

Pregnancy outcomes in women with a surgically short cervix with no history of preterm birth

L.T. Fricke^{1,2}, H.C. Bartels^{1,3}, G. Corbett^{1,3}, L. Lütke¹, S. Corcoran^{1,3}.

1. Obstetrics and Gynaecology Department, The National Maternity Hospital, Holles St., Dublin 2, Ireland.
2. Medical Faculty of Heidelberg, Heidelberg University, Grabengasse, Heidelberg, Baden-Württemberg, Germany.
3. Perinatal Research Centre, University College Dublin, Belfield, Dublin 4, Ireland.

Abstract

Aims

Preterm birth is the leading cause for potentially lifelong morbidity and neonatal death. This study explores pregnancy outcomes for women with a surgically short cervix and no history of preterm birth.

Methods

This was a single-centre prospective cohort study including 144 patients who attended a specialist preterm birth clinic in a tertiary referral maternity hospital between 2019 and 2023. Inclusion criteria were significant cervical surgical history and no history of preterm birth.

Results

Among women with prior significant cervical surgical, those with a short cervical length ($n=8/40$, 20%) had a higher rate of preterm birth than women with a normal cervical length ($n=7/104$, 7%). Women with a short cervical length who had received a transabdominal cerclage were less likely to experience preterm birth ($n=0/18$, 0%) than if they did not have a transabdominal cerclage ($n=5/22$, 23%). Women with a normal cervical length could safely be managed conservatively.

Conclusion

Women with a short cervical length and no history of preterm birth may benefit from transabdominal cerclage. Where there is a history of significant cervical surgery but the cervical length remains normal, there is a high chance of a term birth. This study provides reassuring data to help counsel patients effectively.

Introduction

Preterm birth is defined as a live birth before 37 weeks of gestation¹. It remains the leading cause for potentially lifelong morbidity and death up to the age of 5 years². Still, the incidence of spontaneous preterm birth (sPTB) seems to be increasing globally³. There are well described maternal risk factors, such as previous preterm birth and cervical surgical history, which significantly increase the risk of preterm birth⁴. The sexually transmitted infection with human papillomavirus has a life-time prevalence of 80%⁵. Persistent infection may lead to (pre-)malignant lesions requiring cervical surgery which doubles the Odds for sPTB⁶.

A short cervical length on ultrasound and previous sPTB are the strongest predictors of sPTB^{7, 8}. Until 24 weeks of gestation, a cervical length of less than 25 mm indicates an increased risk of sPTB⁹. After 24 weeks of gestation, the predictive value of the cervical length measurements decreases¹⁰.

Treatment options to prevent sPTB include the use of vaginal progesterone, a cervical pessary or a cerclage¹¹. A cerclage can be placed either vaginally or abdominally. A vaginal cerclage can be removed and allows women to have a vaginal delivery, whereas women with a transabdominal cerclage require a caesarean section as mode of birth. On the other hand, a transabdominal cerclage can be placed in women with an extremely short cervix even when vaginal cerclage placement is technically challenging or impossible. However, a randomized controlled trial (RCT) of 111 patients found that transabdominal cerclage is more effective than vaginal cerclage in women with recurrent sPTB, who have previously had a failed trial of vaginal cerclage¹². The literature is unclear on the best course of action in patients with an extremely short cervix following multiple excisional therapies for cervical dysplasia and no history of sPTB. To our knowledge, the role of transabdominal cerclage in women with a surgically short cervix and no history of sPTB have not yet been studied clearly.

The aim of this study is to investigate the pregnancy outcomes of women with no prior history of sPTB, who have a history of significant surgery to the cervix.

Methods

This is a prospective cohort study on pregnancy outcomes in women with a surgically short cervix and no history of sPTB in a single centre between September 2019 and March 2023. Cases were identified prospectively.

Data was collected via electronic medical record chart review. Eligible participants were identified from a prospectively maintained clinic registry of all patients.

Approval for this study was obtained from the hospital ethics committee (Ref: RA 04 2023). As this study utilized a surveillance database, informed consent was not needed.

The specialist preterm birth clinic is a stand-alone tertiary referral maternity hospital with approximately 7,000 deliveries per annum, receiving nationwide referrals of women at high risk of sPTB. The clinic has a multidisciplinary approach with a dedicated consultant with interest in preterm birth, a dedicated midwife and a research fellow as well as a close collaboration with surgeons on complex surgical cases. Cervical length was measured serially by experienced trained staff using transvaginal ultrasound. The shortest measurement was selected. The clinic provides predominantly antenatal care, with some women also attending for pre-conceptual care following extensive cervical surgeries.

Inclusion criteria were consecutive patients in the preterm birth clinic who had a significant cervical surgical history. A significant cervical surgery was defined as multiple Large Loop Excision of the Transformation Zone (LLETZ), a single LLETZ >2 cm deep, a cone biopsy, or a trachelectomy. Participants who gave birth at another centre were excluded.

The primary outcome was sPTB rate. Secondary outcomes included mode of delivery, birthweight, Apgar after 1 and 5 minutes, admission on neonatal intensive care unit (NICU) and neonate complications. The possible confounders maternal age at delivery, body mass index (BMI), and social deprivation were also assessed.

Conservative management involves seeing patients every 2-3 weeks, measuring cervical length using transvaginal ultrasound and monitoring them for signs and symptoms of preterm birth. Progesterone treatment includes daily application of progesterone at night. Cervical pessaries (Arabin) are placed by trained medical staff and removed at 36 weeks of pregnancy or in case of onset of labour. Vaginal approach cervical cerclages are placed at the gestational age of 13 to 21 weeks. Transabdominal cerclages are placed either pre- or post-conceptionally before 12 weeks of gestation. Some measures are used simultaneously. The individual treatment path was chosen based on careful examination by the experienced team in agreement with the patient.

The data are presented as counts and proportions and mean with standard deviation (SD) for continuous data or median and interquartile range for non-normal categorical data. Data were compared between groups using Odd's ratio (OR) with 95% confidence intervals (CI). P values were calculated with a two-tailed homoscedastic T-test and a significance level of $\alpha=0.05$ to allow a descriptive comparison indicating possible trends. All calculations were determined using Excel, Microsoft Office Professional Plus 2016.

Results

In total, 179 patients with a significant cervical surgical history and no previous sPTB were screened as eligible. Of these, 35 participants were excluded as follows; 2 as these were pre-conceptual visits who did not have a pregnancy during the study period, 7 as no cervical length

was available, and 26 who gave birth in another centre. In total, a final cohort of 144 women were considered for analysis.

The mean age (SD) was 36 years (± 3) and the median parity 0 (interquartile range (IQR) 0-1) (Table 1). The mean BMI (SD) at booking was 25 kg/m² (± 6). On average, women were socio-economically marginally above average (2016 Pobal HP Deprivation Index for Small Areas; mean=6.0 $\pm$ 10.0).

Most women (n=81/144, 56%) had undergone multiple LLETZ and 45 women (31%) had had a single LLETZ >2 cm deep. 37 patients (26%) have had a conization. About 15% of women had undergone both LLETZ and conization (n=22/144). 2% (n=3/144) of women have had a trachelectomy.

Table 1: Demographics	N = 144
Maternal age (years)	36.0 $\pm$ 3.0
BMI (kg/m ²) at booking	25.0 $\pm$ 6.0
HP index	6.0 $\pm$ 10.0
Parity (median)	0.71 $\pm$ 0.89 Median 0 IQR 0-1
Cervical surgical history *	
LLETZ x1	45 (31%)
Multiple LLETZ	81 (56%)
Conization	37 (26%)
Trachelectomy	3 (2%)
Values in mean (percentage) and standard deviation (SD) unless otherwise stated	15 (10%) conization and LLETZ x1 7 (5%) conization and multiple LLETZ
*some patients had a combination of cervical surgical histories	

Interventions in index pregnancy according to cervical length

Of all 144 women with no history of sPTB and significant cervical surgical history, the interventions performed during the index pregnancy were categorised according to cervical length (Table 2). Most patients (n=104/144, 72%) had a normal cervical length (>2.5 cm). About a quarter of patients (n=34/144, 24%) had a short cervix (1.0-2.5 cm) and 4% (n=6/144) had an extremely short cervix (≤1.0 cm).

Women with a normal cervical length were significantly more likely to be managed with a conservative approach than women with a short (n=75/104, 72% vs n=3/34, 9%; p<0.01) or extremely short cervix (n=75/104, 72% vs n=1/6, 17%; p<0.01). Women with a short cervix received significantly more frequently progesterone than women with a normal (n=27/34, 79% vs n=29/104, 28%; p<0.01) and extremely short cervix (n=27/34, 79% vs n=2/6, 33%; p=0.02). Cervical pessaries were used significantly more often in women with a short cervix than women with normal cervical length (n=10/34, 29% vs n=4/104, 4%; p<0.01). In women with normal cervical length, transabdominal cerclage was performed significantly less frequently than in women with a short (n=2/104, 2% vs n=14/34, 41%; p<0.01) or extremely short cervix (n=2/104, 2% vs n=4/6, 67%; p<0.01). There were no other treatment differences between the three groups.

Table 2: Intervention	N = 104	N = 34	N = 6
Cervical length (cm)	>2.5	1.0-2.5	≤1.0
Intervention**			
Conservative	75 (72%)	3 (9%)	1 (17%)
Progesterone	29 (28%)	27 (79%)	2 (33%)
Cervical pessary	4 (4%)	10 (29%)	1 (17%)
Vaginal cerclage	4 (4%)	2 (6%)	0 (0%)
Transabdominal cerclage	2 (2%)	14 (41%)	4 (67%)
Values in mean (percentage) and standard deviation (SD) unless otherwise stated	4 (4%) progesterone and cervical pessary	10 (29%) progesterone and cervical pessary	2 (33%) progesterone and transabdominal cerclage
**some patients had a combination of interventions	4 (4%) progesterone	1 (3%) progesterone	

Table 2: Intervention	N = 104	N = 34	N = 6
	and vaginal cerclage	and vaginal cerclage	
	2 (2%) progesterone and transabdominal cerclage	11 (32%) progesterone and transabdominal cerclage	

Outcomes according to cervical length

The outcomes of the index pregnancy were analysed according to the cervical length. None of the patients included in this study had an elective iatrogenic preterm birth nor gave birth before the 24th week (Table 3). Women with a short cervix had significantly more sPTBs between 34+0 and 36+6 weeks than women with a normal cervical length (n=6/34, 18% vs n=6/104, 6%; p=0.03). Whereas women with a normal cervical length had significantly more term births than women with a short cervix (n=97/104, 93% vs n=26/34, 76%; p=0.01). Whereas the interval between PPRM and birth in women with a short cervix was longer with 3(±2) days than in women with a normal cervical length with 1(±1) day (p=0.01). The overall gestational age at delivery of 39(±2) weeks was higher in women with a normal cervical length than in women with a short cervix who gave birth around 37(±3) weeks (p<0.01).

Regarding mode of delivery, those with a normal cervical length had a higher spontaneous vaginal birth rate than women with a short (n=62/104, 60% vs n=7/34, 21%; p<0.01) or extremely short cervix (n=62/104, 60% vs n=0/6, 0%; p<0.01). Women with a normal cervical length had a lower caesarean section rate than women with a short (n=24/104, 23% vs n=25/34, 74%, p<0.01) or extremely short cervix (n=24/104, 23% vs n=6/6, 100%, p<0.01).

Table 3: Outcomes	N = 104	N = 34	N = 6
Cervical length (cm)	>2.5	1.0-2.5	≤1.0
Gestational age at birth (weeks)			
≤23+6	0 (0%)	0 (0%)	0 (0%)
24+0 – 27+6	1 (1%)	1 (3%)	0 (0%)
28+0 – 33+6	0 (0%)	1 (3%)	0 (0%)

Table 3: Outcomes	N = 104	N = 34	N = 6
34+0 – 36+6	6 (6%)	6 (18%)	0 (0%)
≥ 37+0 weeks	97 (93%)	26 (76%)	6 (100%)
PPROM <37 weeks	7 (7%)	6 (18%)	0 (0%)
Gestational age at PPRM (weeks)	34.0±3.0	33.0±4.0	n/a
Interval from PPRM to delivery (days)	1.0±1.0	3.0±2.0	n/a
Gestational age at delivery (weeks)	39.0±2.0	37.0±3.0	38.0±1.0
Mode of delivery			
spontaneous	62 (60%)	7 (21%)	0 (0%)
operative	18 (17%)	2 (6%)	0 (0%)
caesarean section	24 (23%)	25 (74%)	6 (100%)
Birthweight (grams)	3450.0±550.0	3150.0±750.0	3500.0±600.0
Apgar 1 min	8.7±1.0	8.6±1.4	8.8±0.4
Apgar 5 min	9.0±0.4	9.0±0.6	9.5±0.5
NICU admission	5 (5%)	4 (12%)	1 (17%)
Neonate complications***	6 (6%)	2 (6%)	1 (17%)
Values in mean (percentage) and standard deviation (SD) unless otherwise stated			
***neonate complications listed in appendix A			

Outcomes in women with a cervical length ≤ 2.5 cm with vs. without transabdominal cerclage

Women with a short or extremely short cervix who had received a transabdominal cerclage were less likely to experience PPROM than if they did not have a transabdominal cerclage but any of the other interventions performed (n=0/18, 0% vs n=6/22, 27%, p<0.01) (Table 4). Furthermore, women with a short or extremely short cervix who had a transabdominal cerclage were less likely to have sPTB than if they did not have a transabdominal cerclage (n=0/18, 0% vs n=5/22, 23%, p<0.01).

Table 4: Cervical length ≤ 2.5 cm	Transabdominal cerclage N = 18	No transabdominal cerclage N = 22
PPROM	0 (0%)	6 (27%)
Preterm birth	0 (0%)	5 (23%)

Discussion

Women with a surgically short cervix and no history of sPTB are at increased risk of sPTB. Treatment with a transabdominal cerclage might improve pregnancy outcomes, especially in those with a short (<2.5cm) or extremely short (<1cm) cervix measured on transvaginal ultrasound.

Where there is a history of significant cervical surgery but the transvaginal ultrasound scan cervical length remains >2.5cm, there is a high chance of a term birth (93%). This is reassuring data to help counsel patients effectively.

Women with a normal cervical length were more likely to give birth at term >37 weeks' gestation, and therefore neonates with a higher birthweight whereas women with a short cervix had more late sPTBs between 34+0 – 36+6 and neonates with a lower birthweight. All women with an extremely short cervix delivered at term and the neonates had a similar birthweight to neonates of women with a normal cervical length. This is likely due to the high proportion of them that had abdominal cerclage. This data suggests a high efficiency of treatment with transabdominal cerclage in women with a surgically short cervix and no history of sPTB.

The average sPTB rate in Europe is 8% and the national Irish sPTB rate as well as the background sPTB rate in the study centre are 7%¹³⁻¹⁵. In women with a short or extremely short cervix the sPTB rate is around 40%, whereas the sPTB rate of women with a surgically short or extremely short cervix and no history of sPTB in this study is 20% (see Figure 3)¹⁶. Women with no history of sPTB and a cervical length >2.5 cm generally received less invasive treatment and had a sPTB rate comparable to the European average confirming a good follow up of these women in the unit.

Published international data shows that women with a short cervix and no risk factor for sPTB have similar rates of sPTB regardless if they received a vaginal cerclage or vaginal progesterone¹⁷. But in women with an extremely short cervix and no prior history of sPTB, the rate of sPTB is significantly reduced by placement of a vaginal cerclage^{17,18}. Our findings echo the association between a short cervix and sPTB, even in absence of prior preterm birth. This confirms that cervical length is a promising predictor of sPTB in women with a significant cervical surgical history and that women with a short cervix do need treatment to prevent sPTB in this population.

There is a positive correlation of invasiveness of the treatment and the pregnancy outcomes in the cohort studied. Our data suggests that transabdominal cerclage may be considered to reduce the risk of sPTB in women with no history of sPTB and a surgically short cervix. The insertion of a transabdominal cerclage involves either laparoscopic or open surgery. Neither of the methods is clearly superior to the other in terms of pregnancy outcomes¹⁹. For

laparoscopic cerclage insertion, a novel port closure device technique leads to a shorter stay in hospital, less loss of blood as well as a trend towards a shorter operating time and less perioperative complications²⁰.

Socioeconomic inequalities are a known risk factor for sPTB²¹. Despite this, no association between HP index and pregnancy outcomes was seen in this study²². However, this may be due to the on average higher HP index in the study population.

Regarding the mode of birth, the caesarean section rate for women with a short or extremely short cervix with 74% and 100%. We posit this raised rate is partially due to the increased use of transabdominal cerclages requiring caesarean birth and partly due to the occurrence of cervical stenosis after excision treatments.

This study has several strengths and limitations. The study was conducted in a stand-alone tertiary referral maternity hospital that receives all referrals nationwide of women with a significant cervical surgical history who require assistance for their pregnancy. All of the current best practice treatment options were examined as part of the study including conservative approach, vaginal progesterone, cervical pessary, vaginal and transabdominal cerclage²³. All medical staff involved in patient care are part of a dedicated specialist preterm birth clinic. This study was performed to prospectively assess the outcomes of women with no history of sPTB but a significant cervical surgical history and a short cervix. This population is understudied and this case series may well be one of the larger cohorts reported as many do not attend specialised care in a dedicated PTB clinic, highlighting the value of this analysis despite its limited sample size. The consultation of these women has been influenced by the treating consultant's appraisal and the groups are not matched. The decision to offer TAC was likely influenced by clinician judgment (e.g., cervical stability, patient preference). This introduces bias, as women receiving TAC may have had other protective factors. The group of women with an extremely short cervix had small numbers limiting the generalisability, but even with these small numbers outcome differences are obvious.

Prospective observational studies comparing the outcomes of patients with an extremely short cervix and no history of sPTB after transabdominal cerclage or alternative intervention is required to increase the knowledge base for further conclusions.

Declarations of Conflicts of Interest:

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Dr Siobhan Corcoran and Dr Gillian Corbett report a relationship with The National Maternity Hospital Foundation that includes funding grants. Dr Siobhan Corcoran and Dr Gillian Corbett report a relationship with Science Foundation Ireland that includes funding grants. The other authors declare that they have no

known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Corresponding Author:

Lia Theresia Fricke,
Obstetrics and Gynaecology Department,
The National Maternity Hospital,
Holles St.,
Dublin 2,
Ireland.

E-Mail: lia.fricke@gmx.de

References:

1. World Health Organization. Preterm Birth. 2023 [Available from: <https://www.who.int/news-room/fact-sheets/detail/preterm-birth>].
2. Perin J, Mulick A, Yeung D, Villavicencio F, Lopez G, Strong KL, et al. Global, regional, and national causes of under-5 mortality in 2000-19: an updated systematic analysis with implications for the Sustainable Development Goals. *Lancet Child Adolesc Health*. 2022;6(2):106–15.
3. Vogel JP, Chawanpaiboon S, Moller A-B, Watananirun K, Bonet M, Lumbiganon P. The global epidemiology of preterm birth. *Best Practice & Research Clinical Obstetrics & Gynaecology*. 2018;52:3–12.
4. Purisch SE, Gyamfi-Bannerman C. Epidemiology of preterm birth. *Semin Perinatol*. 2017;41(7):387–91.
5. ICO/IARC HPV Information Centre. Human Papillomavirus and Related Disease Report 2021 [updated 22.10.2021. Available from: <https://hpvcentre.net/statistics/reports/XWX.pdf>].
6. Cobo T, Kacerovsky M, Jacobsson B. Risk factors for spontaneous preterm delivery. *International Journal of Gynecology & Obstetrics*. 2020;150(1):17–23.
7. Khandre V, Potdar J, Keerti A. Preterm Birth: An Overview. *Cureus*. 2022;14(12):e33006.
8. Mercer BM, Goldenberg RL, Das A, Moawad AH, Iams JD, Meis PJ, et al. The preterm prediction study: a clinical risk assessment system. *Am J Obstet Gynecol*. 1996;174(6):1885–93; discussion 93–5.
9. Iams JD, Goldenberg RL, Meis PJ, Mercer BM, Moawad A, Das A, et al. The length of the cervix and the risk of spontaneous premature delivery. National Institute of Child Health and Human Development Maternal Fetal Medicine Unit Network. *N Engl J Med*. 1996;334(9):567–72.

10. Seravalli V, Abati I, Strambi N, Tofani L, Tucci C, Tartarotti E, et al. Universal cervical length screening for preterm birth is not useful after 24 weeks of gestation. *Acta Obstet Gynecol Scand.* 2023;102(11):1541–8.
11. da Fonseca EB, Damião R, Moreira DA. Preterm birth prevention. *Best Pract Res Clin Obstet Gynaecol.* 2020;69:40–9.
12. Shennan A, Chandiramani M, Bennett P, David AL, Girling J, Ridout A, et al. MAVRIC: a multicenter randomized controlled trial of transabdominal vs transvaginal cervical cerclage. *Am J Obstet Gynecol.* 2020;222(3):261.e1–.e9.
13. World Health Organization. Born too soon: decade of action on preterm birth. . Geneva; 2023.
14. The National Maternity Hospital. NMH Annual Report 2023. 2024.
15. Healthcare Pricing Office (HPO) Health Service Executive (HSE). Perinatal Statistics Report, 2021. 2024.
16. Brown K LC, Binks M. Short cervix and preterm birth in the top end. *Aust N Z J Obstet Gynaecol* 2023.
17. Souka AP PM, Pilalis A. Very short cervix in low-risk asymptomatic singleton pregnancies: Outcome according to treatment and cervical length at diagnosis. *Acta Obstet Gynecol Scand.* 2020.
18. Berghella V CA, Rust OA, To M, Otsuki K, Althuisius S, Nicolaides KH, Roman A, Saccone G. . Cerclage for sonographic short cervix in singleton gestations without prior spontaneous preterm birth: systematic review and meta-analysis of randomized controlled trials using individual patient-level data. *Ultrasound Obstet Gynecol.* 2017.
19. Hulshoff CC, Hofstede A, Inthout J, Scholten RR, Spaanderman MEA, Wollaars H, et al. The effectiveness of transabdominal cerclage placement via laparoscopy or laparotomy: a systematic review and meta-analysis. *American Journal of Obstetrics & Gynecology MFM.* 2023;5(1):100757.
20. Corbett GA, Windrim C, Higgins S, McAuliffe FM, Wilkinson M, O’Brien D, et al. Laparoscopic prepregnancy transabdominal cerclage: operative and pregnancy outcomes for a novel technique of suture placement using port closure device. *American Journal of Obstetrics and Gynecology.* 2023.
21. McHale P, Maudsley G, Pennington A, Schlüter DK, Barr B, Paranjothy S, et al. Mediators of socioeconomic inequalities in preterm birth: a systematic review. *BMC Public Health.* 2022;22(1):1134.
22. Haase T, Pratschke, J. The 2016 Pobal HP Deprivation Index for Small Areas (SA). 2017.
23. Baroutis D, Katsianou E, Fragiskos I, Papakonstantinou ME, Koukoumpanis K, Giannakaki AG, et al. Spectrum of Cervical Insufficiency: Management Strategies from Asymptomatic Shortening to Emergent Membrane Prolapse. *J Clin Med.* 2025;14(23).

Appendix:

Abbreviations:

Apgar (Apgar score)

BMI (body mass index)

HP index (Pobal Haase & Pratschke Deprivation Index): provides an up-to-date analysis of the geographical distribution of deprivation and permits comparisons

IQR (interquartile range)

LLETZ (large loop excision of the transformation zone)

NICU (neonatal intensive care unit)

PPROM (preterm premature rupture of membranes)

sPTB (spontaneous preterm birth)

RCT (randomized controlled trial)

SD (standard deviation)

A: Neonate complications

1x: grunting, cephalohematoma, Facial bruising, prominent chest wall, right hip click on ortolani, neonatal death, late onset Bacterial sepsis/ meningitis at day of life 9, cardiomyopathy, small for dates, pyrexia

2x: transient tachypnoea of newborn, extreme low birth weight, intraventricular hemorrhage resolved on cranial ultrasound prior to discharge, respiratory distress of prematurity needing respiratory support

3x: neonatal jaundice