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Original Research Article

Effect of different conization ranges on pregnancy outcomes

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Abstract

Purpose: *To analyze the influence of different conization on pregnancy outcomes.*
Methods: *The data of 78 women at childbearing age having cervical conization in our hospital from January 2013 till December 2015, was collected and analyzed. The control group comprised of 80 women of childbearing age with matched clinical data, who did not undergo cervical conization. Data on the conization procedure were analyzed and pregnancy and obstetric outcomes were assessed. using the. Comparisons were made using the 2test or the Fisher exact test and Student T-test as appropriate.*
Results: Cold knife cervical conization prolonged the time to conception in patients. Following the procedure, the incidence of premature delivery and premature rupture of membranes were significantly increased as also the rate of early abortions. The depth and circumference of conization was found to be directly correlated with the rate of premature delivery and premature membrane rupture, but not with fetal growth restriction and macrosomia.
Conclusion: *The depth and circumference of resection should be based on the type of cervical lesions as well as the prognosis and the future pregnancy plans of the patients.*

Keywords: *Cervical conization; cold knife conization; cervical intraepithelial neoplasia; conization depth; conization circumference*

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INTRODUCTION

Cervical cancer is one of the most prevalent gynecological tumors and its incidence continues to increase. Cervical intraepithelial neoplasia (CIN) is a precursor of cervical cancer. Untreated high-grade CIN significantly increases the risk of invasive cancer [1, 2]. World Health Organization (WHO) renamed CIN as cervical intraepithelial lesion [3]. The classification was changed into low-grade squamous intraepithelial lesion (LSIL) and high-grade squamous intraepithelial lesion (HSIL). Treatment of cervical lesions, especially HSIL, is regarded as an important way to prevent the occurrence of cervical cancer [4].

Cervical conization is a type of cervical tissue resection. The tissue removed includes the cervical transitional zone and part or all of the cervical tissue. The commonly used surgical methods are divided into four types: cold knife conization (CKC), loop electrical procedure

(LEEP), laser conization, and Harmonic scalpel cone [5, 6]. CKC was the first to be used in clinical practice and is a traditional conization method. It has the advantage that it can provide the most original specimen without causing electric burns on the edges. The disadvantages are that it is time-consuming and can easily lead to infection, and it also increases the incidence of bleeding, cervical adhesion, and cervical incompetence [7].

Based on the reports from many studies, it is currently believed that cervical conization does not have a significant impact on fertility and does not lead to secondary infertility. But there are different opinions on the effect of conization in pregnancy outcomes. Some studies have shown a correlation within preterm birth and CIN treatment[8, 9]; but others haven't supported this[10, 11]. If only the second trimester losses are taken into consideration, differences were reported between the patients with treatment or without [9, 12-14], while some other studies did not [15-17].

Squamous intraepithelial lesions are correlated with the occurrence of invasive cervical cancer, which reflects the process of continuous occurrence and progression of cervical cancer. Most LSILs can fade away gradually, but HSILs have the possibility of canceration. SIL is a critical stage in the prevention and treatment of cervical cancer. Intraepithelial lesions tend to occur in younger patients, many of whom would have plans for a future pregnancy. Therefore, correct clinical diagnosis and timely and reasonable treatment measures can not only effectively block the progress of the disease and reduce the risk of cervical cancer, but also retain the fertility of the patients and fulfil their wishes for a future childbirth. CKC of the cervix has been widely used in the treatment of high-grade cervical lesions due to its advantages of non-thermal damage, clear margin of tissue specimen, and convenient pathological examination [7].
Experimental studies showed that conization of the cervix does not affect the capacity for pregnancy, but because of the decrease or absence of cervical mucosa following cervical conization, cervical mucus secretion is insufficient, which increases the resistance of sperm entering the uterine cavity. Conization of the cervix destroys the local defense function of the cervix and thereby increases the chance of ascending infections in the reproductive tract. This may prolong the time to conception and increase the risk of early abortion [18-20].

For patients with different lesion dimensions, different conization ranges are chosen, and the performance of the cervix is very closely related to the length and tissue volume of the residual cervix. Therefore, we aimed to evaluate the effect of the depth and circumference of CKC on the outcome of pregnancy, to individualize and rationalize the range of operation.

METHODS

This is a retrospective review involving 78 patients who intended to get pregnant and for whom complete clinical data were available following cervical conization in the Tianjin Central Obstetrics and Gynecology Hospital from January 2013 till December 2015. The patients' age ranged from 20 to 40 (31.5 ± 4.7) years. The control group comprised of 80 randomly selected women of childbearing age (age: 30.2 ± 4.9 years) who did not undergo cervical conization. The inclusion criteria were no history of cervical surgery, habitual abortion, multiple pregnancy, or cervical dysfunction. The study was approved by Tianjin Central Hospital of Gynecology Obstetrics (2015KY031). Informed consent was signed by all participants.

Outcomes analyzed included the time taken for a non-contraceptive pregnancy, infertility (no contraception for more than one year), abortion, delivery rate (>28 weeks), spontaneous delivery, and cesarean section. Instances of premature birth, premature rupture of membranes (PROM), fetal growth restriction (FGR), and macrosomia were recorded. To limit the effects of confounding factors, the first pregnancy and outcome after surgery were compared between the two groups. In this study, the clinical and follow-up data of the patients were examined and the data on the conization procedure, such as the depth and the circumference of conization, were analyzed.

SPSS 17.0 statistical software was used to process the normal distribution of data and the measurements are expressed as mean±SD. The Student's T test was to evaluate difference between two groups. The measurement data of non-normal distribution are expressed as median (quartile spacing), and the comparison between groups was carried out by the non-parametric test. The comparison of the two sample rates was made by χ^2test or Fisher exact probability method; $P<0.05$ was deemed significant.

RESULTS

Of the 78 patients in the test group, 63 patients (80.8%) had their first pregnancy and the average number of pregnancies was 1.2 ± 0.4. In

the control group, 52 were first pregnancies (65.0%), and the average of the pregnancies was 1.4 ± 0.5. The general data of the two groups were comparable (P > 0.05).

In this study, the depth of the conical incision was 1.3-2.5 cm. To investigate the influence of conization depth on the pregnancy, the patients in the surgical (test) group were divided into the shallow conization group (1.3-2.0 cm) and the deep conization group (2.0-2.5 cm) according to the median conization depth of 2 cm. Each group had 39 cases. Among the patients in the test group, the difference in the conization depth did not affect the pregnancy time, infertility rate, and cesarean section rate, but with the increase of conization depth, the probability of early abortion was increased (Table 2).

In this study, the range of the conization circumference was 4.3-6.5 cm. To investigate the impact of conization circumference on pregnancy outcome, the patients were divided into the small conization circumference group (4.3-5.8 cm) and the large conization circumference group (5.8-6.5 cm) according to the median conization circumference of 5.8 cm. Each group had 39 patients. It was found that differences in the conization circumference did not affect the pregnancy time, infertility rate, and cesarean section rate, but with increase in conization circumference, the probability of early abortion was increased (Table 3).

Statistical analysis of the delivery rate, premature delivery rate, PROM, FGR, and incidence of macrosomia showed that CKC reduced the delivery rate and significantly increased the incidence of premature labor and PROM but did not cause fetal growth restriction and macrosomia (Table 4). It also showed that the increase in conization depth significantly increased the rate of delivery and the incidence of premature delivery and PROM but did have any effect on FGR and incidence of macrosomia (Table 5).

However, the statistical analysis of the parturition rate, premature delivery rate, PROM, FGR, and incidence of macrosomia showed that increase in the conization circumference significantly increased the rate of delivery and the incidence of PROM, but did not have any effect on premature birth, FGR, and incidence of macrosomia (Table 6).

Table 1: Pregnancy outcomes between the surgical (test) and control groups [n (%)]

Group	N	Pregnancy time [month (four quantile spacing)]	Infertility	Early abortion	Late abortion	Spontaneous labor	Cesarean section
Control	80	9.2 (6.9)	8 (10)	2 (2.50)	1 (1.25)	42 (52.50)	27 (33.75)
Test	78	16.4 (11.7)	13 (16.67)	9 (11.54)	0 (0)	29 (37.18)	27 (34.62)
χ^2		-	1.523	4.981	-	3.746	0.013
P		0.004[a]	0.217	0.026	1.000[b]	0.053	0.909

[a]Non-parametric test, [b]Fisher exact probability method

Table 2: Pregnancy outcomes between shallow and deep conization [n (%)]

Conization type	N	Pregnancy time [month (four quantile spacing)]	Infertility	Early abortion	Late abortion	Spontaneous labor	Cesarean section
Shallow	39	15.6 (11.4)	5 (12.82)	1 (2.56)	0 (0)	17 (43.59)	16 (41.03)
Deep	39	17.2 (12.8)	8 (20.51)	8 (20.51)	0 (0)	12 (30.77)	11 (28.21)
χ^2		-	0.831	-	-	1.372	1.416
P		0.719[a]	0.362	0.029[b]	1.000[b]	0.241	0.234

[a]Non-parametric test, [b]Fisher exact probability method

Table 3: Pregnancy outcomes between small and large conization circumference [n (%)]

Size of conization circumference	N	Pregnancy time [month (four quantile spacing)]	Infertility	Early abortion	Late abortion	Spontaneous labor	Cesarean section
Small	39	15.5 (11.3)	6 (15.38)	1 (2.56)	0 (0)	17 (43.59)	15 (38.46)
Large	39	17.3 (12.6)	7 (17.95)	8 (20.51)	0 (0)	12 (30.77)	12 (30.77)
χ^2		-	0.092	-	-	1.372	0.510
P		0.804[a]	0.761	0.029[b]	1.000[b]	0.241	0.475

[a]Nonparametric test, [b]Fisher exact probability method

Table 4: Obstetric outcomes between the surgical and control groups [n (%)]

Group	N	Childbirth	Premature delivery	PROM	FGR	Macrosomia
Control	80	69 (86.25)	5 (6.25)	7 (8.75)	5 (6.25)	8 (10)
Test	78	56 (71.79)	14 (17.95)	17 (21.80)	6 (7.69)	12 (15.38)
χ^2		4.994	5.109	5.217	0.127	1.036
P		0.025	0.024	0.022	0.722	0.309

PROM: premature rupture of membranes; FGR: fetal growth restriction

Table 5: Obstetric outcomes between the shallow and deep conization groups [n (%)]

Conization type	N	Childbirth	Premature delivery	PROM	FGR	Macrosomia
Shallow	39	33 (84.62)	3 (7.69)	4 (10.26)	3 (7.69)	5 (12.82)
Deep	39	23 (58.97)	11 (28.21)	13 (33.33)	3 (7.69)	7 (17.95)
χ^2		6.331	5.571	6.093	-	0.394
P		0.012	0.018	0.014	1.000[a]	0.530

[a]Fisher exact probability method; PROM: premature rupture of membranes; FGR: fetal growth restriction

Table 6: Obstetric outcomes between the small and large conization circumference groups [n (%)]

Conization circumference size	N	Childbirth	Premature delivery	PROM	FGR	Macrosomia
Small	39	33 (84.62)	4 (10.26)	4 (10.26)	2 (5.13)	5 (12.82)
Large	39	23 (58.97)	10 (25.64)	13 (33.33)	4 (10.26)	7 (17.95)
χ^2		6.331	3.134	6.093	-	0.394
P		0.012	0.077	0.014	0.675[a]	0.530

[a]Fisher exact probability method; PROM: premature rupture of membranes; FGR: fetal growth restriction

DISCUSSION

The results of this study showed that there was no statistical difference in the infertility rates between the operation group and the control group, suggesting that conization did not increase the infertility rate in patients, which is consistent with the results of previous research. However, the time to pregnancy after withdrawing contraceptive in the operation group was significantly longer than that in the control group, which confirmed the view that conization had a significant effect on the time taken for pregnancy following contraceptive use. The rate of early abortion was significantly higher in the operation group than that in the control group, which was consistent with the literature reports.

Previous literature showed that the risk of premature delivery and PROM increased with the increase of conization volume and depth [21-25]. Our investigation of the effect of conization depth on pregnancy outcomes showed that there were no significant differences in the time of pregnancy without contraception, the incidence of infertility, the late abortion rate, and the proportion of spontaneous labor with cesarean section between the different conization depth groups. The early abortion rate in the deep conization group was significantly higher than that in the shallow conization group. Thus, with the increase of cervical conization depth, the possibility of early abortion increased significantly. The effects of conization circumference on obstetric and pregnancy outcomes were also investigated. The study found that there was no significant difference in the postoperative pregnancy rate, the time of pregnancy without contraception, the incidence of infertility, the incidence of late abortion, and the composition ratio of cesarean section with spontaneous delivery between the different conization circumference groups. The incidences of early abortion, PROM, and premature delivery increased significantly with the increase in the conization circumference. The reason may be that the conic angle (cone angle and cone bottom angle) remained unchanged. The larger the conical diameter and the higher the cone height, the more the cervical tissue that is removed, thus reducing the cervical load capacity. The cervical mucus secreted by the cervix after the operation decreases, and the cervical defense function is weakened. This makes pregnant women prone to clinical and subclinical infections, so that the risk of abortion, premature delivery, and PROM is increased.

Positive associations have been found between CKC and enhanced risk of perinatal morality, preterm delivery, and low birth weight [26, 27]. A 3-fold increased risk on CKC, and a higher risk among women with conization were reported previously[28]. A large number of retrospective

controlled studies found that compared to that in the control group, the risk of premature delivery, PROM, preterm PROM, and low birth weight increased significantly in the CKC group [29]. The results of this study showed that the delivery rate of the operation group was lower than that of the control group, while the premature delivery rate and the incidence of PROM were higher. However, the incidence of cervical intraepithelial lesions is related to smoking, and smoking is also one of the causes of fetal growth restriction. This study did not include smokers. The results showed that conization operation, depth of conization, and different perimeters of conization are not related to fetal birth weight, so we think it may lead to fetal birth weight abnormality. The reasons are still controversial.

CONCLUSION

There is need to strengthen the management of the perinatal period and prevent genital tract infections in those who have undergone cervical conization. The depth of conization should be minimized, so as to reduce the incidence of adverse pregnancy outcomes. Women with cervical intraepithelial lesions requiring aggressive therapy who wish to conceive in the future are expected to be told about preterm birth risk. In addition, pregnancy must be closely monitored with cervical length measurements in women who have undergone conization procedures.

DECLARATIONS

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Ethical approval

This study was approved by Tianjin Central Hospital of Gynecology Obstetrics (2015KY031).

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. YW, SSL, JXL, YLG conceived and designed the study. YW, JXL and YLG collected the data. YW and JXL performed the data analysis and interpretation. YW and SSL wrote the manuscript and revised the important intellectual content. All authors edited and approved the final manuscript.

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