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Archives of Obstetrics and Gynaecology Case Series

Cerclage Related Complications after Trachelectomy: A Retrospective Case Series

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Abstract

Purpose: Cerclage related complications in patients after trachelectomy are rare, but can have an immense effect on fertility and obstetric outcomes. We aim to report on cerclage related complications after trachelectomy and to increase awareness and develop preventive strategies.

Methods: Retrospective case series from 2006-2021 in a single tertiary referral center, including patients who experienced cerclage related complications after vaginal or abdominal trachelectomy because of early-stage cervical cancer.

Results: Ten patients suffered from cerclage related complications after trachelectomy. The cerclage position was examined by transvaginal ultrasound. Cerclages were displaced after (i) trachelectomy (n=6), (ii) cesarean section following trachelectomy (n=2) and (iii) trachelectomy and cesarean section, complicated by a uterine niche (n=2). Five patients were pregnant at diagnosis of cerclage displacement: four patients presented with preterm prelabor rupture of the membranes (PPROM) in the second trimester and one patient underwent trachelectomy in the late first trimester, complicated by an intrauterine infection and cerclage migration to the vagina. All five pregnancies were terminated because of intrauterine infection and/or poor fetal prognosis after removal of the dislocated cerclage. Cerclages were removed vaginally (n=7), hysteroscopically (n=2) or laparoscopically (n=1). Five patients were not pregnant at diagnosis of cerclage displacement: three patients presented with gynecological symptoms and two patients presented with subfertility with the cerclage located in the uterine niche.

Two patients conceived without a new cerclage, both suffered from PPROM and second trimester fetal loss. A new cerclage was placed laparoscopically in nine patients. Seven patients conceived: five ongoing pregnancies resulted in a cesarean section at a mean gestation age of 37+ weeks, two patients experienced a spontaneous first trimester miscarriage after which they conceived again; one is currently in the first trimester and one is currently in the third trimester of pregnancy.

Conclusion: In this retrospective case series dislocated cerclages may result in poor fertility and obstetric outcomes. Dislocation might be related to a subsequent cesarean section. New laparoscopic cerclage placement resulted in favorable fertility and obstetric outcomes. We recommend to evaluate cerclage position prior to pregnancy or fertility treatment in patients after trachelectomy. This may prevent impaired fertility and obstetric complications.

Keywords: Cerclage migration, Dislocated cerclage, Laparoscopic abdominal cerclage, Permanent cerclage, Trachelectomy

Abbreviations: PPROM: Preterm Prelabor Rupture of the Membranes; IVF: *In Vitro* Fertilization; RAT: Radical Abdominal Trachelectomy; RVT: Radical Vaginal Trachelectomy

Introduction

Active cervical cancer screening in developed countries has resulted in increased early-stage diagnosis of cervical cancer in young women with a strong desire to preserve reproductive function [1]. For this purpose, simple vaginal

trachelectomy for stages 1A1-1A2 and radical vaginal trachelectomy (RVT) for node-negative stage IB1 with tumors <2 centimeters are usually performed with pelvic lymphadenectomy. Radical abdominal trachelectomy (RAT) with pelvic lymphadenectomy can be performed for stage IB2 (FIGO 2018) tumors [2].

It is common practice to place a permanent cerclage during trachelectomy [3] to offer mechanical support to the cervix and possibly prevent ascending infections, which are thought to initiate the inflammatory cascade that plays a key role in preterm prelabor rupture of the membranes (PPROM) and onset of preterm labor [4]. As a tertiary referral center, we observed fertility and obstetric complications in patients after trachelectomy that may be related to cerclage displacement. Although cerclage related complications seem rare, the effect on adverse fertility and obstetric outcomes is profound. We therefore believe this information is relevant to develop preventive strategies for these problems. The aim of this study is to summarize the results of these complicated cases in order to search for underlying causes that possibly could be prevented or detected earlier.

Materials and Methods

Patient data regarding dislocated cerclages and related complications were collected retrospectively from 2006 to 2021 in a single tertiary referral center. The Medical Ethical Committee concluded that the Medical Research Involving Human Subjects Act (WMO) did not apply and the requirement to obtain informed consent was waived.

Theory and Calculation

The uterine cervix plays an important role in preventing spontaneous preterm birth. It not only provides mechanical support to retain the pregnancy to term, but it also functions as a barrier against intrauterine infections [5,6]. A pregnancy after trachelectomy is therefore at increased risk for ascending infections and chorioamnionitis, PPROM, second trimester fetal loss and preterm birth [7], which could be prevented by placing a permanent cerclage during trachelectomy.

The lifespan of a permanent cerclage is unknown. It is suggested that increased intra-abdominal forces on a cerclage through one or more pregnancies may accelerate the rate of erosion [8]. Most reports examine the index pregnancy following a permanent cerclage only [9,10]. Long-term data on permanent cerclages, such as second or third pregnancy outcomes or complications are rare. Only one study shows 95-100% neonatal survival in 22 patients with a second or third pregnancy with the laparoscopic cerclage left *in situ* [11]. Known long-term cerclage related complications such as suture erosion, migration and fistulae are rare and have been scarcely reported [12].

Results

Mean age of patients was 33.1 years at time of referral. Prior fertility preserving vaginal or abdominal trachelectomy with permanent cerclage was performed in different tertiary hospitals in the Netherlands. None of the patients had ultrasound examination of the cerclage location before or during pregnancy.

In six pregnant patients (patient A, B, C, D, E, F) the cerclage was displaced after trachelectomy. Patient A, B and C presented with PPROM in the second trimester of pregnancy and upon ultrasound evaluation the cerclage was dislocated. These pregnancies were terminated, because of signs of intrauterine infection and/or poor fetal prognosis. The dislocated cerclages were removed vaginally.

In patient A it was not possible to deliver the fetus vaginally, due to a rigid neo-cervix and little dilation, despite further dilating and opening the posterior part of the neo-cervix, and instrumental delivery. A cesarean section had to be performed. A laparoscopic cerclage was placed two years later and her next pregnancy resulted in a cesarean section at term.

In patient B the cerclage was remarkably low and could not be completely identified around the neo-cervix (Figure 1A). The cerclage was cut through vaginally at the level of the internal cervical ostium and she delivered after administration of Misoprostol. A new laparoscopic cerclage was placed six months later at the level of the uterine vessels (Figure 1B). A small part of the old cerclage located at approximately 1.5 centimeters below the insertion of the uterine vessels was visible during laparoscopy. All patients were advised to await postoperative examination two months after surgery before attempting to conceive. Ultrasound examination showed a well-positioned cerclage (Figures 2 and 3A). She conceived within a month, but had a spontaneous first trimester miscarriage. She conceived again within two months and at the time of writing is in the third trimester of pregnancy. In patient C the cerclage was positioned around the left posterior part of the neo-cervix only (Figures 3B and 4) and was removed vaginally because of contractions. She delivered after administration of Misoprostol and a new laparoscopic cerclage was not placed because she has no desire to become pregnant yet.

Two patients (D and E) presented with gynecologic symptoms. Patient D presented with postcoital bleeding. At inspection of the cervix the cerclage was migrated to the vagina. An MRI confirmed the dislocation and it was removed vaginally. We laparoscopically placed a cerclage two years later and she conceived ten months later. Her

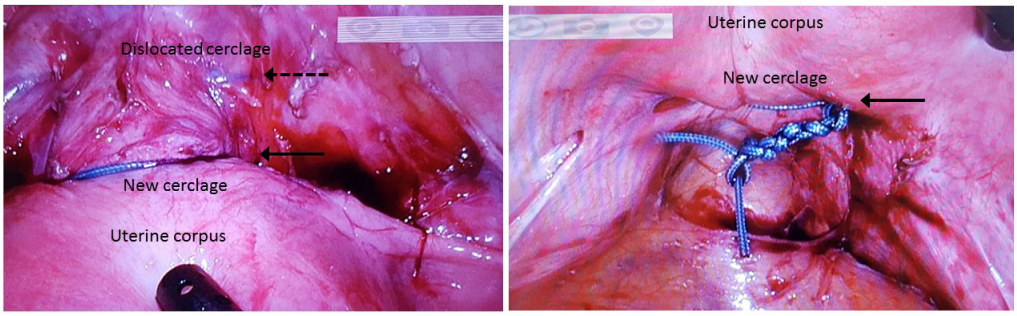

Figure 1: Peri-operative aspect of correctly placed and dislocated cerclage. A) Anterior view after laparoscopic placement of the new cerclage. The arrow points toward the new cerclage. The interrupted arrow points toward the small part of the old displaced cerclage, which is located approximately 1.5 centimeters below the level of the uterine vessels. **B)** Posterior view after laparoscopic placement of the new cerclage with the knot tied posteriorly. The arrow points toward the new cerclage.

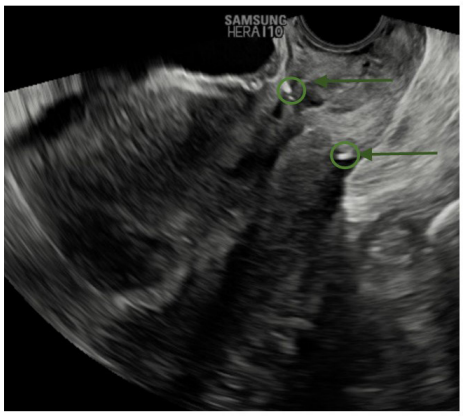

Figure 2: Two- and three-dimensional ultrasound examination of normal position of the cerclage. A) Two-dimensional mid-sagittal view of cerclage. Green arrows point towards the outer contours of the cerclage which completely surround the neo-cervix. **B)** Two-dimensional sagittal and transverse video clip of normal position of cerclage. **C)** Three-dimensional video clip of normal position of the cerclage.

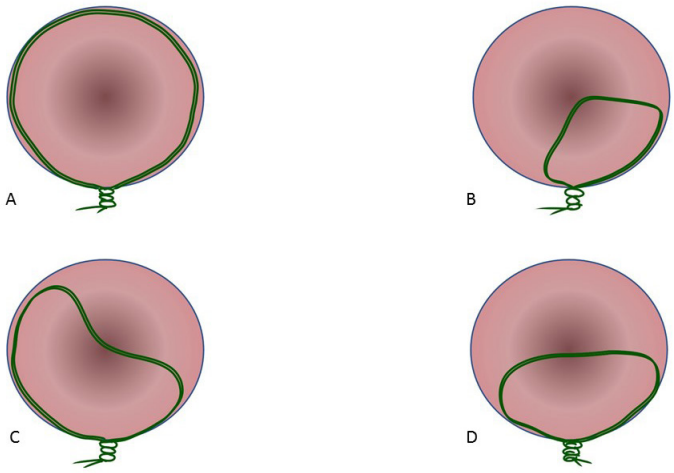

Figure 3: Transverse view of the neo-cervix with normal and abnormal position of the cerclage. A) normal position of the cerclage **B)** cerclage around the left posterior part of the neo-cervix only **C)** cerclage migrated to cervical canal **D)** cerclage around the posterior part of the neo-cervix only.

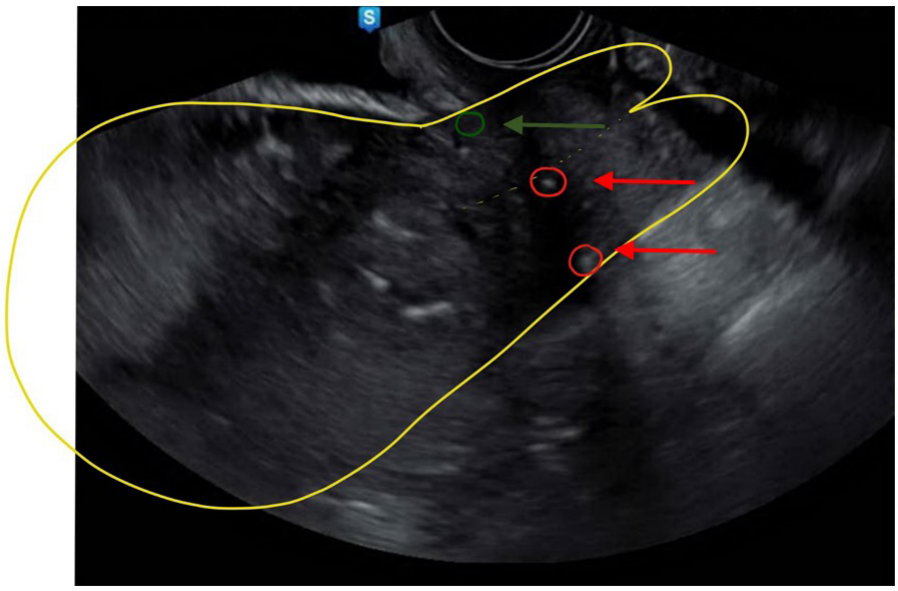

Figure 4: Two-dimensional ultrasound examination of abnormal position of the cerclage. Yellow line outlines the outer uterine contour. Red circles indicate the position of the cerclage around the posterior neo-cervix only. Green circle indicates the position where the cerclage should be expected in case of a normal position.

pregnancy was uncomplicated with at term cesarean section.

Patient E presented with constipation and recurrent cystitis two years after trachelectomy. Ultrasound showed displacement of the cerclage and it was removed laparoscopically in another hospital, without placement of a new cerclage. She did not become pregnant after two *in vitro* fertilization (IVF) treatments and was referred. We decided to first place a new laparoscopic cerclage before starting her third IVF treatment. To date, she did not conceive yet.

Patient F underwent a trachelectomy at 12+2 weeks of gestation. She suffered from intrauterine infection and the cerclage was migrated to the vagina (Figure 3C). It was removed vaginally and a curettage was performed. We laparoscopically placed a cerclage one year later, but she did not conceive. She had one IVF cycle after which fertility treatment ended because of poor ovarian response. She suffered from abdominal pain, dysmenorrhea and hematometra based on cervical stenosis. Cervical dilatation did not succeed because of severe pain. Five years after cerclage placement, a hysterectomy was performed with good results concerning her abdominal pain.

Two patients (G and H) suffered from cerclage displacement after cesarean section following trachelectomy. Patient G presented with intermenstrual blood loss. Ultrasound examination showed that the cerclage was located around the posterior part of the neo-cervix only (Figure 3D). An MRI could not determine the precise location of the cerclage. After consultation with her oncological referral center, it was decided not to intervene, based on the rationale that there would be enough fibrosis to maintain a future pregnancy. Her next pregnancy was complicated by PPROM at 20 weeks of gestation. The pregnancy was terminated because of intrauterine infection signs and poor fetal prognosis. The cerclage was removed vaginally and she delivered after administration of Misoprostol. Five months later we laparoscopically placed a cerclage. We observed a thin anterior uterine wall possibly due to previous migration of the cerclage through the anterior part of the cervix. We placed additional sutures during laparoscopy to restore the integrity of the anterior uterine wall before placement of the cerclage. She conceived one year later by IVF. This pregnancy was complicated by PPROM at 33+4 weeks of gestation. A cesarean section was performed two days later, because of contractions and intrauterine infection signs. During cesarean section the cerclage was correctly positioned and left in place.

In patient H the abdominal cerclage was removed vaginally in another hospital six weeks after her second cesarean section, because of abdominal and vaginal complaints based on a displaced cerclage, which protruded into the vagina. She was referred for a new laparoscopic cerclage while she was 10 weeks pregnant. Laparoscopy was performed at 12 weeks of gestation, but was converted to laparotomy because of extensive adhesions due to the trachelectomy combined with deep endometriosis resulting in poor visualization of the uterine arteries at the

posterior site. Her pregnancy was uncomplicated and an at term cesarean section was performed.

Two patients (I and J) were referred because of a uterine niche, secondary subfertility and unsuccessful fertility treatments after trachelectomy and cesarean section. Ultrasound showed that the cerclage was partly positioned in the uterine niche in patient I. Office hysteroscopy confirmed the dislocation and the cerclage was cut and the visible part removed. Her oncological referral center advised not to place a new cerclage. She conceived naturally within two months after surgery, but at 16 weeks of gestation membranes ruptured. The pregnancy was terminated. She was again referred for consultation about a laparoscopic cerclage. Ultrasound examination showed a small uterine niche with thick residual myometrium of 8.9 millimeters. After four months we laparoscopically placed a cerclage after extensive adhesiolysis, but without niche repair given the thick residual myometrium. Two months post-surgery ultrasound showed a well-positioned cerclage. She conceived two months later after intrauterine inseminations, but suffered from premature contractions with funneling through the cerclage at 26+1 weeks of gestation. Without additional complications, a cesarean section was performed at term.

In patient J ultrasound and office hysteroscopy showed that the cerclage was positioned in the uterine niche towards the cervical canal (Figures 5 and 6). The displaced cerclage was removed hysteroscopically and we laparoscopically placed the cerclage under hysteroscopic guidance. Upon bladder dissection to create a window for placement of the new cerclage, the uterine niche was opened, resected and the new cerclage was placed superior to its wound bed (Figure 7). She conceived after the first embryo transfer after removal of the displaced cerclage, but this pregnancy ended in a spontaneous first trimester miscarriage. Her next embryo transfer resulted in a pregnancy and she is currently in the first trimester of pregnancy. For details see Table 1 and Table 2.

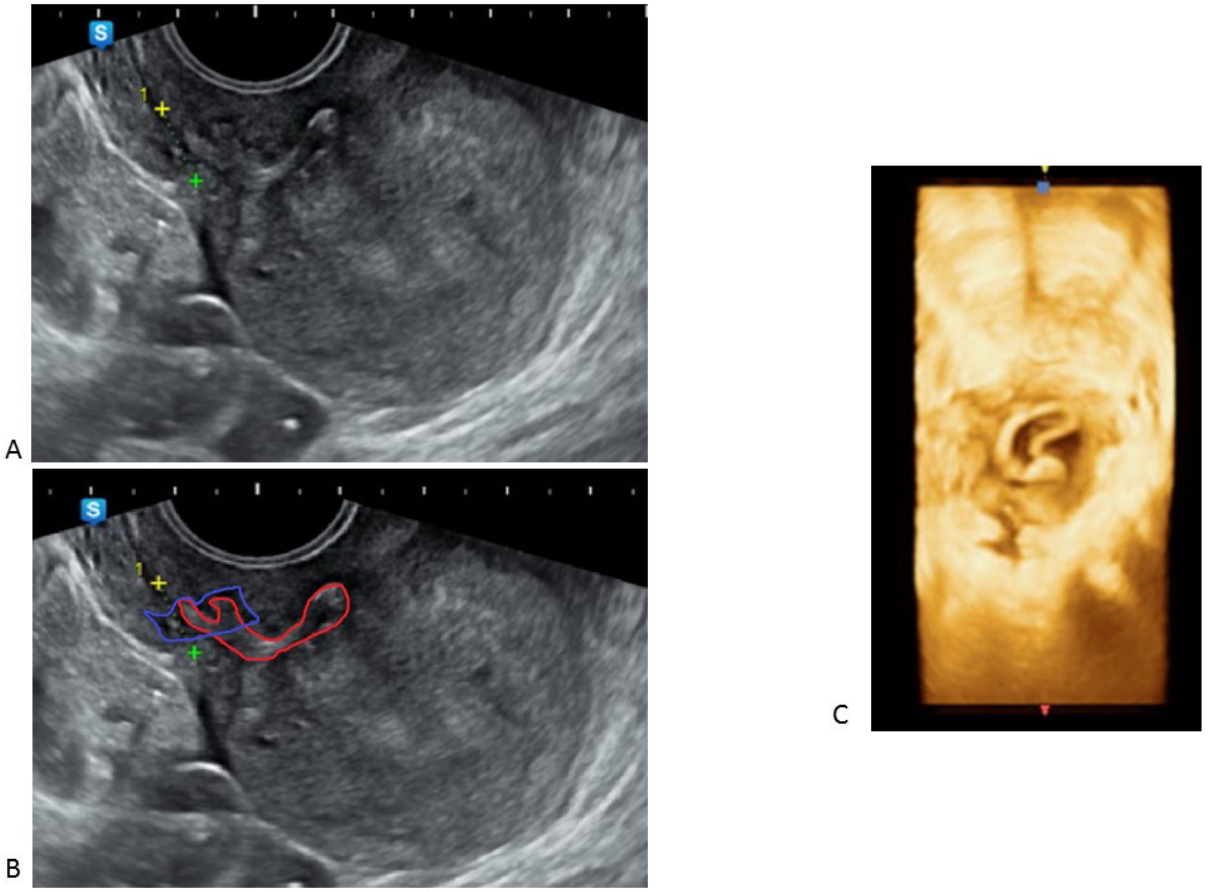

Figure 5: Two- and three-dimensional ultrasound examination of abnormal cerclage in uterine niche. A) Two-dimensional mid-sagittal view of cerclage in uterine niche and cervical canal. **B)** Red line outlines the dislocated cerclage, blue line outlines the uterine niche. **C)** Three-dimensional view of cerclage in uterine niche and cervical canal.

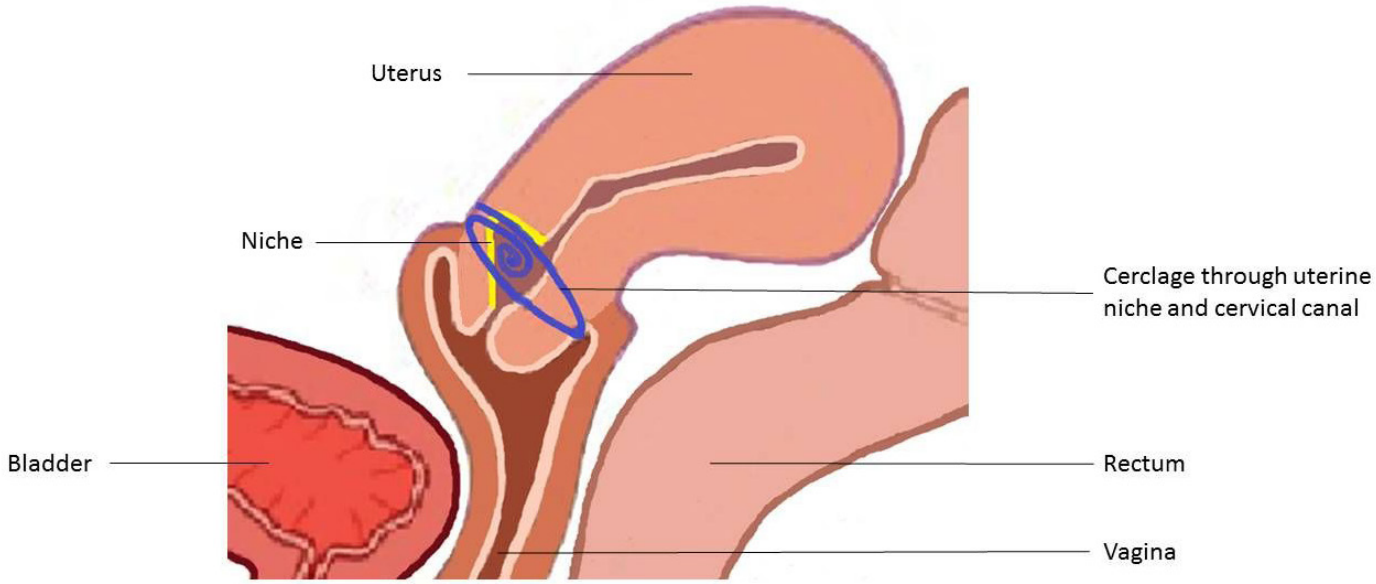

Figure 6: Mid-sagittal view of neo-cervix with cerclage in uterine niche. The niche is outlined in yellow, the dislocated cerclage in blue.

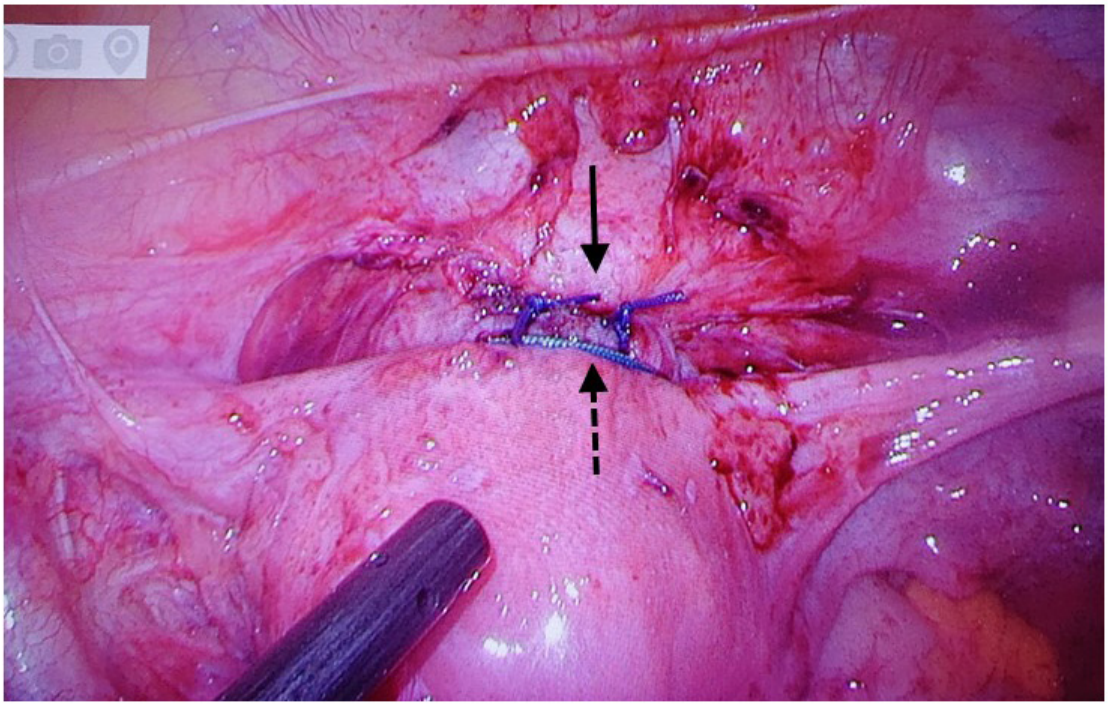

Figure 7: Peri-operative aspect of cerclage after uterine niche resection. The arrow points towards the sutures of the niche resection. The interrupted arrow indicates the cerclage, which is positioned superior the niche wound bed.

Table 1: Obstetric, surgical and cerclage characteristics in patients with fertility sparing surgery for cervical cancer.

Patient	Age	Obstetric history prior to trachelectomy	Method of conception before trachelectomy	FIGO classification	Fertility sparing surgery for cervical cancer	Obstetric outcomes after trachelectomy	Cerclage related complication	Surgical approach of cerclage removal
A, 8426810	26 (29-12-1982)	2x therapeutic abortion	spontaneous	1B1	2007 RVT, cerclage, laparoscopic SLND and PLND	PPROM at 20+4 weeks of gestation, TOP, CS	Displaced	Vaginally
B, 1217406	30 (22-12-1989)	therapeutic abortion, spontaneous miscarriage	spontaneous	1B2	2017 laparoscopic PLND, RVT impossible due to size of tumor, neoadjuvant chemotherapy, RAT and cerclage	PPROM at 18+5 weeks of gestation, TOP, vaginal delivery, manual removal of placenta	Displaced: very low located at the cervical os	Vaginally
C, 848505	38 (2-9-1980)	2x CS at term	spontaneous	1B1	2016 RVT, cerclage and laparoscopic PLND	PPROM at 16+6 weeks of gestation, TOP, vaginal delivery, postpartum haemorrhage with a total blood loss of 2500 ml, manual removal of the placenta and ultrasound guided curettage. She received Sulprostone, 1 gram of tranexamic acid and one unit of packed red blood cells, could leave the hospital in a good clinical condition the next day.	Displaced: positioned at the left posterior cervical part only	Vaginally
D, 7509730	29 (1978)	NA	NA	1B1	2006 RVT, cerclage, robot SLND, PLND	NA	Displaced: loose in vagina and detached from neo-cervix	Vaginally
E, 1235219	27 (1979)	NA	NA	1B1	2004 RAT and cerclage	NA	Displaced	Laparoscopically
F, 8792845	36 (1976)	pregnant during trachelectomy	spontaneous	1B1	2011 RAT, cerclage, laparoscopic PLND	Intra-uterine infection, curettage at 13+5 weeks of gestation	Infection	Vaginally

G, 7458576	35 (24-1-1982)	NA	NA	1B1	2007 RVT, cerclage and laparoscopic PLND	First trimester miscarriage and curettage, CS at 35 + 6 weeks of gestations, PPROM at 20+2 weeks of gestation, TOP, vaginal delivery	Displaced	Vaginally
H, 1331015	38 (1979)	2x CS at term, spontaneous miscarriage	spontaneous	1A2	2009 RAT and cerclage	NA	Displaced: protruded into vagina	Vaginally
I, 715601	37 (30-12-1981)	NA	NA	1B1	2011 RAT and cerclage	PPROM at 16 weeks of gestation, TOP, vaginal delivery	Displaced: through uterine niche	Hysteroscopically
J, 1494779	35 (18-6-1983)	NA	NA	1B1	2013 RVT, cerclage and PLND	NA	Displaced: through uterine niche	Hysteroscopically

LAC: laparoscopic abdominal cerclage; CS: Cesarean section; IUI: intrauterine insemination; IVF: in vitro fertilization; N: no; NA: not applicable; PLND: pelvic lymph node dissection; PPROM: preterm prelabour rupture of the fetal membranes; RAT: radical abdominal trachelectomy; RVT: radical vaginal trachelectomy; SLND: sentinel lymph node dissection; TOP: termination of pregnancy; Y: yes

Table 2: Surgcial, obstetric and neonatal outcomes after new laparoscopic abdominal cerclage in patients with fertility sparing surgery for cervical cancer and failure of initial cerclage.

Patient	New LAC	Complications during LAC	Pregnant after LAC	Method of conception after LAC	Complications during pregnancy after LAC	Obstetric outcomes after LAC	Neonatal outcomes
A, 8426810	Y	N	Y, after 24 months	IUI	N	CS at 39 weeks of gestation	healthy neonate
B, 1217406	Y	N	Y, after 1 months	natural	N	currently in second trimester of pregnancy	NA
C, 848505	N: no desire to conceive yet	NA	NA	NA	NA	NA	NA
D, 7509730	Y	N	Y, after 10 months	natural	N	CS at 39 weeks of gestation	healthy neonate
E, 1235219	Y	N	N, despite fertility treatments	NA	NA	NA	NA
F, 879**2**845	Y	Y: paracervical perforation	N, low ovarian response during IVF and hysterectomy 5 years later because of severe dysmenorrhoea	NA	NA	NA	NA

G, 7458576	Y	N	Y, after 12 months	IVF	Y: admisson at 33+4 weeks of gestation because of PPROM and signs of intra-uterine infection	CS at 33+6 weeks of gestation	healthy neonate
H, 1331015	Y, placed during pregnancy	Y: conversion to laparotomy because of blood loss (650ml) and poor visualization	Y	natural	N	CS at 37+3 weeks of gestation	healthy neonate
I, 715601	Y	N	Y, after 2 months	IUI	Y: admission at 26+1 weeks of gestation because of premature contractions with funneling through the cerclage and a cervical length of 6 millimeters, corticosteroids were applied without tocolytics.	CS at 39+3 weeks of gestation	healthy neonate
J, 1494779	Y	N	Y, after 22 months	IVF	spontaenous early first trimester miscarriage	early first trimester miscarriage	NA

cerclage displacement after trachelectomy

cerclage displacement after Cesarean section following trachelectomy

cerclage displacement after Cesarean section and trachelectomy with a uterine niche, secondary subfertility and unsuccesfull fertility treatmetns

In nine patients a new cerclage was placed laparoscopically. We previously described the technique [13]. In addition, we performed hysteroscopic guidance to detect potential cerclage placement through the cervical canal. Surgical procedures were without major complications, apart from one conversion and one minor complication (paracervical perforation).

Discussion

We found that abnormal cerclage position can be identified by transvaginal ultrasound examination. Importantly, displaced cerclages seem to be related with adverse fertility and obstetric outcomes. Cerclage related complications can be categorized into three groups, cerclage displacement after: (i) trachelectomy, (ii) cesarean section following trachelectomy and (iii) cesarean section and uterine niche related pathology following trachelectomy. Furthermore, a new laparoscopic cerclage, after removal of a displaced cerclage, shows favorable surgical and obstetric outcomes.

Despite the small number of patients, given its rarity, the described information is useful in counseling patients who face the dilemma of a displaced cerclage. An expectant management with increased risk of second trimester fetal loss should be weighed against a high fetal survival rate, but patients will need a second surgical procedure to place the cerclage and deliver by cesarean section. The chance that patients will not conceive after a new cerclage should be taken into account, although an abdominal cerclage itself does not affect fertility rates [14].

Various factors may increase the risk of cerclage migration and complications after trachelectomy. Placement of a foreign body at a wound induces a higher risk of infection and subsequently increased risk of cerclage migration. A cesarean section could also be a risk factor for cerclage migration. Particularly if a cesarean section is performed after trachelectomy, as the tendency is to open too low because of the absent cervix. We advise to (digitally) verify the cerclage position and perform the uterotomy proximal from the cerclage to prevent too low incisions. A close proximity of the cerclage to the wound bed could result in cerclage migration. Disturbed uterine wound healing or uterine niche development may attribute to cerclage migration, but this remains to be investigated. Whether the used suture material, like multi- or monofilament has an effect on this risk is also unknown.

Abnormal cerclage positioning may negatively impact fertility as well. A displaced cerclage, specifically through the uterine wall into a uterine niche and cervical canal, might adversely affect embryo implantation by disruption of the endometrial contour or induce a detrimental environment. This might have been the case in some patients, as they conceived quickly after removal of the displaced cerclage. This emphasizes the importance of assurance of the correct cerclage position prior to fertility treatment or before attempting to conceive. Other factors, however, may play a role in subfertility as was probably the case in one patient with low ovarian response.

In our series, although limited by the small number of patients and the retrospective study design, patients with an ongoing pregnancy after a new laparoscopic cerclage showed high fetal survival rates. Two patients who conceived without a new cerclage suffered from second trimester fetal loss. We advise to embed assessment of cerclage position after trachelectomy in standard evaluation prior to each conception, fertility treatment or gynecological symptoms. Patients should also be informed that it is unknown how often a pregnancy with a displaced cerclage ends successfully. Currently, there are no guidelines for optimal management of high-risk pregnancies after trachelectomy. Extensive counseling on reproductive function and obstetric management in patients after trachelectomy (preferentially before fertility-saving surgery) requires a close collaboration between gynecologic-oncologists, obstetrician-gynecologists, fertility specialists and minimally-invasive-gynecologists.

It is unknown what the best strategy is in case of displaced cerclage and uterine niche. We believe that only a large (residual myometrium of <3 millimeters) symptomatic niche should be repaired. The advantage of niche repair is that migration of the cerclage may be prevented, but this needs to be weighed against delay to attempt to conceive because of an advised healing period of six months.

Prospective registration of all patients with a permanent cerclage including data on fertility, obstetric outcomes and short- and long-term complications is needed to gain insight into the efficacy and safety of a permanent cerclage in subsequent pregnancies and identify risk factors for cerclage migration.

Diagnostic accuracy needs to be evaluated, but in our experience abnormal cerclage positioning can be easily detected by transvaginal ultrasound. If the cerclage cannot be visualized completely around the cervix, the cerclage is displaced and a new laparoscopic cerclage can be considered in patients willing to conceive.

To the best of our knowledge, this is the first report on fertility and obstetric complications related to cerclage displacement after trachelectomy. This will increase awareness of cerclage related complications and we provide recommendations on how these complications may be prevented. A limitation is the small number of patients and retrospective design.

Conclusions

We describe ten patients with a displaced cerclage and related obstetric and fertility complications after trachelectomy. In nine patients we laparoscopically placed a new cerclage, which was successful in all six ongoing pregnancies. Two patients conceived without a new cerclage and suffered from second trimester fetal loss. We recommend to evaluate cerclage position before each pregnancy and fertility treatment. Long-term evaluation of patients after trachelectomy and cerclage is needed to gain more knowledge about pregnancy outcomes and indications for a new cerclage. Based on limited data we currently advise to consider a new laparoscopic cerclage in case of displacement given its favorable surgical and obstetric outcomes.

Highlights

- The (in)correct position of a cerclage can be examined by transvaginal ultrasound examination.
- Dislocated cerclages seem related with adverse fertility and obstetric outcomes.
- After a dislocated cerclage a new laparoscopic cerclage shows favorable surgical and obstetric outcomes.
- Ultrasound evaluation of cerclage location prior to each pregnancy or fertility treatment in patients after trachelectomy may prevent fertility and obstetric complications due to cerclage displacement.
- Long-term evaluation of patients after trachelectomy and cerclage is needed to gain insight into pregnancy outcomes and indications for a new cerclage.

Author Contribution

NB Burger: protocol/project development, data collection and management, data-analysis, manuscript writing/editing.

N Abdulrahman: data collection and management, data-analysis, manuscript writing/editing.

MA de Boer: manuscript writing/editing

G Fons: manuscript writing/editing.

JAF Huirne: protocol/project development, manuscript writing/editing

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Vitae

Dr. Nicole B. Burger will soon finish her education as gynecologist at the Amsterdam University Medical Centre. She has great interest in benign gynecology and recently completed a fellowship in Minimally Invasive Gynecology, which focused on advanced laparoscopy, including laparoscopic abdominal cerclages. This procedure is executed in a limited number of European expertise centers and in only two tertiary hospitals in the Netherlands. Besides her fulltime clinical activities, Dr. Burger has a specific interest in medical scientific research. She has advanced and developed the line of research on laparoscopic abdominal cerclages and supervises a PhD-student in research projects on laparoscopic abdominal cerclages.

Dr. Nour Abdulrahman works as a medical doctor and PhD-candidate at the department of Gynecology and Obstetrics of the Amsterdam University Medical Centre. As clinician and researcher, her focus is mainly on laparoscopic abdominal cerclages and related surgical, fertility and obstetric outcomes. During her PhD she has and will conduct several and various types of studies in order to investigate the value of laparoscopic abdominal cerclage in the prevention of (recurrent) extreme preterm birth, identify high-risk patients who will benefit from this procedure and to optimize care by standardization of the indication and management of patients with an increased risk for cervical incompetence.

Dr. Marjon A. De Boer is a gynecologist-perinatologist specialized in care for pregnant women with an increased risk due to an existing diseases and disorders (such as cervical incompetence, heart defects or blood diseases), but also pregnant women who become ill as a result of the pregnancy (e.g., pre-eclampsia). She conducts both translational research and clinical research. Her main interest in translational research is molecular biological research such as non-invasive diagnostics for trisomy's (NIPT). Her clinical research focuses on women with poor obstetric history for example due to cervical incompetence and preventing preterm birth.

Dr. Guus Fons is a gynecologist-oncologist with a specific focus on late effects of gynecological cancer. She is involved in several studies investigating fertility and obstetric outcomes of women after (treatment for) gynecological cancer, for example after trachelectomy. Dr. Fons is a dedicated gynecologist-oncologist within the center for gynecological oncology Amsterdam (CGOA) since 2007. Dr. Fons and her team are ahead in research regarding treatment, late effects of gynecological cancer and quality of life.

Prof. dr. Judith A.F. Huirne has been working as a gynecologist at the Amsterdam UMC since 2007. Her expertise is within the field of benign gynecology with a specific focus on niches, myomas, adenomyosis and abdominal cerclages. She guides a large team of gynecologist and PhD-students to gain more insight in the underlying mechanisms of these diseases, disorders and their treatment. In 2016 she founded the Uterine Repair Center at the Amsterdam UMC, a center specialized in the diagnosis and treatment of benign gynecological disorders with specific focus on quality of life and attention for scientific research in order to improve patient care.