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Rescue cervical cerclage with natural Progesterone supplementation: A personal experience with five cases

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Abstract

Objective: To share my experience of the five patients with cervical insufficiency, open cervix, and bulging membranes into the vagina, which I had between 2015 and 2019. All managed with a Rescue Cervical Cerclage (RCC) procedure.

Methods: The study includes anonymous brief information about the five patients with the above condition, covering their ethnicities, ages, body mass index (BMI), previous obstetrical and medical histories, laboratory and ultrasonography results, physical examination findings, rescue cervical cerclage procedures, and their care during the index pregnancy, as well as the outcome of this pregnancy.

Results: The average age of patients in this study was 28.8, ranging from 20 to 34 years. One patient had a significant obstetrical history with a previous cervical surgery and a previous pregnancy loss. The rescue cervical cerclage procedure was performed at an average age of 20 weeks of gestation and 3 days. The cerclage suture was removed at an average age of 34 weeks and 3 days of gestation. The average time of delivery was 35 weeks and 2 days of gestation. Sadly, one patient experienced an intra-uterine foetal demise (IUID) at 32 weeks and 2 days of gestation. On average, rescue cervical cerclage prolonged pregnancy by 109 days (15 weeks and 4 days). The longest duration was 138 days (19 weeks and 5 days), and the shortest duration was 89 days (12 weeks and 5 days). The take-home baby rate was 80%, with the rescue cervical cerclage being successful in bringing the foetus to viability and beyond extreme prematurity in all cases.

Conclusion: Rescue cervical cerclage is a recommendable option for patients with cervical insufficiency, open cervix and bulging membranes into the vagina, provided there are no clear contraindications like active labour, bleeding, premature Preterm Rupture of Membranes (PPROM) and infection. These pregnancies remain at high risk and should receive ongoing specialist care.

Keywords: Cervical insufficiency, rescue cervical cerclage, preterm birth, perinatal outcome, high-risk pregnancies.

Introduction

When a pregnant patient presents before foetal viability, which is currently at around 24 weeks of gestation, with an open cervix and bulging membranes into the vagina, the pregnancy is almost always doomed. With the membranes in contact with the vaginal microbiome, soon infection would occur, membranes would rupture, followed by a certain miscarriage. Bed rest, in addition to natural progesterone and at times Indomethacin, a Non-Steroidal Anti-Inflammatory Drug (NSAID), together with Antibiotics, may be an option. However, according to Bayrak *et al.* ^[1] the take-home baby rate was 0% compared to 63% for those patients who had a Rescue Cervical Cerclage (RCC). In Shivani *et al.* ^[2] study, which was a literature review, including 50 patients who had an RCC, pregnancy prolongation was for about 71.2 days with a live birth rate of 92.4%. My study showed that RCC was successful in all five cases, with all pregnancies prolonged to viability. Unfortunately, in one of the cases, there was a stillbirth at 33 weeks of gestation, and for the remaining four cases, babies survived and were all born beyond 32 weeks of gestation. RCC works in the absence of active bleeding, active labour, and active infection. Therefore, it should be offered to patients, as per most guidelines, namely SOGC ^[3] and RCOG ^[4], despite the controversy and the fact that it is not universally accepted, as mentioned in Bayrak *et al.* ^[1]. RCC is a salvage measure for pregnancies which are at a high risk of severe preterm delivery or mid-trimester miscarriage.

This paper aims to detail my experience with the five cases, three at Waitemata District Health Board (WDHB), one at Lakes District Health Board (LDHB) and one at Taranaki District Health Board (TDHB) and to encourage colleagues to offer this procedure to appropriate

patients with cervical insufficiency (formerly known as incompetence), with an open cervix and bulging membranes into the vagina.

Study Methods

This study includes the 5 cases of Rescue Cervical Cerclage with an open cervix and membranes bulging into the vagina. That I had to manage clinically from 2015 until 2019, and all were offered and accepted a RCC procedure. The patients will be mentioned anonymously, with details about their presentation with a dilated cervix, age, ethnic group, gravidity, parity, blood group, Rhesus status, gestational age, and the expected date of confinement (EDC). For more privacy, I later opted not to include EDC in the study. Previous obstetrical history, previous medical history with risk factors, including previous or known history of cervical insufficiency and cervical surgery, smoking status, and BMI, will also be recorded. Physical examinations will include a speculum examination. Blood test results will include Full Blood Count and CRP. In addition to MSU and Cervicovaginal swabs. Operation details will cover the RCC procedure details. Perioperative management will include antibiotics, bed rest, Progesterone, and discharge from the hospital. In addition to follow-up details post-RCC. Ultrasound Scan findings before and after the RCC will mention the cervical length, funnelling of cervix, with an Ultrasound Scan Photo of the cervix before and after the RCC for each patient, anonymously. Timing of removal of cerclage suture, time and mode of delivery (labour description, spontaneous versus Induction of Labour (IOL), spontaneous vaginal delivery (SVD), assisted vaginal delivery and caesarean section) and time between RCC and delivery (in days and weeks). Any post-partum complications, new-born Apgar score at 1 and 5 minutes, sex, birth weight, need for resuscitation, admission to Special Care Baby Unit (SCABU) or Neonatal Intensive Care Unit (NICU), antibiotic treatment, other special treatments, and discharge home details for baby and mother for each case. This will be followed by a discussion of findings with a review of recent literature on this subject.

Ethics approval

I sought approval from the Health and Disability Ethics Committees of the Ministry of Health of New Zealand, which was granted in July 2020 (number: 20/STH/99AM01). Additionally, I also obtained approval from the local Ethics Committees at Waitemata District Health Board (WDHB), Lakes District Health Board (LDHB), and Taranaki District Health Board (TDHB), as well as the Māori Ethics Committee at TDHB. Furthermore, I obtained permission from each of the five patients included in this study. My five patients authorised me to publish this study in a national or international Medical Journal. The study was significantly delayed due to the COVID-19 pandemic.

Case number 1

The patient was a 34-year-old New Zealand European and a never-smoker. She was G3P2 with two previous vaginal deliveries: the first at 38 weeks' gestation, complicated by third-degree vaginal tear, and the second was a spontaneous, quick delivery at 40 weeks' gestation of an IUGR baby on the 0 centile for the customised growth chart. Her blood group was O Rh(D) Positive, and her BMI was 19.7 kg/m². She had no previously known cervical pathology and opted not to have a Maternal

Serum Screening of the first Trimester (MSS1). The patient presented to the hospital at 19 weeks and 6 days' gestation, after an anatomy ultrasound scan (USS) showed an open, shortened Cervix of 5 mm (Fig 1, 2). She was not in labour, had no bleeding, and was not febrile. Her FBC showed a Hb of 125 g/L, a WBC of 10.3x10⁹/L, and Neutrophils of 7.6x10⁹/L. CRP of 7 mg/L. Cervicovaginal swabs were consistent with normal vaginal flora and were negative for Chlamydia and Gonorrhoea. Her urine was unremarkable. The patient consented to be examined under spinal anaesthesia and was given prophylactic antibiotics with Cefoxitin 2 g IV. She was placed in the lithotomy position, examined with a sterile speculum, and found to have an open cervix to 2 cm with bulging membranes into the upper vagina. The patient agreed to consider an RCC. She was therefore prepped with Chlorhexidine non-alcoholic solution externally and her upper vagina was irrigated with a warm saline solution. A McDonald Suture was placed with the use of a 5 mm Mersilene Tape; the cervix appeared to be 2 cm long beyond the suture after the suture was tied at 12 o'clock. The procedure was uncomplicated, and the post-op plan included Bed Rest for 24 hours, Cefoxitin 1 g IV q 8h for 48 hours, Tocolysis with Nifedipine 20 mg PO q8 h for 48 hours, and micronised progesterone (Utrogestan®) 200 mg PV starting day 1 post-op. A growth scan was planned at 24 weeks of gestation with consideration of antenatal steroids. She was advised to avoid intercourse, lifting heavy objects, strenuous exercise, swimming and diving throughout the pregnancy. The cervical suture was to be removed at 36-37 weeks' gestation. The post-operative stay was uncomplicated, and the patient was discharged on day 2 post-op.

She was seen in the Antenatal Clinic at 23 weeks and 3 days of gestation. Cervical length on USS was 20 mm beneath the suture and 8 mm above it (Fig 3). The patient was given antenatal steroids as planned. She continued her follow-up with the obstetric team. The pregnancy was complicated by a small for gestational age (SGA) foetus. A repeat USS at 26 weeks' gestation showed the same cervical length with an SGA foetus. The patient was seen by me at 36 weeks and 1 day of gestation to have her cervical suture removed. The procedure was uncomplicated, with some bleeding controlled with pressure. She continued the follow-up given the SGA foetus. A decision was made for induction of labour (IOL) at 38 weeks and 5 days of gestation. She had one dose of Prostin E2, 1 mg at 11:45. Amniotomy was performed the following day at 12:05 at 4-5 cm with clear liquor, followed by Oxytocin augmentation from 14:25 and a spontaneous vaginal delivery at 17:39. The placenta was delivered at 17:50 with an intact perineum and bilateral labial grazes and estimated blood loss (EBL) was 100 mL. The postpartum stay was uncomplicated, and the patient was discharged on day 2 postpartum. The baby was born as vertex (VTX), occiput anterior (OA), at 38 weeks and 6 days gestation, almost 19 weeks (132 days) after the RCC. This was a baby boy with Apgar scores of 9/10 and 10/10, not requiring any resuscitation. His birthweight was 1810 g, which is less than < the 3rd percentile on the customised growth chart. The baby was admitted to the Special Care Baby Unit (SCABU) and needed nasogastric tube (NGT) feeding, then transitioned to breastfeeding. He was discharged home at 40 weeks and 2 days' gestation equivalent.

Ultrasonographic cervical Figs before and after the cerclage



Fig 1: Pre-cerclage USS Fig, sagittal view of cervix.



Fig 2: Pre-Cerclage USS Fig, transverse view of cervix.



Fig 3: Post-cerclage USS Fig, sagittal view of closed cervix.

Case Number 2

The patient was a 32-year-old, ethnic Indian, G1P0 with blood group B Rh(D) positive. She had no previous cervical pathology and was a never-smoker with a BMI of 27.3 Kg/m². She did not undergo Maternal Serum Screening in the first trimester (MSS1). The patient presented to the hospital at 19 weeks and 6 days' gestation with a history of 2 days of vaginal spotting. An anatomy ultrasound scan (USS) showed cervical funnelling, and a speculum examination revealed an open cervix with membranes bulging into the vagina. Her full blood count (FBC) showed: A Haemoglobin Level (Hb) of 127 g/L, a white blood cell (WBC) count of 12.9x10⁹/L, and neutrophils 9.3x10⁹/L. C-reactive protein (CRP) was 10 mg/L. Cervicovaginal swabs were consistent with bacterial vaginosis (BV) and were negative for Chlamydia and Gonorrhoea. The urine test was unremarkable. The patient was counselled about her options and was keen to consider a Rescue Cervical Cerclage (RCC) procedure. She was not in labour, experiencing significant vaginal bleeding, or showing signs of obvious infection. The procedure was performed under General Anaesthesia (GA) at 20 weeks' gestation. On examination, she was found to have an open cervix to 4 cm with membranes bulging deep into the vagina with cloudy amniotic fluid in the sac indicative of possible early infection (Fig 4). The patient was prepped with Chlorhexidine non-alcoholic solution externally and the upper vagina was washed thoroughly with warm Saline solution. Antibiotic prophylaxis included Cephazolin 2 g IV and Metronidazole 500 mg IV. A Successful McDonald Cerclage was placed using 5 mm Mersilene tape, with the help of the Trendelenburg position and pushing the membranes up into the uterine cavity with a wet sponge on a stick, later digitally. The suture was tied anteriorly at 12 o'clock with about 2.5 cm length of cervix beneath the suture. The procedure was uncomplicated with minimal blood loss. The post-operative management plan included bed rest for 24 hours, the continuation of the IV antibiotics prescribed peri-operatively for 48 hours and the commencement of micronised progesterone (Utrogestan®) 200 mg vaginally from day 1 post-op. The patient was advised to avoid sexual intercourse, strenuous exercise, heavy lifting, swimming and diving throughout the pregnancy. Frequent follow-up in the Antenatal clinic was planned, with the first review at 24 weeks of gestation, and a repeat USS. The patient was informed that in the case of Labour, significant bleeding or Chorioamnionitis, the suture must be cut. Otherwise, the suture was to be removed at 36-37 weeks' gestation. The patient was well post-op and was discharged home on day 2 post-op.

The patient was seen in the antenatal clinic at 24 weeks of gestation and 1 day. Cervical length was 17 mm, with 10 mm of closed cervix above the suture line (Fig 5). The patient was given antenatal steroids at 26 weeks' gestation. She was seen again at 28 weeks and 1 day gestation, with a 16 mm long cervix on USS. The pregnancy was further complicated by gestational diabetes mellitus (GDM), necessitating treatment with insulin. The patient occasionally complained of some pressure feeling and vaginal discharge. She was admitted to the hospital at 31 weeks and 6 days' gestation for prophylactic antenatal Steroids with insulin cover. The patient presented to the hospital at 32 weeks and 4 days' gestation with tightening and preterm premature rupture of membranes (PPROM) with clear liquor at 18:30. The cerclage suture was removed at 19:55. The patient was covered with penicillin, and labour was allowed to proceed. She was 5 cm dilated at 22:10 and proceeded to a spontaneous Vaginal Delivery with Vertex (VTX), Occiput Anterior (OA), at 01:44 with a small first-degree tear not requiring suturing and an

Estimated Blood Loss (EBL) of 100 mL. The placenta was delivered at 01:57 by controlled cord traction (CCT). The post-partum stay was uncomplicated, and the patient was discharged on day 2 post-partum. The baby girl was born well with Apgar scores of 9/10 and 9/10, weighing 1800 g on the 50th percentile for customised growth chart at a gestational age of 32 weeks and 5 days. This was almost 13 weeks, or 89 days, after the RCC. The baby was admitted to the Special Care Baby Unit (SCABU). She did not require resuscitation at birth. The baby had nasogastric tube (NGT) feeding and transitioned well to breastfeeding and bottle feeding. She needed treatment for jaundice and had a tongue tie released. The baby was discharged home at 36 weeks and 3 days' gestation equivalent.

Case number 3

This was a 35 years old, ethnic Indian, G2P1 with a previous uncomplicated spontaneous vaginal delivery at term (38+5 days). Her blood group is B Rh(D) positive, and she was a nonsmoker. She had a low-risk MSS1 and no previous significant medical history or cervical pathology. Her booking BMI was 22 kg/m². The patient presented to the North Shore Hospital at 19 weeks and 5 days gestation after having an anatomy ultrasound scan that showed an open cervix to 3 cm (Figs 6, 7), which was confirmed on speculum examination. FBC showed an Hb of 129 g/L with a WBC count of 12.2x10⁹/L, a Neutrophils count of 8.8x10⁹/L and a CRP of 3 mg/L. Cervicovaginal swabs showed altered vaginal flora and were negative for Chlamydia and Gonorrhoea. Urinalysis was unremarkable, and culture showed a mixed, insignificant growth. The patient was not febrile, had no vaginal bleeding and was not in labour. She was counselled about her options and was keen to consider an RCC procedure. The procedure could not be performed until the following day, so the patient was covered with Amoxicillin 1 g IV q 6 hours and Metronidazole 500 mg IV q 8 hours. The RCC procedure was performed in the afternoon, at 19 weeks and 6 days of gestation. The patient was under GA, was placed in the dorsolithotomy position and prepped with Chlorhexidine non-alcoholic solution externally and warm saline solution internally. Cephazolin 2 g IV was given in addition to the other antibiotics. The membranes were pushed inside the uterus with a wet sponge on a stick and then digitally. A 5mm Mersilene tape on a blunt needle was used. Glycerol Trinitrate (GTN) spray was given sublingually to relax the uterus, and a McDonald cerclage suture was placed with a cervical length beneath the suture of 2.5 cm anteriorly and 2 cm posteriorly. The procedure was uncomplicated and successful with minimal blood loss. The post-op management included relative bed rest for 24 hours and continuing the already prescribed IV antibiotics for 48 hours. Micronised progesterone (Utrogestan®) 200 mg PV was administered from day 1 post-op until 36 weeks' gestation with removal of the suture around 36-37 weeks' gestation. Follow-up included a repeat USS at 24 weeks of gestation. Precautions included avoidance of sexual intercourse, heavy lifting, strenuous exercise, swimming and diving for the remainder of the pregnancy. The post-operative stay was unremarkable, and the patient was discharged on day 2 post-op. The patient was seen in the Antenatal clinic at 21 weeks and 4 days and was well. An USS showed a closed cervix of 14 mm beneath the suture and V-shaped funnelling of the cervix above the suture of 11 mm in length and 5 mm wide (Fig 8). Another scan was done at 24 weeks plus 1 day gestation and 28 weeks' gestation, and cervical length was not measured anymore. The pregnancy continued without any significant complications with a normally grown foetus on serial ultrasound scans. The cervical suture was removed at 36 weeks and 3 days of gestation without any problems or complications. The patient presented in labour to the birthing suite at 00:25 at 38 weeks' gestation with PROM

and clear liquor at 20:00, she was 4-5 cm dilated. She had an Epidural at 02:10. At 3:51, a prolonged bradycardia was noted after an abnormal CTG, and a decision was made for an emergency Caesarean Section (CS). The procedure was uncomplicated with a blood loss of 400 mL. The patient was discharged on day 2 post-op, and she was well. The baby was a boy presenting as vertex (VTX), Occiput posterior/transverse (OP/OT) with Apgar scores of 9/10 and 10/10, not requiring resuscitation, weighing 3010 g (at the 50th percentile for the customised growth chart). The baby was discharged with the mother breastfeeding well. This was 19 weeks and 5 days after the RCC procedure, or otherwise 138 days after the procedure.

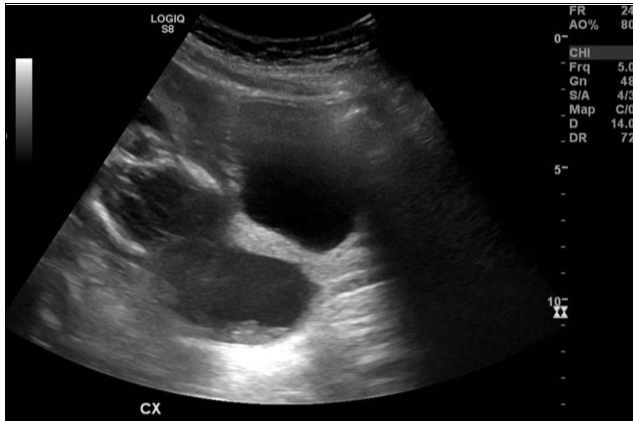


Fig 4: Pre-cerclage USS Fig, sagittal view of open cervix with bulging membranes and echogenic debris in the amniotic fluid.



Fig 5: Post-cerclage USS Fig, sagittal view of closed cervix.



Fig 6: Pre-cerclage USS Fig of open cervix with bulging membranes into the vagina, sagittal view.



Fig 7: Pre-cerclage USS Fig of open cervix, transverse view.



Fig 8: Post-cerclage USS Fig of closed cervix, sagittal view.

Case number 4

This was a 20-year-old, ethnic New Zealand Māori, G1P0 with. Her blood group is O Rh(D) positive. Her booking BMI was 30.4 kg/m². She had no past medical or surgical history of note. She was a smoker and became a vaper during pregnancy. She had a Low-Risk MSS2 (second Trimester screening for aneuploidy), and a normal Nuchal translucency scan with NT=2.2 mm. She had some minor vaginal bleeding at 13 weeks of gestation. She had her anatomy USS at 21 weeks' gestation and was found to have an open cervix; 10 mm at the internal os and 15 mm at the external os (Fig 9). She presented after the USS to the delivery suite, and on further questioning, the patient has been noticing some lower abdominal cramps over the past few weeks, relieved with passing bowel motions. On examination with a sterile speculum, she was found to have an open cervix to 3 cm with bulging membranes into the vagina. Further investigations revealed an FBC with a WBC of 13.8 x10E9/L and a Neutrophil Count of 10.8 x10E9/L/L. CRP was 7.5 mg/L. Cervicovaginal swabs were unremarkable with a negative STI Screen for Chlamydia and Gonorrhoea. Her MSU showed a mixed, insignificant growth. The patient was initially managed expectantly for the first 24 hours. Then, as I were the on-call Consultant the following day, I counselled the patient about considering an RCC since she had no signs of infection, being afebrile with no active bleeding or labour. Under General anaesthesia, at 21 weeks and 1 day gestation, prophylactic antibiotics with Cephazolin 2 g IV and in the Lithotomy position. She was found to have an open cervix as described above. She was prepped with Povidone Iodine solution externally and warm saline solution for the upper vagina. With the help of the Trendelenburg position, an RCC was performed, using the McDonald Technique, with the use of Nylon 1 suture

on a blunt needle. The cervical length after tying the suture was about 2 to 2.5 cm. The post-op plan was for bed rest for 24 hours, Amoxicillin 1 g IV q6 h plus Metronidazole 500 mg IV q 8 hours for 48 hours, with good hydration and Micronised Progesterone (Utrogestan®) 200 mg PV from day 1 post-op. The patient was discharged 2 days later as planned. The patient was advised to avoid intercourse, lifting or pushing heavy objects, strenuous exercises, swimming or diving throughout the pregnancy. The patient presented the following day with some lower abdominal discomfort; she and the foetus were well, investigations were unremarkable, and the patient was reassured and discharged home to continue her Utrogestan®. The patient presented several times thereafter at 23 weeks gestation, at 24 weeks and 1 day gestation, at 24 weeks and 3 days gestation, at 29 weeks and 3 days gestation and 30 weeks and 3 days gestation with the same complaints of lower abdominal discomfort. She was seen by me, reassured and discharged. Because our service would not be able to care for premature babies, the patient was referred to the Regional Tertiary centre in Waikato. The patient was seen at 24 weeks of gestation following her USS done at 23 weeks and 5 days of gestation. This showed a cervical length of 21 mm, which under fundal pressure reduced to 18 mm (Fig 10). I saw the patient again in the antenatal clinic at 27 weeks and 2 days gestation with a scan done at 26 weeks and 6 days gestation showing a cervical length of 15 mm with normal foetal growth and well-being noted. A speculum examination was conducted, and an FFN test was taken, which was faintly positive. A cervical length measurement by me was 21.8 mm without fundal pressure. A high vaginal swab was taken, and this was unremarkable. Antenatal Steroids: Betamethasone 11.4 mg was given over two days as per usual protocol. I have arranged a repeat growth USS at 31-32 weeks, and a planned follow-up thereafter. At this stage, I had to move to another Hospital for another Locum Tenens job. The patient was seen again at 32 weeks' gestation as planned; foetal growth was fine, and the cervical length was 27 mm. All was going well, and there was another scan arranged and a planned removal of the suture at 36 weeks of gestation. At 32 weeks and 6 days of gestation, the patient presented to the unit with decreased foetal movements. She had a short CTG that was reviewed by the midwifery team, and the patient was discharged. She presented again at 33 weeks and 2 days gestation with backache, and no FHR could be heard. An informal USS suspected an IUFD with oligohydramnios. The patient was commenced on Augmentin® 1.2 g IV q 8 hours. A confirmatory formal scan was arranged for the following day. The patient started having painful contractions overnight and was given Terbutaline to make her uterus quiescent until the morning, when she had her formal USS at 9 am, which confirmed the diagnosis. The cervical suture was removed around Midday. Induction of labour commenced with Misoprostol 400 mcg PV at 12:30 pm, followed by Misoprostol PO q3 hours. The patient was established in labour by 3 pm, Epidural Analgesia was given after midnight at 8 cm of dilatation, followed by a spontaneous vaginal delivery (SVD) several hours later at 6:45 am, and an active management of the 3rd stage with an estimated blood loss (EBL) of 300 mL. The postpartum stay was uncomplicated, and the patient was discharged 48 hours later to complete a week-long course of Augmentin® PO. Gestation at delivery was 33 weeks and 4 days gestation; this was 13 weeks and 3 days after the RCC procedure; that is 94 days. This was a stillborn baby boy presenting as VTX, OA, with a birth weight of 2210 g, which is on the 45th percentile on the customised growth chart. The patient declined an autopsy but agreed to the placenta being sent to histopathology, the latter showed acute necrotising funisitis and acute chorioamnionitis. On further multidisciplinary review,

it was concluded that the cause of this sad outcome was that the patient had an unrecognised PPRM with Acute Chorioamnionitis, which eventually led to a severe foetal infection in utero and the foetal demise.

Case number 5

This was 23 years 23-year-old, ethnic New Zealand European, G4P1(-1). She had a previous partial molar pregnancy managed with a D&C, followed by another incomplete miscarriage at 13 weeks and 3 days gestation, also requiring a D&C. At the beginning of this second pregnancy, at 4 weeks of gestation, she had a LLETZ procedure to a depth of 9 mm for a CIN2/3 lesion. Afterwards. Her third pregnancy ended with a very premature delivery at 20 weeks and 1 day with foetal demise a few minutes after birth, attributed to cervical incompetence. This delivery was also complicated by a significant post-partum haemorrhage (PPH) of 1.3 L and required a EUA with gentle curettage in addition to uterotonics. She also had three ORL surgeries for right conductive hearing loss. Her BMI was 23 kg/m² and her blood group is O Rh(D) positive. She has never smoked. This was her fourth pregnancy. She was seen early on in this pregnancy and had a low-risk MSS1 and a prophylactic McDonald Cerclage with a Mersilene tape 5 mm at 12 weeks and 2 days gestation by another colleague. She was seen at 16 weeks and 2 days of gestation for follow-up, and she was well. The patient presented at 21 weeks' gestation with an anatomy USS showing an incompetent cervix despite the cerclage with membranes bulging through the vagina. The cervix was open to 17 mm with an hourglass appearance (Figs 11, 12). On sterile speculum examination, there were bulging membranes through the open cervix with mild watery-like discharge, with the Cerclage suture still in situ. FBC showed an Hb of 120 g/L, a WBC count of 15.2 xE9/L and a Neutrophil count of 11.4 xE9/L. CRP was 4 mg/L. Cervicovaginal swabs showed a normal genital flora with no evidence of Chlamydia and Gonorrhoea. Urinalysis was unremarkable, and urine culture was negative. The patient was afebrile, not bleeding and not in labour. The patient was counselled about a EUA and an RCC procedure, which she agreed to. She was commenced on Amoxicillin 1 g IV q6 hours and Metronidazole 500 mg IV q8 hours. The procedure was performed on the same day in the afternoon and under GA. The patient was placed in the lithotomy position, and there was a significant flow of watery leucorrhoea with concerns about PPRM. An AmniSure test was performed and was assuredly negative. The patient was prepped with a Povidone iodine solution externally and with warm saline irrigation to the deep vagina. With the help of the Trendelenburg position, a McDonald RCC procedure was performed using Nylon 1 on a sharp round suture after pushing the membranes deep into the uterus with wet cotton tip buds and digitally before tying the suture. About 2 cm of cervix was noted beneath the suture, and the knot was made at 12 o'clock. The Mersilene tape suture was left in situ. The procedure was successful. The post-op management plan included relative bed rest for 48 hours, continuation of the IV antibiotics for 48 hours, and the commencement of micronised progesterone (Utrogestan®) 200 mg PV to be started on day 1 post-op. Further usual advice included avoidance of sexual intercourse, heavy lifting, strenuous physical exercise, swimming or diving. All that in addition to close follow-up in the antenatal clinic with the first review at 24 weeks of gestation. The patient was well and was discharged on day 2 post-op.

The patient was reviewed in the antenatal clinic at 24 weeks and 1 day of gestation. She was well and had a scan earlier on the same day showing a closed cervix measuring 31-32 mm with no funnelling on the Valsalva manoeuvre (Fig 13, 14). The patient was seen on the delivery suite two weeks late at 26 weeks and 3

days gestation with a throbbing sensation in the cervix. On a bedside USS, her cervical length was 36 mm. She and her foetus were well. The patient was seen again at 28 weeks' gestation with a normally grown foetus and a cervical length of 30-32 mm. No further cervical length was requested. The patient was seen again at 32 weeks' gestation.

The patient presented to the delivery suite at 33 weeks and 4 days of gestation with PPROM of clear liquor. She was Tocolysed with Nifedipine and given antenatal steroids in addition to oral Erythromycin. Two days later, at 33 weeks and 6 days of gestation, the cervical cerclage sutures were removed, and the patient was managed expectantly on the ward. The patient went into spontaneous labour at 34 weeks and 1 day of gestation. She was covered in labour with benzyl Penicillin for group B streptococcus (GBS) prophylaxis. The patient was fully dilated at 09:15 and delivered the baby at 11:01. This was a VTX, OA, spontaneous vaginal delivery. The placenta was delivered with CCT. EBL was 300 mL. The postpartum stay was unremarkable, and the patient was discharged two days later. The patient delivered 13 weeks and 1 day after the RCC was placed, that is, 92 days after the RCC. The baby was a boy born with Apgar scores of 9/10 and 10/10, not requiring resuscitation, with a weight of 2120 g, which is on the 50th percentile for the customised growth chart. The baby was transferred to the SCABU, needed NGT feeding, and then progressed to breastfeeding. The baby was discharged home at 36 weeks and 1 day of gestation equivalent.

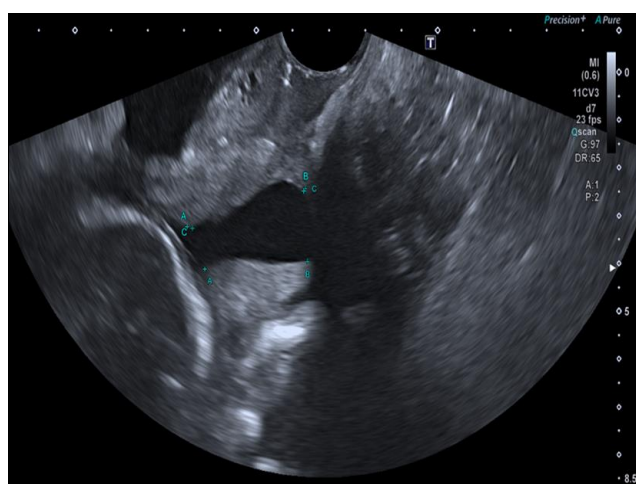


Fig 9: Pre-cerclage USS Fig, sagittal view of open cervix with bulging membranes into the vagina.

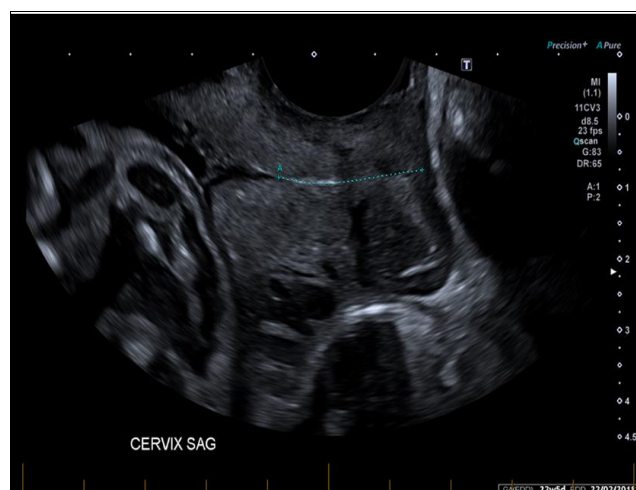


Fig 10: Post-cerclage USS Fig of closed cervix, sagittal view



Fig 11: Pre-cerclage USS Fig of open cervix, sagittal view, with hour-glass appearance of bulging membranes into the vagina.



Fig 12: Pre-cerclage USS Fig of cervix, sagittal view with Valsalva.



Fig 13: Post-cerclage USS Fig of closed cervix, sagittal view.



Fig 14: Post-cerclage Fig of cervix with Valsalva, sagittal view.

Results

Table 1: Characteristics of patients in this study.

Patients	Ethnicity	Age	*BMI s(Kg/m ²)	Smoking status.	Gravidity	Parity	History of Cervical Insult
Case 1	NZ European (**E)	34	19.7	Never smoked	3	2	Nil
Case 2	Indian (#I)	32	27.3	Never smoked	1	0	Nil
Case 3	Indian (#I)	35	22	Never Smoked	2	1	Nil
Case 4	NZ Māori (##M)	20	30.4	Smoker/Vaper	1	0	Nil
Case 5	NZ European (E)	23	23	Never Smoked	4	2 (-1)	Yes
Average	E=40%, I=40%, M=20%	28.8	24.48	1/5 (20%) Smoking	2.2	3/5 (0.6)	1/5 (20%)

*BMI: Body Mass Index. **E: European. #I: Indian. ##M: Māori.

The average age of the patients in this study was 28.8 years. Two patients were New Zealand Europeans, two patients were ethnic Indians, and one patient was New Zealand Māori. The average BMI was 24.48 Kg/m². Only one patient was a smoker/vaper. The average gravidity was 2.2, and parity was

0.6. Only one patient had a history of cervical surgery with a LLETZ procedure, D&C and a previous loss. She was diagnosed with cervical insufficiency and had a prophylactic cervical cerclage at 12 weeks of gestation (See Table 1).

Table 2: Physical examination, laboratory tests, and maximum cervical length post rescue cervical cerclage

Patients	Cervical opening on examination	*WBC xE9/L	Neutrophils xE9/L	**CRP mg/L	Cervico-vaginal Swabs	Urine culture	Maximum Cervical length post-#RCC (mm)
Case 1	2cm (BM)	10.3	7.6	7	Normal	Normal	28
Case 2	4 cm (##BM and cloudy AF)	12.9	9.3	10	Bacterial Vaginosis (^a BV)	Normal	17
Case 3	3cm (BM)	12.2	8.8	3	Altered Flora	Mixed Growth	24
Case 4	3 cm (BM)	13.8	10.8	7.5	Normal	Mixed Growth	27
Case 5	2 cm (BM with Hour-Glass)	15.2	11.4	4	Normal	normal	32
Average	2.8 cm	12.88	9.58	6.3			25.6 mm

*WBC: White Blood Cells. **CRP: C-Reactive Protein. #RCC: Rescue Cervical Cerclage. ##BM: Bulging membranes into the vagina. ^aBV: Bacterial Vaginosis

On average, the cervix was open to 28 mm with bulging membranes into the vagina. Only one patient (case 2) had a cloudy Amniotic Fluid. This patient (case 2) had the shortest cervix post-cerclage, 17 mm, and the lowest time from cerclage placement to delivery, 89 days. She also had the most premature baby of the group, with delivery at 32 weeks and 5 days of gestation. The Average WBC count was 12.88 xE9/L, and the average Neutrophil count was 9.58 xE9/L. The average CRP

value was 6.3 mg/L. Cervicovaginal swabs were negative for Chlamydia and Gonorrhoea in all patients but showed bacterial vaginosis (BV) in one case and an altered vaginal flora in another case. Urine culture was negative for 3 patients and showed mixed, insignificant growth in two other patients. The average cervical length post-Cerclage was 25.6 mm; this measurement included cervical length below and above the suture. (Table 2)

Table 3: Rescue Cerclage and outcome for patients:

Patients	*GA at Diagnosis (Weeks + Days)	*GA at Cerclage (Weeks + Days)	*GA at Cerclage Removal (Weeks + Days)	*GA at Delivery (Weeks + Days)	Mode of Delivery	Extension of pregnancy (Days/ Weeks)	Take home baby *GA Weeks + Days)
Case 1	19 + 6	20	36 + 1	38 + 6	#SVD at Term after ^a IOL	132/ (18+6)	Live, 40 + 2
Case 2	19 + 6	20	32 + 4	32 + 5	#SVD Preterm after ^b PPROM	89/ (12 + 5)	Live, 36 + 3
Case 3	19 + 5	19 + 6	36 + 3	38	##C/S for Foetal Distress	138/ (19 + 5)	Live, 38 + 2
Case 4	21	21 + 1	33 + 3	33 + 4	#SVD, Preterm after ^b PPROM	94 / (13 + 3)	Stillbirth 33 + 4
Case 5	21	21	33 + 6	34 + 1	#SVD Preterm after ^b PPROM	92 / (13 + 1)	Live, 36 + 1
Average	20 + 2	20 + 3	34 + 3	35 + 2	4 #SVD (80%), 1 ##C/S (20%)	109/ (15 + 4)	Live 80%, Stillbirth 20%

*GA= Gestational Age. #SVD=Spontaneous Vaginal Delivery. ##C/S=Caesarean Section. ^aIOL= Induction of Labour. ^bPPROM = Premature Preterm Rupture of Membranes.

The average gestational age at diagnosis of cervical insufficiency was 20 weeks and 2 days, which typically coincides with the timing of the routine anatomy/morphology ultrasound scan. The average gestational age at which the rescue cervical cerclage (RCC) was placed was 20 weeks and 3 days. The Average timing for removal of the cerclage suture was at 34 weeks and 3 days of gestation, and the average time of delivery was 35 weeks and 2 days of gestation. Only one patient required an emergency caesarean section (1/5; 20%) for foetal distress and the four remaining patients had an uncomplicated spontaneous vaginal delivery (SVD). Two patients (40%) were delivered at term, whereas three patients had a preterm delivery beyond 32 weeks of gestation. One patient required an induction of labour (IOL) at term due to concerns about foetal growth restriction (SGA). Sadly, one patient had an intra-uterine foetal

demise (IUF) at 33 weeks and 2 days gestation following a clinically undiagnosed Premature Preterm Rupture of Membranes (PPROM), followed by chorioamnionitis. On average, the RCC procedure prolonged the gestation by 109 days (15 weeks and 4 days). The longest duration was 138 days (19 Weeks and 5 days), and the shortest duration was 89 days (12 weeks and 5 days). In all cases, RCC was successful in bringing the foetus to viability and beyond extreme prematurity. (Table 3)

Discussion

Preterm birth is the leading cause of neonatal morbidity and mortality worldwide and accounts for approximately 12% of all pregnancies [5]. Cervical insufficiency accounts for 20% of miscarriages and extreme preterm deliveries between 16 and 27 weeks of gestation [5]. Cervical incompetence is defined as the

dilation and shortening of the cervix before 37 weeks of gestation, without preterm labour. The incompetent cervix is a well-recognised cause of mid-trimester miscarriage, recurrent pregnancy loss in the mid-trimester and preterm labour presenting with bulging membranes in the absence of significant uterine contractility or rupture of membranes [6], as seen in my five cases. Cervical insufficiency affects 1% of all pregnancies and 8% of women with recurrent mid-trimester losses. The cervix plays a very important role in maintaining pregnancy. It is also a mechanical barrier that prevents exposure and prolapse of foetal membranes, and in combination with the mucous plug, protects against ascending infection [6]. Cervical insufficiency means that the cervix is weak and is unable to remain closed until the date of delivery, manifesting itself in painless softening and shortening of the cervix without contractions [6]. Up to 85% of cervical dry weight is collagen [3].

There is no diagnostic test for cervical insufficiency before pregnancy, although many tests have been reported or are used, such as assessment of the cervical canal width by hysterosalpingogram, assessment of ease of insertion of cervical dilator (size 9 Hegar) without resistance, the force required to withdraw an inflated Foley's catheter through the internal cervical os, the force required to stretch the cervix using an intracervical balloon. None of these meet the criteria for a diagnostic test according to SOGC [3]. Cervical insufficiency is, therefore, a diagnosis of exclusion. In recent practice, transvaginal ultrasonography has emerged as a reliable and reproducible method of cervical assessment, with cervical shortening correlating well with the risk of preterm labour. Ultrasonography findings of possible cervical insufficiency include cervical funnelling, cervical shortening or overt cervical dilatation [3]. The five cases in my study were diagnosed by ultrasonography at the time of the Routine Anatomy Ultrasound Scan (USS) offered to all pregnant women in New Zealand between 18-22 weeks of gestation.

Cervical insufficiency can be either acquired or congenital, with the most prevalent risk factors being obstetrical cervical laceration or caesarean section at full dilatation, [3] trachelectomy, cone biopsy, Loop Electrosurgical Excision (LEEP) or as also known as Large Loop Excision of the Transformation Zone (LLETZ), forced cervical dilatation during a previous uterine evacuation (D&C), impaired embryological development of the Mullerian Ducts (i.e.; Diethylstilbesterol exposure in utero) [3], and maternal connective tissue diseases associated with collagen deficiency like Marfan and Ehler Danlos Syndromes. However, in many cases, like 4 out of my 5 cases, cervical insufficiency/incompetence has no profound aetiology and is characterised as idiopathic [7].

In previous studies patients with cervical dilatation of more than 3 cm and membranes protruding into the vagina were considered high risk for any intervention [1]. In this country, patients would be either offered expectant management with antibiotic coverage and relative bed rest or termination of the pregnancy. Thankfully, over the past decade or so, more rescue cervical cerclage (RCC) procedures have been implemented than in previous decades. Liddiard *et al.*, in 2011, reported on cervical cerclage operations at a tertiary centre in Scotland between 1985 and 2009. They found a significant increase in the number of emergency cerclages performed in the past 4 years. Many studies have reported promising outcomes with RCC, such as that of Abu Hasim *et al.* in 2014 [1]. Since then, the three major Obstetrics and Gynaecology Colleges and FIGO have issued guidelines regarding the appropriateness of offering an RCC procedure. The American College of Obstetricians and

Gynaecologists (ACOG) [8] in 2014, with its practice guideline No. 124, recommends RCC (Physical Examination Indicated Cervical Cerclage) for singleton pregnancies with painless cervical dilatation in the second trimester after excluding uterine activity and intra-amniotic infection before 24 weeks of gestation [7, 8]. The Society of Obstetricians and Gynaecologists of Canada (SGOC) [3], in their clinical guideline No.373 dated February 2019, advises for the consideration of RCC in case of cervical dilatation of 1-4 cm before 24 weeks gestation, with or without foetal membranes exposure after excluding uterine activity or chorioamnionitis, in singleton and twin pregnancy with cervical dilatation more than 1 cm before viability [3, 7]. The Royal College of Obstetricians and Gynaecologists (RCOG) [4] in its green top guideline No. 75 advises individualised decision making up to 27 weeks and 6 days gestation [4, 7]. The International Federation of Gynaecology and Obstetrics [9], in its 2021 good practice guideline, advises considering RCC in cases of cervical shortening and dilatation with foetal membrane exposure before 24 weeks of gestation [7, 9]. In my opinion, it is appropriate to offer this procedure to all patients with cervical dilation and membranes exposure before the age of viability, currently set at 24 completed weeks of gestation. My five RCC procedures in this study were performed from 2015 to 2019.

There are three types of cervical cerclages: The first is the history indicated, performed in asymptomatic women with risk factors in the obstetric or gynaecologic history that increase the risk of preterm birth. This type is usually offered at the beginning of the second trimester. The second type is the ultrasound-indicated cerclage, performed on asymptomatic women with cervical shortening. The third type is the rescue cerclage, where the cervix is already open and the foetal membranes are exposed [9]. The last two types are usually performed any time during the second trimester before foetal viability, which is 24 weeks of gestation [3, 4, 8, 9]. Only the third type is going to be discussed in this study.

Before offering a rescue cervical cerclage (RCC), it is crucial to rule out overt infection, active labour, Premature Preterm Rupture of Membranes (PPROM), active bleeding likely due to an abruption, and foetal abnormalities incompatible with life, as these are absolute contraindications to the procedure [3, 4, 7, 8]. A physical examination including vital signs, cervical assessment, along with additional investigations, such as cervicovaginal swabs, urine examination and culture, and basic blood tests like a full blood count (FBC) and a CRP, are essential. These basic investigations are recommended by the Society of Obstetricians and Gynaecologists of Canada (SGOC) [3]. The Royal College of Obstetricians and Gynaecologists (RCOG) [4] advises that maternal white cell count, and C-Reactive Protein can be used to detect Chorioamnionitis before insertion of an emergency cerclage. The decision to perform these tests should be based on the overall clinical picture, but in the absence of clinical signs of Chorioamnionitis, the decision for emergency cerclage need not be delayed [4]. Any delay in performing the procedure must balance the risk of inserting a suture in a cervix that is inevitably going to continue dilating against the increased risk of ascending infection [4].

After this initial assessment, patients have two options: expectant management or an RCC procedure. Some clinicians advise that before performing an RCC, an amniocentesis should be performed to exclude an intra-amniotic infection and aid in reducing the intra-amniotic pressure [10]. However, there are no randomised studies that confirm the effect of this approach [3]. Data suggests that 80% of cases of acute cervical insufficiency may be associated with intra-amniotic infection [3]. Hence, most

clinicians would be inclined to use broad-spectrum antibiotics perioperatively. Bayrak *et al.* [1] and Shivani *et al.* [2] used broad-spectrum antibiotics, in addition to Indomethacin, an NSAID which inhibits prostaglandin synthesis; these were continued for 24 hours and 3 days, respectively, post-operatively [1, 2]. M. Wierzchowska-Opoka *et al.* noted that previous studies found microorganisms in the amniotic cavity in 8-52% of cases, and some studies recommend the use of broad-spectrum antibiotics like Ceftriaxone, Clarithromycin and Metronidazole [6]. In my five cases, patients received intravenous (IV) Amoxicillin or a Cephalosporin, in addition to Metronidazole, and these were continued for 48 hours post-op. My patients did not receive Indomethacin, only micronised progesterone 200 mg PV starting day 1 post-op. Only my first patient (case 1) received tocolysis in the form of Nifedipine PO as per local protocol. No amniocentesis was offered to rule out an intraamniotic infection; I believed that antibiotic coverage would be enough. Patients were thoroughly counselled about the procedure's risks and benefits, and were made aware that should an infection develop, or active labour ensue, or significant bleeding occur, or if the membranes rupture, the cerclage suture would need to be cut, and miscarriage or premature delivery allowed.

When performing a rescue cervical cerclage (RCC) procedure, the choice between the (Modified) Shirodkar, which involves bladder mobilisation, and the McDonald technique is important. Basbug *et al.* [11] included 47 cases of rescue cerclage, 27 McDonald, and 20 modified Shirodkar procedures, and found that the methods were similar in prolonging pregnancy. The success rates of both techniques in extending pregnancies beyond gestational weeks 28, 32 and 37 did not differ. The McDonald procedure has become more common owing to its easier implementation and relatively lower intra-operative complication rates. What is important is to have a residual cervical length after cerclage of more than 2 cm to effectively prevent preterm labour. The cerclage suture should be as close as possible to the internal cervical os. The Shirodkar procedure is less favoured nowadays by obstetricians due to its additional complications, when compared with the McDonald's procedure, including excessive blood loss, bladder injury and fistula formation [11]. All major medical societies and colleges, ACOG⁸, RCOG [4], SGO [3] and FIGO [9], advise that there is no preferred cerclage technique and the choice should be based on the surgeon's experience. This recommendation was based on a meta-analysis of 277 patients [3, 4, 7, 8, 9]. In my study, all patients were offered the McDonald's cerclage procedure, which I felt more comfortable performing based on my prior surgical experience. I used mostly the 5 mm Mersilene tape with a blunt needle for 3 patients and Nylon 1 for two patients. RCOG [4] guidelines leave the choice of suture material to the discretion of the surgeon [4]. My preference was for the procedure to be performed under General Anaesthesia; four patients agreed to this, and one opted for spinal anaesthesia with the anaesthetist. RCOG [4] guidelines do not favour an anaesthetic method and leave the decision to the anaesthetist and the patient [4].

The complications of Cervical Cerclage in general include sepsis, premature rupture of membranes intraoperatively or postoperatively, premature labour, injury to bladder, cervical dystocia and cervical laceration at delivery if cerclage is not removed in time (11-14%) and haemorrhage [3]. Thankfully, in all my cases, no complications were noted.

The procedure of insertion of an emergency suture is technically difficult. The protruding membranes into the vagina make it challenging to place the cervical suture properly, with the overwhelming risk of iatrogenically rupturing the membranes

and losing the pregnancy that we aim to save. Placing the rescue suture requires a slightly different approach from the standard procedure. To avoid PPROM, the foetal membranes should be lifted above the planned suture site. Some clinicians have found that filling the bladder with warm saline solution and placing the patient in the Trendelenburg position are effective in draining the prolapsed foetal membranes by lifting them [6]. Debby *et al.* suggest inserting a catheter balloon into the dilated cervix, filling it with 30 mL of saline and then withdrawing the catheter before tying the suture [6]. Son *et al.* suggest the use of a special uniconcave balloon. This balloon appears convenient for the operator, but the results were disappointing [6]. A. Kesrouani *et al.* [12] suggest the use of a Foley's catheter with suturing the distal end of the catheter a few centimetres proximally with Silk 2/0 thread to maintain the balloon at the distal position, therefore avoiding any undue trauma with the tip of the catheter to the membranes [12]. In my cases, I managed to push the prolapsed foetal membranes into the lower uterine cavity with the use of saline wet sterile Jambo cotton tips or a wet gauze swab on a stick. This was facilitated by the patients being fully relaxed under general anaesthesia and using the Trendelenburg position. Another important issue was avoiding antiseptic use in contact with the prolapsed membranes. Only the lower part of the vagina was prepped with either Chlorhexidine non-alcoholic solution or Povidone Iodine aqueous solution. The upper part of the vagina, cervix, and membranes were irrigated thoroughly with warm saline solution to avoid chemical irritation and fragilization of the membranes. This has not been mentioned in any of the studies I reviewed. Moreover, I did not insert any occlusion suture in addition to the cerclage suture, as there is no evidence to support this practice [4].

Is there a role for adjuvant progesterone supplementation in cases of rescue cervical cerclages (RCCs)? Progesterone is the pro-gestation/pro-pregnancy hormone. The proposed mechanisms of action of progesterone include regulating the expression of progesterone receptors in the myometrium and cervix, directly regulating the expression of key contraction-associated genes, including the oxytocin receptor. Progesterone interferes with cortisol-mediated regulation of placental gene expression, the most important of which is placental Corticotropin-Releasing Hormone (CRH), which has been implicated as the "placental clock" regulating the timing of labour. Progesterone blocks proinflammatory cytokine-induced apoptosis within the foetal membranes, thereby preventing PPROM and subsequent preterm birth [13]. Although no robust studies show a significant improvement in outcomes with adjuvant progesterone treatment [3, 4, 7, 8], a systematic review and meta-analysis are being designed to investigate this [14]. Most guidelines recommend the use of progesterone treatment with cervical shortening and a previous preterm birth. The best route of progesterone application is the transvaginal route. The intramuscular injection of 17-OHP-C in a double-blind, placebo-controlled international trial did not decrease recurrent preterm birth <35 weeks of gestation [15]. In another study S. Shor *et al.*, [16] showed that combination rescue therapy for patients with a short cervix, including cervical cerclage, vaginal progesterone and Arabin cervical pessary, was effective, prolonging pregnancies and safely bringing them to term. Of note is that in this study, none of the cases had an overtly dilated cervix and exposed foetal membranes [16]. A.R. Roman *et al.*, [17] in their study, which included 66 patients with a shortening cervix despite a cerclage being placed, noted that half of those patients received Cerclage and Progesterone, and half received Cerclage only. Patients were followed up with transvaginal

ultrasonography for cervical length surveillance. Progesterone was also administered to those with ongoing shortening of the cervix despite the cerclage. This was found to significantly prolong the pregnancy (to 36.36 weeks/ birthweight 2829 g compared to 32.63 weeks/birthweight 2134 g; $p=0.0036/p=0.0065$) for those treated with cerclage alone, despite both groups having a significantly shortened cervix and cervical cerclage in situ [17]. All my patients in this study received 200 mg of micronised progesterone (Utrogestan®) per vaginum (PV) from day 1 post-op until 36 weeks of gestation or delivery, if it happens before then. My rationale for using progesterone was that in such rescue cases, all that is physiologically beneficial ought to be used to give the pregnancy the best chance to continue to viability. Even in elective cerclages, I also recommend the use of adjuvant Progesterone. Moreover, I have used micronised progesterone in cases with a shortening cervix and a cerclage in situ with good effect, as seen in the above study [17]. However, I have no experience with the use of Arabin pessaries.

My patients were considered high-risk antenatal patients and were followed in antenatal specialist clinics with serial growth scans and cervical measurements until around 28 weeks of gestation. Serial Ultrasound scans showed a lengthening of the cervix following the rescue cervical cerclage (RCC) procedure; that is, the cervix closing above the suture plane. This was also noted in other studies [3, 4, 7] and is not fully understood. Patients were advised to avoid strenuous physical activities, lifting heavy objects, sexual intercourse and swimming. These were based on expert opinion, rather than studies. I am aware that RCOG⁴ advises against routine abstinence after cerclage, but I would still insist on abstinence for all patients with cerclage, especially those with rescue cerclages. Anecdotally, a recently managed patient with an RCC, not included in this study, who refused to heed my advice on stopping sexual intercourse and presented after sex with profuse bleeding, necessitating the removal of the suture, which led to the loss of the pregnancy, consolidates this opinion of mine.

How effective are rescue cervical cerclages (RCCs), and are there predictors or prognostic factors that would determine outcomes? E. M. Jalal *et al.* [18] found in their study that for each day after the non-elective cerclage, the odds of reaching a gestational age > 28 weeks increased by 6%. Berghella *et al.* concluded in their study that the risk of preterm birth is decreased by 6% with every additional millimetre in cervical length [17]. This information can be used to counsel and reassure patients [18]. For H. Kobayashi *et al.* [19] three risk factors predicted spontaneous preterm birth before 34 weeks of gestation after emergency cerclage without the use of adjuvant vaginal progesterone: an unmeasurable cervical length (CL=0), a previous history of a preterm birth and the presence of sludge in the amniotic fluid on ultrasound. Spontaneous preterm births occurred in 16% of patients, which is comparable to the recent data [18]. My patient (case 2) would relate well to this as she was the only patient who had sludge in the Amniotic Fluid, and she was the only patient who delivered at 32 weeks of gestation.

Fuchs *et al.* used a multivariate logistic regression method to develop a score for assessing the risk of early preterm delivery before 32 weeks of gestation for patients receiving a rescue cerclage. The score ranges from 0-15 points based on the following four criteria independently associated with early preterm delivery: obstetric history, cervical dilatation, membranes bulging into the vagina and infection. The authors found that a history of second-trimester loss, nulliparity, a cervix dilated more than 4 cm, membranes bulging into the vagina and

infection with $WBC \geq 13,600 \text{ mm}^3$, and a $CRP > 15 \text{ mg/L}$, were associated with emergency suture failure [6]. Ito *et al.* noted that CRP levels of $\geq 4 \text{ mg/L}$ and $WBC \geq 10,000 \text{ mm}^3$ were associated with a significantly reduced delivery beyond 28 weeks of gestation [6]. In my study, the average WBC count was $12.88 \times 10^9/\text{L}$ ($12,800 \text{ mm}^3$), and the average CRP value was 6.3 mg/L . The average gestational age at delivery was 35 weeks and 2 days. Perioperative antibiotic coverage may have played a role in treating a possible subclinical infection and thereby led to the prolongation of the pregnancy.

Park K H *et al.* [20] conducted a retrospective study on 65 singleton pregnancies undergoing rescue cerclages and were subjected to amniocentesis with measurement of En-RAGE, IL-6, IL-8, IP-10 as inflammatory mediators and Kallistatin, MMP-2/8 and uPA as extracellular matrix remodelling-related molecules were assayed. The authors found that intraamniotic inflammation with IL-6 levels of $\geq 2, 6 \text{ ng/mL}$ was independently associated with spontaneous preterm birth after cerclage placement. The odds of spontaneous preterm delivery increased significantly with each increasing quartile of the baseline level of each inflammatory marker [20]. D.M Diago Mudoz *et al.* [21], found that patients who underwent a rescue cerclage with vaginal Interleukin-6 (IL-6) < 61.4 pg/L (collected from the vaginal fornix with a cotton tip swab over 30 seconds) had a longer latency time between diagnosis and delivery and could be considered below the above value to be the best predictor of pregnancy outcome. IL-6 is a major pro-inflammatory cytokine released in response to a bacterial infection and is better measured in the amniotic fluid via amniocentesis. Nonetheless, there is a correlation between the amniotic fluid level and vaginal levels. Intra-amniotic IL-6 > 2600 pg/L predicts a short latency interval between cerclage and delivery. Intra-amniotic inflammation is defined by IL-6 > 2.5 ng/L [21].

S. Y. Kim *et al.* [22] looked at various novel maternal plasma mediators of immune regulation associated with inflammation, which could independently predict the clinical outcomes of rescue cerclages. Using a multivariate Firth's logistic regression analysis revealed that high levels of IGFBP-3 (Insulin-like Growth Factor Binding Protein 3) and S100A8/A9 (S100 Calcium Binding Protein A8/A9 complex) and low levels of MIP-1 α (Macrophage Inflammatory Protein 1 α) were significantly associated with spontaneous preterm birth ≤ 28 weeks of gestation. Whereas only low levels of MIP-1 α were significantly associated with spontaneous preterm birth ≤ 34 weeks of gestation. These tests could be used as non-invasive biomarkers to identify women at high risk of preterm labour following a rescue cerclage and to counsel them before the procedure [22].

The most important risk factors for failure of the RCC are advanced cervical dilatation of more than 4-5 cm with significant effacement and bulging of membranes into the cervix. Multiple pregnancy is also a risk factor for a failed procedure. RCC can be an alternative treatment only for selected patients with twin pregnancies with advanced dilatation and exposed foetal membranes [6]. SOGC³ advises, based on a retrospective study showing a reduction in preterm delivery and perinatal mortality in twin pregnancy, that an emergency or RCC with dilated cervix may be considered before viability [3, 7]. SOGC³ advises against elective cerclage in twins with a shortened cervix < 25 mm, as this might increase the risk of preterm birth.

Is expectant, bed rest management of cervical insufficiency with exposed membranes a worthwhile option? Due to ethical

reasons, most data concerning the effectiveness of emergency Rescue Cervical Cerclage (RCC) comes from retrospective analysis, mainly because we cannot randomise patients into having RCC or expectant management. Therefore, each retrospective study regarding this matter seems valuable [6]; hence, this contribution of mine with these five cases. M. Bayrak *et al.* [1] compared patients who had a rescue cerclage versus those who had conservative management and noted that the take-home baby rate was 63% in the cerclage group and 0% in the conservative management group. The pregnancy prolongation was 64 days versus 13.5 days, respectively [1, 6]. Many other studies compared the effectiveness of the RCC to patients who refused it and opted for conservative bed-rest management. These studies have observed significant benefits of the rescue cerclage procedure [6]. A Meta-analysis by Christos Chatzakis and co-authors published in 2020 showed that operative management versus conservative management led to pregnancy prolongation (by an average of 47 days), older gestational age at delivery (with a difference of 5 weeks), lower risk of neonatal hospitalisation in the intensive care unit and lower foetal mortality [6]. RCOG [4] mentions that emergency cerclage may delay birth by approximately 34 days in suitable cases. G. Turkyilmaz and O. Karaaslan showed a 47.3-day prolongation of pregnancy and 65% neonatal survival.²³ Ehsaniport *et al.* reviewed 10 studies that included 757 patients, 64% underwent RCC, and 36% were expectantly managed. They found that an RCC was associated with increased neonatal survival (71% versus 43%) [23]. Ciancimino *et al.* showed that for their 12 patients undergoing RCC, pregnancy was extended by an average of 89.9 days, and neonatal survival was 83.3% [6]. Namouz *et al.* reviewed 34 studies including 994 cases of RCCs. They found the mean prolongation of pregnancy to be 61 days and mean gestational age at delivery of 30 weeks of gestation, with a live birth rate of 84.8% and neonatal survival of 80.6%. They therefore suggested that rescue cerclage is associated with a longer latency period and better outcomes compared to bed rest [6]. In another paper, there was an increased treatment-to-delivery interval by 10 weeks [24]. My study showed a medium prolongation of pregnancy of 109 days, that is, about 15 weeks and 4 days. The longest duration was 138 days (19 weeks plus 5 days), and the shortest duration was 89 days (12 weeks and 5 days). For all cases, RCC was successful in bringing the foetus to viability and beyond extreme prematurity. In my opinion, all five pregnancies would have been lost without the RCC procedure.

Is there a place for a repeat rescue cervical cerclage (RCC) procedure after a previous failed transvaginal or trans-abdominal procedure? P. Ru *et al.* [25] studied retrospectively 55 singleton pregnancies with probable rescue cerclage failure in Shanghai, China. Nine patients had protruding membranes beneath the suture line, and the others had painless cervical dilatation detected on monitoring ultrasonography. All patients had a repeat RCC procedure. Their Study showed that the median Gestational Age (GA) at delivery was 31.3 weeks, and the neonatal survival rate was 72.7%. They concluded that repeat cerclage may be a valuable option for such patients [25]. T. Cok [26] reported three cases of vaginal rescue cerclages using the Shirodkar technique that were performed for ongoing cervical funnelling despite a Laparoscopically placed abdominal cerclage with all patients delivering at 38 weeks' gestation [26]. Case number 5 in my study was a repeat RCC at 21 weeks of gestation. I think that patients who have an apparent cervical cerclage failure should be offered a rescue procedure if no contraindications are present, namely active labour, PPRM,

active bleeding or infection.

Are Ultrasound monitoring of cervical length and foetal fibronectin testing (fFN 10Q), which has now been discontinued, or the other tests that replaced it, PartoSure (Placental Alpha-Microglobulin-1; PAMG-1), or ActimPartus (Phosphorylated IGF-BP-1; pHIGFBP-1) useful following the insertion of a rescue cervical cerclage (RCC)? Ultrasonographic monitoring of cervical length was important at least until 28 weeks of gestation for my five cases, who were managed in secondary hospitals with no NICU to care for significant prematurity. Most local guidelines recommend cervical length measurements fortnightly up to 24 weeks of gestation for all patients with cervical insufficiency with or without a cerclage suture in situ. Foetal fibronectin testing may be an adjunct for reassurance and for guiding the administration of prophylactic antenatal steroids (Betamethasone). Three of my patients had antenatal steroids, and one of them was based on a faintly positive fFN test. I do, though, agree with RCOG [4] that routine fFN testing is not usually recommended post-cerclage and that this test or its replacements may provide reassurance to patients and clinicians in RCC cases.

Finally, what is of utmost importance is to recognise that patients with RCC procedures are high-risk obstetrical patients and their care should always be under a specialist obstetrician and gynaecologist or a maternal-foetal medicine (MFM) specialist. Sadly, my foetal loss in this series (case 4) was a missed diagnosis of PPRM, which led to Chorioamnionitis and subsequent IUFD. A timely consultation with a senior Obstetrician could have potentially averted this.

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Addendum: I do not have any conflicts of interest to declare. In the final proofing of this study, I have used Microsoft Copilot to check for spelling or grammatical errors. I have also used ChatGPT to recheck my calculations.

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