



ORIGINAL ARTICLE

Transvaginal and transperineal ultrasound follow-up after laparoscopic correction of uterine retrodisplacement in women with posterior deep infiltrating endometriosis

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Background: Retrodisplacement of the uterus (retroflexion and/or retroversion) may be associated with pelvic pain symptoms and posterior deep infiltrating endometriosis (DIE). Previous studies in symptomatic women with retrodisplacement of the uterus showed the efficacy of hysteropexy in terms of pain symptoms improvement.

Aim: To evaluate sonographic, clinical and surgical outcomes of a hysteropexy technique

Materials and Methods: Laparoscopic round ligament plication and tilting of the uterine fundus in women with uterine retrodisplacement and posterior deep infiltrating endometriosis was performed. Forty-two symptomatic women were enrolled and the sonographic data of each (angle of uterine version and uterine flexion, uterine mobility) was assessed before and after surgery with transvaginal and transperineal approaches. Women were also evaluated at 1, 6 and 12 months after surgery for pain symptoms with a numerical rating scale (dysmenorrhoea, dyspareunia and chronic pelvic pain), intraoperative data and surgical complications.

Results: The additional mean operative time of hysteropexy procedure was 8 ± 3 min. At early follow-up both the uterine angles were significantly ($P < 0.001$) reduced. At 12-month follow-up, seven patients (16.7%) presented a retroverted uterus, while 12 (28.6%) presented a retroflexed uterus; the sliding sign remained negative in four patients (9.5%). A significant improvement of symptoms ($P < 0.001$) was observed during the follow-up.

Conclusion: Laparoscopic hysteropexy appears as an effective additional surgical procedure, which can temporarily correct the uterine position in order to reduce the risk of postoperative adhesions.

KEYWORDS

endometriosis, hysteropexy, laparoscopy, transperineal ultrasound, transvaginal ultrasound

INTRODUCTION

Uterine position can be identified by two angles: (i) angle of version, between the axis of the uterine body and the vaginal canal; and (ii) angle of flexion, between the axis of the uterine cervix and the uterine body, with the vertex located at the level of the uterine isthmus.^{1,2} The retrodisplacement (retroflexion and/or retroversion) of the uterus is a normal physiologic variant present in 20% of women, but it can also be associated with chronic retracting posterior deep infiltrating endometriosis (DIE) and adhesions.^{3–5} Pelvic pain symptoms, like dysmenorrhoea, chronic pelvic pain and dyspareunia, can be related to the retrodisplacement of the uterus.^{1,6} Theoretically, complete surgical excision of endometriosis without correction of uterine retrodisplacement might cause persistent pelvic pain after surgery.

Various hysteropexy techniques have been described in the literature as effective in relieving pain symptoms,^{7–9} although their success rate decreased in women with endometriosis.¹⁰ It should be emphasised that in these studies the improvement given by the correction of the uterine retrodisplacement in women with severe endometriosis and the role of hysteropexy in the prevention of adhesion formation were not studied. Furthermore, during follow up, no objective data on the angle of retroflexion was reported. Among the various hysteropexy techniques, the most popular is the fixation of the round ligament to the anterior abdominal wall.^{11,12} Recently, we have proposed laparoscopic suspension of the retrodisplaced uterus to the anterior abdominal wall. This technique should be performed through plication and shortening of both round ligaments and additional tilting of the uterine fundus to correct uterine retrodisplacement after excision of posterior DIE.¹³

The aim of the present study was to evaluate sonographic outcomes, together with clinical and surgical outcomes related to surgical procedure for hysteropexy in women with uterine retrodisplacement and posterior DIE.

MATERIALS AND METHODS

This is a pilot, single-centre, prospective study conducted between January 2014 and November 2016. We enrolled 47 symptomatic women with posterior DIE and uterine retrodisplacement scheduled for laparoscopic excision of DIE and hysteropexy. Exclusion criteria were genital prolapse, previous pelvic surgery and ultrasound diagnosis of one or more uterine fibroids of a diameter ≥ 4 cm. All patients gave written informed consent to participate in the study after adequate counselling on proposed treatment and related benefits, risks and alternatives. Full ethics approval was obtained from our local Ethics Committee for the study protocol (1132015/U/sper).

Preoperative diagnosis of posterior DIE was based on gynaecological examination, transvaginal and transabdominal ultrasound and, if necessary, magnetic resonance imaging (MRI). For

each patient, endometriosis-related symptoms (dysmenorrhoea, chronic pelvic pain, dyspareunia) were assessed using the 11-point numerical rating scale (NRS).

Sonographic evaluation

Transvaginal (TV) and transperineal (TP) 2D ultrasound scans of the pelvis were performed with an empty bladder by a single experienced operator in ultrasonographic evaluation of endometriosis (L.D.M.), using transvaginal wide-band 5.0–9.0 MHz and 3.5–7 MHz curved array transducers, respectively (Voluson S8, GE, Milwaukee, WI, USA).

Recorded ultrasonographic data were as follows.

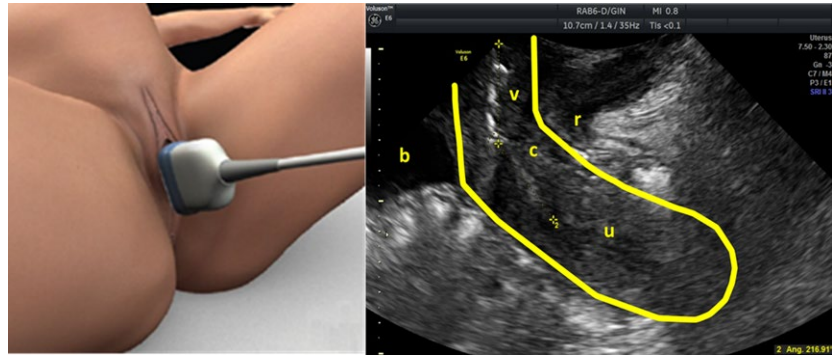
1. *Uterine angle of version*: anteversion is defined as an anterior right angle between the longitudinal axis of the body of the uterus and that of the vagina; retroversion represents an angle of the uterine body similar to that of the vagina, with the body directed posteriorly toward the sacrum.
2. *Uterine angle of flexion*: it is assessed as the anterior angle between the longitudinal axis of the cervix and the longitudinal axis of the uterine body.
3. *Sliding sign* (for the evaluation of uterine mobility): it is assessed with a combination of gentle pressure placed against the posterior uterine wall with the transvaginal probe and abdominal pressure with the examiner's free hand, to determine whether the anterior wall of the rectum slides freely through the posterior uterine wall (positive sliding sign) or not (negative sliding sign), as previously described.¹⁴ A negative sliding sign is regarded as a soft marker for the presence of adhesions between the posterior uterine wall and the anterior wall of the rectum. A negative sliding sign on TV sonography predicted DIE of the rectum with a sensitivity of 85% and specificity of 96% as already said in the study by Hudelist *et al.*¹⁴

The uterine angle of version was obtained with TP 2D ultrasound, in order not to affect the angle by using a vaginal probe. A mid-sagittal view was obtained by placing the 3.5–7 MHz curved array transducer on the perineum (Fig. 1), after covering the transducer with a glove. Labia separation may be necessary to improve image quality. The resulting image (Fig. 1) includes the pubic symphysis anteriorly, and then the urethra and bladder neck, the vagina, the cervix, the rectum and the anal canal, as previously described by Dietz.¹⁵ The angle of uterine version was measured using the 'Generic Angle' function. The uterine angle of flexion was detected using a TV 2D ultrasound. This angle as well was measured using the 'Generic Angle' function. Three measures were recorded for each patient, and the mean value was used for analysis.¹

Intervention

After complete laparoscopic excision of endometriosis, as previously reported,^{16–18} correction of the retrodisplacement of the

FIGURE 1 Transperineal ultrasound and measurement of the angle of uterine version. b: Bladder; v: vagina; c: cervix; u: uterus; r: rectum. Reproduced with permission and adapted from figure 1 in the study by Youssef *et al.*²¹



uterus was performed.¹³ Surgical technique for hysteropexy consists of four steps, as reported in Figure 2. To prevent iatrogenic tubal obstruction, we paid particular attention to attaching the uterine fundus at 1.5–2 cm medial to the uterine cornua. In all women, tubal chromoperturbation was performed before and after the procedure to verify their patency.

Follow-up evaluation

Pelvic examination, TV and TP 2D ultrasound were performed during follow-up evaluation at 1, 6 and 12 months after surgery. In each visit, uterine angles, sliding sign and symptom intensity (NRS) were evaluated. An overall score ≥ 5 was suggestive of relapse.

Statistical analysis

All analyses were performed using the Statistical Package for Social Sciences (SPSS) software version 24.0 (IBM, Armonk, NY, USA). Continuous data were expressed as mean or standard deviation (SD) or median and range, when indicated, whereas categorical variables were reported in absolute and per cent values.

Comparison of preoperative and postoperative data was done using Student's *t*-test. Significance was set to $P < 0.05$.

RESULTS

Five out of 47 women were lost in the follow-up, while 42 women completed the study. Posterior DIE was localised in the recto-vaginal septum in 15 women (35.7%) and rectum in 27 women (64.3%). Baseline characteristics of the study population and other associated endometriotic lesions are reported in Table 1.

Preoperative assessment

At preoperative TV and TP ultrasound, uterine retroversion was detected in 37 (88.1%) women and uterine retroflexion in 33 (78.6%) women; 28 (66.7%) women had both retroverted and retroflexed uteri. The mean angle of version measured with the TP ultrasound was $125^\circ \pm 16.7$, while the mean angle of retroflexion measured with the TV approach was $226^\circ \pm 48.5$. As regards uterine mobility evaluation at preoperative TV ultrasound, six women

FIGURE 2 Surgical steps of hysteropexy technique. (a) First step: the first stitch involved the anterior abdominal wall medially and close to the medial umbilical ligament, hitching the fascia transversalis. (b) Second step: the suture passed through the round ligament plicating and shortening it, from the inguinal canal up to the uterine insertion. (c) Third step: the needle pierced the muscular layer of the anterior uterine wall and exited from uterine fundus in latero-medial, ventro-dorsal and cranio-caudal directions. (d) Fourth step: a knot was tied intracorporeally between the two free ends of the semicontinuous sutures drawing a V shape figure.

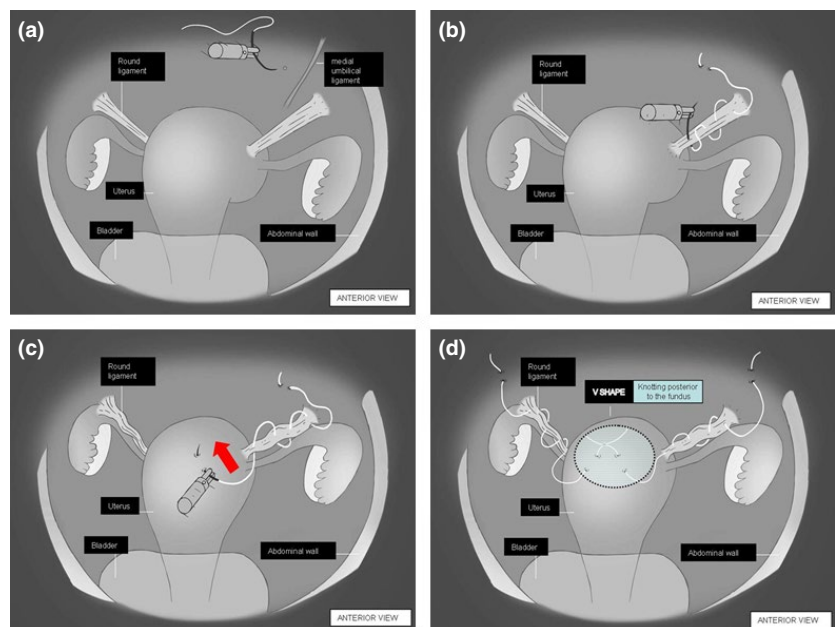


TABLE 1 Baseline characteristics of the study population (42 patients)

Age, years, mean \pm SD	34.3 \pm 5.2
Body mass index (kg/m ²), mean \pm SD	22 \pm 4.5
Parity	
Nulliparous, <i>n</i> (%)	27/42 (64.3)
Parity \geq 1, <i>n</i> (%)	15/42 (35.7)
Medical therapy within 3 months before surgery, <i>n</i> (%)	11/42 (26.0)
Localisation of rectal endometriosis	
Recto-vaginal septum	15/42 (35.7)
Rectum	27/42 (64.3)
Other endometriotic locations, <i>n</i> (%)	
Ovary	18/42 (42.8)
Vagina	3/42 (7.1)
Parametrium	5/42 (11.9)
Uterosacral ligaments	14/42 (33.3)
Bladder	2/42 (2.7)
Ureter:	11/42 (26.2)
Bilateral	5/11 (45.4)
Monolateral	6/11 (54.5)

(14.3%) presented a positive sliding sign, while 36 (85.7%) women had a fixed uterus (negative sliding sign). Preoperative pain symptoms (dysmenorrhoea, dyspareunia, chronic pelvic pain) were collected for all women: 28 women (66.7%) presented with dysmenorrhoea, while 26 women (61.9%) had dyspareunia and 23

(54.7%) complained of chronic pelvic pain. All women had at least one or more of these symptoms.

Intraoperative data

Complete laparoscopic excision of endometriotic lesions was performed, and endometriosis diagnosis was histopathologically confirmed in all cases. Operating time for the only hysteropexy procedure was 8 \pm 3 min. Thirty-eight (90.5%) women presented bilateral tubal patency before the procedure, and no cases of tubal occlusion after hysteropexy were observed.

Postoperative assessment and follow-up

Only a postoperative complication was detected; on the first postoperative day, a transient vulvar haematoma was observed in a woman and spontaneously disappeared after 10 days. During follow-up, 32 women (76.2%) commenced postoperative oestrogen-progestin or progestin therapy, starting from the first menstrual cycle after surgery. No case of recurrence of endometriotic lesions was observed during follow up.

Pre- and postoperative ultrasonographic and clinical data of the study population during the entire monitoring are reported in Table 2. Variations in the angle of uterine flexion are showed in Figure 3.

At one month of follow up, all women presented an anteverted uterus ($P < 0.001$) and only six women (14.3%) presented a retroflexed uterus ($P < 0.001$). The sliding sign was found positive in all

TABLE 2 Pre- and postoperative ultrasonographic and clinical data of the study population (42 patients)

	Preoperative evaluation		Postoperative evaluation					
			1 month		6 months		12 months	
	NRS (IR)	<i>n</i> (%)	NRS (IR)	<i>n</i> (%)	NRS (IR)	<i>n</i> (%)	NRS (IR)	<i>n</i> (%)
Symptoms								
Dysmenorrhoea	8 (0–10)	28/42 (66.6)	0 (0–6)*	2/42 (4.8)	2 (0–6)*	2/42 (4.8)	4 (0–6)*	5/42 (11.9)
Dyspareunia	8 (0–10)	26/42 (61.9)	0 (0–0)*	0/42	0 (0–6)*	0/42	2 (0–6)*	2/42 (4.8)
Chronic pelvic pain	8 (0–10)	23/42 (54.7)	0 (0–5)*	2/42 (4.8)	0 (0–5)*	2/42 (4.8)	3 (0–5)*	3/42 (7.1)
Uterus displacement								
Retroverted		37/42 (88.1)		0/42*		3/42 (7.1)*		7/42 (16.7)*
Retroflexed		33/42 (78.6)		6/42 (14.3)*		8/42 (19.0)*		12/42 (28.6)*
Both		28/42 (66.7)		0/42*		3/42 (7.1)*		7/42 (16.7)*
Mean angle at US								
Version		125° \pm 16.7		95° \pm 50.7*		102° \pm 50.7*		128° \pm 50.7
Flexion		226° \pm 48.5		142° \pm 26.5*		170° \pm 22.3*		187° \pm 25.3
Sliding sign								
Positive		6/42 (14.3)		42/42 (100.0)*		38/42 (90.5)*		38/42 (90.5)*
Negative		36/42 (85.7)		0/42*		4/42 (9.5)*		4/42 (9.5)*

IR, interquartile range; NRS, numerical rating scale; US, ultrasound

*Significance vs preoperative, $P < 0.001$

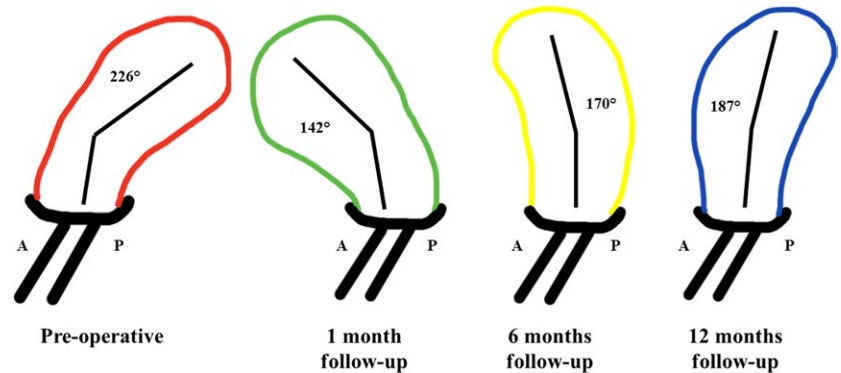


FIGURE 3 Pre- and postoperative variations in the angle of uterine flexion

women ($P < 0.001$). Postoperative TP ultrasound showed that the angle of uterine version was significantly ($P < 0.001$) reduced after the procedure from mean preoperative angle of $125^\circ \pm 16.7^\circ$ to mean postoperative follow-up angle of $95^\circ \pm 50.7^\circ$. Moreover, a consistent improvement ($P < 0.001$) of the angle of flexion at TV ultrasound was detected from the mean preoperative angle of $226^\circ \pm 48.5^\circ$ to the mean postoperative angle of $142^\circ \pm 26.5^\circ$. A significant improvement ($P < 0.001$) of pain symptom NRS scores was observed in comparison with preoperative scores.

At six months of follow up, three women out of 42 (7.1%) presented a retroverted uterus ($P < 0.001$) and eight women (19%) presented a retroflexed uterus ($P < 0.001$). A negative sliding sign was detected in four women (9.5%; $P < 0.001$). Among them, one woman had an anteverted uterus without retroflexion and the other three presented a retroflexed uterus. The mean angle of version was $102^\circ \pm 21.8^\circ$ ($P < 0.001$), while the angle of flexion was $170^\circ \pm 26.5^\circ$ ($P < 0.001$). No symptoms were reported except for two women (4.8%) with dyspareunia and two (4.8%) with dysmenorrhoea, even if the NRS score was significantly ($P < 0.001$) lower than preoperatively for both symptoms.

At 12 months of follow up, seven women out of 42 (16.7%) presented a retroverted uterus ($P < 0.001$), while 12 (28.6%) patients out of 42 presented a retroflexed uterus ($P < 0.001$). The sliding sign remained positive in 38 patients (90.5%; $P < 0.001$), as at 6 months of follow up. The mean angle of version was $128^\circ \pm 50.7^\circ$ ($P = \text{NS}$), while the angle of flexion was $187^\circ \pm 25.3^\circ$ ($P = \text{NS}$). Regarding symptoms, two women (4.8%) reported dyspareunia, five (11.9%) dysmenorrhoea and three more (7.1%) complained of chronic pelvic pain; a significant improvement ($P < 0.001$) of pain symptom NRS scores was observed in comparison with preoperative scores.

All significances were intended versus preoperative conditions. All statistically significant data were intended versus the pre-operative condition.

DISCUSSION

This is the first study evaluating the impact of hysteropexy on uterine position and mobility in patients with DIE and uterine retrodisplacement with both TV and TP ultrasound. The main

advantage of the TP approach may be the reduced variation in the uterine angle of version, in order not to affect the angle by using a vaginal probe. Moreover, using the conventional TV approach, we objectively evaluated the angle of uterine retroflexion to access its potential association with menstrual pain.¹

Previous studies⁷⁻⁹ reported satisfactory clinical outcomes after hysteropexy in symptomatic women with retroflexed and/or retroverted uteri. However, these studies mainly focused on pain relief and did not report objective data on uterine position. In fact, only one study¹⁰ performed TV ultrasound after the procedure, but merely to assess the presence or absence of uterine retroflexion and/or retroversion in postoperative days 2-4. It should be noted that the success rate of previously described hysteropexy techniques was lower in women with endometriosis than in women without endometriotic lesions.¹⁰ Theoretically, untreated uterine retrodisplacement might result in persistent pain symptoms even after complete surgical excision of endometriosis. From our results, it seems that hysteropexy with plication of round ligaments and tilting of the uterine fundus could be a successful and reasonable option in these patients. This technique causes a shortening of the round ligaments, as in most of the techniques described,^{11,12} and also modifies the position of the uterine fundus to counteract its chronic traction due to posterior DIE or adhesions.

Pelvic surgery for endometriosis is associated with a high rate of postoperative adhesion formation,¹⁹ especially when the pelvic posterior compartment is involved.¹⁴ Postoperative adhesions are a source of persistent pelvic pain and dyspareunia.²⁰ Interestingly, despite the moderate rate of 'anatomical recurrence' (retroflexion and retroversion were reported in 28.6% and 16.7% of women at 12 months follow-up, respectively), the improvement in uterine mobility after surgery might prove the success of this hysteropexy technique in reducing the adhesion formation between the uterus and the pelvic posterior compartment immediately after surgery. The feasibility and efficacy of this technique are supported by an improvement in pain symptoms even at 12 months, when there is a higher tendency to retrodisplacement.

Main limitations of the study are the absence of a control group and the impossibility of separating the effects of DIE excision from the effect of the hysteropexy technique on endometriosis-related symptoms.

In conclusion, combined use of TP and TV ultrasound may help to objectively evaluate the outcome of surgical correction of uterine retrodisplacement. Laparoscopic hysteropexy with round ligament plication and associated tilting of the uterine fundus appears to be an effective additional surgical procedure in women with uterine retrodisplacement and posterior DIE. Laparoscopic hysteropexy may temporarily correct the uterine position and therefore, reduce the risk of postoperative adhesions.

CONCLUSION

Combined use of TP and TV ultrasound can help to objectively evaluate the outcome of surgical correction of uterine retrodisplacement. Laparoscopic hysteropexy with round ligament plication and associated tilting of the uterine fundus appears to be an effective additional surgical procedure in women with uterine retrodisplacement and posterior DIE. Laparoscopic hysteropexy may temporarily correct the uterine position and therefore, reduce the risk of postoperative adhesions.

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