



Forceps-Assisted Delivery Leads to the Formation of Uterine Isthmus Diverticulum

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Abstract

The formation of uterine diverticula following forceps-assisted delivery is an infrequent complication characterized by irregular and prolonged postpartum menstruation. Although ultrasound and MRI can aid in diagnosis, the identification often suffers from delayed recognition due to a lack of cesarean section history. Herein, we present a case of a 31-year-old woman who developed a uterine diverticulum due to forceps-delivery and was misdiagnosed for 4 years. Here, we propose how to identify and avoid uterine diverticula following forceps-assisted delivery early.

Keywords: Forceps-assisted delivery; Uterine isthmus diverticulum; Uterus; Menstrual disorder

Introduction

Uterine diverticulum refers to small anatomical divisions within the uterine cavity, typically categorized as congenital or secondary [1]. Secondary uterine diverticula are commonly attributed to procedures such as cesarean section, myomectomy, assisted delivery, and other interventions [2]. While there have been numerous reports on cicatricial diverticulum resulting from cesarean section, limited literature exists regarding large diverticula following forceps-assisted delivery.

Forceps-assisted delivery refers to the utilization of forceps during the second stage of labor to expedite fetal delivery for maternal benefit. It is worth noting that forceps-assisted delivery can result in iatrogenic cervical laceration, characterized by persistent active vaginal bleeding postpartum, even after excluding placental factors, soft birth canal laceration, and uterine contractions [3]. This paper presents a case study of abnormal uterine bleeding and a large diverticulum in the uterine isthmus following forceps-assisted delivery. Failure to timely detect cervical laceration during forceps midwifery resulted in postoperative abnormal uterine bleeding. The integration of labor history, clinical symptoms, and imaging aids in diagnosis, ultimately leading to the diagnosis of uterine isthmus diverticulum. Informed consent statement and ethical approval were obtained for this study.

Case Presentation

The patient, a 31-year-old nulliparous woman, presented to our hospital with a history of postpartum menstrual disorder for over 4 years. The patient's menstrual cycles previously had a regular duration of 28 to 30 days, with a period lasting for 4 to 5 days. But the patient experienced altered menstrual regularity after six months post-delivery. To be specific, the patient underwent forceps-assisted delivery at a hospital due to dystocia and macrosomia in March 2018, resulting in a postpartum hemorrhage of 710 ml within a two-hour timeframe. The hemorrhage was successfully controlled by uterine tamponade. After six months, the patient experienced altered menstrual regularity characterized by irregular cycles lasting for 30 days and prolonged periods lasting for 15 to 20 days, accompanied by continuous spotting. In 2020, the patient underwent treatment at the local hospital where B-ultrasound examination results revealed a "cystic mass in the anterior wall of the cervix." However, considering the absence of a history of cesarean section, the possibility of uterine incision scar diverticulum was not considered. Furthermore, despite conservative drug treatment, there was no improvement observed in abnormal menstruation.

In 2023, the patient was admitted to our hospital and underwent three-dimensional ultrasound examination of the uterus, which revealed a well-defined hypoechoic area measuring approximately 67 mm × 54 mm × 63 mm in the isthmus region with visible anterior wall of cervix. Within this

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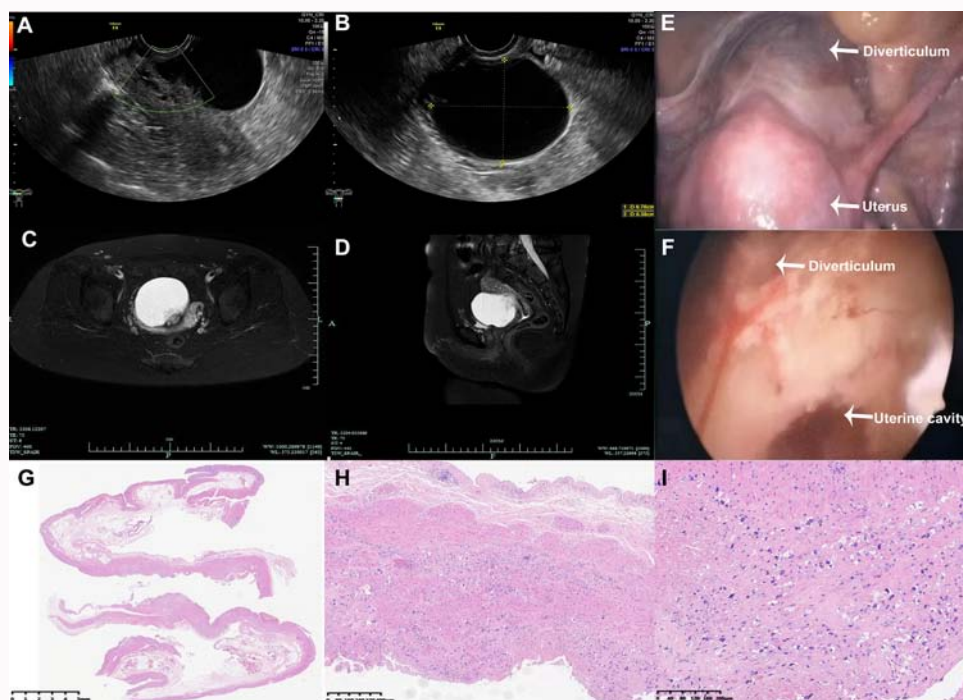


Figure 1: Imaging examinations, intraoperative observations, and relevant pathologic section images of the patient. A, B) uterus ultrasonography findings. C, D) Magnetic resonance image of uterus. E) Laparoscopic exploration identified a diverticulum connected with uterus. F) Hysteroscopic exploration identified a diverticulum opening and cervical opening. G-I) Pathological images of excised diverticulum tissue specimens.

area, fine dot echoes and flocculent echoes were observed along with an indistinct boundary with the cervix. Furthermore, Color Doppler Flow Imaging (CDFI) detected blood flow signals in the peripheral wall (Figure 1A, 1B). The pelvic MRI examination revealed thinning of the muscle layer at the distal end of the anterior uterine wall, accompanied by a prominent outward protrusion measuring approximately 6.8 cm × 6.1 cm in size, which were connected to the intima and exhibited an intimal signal shadow. Both T1 and T2 in the protrusion showed high signals (Figure 1C, 1D).

Subsequently, the patient underwent laparoscopic combined hysteroscopic surgery on March 30th, 2023. Laparoscopic exploration revealed a uterus of normal size, with a prominent cystic mass measuring approximately 6.5 cm in diameter protruding towards the abdominal cavity from the right side of the isthmus of the uterus. The sac wall appeared delicately thin, resembling silk, and contained a viscous brown substance (Figure 1E). Simultaneously, hysteroscopic exploration was performed, revealing a substantial diverticulum in the cervical isthmus with an opening below it (Figure 1F). Gradual dilation of the cervix opening using a probe allowed for subsequent insertion of hysteroscopy to visualize both endometrioid tissue and the openings of the fallopian tubes bilaterally. Subsequently, a copious amount of brown fluid was discharged from the opening of the diverticulum. Laparoscopic resection of the cervical diverticula was performed following completion of the probe. The excised diverticulum exhibited a peritoneal covering on its surface, smooth muscle in its wall, and intima or decidua lining its cavity that communicated with the uterine cavity, consistent with a diagnosis of uterine diverticulum. The postoperative pathological examination revealed a significant thinning (0.1-0.2 cm) of the smooth muscle in the uterine diverticulum, accompanied by enlarged nuclei resembling changes observed at the site of placental attachment. Additionally, a small number of chronic inflammatory cells were infiltrated (Figure

1G-1I).

After a postoperative period of 45 days, the patient's menstruation returned to normal with a regular cycle length of 30 days and a menstrual duration of 5 days, without experiencing dysmenorrhea.

Discussion

Forceps application is a crucial intervention for managing dystocia during the second stage of labor, ensuring maternal and neonatal survival. However, improper utilization of forceps often results in perineal, vaginal, cervical lacerations, pelvic or joint injuries, postpartum hemorrhage, and infection [3,4]. It is noteworthy that uterine diverticulum caused by forceps delivery is an exceedingly rare occurrence.

Uterine diverticulum refers to a division that occurs inside the uterus that commonly occurs following cesarean section or uterine surgery [5]. The presence of a small division within the uterus leads to the accumulation of menstrual blood in the diverticulum, while newly formed valves surrounding it impede smooth outflow of menstrual blood from the diverticulum. Upon changes in position, activity, or sexual intercourse, gradual drainage of accumulated menstrual blood takes place in small quantities from the uterine diverticulum. Depending on its size, bleeding may persist for up to ten days. Furthermore, infection within the diverticular contents can result in lower abdominal pain and fever, potentially leading to infertility and adverse pregnancy outcomes for certain patients. The diagnosis of uterine diverticula should meet the following conditions: (1) Peritoneal coverage; (2) Smooth muscle in the wall; (3) There is endometrium or decidual covering in the lumen; (4) Connected with the uterine cavity [6,7].

The patient's menstrual cycle was regular prior to delivery; However, following the forceps delivery due to dystocia in 2018, her

menstrual cycle became irregular and extended for approximately 20 days. Both ultrasound and MRI examinations of the patient's uterus revealed a mass on the right side of the isthmus that appeared to be connected with the uterine cavity. Nevertheless, considering there was no history of cesarean section or other uterine procedures before delivery, congenital uterine diverticulum was not initially considered as a possibility, leading to a missed diagnosis. Following hysteroscopic combined with laparoscopic surgery and subsequent pathological examination results after four years, this case was ultimately diagnosed as cervical diverticulum caused by an uncommon forceps delivery.

We hypothesize that the formation of this diverticulum can be attributed to two factors. Firstly, prolonged and intense contractions during the patient's second stage of labor may lead to increased susceptibility of uterine rupture. Secondly, improper forceps delivery technique resulted in a tear in the muscular layer of the cervical isthmus, subsequently forming a small uterine diverticulum. Besides, the absence of menstrual blood flow into the diverticulum after delivery hindered this diverticulum timely detection by B-ultrasound. Consequently, accumulation of menstrual blood within the small posterior uterine diverticulum gradually enlarged it over time, leading to persistent menstrual spotting for the patient.

To mitigate complications associated with forceps usage, it is important to ensure that the forceps leaf is properly positioned without embedding its end into the vaginal vault. If buckling the forceps proves challenging, it may indicate a high fetal head position, necessitating exploration of the vagina and adjustment of forceps placement rather than applying excessive force. Difficulties in traction should prompt consideration of incorrect traction direction or inadequate pelvic-fetal head proportions; thus, forced pulling should be avoided to prevent harm to both fetus and birth canal. During forceps traction, uniform application of downward pressure along the direction of the forceps is crucial while maintaining a slow speed and avoiding any swaying motion of the handle. Improper operation could potentially lead to partial or complete tearing of maternal myometrium [8].

The uterine diverticulum should be promptly excised through surgical intervention. During the excision procedure, complete removal of the functional endometrium and cervical glands is necessary, while preserving the muscular layer to minimize the risk of perforation, stenosis, occlusion, excessive deformation of the cervical canal, and perinatal uterine rupture in subsequent pregnancies [9]. Due to a lower proportion of smooth muscle tissue and reduced contractility within the cervix, there is an increased likelihood of scar rupture at the site where a cervical diverticulum has been removed. Consequently, vaginal delivery is not recommended for subsequent pregnancies due to potential risks associated with uterine rupture; instead, cesarean section offers a relatively safe option for pregnancy termination [10].

This case report presents a rare complication of forceps assisted delivery - uterine diverticula. It also emphasizes the importance

of early identification of uterine diverticulum, even if there is no history of cesarean section, a history of forceps midwifery should be considered when the presence of uterine diverticulum is suspected. This case provides diagnostic ideas for patients who have no history of cesarean section but show signs of uterine diverticulum.

Conclusion

The patient's menstrual pattern underwent changes following forceps-assisted delivery, and the diagnosis of uterine giant diverticulum was finally made by hysteroscopic surgery. Given the absence of any prior history of cesarean section or uterine surgery, the rare complication of cervical muscle tear resulting from forceps application was considered.

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