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A novel hysteroscopic technique in the correction of isthmocele: a prospective randomized clinical trial

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Abstract

Background: Many obstetric and gynecological complications are attributed to the presence of an isthmocele, also known as a 'niche' or 'Cesarean scar defect (CSD)' which arises due to a defect in the healing of a Cesarean section scar at the isthmic level. The authors in this study sought to evaluate the effect of a new hysteroscopic technique in the correction of isthmocele regarding improvement of CSS, sonographic CSD parameters and incidence of spontaneous pregnancy.

Methods: The study was conducted on 100 females in whom transvaginal ultrasound showed a depth scar defect of at least 2 mm and a residual myometrium of at least 3 mm. They were then randomized to one of two groups: Group A (50 cases) received hysteroscopic correction of isthmocele using the new technique & Group B (50 cases) did not receive hysteroscopic correction & received only medical treatment and expectant management for pregnancy. Participants were invited to visit the outpatient department at 1, 3, and 6 months after surgery to evaluate the niche depth and residual myometrial thickness, improvement of cesarean scar symptoms and incidence of spontaneous pregnancy.

Results: The mean improvement of postmenstrual spotting days in group A in the 1st, 3rd, and 6th months after hysteroscopic surgery was 2.16, 1.5, and 1 day respectively, which was significantly higher compared to 4.66, 4.16, and 3.78 days in the control group B, respectively ($P < 0.001$). Spontaneous pregnancy was observed in 21 patients (42%) in group A and in 12 patients (24.0%) in group B, p value = 0.056.

Conclusion: The new four-step hysteroscopic approach of isthmocele repair was significantly superior to expectant management in infertile women with a symptomatic niche with a RMT ≥ 3 mm in terms of higher pregnancy rates and clinical improvement of CSD syndrome.

Keywords: Isthmocele; Hysteroscope; Post-menstrual spotting; Secondary infertility; Cesarean section.

Introduction

Over the past few decades, cesarean section (CS) has been increasingly performed and has become the most common surgical procedure among women worldwide.[1, 2]

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The increased incidence of Cesarean section worldwide has led to many emergent obstetric complications (risk of developing placenta previa, placenta accreta, pregnancy implantation at the level of the scar and uterine rupture in subsequent pregnancies) and gynecological complications (abnormal uterine bleeding, typically postmenstrual, dyspareunia and abdominal/pelvic pain).[3]

The complications are mostly attributed to the presence of an isthmocele, also known as a 'niche' or 'Cesarean scar defect (CSD) which arises due to a defect in the healing of a Cesarean section scar at the isthmic level.[3]

A caesarean scar defect (CSD) -niche- is a late complication of caesarean delivery with a prevalence widely ranging between 56 and 84% depending on the definition and the diagnostic modality used.[4] In addition, many studies have linked the presence of pronounced isthmoceles with secondary subfertility.[3, 5]

A meta-analysis published in 2013 estimated that undergoing a Cesarean section could reduce the probability of subsequent pregnancies by an average of 10% compared to vaginal delivery.[6] Moreover, a previous Caesarean section impairs live birth rates after IVF or ICSI compared to a previous vaginal delivery and the presence of a CSD in women, especially those ≤ 35 years of age, has been shown to significantly impair the chances of subsequent pregnancies.[7, 8]

In fact, 2D-TVS was the first-line imaging technique in the diagnosis of isthmocele and was an accurate way of diagnosing and measuring CSDs, with or without saline solution or gel or even three-dimensional images, and has high detection rates.[9] To provide guidance for detailed uterine CSD evaluation by TVS, 15 European experts reached a consensus by means of a modified Delphi procedure.[9] Defects were defined as an indentation with a depth of ≥2 mm at the site of CS.[9]

CSDs could be subclassified as follows: 1) simple CSD; 2) simple CSD with one branch; 3) complex CSD (with more than one branch).[9] CSD measurements were based only on myometrial values, and the endometrium should be excluded. Length, depth, RMT, width, adjacent myometrial thickness, distance between the CSD and the vesicovaginal fold, and distance between the CSD and the external os were clinically relevant measurements of CSDs.[9] Length, depth, and RMT should be measured in the sagittal plane, while the transverse plane is used only for the third dimension of these defects (width).[9]

MRI and TVS are thus both appropriate tools to determine RMT. The advantages of MRI are reproducibility of measurements and a clearer view of the defect before surgery.[10] However, its use may be disputed, because preoperative RMT values were found to be similar with the use of TVS.[10]

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CSDs could also be diagnosed by hysteroscopy. In this case, a cavity is observed on the anterior side of the isthmus, and the presence of hyper vascularized areas and dendritic vessels with hemorrhage or polyps could suggest bleeding from the defect. The presence of old blood may also be noted, suggesting retained menstruation in the CSD or an endometriotic origin.[11]

Although not all patients are symptomatic, abnormal bleeding and pain have a negative impact on physical and psychological quality of life as well as social relationships.[12] Therefore, it is generally agreed that isthmocele management should be decided based on the patient's symptoms and plans for future childbearing.[13]

Several studies have demonstrated that surgical resection of isthmoceles reduces postmenstrual spotting, with high satisfaction rates.[14, 15] Moreover, Stegwee et al.[16] found that postmenstrual spotting and pain had considerable impact on sexual behavior, work activity and even self-esteem, with patients reporting significant improvement in their quality of life after surgical repair.

Medical treatment of CSDs has been insufficiently investigated in small series. Zhang et al.[17]reported prevention of recurrent bleeding in >80% of women with the use of estrogen and progesterone. Conversely, Chen et al.[18] found the levonorgestrel intrauterine device effective in 88.3% of their patients (n = 5/6) with CSD-related intermenstrual bleeding.[18]

In case of failure of or contraindications to medical treatment, surgery should be contemplated according to the severity of symptoms, including infertility, the desire to preserve the uterus, the size of the CSD, and RMT.[5]

Hysteroscopy, as a minimally invasive method with good therapeutic effects, should be applied as first line in management of cesarean scar defects.[19] A recent systematic review and meta-analysis of the efficacy and safety of different surgical approaches for the treatment of symptomatic isthmocele found that hysteroscopic correction improved symptoms in about 85% of the patients and was associated with the lowest risk of complications.[20]

Hysteroscopic niche resection seems a plausible intervention that has the advantage of being a diagnostic and therapeutic minimally invasive procedure that is cost-effective offering a high degree of safety with a low risk of complications and high success rates in terms of improving not only gynecological systems but also conception in those with secondary infertility.

The aim of our study was to evaluate a new proposed surgical approach for hysteroscopic isthmoplasty in improving symptoms of cesarean scar syndrome (bleeding status and chronic pelvic pain). Secondary outcome was to assess the

expected pregnancy through natural conception in patients with secondary infertility after hysteroscopic correction.

Materials and methods

The study was a randomized controlled trial conducted on 100 female patients recruited from the gynecology clinic at the university hospital. Our inclusion criteria were patients with cesarean scar defect (niche) complaining of post menstrual spotting and/or pelvic pain and/or secondary infertility 6 months or more with previous one or more cesarean sections and ultrasound diagnosis of cesarean scar defect (CSD) showed residual myometrial thickness (RMT) 3 mm or more. Our exclusion criteria were pregnancy, other pathology causing AUB and/or pelvic pain, endometrial or cervical malignancy, PID, previous history of niche repair and other causes of secondary infertility e.g. male factor and tubal factor.

A total sample size of 100 women suffering from CSS, after signing their informed consents, were chosen. A minimum required sample size of 50 women per each group (total sample = 100 women) was needed to determine the efficacy of the new proposed hysteroscopic isthmoplasty technique in improving CSS and achieving spontaneous pregnancy; taking into consideration 80% power at 95% confidence and 0.05 significance level to detect proportion difference in the outcome. Sample size was calculated using R software.

The patients were randomly assigned to 2 groups through computer-based randomization (Random Digit R Software) in a way that was both unbiased and reproducible.

The patients were placed in extended lithotomy position and the procedure was performed under general anesthesia after surgical draping of the field. The cervix was dilated under transabdominal ultrasound guidance with a Hegar dilator up to size 9 mm & the uterine cavity was assessed at the beginning of the procedure.

Surgical procedures were performed using a 9 mm resectoscope with 300 optical system (Hopkinsii; Karl Storz Tuttlingen, Germany). The adequate distension of the uterine cavity was ensured by the automatic irrigation system Hydromat (Karl Storz), which guaranteed a constant intracavitary pressure between 90- and 120-mm Hg. The resectoscope was placed in the uterine cavity to exclude any endometrial or cervical pathology and to evaluate the isthmocele (depth, width & height) as well as evaluate the overlying endometrium while extracting resectoscope. A monopolar electrode was used. Glycine 1.5% solution was used as the distension medium. The procedure was interrupted only if the deficit of glycine reaches 1200 ml.

Patients randomized to group A received hysteroscopic correction of isthmocele using the new technique.

The new surgical technique concentrates on four aspects, and these were the four main sources of blood coagulation and must be addressed to reduce prolonged bleeding. The procedure involved performing an initial resection gradient of the distal edge of the isthmocele from the apex of the isthmocele down to the cervical outer orifice. Secondly, the distal and proximal niches of the isthmocele were resected. Thirdly, the small cave on the scar side of the isthmocele was electrocauterized on the distal and proximal sides, not only over the niche bottom. Fourthly, the isthmocele was managed until it was largely connected to the cavity.

Patients randomized to group B did not receive hysteroscopic procedure & received only medical treatment and expectant management for pregnancy.

The initial Outpatient Department (OPD) follow-up was at 1 week postoperatively for management of acute postoperative complications. Participants were invited to visit the outpatient department at 1, 3, and 6 months after surgery. At each follow-up visit, the participants underwent a transvaginal ultrasound to evaluate the niche depth and residual myometrial thickness. Improvement was defined as absence of postmenstrual spotting (complete) or a reduction in average days of postmenstrual spotting (partial); no improvement was no change. The patient's subjective assessment of suprapubic pain was calculated based on the Numerical Rating Scale.[21] The incidence of spontaneous pregnancy during the follow-up period was recorded.

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp). Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, standard deviation, median and interquartile range (IQR). Significance of the obtained results was judged at the 5% level.

The used tests were:

1- Chi-square test: For categorical variables, to compare between different groups.

2- Student t-test: For normally distributed quantitative variables, to compare between two studied groups.

3- Mann Whitney test: For not normally distributed quantitative variables, to compare between two studied groups.

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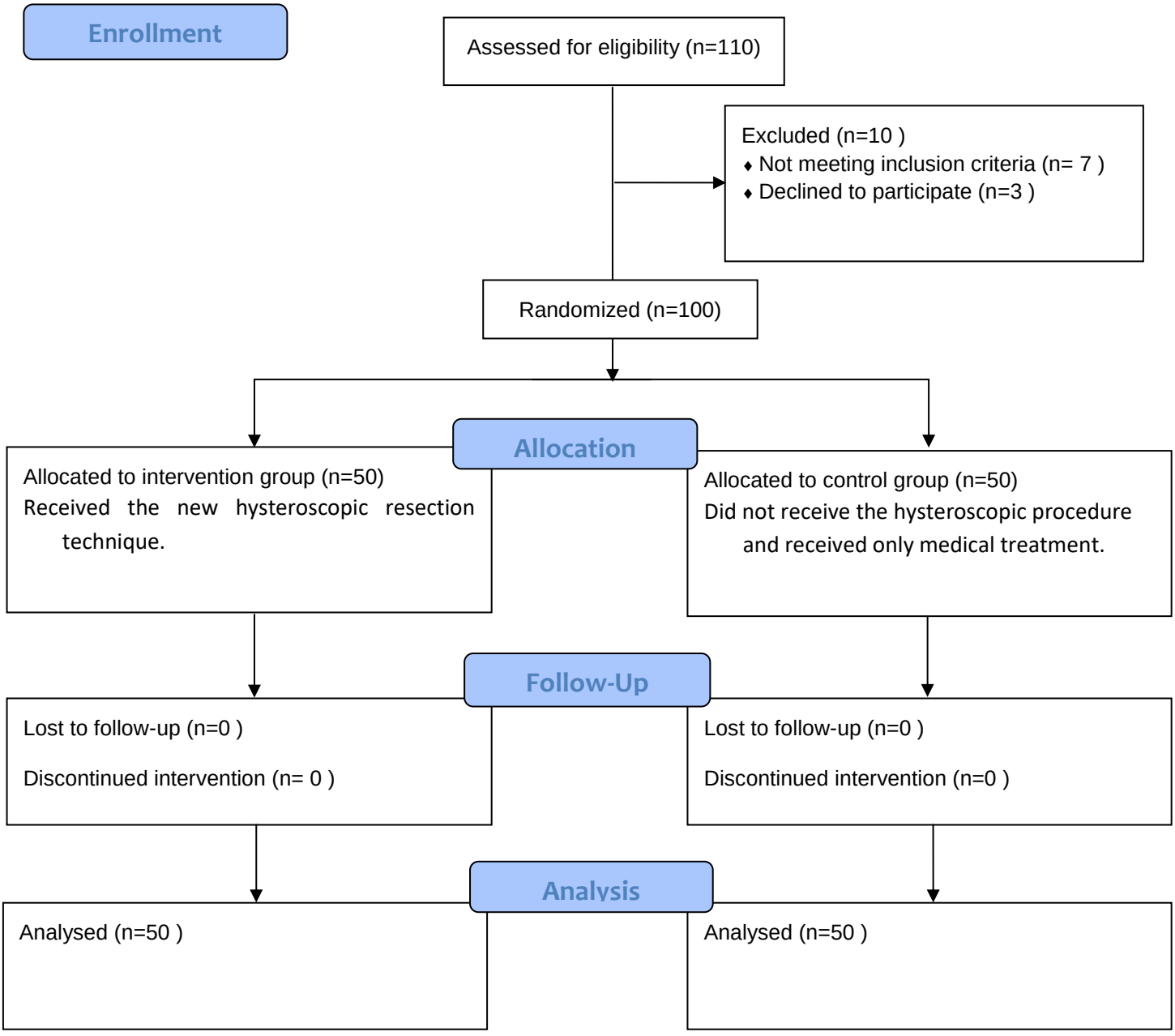
Results

Figure 1 – Flow-chart of the Participants in the RCT



As regards age and obstetric history (Table 1), there was no statistically significant difference between the two studied group with a mean of 29.58 ± 4.85 in group A & 30.82 ± 4.48 in group B in relation to age, and 2.76 ± 1.33 in group A & 3.16 ± 1.0 in

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group B in relation to gravidity, and 2.26 ± 1.01 in group A and 2.56 ± 0.93 in group B in relation to parity and 0.50 ± 0.91 in group A & 0.60 ± 0.67 in group B in relation to abortion.

Table 1 -Comparison between the two studied groups according to age and obstetric history

	Group A (n = 50)	Group B (n = 50)	Test of Sig.	p
Age (years)				
Min – Max.	21.0 – 37.0	23.0 – 38.0		
Mean ± SD.	29.58 ± 4.85	30.82 ± 4.48	t= 1.328	0.187
Median (IQR)	30.50 (25.0 – 33.0)	32.50 (27.0 – 34.0)		
Gravidity				
Min – Max.	1.0 – 5.0	2.0 – 5.0		
Mean ± SD.	2.76 ± 1.33	3.16 ± 1.0	U= 986.00	0.060
Median (IQR)	2.0 (2.0 – 4.0)	3.0 (2.0 – 4.0)		
Parity				
Min – Max.	1.0 – 4.0	1.0 – 5.0		
Mean ± SD.	2.26 ± 1.01	2.56 ± 0.93	U= 1023.50	0.101
Median (IQR)	2.0 (1.0 – 3.0)	3.0 (2.0 – 3.0)		
Abortion				
Min – Max.	0.0 – 4.0	0.0 – 2.0		
Mean ± SD.	0.50 ± 0.91	0.60 ± 0.67	U= 1055.50	0.123
Median (IQR)	0.0 (0.0 – 1.0)	0.50 (0.0 – 1.0)		

IQR: **Inter quartile range** SD: **Standard deviation** **t: Student t-test**
U: Mann Whitney test
p: p value for comparing between the two studied groups

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As regards number of previous CS and years of infertility, there was no statistically significant difference between the two studied groups (Table 2).

Table 2 - Comparison between the two studied groups according to no. of previous CS and years of infertility

	Group A (n = 50)		Group B (n = 50)		Test of Sig.	p
	No.	%	No.	%		
No. of previous CS						
1	13	26.0	8	16.0		
2	18	36.0	15	30.0	χ^2= 2.855	0.240
≥3	19	38.0	27	54.0		
Years infertility						
Min – Max.	1.0 –6.0		1.0 –5.0			
Mean ± SD.	3.30 ± 1.43		2.78 ± 1.07		U= 1030.00	0.114
Median (IQR)	3.0 (2.0 –4.0)		3.0 (2.0 –3.0)			

IQR: **Inter quartile range** SD: **Standard deviation; U: Mann Whitney test; χ^2: Chi square test**
p: p value for comparing between the two studied groups

As regards RMT of CS niche measurement by ultrasound in both studied groups, there was no statistically significant difference between them in initial evaluation, while there were statistically significant differences between them after 1,3&6 months of follow up showing significant improvement of RMT following hysteroscopic correction using the new technique (group A) to reach a mean of 5.89 ± 0.33 mm after 6 months while initial measure was of a mean 3.54 ± 0.42 mm (Table 3a) (Figure 2).

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Table (3a): Comparison between the two studied groups according to RMT

RMT (mm)	Group A (n = 50)	Group B (n = 50)	t	p
Initial				
Min – Max.	3.0 – 4.20	3.0 – 4.50		
Mean ± SD.	3.69 ± 0.43	3.55 ± 0.44	1.661	0.073
Median (IQR)	3.95 (3.40 – 4.0)	3.50 (3.0 – 4.0)		
1 month				
Min – Max.	4.0 – 5.20	3.0 – 4.20		
Mean ± SD.	4.69 ± 0.38	3.54 ± 0.43	14.213*	<0.001*
Median (IQR)	4.90 (4.30 – 5.0)	3.50 (3.0 – 4.0)		
3 months				
Min – Max.	4.80 – 5.90	3.2 – 4.40		
Mean ± SD.	5.34 ± 0.33	3.60 ± 0.36	25.176*	<0.001*
Median (IQR)	5.40 (5.10 – 5.60)	3.50 (3.20 – 4.0)		
6 months				
Min – Max.	5.0 – 6.50	3.0 – 4.0		
Mean ± SD.	5.89 ± 0.33	3.54 ± 0.42	30.883*	<0.001*
Median (IQR)	5.95 (5.80 – 6.0)	3.50 (3.0 – 4.0)		

IQR: **Inter quartile range** SD: **Standard deviation** **t: Student t-test**
p: p value for comparing between the two studied groups
*: Statistically significant at $p \leq 0.05$

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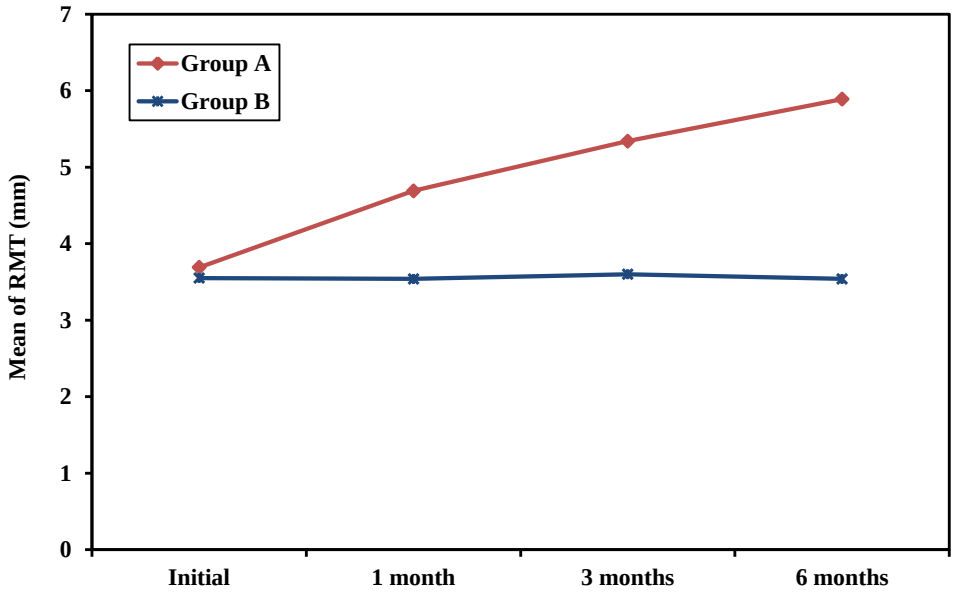

Figure 2 - Comparison between the two studied groups according to RMT

Moreover, there were statistically significant differences between measurements of RMT in group A after 1, 3 & 6 months in relation to each other (Tale 3b) showing significant improvement over time.

Table (3b): Comparison between the different studied periods according to RMT in Group A (n = 50)

	Initial	1 month	3 months	6 months	F	p
RMT (mm)						
Min – Max.	3.0 – 4.20	4.0 – 5.20	4.80 – 5.90	5.0 – 6.50		
Mean ± SD.	3.69 ± 0.43	4.69 ± 0.38	5.34 ± 0.33	5.89 ± 0.33	534.605*	<0.001*
Median (IQR)	3.95(3.40 – 4.0)	4.90(4.30 – 5.0)	5.40(5.10–5.60)	5.95(5.80 – 6.0)		
Increase(%)		**1.0 (28.21%)**	**1.65 (46.32%)**	**2.20 (61.68%)**		
p_0		<0.001*	<0.001*	<0.001*		

IQR: **Inter quartile range ;** SD: **Standard deviation ; F: F test (ANOVA) with repeated measures,** Sig. bet. periods was done using **Post Hoc Test** (**adjusted Bonferroni);** p: p value for comparing between the different studied periods; p_0: p value for comparing between **Initial** and each other period periods; *: Statistically significant at $p \leq 0.05$

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As regards CSD induced postmenstrual spotting, there was marked reduction in total days of bleeding and post-menstrual spotting days in interventional group A and statistically significant difference between both studied groups after 1,3 and 6 months with marked improvement in group A following hysteroscopic correction (Table 4) (Figure 3).

Table 4 - Comparison between the two studied groups according to bleeding

	Bleeding (days)		Post menstrual spotting (days)	
	Group A (n = 50)	**Group B (n = 50)**	**Group A (n = 50)**	**Group B (n = 50)**
Initial				
Min – Max.	10.0 – 15.0	10.0 – 14.0	5.0 – 9.0	6.0 – 9.0
Mean ± SD.	11.80 ± 1.39	12.08 ± 0.97	6.88 ± 1.17	7.02 ± 0.98
Median (IQR)	12.0 (11.0 – 13.0)	12.0 (11.0 – 13.0)	7.0 (6.0 – 8.0)	7.0 (6.0 – 8.0)
t (p)	t=1.173 (p=0.244)		t=0.648 (p=0.518)	
1 month				
Min – Max.	5.0 – 9.0	7.0 – 9.0	1.0 – 5.0	4.0 – 8.0
Mean ± SD.	7.26 ± 1.37	8.42 ± 0.67	2.16 ± 1.06	4.66 ± 0.94
Median (IQR)	7.0 (6.0 – 8.0)	9.0 (8.0 – 9.0)	2.0 (1.0 – 3.0)	4.0 (4.0 – 5.0)
t (p)	t=5.382* (p<0.001*)		t=12.504* (p<0.001*)	
3 months				
Min – Max.	4.0 – 8.0	6.0 – 9.0	1.0 – 4.0	3.0 – 7.0
Mean ± SD.	5.96 ± 1.29	7.98 ± 0.74	1.50 ± 0.74	4.16 ± 1.09
Median (IQR)	6.0 (5.0 – 7.0)	8.0 (8.0 – 8.0)	1.0 (1.0 – 2.0)	4.0 (3.0 – 5.0)
t (p)	t=9.581* (p<0.001*)		t=14.262* (p<0.001*)	
6 months				

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Min – Max.	3.0 – 8.0	6.0 – 9.0	0.0 – 3.0	3.0 – 6.0
Mean ± SD.	5.12 ± 1.19	7.66 ± 0.75	1.0 ± 1.07	3.78 ± 0.76
Median (IQR)	5.0 (4.0 – 6.0)	8.0 (7.0 – 8.0)	1.0 (0.0 – 2.0)	4.0 (3.0 – 4.0)
t (p)	t=12.798* (p<0.001*)		t=14.962* (p<0.001*)	

IQR: **Inter quartile range** SD: **Standard deviation** **t: Student t-test**
p: p value for comparing between the two studied groups
*: Statistically significant at p ≤ 0.05

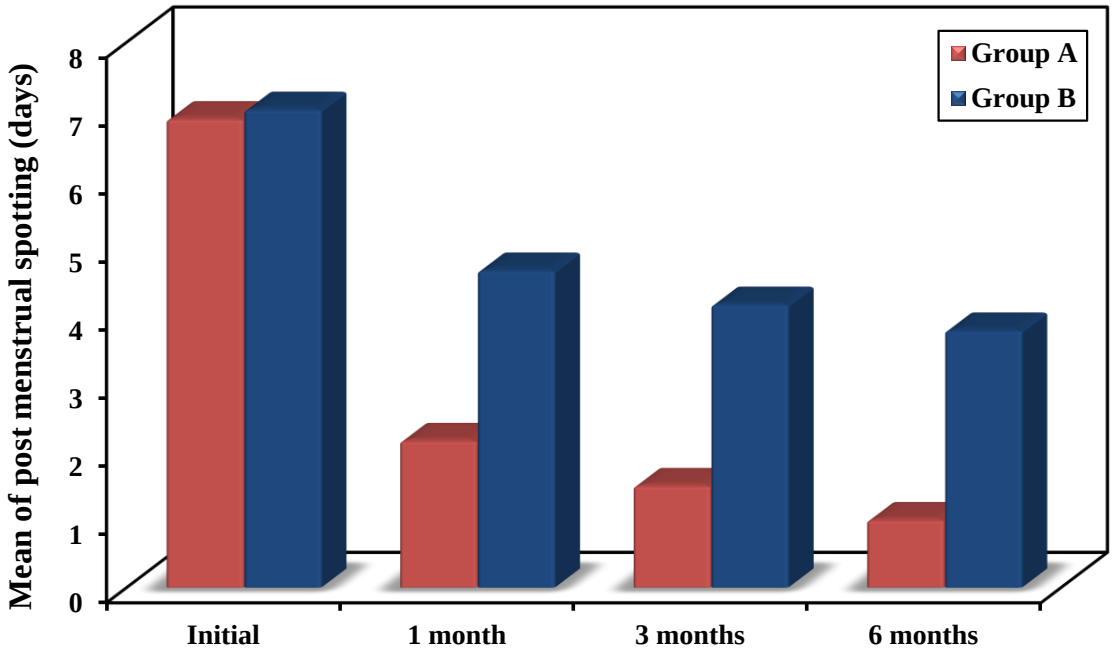

Figure 3 - Comparison between the two studied groups according to post menstrual spotting (days)

As regards CSD induced pelvic pain, and according to numerical pain scoring system, there was statistically significant difference between both studied groups after 1,3 and 6 months with marked improvement in group A following hysteroscopic correction (Table 5).

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Table 5 - Comparison between the two studied groups according to pain scoring

Pain scoring	Group A (n = 50)	Group B (n = 50)	Test of Sig.	p
Initial				
Min – Max.	4.0 – 7.0	4.0 – 7.0		
Mean ± SD.	6.14 ± 0.88	6.04 ± 1.01	t= 0.528	0.599
Median (IQR)	6.0 (6.0 – 7.0)	6.0 (6.0 – 7.0)		
1 month				
Min – Max.	3.0 – 7.0	4.0 – 8.0		
Mean ± SD.	5.24 ± 0.85	5.64 ± 1.01	t= 2.152*	0.034*
Median (IQR)	5.0 (5.0 – 6.0)	6.0 (5.0 – 6.0)		
3 months				
Min – Max.	2.0 – 6.0	4.0 – 8.0		
Mean ± SD.	4.10 ± 1.11	5.70 ± 1.05	t= 7.385*	<0.001*
Median (IQR)	4.0 (3.0 –5.0)	6.0 (5.0 –6.0)		
6 months				
Min – Max.	1.0 – 6.0	4.0 – 7.0		
Mean ± SD.	3.86 ± 1.32	5.38 ± 0.90	t= 6.708*	<0.001*
Median (IQR)	4.0 (3.0 –5.0)	5.50 (5.0 –6.0)		
Improvement				
Min – Max.	0.0 – 6.0	0.0 – 2.0		
Mean ± SD.	2.28 ± 1.58	0.66 ± 0.72	U= 444.00*	<0.001*
Median (IQR)	2.0 (1.0 –3.0)	1.0 (0.0 –1.0)		

IQR: **Inter quartile range ; SD: Standard deviation ; t: Student t-test ; U: Mann Whitney test**
p: p value for comparing between the two studied groups; *: Statistically significant at $p \leq 0.05$

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Concerning incidence of pregnancy, 62% of patients got pregnant following hysteroscopic correction of niche (group A) while only 38 % got pregnant following expectant management in group B with statistically significant difference between both studied groups (Table 6, Figure 4).

Table 6 - Comparison between the two studied groups according to incidence of pregnancy.

Pregnancy test	Group A (n = 50)		Group B (n = 50)		χ^2	p
	No.	%	No.	%		
1 month	0	0.0	0	0.0	–	–
3 months	10	20.0	7	14.0	0.638	0.424
6 months	21	42.0	12	24.0	3.664	0.056
Overall	**31**	**62.0**	**19**	**38.0**	**5.760***	**0.016***

χ^2: Chi square test; p: p value for comparing between the two studied groups; *: Statistically significant at $p \leq 0.05$

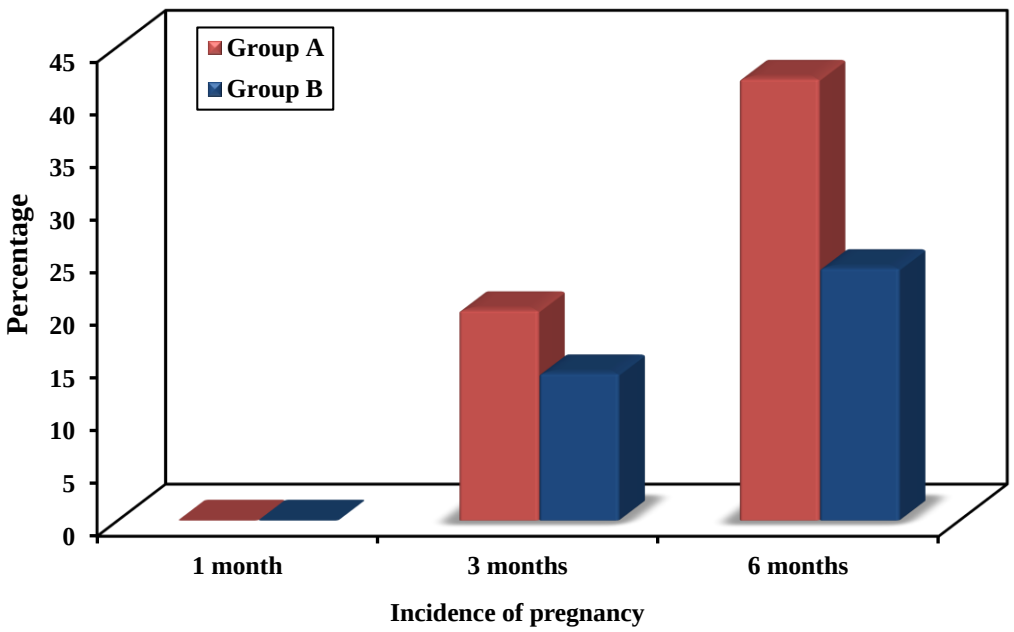

Figure 4 - Comparison between the two studied groups according to incidence of pregnancy.

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Discussion

Our study statistically proved that there were significant differences between intervention group A using the new hysteroscopic niche resection technique of wide base excision and expectant group B in relation to all CSS and sonographic niche parameters following 6 months of follow up.

Our results were comparable to multiple other studies that also evaluated the effect of hysteroscopic isthmoplasty – despite using other surgical techniques – and expectant and medical treatment in CSD syndrome.

As regards CSS sonographic niche parameters: Our study showed improvement in the CS niche sonographic parameters: mean RMT (+2.2 mm; $P < 0.001$); mean size of the CSD (height: −4.23 mm; depth: −3.83 mm; $P < 0.001$).

In accordance with our results, Paolo Casadio et al. (2023),[22] conducted a single-center, observational, prospective, cohort study enrolling all symptomatic patients diagnosed with CSD and routinely scheduled for channel-like (360°) hysteroscopic resection. They found a significant difference before and after the procedure in mean RMT (+2.0 mm; $P < 0.001$); mean size of the CSD (base: +1.6 mm; height: −2.5 mm; transverse diameter: −3.2 mm; volume: −263.7 mm^3; $P < 0.001$).

Confirming our results, El-Gamal HH et al. (2021),[23] conducted two independent prospective cohort studies to compare the effectiveness of a hysteroscopic niche resection versus no treatment in women with postmenstrual spotting and a uterine caesarean scar defect. They found that there was a significant improvement in intervention group more than the control group after 3 months, also the control group improved after 6 months, but the intervention groups were significantly higher than the control group.

In contrast to our results, Nguyen et al. (2022),[1] conducted a prospective study using the classical surgical technique with four main steps, including identification of relevant anatomy, resection of the cephalad edge of fibrosis, resection of the caudal edge of fibrosis, and ablation of the niche base. They found that There were no differences in niche depth and residual myometrium thickness on ultrasound in the period before and after hysteroscopy.

A regards CSS manifestations (AUB and pelvic pain): Our study showed improvement in the CSS manifestations: (1) mean VAS score for pelvic pain (−2.28; $P < 0.001$), (2) AUB -total days of bleeding- (-6.68; $P < 0.001$) and (3) post-menstrual spotting days (-5.88; $P < 0.001$).

In accordance with our results, Paolo Casadio et al. (2023),[22] They found -as secondary outcomes- mean VAS score for dyspareunia (−5.84; $P < 0.001$), dysmenorrhea (−8.94; $P < 0.001$), pelvic pain (−2.94; $P < 0.001$); (3) AUB rate (91% vs. 3%; $P < 0.001$). Lastly, regarding patients' satisfaction the mean PGI-I score ± SD was 1.7 ± 0.9.

In accordance with our results, Nguyen et al.(2022),[1] followed participants up at 1, 3, and 6 months postoperatively. The number of women with improved postmenstrual spotting symptoms after 1, 3, and 6 months were 39.1% (9/23), 61.9% (13/21) and 68.8% (11/16), respectively. Suprapubic pain resolved in 94% (15/16) of the women in the first month. Although three women re-appeared suprapubic pain after six months, the pain levels were decreased with the mean NRS score of the four women before and after isthmoplasty were 4.7 +/- 0.9 and 2.5 +/- 1, respectively.

Confirming our results, El-Gamal HH et al. (2021),[23] found a significant improvement in interventional group after 3 months more than the control group of expectant management in bleeding micturition characteristics which includes total days of spotting, spotting end of menstruation, intermenstrual spotting, discomfort from spotting, dysmenorrhea and daily pain during micturition, after 6 months the two-group improved but the interventional group was significantly higher than control group.

In contrast to our results, Xuyin Zhang et al. (2016),[17] conducted a prospective study was conducted among patients who underwent treatment of CSDs at a hospital in Shanghai, China, between April 1, 2010, and December 31, 2014. Treatment included laparoscopy (group 1), vaginal surgery (group 2), hysteroscopy (group 3), combined oral contraceptives (group 4), and the levonorgestrel intrauterine system (group 5). Patients who underwent surgery and those in group 4 (n = 18) experienced shortened menstrual periods after treatment ($P < 0.001$ for all comparisons). For group 5 (n = 5), the duration of menstruation was similar before and after therapy ($P = 0.89$). All 32 women who desired fertility underwent laparoscopy; 12 (37.5%) became pregnant after this procedure. All treatments for CSDs other than the levonorgestrel intrauterine system shortened menstrual periods with almost similar results.

As regards infertility and incidence of pregnancy: Our study showed the incidence of spontaneous pregnancy was 62% in intervention group A vs 38% in group B within 6 months.

In accordance with our results, Chuqing He et al. (2023),[24] reported the fertility outcomes between women who received hysteroscopic niche resection group or expectant management. In their surgical technique a cutting loop was used to resect distal rim of the niche and coagulate the surface of the niche. The pregnancy rate was higher in hysteroscopic niche resection group than that in expectant management

group (n = 72.2% versus n = 56.4%, risk ratio = 2.01, 95% CI 1.04-3.88, p = 0.04) while the live birth rate was comparable in both groups (HNR versus expectant management as 55.5% versus 45.7%, risk ratio = 1.48, 95% Cl 0.80-2.75, p = 0.21).

In accordance with our results, Nguyen et al.(2022),[1] found that the rate of spontaneous pregnancies within 6 months of isthmoplasty was 30.4% (7/23).

In contrast to our results, Carry Verberkt et al. (2022),[25] performed a systematic review and meta-analysis to assess the effect of a uterine niche resection on fertility and pregnancy outcomes in women with and without infertility. The RCT compared a surgical intervention with expectant management, whereas the other studies had an observational design. The reported surgical procedures were hysteroscopic niche resection (HNR) (n = 14), vaginal niche resection (n = 7), laparoscopic niche resection (n = 7), and laparotomic niche resection (n = 2).

Overall, the effect of a niche resection on the live birth rate was lower in women without infertility than in women with infertility: 36% (95% CI, 26 %–46%) vs. 54% (95% CI, 44%–64%).The live birth rates per different operative technique showed similar trends: HNR, 52% (95% CI, 40%–64%) vs. 55% (95% CI, 38%–71%); laparoscopic niche resection, 36% (95% CI, 25%–48%) vs. 42% (95% CI, 30%–55%); and vaginal niche resection, 25% (95% CI, 9%–46%) vs. 60% (95% CI, 52%–67%).

The only RCT performed showed a significantly higher pregnancy rate after HNR than that after expectant management (N = 61 women; relative risk, 2.41; 95% CI, 1.32–4.39) in women diagnosed with infertility. There were no significant differences in the pregnancy and miscarriage rates between the different populations.

A cesarean scar pregnancy was reported in 0.97% of pregnancies. After a hysteroscopic approach, in 4 (2.8%) of 145 deliveries, a uterine dehiscence or rupture was reported. There was no uterine dehiscence described after the other niche interventions. Based on the current available data, it is not advised to perform a niche resection to improve fertility outcomes. Well-designed comparative studies are necessary to investigate whether there is a role for niche surgery in patients regarding fertility outcomes.

The current study had the following strengths: the randomization of participants through computer generated randomization. All patients were treated by the same surgical team, suggesting that the study population was homogeneous. Finally, other possible precipitating factors, such as age, obstetric history, number of previous cesareans, other causes of infertility were not dominant key factors and there was no difference between both groups concerning them. To the best of our knowledge, this study is one of very few studies which evaluated postoperative changes in CSD parameters (Depth, Height and RMT) using TVUS following hysteroscopic correction.

There are some limitations in the current study; The small sample size of participants in this study made our results not too solid to be generalized and standardized. We did not extend our comparison to the infertility management by ART following failed spontaneous pregnancy in the 6 months follow up period. Follow up post-operative was only for 6 months and concerned mainly upon bleeding, pain changes and spontaneous pregnancy and for sure not pregnancy outcomes, live birth rates and other obstetric complications related to surgical approach (miscarriage, PROM, PTLP, CS pregnancy, uterine rupture, or placenta accreta). The absence of a long-term follow-up evaluation which appears necessary to confirm our preliminary data on pain symptoms and AUB after hysteroscopic repair. A possible placebo effect on postoperative symptoms as patients were aware that the procedure was a treatment strategy.

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