27	< 0.01
Time for mesh fixation to the sacrum	26.1 ± 9.1 (15 - 42)	30.3 ± 13.6 (16 - 48)	- 4.64	0.9
Total time for mesh fixation	56.83 ± 10.8 (45 - 78)	87.43 ± 13.2 (71 - 111)	- 30.6	0.01
Time for associated procedures	**44.5 ± 13.4 (25 - 60)	***18.5 ± 2.12 (17 - 20)	-	-
Total operative time	102.82 ± 20.1 (77 - 138)	93.24 ± 22.2 (60 - 144)	9.58	0.8

*** = associated procedures, which included ATOM, PB and TOT*

**** = associated procedures, which included AC, TOT and PP*

Abbreviations: LHS = laparoscopic hysterosacropexy; VALHS = vaginally assisted laparoscopic hysterosacropexy; ATOM = anterior transobturator mesh; PB = posterior "bridge" procedure; TOT = transobturator midurethral tape; AC = anterior colporaphy; PP = perineal plasty.

uterus and the time necessary to perform associated procedures to correct the fascial support of the vaginal walls and perineal body. The total time for mesh fixation (operative time for the attachment of the mesh to the cervical ring and to the sacrum) was shorter for VALHS than LHS (56.8 ± 10.8 (SD) vs. 87.4 ± 13.2 (SD) minutes, p=0.011). These differences result from the more facile attachment of the mesh by vaginal route. The operative time necessary to attach the mesh to the cervical ring for VALHS was half as long as that of LHS (34.1± 6.5 (SD) vs. 60.3 ± 8.3 (SD), p < 0.01).

There was no statistically significant difference between the quantity of blood lost during either LHS or VALHS (115 ± 18.4 (SD) mL vs. 120 ± 20.6 (SD) mL). All patients had a hospital stay of one-two days and there were no intraoperative complications.

The median follow-up time was 34 months (range: 12-70 months). All patients attended their first follow-up visit and subsequent visits at three months and one year. There was no mesh erosion in any group. There was a 100% success rate in terms of uterine and upper vaginal support for both groups, as no patient required further surgery for recurrent uterine prolapse. Three cases (9.3%) treated with LHS developed second-degree cystoceles in the first year after the initial surgery. The cystoceles were treated with the A.T.O.M. procedure.

No long-term (12-45 months) intestinal complications were registered in the seven cases where the mesh was left unburied.

Discussions

The clinical aspect of advanced uterovaginal prolapse ("cervix-first" vs. "cervix-last") is determined by the level of the pelvic suspension and support system at which the main damage is located [3]. This observation allows the clinician to plan an operative strategy according to the presence or absence of major fascial defects at the second and third suspension levels of the vagina. The "cervix-first" type of prolapse can therefore be treated as a central compartment defect, as first- and second-degree prolapse associated with this type is cured by the simple suspension of the vaginal apex by LHS. However, most of these cases also require a supplementary vaginal procedure for the treatment of urinary incontinence or perineoplasty, allowing the surgeon to fix the mesh at the level of the cervical ring before proceeding with the laparoscopic step of the surgery. This allows the surgeon to have a short operative time even in LHS, where the attachment of the mesh is time-consuming compared to VALHS.

In our opinion, hysterectomy for severe utero-vaginal prolapse is unnecessary and the omission of this step has several advantages, because, as Bonney noted in 1934, uterine prolapse is not a cause but an effect, and hysterectomy is not a solution to restore

the normal anatomy of a prolapsed vagina [4]. Leaving the cervical ring in place offers the best support for the suspension of the vaginal apex and the atrophy of the already-weakened uterine ligaments as a consequence of poor vascular supply is thus avoided. Therefore, uterus-sparing surgery shortens the operative time for sacropexy and provides a good suspension for the vaginal apex.

In 1999, Godin, Nissole and Donnez performed a colposacropexy for vaginal vault prolapse by transvaginally suturing a polypropillene mesh to the vaginal walls and fixing the mesh to the promontorium with titanium tacks [5]. The anatomical benefits of sacral colpopexy are well-documented in literature [6 - 8]. The recurrence of apical prolapse after sacropexy is rare, although it predisposes to another form of prolapse in other compartments at different periods of time after the initial surgery. According to the literature, the appearance of additional prolapse is either due to a redistribution of forces (thus weakening the anterior compartment) or to unidentified or unaddressed defects before the operation [9,10]. In this case series, given that cystocele was excluded upon initial evaluation, its postoperative appearance in 9.3% of the patients treated with LHS was probably due to the redistribution of forces in the anterior compartment after posterior suspension of the uterus to the promontory,

There are numerous advantages to vaginally-assisted laparoscopic hysteropexy. It is a minimally-invasive technique which preserves the uterus, allows for an easy suture of the mesh to the cervical ring and reduces blood loss. Furthermore, patients with multicompartment defects benefit from a reduction in operative time while avoiding the complications associated with the laparoscopic dissection of the bladder and rectum.

The goals at the outset of this study were to shorten the total operative time and reduce the difficulty of the laparoscopic step. Several studies place the mean time for laparoscopic colposacropexy (LCS) between 181-269 minutes [11-14]. In this case series, the total operative time for LHS was 93,2 minutes. Although vaginal assistance increases the total operative time when it is necessary to add associated procedures, it shortens the time for mesh attachment compared to an exclusively laparoscopic alternative in patients with multicompartment defects and offers the possibility to solve the defects of other pelvic compartments during the same procedure.

Although the rate of complications of sacrocolpopexy is generally estimated at 15% [15], there were no perioperative complications related to bladder or rectal injuries in both patient groups. Open dissection by the vaginal route in VALHS offers the surgeon a more facile approach to the bladder and rectum and bypasses the pitfalls associated with laparoscopic electrosurgery. Mesh erosion or other related complications were not noted. The preservation of the uterus and the attachment of the mesh at the level of the uterine isthmus prevent mesh erosion at the level of the vaginal apex.

Conclusions

The present study suggests that the combination of the vaginal and laparoscopic routes is useful in obtaining a variant of sacropexy, which is as minimally-invasive as possible and has a short operative time. The vaginal route offers a safe alternative for suturing the mesh and treating concurrent vaginal wall prolapse, while the laparoscopic route reduces the risks associated with open abdominal surgery. The election of the surgical procedure according to the clinical confirmation of the primary mechanism of advanced utero-vaginal prolapse is a valuable strategy which aims to reduce the rate of prolapse, relapse and the rate of intraoperative complications: VALHS is a multicompartment solution, while LHS is especially suitable for central compartment defects.

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