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Iatrogenic Uterine Perforation with Kronner Uterine Manipulator

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Abstract

Iatrogenic uterine perforation due to initial overinflation of the Kronner uterine manipulator balloon through the balloon port is previously unreported. A 37-year-old multipara with a 1 year history of dysmenorrhea, menorrhagia, and post coital spotting desired permanent sterilization following 9 years of copper intrauterine device (IUD) use. At the onset of the procedure a Kronner uterine manipulator was placed and inadvertently inflated with 30 ml instead of 10 ml of air. Upon insertion of the laparoscope for laparoscopic tubal sterilization a 1 cm diameter perforation of the uterine fundus was noted. Hemostasis was achieved by bipolar cauterization, following which the intended procedure was completed. We believe that the iatrogenic uterine perforation was caused by overinflation of the intrauterine balloon of the Kronner uterine manipulator, in a uterus whose fundus was already weakened from 9 years of IUD use. While intrauterine balloons placed for gynecologic or obstetrical hemostasis may be inflated from 30 to 300 ml, overinflation of a uterine manipulator balloon in nonhemorrhagic situations can cause uterine perforation.

Keywords: Iatrogenic uterine perforation; Kronner uterine manipulator; Uterine manipulator balloon overinflation; Uterine perforation

Abbreviations: D&C: Dilation and Curettage; IUD: Intrauterine Device

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Introduction

The RUMI and HUMI/Kronner uterine manipulators (RUMI® and HUMI®/Kronner® Uterine manipulator Injector, Cooper Surgical, Shelton, CT), the Clearview™ uterine manipulator (Clinical Innovations, Abingdon, England), and the Majoli uterine manipulator (Cook Group Inc, Spencer IN), are four of many tenaculumless manipulators used for uterine mobilization and chromopertubation that have both an inflatable balloon for securing the manipulator in place, and a patent channel for chromopertubation. Several uterine manipulators such as the Pelosi Uterine manipulator (Apple Medical Corporation, Marlborough, MA) and the Cohen Cannula (Richard Wolf, Vernon Hills, IL) that permit chromopertubation are balloonless, but incorporate a tenaculum. We are aware of two reported cases of iatrogenic uterine rupture due to overinflation of a RUMI manipulator, one of which necessitated a return to the operating room for retroperitoneal hematoma treatment [1].

The disposable Kronner uterine manipulator consists of one port for the intrauterine balloon which secures the manipulator in place and one port for chromopertubation, with a spring loaded platform in the handle of the manipulator (**Figure 1).** We report what to our knowledge based on searching the PubMed database using the search terms “uterine perforation,” and “uterine manipulator,” is the third case of iatrogenic uterine perforation due to overinflation of a uterine manipulator balloon **(Table 1)**, and the first case of iatrogenic uterine perforation due to overinflation of a uterine manipulator at initial placement of the manipulator [1-4].

Case Report

A 37-year-old woman (gravida 4, para 2022) presented to her gynecologist with a one year history of pelvic pain beginning seven days prior to the onset of menstruation, dysmenorrhea for the first day of menstruation, menorrhagia, and postcoital

Table 1 Reported cases uterine perforation with uterine manipulators.

Reference No./ Year	Manipulator	Reason for Surgery	Causation	Outcome	Cases
4/2014	Hohl	Endometrial hyperplasia	Improper uterine sounding. Uterine perforation with Hohl uterine sound. Recto-sigmoid colon adherent to uterine fundus	Bowel perforation. Uterine rupture.	1
3/2007	KOH Colpotomizer or RUMI	Not given	Not given	Uterine perforation.	1
Current publication 2015	Kronner	Multiparity. Copper IUD use for 9 years	Initial balloon overinflation	Uterine perforation	1
2/2007	Kronner	Ovarian cyst	Cervical conization for CIN III performed 5 days earlier.	Uterine cervix perforation into the anterior cul-desac.	1
1/2005	RUMI	1-Primary Infertility 2-Pelvic pain	Balloon port mistaken for injection port. Intrauterine balloon overinflation with methylene blue.	1 and 2-Uterine perforation. 2-Retroperitoneal hematoma.	2

Figure 1 Kronner intrauterine manipulator.

spotting. She also complained of nocturia and urinary urgency. Her gynecologic history was significant for a dilation and curettage (D&C) in 1989, copper intrauterine device (IUD) use for 9 years following a normal spontaneous vaginal delivery of twins in 1996, conization of the cervix for a high grade squamous intraepithelial lesion in 2003, and ovarian cystectomy in 2005. Pelvic examination was normal with visible IUD strings. The IUD was removed. The Pap test was interpreted as atypical endocervical cells. Endocervical curettage showed benign endocervix with squamous metaplasia. Endometrial biopsy was interpreted as proliferative endometrium with fragments of fibromuscular tissue. Urine culture and cytology were negative for infection or malignancy. Transabdominal pelvic ultrasound showed a 6.8 × 4.1 × 5.6 cm uterus, a 6 mm endometrial stripe, a 4.1 × 2.6 × 2.5 cm right ovary, and a 4.4 × 3.4 × 1.7 cm left ovary. There was no free fluid in the cul-de-sac. She was offered cystoscopy to further evaluate overactive bladder, and a laparoscopic bilateral tubal sterilization to provide contraception in lieu of the IUD.

Intraoperatively, the uterus was sounded but not dilated. A Kronner uterine manipulator with a 30 ml syringe already placed on the balloon port, was handed off to a physician who did not normally place the uterine manipulator. Instead of only filling the balloon with 10 ml air, the entire capacity of the 30 ml syringe was used, filling the balloon with 30 ml of air. Following placement of the laparoscope, the Kronner uterine balloon was visible through a 1 cm diameter perforation of the uterine fundus **(Figure 2).** The Kronner uterine manipulator was removed vaginally, the rim of the perforation cauterized with bipolar cautery for good hemostasis, and Surgicel (Surgicel® Ethicon Inc, Piscataway NJ) placed. The bilateral tubal sterilization was performed with bipolar cautery. Cystoscopy was negative for Hunner's ulcers or glomerulations. Postoperatively the patient had no further complaints of abnormal uterine bleeding.

Discussion

To the best of our knowledge, this is the first reported case of iatrogenic uterine perforation due to overinflation of the Kronner uterine manipulator balloon at initial manipulator placement. Normally, a 10 ml syringe is used for inflation of the Kronner manipulator balloon. In this instance, a 30 ml syringe was inadvertently used. Unlike the two previously reported cases of uterine rupture with overinflation of a RUMI uterine manipulator balloon, overinflation of the manipulator balloon was not due to mistaking the balloon port for the chromopertubation port [1]. While the normal uterine capacity is 2 to 20 ml, up to 40 ml of saline may be used for balloon tamponade after hysteroscopic resection of myoma, and up to 300 ml of saline for postpartum hemorrhage intrauterine balloon tamponade [5,6]. Thus, overinflation with 30 ml of saline may not be the sole cause of the fundal uterine perforation. Our patient's uterine fundus may have been weakened from 9 years of IUD usage. Uterine perforation is a well known adverse effect of intrauterine devices [7]. Alternatively, perforation could have resulted from the initial sounding of the uterine cavity, with the overinflated Kronner uterine manipulator balloon simply enlarging the uterine

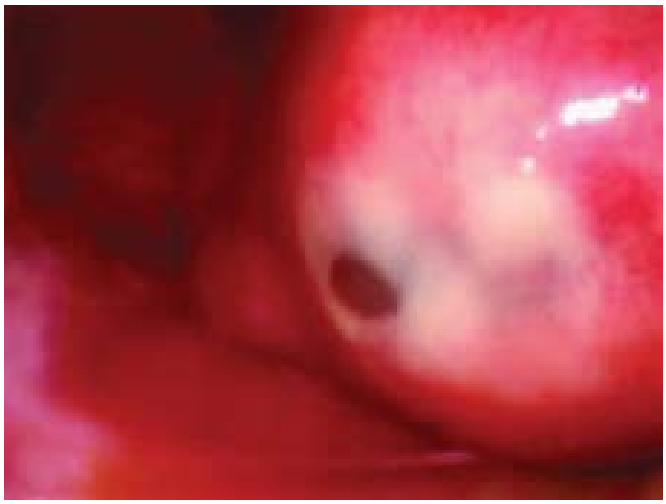

Figure 2 Uterine perforation following overinflation of Kronner uterine manipulator balloon.

perforation. Inserting the uterine manipulator through an non-mechanically dilated cervix, could also have contributed to a fundal uterine perforation. However, there was no indication intraoperatively that perforation occurred with either sounding the uterus or insertion of the uterine manipulator.

Occult perforation can occur at the time of D&C, as is reported to be the case in several instances of occult uterine perforation discovered at cesarean section [8,9]. However, in our case the patient successfully delivered a term twin pregnancy vaginally without complication 7 years following a D&C, which may suggest that in this case there was not an occult uterine perforation from the patient's prior D&C.

Unsuspected uterine perforation may be revealed at laparoscopy [8]. While previously, in cases of unsuspected uterine perforation, the actual perforation was believed to have occurred during D&C, currently, laparoscopic or abdominal myomectomy and operative hysteroscopy may be more frequent causes of occult uterine perforation [10]. Uterine perforation may also occur during laparoscopy due to trocar puncture, or to the uterine sound [11].

In the case presented, the patient's operative course was minimally altered due to the uterine perforation, and there were no post operative sequela to the patient. However, uterine rupture due to overinflation of a uterine manipulator balloon can lead to extended postoperative hospitalization for procedures that were anticipated to be ambulatory, or a return to the operating room for treatment of an acute abdomen [1]. In teaching institutions, or when gynecologic laparoscopists do not work with a consistent operating room team, there must be close adherence to manufacturers' instructions, or consideration given to using balloonless uterine manipulators, such that potentially serious adverse events may be avoided.

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