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Research Article

Prevention of Cervical Stenosis After Cervical Conization Using a Nelaton Catheter: A Retrospective Analysis of 556 Cases

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ABSTRACT

Objective: This study aimed to investigate 1) the incidence of and risk factors for cervical stenosis, and 2) the ability of prophylactic catheter insertion to prevent the cervical stenosis after cervical conization.

Methods: The clinical data of 556 females that were treated with cervical conization between August 2007 and December 2018 were collected. After excluding 65 postmenopausal women, the remaining 491 patients were included in this study, and their data were retrospectively reviewed. Cervical stenosis was defined as complete obstruction of the cervical canal or partial obstruction of the cervical canal accompanied by a menstrual disorder that developed after cervical conization. The patients were divided into two groups according to the catheter-indwelling period: the shorter group (catheter-indwelling period: <7 days) and longer group (catheter-indwelling period: ≥7 days). Univariate and multivariate analyses were performed to identify predictors of cervical stenosis.

Results: After a median follow-up period of 37.3 months, 80 (16.3%) patients had developed cervical stenosis. Univariate and multivariate analyses confirmed that superficial conization (depth: <15mm) and a long catheter-indwelling period after cervical conization were significantly associated with a reduced risk of cervical stenosis.

Conclusion: Cervical stenosis occurred in 16.3% of patients who underwent cervical conization. It was demonstrated that catheter insertion is safe and a longer catheter-indwelling period (≥7 days) and superficial conization (depth: <15mm) are associated with a reduced risk of cervical stenosis after cervical conization. Further prospective studies are needed to establish the optimal strategy for preventing cervical stenosis.

Introduction

The strategies used to manage cervical intraepithelial neoplasia (CIN) and microinvasive carcinoma (MIS) have become more conservative over the past few decades [1]. Due to its minimal invasiveness, lower cost, and technical ease, cervical conization has become a standard treatment for CIN and MIS [2].

According to previous reports, cervical conization is effective against CIN and MIS in >90% of cases [3]. However, cervical conization is associated with various complications that can reduce patients' quality of life (QOL). The short-term complications of cervical conization include bleeding, increased discharge, infection, or bladder/rectal perforation, and the long-term complications include cervical stenosis, menstrual disorders, and increased risks of miscarriages and preterm deliveries [4-10].

Cervical stenosis involves partial or complete obstruction of the cervical canal. As it can cause menstrual disorders (i.e., dysmenorrhea, amenorrhea, or prolonged menstruation) or infertility, cervical stenosis is regarded as one of the most important complications associated with cervical conization. Previous studies have suggested that cervical stenosis occurs in 2.2-27% of patients who undergo cervical conization [4-13]. It has also been reported that menstrual disorders were observed

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in 25-30% of patients after cervical conization [5]. These results indicate that a significant number of women experience complications that can reduce their QOL after cervical conization. Thus, the development of an effective strategy for preventing cervical stenosis after cervical conization is urgently needed.

Various devices (e.g., the Nelaton catheter, intrauterine contraceptive devices, and nitinol-coated stents) for preventing cervical stenosis after cervical conization have been developed and successful results have been described in several case reports [14-16]. However, to the best of our knowledge, the efficacy of these preventative devices has never been evaluated in a randomized controlled study or cohort study, including a large number of patients. Thus, there are no evidence-based guidelines regarding the prevention of cervical stenosis after cervical conization.

In the current study, using clinical data obtained from 556 patients, we retrospectively investigated the incidence of and risk factors for cervical stenosis after cervical conization. We also investigated the efficacy of catheter insertion for preventing cervical stenosis after cervical conization.

Patients and Methods

I Patients

Between August 2007 and December 2018, a total of 556 patients underwent cervical conization at Nara Medical University Hospital. No patients underwent surgery, chemotherapy, or radiotherapy for cervical lesions prior to electrosurgical conization. Information about the following factors were collected through a chart review of the patients' medical records: age, menstrual history (cycle, duration, discomfort, and the amount of flow), gravidity and parity, dysmenorrhea status, pre- and postoperative diagnosis, body mass index, the date of surgery, the depth of the conization specimen, the conization procedures performed, catheter insertion (the size and length of the catheter and the indwelling period), and the complications that occurred after conization and the treatments administered for them.

As the aim of the current study was to investigate the incidence of cervical stenosis and menstrual disorders after cervical conization, we excluded 65 postmenopausal patients. The remaining 491 patients were included in this study, and their clinical data were retrospectively reviewed.

II Surgical Procedures and Post-Treatment Follow-Up

Conization was performed using an ultrasonically activated harmonic scalpel (Johnson and Johnson, available in Japan), cold knife, or electric surgical knife, depending on the year in which the surgery was performed. After the conization procedure, a Nelaton catheter (12-14 Fr, 70 mm in length) was inserted into the uterine cavity through the cervical canal. No sutures were inserted to fix the catheter in place. Nelaton catheters can be used for ongoing drainage of the uterine cavity and might prevent cervical stenosis during the healing phase. Basically, the catheter was left in place until it spontaneously fell out. If the catheter did not spontaneously fall out, it was removed 3 months after the conization procedure or if the patient felt uncomfortable about the inserted catheter. Postoperatively, the patients were followed-up regularly at our outpatient clinic, i.e., at 2 weeks after the conization procedure, every 3-6 months in the first year, and every 6-12 months thereafter for 4 additional years.

III Definition of Cervical Stenosis

Cervical stenosis was defined as the complete obstruction of the cervical canal (accompanied by amenorrhea and/or hematometra) or partial obstruction of the cervical canal accompanied by a menstrual disorder (including hematometra, dysmenorrhea, or prolonged menstruation) that developed after cervical conization.

IV Results and Interpretation

Categorical data were analyzed using the Chi-square test. We used logistic regression analysis and a Cox proportional hazards model to assess the risk factors for cervical stenosis. All analyses were performed using SPSS version 25.0 (IBM SPSS, Armonk, NY, USA). Two-sided p-values of <0.05 were considered to indicate a statistically significant difference.

Results

I Patients

Between August 2007 and December 2018, a total of 556 patients underwent electrosurgical conization at Nara Medical University Hospital. After excluding 65 postmenopausal women, the remaining 491 patients were included in the current study. The patients' demographic and clinical characteristics are outlined in (Table 1). The median age of the patients at the time of the conization was 38.0 years. The patients' postoperative diagnoses were as follows: CIN $\leq$2: 12.6%, CIN3: 78.4%, adenocarcinoma in situ (AIS): 2.2%, CIS+AIS: 0.8%, microinvasive or invasive squamous cell carcinoma: 5.1%, and others: 0.8%. The conization devices used included a harmonic scalpel in 479 cases, a cold knife in one case, and an electric surgical knife in 6 cases. No information was available about the conization procedures conducted in the remaining 5 cases.

After the conization procedure, a Nelaton catheter was inserted with the aim of preventing cervical stenosis in 394 (80.2%) patients. The duration of the catheter-indwelling period varied among the patients (mean: 6.31 days, range: 0-108 days). After the median follow-up period of 37.3 months, 80 (16.3%) out of 491 patients had developed cervical stenosis. Complete obstruction of the cervical canal occurred in 15 (3.0%) patients, and partial obstruction of the cervical canal with a menstrual disorder occurred in 65 (13.3%) patients. The median time from cervical conization to the development of cervical stenosis was 6.6 months (range: 0.9-45.9 months).

Table 1: Demographic and clinical characteristics of the study population.

				n = 491 (%)
Age	Median (range)			38.0 (17-58)
	< 50			464 (94.5)
	≥ 50			27 (0.5)
Gravida	0			99 (20.2)
	≥ 1			381 (77.6)
	Not available			11 (2.2)
Parity	0			142 (28.9)
	≥ 1			342 (69.7)
	Not available			7 (1.4)
Menstrual cycle	Regular			343 (69.9)
	Irregular			109 (22.2)
	Not available			39 (7.9)
Post-partum[a)]	Yes			2 (0.4)
	No			489 (99.6)
BMI	< 25			420 (85.5)
	≥ 25			70 (14.3)
	Not available			1 (0.2)
Histology[b)]	CIN ≤ 2			62 (12.6)
	CIN3			385 (78.4)
	AIS			11 (2.2)
	CIN3 + AIS			4 (0.8)
	Microinvasive or invasive SCC			25 (5.1)
	Others			4 (0.8)
Depth of conization	< 15			237 (48.3)
(mm)	≥ 15			251 (51.1)
	Not available			3 (0.6)
Catheter insertion	Yes			394 (80.2)
		French catheter scale	12Fr.	18 (3.7)
			14Fr.	201 (40.9)
			16Fr.	141 (28.7)
			Not available	34 (6.9)
	No			94 (19.2)
	Not available			3 (0.6)
Cervical stenosis	Yes			80 (16.3)
		Partial obstruction	Menstrual abnormality	47 (9.6)
			Dysmenorrhea	18 (3.7)
			Hematometra	2 (0.4)
		Complete obstruction		13 (2.6)
	No			411 (83.7)

BMI: body mass index; CIN: cervical intraepithelial neoplasia; AIS: adenocarcinoma in situ; SCC: squamous cell carcinoma.
[a)]: within 8 weeks of delivery; [b)]: postoperative diagnosis.

II Efficacy of Catheter Insertion as a Strategy for Preventing Post-Conization Cervical Stenosis

To investigate the efficacy of catheter insertion as a strategy for preventing cervical stenosis after cervical conization, we first divided the cases into two groups depending on the length of the catheter-indwelling period, the shorter group (catheter-indwelling period: <7 days) and the longer group (catheter-indwelling period: ≥7 days). When the two groups were compared, it was found that there were no significant intergroup differences in any of the patients' characteristics (Table 2).

Table 2: Characteristics between shorter catheter-indwelling group (less than 7 days) and longer catheter group (over 7 days).

				Shorter group No. (%) (< 7 days)	Longer group No. (%) (≥ 7 days)	P-value
Age[a)]				n = 309	n = 146	0.225
(years old)	< 50			290 (93.9)	141 (96.6)	
	≥ 50			19 (6.1)	5 (3.4)	
Gravida[b)]				n = 301	145	0.660
	0			63 (20.9)	33 (22.6)	
	≥ 1			238 (79.1)	112 (76.7)	
Parity[c)]				n = 305	n = 145	0.441
	0			88 (28.9)	47 (32.4)	
	≥ 1			217 (71.1)	98 (67.6)	
Menstrual				n = 290	n = 131	0.227
Cycle[d)]	Regular			212 (73.1)	103 (78.6)	
	Irregular			78 (26.9)	28 (21.4)	
Post- partum[e), f)]				n = 309	n = 146	0.679
	Yes			1 (0.3)	0	
	No			308 (99.7)	146	
BMI[g)]				n = 308	n = 146	0.547
	< 25			266 (86.4)	123 (84.2)	
	≥ 25			42 (13.6)	23 (15.8)	
Histology[h), i)]				n = 309	n = 146	0.435
	CIN ≤ 2			43 (13.9)	15 (10.2)	
	CIN3			239 (77.4)	118 (80.8)	
	AIS			8 (2.6)	2 (1.4)	
	CIN3+AIS			4 (1.3)	0	
	Microinvasive or invasive SCC			13 (4.2)	9 (6.2)	
	others			2 (0.6)	2 (1.4)	
Depth of				n = 308	n = 145	0.491
Conization[J)]	< 15			153 (49.7)	67 (46.2)	
(mm)	≥ 15			155 (50.3)	78 (53.8)	
Cervical stenosis[k)]				n = 58	n = 14	0.729
	Partial obstruction	Menstrual abnormality		34 (58.6)	9 (64.3)	
		Dysmenorrhea		14 (24.1)	2 (14.3)	
		Hematometra		2 (3.5)	0	
	Complete obstruction			8 (13.8)	3 (21.4)	

BMI: body mass index; CIN: cervical intraepithelial neoplasia; AIS: adenocarcinoma in situ; SCC: squamous cell carcinoma.

Excluded cases because of unclear information: [a)]:36 cases, [b)]: 45cases, [c)]: 41 cases, [d)]: 70 cases, [e)]: 36cases, [g)]: 37 cases, [i)]: 36 cases, [j)]: 38 cases, [k)]: 8 cases.

[e)]: within 8 weeks of delivery, [h)]: postoperative diagnosis.

Table 3: Univariate and Multivariable analysis of cervical stenosis occurrence after conization.

		Univariate analysis		Multivariable analysis	
		Risk ratio (95% CI)	**P-value**	**Risk ratio (95% CI)**	**P-value**
Age (years old)	< 50	1.00 (referent)			
	≥ 50	1.88 (0.77 - 4.59)	0.169		
Parity	0	1.00 (referent)			
	≥1	1.66 (0.93 - 2.95)	0.084		
Menstrual cycle	Irregular	1.00 (referent)			
	Regular	0.89 (0.51 - 1.56)	0.676		
BMI	< 25	1.00 (referent)			
	≥ 25	0.73 (0.34 - 1.53)	0.398		
Depth (mm)	< 15	1.00 (referent)		1.00 (referent)	
	≥ 15	1.95 (1.18 - 3.21)	0.009[a)]	1.89 (1.12 - 3.20)	0.017[a)]
Duration of	< 7	1.00 (referent)		1.00 (referent)	
catheter insertion (days)	≥ 7	0.93 (0.87 - 0.98)	0.014[a)]	0.92 (0.87 - 0.98)	0.011[a)]

BMI: body mass index; CI: confidence interval; [a)]: P<0.05 were considered statistically significant.

In univariate analyses, superficial conization (depth: <15mm) and a long catheter-indwelling period (duration: ≥7 days) were demonstrated to be significantly associated with a reduced risk of cervical stenosis after cervical conization (Table 3). In multivariate analysis (Table 3), superficial conization (depth: <15mm) and long catheter-indwelling period (duration: ≥7 days) was also found to be independent factors to reduce cervical stenosis (hazard ratio: 1.89, 95% confidence interval: 1.12-3.20; p=0.017, hazard ratio: 0.92, 95% confidence interval: 0.87-0.98; p=0.011, respectively).

Discussion

Cervical stenosis is a particularly important complication of conization because it can cause menstrual disorders and infertility and can also be an obstacle to performing cytological or colposcopic follow-up examinations. As increasing numbers of young women are presenting with CIN, the development of an effective strategy for preventing cervical stenosis after cervical conization is urgently needed [17].

In the current study, cervical stenosis (complete obstruction) and partial obstruction of the cervical canal in combination with a menstrual disorder were observed in 3.0% and 13.3% of patients, respectively. We also showed that catheter insertion is safe and that a longer duration of catheter insertion (≥7 days) is associated with a reduced risk of cervical stenosis after cervical conization. These results indicate that catheter insertion is effective at preventing cervical stenosis in patients who undergo cervical conization. To the best of our knowledge, this is the only large cohort study to suggest that catheter insertion is effective at preventing cervical stenosis after cervical conization.

The incidence rates of cervical stenosis and menstrual disorders were consistent with the findings of previous studies, indicating that a significant number of women experience complications that can reduce their QOL after cervical conization [4-10]. Importantly, although roughly 90% of cases of cervical stenosis developed within 2 years of conization, the remaining 10% developed 3 to 4 years after the conization procedure, indicating the need for careful post-treatment follow-up of women who undergo cervical conization.

In our analysis of potential predictors of cervical stenosis after cervical conization, we found that deeper conization is independently associated with an increased risk of cervical stenosis (Table 3). Other groups have suggested that age (≥46 years), menopausal status (postmenopausal), and a shorter time since delivery (≤12 months) are risk factors for cervical stenosis [12]. However, these factors were not found to be independent predictors of cervical stenosis in the present study. We cannot draw any conclusions regarding the best candidates for post-conization catheter insertion based on the results of the current study. However, as adverse events were only observed in 0.2% of patients, catheter insertion can be recommended for all women who undergo cervical conization, or at least for “high-risk” women who display these known risk factors.

The limitations of our study need to be addressed. First, this study was conducted at a single institution. The second limitation was the retrospective nature of this study. We intend to verify our clinical findings in prospective multi-institutional studies. The third limitation was the heterogeneity of the conization procedures. As previous studies have suggested that the incidence of cervical stenosis differs between conization procedures, the efficacy of catheter insertion as a way of preventing cervical stenosis might also be influenced by the type of conization procedure performed [4, 7, 11]. The fourth limitation was that although the present study demonstrated that a prolonged catheter-indwelling period (≥7 days) is associated with a reduced risk of cervical stenosis, the impact of catheter insertion on patient satisfaction and QOL remains unknown. Moreover, we cannot draw any definitive conclusions regarding the most appropriate duration of catheter insertion in the current study. To develop an optimal prevention strategy, future prospective investigations comparing the effectiveness of different catheter insertion programs, in which efficacy, safety, patient satisfaction, and QOL are measured as outcomes, are warranted.

Conclusion

We found that cervical stenosis occurred in 16.3% of patients who underwent cervical conization. It was demonstrated that catheter insertion is safe and a longer catheter-indwelling period (≥7 days) and superficial conization (depth: <15mm) are associated with a reduced risk of cervical stenosis after cervical conization. We consider that the results of our clinical study provide a rationale for future prospective investigations aimed at establishing the optimal strategy for preventing cervical stenosis after cervical conization.

Consent

Written informed consent was obtained from all patients, and these data were fully anonymized.

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Conflicts of Interest

None.

Ethical Approval

The study protocol was approved by the ethics committee of Nara Medical University Hospital (reference number: 2244).

REFERENCES

1. Massad LS, Einstein MH, Huh WK, Katki HA, Kinney WK et al. (2013) 2012 updated consensus guidelines for the management of abnormal cervical cancer screening tests and cancer precursors. *J Low Genit Tract Dis* 17: S1-S27. [Crossref]
2. Saslow D, Solomon D, Lawson HW, Killackey M, Kulasingam SL et al. American Cancer Society, American Society for Colposcopy and Cervical Pathology, and American Society for Clinical Pathology screening guidelines for the prevention and early detection of cervical cancer. *J Low Genit Tract Dis* 16: 175-204. [Crossref]

3. Martin Hirsch PP, Paraskevaidis E, Bryant A, Dickinson HO, Keep SL (2010) Surgery for cervical intraepithelial neoplasia. *Cochrane Database Syst Rev* 6: CD001318. [Crossref]
4. Baldauf JJ, Dreyfus M, Ritter J, Meyer P, Philippe E (1996) Risk of cervical stenosis after large loop excision or laser conization. *Obstet Gynecol* 88: 933-938. [Crossref]
5. Furugori M, Asai Sato M, Katayama K, Hirahara F, Miyagi E (2017) Short- and long-term complications and the impact on quality of life after cervical conization by harmonic scalpel. *J Obstet Gynaecol Res* 43: 749-757. [Crossref]
6. Monteiro AC, Russomano FB, Camargo MJ, Silva KS, Veiga FR et al. (2008) Cervical stenosis following electrosurgical conization. *Sao Paulo Med J* 126: 209-214. [Crossref]
7. Brun JL, Youbi A, Hocké C (2002) Complications, sequellae and outcome of cervical conizations: evaluation of three surgical technics. *J Gynecol Obstet Biol Reprod (Paris)* 31: 558-564. [Crossref]
8. Matsumura M, Ota T, Takeshima N, Takizawa K (2010) Shimodaira-Taniguchi conization method: its utility and reliability. *Int J Gynecol Cancer* 20: 1025-1030. [Crossref]
9. Houlard S, Perrotin F, Fourquet F, Marret H, Lansac J et al. (2002) Risk factors for cervical stenosis after laser cone biopsy. *Eur J Obstet Gynecol Reprod Biol* 104: 144-147. [Crossref]
10. El Nashar SA, Shazly SA, Hopkins MR, Bakkum Gamez JN, Famuyide AO (2017) Loop Electrosurgical Excision Procedure Instead of Cold-Knife Conization for Cervical Intraepithelial Neoplasia in Women With Unsatisfactory Colposcopic Examinations: A Systematic Review and Meta-Analysis. *J Low Genit Tract Dis* 21: 129-136. [Crossref]
11. Mathevet P, Chemali E, Roy M, Dargent D (2003) Long-term outcome of a randomized study comparing three techniques of conization: cold knife, laser, and LEEP. *Eur J Obstet Gynecol Reprod Biol* 106: 214-218. [Crossref]
12. Tanaka Y, Ueda Y, Kakuda M, Kubota S, Matsuzaki S et al. (2017) Predictors for recurrent/persistent high-grade intraepithelial lesions and cervical stenosis after therapeutic conization: a retrospective analysis of 522 cases. *Int J Clin Oncol* 22: 921-926. [Crossref]
13. Fanfani F, Landoni F, Gagliardi ML, Fagotti A, Preti E et al. (2014) Sexual and Reproductive Outcomes in Early Stage Cervical Cancer Patients after Excisional Cone as a Fertility-sparing Surgery: An Italian Experience. *J Reprod Infertil* 15: 29-34. [Crossref]
14. Jung Y, Ahn JH, Kim RY, Yoon JH, Lee SJ (2017) Effective therapeutic strategy for massive retroperitoneal hematoma after conization: arterial embolization and pigtail catheter insertion. *Eur J Gynaecol Oncol* 38: 135-138. [Crossref]
15. Nasu K, Narahara H (2010) Management of severe cervical stenosis after conization by detention of nylon threads tied up to intrauterine contraceptive device. *Arch Gynecol Obstet* 281: 887-889. [Crossref]
16. Grund D, Köhler C, Krauel H, Schneider A (2007) A new approach to preserve fertility by using a coated nitinol stent in a patient with recurrent cervical stenosis. *Fertil Steril* 87: 1212.e13-1212.e6. [Crossref]
17. Cancer Information Service, National Cancer Center. Japan: Cancer Registry and Statics.