CLINICAL CASE

1. Doctor of Obstetrics and Gynecology, National University of Cajamarca, Department of Gynecology and Obstetrics, Cajamarca Regional Teaching Hospital, Cajamarca, Peru. ORCID 0000-0002-3333-7019, email: jcollantes@unc.edu.pe
2. Obstetrician-Gynecologist, National University of Cajamarca, Department of Gynecology and Obstetrics, Cajamarca Regional Teaching Hospital, Cajamarca, Peru. ORCID: 0000-0003-2282-9867, email: sperezv@unc.edu.pe

Authors' contributions (CRediT taxonomy)[1]

Collantes Cubas, Jorge Arturo: Participated in conceptualization, data curation, formal analysis, research, methodology, project management, writing the original draft, and fundraising. He was also responsible for the final integration of the manuscript and the overall coordination of the study.

Pérez Ventura, Segundo Alberto: Participated in conceptualization, data curation, formal analysis, research, methodology, project management, writing of the original draft, and acquisition of funds. He was also responsible for the final integration of the manuscript and the overall coordination of the study.

Ethical responsibilities:

Data confidentiality: The data originated from the Cajamarca Regional Teaching Hospital and has been approved by the research committee.

Funding: Self-funded.

Artificial intelligence: The authors declare that they have used artificial intelligence technology in the translation and editing process.

Conflict of interest: This study does not represent any conflict of interest.

Received: 2 September 2025

Accepted: 12 November 2025

Online publication: 8 December 2025

Corresponding author:
Jorge Arturo Collantes Cubas
Urb. Molinos del Inca C-5, Los Baños del Inca, Cajamarca, Perú
976390499
jcollantes@unc.edu.pe

Cite as: Collantes J, Pérez S. Postpartum Hemorrhage: The New Shar-pei Uterine Compression Technique in Refractory Uterine Atony. Report of a Surgical Technique in Two Cases. Rev peru ginecol obstet. 2025;71(3). DOI: https://doi.org/10.31403/rpgo.v71i2808

Postpartum hemorrhage: New Shar-pei uterine compression technique in refractory uterine atony. Report on surgical technique in two cases

Hemorragia postparto: Nueva técnica Shar-pei de compresión uterina en Atonía Uterina Refractaria. Reporte de técnica quirúrgica en dos casos

Jorge Arturo Collantes Cubas[1], Segundo Alberto Pérez Ventura[2]

DOI: https://doi.org/10.31403/rpgo.v71i2808

ABSTRACT

Postpartum hemorrhage remains one of the leading causes of maternal mortality, particularly when uterine atony is unresponsive to medical treatment or conventional compression sutures. We report two cases of refractory uterine atony during cesarean section in which, after unsuccessful B-Lynch suture, a new compression technique named Shar-pei was applied. In both cases, bleeding was effectively controlled and hysterectomy was avoided. Postoperative recovery was favorable without major complications. The Shar-pei technique is proposed as a simple, reproducible second-line surgical option, particularly valuable in low-resource settings where uterine preservation is essential.

Key words: postpartum hemorrhage, uterine atony, Shar-pei technique, compression suture, B-Lynch

RESUMEN

La hemorragia posparto sigue siendo una de las principales causas de mortalidad materna, especialmente cuando la atonía uterina no responde al tratamiento médico ni a las suturas compresivas convencionales. Se presentan dos casos de atonía uterina refractaria ocurridos durante cesárea, en los cuales, tras la aplicación infructuosa de la técnica de B-Lynch, se empleó una nueva técnica de compresión uterina denominada Shar-pei. En ambos casos, la técnica logró un control efectivo del sangrado y evitó la histerectomía. La evolución posoperatoria fue favorable, sin complicaciones mayores. La técnica Shar-pei se propone como una alternativa quirúrgica de segunda línea, sencilla y reproducible, especialmente útil en contextos de recursos limitados donde la preservación uterina es prioritaria.

Palabras clave: hemorragia posparto, atonía uterina, técnica Shar-pei, sutura compresiva, B-Lynch

Introduction

Postpartum hemorrhage (PPH) is one of the leading causes of maternal mortality worldwide, accounting for 20.8% of cases in Latin America and the Caribbean[2]. In Peru, maternal deaths during childbirth or the postpartum period accounted for 71.2% of cases in 2024[3]. Furthermore, in Cajamarca, the incidence of postpartum hemorrhage is 67/1000 live births, with atony being the cause in 60.2% of cases[4]. This represents a major clinical challenge when it does not respond to standard medical treatment with uterotonics, prostaglandins, or tranexamic acid[5].

There are strategies to save lives in postpartum obstetric hemorrhage[6], depending on the cause. These can include external vascular control techniques (uterine massage, external aortic compression[7], anti-shock suit[8], ZEA technique of intravaginal clamping of uterine arteries[9], internal vascular control such as internal compression of the abdominal aorta[10], aortic clamping[11], intra-aortic balloon placement[12], Bakri balloons and intrauterine variants combined with uterine compression techniques[13,14], intrauterine suction techniques such as the Jada sys-

tem[15], single and double intrauterine tourniquets[16], etc. have been proposed as emergency measures[17].

Various life-saving strategies have been described for the management of postpartum obstetric hemorrhage, tailored to the underlying etiology[6]. These include external vascular control techniques, such as uterine massage, external abdominal aortic compression[7], the use of an anti-shock garment[8], and the ZEA technique involving intravaginal clamping of the uterine arteries[9]. Internal vascular control measures have also been reported, including internal compression of the abdominal aorta[10], aortic clamping[11], intra-aortic balloon occlusion[12], and the use of Bakri balloons or other intrauterine balloon devices combined with uterine compression techniques[13,14]. In addition, intrauterine suction systems, such as the Jada system[15], as well as single and double intrauterine tourniquet techniques[16], have been proposed as emergency interventions in the management of severe postpartum hemorrhage[17].

As for compression sutures, since the introduction of uterine compression sutures by B-Lynch in 1997, various techniques have been developed with the aim of avoiding hysterectomies and preserving fertility[14,18]. These techniques include vertical, horizontal, mixed, removable, and non-removable variants, including those of Hayman[19], Cho[20], Pereira[21], the uterine compression technique of Bhal[22], Mansoura[23], the uterine compression sutures of Ouahba[24], the double B-Lynch[25], the uterine flexion technique [26], the hemostatic technique of multiple square sutures by Cho et al.[27,28] Náusicaa[29], ring suture[30], Esike's, triple vertical compression, vertical + horizontal, sandwich, etc[17].

The underlying principle of these techniques is the application of external pressure to the myometrium in order to promote uterine contraction and thereby reduce hemorrhage. Nevertheless, each method presents inherent technical limitations, procedural risks, or variable effectiveness, particularly in cases of refractory uterine atony. Consequently, there remains a critical need for alternative approaches that are reproducible, safe, and feasible in resource-limited settings. Nieto Calvache et al.[31] propose that uterine compression techniques should be understood according to their mechanism of action in relation to uterine vascular perfusion and their capacity to control bleeding in either the upper uterine segment or body (S1) or the lower uterine segment (S2). They further emphasize the importance of regular team training, recommending refresher instruction every six months regardless of the technique employed. The aim of this report is to describe a novel uterine compression technique, termed the Shar-pei technique, for the management of refractory uterine atony unresponsive to the B-Lynch suture, through the presentation of two cases in accordance with the CARE reporting guidelines[32].

Case report

Two clinical cases and the surgical technique employed are presented. In the first case, a 19-year-old primigravid patient (Y.S.G.) at 35 weeks of gestation was admitted with a 13-hour history of premature rupture of membranes, threatened preterm labor, and a breech presentation. A primary transverse segmental cesarean section was performed, during which she presented severe uterine atony that did not improve with uterotonics (oxytocin, misoprostol, and ergometrine). Given the persistence of atony, a modified B-Lynch suture was performed, followed by the Shar-pei uterine compression technique, achieving hemostasis. Subjective bleeding of 600 ml was reported. In the immediate postoperative period, hemoglobin decreased from 13 g/dL to 11.7 g/dL, without requiring a blood transfusion. She received antibiotic treatment for risk of endometritis and progressed favorably. She was discharged after eight days of hospitalization with diagnoses of transverse segmental cesarean section plus B-Lynch and Sharpei for uterine atony, resolved endometritis, and mild anemia under treatment.

In the second case, a 34-year-old primigravid patient (S.O.P.), who conceived through in vitro fertilization and was carrying a twin pregnancy at 35 weeks of gestation, was hospitalized on April 4, 2025, due to threatened preterm labor and rupture of membranes. On April 8, 2025, a primary low transverse segment cesarean section was performed, resulting in the delivery of two live neonates. During the procedure, she presented with 2000 mL of hemorrhage due to uterine atony, refractory to medical treatment and B-Lynch suture, so the Shar-pei uterine compression technique was applied, achieving adequate contraction and con-

trol of bleeding. Hemoglobin decreased from 12.1 to 6.8 mg/dL, and she was discharged with hemoglobin at 8.5 mg/dL. She required a transfusion of three units of packed red blood cells and one unit of cryoprecipitate, as well as antibiotic treatment.

In the postoperative period, a diagnosis of HELLP syndrome was added, with good clinical progress. She was discharged after nine days of hospitalization, with progressive recovery of her blood count and resolution of moderate anemia.

The Shar-pei suture is used in areas where uterine atony persists after an initial surgical technique has been performed without complete success. After the B-Lynch suture, considering that hysterorrhaphy has already been performed. After the B-Lynch suture, chromic catgut divides the uterus into three zones: right, left, and central, which may maintain foci of atony. In these cases, the Shar-pei suture is placed in the affected areas. If the atony is generalized, a suture is placed in each compromised area.

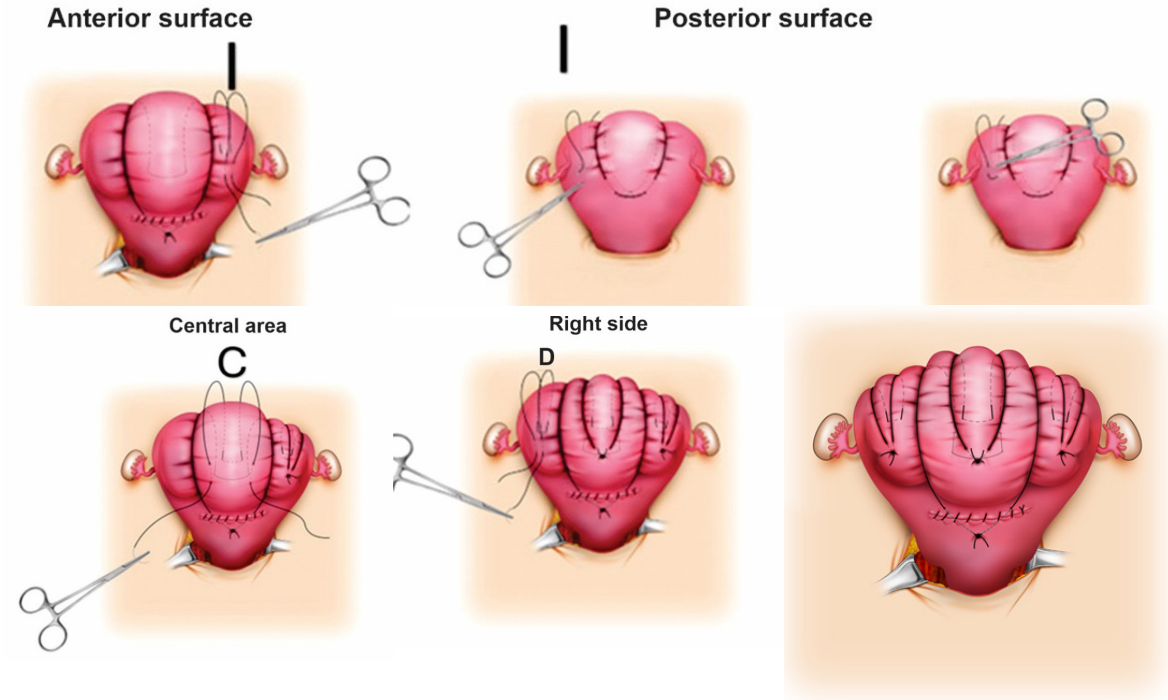
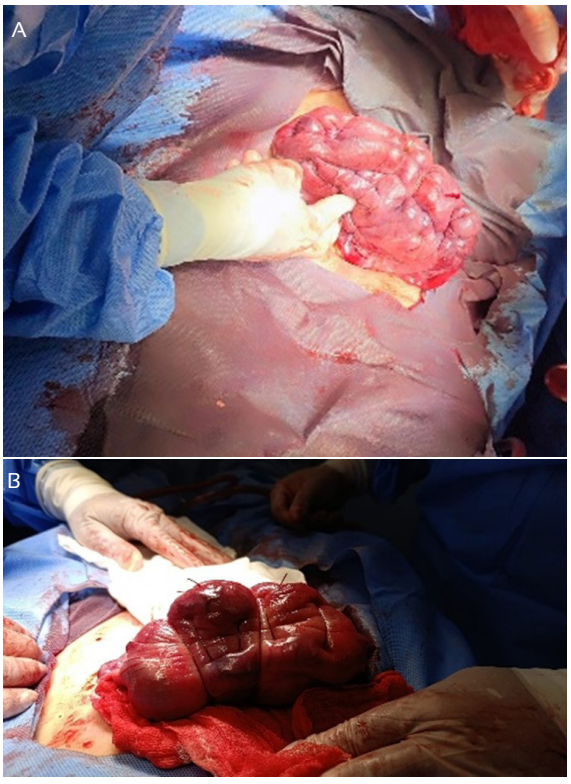


Figure 1: Uterine compression suture: Shar-pei. After administering uterotonics and performing the B-Lynch suture, uterine atony persists. With the B-Lynch suture, the uterus is divided into three zones: left, central, and right (L, C, and R). Start on the left side (L): For this technique, 1/0 MR 35–40 chromic catgut is used. The procedure begins on the left side: with a first entry and exit on the anterior surface of the uterus. The suture is then brought over the uterine fundus, with the second entry and exit made vertically on the posterior surface. Next, internally at 3–4 cm, the third entry and exit are made on the posterior surface vertically from bottom to top, the suture is brought over the fundus, and the fourth entry and exit are made from top to bottom parallel and at the same height as the first. b. Placement of suture in central area (C). Continue with the central area (C): In this central area, the same four steps as before are performed, i.e., with a first entry and exit on the anterior surface of the uterus; then, the suture is brought over the uterine fundus, with the second entry and exit being made vertically on the posterior surface. Next, internally at 3-4 cm, the third entry and exit are made on the posterior surface vertically from bottom to top, the suture is brought above the fundus, and the fourth entry and exit are made from top to bottom parallel and at the same height as the first. c. Suture placement on the right side (R). Continue with the right side (R): On the right side, perform the same four steps as before, i.e., with a first entry and exit on the anterior surface of the uterus; then, bring the suture over the uterine fundus, making the second vertical entry and exit on the posterior surface. Next, externally at 3-4 cm, the third entry and exit are made on the posterior surface vertically from bottom to top, the suture is brought above the fundus, and the fourth entry and exit are made from top to bottom parallel and at the same height as the first. d. B-Lynch and Shar-pei.

Figure 2. Real cases of Shar-pei sutures. a. Case 1. b. Case 2.



For the technique, 1/0 MR 35–40 chromic catgut is used. On the left side: the procedure begins with an initial entry into the anterior surface of the uterus, exiting approximately 4 cm higher on the same surface. The suture is then brought over the uterine fundus, with the second stitch placed on the posterior surface and exiting 4 cm lower. Next, parallel to and about 4 cm away, it re-enters the posterior surface, exiting 4 cm higher. It then crosses back through the uterine fundus to the anterior surface, entering and exiting 4 cm lower, where the stitches are tied. If atony persists in the central and right areas, the same procedure is repeated in each area. (Figure 1 a-d).

This is a vertical, non-removable technique for managing atony in zone 1 (S1), considered a second-line treatment when there is no response to B-Lynch suturing, and which does not require complementary techniques. The end result is a firmly contracted uterus with multiple transverse folds that evoke the characteristic skin appearance of the Shar-Pei dog[33], which gives rise to the name of this compression technique (Figure 2).

Discussion

Two cases are described in which cesarean delivery was complicated by uterine atony refractory to uterotonic agents and the B-Lynch compression suture. Prior to undertaking hysterectomy, a Shar-pei suture was applied, successfully achieving hemostasis and thereby avoiding uterine removal. In contrast to other compression methods, the Shar-pei technique is non-transfixing, technically simple, and particularly effective for atony involving the S1 zone.

The B-Lynch technique has demonstrated high efficacy rates, ranging from 91% to 100% across multiple series, and is widely regarded as a simple, rapid, and safe intervention[34]. Nevertheless, its effectiveness may be reduced in cases of a markedly flaccid uterus or extensive atony of the lower uterine segment. In such situations, alternative approaches, including the Hayman technique, may be considered, as they do not require a uterine incision; however, these methods provide less effective control in the lower uterine zone[19].

The Cho suture, using multiple square stitches, provides uniform compression but can cause ischemic necrosis and clot entrapment if used without adequate monitoring[20]. In contrast, Shar-pei avoids excessive transfixion, allowing targeted control in specific areas.

The Pereira and Náusicaa techniques offer versatility through combined or lateral anchor patterns, useful in diffuse atony[21,29]. However, their complexity can increase surgical time. The VV-Mansoura technique[23] and Caliskan ring suture represent anatomically broad approaches but require advanced experience[35,30].

An important aspect in choosing the technique is the impact on fertility. Longitudinal studies have reported normal menstruation and subsequent viable pregnancies after techniques such as B-Lynch and Cho, although with certain risks of intrauterine adhesions and focal necrosis[36].

The Shar-pei technique, which uses vertical stitches without transfixion of the endometrial cavity, covering the S1 zone, i.e., the uterine body, could control bleeding from the horizontal bran-

ches of the uterine artery, as described by Palacios Jaraquemada et al.[37,38]. Its simplicity also makes it a viable option in referral hospitals such as the Cajamarca Regional Teaching Hospital, where 60% of postpartum hemorrhages are due to atony and 32.8% occur in nulliparous women[4].

Like any emerging technique, Shar-pei requires multicenter validation and longitudinal follow-up, especially to document late complications and future obstetric outcomes.

Acknowledgments

We would like to thank Fabián Cabrera (email: ztavros@hotmail.com) for his valuable graphic contributions.

Referencias bibliográficas

1. Allen, L., Scott, J., Brand, A. et al. Publishing: Credit where credit is due. Nature 508, 312–313 (2014). doi: https://doi.org/10.1038/508312a
2. Khan KS, Wojdyla D, Say L, Gülmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. Lancet. 2006;367(9516):1066-1074. doi:10.1016/S0140-6736(06)68397-9
3. Centro Nacional de Epidemiología, Prevención y Control de Enfermedades – MINSA. Situación de la Mortalidad Materna 2024 (SE 51). Lima: MINSA; 2024.
4. De La Cruz Chules SJ. Características clínico epidemiológicas de hemorragia postparto primaria en el Hospital Regional Docente de Cajamarca en el periodo 2021-2023 [tesis]. Cajamarca: Universidad Nacional de Cajamarca; 2025. Disponible en: http://hdl.handle.net/20.500.14074/7876.
5. Boatin AA, Ngonzi J. Early Detection and Bundled Treatment for Postpartum Hemorrhage. N Engl J Med. 2023;389(1):79-80. doi:10.1056/NEJMe2305857
6. Bienstock JL, Eke AC, Hueppchen NA. Postpartum Hemorrhage. N Engl J Med. 2021;384(17):1635-1645. doi:10.1056/NEJMra1513247
7. Nieto-Calvache AJ, Palacios-Jaraquemada JM, Aryananda RA, Basanta N, Cininta N, Rivera LF, Bautista E, Hussein AM, External aortic compression: buying time to save lives in obstetric hemorrhage, American Journal of Obstetrics and Gynecology (2024), doi: https:// doi.org/10.1016/j.ajog.2024.09.017
8. Yeshitila YG, Bante A, Aschalew Z, Afework B, Gebeyehu S. Utilization of non-pneumatic anti-shock garment and associated factors for postpartum hemorrhage management among obstetric care providers in public health facilities of southern Ethiopia, 2020. PLoS One. 2021;16(10):e0258784. doi:10.1371/journal.pone.0258784
9. Nieto-Calvache AJ, Basanta N, Palacios-Jaraquemada JM, Rivera-Torres LF, Zea F. Vaginal clamping of uterine arteries: a temporary intervention to stop bleeding in postpartum hemorrhage. Am J Obstet Gynecol. 2025 Jun 28:S0002-9378(25)00748-0. doi:10.1016/j.ajog.2025.06.060
10. Nieto-Calvache AJ, Palacios Jaraquemada JM, Basanta N, et al. Internal manual compression of the aorta-an effective way to temporarily control pelvic bleeding in obstetrical hemorrhage. Am J Obstet Gynecol. 2022;227(1):96-97. doi:10.1016/j.ajog.2022.02.040
11. Chou MM, Chen MJ, Su HW, et al. Vascular control by infrarenal aortic cross-clamping in placenta accreta spectrum disorders: description of technique. BJOG. 2021;128(6):1030-1034. doi:10.1111/1471-0528.16605
12. Manzano-Nunez R, Escobar-Vidarte MF, Naranjo MP, et al. Expanding the field of acute care surgery: a systematic review of the use of resuscitative endovascular balloon occlusion of the aorta (REBOA) in cases of morbidly adherent placenta. Eur J Trauma Emerg Surg. 2018;44(4):519-526. doi:10.1007/s00068-017-0840-4
13. Said Ali A, Faraag E, Mohammed M, et al. The safety and effectiveness of Bakri balloon in the management of postpartum hemorrhage: a systematic review. J Matern Fetal Neonatal Med. 2021;34(2):300-307. doi:10.1080/14767058.2019.1605349
14. Bouchghoul H, Madar H, Resch B, et al. Uterine-sparing surgical procedures to control postpartum hemorrhage. Am J Obstet Gynecol. 2024;230(3S):S1066-S1075.e4. doi:10.1016/j.ajog.2022.06.018
15. Jackson FI, Dilena NJ, Ableman SH, Blitz MJ, Gerber S. Hemorrhage management using a Foley catheter for uterine suction. Am J Obstet Gynecol. 2025 Jun 29:S0002-9378(25)00765-0. doi:10.1016/j.ajog.2025.06.065
16. Castillo Reyther RA, Kway VB, Mendoza Huerta M, De La Maza Labastida S, Trujillo Cruz EY. The use of the double uterine segment tourniquet in obstetric hysterectomy for bleeding control in patients with placenta accreta spectrum. Int J Gynaecol Obstet. 2023;160(3):917-922. doi:10.1002/ijgo.14720
17. Hofmeyr GJ. Novel concepts and improvisation for treating postpartum haemorrhage: a narrative review of emerging techniques. Reprod Health. 2023;20(1):116. Published 2023 Aug 11. doi:10.1186/s12978-023-01657-1
18. B-Lynch C, Coker A, Lawal A, Abu J, Cowen M. The B-Lynch surgical technique for the control of massive postpartum haemorrhage: an alternative to hysterectomy? Five cases reported. Br J Obstet Gynaecol. 1997;104:372-5.
19. Hayman RG, Arulkumaran S, Steer PJ. Uterine compression sutures: surgical manage ment of postpartum hemorrhage. Obstet Gynecol 2002;99:502–6.
20. Cho JH, Jun HS, Lee CN. Hemostatic su turing technique for uterine bleeding during ce sarean delivery. Obstet Gynecol 2000;96: 129–31.
21. Pereira A, Nunes F, Pedroso S, Saraiva J, Retto H, Meirinho M. Compressive uterine su tures to treat postpartum bleeding secondary to uterine atony. Obstet Gynecol 2005;106: 569–72.
22. Bhal K, Bhal N, Mulik V, Shankar L. The uterine compression suture–a valuable approach to control major haemorrhage at lower segment caesarean section. J Obstet Gynaecol 2005;25:10–4.
23. El Refaeey AA, Abdelfattah H, Mosbah A, Gamal AM, Fayla E, Refaie W, et al. Is early intervention using Mansoura-VV uterine compression sutures an effective procedure in the management of primary atonic postpartum hemorrhage? A prospective study. BMC Pregnancy Childbirth. 2017;17:160. doi:10.1186/s12884-017-1349-x

24. Ouahba J, Piketty M, Huel C, et al. Uterine compression sutures for postpartum bleeding with uterine atony. BJOG. 2007;114(5):619-622. doi:10.1111/j.1471-0528.2007.01272.x

25. Şahin H, Soylu Karapınar O, Şahin EA, Dolapçıoğlu K, Baloğlu A. The effectiveness of the double B-lynch suture as a modification in the treatment of intractable postpartum haemorrhage. J Obstet Gynaecol. 2018 Mar 20:1-5. doi:10.1080/01443615.2017.1420046

26. Songthamwat S, Songthamwat M. Uterine flexion suture: modified B-Lynch uterine compression suture for the treatment of uterine atony during cesarean section. Int J Womens Health. 2018;10:487-492. doi:10.2147/IJWH.S170460

27. Matsubara S, Yano H, Ohkuchi A, Kuwata T, Usui R, Suzuki M. Uterine compression sutures for postpartum hemorrhage: an overview. Acta Obstet Gynecol Scand. 2013;92(4):378-385. doi:10.1111/aogs.12077

28. Moleiro ML, Braga J, Machado MJ, Guedes-Martins L. Uterine Compression Sutures in Controlling Postpartum Haemorrhage: A Narrative Review. Acta Med Port. 2022;35(1):51-58. doi:10.20344/amp.11987

29. Shih JC, Liu KL, Kang J, Yang JH, Lin MW, Yu CU. «Nausicaa» compression suture: a simple and effective alternative to hysterectomy in placenta accreta spectrum and other causes of severe postpartum haemorrhage. BJOG. 2019;126(3):412-417. doi:10.1111/1471-0528.15410

30. Çalışkan E, Akar B, Ceylan Y, Karadağ C. A novel low uterine segment sandwich technique (Caliskan's technique) for the management of post-cesarean hemorrhage due to placenta previa accreta. Turk J Obstet Gynecol. 2021;18(2):79-84. doi:10.4274/tjod.galenos.2021.72437

31. Nieto-Calvache AJ, Palacios-Jaraquemada JM, Sarria-Ortiz D, Galindo-Velasco V, Basanta N. How to choose and apply a uterine compression suture for the management of postpartum hemorrhage?. Int J Gynaecol Obstet. Published online March 12, 2024. doi:10.1002/ijgo.15468

32. Riley DS, Barber MS, Kienle GS, et al. CARE guidelines for case reports: explanation and elaboration document. J Clin Epidemiol. 2017;89:218-235. doi:10.1016/j.jclinepi.2017.04.026

33. Muller GH. Skin diseases of the Chinese Shar-Pei. Vet Clin North Am Small Anim Pract. 1990;20(6):1655-1670. doi:10.1016/s0195-5616(90)50166-7

34. Matsuzaki S, Jitsumori M, Hara T, Matsuzaki S, Nakagawa S, Miyake T, et al. Systematic review on the needle and suture types for uterine compression sutures: a literature review. BMC Surg. 2019;19:196. doi:10.1186/s12893-019-0660-z

35. Li GT, Li XF, Zhang YH, Si Y, Li GR, Xu HM. Ring compression suture for controlling post-partum hemorrhage during cesarean section. J Obstet Gynaecol Res. 2018;44(8):1424-1430. doi:10.1111/jog.13676

36. Habek D, Miletić AI, Medić F. Fertility after B-Lynch compressive uterine sutures. J Obstet Gynaecol Res. 2023;49(1):358. doi:10.1111/jog.15477

37. Palacios-Jaraquemada JM, Nieto-Calvache Á, Basanta NA. Anatomical basis for the uterine vascular control: implications in training, knowledge, and outcomes. Am J Obstet Gynecol MFM. 2023;5(7):100953. doi:10.1016/j.ajogmf.2023.100953

38. Palacios Jaraquemada JM, García Mónaco R, Barbosa NE, Ferle L, Iriarte H, Conesa HA. Lower uterine blood supply: extrauterine anastomotic system and its application in surgical devascularization techniques. Acta Obstet Gynecol Scand. 2007;86(2):228-234. doi:10.1080/00016340601089875