Uterine Rupture After Robotic-Assisted Laparoscopic Myomectomy

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ABSTRACT

Introduction: Uterine rupture is an acute obstetric emergency requiring a rapid response by a multidisciplinary team of physicians and allied health care professionals to minimize the risk of both maternal and neonatal morbidity and death. A risk factor is previous myomectomy. Robotic-assisted laparoscopic myomectomy is a technologically cutting-edge approach to a common surgical procedure, myomectomy. Pregnancy after robotic-assisted laparoscopic myomectomy has been reported in the literature.

Case Description: We report a case of spontaneous uterine rupture in a subsequent pregnancy after robotic-assisted laparoscopic myomectomy.

Discussion: With use of robotic assistance, the technique changes when compared with standard laparoscopic myomectomy. Areas of potential concern are the amount and type of energy required to excise the fibroid from the myometrial bed.

Key Words: Myomectomy, Uterine Rupture, Robotic Surgery, Laparoscopy, Spontaneous, Pregnancy.

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INTRODUCTION

For women with the symptoms of uterine fibroids who wish to preserve their fertility or whose fertility concern is because of fibroids, the more conventional approach of myomectomy by laparotomy or laparoscopy is being challenged by the rapid expansion of robotic techniques. A potential consequence of myomectomy is spontaneous uterine rupture. Parker et al[1] have noted that there is a risk of uterine rupture during pregnancy, after laparoscopic myomectomy, due to the use of bipolar energy. This risk has not previously been noted with the use of robotic assistance.[1]

CASE

The patient was a 34-year-old woman, gravida 1, para 0, who had a history of menorrhagia and dysmenorrhea; on ultrasonography, 2 myomata were noted. She had no history of diabetes, hypertension, or obesity. The larger of the 2 intramural myomas was 9 cm in diameter without any evidence of degeneration arising from the midline posterior aspect of the uterus. This 9-cm myoma had a submucosal and subserosal component. A smaller, 5-cm, predominantly subserosal fibroid anteriorly was noted. Robotic-assisted multiple myomectomy with the da Vinci system (Intuitive Surgical, Sunnyvale, California) was performed without complication, with an estimated blood loss of 75 mL. Unipolar cautery was used to incise the midline posterior aspect of the serosa from the fundus to 2 cm above the internal os. Blunt dissection was used to isolate the vasculature; then, Intuitive Surgical's Endowrist PK Dissecting Forceps (Sunnydale, California) was used to coagulate the vessels. Sharp scissors were used to transect the endoscopically coagulated pedicles. This process was repeated until the entire myoma was "shelled out" via hemostasis. During removal of the 9-cm posterior myoma, the endometrial cavity was entered. The defect was closed in 3 discrete layers. The first layer was a running, nonlocking No. 2-0 polyglactin 910 suture. The second layer was a combination of Lapra-Ty Clips (Ethicon, Somerville, New Jersey) and running, nonlocking No. 2-0 polyglactin 910 sutures to imbricate the myometrial defect. The final layer was a V-Loc device (Covidien, Mansfield, Massachusetts) with No. 2-0 polyglactin 910 running suture in the serosa. Excellent reapproximation of the uterine defects and hemostasis were attained. At no time was a tourniquet or vasopressin used. The extent of electrocautery used to control hemostasis was considered "normal," that is, it was used only to control brisk bleeding, as opposed to "excessive."[2] An adhesive preventive agent was placed on the posterior aspect of the uterus.

Approximately 164 days after the robotic procedure, the patient conceived. The pregnancy was remarkable for a single umbilical artery for which the patient underwent antepartum testing. Multiple ultrasonographic examinations throughout the pregnancy showed no residual myomata. The patient was offered amniocentesis at 36 weeks to assess fetal lung maturity and delivery if mature. This management approach regarding the timing of delivery is similar to that recommended by Ouyang and Norwitz[3] in patients with previous myomectomy when the myometrium was significantly compromised. The patient declined this recommendation and was scheduled to undergo cesarean section at 38 weeks.

At 37 weeks' 3 days' gestation, the patient presented to the labor and delivery unit via rescue squad after a syncopal episode that evening at home. The patient complained of diffuse and worsening abdominal pain that began that morning, along with low-back pain; she denied any vaginal bleeding or recent trauma. Physical examination on admission to the labor and delivery unit was significant for a diffusely tender abdomen. The vital signs were as follows: systolic/diastolic blood pressure, 112/71 mm Hg; heart rate, 114 beats/min; and oxygen saturation, 100%. Fetal heart tones were initially category II (baseline, 140 beats/min; absent variability; no accelerations or decelerations). External assessment with a tocodynamometer showed no uterine contractions. Within minutes of presentation, fetal heart tones exhibited a spontaneous deceleration and subsequent fetal bradycardia. The cervix was 1 cm dilated and 100% effaced, and the vertex was at the –2 station with no vaginal bleeding.

The patient was quickly transferred to the operating room for an emergency cesarean section. On entering the peritoneal cavity, the surgeon found copious amounts of blood and clotted material. After delivery of a viable female neonate weighing 4050 g, the uterus was gently elevated above the operative field. Posteriorly, there was a V-shaped indentation of the very thin but intact myometrium beginning near the uterine fundus and extending inferiorly to a complete uterine perforation of the wall approximately 1 cm in diameter and believed to be the sole source of the intraperitoneal bleeding. The low transverse uterine incision was closed in 2 layers: a running, locking suture of No. 0 polyglactin 910 followed by a running suture of No. 0 polyglactin 910 imbricating the first suture. In a similar manner, posteriorly, the thinned myometrium and complete uterine perforation described earlier were closed. Blood loss was estimated at 3500 mL. The patient received 3000 mL of crystalloids and 2 U of packed red blood cells.

The patient's postoperative course was complicated by anemia, for which she received an additional unit of packed red blood cells, and endometritis treated with intravenous antibiotics. She was discharged on postoperative day 4 with hemoglobin and hematocrit levels of 7.5 grams and 23.5 percent, respectively.

At delivery, the neonate was apneic with a heart rate of <100 beats/min. Positive pressure ventilation was given by mask. The neonate was intubated at 1 minute of life. The Apgar score was 3, 5, and 7 at 1, 5, and 10 minutes, respectively. At 30 minutes of age, the neonate began moving all 4 extremities spontaneously with good tone and began opening her eyes. Arterial blood gas analysis of the umbilical artery showed the following: pH <6.73; partial pressure of carbon dioxide, 149; partial pressure of oxygen, <18; and Base Excess, –27. The neonate received mechanical ventilation because of significant metabolic acidosis and was given 5 mEq of sodium bicarbonate. Because of neonatal depression, she was transferred to the Children's Memorial Hospital Neonatal Intensive Care Unit for head cooling.

The neonate underwent head cooling for 72 hours. She was subsequently discharged while receiving Synthroid (Abbott Laboratories, Abbott Park, Illinois, USA) and phenobarbital. At 2 months of age, the infant was seen by our neonatology follow-up program. Her weight of 4950 g was at the 50 percentile. The findings of her physical examination were normal, and she showed appropriate prelinguistic, cognitive, social, and feeding skills for her age.

DISCUSSION

The purpose of this article is to discuss a rarely reported complication after a robotic-assisted laparoscopic myomectomy (RALM) that appears to be due to the use of bipolar cautery. The laparotomy approach to myomectomy is being replaced by the rapid expansion of laparoscopic and robotic techniques.[4] With the exception of the duration of operative time favoring myomectomy via laparotomy, RALM benefits include less blood loss, a quicker recovery time, fewer intravenous or oral analgesics, and a shorter hospital stay.[4,5] Pregnancy rates after intramural fibroids have been found to be between 68% and 74%.[6]

Multiple etiologies of uterine rupture have been suggested and include use of bipolar energy on the bed of the myometrium.[1] Electrocautery may also contribute to uterine rupture by its effect on suture tensile strength if used too close to the suture material. Previous authors addressed this by showing that when suture material was exposed to bipolar cautery for 4 seconds, significant changes in suture tensile strength were observed, which may affect wound healing after myomectomy.[7] Although pregnancy outcomes after RALM, laparoscopic myomectomy, and traditional myomectomy may be similar, one must be cautious regarding the use of bipolar desiccation.

Just as in laparoscopic myomectomy as compared with open myomectomy, there is increased potential for the surgeon to use electrocautery; this potential is even greater in RALM compared with laparoscopic myomectomy.[8] Magnification of the surgical field may make small blood vessel bleeding more apparent and lead to excessive use of desiccation with electrosurgery, especially for the more novice robotic surgeon, perhaps to the detriment of wound healing. In open myomectomy, the initial incision in the serosa is a unipolar cutting current, with subsequent hemostasis largely controlled through clamping and suturing. In this case the initial incision in the serosa was the same as that used in an open case, but subsequent hemostasis was largely controlled by discrete identification of vessels and subsequent use of bipolar energy. Even though the exposure of the myometrium to bipolar energy appeared to be normal, it was definitely more than what is experienced during an open procedure. A 2004 study observed the differences in scars between laparoscopic and open myomectomy.[8] It found that laparoscopic myomectomy scars were more strained when compared with open myomectomy scars and had a thinner-than-normal myometrium, whereas open myomectomy resulted in a myometrium of normal thickness. The study concluded that these results were due to the use of sutures during open myomectomy, whereas during laparoscopic myomectomy, significantly more electrocautery was used to achieve hemostasis. It follows that if there is even more extensive use of bipolar electrocautery in robotic myomectomy when compared with laparoscopic myomectomy, the resultant scars might potentially be even more strained and the myometrium thinner.[1,8] Antepartum evaluation of the myometrial thickness at sites of myomectomy in an effort to identify pregnant women with marked thinning that might predispose them to uterine rupture has been suggested[8]; however, ultrasonographic imaging was not effective in predicting uterine rupture.

The described case is significant in that a 3-layer closure of the myometrial defect at the time of RALM was implemented; it was performed by an experienced laparoscopic surgeon (who had previous experience with well over several hundred laparoscopic myomectomies; at the time of the case, had performed >50 robotic cases, of which 10 were myomectomies; and currently holds certification in laparoscopic surgical procedures, group C, type 1, from the Council on Gynecologic Endoscopy); and there was no excessive use of electrocautery, all of which are recommendations in the literature.[9] In a reported case of uterine rupture after RALM, a single-layer closure was performed, and it was advised, based on this fact, that a multiple-layer closure is necessary to ensure a minimal risk of subsequent uterine rupture.[2] The same article advised surgeons to refrain from the extensive use of diathermy for hemostasis to minimize the risk of uterine rupture, but as stated earlier, RALM may use the same, if not significantly more, electrocautery for hemostasis.

CONCLUSION

In this case, whether the operative technique used was laparoscopic, robotic, or open, the size and direction of the incision, as well as the method of myomotomy, would have been similar. It seems reasonable that regardless of the operative technique, the use of a cutting current on a low-energy setting for the initial myomotomy incision would expose the myometrium to a minimal amount of energy effect. The myoma did not have any evidence of degeneration, and the myoma defect was closed in 3 layers of long-lasting absorbable suture. The patient's history did not include any factors that may have hindered the healing process. It appears that the one variable that was different in this robotic case was the use of bipolar cautery as a method of hemostasis in the shelling out of the myoma.[10] Thus, regardless of the technique used, it appears— on the basis of this case—that one must avoid using bipolar energy to control hemostasis. One aspect of robotic myomectomy that is unique relative to laparoscopic myomectomy is the enhanced visualization and dexterity. Therefore, achieving hemostasis via suturing is essential, and the robotic platform allows this to be more easily accomplished relative to the laparoscopic approach.

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