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Retrospective Study

Effect of Mirena placement on reproductive hormone levels at different time intervals after artificial abortion

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Abstract

BACKGROUND

Improper methods of contraception greatly increase the risk of abortion, cervical or endometrial lesions, and the number of recurrent artificial abortions. These complications result in the deterioration of a patient's outcome. Further, the proportion of artificial abortions is highest among unmarried females. Placement of an intrauterine device, such as the Mirena, after an artificial abortion may decrease the likelihood of an endometrial injury caused by recurrent abortions while significantly improving its contraceptive effects.

AIM

To discuss the effect of Mirena placement on reproductive hormone levels at different time points after an artificial abortion.

METHODS

Women ($n = 119$) undergoing an artificial abortion operation were divided into the study ($n = 56$) and control ($n = 63$) groups. In the study group, the Mirena was inserted immediately after the artificial abortion, whereas in the control group, it was inserted 4–7 d after the onset of the first menstrual cycle after abortion. All participants were followed-up for 6 mo to observe the continuation and expulsion rates and adverse reactions and to measure the levels of serum estradiol (E2), follicle stimulating hormone (FSH), and luteinizing hormone (LH).

RESULTS

The continuation rates were 94.64% and 93.65% in the study group and the control group, respectively. The expulsion rates were 1.79% and 3.17% in the study group and the control group, respectively. There was no statistically significant difference between the two groups ($P > 0.05$). There were also no statistically significant differences in the proportion of patients with bacterial vaginitis, trichomonas vaginitis, or cervicitis between the groups ($P > 0.05$). Six months after Mirena placement, E2 Levels were 45.50 ± 7.13 pg/mL and 42.91 ± 8.10 pg/mL,

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FSH 13.60 ± 3.24 mIU/mL and 14.54 ± 3.11 mIU/mL, and LH 15.11 ± 2.08 mIU/mL and 14.60 ± 3.55 mIU/mL in the study and control groups, respectively. There were no significant differences in hormone levels between the two groups ($P > 0.05$). There were also no statistically significant differences in the proportions of abnormal menstruation, prolonged menstruation, or pain during intercourse between the study and control groups after Mirena placement ($P > 0.05$). There were no statistically significant differences in uterine volume, sexual desire, sexual activity, or the sexual satisfaction score between the study and control groups before and after Mirena placement ($P > 0.05$).

CONCLUSION

Placement of a Mirena intrauterine device immediately after an artificial abortion does not increase the risk of adverse reactions and can help prevent endometrial injury caused by recurrent abortions.

Key Words: Artificial abortion operation; Mirena intrauterine device; Sex hormone; Clinical effect

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Core Tip: In summary, immediate placement of the Mirena intrauterine device after artificial abortion has good effect, preventing secondary surgery and achieving the desired contraceptive effect without increasing the incidence of adverse reactions.

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INTRODUCTION

The number of artificial abortions has increased yearly. And with the development of more open sex lives, the number of artificial abortions may continue to increase[1]. Recurrent artificial abortions can increase the risk of intrauterine adhesion and secondary infertility, which may result in the deterioration of the patient's clinical outcome[2]. Placement of an intrauterine device (IUD), such as the Mirena, after an artificial abortion can improve menstrual disorders *via* effective contraception and prevent uterine adhesions[3,4]. Nevertheless, because IUD placement one month after the artificial abortion surgery may increase pain in the patient and result in a second surgery, patients are less accepting of IUDs. In recent years, some researchers believe that it is effective to implant the IUD immediately after an artificial abortion[5]. However, the most effective time for IUD placement after artificial abortion is still debatable. Researchers have compared the clinical results of patients who had an IUD placement one month after surgical abortion with those who had one immediately after. Results showed that IUD placement immediately after surgical abortion could effectively reduce the occurrence of intrauterine adhesions caused by secondary surgery. However, the analysis of sex hormones and adverse reactions after IUD placement is insufficient. In this study, we examined the clinical effects of, such as hormone levels and adverse effects, in women who underwent IUD placement immediately after surgical abortion and in those who had one later during a second surgery[6].

MATERIALS AND METHODS

General data

A total of 119 women who underwent artificial abortion between January 2017 and

January 2019 were selected. Inclusion criteria were: (1) Pregnancy within 8 wk; (2) Voluntary placement of the Mirena IUD [Bayer HealthCare Pharmaceuticals Co., Ltd Guangzhou Branch, containing levonorgestrel 52 mg/unit (20 µg/24 h)]; (3) Complete clinical follow-up data; and (4) Informed consent from the participant. Exclusion criteria were: (1) Diagnosis of genital malformations, pelvic inflammatory disease, or any sexually transmitted diseases; (2) Association with a malignant tumor, hypertension, diabetes mellitus, immune system diseases, or other basic diseases; and (3) Tissue residue or suspicion thereof after surgery. Participants were divided into either the study group ($n = 56$) or control group ($n = 63$) according to the time of Mirena placement.

Treatment methods

All participants underwent surgical abortions in strict accordance with relevant regulations. Participants in the study group had the Mirena inserted immediately after surgical abortion.

The specific details of the surgery were as follows. All participants were prepared and surgical instruments were disinfected before surgery. The patients underwent a routine gynecological examination using a speculum. After confirmation that none of the exclusion criteria were present, the patients underwent surgery. First, the anterior portion of the cervix was clamped and pulled outward by a cervix clamp. The depth of the uterine cavity was measured using uterine probe along the uterine position, with some participants requiring cervical dilatation. The Mirena IUD was pushed into the patient's uterus with the placement device. The position of the IUD was checked to ensure accurate placement, and the push rod was removed and disinfected. The external tail wires were cut to retain approximately 1.5 cm of length. The patient was observed for signs of bleeding after removal of the cervical clamp.

The control group had the Mirena placed 4–7 d after the onset of the first menstrual cycle after artificial abortion. Relevant examinations were carried out before surgery to ensure proper procedure. The surgery procedures and methods were the same as in the study group. All participants were prescribed an antibiotics anti-infection treatment after surgery. Sexual intercourse and pelvic baths were prohibited within 7 d and 2 wk after surgery.

Detection methods

The following indicators were detected on the 4th–5th day of the menstrual cycle before and after the IUD release in all participants: 5 mL of venous blood samples were collected with limosis, placed for 30 min, and centrifuged at 3000 rpm for 12 min. Serum was collected and LH, FSH, and E2 Levels were determined by electrochemiluminescence using the Beckman Kurt UniCel DxI 800 chemiluminescence immunoassay analyzer (Zhengzhou Autobio Diagnostics Co., Ltd., Zhengzhou, China) and the EasyBlot ECL chemiluminescence chromogenic reagent (Fisher Scientific, Pittsburgh, PA) according to the manufacturer's instructions.

The brief index of sexual functioning for women was used to evaluate the quality of each patient's sexual life, including sexual desire, sexual activity, and sexual satisfaction. The higher the score, the better the quality of sexual life.

Statistical analysis

SPSS22.0 software was used for statistical analysis. Independent sample *t*-test was used for the comparison of E2, FSH, and LH levels and other indicators between the two groups. χ^2 or Fisher's exact test was used for the comparison of indicators such as the continuation and expulsion rates of the IUD. Test level: Bilateral = 0.05.

RESULTS

Comparison of patient characteristics

There were no statistically significant differences in age, gravidity, body mass index, and length of menstrual cycles between the two groups ($P > 0.05$) (Table 1).

Comparison of the continuation and expulsion rates of the IUD

There were no statistically significant differences in the continuation or expulsion rates between the two groups. There were also no statistically significant differences in the proportion of patients with bacterial vaginitis, trichomonas vaginitis, or cervicitis between the study and control groups ($P > 0.05$). Moreover, no statistically significant

Table 1 Comparison of general information between the control and study groups

Group	Cases	Age (yr)	Pregnancy times (Times)	BMI (kg/m ²)	Menstrual cycle (d)
Observation group	56	27.84 ± 3.03	2.60 ± 0.45	22.40 ± 3.11	30.21 ± 4.54
Control group	63	28.15 ± 2.94	2.41 ± 0.58	21.54 ± 4.03	29.62 ± 5.80
<i>t</i> value		-0.566	1.978	1.291	0.612
<i>P</i> value		0.573	0.050	0.199	0.541

BMI: Body mass index.

difference in the number of women with abnormal menstruation, prolonged menstruation, or pain during intercourse between the groups after IUD placement was observed ($P > 0.05$) (Table 2).

Comparison of uterine volume, sexual desire, sexual activity, and sexual satisfaction after IUD placement

There were no statistically significant differences in the E2, FSH, and LH levels between the two groups 6 mo after IUD placement ($P > 0.05$). There was also no statistically significant difference in uterine volume between the two groups before and after IUD placement ($P > 0.05$). There were no statistically significant differences in sexual desire, sexual activity, or sexual satisfaction scores between the two groups after IUD placement ($P > 0.05$) (Table 3).

DISCUSSION

The Mirena IUD is a series of birth control rings that interferes with implantation of the fertilized eggs by releasing low levels of progesterone, which affects endometrial receptivity and achieves contraception. Thus far, most clinical practitioners believe that beneficial contraceptive effects from IUD placements are obtained in the month following an artificial abortion[7-9]. However, there are some limitations to IUD placement one month after artificial abortion: (1) The patient requires an additional uterine cavity operation, and repeated uterine orifice expansion increases the risk of endometrial and cervical injuries[10]; and (2) Patients require frequent hospital visits, which can be time-consuming and can affect the work and life of a patient. This study aimed to describe the differences observed between patients who had an IUD placed either immediately following surgical abortion or one month later[11].

Immediate placement of an IUD after surgery prevents repeated operations while reducing a patient's pain. Further, IUD placement can significantly promote the repair and proliferation of the endometrium and prevent the occurrence of intrauterine adhesions *via* the release of weak physiological hormones from the IUD[12]. Previous studies have shown that the Mirena can improve contraceptive effects and reduce the risk of intrauterine adhesions compared with other types of IUDs. However, the analysis of the Mirena's effect on sex hormone levels *in vivo* is insufficient[13].

This study found no significant differences in the continuation or expulsion rates of the IUD at different time points, suggesting that immediate placement of an IUD after surgical abortion does not affect the long-term use of an IUD. Although the uterus is large and the uterine cavity deep, the reasonable use of oxytocin can promote the contraction of the uterus. Based on this, IUD placement can prevent risk from long-term IUD downshift or shedding[14,15].

There was no significant difference in the incidence of vaginitis or cervical lesions between the two groups in our study, indicating that the risk of gynecological infectious diseases is not increased when an IUD is placed immediately after surgical abortion. Immediate IUD placement after artificial abortion does not increase the occurrence of infectious inflammatory diseases on the basis of standard vaginal disinfection under the guidance of aseptic techniques. Other relevant researchers have found that immediate IUD placement after artificial abortion can significantly reduce the risk of long-term vaginitis in patients who undergo abortion and prevent the impact of a secondary IUD placement on the uterine environment[16,17]. The reliability of clinical application is apparent.

Table 2 Comparison of intrauterine device continuation and removal rates, reproductive tract infections, abnormal menstrual volumes, and prolonged menstrual period between the two groups, *n* (%)

Group	Observation group (<i>n</i> = 56)	Control group (<i>n</i> = 63)	χ^2	<i>P</i> value
Continuation rate	53 (94.64)	59 (93.65)	0.053	0.818
Ring removal rate	1 (1.79)	2 (3.17)	0.000	1.000
Bacterial vaginitis	6 (10.71)	10 (15.87)	0.678	0.410
Trichomonal vaginitis	2(3.57)	3 (4.76)	0.000	1.000
Cervicitis	8 (14.29)	11 (17.46)	0.223	0.637
Abnormal menstrual volume	3 (5.36)	4 (6.35)	-	1.000
Prolonged menstruation	2 (3.57)	3 (4.76)	-	1.000
Sexual intercourse pain	1 (1.79)	2 (3.17)	-	1.000

-. The use of Fisher's exact test.

Table 3 Comparison of sex hormone levels, uterine volume, and sex life quality scores between the two groups

Group		Observation group (<i>n</i> = 56)	Control group (<i>n</i> = 63)	<i>t</i> value	<i>P</i> value
E2 (pg/mL)		45.50 ± 7.13	42.91 ± 8.10	1.841	0.068
FSH (mIU/mL)		13.60 ± 3.24	14.54 ± 3.11	-1.614	0.109
LH (mIU/mL)		15.11 ± 2.08	14.60 ± 3.55	0.941	0.349
Uterine volume (cm ³)	Before placement	120.33 ± 6.93	119.28 ± 8.03	0.759	0.449
	1 mo after placement	122.10 ± 9.10	121.28 ± 8.28	0.515	0.608
	6 mo after placement	121.15 ± 8.82	122.02 ± 9.11	-0.528	0.599
Sexual life quality scores	Sexual desire (points)	25.68 ± 2.10	25.10 ± 2.81	1.262	0.209
	Sexual activity (points)	38.28 ± 4.48	38.10 ± 5.21	0.201	0.841
	Sexual satisfaction (points)	30.20 ± 3.10	29.82 ± 2.88	0.693	0.49

E2: Estradiol; FSH: follicle stimulating hormone; LH: luteinizing hormone.

E2, FSH, and LH are sexual hormone indicators in patients. We found no significant differences in the levels of E2, FSH, and LH between the control and study groups. This suggests that immediate IUD placement after abortion does not affect the level of sexual hormones, and we also found it does not affect ovarian function after 6 mo. The Mirena's effects are mostly limited to the local uterine cavity, and it has little effect on the hypothalamus-pituitary-ovarian axis; thus, it does not affect systemic hormone levels. Abnormal menstrual volume, a prolonged menstrual period, and pain during sexual intercourse are common clinical symptoms after IUD placement[18-20]. But we found no statistically significant differences in menstrual volume, the length of the menstrual cycle, or pain experienced during sexual intercourse between the two groups in our study, suggesting that immediate IUD placement after artificial abortion does not increase the occurrence of such adverse reactions. The degree of satisfaction of patients is relatively high. However, this study was conducted in a single center. In the future, we plan to work with other centers to conduct a study with a large sample size.

CONCLUSION

In conclusion, immediate placement of the Mirena IUD after artificial abortion does not increase adverse reactions and prevents secondary surgery to achieve a contraceptive effect.

ARTICLE HIGHLIGHTS

Research background

Placement of an intrauterine device (IUD), such as the Mirena, after an artificial abortion may decrease the likelihood of an endometrial injury caused by recurrent abortions while significantly improving its contraceptive effects.

Research motivation

To discuss the effect of Mirena placement on reproductive hormone levels at different time points after an artificial abortion.

Research objectives

Placement of appropriate IUD after induced abortion can improve the contraceptive effect of patients, reduce adverse reactions caused by contraception, and provide reference for clinical contraceptive treatment.

Research methods

Serum levels of estradiol, follicle-stimulating hormone, luteinizing hormone in patients and the continuation and expulsion rates undergoing different birth control regimens were retrospectively compared.

Research results

The recurrence rates of the two groups were 94.64% and 93.65%, respectively, and there was no significant difference in exclusion rates and adverse reactions. There was no significant difference between the two groups in the proportion of bacterial vaginitis, trichomonas vaginitis, or cervicitis. Six months after Mirena placement, there was no significant difference in hormone levels between the two groups. After the placement of Mirena, there was no significant difference in the proportion of abnormal menstruation, prolonged menstruation and painful intercourse between the study group and the control group. Before and after Mirena placement, there were no significant differences in uterine volume, sexual desire, sexual activity and sexual satisfaction scores between the study group and the control group.

Research conclusions

Placement of a Mirena intrauterine device immediately after an artificial abortion does not increase the risk of adverse reactions and can help prevent endometrial injury caused by recurrent abortions.

Research perspectives

This study took a small number of samples, and the next research direction was to explore the birth control effects of different intrauterine devices.

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