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Evaluation of Patients With Uterine Perforation After Intrauterine Device Placement and Determination of Risk Factors: A Retrospective Case-Control Study

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ABSTRACT

To determine the risk factors by evaluating patients with uterine perforation after intrauterine devices (IUD) placement. Also, it was to make suggestions and contribute to the literature in order to prevent uterine perforation after the IUDs placement and how we should behave when we encounter these patients.

Twenty-two patients with uterine perforation after IUDs placement (patient group) diagnosed and treated at our clinic and 30 patients with IUDs in place in the uterine cavity (control group) were retrospectively evaluated and compared.

IUDs insertion by a midwife and during the breastfeeding and puerperal period significantly increased the frequency of uterine perforation after IUDs placement, while insertion during the menstrual period significantly reduced risk. Uterine perforation after IUDs placement were most frequently localized in the myometrium (54.5%) and the douglas (13.6%). Uterine perforation-related complications were absent in 59.1% of patients. Of patients, 40.9% underwent hysteroscopy, 18.2% laparoscopy. The diagnostic method was ultrasonography alone at a rate of 68.2%.

IUDs could be inserted during menstruation where possible, and patients could be informed about the high risk of uterine perforation after IUDs placement associated with the breastfeeding and puerperal periods. We recommend that IUDs be inserted with ultrasonography in this period. Midwives should receive regular training in order to increase their knowledge and experience on this subject. We recommend ultrasonography as the primary diagnostic method. Those with IUDs embedded in the myometrium can primarily undergo hysteroscopy, and those with IUDs in the abdomen can undergo laparoscopy or laparotomy.

Keywords: Intrauterine device, complication, uterine perforation, risk factors

Introduction

Intrauterine devices (IUD) constitute the most common method of long-acting reversible contraception due to their high effectiveness, safety, ease of application, and cost-effectiveness. On average, it is used by 23% of women who use a contraceptive method, with rates ranging between < 2% and > 40% across different countries (1, 2). As of 2018, there exist five types of IUDs in the United States of America; one involves copper, and four release progestin levonorgestrel (LNg) (3). The contraceptive effects of IUDs are multifactorial. They take effect through spermicidal effects, the inhibition of fertilization, and the creation of an unsuitable environment for implantation by causing chronic inflammatory changes in the endometrium and tuba uterina. LNg IUDs also exert a contraceptive effect by changing and partially inhibiting ovulation (4). In typical use, copper IUDs are associated with an annual failure rate of 0.8 per 100 women; and similarly, in typical use, LNg IUDs are associated with an annual failure rate between 0.2 and 0.3 per 100 women (5-8). IUDs, particularly LNg IUDs, also offer non-contraceptive benefits. These benefits include the treatment of heavy menstrual bleeding, dysmenorrhea, pelvic pain, endometriosis, endometrial hyperplasia, and endometrial cancer (9). Ultrasonography (US) is the most common primary diagnostic method in the evaluation of IUDs due to its cost-effectiveness, not involving radiation, and the property of offering a perfect evaluation of pelvic anatomy (10).

Apart from the advantages, IUDs are also associated with certain disadvantages. Although

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IUD-related complications are rare, they can be encountered more frequently due to the increase in the popularity of IUDs. IUD-related complications include migration, expulsion, and partial or complete uterine perforation. Among these, perforation is a rare but serious complication, the incidence of which was reported as 0.2-3.6 in 1000 (11). The occurrence of uterine perforation due to IUDs can result in contraceptive failure; and adhesion, fistulas, infection, abscess, and the perforation of the surrounding blood vessels, intestine, and bladder due to the migration of the IUD to the peritoneal cavity after uterine perforation (11).

This retrospective case control study aims to evaluate patients with uterine perforation after IUD placement and to determine the predisposing risk factors by comparing these patients to those in a control group. This study aims to make recommendations and contribute to the literature as to how we can prevent the occurrence of uterine perforation after IUD placement and the approach we must adopt when encountered with these patients.

Material and Methods

This retrospective case control study included 22 patients with uterine perforation after IUD placement (patient group) who were diagnosed and surgically treated in the Gynecology and Obstetrics Clinic of a university hospital between January 2012-March 2020 and 30 control patients with IUDs without any complications. Approval was granted for this study by the Dicle University Faculty of Medicine Ethics Committee (Date: 16.07.2020, Approval number: 258). All procedures were performed according to the Declaration of Helsinki.

The patient group included patients in whom an IUD was not seen in the endometrial cavity and an IUD string was not seen in the cervical ostium on vaginal examination, patients with an IUD found outside the endometrial cavity in the uterine myometrium, serosa or the abdomen, and patients who were operated; the control group included patients whose IUDs were in place in the endometrial cavity with an IUD string visible in the cervical ostium on vaginal examination. For both study groups; patients who had IUDs other than copper and LNg IUDs were excluded. Only those who used an IUD for contraception were included. Patients in whom an IUD string was not seen on vaginal examination but the IUD was found either within the endometrial cavity or displaced towards the cervical ostium in the endometrial cavity were excluded. Patients whose IUD insertion was performed under anesthesia and those with uterine anomalies, those who indicated pelvic inflammatory diseases during IUD insertion were not included in the study. Patients' demographic characteristics, previous delivery methods and the number of cesarean deliveries, duration of IUD use, IUD type, by whom the IUD was inserted, whether the patient experienced pain during insertion, menstruation, and breastfeeding states at insertion, and time of insertion were noted for both groups. Additionally, IUD location, IUD complications, where the diagnosis of IUD translocation was made, diagnostic method, treatment method, complaint at diagnosis, number of days of postoperative hospitalization, whether the patient conceived after the operation, and the current method of contraception used by the patient were noted for the patient group. The data were obtained by inspecting the hospital information management system archives and patient files.

At our tertiary hospital, IUD insertion is not a routine procedure. IUD insertion is placed on patients by general practitioners or midwives at primary healthcare centers. Midwives who insert IUD have certificates. Patients included in the study were comprised of those who either presented to our hospital for a control examination or were referred from external centers due to the absence of an IUD string in the cervical ostium on vaginal examination. In patients without a visible IUD string, it was routinely checked using a brush whether or not the string was within the cervical ostium, a pregnancy test was ordered, and US was performed routinely. Each patient was evaluated on an individual basis and other diagnostic methods were used in cases where deemed necessary. Patients with IUDs in the uterine cavity that were completely settled in the cavity and an IUD string visible on vaginal examination were considered normal; patients in whom the IUD was not found in the uterine cavity but anchored in the myometrium and the IUD string was not visible on vaginal examination were considered to have partial uterine perforation, and patients in whom the IUD was not in the uterine cavity but the abdomen were considered to have a complete uterine perforation. Patients with complete or partial uterine perforation were defined as uterine perforation after IUD placement patients. At our clinic, all patients diagnosed with an uterine perforation after IUD placement were operated on after obtaining consent.

Statistical Analysis: For statistical analysis, SPSS 21 (Statistical Package for Social Sciences, Inc.,

Chicago, IL, USA) software package for statistics was used. Descriptive data were presented in the form of mean, standard deviation, frequency, and percentage values. The Kolmogorov Smirnow test was performed to determine whether the data conformed to a normal distribution. Categorical data were evaluated using the chi-square test. Data consistent with a normal distribution were analyzed using the parametric Student's t-test, and data inconsistent with a normal distribution were analyzed using the non-parametric Mann-Whitney U test. Factors determined to be significant regarding the risk of IUD translocation were subjected to multiple linear regression analysis to determine whether they were influenced by parity. A p-value<0.05 was considered statistically significant.

Results

In our clinic, we identified 22 patients with uterine perforation after IUD placement throughout the study period. Forty-seven patients were determined to not have a visible IUD string on vaginal examination but to have an IUD in the endometrial cavity. These patients were excluded from the study and their IUDs were removed by curettage or hysteroscopy.

Patients in the patient group showed a mean age of 33.7 ± 7.8 and parity of 4.0± 2.0, and patients in the control group showed a mean age of 35.4 ± 6.3 and parity of 2.8± 1.8. Between the two groups, parity was significantly higher in the patient group (p= 0.022). Results other than parity were consistent between the two groups. Demographic and clinical values of the two groups are compared in Table 1.

Upon comparison of the patient and control groups; we determined that the insertion of the IUD by a midwife and during the breastfeeding period or the puerperium in the patient group were associated with a significantly higher risk of uterine perforation after IUD placement. We determined that the insertion of the IUD during menstruation significantly reduced the risk of uterine perforation after IUD placement occurrence (p= 0.007). No significant differences were determined between the two groups regarding the other data specified in Table 2. When we investigated whether or not parity influenced the factors determined to be significant regarding the risk of uterine perforation after IUD placement, it was found that parity did not have a significant effect on these factors (p>0.05).

Upon evaluation of the data of patients in the uterine perforation after IUD placement group; the IUD was found to be located in the myometrium in 12 patients (54.5%) and the douglas in 3 patients (13.6%). No IUD-related intraoperative complications were encountered in 13 patients (59.1%). Twelve patients were diagnosed at our clinic (54.5%). As the treatment method, 9 patients (40.9%) underwent hysteroscopy (H/S), 4 patients (18.2%) underwent laparoscopy (L/S), and 4 patients (18.2%) underwent laparotomy (L/T). The diagnosis was made based on US alone in 15 patients (68.2%). At diagnosis, 11 patients (50%) presented abdominal pain, while 9 (40.9%) did not present any symptoms. The duration of postoperative hospitalization was 3 days in 9 patients (40.9%). After an uterine perforation after IUD placement, 18 patients (81.8%) did not conceive and 17 patients (77.3%) were determined to have their partners use contraception as the contraceptive method (Table 3).

Discussion

IUDs have become a popular contraceptive method due to their advantages. In Turkey, another advantage associated with IUDs is that they are inserted free of charge at primary healthcare centers. However, due to the increase in IUD use, IUD-related complications occur more frequently (11). Therefore, the complication rate could be reduced by determining the patients who are at risk for the complications in advance and taking precautions. Accordingly, in this study, we tried to determine the risk factors by comparing the data of patients with uterine perforation after IUD placement with those of a control group. We aimed to contribute to the literature by making suggestions based on the results of our study as to the approach we need to adopt to prevent the occurrence of uterine perforation after IUD placement and when we encounter such patients.

In a study conducted by Agacayak et al. (12), the mean age of the patients was determined as 27.3 (25-29), and the parity as 2.8 (2-4). In this study; patients in the patient group showed a mean age of 33.7 ± 7.8 and parity of 4.0± 2.0; and patients in the control group showed a mean age of 35.4 ± 6.3 and parity of 2.8± 1.8, consistent with the cited study. Thus, all patients included in this study were comprised of patients in the reproductive period who used IUDs as a contraceptive method. Parity was not comparable

Table 1. Evaluation of Demographic and Clinical Values

n= 52	Control group (Mean±SD) n= 30	Patient group (Uterine perforation after IUD placement) (Mean±SD) n= 22	p
Age	35.4 ± 6.3	33.7 ± 7.8	0.369
Gravidity	3.2± 1.9	4.3± 2.1	0.055
Parity	2.8± 1.8	4.0± 2.0	0.022
Abortion	0.4±0.7	0.2±0.5	0.407
Number of living children	2.9± 1.6	3.7±1.7	0.073
Number of cesarean deliveries	1.1±1.3	0.9±1.2	0.673
Duration of IUD use (days)	1009.0± 785.8	1020.3±847.2	0.993

SD: Standart Deviation; IUD: Intrauterine Device
Independent t-test, Mann Whitney U Testi
p<0.05 statistically significant (in bold)

between the two groups. However, upon multiple linear regression analysis, we determined that parity did not have a significant effect on the factors found to be significant regarding the occurrence of uterine perforation after IUD placement (p>0.05).

When we consider the study conducted by Soydinc et al.; IUDs were inserted by midwives in 81% of patients and during the breastfeeding period in 81% of the patients (13). Similarly, in the study by Agacayak et al., IUDs were inserted by midwives in 61.7% of the patients and during the puerperal period in 44.2% of the patients (12). Also, the Agacayak et al. study reported that the presence of cesarean delivery in patient history could also constitute a risk factor for uterine perforation after IUD placement. Their study reported that 58.8% of the patients had a history of cesarean delivery. In the present study, we determined the rates of IUD insertion by midwives and during the breastfeeding period and the puerperium to be significantly higher in the patient group compared with the control group. On the other hand, we determined that the rate of IUD insertion during menstruation was significantly higher in the control group compared with the patient group (p= 0.007). When we looked at the number of cesarean deliveries and also compared the previous delivery methods of the patients in our study, we did not determine any significant differences between the two groups (p= 0.512, p= 0.683); thus, we determined that the number of previous cesarean deliveries and the method of previous delivery were not risked factors for uterine perforation after IUD placement. The difference of our study from these two cited studies is that we compared patients with uterine perforation after IUD placement with a control group and obtained results of higher statistical significance. A common aspect of these two studies and our study is that they were conducted in the same region, meaning that they involved the same patient population. Meanwhile, a study conducted by Kaislasuo et al. retrospectively compared patients with LNg IUDs and copper IUDs in two groups and reported that the majority of patients with uterine perforation had undergone IUD insertion during amenorrhea, breastfeeding, and the first 6-months postpartum (14). Similarly, we found in this study that performing the IUD insertion during menstruation significantly reduced the risk of uterine perforation after IUD placement.

In a prospective study by Barnett et al., the relationship of uterine perforation risk with the type of IUD used was investigated. There was no significant difference between LNg IUDs and copper IUDs in terms of perforation risk (15). The study conducted by Kaislasuo et al. also compared patients with LNg IUDs and copper IUDs in two groups and did not determine a difference between these groups about the incidence of perforation (14). In agreement with these two studies, no significant relationship was determined between IUD type and perforation in our study (p= 0.689).

In a study conducted by Lohr et al., it was reported that the risk of uterine perforation was not higher in nulliparous women compared with multiparous women (16). In our study, only one

Table 2. Comparison of Factors Affecting Uterine Perforation After Iud Placement Between Groups

		Control group n (%)	Patient group (Uterine perforation after IUD placement) n (%)	p
Previous delivery methods	Vaginal birth	14 (47%)	11 (50%)	0.683
	Cesarean section	15 (50%)	11 (50%)	
	Nulligravid	1 (3%)	0 (0%)	
IUD type	Copper IUD (TCu 380A)	27 (90%)	19 (86%)	0.689
	Hormonal IUD (LNg IUDs)	3 (10%)	3 (14%)	
Status of personnel inserting the IUD	Midwife	13 (43%)	15 (68%)	0.002
	General practitioner	1 (3%)	5 (23%)	
	ObGyn specialist	16 (54%)	2 (9%)	
History of pain during insertion	Pain felt during insertion	10 (33%)	8 (36%)	0.525
	No pain	20 (67%)	14 (64%)	
Number of cesarean deliveries	0	15 (50%)	12 (55%)	0.512
	1	3 (10%)	4 (18%)	
	2	7 (23%)	2 (9%)	
	3	4 (14%)	3 (14%)	
	4	0 (0%)	1 (4%)	
	5	1 (3%)	0 (0%)	
Menstruation states at insertion	While menstruating	28 (93%)	14 (64%)	0.007
	While not menstruating	2 (7%)	8 (36%)	
Breastfeeding states at insertion	Yes	13 (43%)	16 (73%)	0.035
	No	17 (57%)	6 (27%)	
Time of insertion	Puerperium	2 (7%)	8 (36%)	0.006
	2–6 months after birth	4 (13%)	3 (14%)	
	6-12 months after birth	9 (30%)	6 (27%)	
	12 months after birth	14 (47%)	5 (23%)	
	No birth	1 (3%)	0 (0%)	

IUD: İntrauterine device
Chi-square test
p<0.05 statistically significant (in bold)

nulliparous patient was inserted with an IUD and uterine perforation was not encountered. However, similarly to our study, since the number of nulliparous patients inserted with IUDs is also low in the literature, it is not known whether nulliparity is a risk factor for uterine perforation after IUD placment and more studies are needed.

When we investigate the literature as to whether or not the presence of pain during IUD insertion could be a risk factor for uterine perforation after IUD placement; 70.5% of patients are found to have experienced pain during insertion based on the study by Agacayak et al. (12). Further, in the study by Kaislasuo et al., the persistence of pain after IUD insertion was reported to be a more favorable sign about complications (14). In the present study, we determined that the presence of pain during IUD insertion was not a risk factor for uterine perforation after IUD placement (p= 0.525).

Table 3: Evaluation of The Data of The Uterine Perforation After Iud Placement Group As Number And Percentage (%)

n=22		Patient group (Uterine perforation after IUD placement) n (%)
IUD location	Omentum	1 (4.5%)
	Parametrium	1 (4.5%)
	Douglas pouch	3 (13.6%)
	Myometrium	12 (54.5%)
	Lumen of sigmoid colon	1 (4.5%)
	Serosa of bladder	1 (4.5%)
	Right tuba uterina	1 (4.5%)
	Pelvic wall	2 (9.1%)
IUD complications	Uncomplicated	13 (59.1%)
	Pelvic abscess	1 (4.5%)
	Pelvic adhesion	4 (18.2%)
	Pregnancy	1 (4.5%)
	Colon injury	2 (9.1%)
	Bladder injury	1 (4.5%)
Where the diagnosis of uterine perforation after IUD was made	At our clinic	12 (54.5%)
	References from outer center	10 (45.5%)
Treatment method	Laparoscopy (L/S)	4 (18.2%)
	Hysteroscopy (H/S)	9 (40.9%)
	Laparotomy (L/T)	4 (18.2%)
	Cesarean section	1 (4.5%)
	Colonoscopy	1 (4.5%)
	H/S+ L/S	1 (4.5%)
	H/S+ L/T	1 (4.5%)
	L/S+ L/T	1 (4.5%)
Diagnostic method	Ultrasonography	15 (68.2%)
	Ultrasonography + Abdominal radiography	5 (22.7%)
	Computerized tomography + Ultrasonography	1 (4.5%)
	Computerized tomography + Ultrasonography + Colonoscopy	1 (4.5%)
Complaint at diagnosis	Asymptomatic	9 (40.9%)
	Menstrual delay	1 (4.5%)
	Vaginal bleeding	1 (4.5%)
	Abdominal pain	11 (50%)
Number of days of postoperative hospitalization	1	1 (4.5%)
	2	4 (18.2%
	3	9 (40.9%)
	5	4 (18.2%)
	6	2 (9.1%)
	8	1 (4.5%)
	16	1 (4.5%)
Conceived after the operation	Yes	4 (18.2%)
	No	18 (81.8%)
Current method of contraception	IUD	1 (4.5%)
	COC	2 (9.1%)
	Their partners use contraception	17 (77.3%)
	No	2 (9.1%)

IUD: İntrauterine device
COC: Combined oral contraceptives

The IUD can be found in various localizations in uterine perforation after IUD placement patients. In a study conducted by Kaleem et al., it was reported that uterine perforation after IUD placement could have serious consequences such as volvulus, fistula formation, intestinal obstruction, intestinal perforation, and peritoneal adhesion and that a minimally invasive approach needed to be preferred in the removal of these IUDs (17). In a study by Kho and Chamsy, it was recommended that an intraperitoneal IUD detected by an imaging method be surgically removed even if the patients are asymptomatic (18). This is because the authors stated encountering adhesion at comparable rates in the surgical procedures of symptomatic and asymptomatic patients. However, their study reported the rate of patients with complete perforation as 84% and the rate of patients with partial perforation as 16% (18). On the other hand, the study conducted by Ucar et al. stated that older, asymptomatic patients with comorbidities could undergo conservative treatment rather than surgical treatment (11). When we review the literature, it was reported that transvaginal US was sufficient to determine the localization of the IUD, while abdominal radiography, computerized tomography, and magnetic resonance imaging could be used alternatively (14). In our study, 12 (54.5%) IUDs were determined to be in the myometrium, 3 (13.6%) in the Douglas, and 2 (9.1%) in the pelvic wall, while IUDs were also localized in the parametrium, omentum, lumen of sigmoid colon, bladder serosa and right tuba uterina. Of our patients, 9 (40.9%) were asymptomatic and we operated on all of our patients after a diagnosis was made, in congruence with the literature. During the operation, 13 of our patients (59.1%) did not manifest any IUD-related complications, while 4 (18.2%) showed pelvic-peritoneal adhesion. In line with the literature, we diagnosed 15 of our patients (68.2%) using only US. As the treatment method, we performed H/S on patients with partial perforation and IUDs embedded in the myometrium, L/S on 4 of the patients (18.2%) with complete perforation, and L/T on the other 4 patients (18.2%) with complete perforation. In a study conducted by Mosley et al., the authors reported fetal mortality in the 30th week in a pregnant patient whom they operated on for an uterine perforation after IUD placement during early pregnancy without knowledge of the pregnancy (19). In the present study, we have a patient who, after having conceived due to an uterine perforation after IUD placement and presented intrauterine growth retardation and anhydramnios in the 25th week, underwent a cesarean section during which the IUD was removed. In the cited study, it was not specified whether the fetal mortality was linked to the uterine perforation after IUD placement or the performed surgery; however, in our study, our impression is that the pregnancy complication was linked to the uterine perforation after IUD placement.

We did not determine any studies that have investigated whether patients conceived after an uterine perforation after IUD placement or which contraception method they used after being operated. In this study, we determined that 18 patients (81.8%) did not conceive and that 17 patients (77.3%) had their partners use contraception as a contraceptive method. We reason that the rate of the use of this contraceptive method and the lack of desire to conceive stem from the fear associated with the IUD complication and that studies on this matter are needed.

A limitation of our study is that the position and size of the uterus could not be evaluated as the data were retrieved from patient files. Patients included in our study were comprised of patients who either had been diagnosed at external centers and referred to our hospital or presented to our hospital for a control examination. Therefore, we think that the number of evaluated patients is lower than the actual number of patients with this condition since asymptomatic patients who did not present for a control examination could not be identified. As IUD insertion is not a routine practice at our clinic, we could not obtain the total number of inserted IUDs, and thus, could not calculate the incidence of IUD translocation. The superiority of our study lies in that the literature on uterine perforation by IUDs mainly involves case reports and reviews and very few research articles since this is a very rare complication.

In conclusion, to reduce the occurrence of uterine perforation after IUD placement, which is a rare and dangerous complication of IUDs; we need to pay attention that IUDs are inserted during the menstrual period. If IUDs are to be inserted during the breastfeeding period or the puerperium, we need to be much more careful during insertion and follow-up of these patients after the procedure. We recommend that IUDs be inserted with ultrasonography guidance during this period. We recommend that midwives be trained regularly in order to increase their knowledge and experience on this matter. We recommend using

US as the primary diagnostic method in the evaluation of patients suspected of having uterine perforation after IUD placement despite these measures and giving precedence to the minimally invasive surgical method.

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