

Success Rate of Cervical Cerclage at Siriraj Hospital

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ABSTRACT

Objective: To determine the success rate of cervical cerclage at Siriraj Hospital and the associated factors.

Methods: The study included 90 pregnant women who received cervical cerclage procedures at Siriraj Hospital during 2007-2016. Clinical information and the cerclage procedures were evaluated. Successful cervical cerclage was defined as delivery at 34 weeks' gestation or more.

Results: The mean maternal age was 31.8 ± 5 years. The most common indication was history of second trimester abortion (76.7%). The mean gestational age (GA) at cervical cerclage was 18.0 ± 4.3 weeks. The mean cervical length was 25.2 ± 12.0 mm. Most of the patients had no cervical dilatation (76.7%). Almost all the cervical cerclage procedures were performed using McDonald's technique (98.9%). Of the 90 women, 66 (73.3%) delivered at >34 weeks' gestation, while 59.9% delivered at >37 weeks' gestation. The mean birth weight was 2404.9 ± 991.7 grams. The success rate of cervical cerclage increased significantly among women with greater cervical length (28.2 ± 10.5 vs. 18.0 ± 14.9 mm., $p=0.002$), without cervical dilatation (83.3% vs. 58.3%, $p=0.046$), without bulging of membranes (92.5% vs. 66.7%, $p=0.002$), and prophylactic operations (89.4% vs. 58.3%, $p=0.001$). Maternal complications were significantly lower in women with successful cervical cerclage (9.1% vs. 45.8%, $p<0.001$).

Conclusion: The success rate of cervical cerclage at Siriraj Hospital was 73.3%. Possible associated factors included cervical length, cervical dilatation, bulging of membranes, and the prophylactic procedure.

Keywords: Cervical cerclage; success rate (Siriraj Med J 2019; 71: 392-398)

INTRODUCTION

Preterm delivery is the most significant obstetric problem worldwide and is a major cause of death after birth. Surviving newborns have high morbidity and mortality rates, both short-term and long-term complications such as neurological developmental abnormalities, respiratory distress, and visual and hearing problems. The issue incurs significant costs for healthcare services. In previous study, the incidence of preterm births in developed countries was found to be 5-7%, but this was higher in developing countries.¹ In Thailand, the incidence of preterm births was 12%,² similar to the rate at Siriraj Hospital (12.89%).³

Cervical insufficiency is a risk factor for preterm labour and is defined as the inability of the uterine cervix to retain a pregnancy in the absence of signs and symptoms of clinical contraction, labour, or both in the second trimester.⁴ The incidence of cervical insufficiency is 0.12 - 2.0% in normal pregnancies, but 15% in habitual abortions.⁵ The cause of cervical insufficiency is still unknown, although it is suspected to be related to cervical operative procedures such as conization, dilatation, and curettage. There is no criteria for diagnosis of cervical insufficiency. The diagnosis is dependent on cervical progression in the second trimester in the absence of

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labour pain or other causes such as premature rupture of membrane, bleeding from vagina, or infection. Transvaginal ultrasonography for cervical length measurement is now used to co-evaluate this condition. However, diagnosis of cervical insufficiency is not only based on short cervical length. Surgical and non-surgical procedures can be used to treat cervical insufficiency. For non-surgical treatments, physical activity restrictions, bedrest, and abstinence from sexual intercourse have been proposed but without strong supporting evidence.⁶ Surgical treatment is in the form of the cervical cerclage procedure, which can be performed either transvaginally or transabdominally. McDonald and Shirodkar's techniques are considered standard cervical cerclage techniques, and there is currently no significant data to prove which technique is superior.⁷⁻⁹ Transabdominal cervical cerclage may be used in cases of failed transvaginal cervical cerclage or if there is a history of trachelectomy.

The American College of Obstetricians and Gynecologists (ACOG) provide a number of recommended indications of cervical cerclage.⁴ The first is dependent upon history (history of unexplained second trimester delivery without labour or abruptio placenta). Second, a physical examination (painless cervical dilation in the second trimester). While the third is based on ultrasonographic information (short cervical length <25 mm.) with a history of prior preterm birth. A previous study reported that cervical cerclage in women with cervical incompetence significantly decreased the incidence of preterm delivery prior to 33 weeks' gestation.¹⁰ Limited data is available for rescue cervical cerclage and the success rate is unpredictable. Prior observational studies suggest that rescue cervical cerclage may be able to improve the neonatal outcomes, although there is insufficient data.¹¹

At Siriraj Hospital, cervical cerclage is used as a surgical treatment for women with cervical incompetence. Yet there is limited clinical information about the success rate of cervical cerclage and neonatal outcomes. The primary objective of this study was subsequently to assess the success rate of cervical cerclage procedures at Siriraj Hospital. Meanwhile, pregnancy outcomes and potential associated factors were also evaluated.

MATERIALS AND METHODS

After approval from the Siriraj Institutional Review Board (Si 555/2017), this retrospective descriptive study was conducted at the Department of Obstetrics and Gynaecology, Faculty of Medicine Siriraj Hospital. The sample size was calculated based on an estimated success rate of 70%. At a 95% confidence level and with a 10% acceptability error, a sample size of at least 81 cases were

required. A total of 90 pregnant women who had undergone a cervical cerclage procedure at the hospital based on any indications between 2007 and 2016 were included in this study. At Siriraj Hospital, the cervical cerclage procedure is performed based on the recommendations of the American College of Obstetricians and Gynecologists.

This study evaluated the clinical information, characteristics of the cerclage procedure, and pregnancy outcomes. Women with detected fetal anomalies, multifetal pregnancy, or who had terminated their pregnancies due to maternal or fatal indications were excluded. Data was obtained from medical records, which included the baseline clinical information, characteristics of the cerclage procedures, and the pregnancy outcomes. Successful cervical cerclage was defined as delivery at > 34 weeks' gestation. Non-viable delivery before 24 weeks' gestation was defined as abortion.

After performing the cervical cerclage procedure, all the patients were admitted for medical staff to closely monitor uterine contraction. If uterine contractions were detected, a tocolytic drug was administered intravenously. Daily vaginal progesterone (Utrogestan 200 mg) was given in some cases until 36 weeks' gestation. An oral nonsteroidal anti-inflammatory drug (ibuprofen 800-1,200 mg per day) was given three days after the operation. In most cases, an intravenous antibiotic (Cefoxitin 1g) was administered intraoperation. And then an oral cephalosporin (Cephalexin 2g per day) was administered for seven days. Post-operative complications such as uterine contraction, vaginal bleeding, cervical laceration, rupture of membrane, and chorioamnionitis were recorded among the study sample population.

Descriptive statistics, including the mean, median, standard deviation, number, and percentage were used to describe the various characteristics as appropriate. Comparisons between the groups were performed using the Student's *t*-test and the chi square test as appropriate. *P* values less than 0.05 were considered statistically significant.

RESULTS

A total of 90 pregnant women who had undergone a cervical cerclage procedure were included in this study. **Table 1** shows the patient's baseline characteristics. The mean maternal age was 31.8 ± 5 years, while the majority of the patients were nulliparous (61.1%), and 88.9% had previously undergone at least one abortion. A history of second trimester abortion was found in 76.7%. Meanwhile, 7.8% had a history of preterm delivery and 15.6% had previous cervical cerclage. Cervical cerclage was indicated by a physical examination in 18.9% of the

TABLE 1. Baseline characteristics of the patients (N=90).

Characteristics	Mean \pm SD
Mean age \pm SD (year)	31.8 \pm 5.0
	N (%)
Parity	
0	55 (61.1)
1	30 (33.3)
2	5 (5.6)
Abortion	
0	10 (11.1)
1	26 (28.9)
\geq 2	54 (60)
Underlying disease	
No	70 (77.8)
Diabetes mellitus	5 (5.6)
Hypertension	4 (4.4)
Cervical pathology*	3 (3.3)
Others**	8 (8.9)
History-indicated cerclage	
History of abortion in 2 nd trimester	69 (76.7)
History of preterm delivery	7 (7.8)
Previous cervical cerclage	14 (15.6)
Physical examination-indicated cerclage	17 (18.9)
Ultrasound-indicated cerclage	31 (34.4)
Previous cervical operation	27 (30)
No	63 (70)
Dilatation and curettage	24 (26.7)
LEEP***	3 (3.3)

* Cervical pathology: Cervical intraepithelial neoplasia, **Others: asthma, hyperthyroid, chronic hepatitis B, mitral stenosis, ***LEEP = Loop electrosurgical procedure

women, while an ultrasonographic examination was used to indicate cervical cerclage in 34.4% of the women. Among these women, 9 cases of cervical cerclage were indicated by both history and a physical examination. Finally, 26 cases had cervical cerclage indicated by both history and ultrasonographic examination.

The characteristics of the cerclage procedure is demonstrated in Table 2. The mean gestational age at the cervical cerclage procedure was 18.0 ± 4.3 weeks and the mean cervical length was 25.2 ± 12.0 mm. Most of the patients had no cervical dilatation (76.7%), while 6.7% had a cervical dilatation of >3 cm. Cervical

cerclage was performed as a prophylactic procedure in 81.1% of the women, while 18.9% underwent rescue operations. Almost all the cervical cerclage procedures were performed using McDonald's technique, while only a single woman underwent the Shirodkar technique following the cervical intraepithelial neoplasia III status post loop electrosurgical excision procedure (CIN III S/P LEEP). Antibiotic prophylaxis was used during the procedure in 91.1% of the cases, and progesterone supplement was used in 50% of the cases. Vaginal progesterone was administered as a supplement after the cerclage procedure until 36 weeks' gestation.

TABLE 2. Characteristics of cerclage procedure (N=90).

Characteristics	Mean ± SD
Mean gestational age at cerclage (weeks)	18.0 ± 4.3
Mean cervical length (mm) (N=70)	25.2 ± 12.0
	N (%)
Cervical dilatation at cerclage	
No dilatation	69 (76.7)
1-2 cm	15 (16.7)
≥ 3 cm	6 (6.7)
Bulging of membranes	13 (14.4)
Type of cervical cerclage	
Prophylactic procedure	73 (81.1)
Rescue procedure	17 (18.9)
Antibiotic prophylaxis	82 (91.1)
Progesterone treatment	45 (50.0)

Table 3 shows the pregnancy outcomes of the women in this study. The mean gestational age (GA) at delivery was 33.9 ± 6.2 weeks. Meanwhile, 66 (73.3%) of the women delivered at > 34 weeks' gestation and 58.9% delivered at > 37 weeks' gestation. All newborns in this group survived and had good outcomes, with APGAR scores > 7 at 1 and 5 minutes after birth, meanwhile there were no NICU admissions. The median interval from cervical cerclage to delivery was 125 days. The mean birth weight was 2404.9 ± 991.7 g. Among the 24 women who delivered before 34 weeks' gestation, 12 had abortions, 2 were stillbirth, and 10 of this group of newborns survived. The lowest GA of the surviving newborns was 27 weeks with a birth weight of 810 g. In the prophylactic cervical cerclage group, 59 out of the 73 women (80.8%) delivered at > 34 weeks' gestation, while 64.3% delivered at > 37 weeks' gestation. In the rescue cervical cerclage group, 7 out of the 17 (41.2%) women delivered at > 34 weeks' gestation and 35.3% delivered at >37 weeks' gestation. Term newborns who were delivered from a rescue operation had cervical dilatation varying between 2-3 cm. The mean interval from cervical cerclage to delivery was very different between the prophylactic and the rescue groups. In the prophylactic group, the median interval was 143 days whereas it was 60 days for the rescue group.

Table 4 displays a comparison between the various characteristics of women who delivered at ≥ 34 and < 34

weeks' gestation. There were no significant differences between the two groups in terms of age and gestational age at cerclage. The mean cervical length in the women who delivered at ≥ 34 weeks' gestation was significantly higher than those who delivered at <34 weeks' gestation (28.2 ± 10.5 vs. 18.0 ± 14.9 mm., $p=0.002$). Cervical dilatation was significantly less among those who delivered at ≥ 34 weeks' gestation, with 83.3% having no cervical dilatation compared to only 58.3% with cervical dilation in the other group ($p=0.046$), while bulging of membranes was also significantly less common in those delivered at ≥ 34 weeks' gestation (7.6% vs. 33.3%, $p=0.002$). The prophylactic cerclage procedure was significantly more common in those delivered at ≥ 34 weeks' gestation (89.4% vs. 58.3%, $p=0.001$). There were no significant differences found between the use of antibiotic prophylaxis and progesterone supplementation. Finally, maternal complications were significantly higher among those delivered at <34 weeks' gestation, including uterine contractions, vaginal bleeding, rupture of membrane and other complications ($p<0.001$).

DISCUSSION

Cervical cerclage is a surgical treatment used for patients with cervical incompetence which aims to reduce the risks of miscarriage and preterm birth. Cervical cerclage procedures are performed to increase the strengthening of the cervix either to maintain pregnancy until term

TABLE 3. Pregnancy outcomes of the women in the study (N=90).

Pregnancy outcome	Mean \pm SD
Gestational age at delivery (weeks)	33.9 \pm 6.2
	N (%)
Gestational age at delivery	
<24 weeks	12 (13.3)
24-27 ⁺⁶ weeks	5 (5.6)
28-33 ⁺⁶ weeks	7 (7.8)
34-36 ⁺⁶ weeks	13 (14.4)
\geq 37 weeks	53 (58.9)
Mean birth weight (grams) (N=87)	2404.9 \pm 991.7
< 1,000	13 (14.9)
1,000-1,999	13 (14.9)
2,000-2,999	33 (37.9)
3,000-3,999	28 (32.1)
Maternal complication	
Uterine contraction	11 (12.2)
Vaginal bleeding	2 (2.2)
Rupture of membrane	2 (2.2)
Others**	2 (2.2)
	Median (IQR)
Interval from cerclage to delivery (days)	125 (63.8, 155.8)

*Others: cervical tear, chorioamnionitis

or to prolong the pregnancy for as long as possible. Based on previous studies,^{12,13} there is limited clinical information about the procedures' efficacy and success rate, as well as regarding which patient groups benefit from the operation and the neonatal outcomes. The overall success rate in both the prophylaxis and rescue cervical cerclage groups in this study was 73.3% and there were good neonatal outcomes. The mean cervical length in the successful group (delivery at GA >34 weeks) was significantly higher than the other group. Cervical dilatation and bulging of membranes were significantly less in the successful group, similar to previous findings.^{11,14} There were no significant differences between the cervical cerclage techniques, the use of antibiotic prophylaxis, and progesterone supplementation. Many studies support a similar efficacy between the McDonald and Shirodkar techniques.^{7,9,15} McDonald's technique is found to be preferable since it is easier to place and remove the

sutures. From a previous study, the addition of vaginal progesterone in the rescue cervical cerclage procedure was associated with a reduction of spontaneous preterm births.¹⁶ Maternal complications were significantly higher among those delivered at <34 weeks' gestation, including uterine contractions, vaginal bleeding, and rupture of membranes.

Prophylactic cervical cerclage was performed in history-indicated and ultrasound-indicated patients. The results show that this group's success rate was high (80.8%) and with low levels of complications. For the rescue cervical cerclage procedure, the success rate was difficult to predict and usually had poor pregnancy outcomes. Patients who had a cervical dilatation exceeding 4 cm with bulging of fetal membrane into the vagina had a higher chance of cerclage failure.¹⁷ In this study, the success rate in the rescue cervical cerclage procedure was only 41.2%. There was a case report of rescue cervical

TABLE 4. Comparison of characteristics between women delivered ≥ 34 and <34 weeks' gestation (N=90).

Characteristics	Delivery at <34 weeks	Delivery at ≥ 34 weeks	P value
	N=24	N=66	
	Mean \pm SD	Mean \pm SD	
Age (years)	31.5 \pm 5.8	31.9 \pm 4.4	0.769
Gestational age at cerclage (weeks)	18.6 \pm 4.2	17.7 \pm 4.4	0.422
Cervical length (mm) (N=70)	18.0 \pm 14.9(N=17)	28.2 \pm 10.5(N=53)	0.002
	N (%)	N (%)	
Cervical dilatation			0.046
No dilatation	14 (58.3%)	55 (83.3%)	
1-2 cm	7 (29.2%)	8 (12.1%)	
>3 cm	3 (12.5%)	3 (4.5%)	
Bulging of membranes	8 (33.3%)	5 (7.6%)	0.002
Type of cervical cerclage			0.001
Prophylactic	14 (58.3%)	59 (89.4%)	
Rescue	10 (41.7%)	7 (10.6%)	
Progesterone treatment	9 (37.5%)	36 (54.5%)	0.153
Antibiotic prophylaxis	21 (87.5%)	61 (92.4%)	0.435
Maternal complications	11 (45.8%)	6 (9.1%)	<0.001
Uterine contraction	6 (25%)	5 (7.6%)	
Vaginal bleeding	1 (4.2%)	1 (1.5%)	
Rupture of membrane	2 (8.3%)	0	
Others*	2 (8.3%)	0	

*Others: cervical tear, chorioamnionitis

cerclage in a patient who had 7 cm. of cervical dilatation and bulging of membranes, and delivered at 33 weeks and 4 days of gestation with good neonatal outcomes.¹⁴ The success rate of the prophylactic group was higher than the rescue group, similar to previous studies (78% vs 53%).^{18,19} For clinical applications, The success rate can apply to counsel the pregnant women who has cervical incompetence and plan to do the cervical cerclage. Early identification of women at risk of cervical incompetence and early treatment will improve outcomes.

A strength of the present study is that almost all of the cervical cerclage procedures were performed by a single experienced obstetrician, meaning that there was no variation in the surgeon skill or technique.

Nonetheless, this study has a number of limitations. The recommendations for cervical cerclage was changed after receiving new research data.^{4,20} History indicated that cervical cerclage had changed from three or more second trimester pregnancy losses to only one or more previous second trimester pregnancy losses. The data used in this study used the previous criteria to diagnose cervical incompetence in some cases, meaning that some cases of cervical incompetence may have been missed. At present, transvaginal ultrasounds are available in all hospitals. Nowadays, we uses cervical length to co-evaluate with any history of prior preterm births. Recent meta-analysis²¹ shows that cervical cerclage in patients with a history of prior preterm births and short cervical length

(<25 mm.) is effective at reducing preterm births, and also avoids unnecessary cervical cerclage based solely on history. In this study, charts from the past 10 years were reviewed, but some cases provided no information about cervical length. Future additional research and RCTs are therefore still require.

CONCLUSION

The success rate of cervical cerclage procedures in the 10 year period at Siriraj Hospital was 73.3%. The success rate in the prophylactic group was 80.8%, while it was 41.2% in the rescue cervical cerclage procedure group. Possible associated factors included cervical length, cervical dilatation, bulging of membranes, and prophylactic procedure.

Author contributions: All authors contributed significantly for the study. PM, PS, and DB together plan and design the study. Conduct of the study and data collection were mainly performed by PM. DB performed data analysis. PM drafted the manuscript. PS and DB were responsible for editing the final manuscript. All authors have reviewed and agree with the final version of the manuscript.

Conflicts of interest: The authors declare no conflicts of interest.

REFERENCES

1. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, et al. The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. *Bull World Health Organ* 2010;88:31-8.
2. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller AB, Narwal R, et al. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. *Lancet* 2012;379:2162-72.
3. Chawanpaiboon S, Sutantawibul A. preterm birth rate in Siriraj Hospital: a seven-year review (2002-2008 BE). *Thai J Obstet Gynecol* 2009;17:204-14.
4. American College of Obstetricians and Gynecologists. ACOG Practice Bulletin No.142: Cerclage for the management of cervical insufficiency. *Obstet Gynecol* 2014;123:372-9.
5. Wang SW, Ma LL, Huang S, Liang L, Zhang JR. Role of cervical cerclage and vaginal progesterone in the treatment of cervical incompetence with/without preterm birth history. *Chin Med J (Engl)* 2016;129:2670-5.
6. Sciscione AC. Maternal activity restriction and the prevention of preterm birth. *Am J Obstet Gynecol* 2010;202:232 e1-5.
7. Wood SL, Owen J. Cerclage: Shirodkar, McDonald, and Modifications. *Clin Obstet Gynecol* 2016;59:302-10.
8. Hume H, Rebarber A, Saltzman DH, Roman AS, Fox NS. Ultrasound-indicated cerclage: Shirodkar vs. McDonald. *J Matern Fetal Neonatal Med* 2012;25:2690-2.
9. Odibo AO, Berghella V, To MS, Rust OA, Althuisius SM, Nicolaides KH. Shirodkar versus McDonald cerclage for the prevention of preterm birth in women with short cervical length. *Am J Perinatol* 2007;24:55-60.
10. Final report of the Medical Research Council/Royal College of Obstetricians and Gynaecologists multicentre randomised trial of cervical cerclage. MRC/RCOG Working Party on Cervical Cerclage. *Br J Obstet Gynaecol* 1993;100:516-23.
11. Naqvi M, Barth WH, Jr. Emergency cerclage: outcomes, patient selection, and operative considerations. *Clin Obstet Gynecol* 2016;59:286-94.
12. Alfirevic Z, Owen J, Sharp AN, Szychowski JM, Goya M. Vaginal progesterone, cerclage or cervical pessary for preventing preterm birth in asymptomatic singleton pregnant women with a history of preterm birth and a sonographic short cervix. *Ultrasound Obstet Gynecol* 2013;41:146-51.
13. Hezelgrave NL, Watson HA, Ridout A, Diab F, Seed PT, Chin-Smith E, et al. Rationale and design of Support: a multi-centre randomised controlled trial to compare three treatments: cervical cerclage, cervical pessary and vaginal progesterone, for the prevention of preterm birth in women who develop a short cervix. *BMC Pregnancy Childbirth* 2016;16:358.
14. Sutthritpongsa P, Wanitpongpan P. Successful rescue cervical cerclage in patient with advanced cervical dilatation in second trimester : case report. *Siriraj Med J* 2016;68:183-6.
15. Figueroa R, Crowell R, Martinez A, Morgan M, Wakefield D. McDonald versus Shirodkar cervical cerclage for the prevention of preterm birth: impact of body mass index. *J Matern Fetal Neonatal Med* 2019;32:3408-14.
16. Jung EY, Oh KJ, Hong JS, Han BR, Joo JK. Addition of adjuvant progesterone to physical-exam-indicated cervical cerclage to prevent preterm birth. *J Obstet Gynaecol Res* 2016;42:1666-72.
17. Abu Hashim H, Al-Inany H, Kilani Z. A review of the contemporary evidence on rescue cervical cerclage. *Int J Gynaecol Obstet* 2014;124:198-203.
18. Liu Y, Ke Z, Liao W, Chen H, Wei S, Lai X, et al. Pregnancy outcomes and superiorities of prophylactic cervical cerclage and therapeutic cervical cerclage in cervical insufficiency pregnant women. *Arch Gynecol Obstet* 2018;297:1503-8.
19. Harger J. Comparison of success and morbidity in cervical cerclage procedures. *Obstet Gynecol* 1980;56:543-8.
20. Lee KN, Whang EJ, Chang KH, Song JE, Son GH, Lee KY. History-indicated cerclage: the association between previous preterm history and cerclage outcome. *Obstet Gynecol Sci* 2018;61:23-9.
21. Berghella V, Mackeen AD. Cervical length screening with ultrasound-indicated cerclage compared with history-indicated cerclage for prevention of preterm birth: a meta-analysis. *Obstet Gynecol* 2011;118:148-55.