Local injection of diluted vasopressin and aqua dissection at the time of modified Shirodkar cerclage: Description of a safe and efficient technique

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Abstract

Many modifications have been incorporated to original Shirodkar technique to make the procedure an easy one whilst maintaining its efficacy. Anecdotal evidence suggest that use of vasoconstrictors before dissecting bladder base during Shirodkar method could be helpful. We performed aqua dissection using diluted vasopressin during modified Shirodkar cerclage in selected patients who required modified Shirodkar method. Our experience shows that judicious use local injection of diluted vasopressin to perform aqua dissection during modified Shirodkar is a safe and efficacious method and would increase the overall quality of the technique by reducing the blood loss and enhancing plane of dissection.

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Abstract

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Key words: Modified Shirodkar cerclage, preterm birth, vasopressin, aqua dissection, cervical cerclage

Introduction.

Cervical cerclage is a key intervention that prevents spontaneous preterm birth in high-risk women (1,2,3). Many methods of cervical cerclage are in practice amongst obstetricians whilst controversies exist regarding the effectiveness and safety of these methods (4). Shirodkar reported his first case in 1955 (5). Since then, many modifications have been added to the original Shirodkar method (6,7).

Macdonald method involves an application of thread around the mid cervical level as a purse string. This is a relatively easy method (7). Although Macdonald method of cervical cerclage is in practice widely, there are instances in which Shirodkar method may be more suitable. History of a failed Macdonald stitch can be considered as an indication for a Shirodkar method (6). Although there are no randomized controlled trials (RCT) to compare the efficacy of various cervical cerclage techniques, one comparative study found that Modified Shirodkar method was superior to Macdonald method (8). Figuera et al reported that Shirodkar was prolonging the pregnancy in obese women as opposed to Macdonald method (9). Cervical cerclage, whichever technique used, is associated with some risks. Surgical manipulation of the cervix can cause uterine contractions, bleeding or infection which may lead to miscarriage or preterm labour (4). These risks must be carefully balanced against the benefits before considering the procedure

It is probable that technical difficulties could have influenced the obstetricians to avoid high level Shirodkar cerclage and to perform Macdonald method. Obviously, dissection of bladder away from cervix in a pregnant uterus leads to bleeding and hence surgical field becomes less clear. Furthermore, the surgeon has to operate within a narrow space. This could lead to accidental puncture of a cervical vasculature or even fetal membranes in some cases. However, it appears that placement of a stitch at the level of internal os of the cervix could give more beneficial effects than placing at a lower level.

We believe that aqua dissection method using diluted vasopressin makes the technically difficult procedure to a fairly an easy one. Randomized clinical trials have shown that infiltration of vasopressin to minimize blood loss in various gynecological surgical procedures is a sound option (10, 11). Although there have been concerns of cardiac events, such events have occurred due to usage of exceedingly high concentrations and inadvertent injection in to blood vessels (12,13,14, 15). FDA warns that vasopressin can induce uterine contractions and advices it's use if the benefits outweigh the risks in pregnancy (16). There is some anecdotal evidence for the use of adrenaline (17). However, vasoconstrictive effect on adrenaline on tissues is longer than vasopressin (5-6 hours vs 17-35 min) (18). This could lead to tissue damage and poor wound healing in the vaginal tissues (19).

We justify that judicious use of vasopressin in selected candidates who would anyway require a method other than a Macdonald cerclage could be a safe and efficacious method to improve the quality of the procedure.

Methods

Patients

Data of 10 patients who underwent modified Shirodkar cerclage were included in this analysis. All of these patients had undergone aqua dissection using diluted vasopressin during modified Shirodkar cerclage procedure.

These procedures were performed by an experienced single operator in 3 different tertiary care centres in Colombo, Sri Lanka from January 2018 to November 2020.

Indications for this method were history of at least one failed Macdonald cerclage cervix shorter than 2 cm, anatomically distorted cervix and opened cervix at the time of presentation (less than 2 cm).

The patients were carefully evaluated by a consultant anesthetist for potential contra indications for the use of vasopressin. All relevant information regarding the procedure and outcomes were collected from clinical records after obtaining permission from the medical directors of the respective centres.

Technique

Procedures were performed under spinal anesthesia and patient was placed in dorsal lithotomy position. Bladder was emptied. Vasopressin 1 vial (20 units) diluted in 200 ml of normal saline was prepared (.1 units / ml). Two Sims specula were used to protect the vaginal tissue and to visualize the surgical field. Upper and lower lips of the cervix were held by two pairs of sponge forceps. 40 ml diluted vasopressin solution infiltrated to vaginal mucosa at the level of cervico vesical reflection. Before infiltrating, negative aspiration was applied to the syringe to test accidental puncture of blood vessels and then slow ingection was done. This produced blanching at the surgical site. (Figure 1)

2-3 cm transverse incision was made at the level of vesico cervical reflection using a pair of curved scissors. A scalpel could be of use for this purpose. Bladder was then dissected upwards using fingers and scissors. (Figure 2)

An atraumatic tissue forceps is used to hold the vaginal wall which was cut opened as a new flap. A sims speculum was gently introduced under the vaginal mucosa and below the bladder base and pushed up further. A fairly bloodless field was created between the bladder base and cervix and surgeon could see as far as level of internal os. (Figure 3). A curved round needle with a teflon tape was passed through paracervical tissues in one side avoiding vasculature at the level of internal os (Figure 4).

Applying a traction through an Allis clamp applied to the lateral aspect of the cervix and placing an index finger of the non-dominant hand would help to avoid the accidental piercing of cervical vasculature.

Same procedure is done from the other side by travelling the needle from posterior aspect of the cervix and taking it through anterior aspect at the same level as previous entry point.

Knot was placed at 12 o clock position (can be placed at 6 o clock position too).

Vaginal mucosa was closed using 2.0 interrupted absorbable suture.

(Figure 5 provides the schematic representation of the key steps)

All these key steps of Modified Shirodkar cerclage were performed following the same techniques that has been described before. (6,7).

All patients were treated with a short course of tocolytics (Oral Nifedipine 20 mg twice daily for 1 week) antibiotics and oral progestogens complying with local policy. Post procedure scan was performed to make sure correct placement of the stitch and fetal viability. Removal of the stitches were done at 36 weeks as an outpatient procedure.

Results

Age range of patients who underwent aqua dissection is 24 -39 years (Mean age 30.9 years). Out of 10 cases, 4 (40 %) of them had had failed Macdonald cerclage in previous pregnancies, the 4 (40%) of them had emergency cerclage, 1 (%) of them had previous T2 miscarriage/miscarriages and short cervix on USS and 1 (1%) had short cervix on USS alone as indications. 4 (40%) of them had the stitch performed after 20 weeks of gestation and 6 (60%) had before 20 weeks. During the procedure no adverse cardiac events or raised blood pressure during the procedure noted. Recorded EBL ranged 5-10 ml (mean EBL – 6.5 ml). 4 (40%) procedures were recorded as difficult procedures by the operator. No single case of tonic uterine

contractions recorded following the procedure. 3(30%) of had vaginal delivery, 1 (10%) vaginal delivery at 26 weeks, 4 had CS (40%), and 2 (20%) of them have not delivered yet. Only 1 (10%) case of retained piece of stitch in the cervix and 1 (10%) stitch was left in-situ as requested by the patient. Only 1 (10%) patient had a delivered at 26 weeks, 8 of them (80%) have continued their pregnancies beyond 34 weeks and one has passed 2 weeks following the procedure.

Brief descriptions of the individual cases, procedures, post procedure and outcomes are shown in the table 1.

Discussion

Vasopressin is a potent endogenous hormone which plays key roles in maintaining osmotic balance, blood pressure regulation, sodium homeostasis, and kidney functioning (20). Apart from these functions, this hormone act via V1a receptors and oxytocin receptors in non-pregnant and pregnant uteri. Action of this hormone, hence implicated in primary dysmenorrhea and onset of labour contractions (21). Although vasopressin is implicated in causing uterine contractions, there is no evidence to suggest that vasopressin is involved in miscarriage or pregnancy loss in early pregnancy. In fact, there is evidence that that oxytocin and V1 receptors in the myometrium and endometrium are down regulated during follicular phase and early pregnancy (22).

Many studies have shown the beneficial effect of vasoconstriction in gynecological surgeries in term of blood loss, easy dissection and shorter surgical time (23). But therapeutic use of vasopressin during pregnancy is limited due its potential adverse effects such as the ability to induce uterine tonic contractions and cardiovascular side effects. However, we argue that this potent vasoconstrictor can be used to to improve the surgical outcomes in pregnant women too. There is conflicting evidence about vasopressin receptors (VPR) and oxytocin receptors (OTR) in the uterus during various stages of menstrual cycle as well as in pregnancy. Anna Riita et al showed that myometrial and endometrial VPR and OTR receptors are down regulated in early pregnancy and up regulated in the second half of the pregnancy (24).

Furthermore, another study done on concentration and distribution of oxytocin receptors in myometrial and decidual tissues in pregnant uteri showed that OTR level is lowest in the cervical region (25) and numbers of receptors and their sensitivity to oxytocin increase towards term and labor (26). In an RCT designed to see the effectiveness of vasopressin usage during dilatation and evacuation, showed a significant reduction in blood loss without any cardiac or blood pressure issues (27).

Contrary to these side effects, moderate stimulation of OTR and VPR in pregnancy has shown positive effects on development and function of the uterus, placenta, fetus, and in the regulation of the cardiovascular systems of the pregnant female and the fetus (28). We believe that injecting diluted vasopressin under the mucosa at vesico cervical junction would cause only a negligible effect on cardio vascular system and uterine tone. In our series, we did not encounter a single case that had increased uterine contractions or miscarriage immediately after the local injection. This could be partly due to safety measures taken such as careful selection of patients, preparation of injection and double checking before infiltration. Moreover, we found that aqua dissection using diluted vasopressin helps the surgeon to create a good surgical field and hence less trauma to the cervix.

There is no documented evidence to prove the safety and efficacy of vasoconstrictors during Shirodkar application. We share our experience to fill this gap and we believe that further studies should be undertaken to find the optimal dose and volume. In our experience, out of 10 women, only one patient miscarried after 4 weeks of the procedure. We believe that other factors could have contributed towards this outcome. None of our patients showed any cardiac abnormalities or blood pressure rise during the procedure. Careful evaluation and safety precautions taken during infiltration of vasopressin could have avoided those adverse effects among our patients. Furthermore, not a single woman in our group developed uterine contractions following the procedure. Surgeon felt much comfortable with this method and a significant improvement in the technique was noted within a short period of time . Aqua dissection using vasopressin seems to be promising in terms of safety and efficiency. It is believed that vasopressin can be judiciously used to enhance

the quality of the procedure .

Potential side effects of vasopressin should not make the surgeons completely avoid the drug and hence the beneficial effects. Further studies should be encouraged to make clear recommendations to use this method appropriately. We believe that many obstetricians are reluctant to perform Shirodkar cerclage due to fear of bleeding and other possible complications. However, our experience shows that aqua dissection using diluted vasopressin can not only help surgeons to perform the surgery easily but also produce substantial clinical benefits. Patient should be informed about the procedural details and discussion with the anesthesiologist is a must before using vasopressin.

This method reduces the operational time and may reduce harm to fetus from the anesthesia. Further it reduces the trauma to cervix as the surgeon's confidence increases due to enhanced surgical field during the procedure. Therefor we suggest that aqua dissection using diluted vasopressin can be safely included as a modification to the existing Shirodkar cerclage technique.

Apart from careful selection of cases, use of optimal dose and double-checking that it's not being injected into a blood vessel by carefully testing can minimize the potential risks. Further comparative studies should be conducted before recommending this method.

Disclosure of interests

None

Contribution to authorship

Development of the method , patient selection, consenting for the procedures, surgical procedures, data collection, analysis and manuscript writing were done by principal author.

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Ethical considerations

Ethical approval was not needed as this was not a human trial according to the World Medical Association Declaration of Helsinki definition of human experimentation. This paper is a description of a modification of an existing technique whereby we attempted to improve the quality of the surgery. Patients who required Shirodkar cerclage were carefully evaluated by consultant anaesthetists and were monitored through out the procedure. Vasopressin is not a contra indicated drug in pregnancy and can be used if the benefits outweigh the risks. Hence we justify that administering this drug in selected patients would improve the outcomes in all settings.

Patients were detailed about the procedure and informed written consents were taken. Operator discussed usage of diluted vasopressin as a local injection with senior consultant obstetricians and consultant anesthetists before administering it and they agreed with it. Medical directors of the hospitals were informed regarding this modification and prior approval obtained to get access to the medical records. All information obtained from clinical records were anonymized and treated with strict confidentiality. Written consent was obtained to use photos and videos of the procedures from relevant patients.

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References

1. Rust O, Atlas R, Reed J, van Gaalen J, Balducci J. Revisiting the short cervix detected by transvaginal ultrasound in the second trimester: Why cerclage therapy may not help. American Journal of Obstetrics and Gynecology. 2001;185(5):1098-1105.

2. Althuisius S, Dekker G, Hummel P, Bekedam D, Kuik D, Van Geijn H. Cervical Incompetence Prevention Randomized Cerclage Trial (CIPRACT): effect of therapeutic cerclage with bed rest vs. bed rest only on cervical length. Ultrasound in Obstetrics and Gynecology. 2002;20(2):163-167.

3. Owen J, Hankins G, Iams J, Berghella V, Sheffield J, Perez-Delboy A et al. Multicenter Randomized Trial of Cerclage for Preterm Birth Prevention in High-Risk Women With Shortened Midtrimester Cervical Length. Obstetrical & Gynecological Survey. 2010;65(2):73-74.

4. Alfirevic Z, Stampalija T, Medley N. Cervical stitch (cerclage) for preventing preterm birth in singleton pregnancy. Cochrane Database of Systematic Reviews. 2017;.

5. Shirodkar V. LONG TERM RESULTS WITH THE OPERATIVE TREATMENT OF HABITUAL ABORTION. Obstetrical & Gynecological Survey. 1968;23(6):553-555.

6. Uchide K, Ueno H, Sumitani H, Ueno H, Inoue M. MODIFICATIONS TO THE MODIFIED SHIRODKAR OPERATION. American Journal of Perinatology. 2000;17(08):437-440.

7. Caspi E, Schneider D, Mor Z, Langer R, Weinraub Z, Bukovsky I. Cervical Internal OS Cerclage: Description of a New Technique and Comparison with Shirodkar Operation. American Journal of Perinatology. 1990;7(04):347-349.

8. Bonney E, Collins V, Gees E, Mweemba M, Simpson N. PPO.66 The Shirodkar procedure for cervical cerclage: a safe and effective alternative to the McDonald suture. Archives of Disease in Childhood - Fetal and Neonatal Edition. 2014;99(Suppl 1): A171.3-A172.

9. Figueroa R, Crowell R, Martinez A, Morgan M, Wakefield D. McDonald versus Shirodkar cervical cerclage for the prevention of preterm birth: impact of body mass index. The Journal of Maternal-Fetal & Neonatal Medicine. 2018;32(20):3408-3414.

10. Kongnyuy E, Wiysonge C. Interventions to reduce haemorrhage during myomectomy for fibroids. Cochrane Database of Systematic Reviews. 2014

11. OKIN C, GUIDO R, MEYN L, RAMANATHAN S. Vasopressin During Abdominal Hysterectomy. Obstetrics & Gynecology. 2001;97(6):867-872.

12. Hobo R, Netsu S, Koyasu Y, Tsutsumi O. Bradycardia and Cardiac Arrest Caused by Intramyometrial Injection of Vasopressin During a Laparoscopically Assisted Myomectomy. Obstetrics & Gynecology. 2009;113(2, Part 2):484-486.

13. Butala B, Shah V, Parikh B, Jayaprakash J, Kalo J. Bradycardia and severe vasospasm caused by intramyometrial injection of vasopressin during myomectomy. Saudi Journal of Anaesthesia. 2014;8(3):396.

14. Martin J, Shenk L. Intraoperative Myocardial Infarction After Paracervical Vasopressin Infiltration. Anesthesia & Analgesia. 1994;79(6):1201???1202.

15. Frishman G. Vasopressin. Obstetrics & Gynecology. 2009;113(2, Part 2):476-477.

16. [Internet]. Accessdata.fda.gov. 2020 [cited 5 December 2020]. Available from: https://www.accessdata.fda.gov/drugsatfda_docs/label/2016/204485s003lbl.pdf

17. Simcox R, Shennan A. Cervical cerclage: A review. International Journal of Surgery. 2007;5(3):205–9.

18. Shimanuki H, Takeuchi H, Kitade M, Kikuchi I, Kumakiri J, Kinoshita K. The effect of vasopressin on local and general circulation during laparoscopic surgery. Journal of Minimally Invasive Gynecology. 2006;13(3):190–4.

19. England GT, Randall HW, Graves WL. Impairment of tissue defenses by vasoconstrictors in vaginal hysterectomies. Obstetrics and Gynecology. 1983 Mar;61(3):271-274.

20. Sharman A, Low J. Vasopressin and its role in critical care. Continuing Education in Anaesthesia Critical Care & Pain. 2008;8(4):134–7.

21. Åkerlund M. The role of oxytocin and vasopressin in the initiation of preterm and term labour as well as primary dysmenorrhoea. Regulatory Peptides. 1993;45(1-2):187–91.

22. Fuchs A-R. Oxytocin and vasopressin receptors in human and uterine myomas during menstrual cycle and early pregnancy. Human Reproduction Update. 1998;4(5):594–604.

23. Cohen S, Senapati S, Gargiulo A, Srouji S, Tu F, Solnik J, et al. Dilute versus concentrated vasopressin administration during laparoscopic myomectomy: a randomised controlled trial. BJOG: An International Journal of Obstetrics & Gynaecology. 2016;124(2):262–8.

24. Fuchs AR, Fuchs F, Husslein P, Soloff MS. Oxytocin receptors in the human uterus during pregnancy and parturition. American Journal of Obstetrics and Gynecology. 1984;150(6):734-741.

25. Kimura T, Tanizawa O, Mori K, Brownstein MJ, Okayama H. Structure and expression of a human oxytocin receptor. Nature. 1992;356(6369):526–9.

26. Uvnäs-Moberg K, Ekström-Bergström A, Berg M, Buckley S, Pajalic Z, Hadjigeorgiou E, et al. Maternal plasma levels of oxytocin during physiological childbirth – a systematic review with implications for uterine contractions and central actions of oxytocin. BMC Pregnancy and Childbirth. 2019;19(1).

27. Schulz KF, Grimes DA, Christensen DD .Vasopressin reduces blood loss from second-trimester dilatation and evacuation abortion. Lancet . 1985 ;2(8451): 353-6. Available from: http://dx.doi.org/ 10.1016/s0140-6736(85)92496-1 [Accessed 10 December 2020].

28. Szczepanska-sadowska E, Cudnoch-jedrzejewska A, Wsol A. The role of oxytocin and vasopressin in the pathophysiology of heart failure in pregnancy and in fetal and neonatal life. Am J Physiol Heart Circ Physiol. 2020 ;318(3): H639-H651. Available from: http://dx.doi.org/ 10.1152/ajpheart.00484.2019 [Accessed 10 December 2020

Figure legends

Figure1. Surgeon injecting diluted vasopressin at cervico vesical junction

Figure 2. Bladder is being pushed upwards

Figure 3. An avascular field is created between bladder base and cervix

Figure 4. Surgeon passing the needle through the para cervical tissues around the internal Os level

Figure 5. Key steps of aqua dissection using diluted vasopressin during modified Shirodkar cerclage

Table1. Brief description of the procedures

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`Shirodkar steps word .docx` available at https://authorea.com/users/468856/articles/562137-local-injection-of-diluted-vasopressin-and-aqua-dissection-at-the-time-of-modified-shirodkar-cerclage-description-of-a-safe-and-efficient-technique