Difference in post-surgical reproductive prognosis between transcervical resection and transcervical incision of the septum

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Summary

Objective: This study aims to determine the difference between transcervical resection of septum (TCRS) and transcervical incision of septum (TCIS) in the improvement of reproductive prognosis. *Study Design:* Women with uterine septum in the Affiliated Hospital of Ningxia Medical University were retrospectively analyzed. A statistical method was used according to operative time, postoperative menstruation, postoperative pregnancy rate, postoperative term delivery rate, and so on. *Results:* Compared with TCRS, the TCIS method decreased operative time, blood loss, and consumption of uterus distension medium. No statistical difference was observed in operative complications between the two methods. After TCIS, the incidence of uterine adhesion was low and the degree of endometrial epithelialisation was high by hysteroscopy review. No statistical difference was observed in residual septum after the operation. The total pregnancy rate after TCIS was higher than that of TCRS. However, no statistical difference was observed in early and late pregnancy loss rates, preterm birth rate, and term birth rate. *Conclusion:* TCIS exhibits advantages of decreasing operative time, blood loss, and consumption of uterus distension medium. TCIS can reduce the incidence of uterine adhesion and can promote endometrial epithelialisation, which are the key factors to increase pregnancy rate after operation.

Key words: TCRS; TCIS; Uterine septum; Reproductive prognosis.

Introduction

Uterine septum is a common type of congenital malformation of the uterus [1], which is the result of failure of Müllerian duct fusion or of inadequate resorption of fusion. Through large-scale hysteroscopic fallopian tube sterilisation, the authors determined that the estimated incidence rate among fertile population was one percent [2]. These abnormalities seem to have a negative effect on reproductive performance [3]. Women with combined uterine septum have higher spontaneous abortion rate (21% to 27%) and premature birth rate (12% to 33%) with low pregnancy rate (40% to 43%) [4]. The result of pregnancy is related to the implanting location of the embryo [5]. Uterine septum has few endometrial glands as well as insufficient estrogen progesterone receptors and vascular endothelial growth factors. However, the uterine septum has different ultrastructures in implantation compared with the endometrium and other parts of the uterus. This difference in ultrastructures is one of the factors that decrease embryo implantation [6, 7]. Increasing the proportion between septum volume and uterus volume results in the increased probability of embryo implantation on the septum, which accounts for embryo loss during pregnancy [8]. Without surgical interventions, these defects cannot be changed through reproductive technology [9]. Not all women with this congenital malformation have experienced repeated spontaneous abortion and premature birth [10]. However, advising women with a history of long-term infertility or repeat embryo loss to perform metroplasty is necessary [11]. The method of uterine septum metroplasty evolved from uterine septum correction through the abdomen from about sixty years ago to the method of hysteroscopy procedures. For the past twenty years, transcervical resection of septum (TCRS) has become a standard approach. TCRS replaced transabdominal or transvaginal uterus septa metroplasty [12]. TCRS takes into account endometrial injuries under surgical electricity. In recent years, transcervical incision of septum (TCIS) was proposed as a new approach. TCIS involves an incision into the septum, but not a massive resection. Theoretically, this approach decreases the damage of the basalis layer of the endometrium after a massive resection of tissue, which makes local endometrial epithelialisation and septum adhesion formation after operation difficult. However, whether or not a barrier exists in epithelialisation of septum tissue, which remains in uterus after incision; how this barrier affects nidation of fertilized ovum and whether or not improving the operation approach is more superior in improving microinvasive and reproductive prognosis have not been reported.

Women with incomplete uterine septum were randomly divided into two groups, namely, TCRS and TCIS. The following aspects were recorded: operative time, blood loss, consumption of uterus distension medium, uterine adhesion, and endometrial epithelialisation after operation. A follow-up of pregnancy outcome after operation was performed. A

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comparative analysis was conducted to determine which approach was superior in improving reproductive prognosis.

Materials and Methods

Cases

A retrospective analysis was conducted on women who were treated in Hysteroscopy Centre in Department of Gynecology in Affiliated Hospital of Ningxia Medical University. These women were diagnosed with incomplete uterine septum. Combining uterine septum and previous miscarriages, and excluding other kinds of infertility, the cases were divided into TCRS and TCIS groups. The surgical procedure was explained in detail to all the women. All women suffered from operation in the follicular phase. This study was conducted in accordance with the Declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Affiliated Hospital of Ningxia Medical University. Written informed consent was obtained from all participants.

Operation

Laminaria was used to soften the cervix the night before operation. The women were administered with lumbar anaesthesia in the lithotomy position. After the laminaria was removed, the perineum and vagina were routinely disinfected. The cervix was dilated to Hagar ten cm. The septum length was recorded by a B-mode ultrasonic diagnostic equipment and a graduated pipe with lens. A mirror was placed to observe the uterine shape and to confirm the width of the septum basement. TCRS was performed with symmetrical incision on two sides of the septum by annular electrode. The septum tissue was removed until the bilateral oviduct opening was in the same visual field. TCIS was performed by making a direct incision along the septum midpoint from the lateropulsion of uterus by a needle electrode. The septum tissue was not removed until the normal uterus was recovered. After incision, a T intrauterine device (IUD) was inserted.

Measurement

The measurement of the septum length included two methods: 1) a graduated probe assisted the mirror to measure the uterine depth. The uterine depth on top of the septum is the septum length; 2) the transaction of the septum was scanned by B-mode ultrasonic equipment to measure the septum length.

Measurement of uterus distension medium: the uterus distension medium was collected in the bag beside the women and was measured by a graduated bag. The volume of use minus the recycled volume is the absorbed volume.

The incision standards included the following: the monitor of the B-mode ultrasonic equipment was used, and the incision reached the uterine basement (one cm to 1.5 cm). Without the monitor, the uterine basement was in the same horizontal line as the uterine corner on both sides, or the incision on both sides reached the fallopian opening (one cm), until the uterine shape recovered to normal [13].

The research parameters included the septum length before operation, operative time, intraoperative blood loss, consumption of uterus distension medium, as well as incidence and types of intraoperative complications.

Postoperative re-examination

The re-examination method involved hysteroscopic review on the third day to the seventh day after postoperative menstruation was cleaned.

The research parameters included residual septum (more than one cm), IUD drops, incidence of uterine adhesion, type of uterine adhesion, and endometrial epithelialisation (endometrial overlay, endometrial thickness on the incision site surface was similar to others, equal opening of the visible crypt and the capillary blood. The presence of all these factors resulted in complete epithelialisation, otherwise, incomplete epithelialisation occurred).

Table 1. — *General conditions between two groups.*

Group	n	Age	Length of septum (cm)	Operative time (min)	Blood loss (ml)	Uterus distension medium (ml)
TCRS	33	28.23 ± 7.15	3.90 ± 0.70	17.23 ± 4.14	15.20 ± 2.12	4820 ± 840
TCIS	37	29.61 ± 4.28	4.00 ± 0.50	14.75 ± 2.56	7.23 ± 3.45	3910 ± 760
t value		-0.992	-0.693	3.050	11.474	4.759
p value		0.325	0.491	0.003	0.000	0.000

Postoperative follow-up

Follow-up period went from August 2009 to August 2011 (24 months). Research parameters included: pregnancy, abortion, premature birth, and term birth after operation.

Statistical analysis

SPSS11.5 was used for the measurement data. When the condition was not enough, χ^2 calibration test was adopted. A $p < 0.05$ was considered a significant statistical difference.

Results

General data

Among 76 cases with incomplete uterine septum, 70 cases volunteered to join this research and signed consent forms. The TCRS group comprised of 33 cases, whereas the TCIS group comprised of 37 cases. No significant statistical difference was observed in age and septum length between the two groups. Two cases in TCIS dropped out because of IUD drop, abdominal pain, and vaginal bleeding.

The general conditions between both groups are shown in Table 1. Two cases in TCRS group with complications during the operation are reported. By contrast, no complications were observed in TCIS group. No significant statistical difference was observed between both groups (calibration $\chi^2 = 0.641$, $p = 0.423$).

Postoperative review

The review after operation is shown in Table 2. A high incidence of residual septum was observed in TCRS group. A significant statistical difference was observed between TCRS and TCIS groups.

The incidence of uterine adhesion in TCIS group was lower than that in TCRS group. The degree of epithelialisation in TCIS group was higher than that in TCRS group, which indicates a significant statistical difference.

Follow-up of reproductive prognosis

The follow-up of reproductive prognosis is shown in Table 3. During the follow-up period, two cases of pregnancy were reported in TCRS group, of which one case was more than 28 weeks pregnant and one case was in early gestation.

Table 2. — *Review and result of "second look hysteroscopy" after operation between two groups.*

Group	n	Drop of intrauterine devices	Septum after operation	*Uterine adhesion* Membrane	Fibro-muscle	Connective tissue	Degree of epithelization
TCRS	33	0	21.21 (7/33)	9.1 (3/33)	3.0 (1/33)	6.1 (2/33)	39.4 (13/33)
TCIS	37	5.4 (2/37)	2.7 (1/37)	5.4 (2/37)	2.7 (1/37)	0	64.9 (24/37)
χ^2		0.405	4.217		0.809		4.541
p		0.524	0.040		0.369		0.033

Table 3. — *Follow-up of reproductive prognosis between two groups.*

Group	n	Pregnancy rate	Abortion rate of pre-pregnancy	Premature birth rate	Full-term birth rate	Pregnancy state
TCRS	33	39.4 (13/33)	3.0 (1/33)	0 (0/33)	15.2 (5/33)	21.2 (7/33)
TCIS	37	64.9 (24/37)	16.2 (6/37)	10.8 (4/37)	35.1 (13/37)	2.7 (1/37)
χ^2		4.541	2.064	2.043	3.647	4.217
p		0.033	0.151	0.153	0.056	0.040

The total pregnancy rate in the TCIS group was higher than that in TCRS group. However, no statistical significance was observed in abortion rate of early pregnancy, premature birth, and term birth. Eight cases in pregnancy state were reported. The results are unknown and incomparable because of different pregnancy durations.

Discussion

The reproductive prognosis of surgical treatment on the uterine septum, which is required for reproduction, requires improvement especially when a case has had repeated spontaneous abortion and premature labour [14]. Abdominal metroplasty in the early period was conducted by removing the parts including the septum. This method involves making a wedge-shaped incision of the uterine fundus. However, this approach has disadvantages of high adhesion rate and smaller uterine volume. Bret improved this approach by dividing the uterine body and septum in half from the uterine fundus. At this point, both halves of septum were incised, but the septal tissue was not removed. After surgery, the uterine body and endometrial cavity maintained their original volume and reproductive potential [15]. This approach is widely adopted for long-term effects. With the invention of hysteroscopy, TCRS became a classic surgical procedure for uterine septum metroplasty [16]. TCIS borrows the idea of Bret, which does not require the removal of septum tissue, but only making an incision. In practice, once the septum tissue is incised, the fibromuscular part that constitutes the septum immediately retracts to match that of the endometrium. The tissue does not exit the endometrium. The fibromuscular part that constitutes the septum is almost absent of blood vessels. Thus, the occurrence of bleeding indicates that the mesometrium is cut. Compared with TCRS, TCIS has better control of incision and indications for stopping incision. By contrast, each removal of tissue in TCRS requires the hysterectoscopic body to be placed into the uterine cavity for tissue removal. The re-entry into the uterine cavity requires time to achieve a clear visual field, which prolongs the operation time (Table 2). The increasing absorption of perfusion fluid increases the occurrence of transurethral resection of the prostate syndrome. Each re-entry into the uterine cavity stimulates the cervical channel to increase the excitation of the pneumogastric nerve, whereas the open blood sinus at the cervical channel is likely to increase the possibility of air embolism because of the change in local pressure at the cervical channel upon reentry [17]. The repeated entry of hysteroscope into the uterine cavity that causes an unclear visual field was unavoidable because of low pressure and bleeding at the wound surface. In TCIS, the septum is simply incised, and no re-entry of hysteroscope into the uterine cavity is needed. In TCIS, waiting for a clear visual field before continuing the operation is unnecessary. Therefore, the operation time is shortened, the absorption of perfusion fluid and blood loss decreases, a constant local pressure at the cervical channel is maintained and consequently, complications during the operation are decreased (in this study, no statistical significance was observed because of insufficient cases of complications). This easy, fast, and microinvasive incision can be achieved as a pattern of "dry cut" with its advantages.

The satisfaction of postoperative uterine adhesion and uterine epithelialisation is an evaluation index, which is used to compare the influence on fertility and potency of these two operation approaches. Uterine adhesion correlates with endometrial epithelialisation obstacle [18]. When the stratum basale of the endometrial tissue is damaged, the fibrinogen and fibrinolysin released by the fibroblast in the trauma parts are in the state of dynamic balance. Under the formative fibrillar network structure, stromal cells undergo endogenous repair through cell cycle to reach epithelialisation, which restores its superficial smooth and endometrial function. The fibrous tissues then undergo degradation. If the endometrial fundus is seriously damaged in the endometrial epithelialisation obstacle combined with uterine immune environmental abnormal condition, an abnormal healing mechanism is formed. Fibrin degradation ability decreases, and a substrate layer and fibration is formed. These two aspects prevent endometrial epithelialisation. Therefore, the principle of operation should aim to diminish the damage of endometrial stratum basale [19]. This aim is advantageous for epithelialisation, and can restore its functionality including endometrial receptivity to fertilised ovum. First, compared with TCRS, TCIS does not involve

tissue resection, and has less damage to the endometrial stratum basale. Second, compared with ring electrodes used in TCRS, the needle electrodes used in TCIS have less contact area with endometrium. The dot-mode incision can make the incision present in one line. The crosswise incision can reduce the degree of thermal endometrial and myometrial damage, as well as reduce the risk of postoperative endometrial epithelialisation obstacle and uterine adhesion. However, giving specific quantification to this risk is difficult. Compared with the result of second-look hysteroscopy of TCRS one month after operation, the incidence of adhesion is low in the TCIS group, and most adhesions are films and easy to separate. The process of epithelialisation is accomplished during second-look one month after operation. Several women who need to have another examination two months after operation exhibit unchanged degree of epithelialisation compared with the first month.

Through the follow-up visits to pregnancy status, the postoperative pregnancy rate of women in the TCIS group was higher than that in TCRS group. Both groups exhibited differences in improving reproductive prognosis, but early pregnancy abortion rate, premature delivery rate, and full-term pregnancy rate demonstrated no statistical differences. The present results suggest that the mechanism of TCIS to improve reproductive prognosis can reduce uterine adhesion and promote myometrial epithelialisation at an early stage.

Regardless of the operational approach and medical instruments used, the ultimate purpose is to improve reproductive prognosis in women. However, a positive reproductive prognosis also includes long-term complications associated with surgery, such as placental adherence, placenta accreta, pregnancy-related uterine rupture, and so on. Although few reports have been made on long-term complications [20], these complications can cause disastrous consequences. The incidence of these complications is related to the degree of myometrial damage by the operation and is theoretically presumed. The characteristics of TCIS incision show that this approach can reduce the stopping time during incision compared with that of TCRS operation approach. However, this aspect needs further analysis. In summary, obstetricians should be particularly alert to this potential risk when managing women with past uterine deformity metroplasty.

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