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Abdominal cerclage by interval laparoscopy and during pregnancy. Case series.

Cerclaje abdominal por laparoscopia de intervalo y durante el embarazo. Serie de casos

Adalberto Rochin Benoit,[1] Erika Fernanda Raña Pohls,[2] Alejandro Arellano Borja[3]

Abstract

OBJECTIVE: To describe five cases of laparoscopic abdominal cerclage, detailing the technique, the perinatal outcomes, and the complications after laparoscopic transabdominal cerclage placement in patients who fulfill the criteria for the procedure during pregnancy, or during the interval between pregnancies.

MATERIALS AND METHODS: Retrospective study of a five-case series at a private hospital in Hermosillo, Sonora, where laparoscopic cerclage was performed. All the patients had indication for abdominal cerclage.

RESULTS: Neonatal survival after the procedure was 4 of 5 cases. The median gestation week at birth was 37.2. There was one early gestational loss (anembryonic abortion). One of the 4 remaining patients had premature rupture of membranes, without affecting the survival of the child. In all cases the cervical cerclage was left *in situ*.

CONCLUSION: Laparoscopic abdominal cerclage is a minimally invasive procedure, it is very effective in patients who are not eligible for the vaginal procedure, or who have had failed vaginal cerclages. In comparison with laparotomy, which is historically the original procedure, it has not been associated with higher morbidity. On the other hand, it has the advantages of a minimally invasive surgery, such as early ambulation, lower risk of infection and bleeding, shorter hospital stay, less pain, lower requirement of analgesics, and shorter time to return to ordinary life.

KEYWORDS: Cervical cerclage; Vaginal; Laparoscopic; Laparotomy; Pregnancy; Gestational age at birth; Early pregnancy loss; Spontaneous abortion; Early ambulation.

Resumen

OBJETIVO: Describir cinco casos de cerclaje abdominal laparoscópico, detallar la técnica, los desenlaces perinatales y las complicaciones posteriores a la inserción del cerclaje transabdominal laparoscópico en pacientes con criterios para su aplicación durante el embarazo o en el intervalo entre embarazos.

MATERIALES Y MÉTODOS: Estudio retrospectivo de serie de cinco casos efectuado en un hospital privado de Hermosillo, Sonora, donde se aplicó el cerclaje por vía laparoscópica. Todas las pacientes tenían indicación para la aplicación de cerclaje abdominal.

RESULTADOS: La supervivencia neonatal, posterior al procedimiento, fue de 4 de 5 casos. La mediana de semanas de gestación al nacimiento fue de 37.2. Se registró una pérdida gestacional temprana (aborto anembriónico). De las cuatro pacientes restantes, una tuvo una complicación de la ruptura prematura de membranas, que no afectó la supervivencia del neonato. En todos los casos se dejó el cerclaje cervical *in situ*.

CONCLUSIÓN: El cerclaje abdominal por laparoscopia es un procedimiento mínimamente invasivo, muy eficaz en pacientes no aptas para el tratamiento vaginal o

[1] Third year Obstetrics and Gynecology resident.
[2] Obstetrician-Gynecologist with Maternal-Fetal Medicine specialization, Children Hospital of Sonora, Hermosillo.
[3] Obstetrician-Gynecologist with Human Reproduction Biology specialization, CIMA Hospital, Sonora, Hermosillo.

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Correspondence
Adalberto Rochin Benoit
adalbertorochinbenoit@gmail.com

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que ya han tenido cerclajes vaginales fallidos. En comparación con la laparotomía, que históricamente es el procedimiento original, no se ha relacionado con mayor morbilidad. En contraparte, ofrece las ventajas de la cirugía mínimamente invasiva: deambulación temprana, menores riesgo de infecciones, sangrado, estancia hospitalaria, dolor, requerimiento de analgésicos y de tiempo para la reincorporación a la vida cotidiana.

PALABRAS CLAVE: Cerclaje abdominal laparoscópico; laparotomía; embarazo; edad gestacional al nacer; pérdida temprana del embarazo; aborto espontáneo; deambulación temprana.

BACKGROUND

According to the Perinatal Medicine European Association, a pre-term birth is between weeks 22 and 36.6 of gestation,[1] or between weeks 20: 0-7 and 36: 6-7 , according to the American College of Obstetricians and Gynecologists.[2] The pre-term rate in Europe ranges from 5 to 18%, but only 0.3 to 0.5% pre-term births happen before 28 weeks, with a noticeably worse prognosis for the outcome. In the United States, approximately 12% of all live births happen before term, with premature labor in approximately 50% of said pre-term births.[2] The two most relevant risk factors are history of previous pre-term births, and short cervix detected by transvaginal ultrasound.[3] The current guidelines of the Society for Maternal-Fetal Medicine in the United States suggest cervical cerclage, progesterone, and ultrasound monitoring of cervical length as treatment options.[4]

Vaginal cervical cerclage was first described around 1950 by Shirodkar and McDonald, cited by Vincenzo et al.[5] It was initially indicated only in cases of previous cervical surgeries or Müllerian anomalies.

Currently, the evidence shows that cervical cerclage is indicated in cases of medical history of two or more pre-term births before the second trimester, or in cases of short cervix (<25 mm), with risk factors of pre-term birth. Cerclage indicated because of medical history should not be performed routinely on women with less than three pre-term previous births, or without gestational losses in the second trimester.[6]

Cervical insufficiency, as a cause of pre-term birth, is estimated to complicate between 0.05 and 1% of all pregnancies.[7] The inability of the cervix to contain a pregnancy occurs in the absence of uterine contractions, generally during the second trimester, before 24 weeks of gestation.[8]

The use of transvaginal cerclage has proven to reduce pre-term births before 35 weeks of gestation by up to 33%, and perinatal morbidity and mortality by up to 28%.[9]

The first transabdominal cerclage was performed by Benson and Durfee in 1965, and it was reported to Zaveri V et al,[10] as an alternative to the vaginal route for patients with extremely short cervix, almost always by laparotomy, and lately as a laparoscopic procedure.

Laparoscopic cerclage has similar success rates and similar complications (uterine vessel injury,

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wound infection, or thromboembolism) when compared with laparotomy. The laparoscopic abdominal access has less intraoperative blood loss, less postoperative pain, and lower risk of adhesions, with shorter hospital stay and better aesthetic outcomes.[11]

MATERIALS AND METHODS

Retrospective study of a series of laparoscopic cerclage cases, carried out at a private hospital in Hermosillo, Sonora. All the patients had to have an indication for abdominal cerclage. All the patients were routinely followed-up in the pre-natal consultations and programmed for pregnancy termination by C-section. *Study parameters*: perinatal and obstetric outcomes, weeks of gestation at pregnancy termination, weight at birth, transoperative bleeding, and complications.

The pregnancies with viable fetuses were finalized by abdominal route, except the abortion case. The suture of the cerclage was left *in situ*, considering it beneficial for a future pregnancy.

Surgical technique

Laparoscopy is performed under general anesthesia, with the patient in lithotomy position, a 16 Fr Foley catheter to shunt, placement of a main 12 mm transumbilical port, 3 lateral ports of 5 mm, and CO2 insufflation and pneumoperitoneum pressure at 14 mmHg. The procedure is as follows: the vesicouterine pouch and torus (junction of uterosacral ligaments) are identified in the anterior and posterior sides of the uterus. The vesicouterine peritoneum is dissected with scissors until the union of the bladder and the uterus is visualized. The arch of both uterine arteries is identified on the posterior surface of the uterus. After rectification of the needles, the suture is made with 5 mm Mersilene. Each one is introduced on each side, at the level of the torus, medial to both uterine arteries, from posterior to anterior. Homeostasis is verified and the tape is adjusted. Then, both needles are cut, and the tape is tied with square intracorporeal knots. Homeostasis is verified again and the vesicouterine pouch is sutured with absorbable 2-0 monofilament. The needles and ports are removed, and the 12 mm port aponeurosis and skin at all access points are sutured.

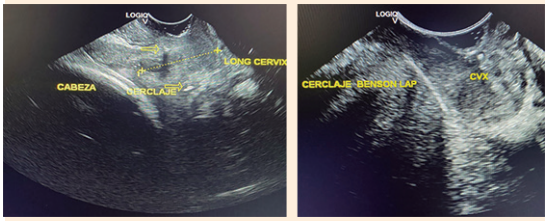
In all the cases of interval laparoscopic abdominal cerclage, a Rumi type transvaginal uterine manipulator is placed, with a lavender Koh tip to facilitate movements towards ante- and retroflexion, and cephalization and lateralization of the uterus. This favors a better exposure of the uterosacral ligaments, a better visualization of uterine vessels, and the descent of the vesicouterine pouch.

When the cerclage placement is abdominal, by laparoscopy, the uterine manipulator placement by vaginal route is omitted.

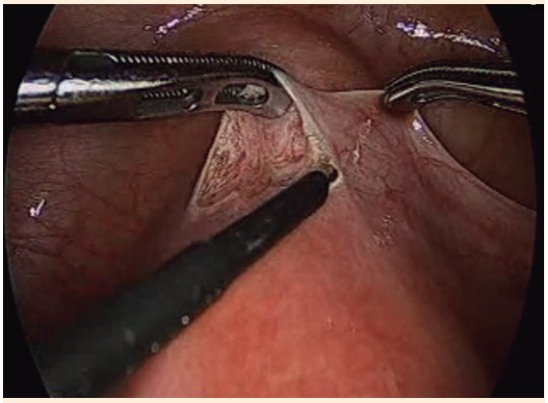
Figures 1 to 10 show the sequence of the application of interval LAP-TAC , with the applied technique. **Figure 11** shows the cerclage *in situ* during C-section.

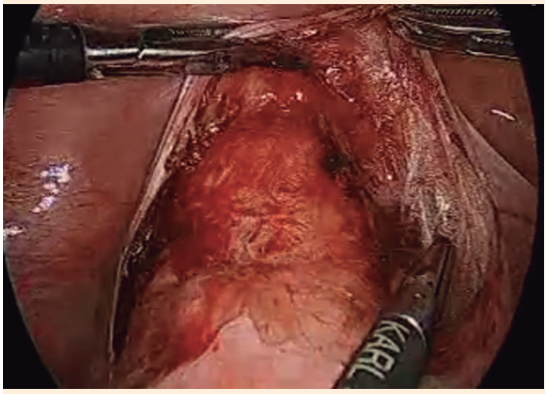
RESULTS

Of the 5 cases, 3 patients had an interval (between pregnancies) laparoscopic abdominal



Figures 1 and 2. Transvaginal ultrasound during pregnancy follow-up where a correctly placed Benson-Durfee cerclage is seen.





Figures 3 and 4. Dissection of the vesicouterine peritoneum with monopolar tip and scissors.

cerclage performed, and 2 patients had it performed during gestation. (**Table 1**) The 5 patients had indication for a Benson-Durfee type abdominal cerclage. One patient had the abdominal cerclage indication due to non-viability for the vaginal route because of cervical anomalies (history of trachelectomy or short-domed cervix). Another patient had gynecologic history of two failed previous vaginal cerclages, due to cervical-isthmic insufficiency.

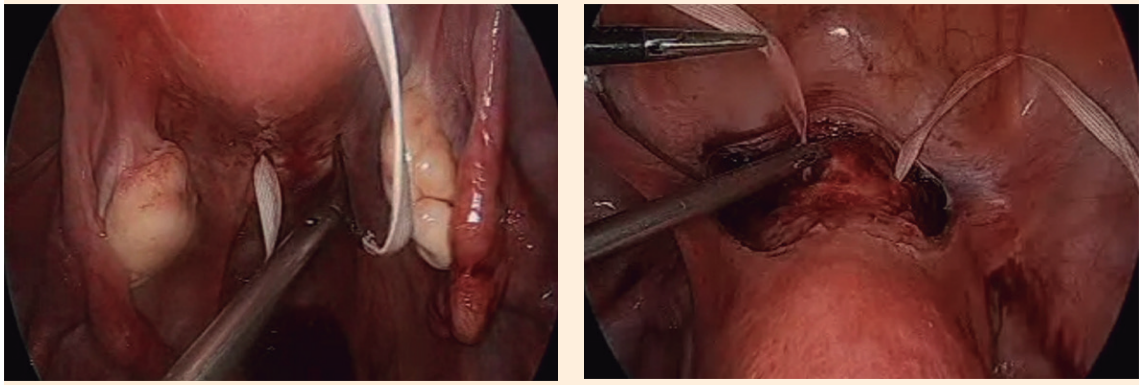
One patient had an abortion at 9 weeks. Out of the 4 remaining patients, 1 had premature membrane rupture, before 34 weeks, and the remaining three had a programmed C-section between 37.0 and 38.0 weeks. The C-section was performed with classical hysterotomy in 3 of the 4 patients (because of no formation, or little formation, of uterine segment), and Kerr type C-section in just one case. No obstetric hemorrhage or associated complications were recorded. The mean gestation week at pregnancy termination was 37.2. Four live births were recorded, with fetal weight between 1652 and 3125 grams. In only one of the cases, it was necessary to refer the newborn to neonatal intensive care services, due to the premature condition and respiratory distress syndrome. **Table 2**

DISCUSSION

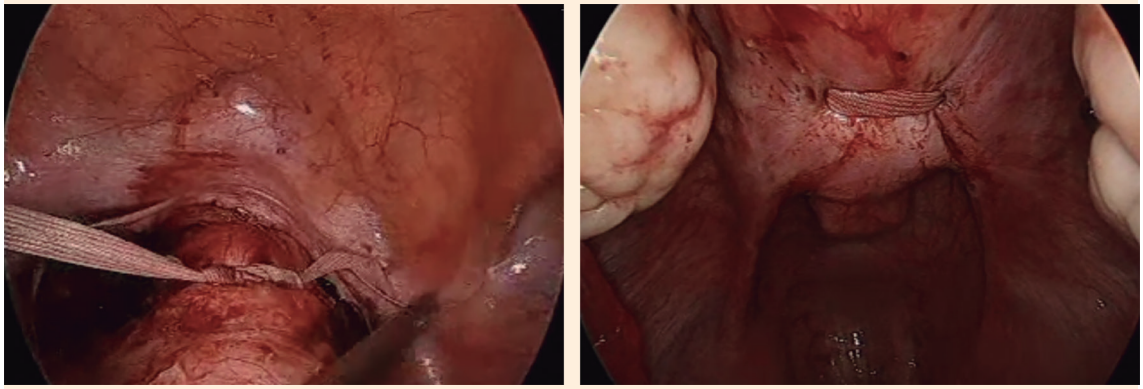
Starting in 1965, when the abdominal cerclage technique was first described, the main indication has been for anatomical defects that don't allow the vaginal route . Currently, the main indication is the failure of a previous vaginal cerclage.[12] Lotgering (2006)[13] made a study with 101 women with an indication for abdominal cerclage where there was higher neonatal survival, as gestation weeks were increased to term, without associated major complications. In our study, the patients had a low incidence of preterm birth and a neonatal survival of live births of 4 out of 4 cases with viable fetuses.

The advantages of the abdominal cerclage are that it is performed near the internal cervix orifice, with lower risk of suture migration, and the absence of a foreign object in the vagina, which lowers the risk of infection. Warren et al.[14] suggest that the advantages of the abdominal cerclage go beyond its mechanical support. There is growing evidence that premature cervical dilation and effacement are the final consequence of an inflammatory process secondary to infection, or a change in the microbial flora.[14] A hypothesis suggests that the sterile placement of the abdominal cerclage mitigates the risk of infection by avoiding the placement of a foreign body in the vaginal cav-

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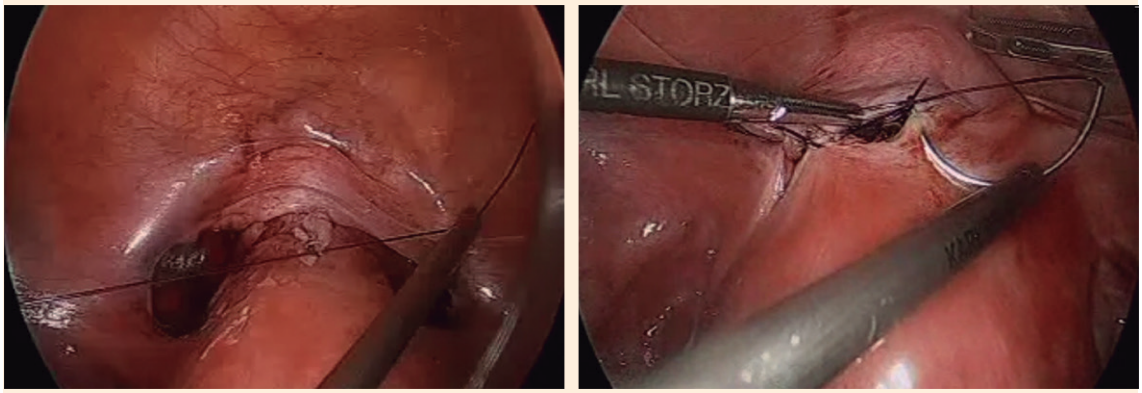
Figures 5 and 6. Insertion of 5 mm Mersilene suture (Ethicon). After adjustment of the curvature of both needles, the juncture of both uterosacral ligaments is identified in the posterior wall of the uterus. At this site, and medial to both uterine arteries, the uterine tissue is passed through, posterior to anterior, visualizing and guiding the emergence of the needles in the anterior wall of the uterus, at the site of the dissection of the vesicouterine peritoneum.



Figures 7 and 8. Anterior knot, the needles are cut, the Mersilene tape is adjusted, and intracorporeal square knots are made.

ity. Despite potential advantages, the abdominal cerclage is a morbid procedure that requires major laparotomies in a short period of time (placement and C-section birth).[15] In the present study, the placement of the cerclage was made by laparoscopy, which improved recovery and decreased morbidity, without increasing the risk of transoperative bleeding.

Ades et al.,[16] in their cohort study, carried out between 2007 and 2014, evaluated 51 patients with laparoscopic abdominal cerclage, and 18 by laparotomy, all of them with history of failed vaginal cerclage. They found a decrease in premature births in 98% of the cases, with an increase in gestation weeks to pregnancy termination. Associated complications for lapa-



Figures 9 and 10. The vesicouterine peritoneum is brought closer to the laparoscopic cerclage, with a 2-0 absorbable monofilament suture.

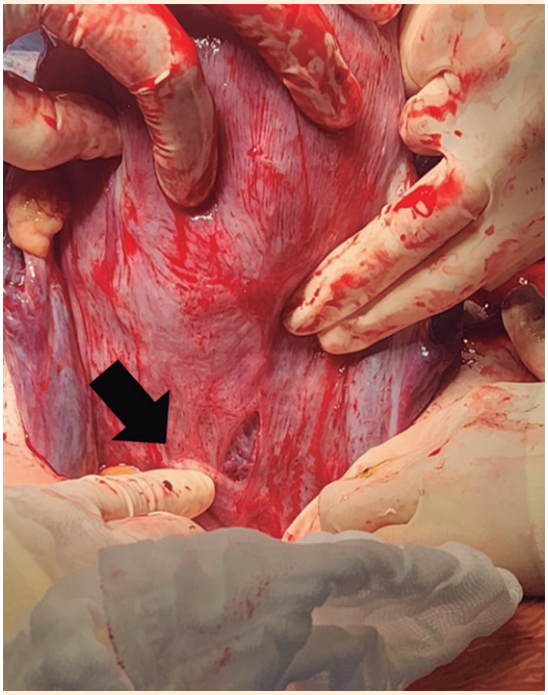


Figure 11. *In situ* cerclage around the juncture of the uterosacral ligaments at the posterior wall of the uterus during a C-section (black arrow).

roscopic abdominal cerclage were 1%, much lower than for laparotomy, with complications in 22% of the patients.[16]

Ades et al. documented the application of the laparoscopic abdominal cerclage in 64 patients, and they reported that neonatal survival increased, even up to 95.8%, with 83% of patients with C-section at 34 weeks or more, and a low percentage of transoperative complications (1.6%).[17]

In another study, Chen et al.[18] recommend that the laparoscopic abdominal cerclage be placed before 14 weeks of gestation, because it increases the risk of spontaneous abortion if done afterwards. In our study there was no association with gestation loss, but it was the only pregnancy with birth before 34 weeks of gestation, without affecting the mortality of the newborn (case 5, the laparoscopic cerclage was placed during the 16th week of gestation, indicated because of cervical shortening. The birth occurred at 30 weeks, due to premature membrane rupture, and the weight of the child was 1050 gr). Other authors agree that the

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Table 1. Summary of the reported clinical cases

(n) Edad	Interval (I) Pregnancy (II)	Previous pregnancies	Placement at gestation weeks	Indication for cerclage	Indication for pregnancy termination	Gestation weeks at pregnancy termination and fetal weight	Pregnancy termination
(1) 39	I	1	-	Trachelectomy due to *in situ* cervical cancer	Programmed	37.3 2970 g	Classical C-section without complications
(2) 36	II	4 1 abortion 1 vaginal birth 1 C-section	9	Failed vaginal cerclages (2)	Programmed	37.2 2720 g	Kerr type C-section without complications
(3) 33	I	1	-	Trachelectomy due to *in situ* cervical cancer	Abortion	9.0	Aspiration curettage (awaiting embryo transfer)
(4) 35	I	2 1 ectopic	-	Trachelectomy due to *in situ* cervical cancer	Programmed	38.0 3125 g	Classical C-section without complications
(5) 35	II	1	16	Cervical shortening during pregnancy: with CL 10 mm	Labor	30.0 1050 g	Premature membrane rupture, classical C-section without complications

Table 2. Pregnancy outcomes

Procedures	(n)
Indication of cerclage	
Trachelectomy because of *in situ* cervical cancer	3
Cervical shortening (CL)	1
Failed vaginal cerclage (2 or more)	1
Indication of interruption	
Programmed C-section	3
Premature rupture of membranes	1
Deferred abortion	1
Blood loss mean	
More than 500 mL	0
<500 ml	5
Neonatal survival	
Live births	4
Abortion	1
Weeks of gestation of the live births:	
More than 34	3
Less than 34	1
Admittance to the neonatal intensive care unit	
Yes	1
No	3

placement of the cerclage during pregnancy increases the risk of fetal loss, but it is lower for laparoscopic procedures (1.2% of the cases), compared with abdominal cerclage by laparotomy (3% of the cases).[19-20]

CONCLUSIONS

The laparoscopic abdominal cerclage is a minimally invasive procedure, it is very effective in patients who are not candidates for the vaginal route, or that have had failed vaginal cerclages. Compared with the procedure by laparotomy, which is the original treatment, it is not associated with higher morbidity. It also offers the advantages of a minimally invasive surgery, such as early ambulation, lower risk of infections, bleeding, hospital stay, pain, analgesic requirements, and faster recovery time to go back to daily life.

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