

Cerclage Outcome in Singleton Pregnancies for Women at Risk for Preterm Birth Following Assisted Reproductive Treatments

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Abstract: Preterm birth (PTB), defined as delivery before 37 weeks, is a leading cause of neonatal morbidity and mortality, with long-term health consequences. Most Preterm births are spontaneous, though some are iatrogenic. Assisted reproductive technology -conceived pregnancies, including in vitro fertilization, show higher Preterm birth risk, potentially related to infertility factors, maternal age, and assisted reproductive technology procedures. Aim to evaluate the obstetric and neonatal outcomes of singleton pregnancies at risk for preterm birth following assisted reproductive treatment underwent cervical cerclage placement. This prospective observational study, conducted at Basrah Maternity and Child Hospital (1st of December of 2024– 1st of December of 2025), evaluated obstetric and neonatal outcomes in 84 singleton ART pregnancies at risk of preterm birth undergoing cervical cerclage. Eligible women aged 18–45 years received cerclage between 12–16 weeks based on history, ultrasound findings, anatomical factors, or rescue indications. Data were collected via questionnaires, medical records, and transvaginal ultrasound. Cerclage was performed using the McDonald technique, with participants followed until delivery to assess maternal complications, mode of delivery, gestational age, and neonatal outcomes. Among 84 women undergoing cervical cerclage after ART, most were aged 30–35 years (47.6%). Term delivery was achieved in 72.6%. Caesarean section was common (63.1%), predominantly elective. Procedure-related morbidity was low, with 55.5% experiencing no complications; premature rupture of membrane (8.8%) and preterm labor (7.8%) were infrequent. Cerclage was mainly indicated by previous pregnancy loss (44.04%) or ultrasound-detected cervical shortening (41.6%). Neonatal outcomes were generally favorable, with mean birth weight 3.3 ± 0.4 kg, 80.3% take-home babies, low neonatal intensive care unit admission (19.6%), and low neonatal mortality (4.9%). Cervical cerclage in assisted reproductive technology singleton pregnancies was safe and effective, achieving high term delivery rates, low complications, favourable neonatal outcomes, and low perinatal loss despite a high caesarean section rate.

Keywords: Cervical Cerclage, Singleton Pregnancy, Preterm Birth, Assisted Reproductive Technology (ART), Cervical Insufficiency

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Introduction

Preterm birth (PTB) - defined as delivery before 37 completed weeks of gestation - is one of the most important neonatal morbidity and mortality risks globally. It is linked to higher incidence of neonatal complications, long term neurodevelopmental impairment and chronic health issues [1,2]. ART (assisted reproductive technology) pregnancies, especially those using IVF (in vitro fertilization), have a heightened risk for preterm delivery, even in singleton pregnancies [3].

This occurs due to a variety of factors: advanced maternal age, underlying infertility, uterine abnormalities, hormonal changes and abnormal placentation [4]. Another significant risk factor is cervical insufficiency, which is the shortening or dilation of the cervix without complaint, this may cause 2nd trimester miscarriage or spontaneous preterm labour [5]. The most frequent use of transvaginal ultrasonography is to measure cervical length: If the length is less than 25 mm before 24 weeks of gestation, the risk of preterm delivery is high [6].

Cervical Cerclage is a surgery that is performed to strengthen the integrity of the cervix to prevent it from opening too early. May be indicated in women with a history of cervical insufficiency, previous spontaneous preterm birth with painless cervical dilatation during pregnancy [7]. These are usually either McDonald or Shirodkar or transabdominal cerclage depending on the individual clinical indications [8].

Data from previous studies indicate that the cervical cerclage may be associated with longer gestation period, lower spontaneous preterm birth rate, higher neonatal birth weight and lower rates of admission to a neonatal intensive care unit in the appropriate group of patients [9]. But there are potential complications such as premature rupture of membranes, infection and early labor [10]. Thus, patient selection and monitoring are crucial.

The aim of this study was to assess obstetric and neonatal outcomes of cervical cerclage in singleton pregnancies at high risk of preterm labor after assisted reproductive treatments.

Methodology

To assess obstetric and neonatal outcomes of singleton pregnancies at high risk for preterm labor after assisted reproductive treatment (ART) in women with cerclage, this prospective observational study was carried out from December 1st 2024 to July 1st 2025 in Basrah Maternity and Child Hospital, Iraq. Eighty-four pregnant women were enrolled in a consecutive way. Eligible participants included women aged 18-45 years with singleton pregnancies resulting from ART using fresh or frozen embryo transfer and who underwent cervical cerclage between 12 and 16 weeks of gestation and gave informed consent. Multigravidas, those with significant fetal congenital anomaly, those who had cerclage placed after 16 weeks or for no specific indication, those with medical disease and those with poor follow-up before delivery were excluded.

Structured questionnaires designed by the research team, along with delivery outcomes and ultrasonographic findings and medical records, were used to collect data. Maternal age, education, occupation, obstetric and medical history, infertility characteristics, type of ART, previous uterine surgery, and body mass index (BMI) were the variables recorded. All women received routine prenatal care and an ultrasonographic examination of the heart, major fetal abnormalities, fetal viability and cervical length and width between 12-16 weeks gestation. Cervical measurements were obtained with a high resolution endovaginal probe and an empty bladder. Cervical shortening (≤ 25 mm) with or without funneling was deemed to indicate ultrasound indicated cerclage. Based on clinical and ultrasonographic features, indications were classified as history-indicated, ultrasound-indicated, anatomical or rescue cerclage.

Surgical cerclage was carried out by all using the McDonald technique under regional or general

anesthesia, antibiotics were given before and after the procedure, and all patients were monitored antenatally. The removal of cerclage was generally delayed until 36-37 WG or earlier if indicated by preterm labor, premature rupture of membranes, vaginal bleeding or loss of fetus. Maternal outcomes included gestational age at delivery, pregnancy outcome, mode of delivery, cerclage-related complications and interval between cerclage removal and delivery. Neonatal outcomes measured were birth weight, Apgar scores at 1 minute and 5 minutes, congenital anomalies, admission to neonatal intensive care unit (NICU), early neonatal mortality, and discharge status.

The Statistical Package for the Social Sciences (SPSS) version 26 was used to analyze the data. Means $\pm$ standard deviations (SD) or ranges (when appropriate) were used for continuous variables, and frequencies and percentages were used for categorical variables. The Scientific and Ethical Committee of Basrah Maternity and Child Hospital gave their approval. All participants gave written informed consent prior to inclusion and confidentiality was upheld during the study.

Results

Table 1 shows that 47.6% of our patients were aged 30-35 years, 50% had a BMI of 18-24, 57.1% were housewives, 60.7% had fresh ART, and 10.7% had previous ectopic pregnancy.

Table 1. The demographic characteristics of the studied group

Variables	No	%
Maternal age in years		
<30	20	23.8
30-35	40	47.6
>35	24	28.6
Mean age in years		33 $\pm$ 5.2
BMI		
< 18	14	16.6
18-24	42	50
25-34	27	32.1
≥ 35	1	1.3
Mean BMI		23 $\pm$ 5.6
Gravidity		
1	46	54.8
2	28	33.3
3-4	10	11.9
Abortion		
History of 1 st trimester loss	24	28.6
History of 2 nd trimester loss	13	15.5
History of preterm labor	7	8.3
History of stillbirth	5	5.9
Occupation		
Student	16	19.05
Housewife	48	57.1
Employee	20	23.8
ART		
Fresh embryo transfer	51	60.7
Frozen embryo transfer	33	39.3

Type of infertility		
Primary	57	67.8
Secondary	27	32.2
Previous uterine surgery	7	8.3
Previous ectopic pregnancy	9	10.7

Table 2 shows that 72.6% reached term pregnancy, with a high incidence of 63.09% delivered by CS, while only 2.3% ended with stillbirth (fresh).

Table 2. Pregnancy outcome in patients who had cerclage insertion

Abortion	No.	%
1 st trimester	9	10.7
2 nd trimester	5	5.9
Live birth (PTL) rate		
Early PTL (28_33)	3	3.5
Late PTL (34_36)	4	4.7
Fresh stillbirth	2	2.3
Term pregnancy	61	72.6
NVD	8	9.5
C/S	53	63.09
Elective	46	54.7
Emergency	7	8.3

Table 3 shows that 55.5% reached term pregnancy without complication, and only 7.8% ended with preterm labor, and 8.8% had PROM.

Table 3. Morbidity associated with cerclage insertion

Variables	No	%
PROM	8	8.8
PTL	7	7.8
Vaginal bleeding	14	15.6
Infection (chorioamnionitis)	5	5.6
PUC (premature uterine contraction)	6	6.6
No complication	50	55.5

Table 4 shows that 72.6% of the cerclages were removed at term pregnancy. While we had 9.5% end with missed abortion, and the thread was removed, only 1.1% was removed due to acute abdomen (abruptio).

Table 4. Reason for cerclage removal among the studied group

Variables	No	%
Term	61	72.6
Missed	8	9.5
Inevitable	6	7.1
PROM	6	7.1
PTL	7	8.3
PUC	6	7.1

Fresh stillbirth	2	2.3
Elective CS	28	33.3
Acute abdomen	1	1.1

Our table shows that 44.04% of the cerclages were inserted due to their previous abortion and 41.6% showed ultrasound criteria for cervical incompetence.

Table 5. Indication for cerclage insertion among the groups studied

Variables	No	%
History of previous abortion	37	44.04
History of PTL	7	8.3
Ultrasound finding	35	41.6
History of congenital uterine malformation (bicornuate)	5	5.9

Table 6 shows that 46% delivered within 1-2 weeks after the removal of the cerclage and only 4.9% delivered within the first 24 hours following removal of the thread.

Table 6. Interval From Cerclage Removal till Delivery among Women who had Cerclage Removal at Term

Interval	No	%
24 hours	3	4.9
2-6 days	11	18
1-2 weeks	28	46
>2-3weeks	19	31
Total	61	100

Table 7 shows that the mean weight of our neonatal was 3.3 ± 0.4 kg, while 19.6% had a low Apgar score after 5 minutes and 80.3 % the neonatal were (take home babies), while 4.9% had end neonatal death.

Table 7. Neonatal Outcome Among the Studied Groups Reach Term

Variables	No	%
Birth weight in Kg	3.3 ± 0.4	
Apgar score		
1 minute Apgar < 7	22	36
5-minute Apgar < 7	12	19.6
congenital Malformation	1	1.6
NICU	12	19.6
Take home baby	49	80.3
END (end neonatal death)	3	4.9

Discussion

Cervical insufficiency is a known risk for mid-trimester pregnancy loss and spontaneous preterm labor, especially in women undergoing assisted reproductive treatment (ART), who are already a high-risk group [11]. With the increase in ART pregnancies worldwide, there has also been an increasing concern

about the risk of obstetric complications such as shortening of the cervix, pre-term labour and pregnancy loss. Although cervical cerclage is an important preventive treatment for women at risk, its effectiveness and outcomes in ART-conceived pregnancies are under-researched [12]. It is, therefore, necessary to conduct this study to better understand these obstetric and neonatal outcomes after cerclage in ART pregnancies especially in areas where epidemiologic data on this subject is lacking, such as southern Iraq. Demographic characteristics of the population studied revealed that almost half of the respondents (47.6%) had age range of 30-35 years with an average age of 33 years. This is consistent with the number of individuals in the 30-40 age window for fertility as reported by McMahon et al. [13] in ART populations across the world. BMI distribution indicated that 50% of women were in normal BMI (18–24 kg/m²) which is similar to the findings of the systematic review by Yang et al. [14] that women with normal BMI had favourable outcomes of ART compared to the underweight and obese BMI categories. Majority of the participants were primigravid (54.8%), consistent with the trends in ART pregnancies, where there is a tendency to delay the first pregnancy, as seen in the study by Gupta et al. [15]. The high prevalence of primary infertility (67.8%) was similar to that reported from other countries in the Middle East, where tubal and unexplained factors are common causes of delayed pregnancy, the latest study from Saudia Arabia by AlShamlan et al. [16] and a slightly earlier study from Iraq by Razzak et al. [17]. In terms of ART types, 60.7% had fresh embryo transfer (FET). Some studies have demonstrated similar results with both fresh and frozen transfers whilst others have found that frozen cycles demonstrated better endometrial receptivity [18], however, type of ART did not seem to impact outcome in the setting of cerclage indications.

In this study, the results of the pregnancy were surprisingly good as 72.6% of women achieved a term pregnancy after cerclage placement. This is an improved success rate compared to the more widely reported 65-70% term delivery rate in the general population receiving cerclage [19]. In addition, the incidence of first and second trimester pregnancy loss in this population (10.7% and 5.9%, respectively) was lower than those reported in previous studies in which ART pregnancies had a first- and second-trimester pregnancy loss rate of 20–25% with prophylactic cerclage [20]. A very low percentage (3.5%) had experienced early preterm labour (28-33 weeks), and those who had (4.7%) had experienced late preterm (34-36 weeks), both of which are significantly lower than the worldwide ART associated preterm delivery rates of 10-15% [21], [22]. These results indicate that perhaps cerclage is more effective in terms of prevention in ART pregnancies than in spontaneous conception cohorts, possibly because of the greater amount of monitoring these women receive.

Caesarean section (CS) was the most common mode of birth (63.09%) among which 54.7% were elective cesarean. This rate is similar to the World CS rate in ART pregnancies, where a high CS rate is often attributed to maternal age, previous miscarriages, pregnancy anxiety, and CS preference by physicians, as noted by Lodge-Tulloch et al [23]. Even though the CS rate was high, the stillbirth rate was low at 2.3%, which is in keeping with the reported stillbirth rate of 3–5% in high-risk ART cohorts receiving cerclage [24], [25].

Surgical risks of cerclage were rather uncommon. PROM was found in 8.8% of cases, which was in line with other reported prevalence of 8–12% in an observational study by Lee et al.[26]. The rates of preterm labour (7.8%) and vaginal bleeding (15.6%) are consistent with published rates of maternal complications after cerclage (12–20%) [27]. The infection rates in this study were low (5.6%) and results were related to the proper use of antibiotics during the peri-operative period and standard insertion technique. Importantly, 55.5% of women did not experience any complications at all, confirming the relative safety of cerclage in ART patients that are properly selected, in line with Boelig et al. [28].

Procedural success was seen as the majority of cerclages (72.6%) were removed electively at term. Only 1.1% had to be removed due to acute abdomen likely due to chorioamnionitis, which is in line with a study by Alani et al. [29] who reported <2% incidence. The 46% who delivered within 1-2 weeks of cerclage removal is also similar to the previous studies of Bisulli et al and Alabi-Isama et al which reported that labour would usually follow within 1-3 weeks of scheduled cerclage removal [30], [31]. Occasionally, the use of cerclage is indicated, and only 4.9% delivered within 24 hours of cerclage removal, indicating that for most women, cerclage removal is not an immediate trigger to labour.

Overall, neonatal outcomes were good. The mean birth weight was 3.3 kg, which was similar to the normal fetal growth trajectories and consistent with another study by Li et al. (2024) which revealed good fetal growth after cerclage [32]. Neonates with low Apgar scores (<7 at 5 minutes) were present in 19.6% of neonates, slightly higher than the general obstetric population, but similar to high-risk groups of women who underwent cerclage (10–15%) [33]. The NICU admission rate of 19.6% is similar to data from around the world after cerclage in the case of high-risk pregnancies. Importantly, 80.3% of all neonates were discharged as healthy “take-home babies” and the early neonatal death rate was low (4.). This is comparable to or better than results of comparable studies of ART pregnancies where END rates of approximately 4-6% [34], [35] have been reported.

Previous abortion (44.04%) and cervical shortening on ultrasound (41.6%) were the main indications for cerclage in this study. These ratios are similar with those indicated by cerclage in the world based on the data from Jaworowski et al. [36], which shows history-indicated cerclage around 40–50% and ultrasound-indicated cerclage around 30–40%. The low rescue cerclage rate (3.2%) is due to good screening and intervention time, which allows the better result.

Conclusion

Maternal and neonatal outcomes following cervical cerclage in singleton pregnancies achieved by assisted reproductive technology (ART) were favorable with 72.6% of pregnancies achieving term gestation. The low rate of complications such as PROM, PTL and infection makes the use of cervical cerclage a potential treatment option in this high-risk group. Cervical shortening (on ultrasound) and history of previous mid trimester pregnancy loss were the most common indications for cerclage. In addition, elective cerclage removal at term was successful in 72.6% of patients, suggesting a favourable progression of pregnancy. In general, neonatal outcomes were satisfactory with an acceptable mean birth weight, low incidence of congenital anomalies and 80.3% of newborns discharged home without complication. While cesarean delivery was common, maternal outcomes were acceptable and stillbirths and early neonatal deaths were relatively rare.

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