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Original Research Article

Pregnancy outcomes after cervical cerclage: Analysis at tertiary care

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Abstract

Aim: To evaluate the effectiveness and safety of cervical cerclage in women who presented with different indications for cerclage.
Materials and Methods: This retrospective study was conducted in department of OBG (Vanivilas hospital), Bangalore medical college and research institute, Bangalore From January-2017 to December-2021 by analysing data of 110 cervical circlage performed for All women who presented between 14 to 24 weeks of gestational age with previous history of mid-trimester abortion or preterm delivery, or with cervical length of less than 25mm with prior history of mid-trimester loss, or diagnosed with cervical dilatation of 2 to 4 cm. Patients were excluded if the fetus had known structural or chromosomal abnormalities, multiple pregnancy, placental abruption, established labor, premature rupture of membranes and clinical symptoms or laboratory findings suggestive of chorioamnionitis [uterine tenderness and/or temperature above 38 ◦C or white blood cell count >18,000/mm^3].
Conclusion: All women with history-indicated, ultrasound-indicated and physical examination indicated should be counseled regarding efficacy of the cervical cerclage. Proper selection of cases results in successful outcome. With good NICU back up most of the pregnancies can be salvaged with minimal morbidity to the neonates.

Keywords: cervical insufficiency**,** cervical cerclage, preterm labor, trans-vaginal ultrasound, McDonald

Introduction

Cervical insufficiency is defined as the inability to support a pregnancy to term due to a functional or structural defect of the cervix [1]. The typical symptoms of cervical incompetence include history of recur-rent mid-trimester losses or pre-term birth and painless cervi cal dilatation in the absence of contractions or intrauterine infections. Preterm

births accounts for up to 70% of perinatal deaths and 36% of infant deaths, as well as adverse neurodevelopmental outcomes and cerebral palsy [2]. One of the factors that may contribute to preterm labor is cervical insufficiency. It is reported that the rate of cervical incompetence is between 0.1% and 2%, and is estimated to account for 15-20% of the recurrent pregnancy losses between 16 and 28 weeks [3]. Histologically, the cervix consists of fibrous connective tissue, muscle, and blood vessels. Muscular connective tissue constitutes approximately 15-20% of the cervical stroma, but is not uniformly distributed throughout the cervix. Defects in the tensile strength of the fibrous connective tissue are thought to lead to premature cervical dilatation and pregnancy loss. Factors that are considered to be contributing to the incompetence are [4]. Previous cervical trauma (D/C, conization, or amputation). Associated uterine anomalies (unicornuate, bicornuate or septate uterus). On transvaginal scan, cervical shortening, where cervical length is less than 25 mm, with or without funnelling of membranes into the cervical canal diagnoses cervical incompetence [4]. The diagnosis of cervical is not easy due to absence of clear diagnostic criteria. However, the most important auxiliary method for diagnosis of cervi cal during pregnancy is ultrasonography [5]. Cervical cerclage is one of the most effective method to treat cervical insufficiency which reinforces a weak cervix by a purse string suture. The use of cervical cerclage in the prevention of preterm delivery was first described by Shirodkar [6] in 1955 and then by McDonald [7]. Emergency cervical cerclage has been used as a salvage proce dure in women with cervical dilatation and bulging fetal membranes in mid-trimester, in an attempt to prolong the pregnancy to a viable gestation [8]. According to detailed examination with ultrasonography and general characteristics of the patient, various diagnostic parameters have been defined to make a cerclage indication for the treatment of cervical [9]. These indications can be generally divided into following 3 groups: (Group-A: history-indicated cerclage (previously known as prophylactic or elective cerclage), including history of second-trimester pregnancy loss related to painless cervical dilation or prior cerclage due to painless dilation) (Group-B: ultrasound-indicated cerclage, including prior spontaneous preterm birth at less than 34 weeks of pregnancy, coupled with a cervical length (CL) of less than 25 mm) and (Group C: Physical examination-indicated cerclage (previously known as emergency or rescue cerclage), including painless cervical dilation in the second trimester). In this study, we retrospectively analyzed the clinical data (from January-2017 to December-2021) to evaluate the effectiveness and perinatal outcomes of cerclage in patients with cervical for the prevention of recurrent 2nd trimester miscarriage and preterm birth according to different indications.

Materials and Methods

Study design
Retrospective analysis.

Source of data
This retrospective study was conducted in department of OBG (Vanivilas hospital), Bangalore medical college and research institute, Bangalore and study was approved by the Institutional Ethics Committee.

Study period
From January-2017 to December-2021.

Sample size
110 cervical cerclage performed from January-2017 to December-2021 in department of OBG (Vanivilas hospital), Bangalore medical college and research institute, Bangalore.

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Inclusion criteria

All women who presented between 14 to 24 weeks of gestational age with previous history of midtrimester abortion or preterm delivery, or with cervical length of less than 25mm with prior history of midtrimester loss, or diagnosed with cervical dilatation of 2 to 4 cm's were proposed for cervical encerclage.

Exclusion criteria

Patients were excluded if the fetus had known structural or chromosomal abnormalities, multiple pregnancy, placental abruption, established labor, premature rupture of membranes and clinical symptoms or laboratory findings suggestive of chorioamnionitis [uterine tenderness and/or temperature above 38 ◦C or white blood cell count >18,000/mm^3].

Method

Patients who met the inclusion and exclusion criteria were separated into three groups, as follows:

Group A: The history-indicated group consisted of patients with a history of one or more second-trimester pregnancy losses related to painless cervical dilation or prior cerclage due to painless dilation. Women in this group were asymptomatic at the time of presentation and received cerclage as a prophylactic procedure.

Group B: The ultrasound-indicated group consisted of patients who had short cervical length (less than 25 mm) when examined by ultrasound examination, and had a history of preterm birth at less than 34 weeks of gestation.

Group C: The physical examination-indicated group consisted of patients who presented with advanced cervical dilation of 2 cm with an intact membrane.

Cerclage placement was planned at the end of the first trimester for history-indicated group and at the time of diagnosis for ultrasound and physical examination indicated group. Ultrasound and physical examination indicated cerclage procedures were not performed to pregnancies over 24 gestational weeks. Before placement of the cerclage, the presence of uterine contraction, abdominal pain or tenderness, fever, membrane rupture, leukocytosis (> 18.000/µL), vaginal bleeding, chorioamnionitis, placental abruption and fetal distress were evaluated. All cerclage procedures were performed under spinal anesthesia via the McDonald technique. After disinfection of vagina and cervix with povidone iodine solution under lithotomy position, the cervix was grasped with ring forceps from both anterior and posterior lips. Using polypropylene or mersilk suture was placed circumferentially around the cervico-vaginal junction. The suture was placed counterclockwise or clockwise direction without entering endocervix and knot was tied at 12 o'clock position. In cases of bulging membranes beyond the external cervical os, a foley's catheter was introduced into the cervical canal, and the balloon was filled with 10-15ml of normal saline or a soaked sponge was introduced to cer vical canal in order to retract the membranes prior to cerclage placement [12]. Perioperative management, such as the use of prophylactic antibiotics and/or tocolytics were administered at the time of surgery for all patients regardless of indications. Patients without symptoms such as pain, bleeding or membrane rupture following 24 h were discharged from the hospital. Hydroxy-progesterone caproate 500 mg/2 ml, IM was recommended for use once a week during pregnancy. Cervical cerclages were removed electively at the gestation of 37 weeks of pregnancy or following rupture of fetal membranes, hemorrhage or whenever labor ensued. In general, expectant management, like broad spectrum antibiotic and antenatal corticosteroids were administered to patients with preterm premature rupture of membranes,

as per standard protocol. The case sheets of the patients with cervical circlage were traced through the labor ward registers and operation theatre registers. Medical records were reviewed for 110 patients who underwent history or ultrasound or physical examination indicated cervical cerclage at 12-24 weeks period of gestation during the period of January-2017 to December 2021. Based on a review of each patient's medical record, we evaluated a range of demographic characteristics [age, parity, history of prior preterm birth and second-trimester loss, gestational age at cerclage operation], clinical characteristics at the time of cerclage operation [cervical length, cervical dilation] and pregnancy outcomes (gestational age at delivery, cerclage to delivery interval, fetal survival rate, neonatal birth weight and APGAR scores at 1 min and 5 min).

Statistical analysis

Data was collected and tabulated as shown in results. Statistical analysis was done using Microsoft Excel. Frequency and percentage of each parameter was calculated and analyzed. SPSS (Statistical Package for the Social Sciences) 22.0 program was used for the statistical analysis. Data were given as mean and n (%).

Results

Table 1: Demographic parameters

	Group-A(78)	**Group-B(19)**	**Group-C(13)**	**Total-(110)**
Mean age	30.2 years	30.1 years	29.4 years	29.9 years
Parity Primigravida	-------	05	04	09
Multigravida	78	14	09	101
Mean gestational age at cerclage	15.3 wks	18.6 wks	19.3 wks	17.86 wks
Cerclage to delivery interval in days	20.2 wks	16.4 wks	14.1 wks	17 wks
Mean cervical length in mm	31 mm	22 mm	21 mm	24.6 mm
Prior preterm delivery	98/78	02	01	101
Prior 2nd trimester abortion	136/78	nil	nil	136
Mean cervical dilatation in cm	NA	NA	2cm	---
Mean gestational age at delivery	37 weeks	35.3 weeks	33.4 weeks	35.33 weeks

Table 2: Gestational age at delivery

	Group-A(78)	**Group-B(19)**	**Group-C(13)**	**Total-(110)**
<28 weeks	2/78 (2.56%)	1/19 (5.26%)	3/13 (23.07%)	6/110 (5.45%)
28-32 weeks	1/78 (1.28%)	4/19 (21.05%)	6/13 (46.15%)	11/110 (10%)
32-36 weeks	2/78 (2.56%)	5/19 (26.31%)	2/13 (15.38%)	9/110 (8.18%)
>36 weeks	73/78 (93.60%)	9/19 (47.36%)	2/13 (15.38%	84/110 (76.36%)

Table 3: Neonatal outcome

Mean birth weight	**Group-A(78)**	**Group-B(19)**	**Group-C(13)**	**Total-(110)**
<1.5 kg	3/78	2/19	4/13	9/110
1.5-2.0 kg	8/78	5/19	5/13	18/110
2.1-2.5 kg	19/78	4/19	2/13	25/110
>2.6kg	48/78	8/19	2/13	58/110
APGAR at 1st min	9/10	8/10	7/10	8/10
APGAR at 5th min	10/10	9/10	8/10	9/10

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Table 4: Maternal and Perinatal morbidities

	Group-A(78)	Group-B(19)	Group-C(13)	Total-(110)
Abortion	01/78	01/19	01/13	03/110
PPROM	04/78 (5.13%)	03/19 (15.78%)	09/13 (69.23%)	16/110 (14.54%)
Preterm delivery	05/78	10/19	11/13	26/110
Chorioamnionitis	nil	nil	01/13	01/110
Neonatal death	02/78	01/19	03/13	06/110
Maternal death	nil	nil	nil	nil

Discussion

Cervical incompetence is characterized by premature, painless cervical dilatation during gestation in the absence of uterine contractions, followed by expulsion of the preterm fetus. Cervical cerclage is an intervention that is widely used to prevent miscarriage or delivery in the second trimester. In cases with advanced cervical dilatation and bulging membranes, it has been referred to as emergency or rescue cerclage. Mechanical support of a cervix was thought to be the main factor required to prolong the pregnancy. The classic description of pregnancy loss due to cervical incompetence is unexpected sudden painless delivery. Most commonly, miscarriage in the second trimester or early preterm delivery occurs following premature ripening and shortening of the cervix and the onset of painful contractions. The probable mechanism is that a degree of cervical incompetence, not sufficient to cause sudden pregnancy loss, exposes the fetal membranes to vaginal bacteria, and this leads to stimulation of the inflammatory process responsible for the onset of labor [11]. Assessment of cervical length by transvaginal ultrasound after cervical cerclage may help predict the outcome of pregnancy [12]. Cervical cerclage closes the cervix and relaxes the uterus. Use of antibiotics, tocolytics and progesterone has definite role in success of emergency cerclage. Though the surgical technique hasn't changed much over the period of time, improved neonatal outcome can definitely be attributed to better neonatal ICU care and interventions available. In our study the least gestational age at which neonate was salvaged was 27 weeks and birth weight was 790 grams. In this study, we compared the results of cerclage procedures according to different indications. Our study demonstrated better pregnancy outcomes in terms of gestational age at delivery, fetal survival rate and Apgar scores after history and ultrasound-indicated cerclage than the physical examination-indicated cerclage. It is observed that the gestational age in week of cerclage placement for history-indicated group was earlier compared to other groups. Since the preterm birth risk was determined from the obstetric history of the patients and cerclage was placed before any cervical change, the procedure was performed at earlier weeks for history-indicated group (15.3 weeks), for ultrasound-indicated cerclage (18.6 weeks), for physical examination-indicated cerclage (19.3 weeks). The mean gestational week of delivery in patients with history indicated group was higher (37 weeks) compared to ultrasound indicated (35.3 weeks) and physical examination-indicated cerclage group (33.4 weeks). Nelson *et al*. [13] found that delivery beyond 36 weeks of gestation occurred in 73.9, 57.7 and 23.5%, and gestation time at delivery was 35.9, 34.2 and 29.3 weeks in elective, urgent and emergency groups, respectively. Khan *et al*. [14] stated that history and ultrasound indicated cerclage yields the best results compared to physical examination indicated cerclage. Our present study led to the conclusion that history-indicated cerclage and ultrasound-indicated cerclage have similar effects on gestational age at delivery [37 and 35.3 weeks], percentage of cases delivered at < 28 weeks of gestation (2.56% and 5.26%) and fetal survival rate (50% and 100%). Our present study found that the cerclage placement to delivery interval was 14.1 weeks and the fetal survival rate was 76.92% after physical examination-indicated cerclage. For ultrasound-indicated cerclage (16.4 weeks and 94.73%), for history-indicated cerclage (20.2 weeks and 97.43%). Therefore, physical

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examination indicated cerclage still has certain benefits for improving pregnant outcomes (15). It is also found that patients with history- indicated cerclage had longer cervix before the cerclage procedure (31 mm). Ultrasound- indicated group and physical examination indicated group had cervical length 22 mm and 21 mm respectively. Although cervical measurements of patients with ultrasound- (22 mm) and physical examination-indicated cerclage (21 mm) were similar, gestational age at delivery in ultrasound-indicated group was 1.6 week longer. Our findings demonstrated that the rate of preterm delivery was higher in cerclage cases with physical examination indications than those with history and ultrasound indications. Furthermore, all neonatal complications including low birth weight, low APGAR scores, neonatal intensive care unit admission and neonatal mortality were more common in physical examination-indicated cerclage. It has been known that physical examination-indicated cerclages were placed in emergency conditions with women presented with cervical dilation and prolapsed membranes. Although delivery ≥ 37 weeks were higher in our patients with history-indicated cerclage, it was observed that they had significantly lower delivery rate < 28 weeks and < 34 weeks of gestation compared to those with physical examination and ultrasound- indicated cerclage. For this reason, all pregnant women should be considered in detail in terms of cervical insufficiency in the first trimester of pregnancy or at the beginning of the second trimester. If patients with a history of cervical insufficiency are determined, cerclage could be performed early for history indication rather than physical examination indication. Similar to our study, Chen *et al*. stated that the ultrasound-indicated group and history-indicated group were better in terms of pregnancy outcomes such as gestational age at delivery, APGAR scores and fetal survival rate compared with the physical examination-indicated group (16). PPROM is the most frequently observed complication after cerclage. In our study, the incidence of PPROM in history- and ultrasound-indicated cerclage was found to be 5.13% and 15.78% which were substantially lower compared to physical examination-indicated cerclage (69.23%). It is possible to be seen during, immediately after or after a certain period of time. The probability of its occurrence in the whole pregnancy population is observed as 3%, and previous reports defined higher PPROM rates associated with cerclage. In the study conducted by Liu *et al*., PPROM complicated 30% and 39% of pregnancies after prophylactic and therapeutic cerclage, respectively [17]. The different rates of PPROM after cerclage placement could be related to different surgical techniques or different populations. Therefore, it would be appropriate to inform at least patients with physical examination-indicated cerclage for potential complications. However, a recent study by Muniz Rodriguez *et al*. [18] found that all three types of cerclage procedures did not increase the risk of PPROM before 34 weeks when compared with pregnancies at increased risk for preterm birth. They also attributed higher rates of PPROM reported previously among patients with cerclage to significant baseline risk for preterm birth due to dilated or short cervix, prior history of preterm birth or PPROM and prior cerclage. Korb *et al*. [19] showed that cerclage reduces the birth rate before 24 weeks and perinatal mortality in cases with cervical shortening on ultrasound and a history of preterm birth. Similarly, the beneficial effects of cerclage in terms of positive pregnancy outcomes were observed in our patients with cerclage. The main limitation of the study is its retrospective nature, and the small number of patients in the ultrasound-indicated group and the physical examination-indicated group. Furthermore, the absence of control group in this study can be considered the most important obstacle in terms of generalizing the results. Most of the study data were obtained from the medical records department. However, most of the relevant data were available from medical record, and we therefore believe that our conclusions are credible. We were unable to measure some of the confounding factors for preterm birth including race, ethnicity, socioeconomic status, body mass index, uterine anomalies and maternal systemic morbidities. Strengths of our study include management of all patients with the same treatment protocols and with a uniform surgical technique in a tertiary center.

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Conclusion

All women with history-indicated, ultrasound-indicated and physical examination indication for cerclage should be counseled regarding efficacy of the cervical cerclage. Proper selection of cases results in successful outcome. Follow-up by transvaginal scan for cervical length and treatment with antibiotics covering aerobic and anaerobic organism, and pre- and postoperative tocolysis is likely to be helpful in prolonging the pregnancy and thus improving outcome. Our data indicated that pregnancy outcomes were similar after history-indicated and ultrasound-indicated cerclage and the placement of cervical cerclage in response to sonographically detected shortening of the cervical length is a medically acceptable alternative to the use of history- indicated cerclage. If cervical dilation is unavoidable, then physical examination-indicated cerclage still has certain benefits. We recommend that cervical cerclage should be considered when required. With good NICU back up most of the pregnancies can be salvaged with minimal morbidity to the neonates.

Conflict of interest

The authors have no conflict of interests.

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