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CASE REPORT

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Robotic-assisted minimal access surgery for large ovarian mass in pregnancy: case report of two patients

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Abstract

Most adnexal masses that are seen during the first trimester are small cysts that resolve on their own by the second trimester. Surgical management may be necessary for individuals who are symptomatic or at high risk of malignancy or torsion. Here we present two cases that underwent robotic-assisted minimal access surgery for large ovarian masses in pregnancy. The robot-assisted approach was utilized to successfully manage both patients and histology confirmed these as benign tumors. The blood loss was minimal and there were no postoperative surgical or obstetrical complications. The fetus in the first case was not resuscitated due to premature membrane rupture at 24 weeks followed by preterm labor. The second patient delivered a healthy full-term baby weighing 3.2 kg at 39 weeks. Robotic-assisted minimally invasive surgery is a safe and reliable option for obstetric patients with an ovarian mass.

Keywords

Robotic-assisted surgery; Minimal access surgery; Ovarian mass in pregnancy; Adnexal masses

1. Introduction

The routine use of obstetrical ultrasound has led to an increase in the diagnosis of adnexal masses, which occur in 0.19–8.8% of all pregnancies [1]. Incidental adnexal masses are commonly observed during the first trimester and usually disappear by the second trimester [2–4]. Although most adnexal masses that are seen during pregnancy are small cysts (<5 cm in size) that resolve on their own, intervention may be necessary for those who are symptomatic or at high risk of malignancy or torsion [5]. Since studies have indicated that 1–8% of adnexal masses in pregnancy are malignant, masses of 6 cm or more should be removed [6–8]. A population-based registry of nearly 5 million patients found that ovarian cancers accounted for 0.93% of all ovarian masses discovered during pregnancy, with 0.0179 ovarian cancers per 1000 deliveries [9]. The early methods for resecting adnexal masses entailed laparotomy. Since the 1990s, laparoscopic hysterectomy procedures have become increasingly common [10, 11]. Laparoscopic surgery has successfully replaced various gynecological procedures that formerly needed a laparotomy. The fundamental benefit of the laparoscopic procedure is the prevention of a large abdominal incision, which leads to lower complications, morbidity, blood loss, shorter hospital stays, and faster recovery. It also prevents the formation of hypertrophic scars, which are frequently induced by laparotomies during pregnancy. Since the emergence of less invasive robotic-assisted surgical methods in 2005, robotic-assisted surgery has gained in popularity. The Food and Drug Administration (FDA) approved the da Vinci Surgical System (designed by Intuitive Surgical, Sunnyvale, CA, USA) for gynecologic surgery in April 2005. Since then, this technology has proven highly effective in benign and malignant cases because of the enhanced 3D vision, high precision, dexterity, range of motion of instruments, improved ergonomics, resulting in less fatigue and hand tremors, and reduced blood loss and postoperative pain, resulting in faster recovery times and shorter hospital stays [10–12]. However, there is limited data on the usage of robotic-assisted surgery in the obstetric population. There are only 38 cases of robotic-assisted laparoscopic surgery (RALS) for non-obstetrical causes during pregnancy that have been reported so far [13]. We present two cases that underwent RALS for adnexal mass during pregnancy, the first to be reported from India.

2. Presentation of cases

2.1 Case 1

A 27-year-old primigravida presented with a complex right ovarian mass detected on routine first-trimester ultrasound at 10 weeks gestation (Fig. 1). The dimension was 18.4 × 11.4 × 9.8 cm, and there were four papillations up to 10 mm in size arising from the inner wall of the cyst. The tumor markers were within normal limits (Cancer Antigen-125 (CA-125): 37.9 U/mL, Carcinoembroyic Antigen (CEA): 0.13 ng/mL, CA 19.9: 3.36 U/mL, Alpha-Fetoprotein (AFP): 1.90 ng/mL, Inhibin A: 77 pg/mL, Inhibin B: 24 pg/mL, Beta Human chorionic gonadotropin (βHCG): 22,830 mIU/mL). A Magnetic resonance imaging (MRI) done at 13 weeks gestation

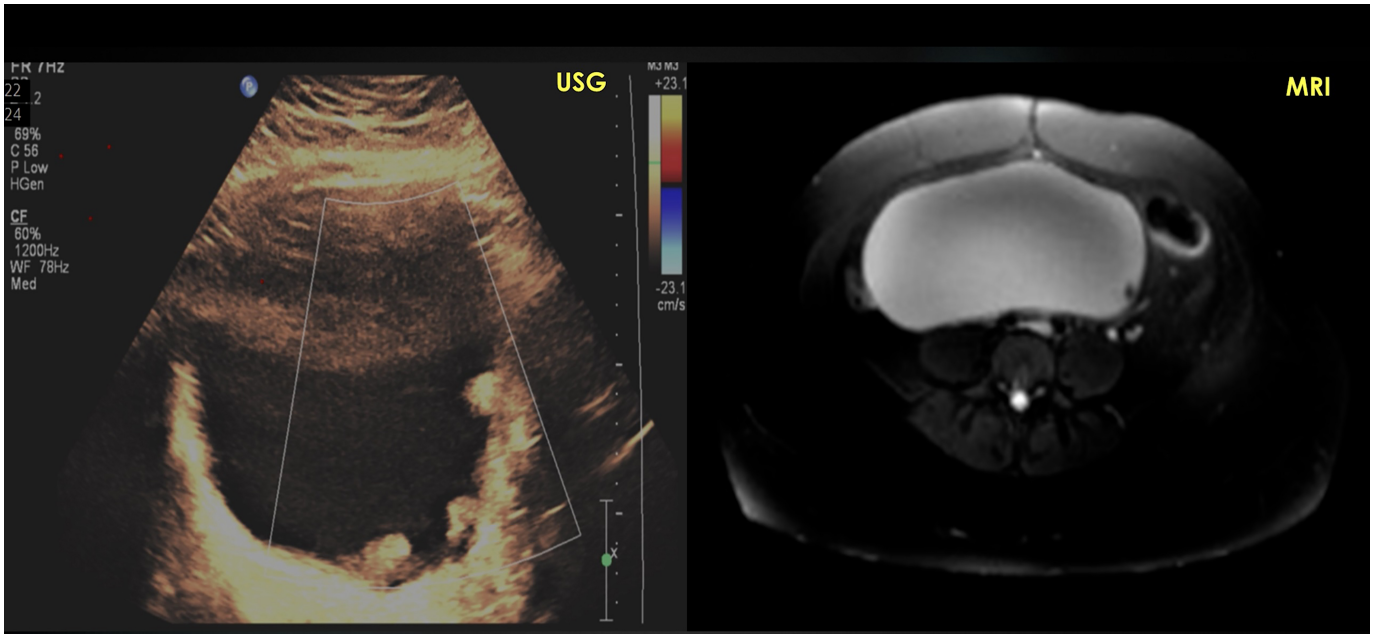

FIGURE 1. Case 1—Thick walled predominantly anechoic right adnexal mass with multiple mural nodules and mild vascularity on USG. USG: Ultrasound Sonography.

revealed a single live intrauterine fetus with a 21.5 × 9.4 × 15.3 cm right ovarian complex cystic mass that had a few eccentric mural nodules (Fig. 1). The mass had grown by 2 cm over 3 weeks, leading to abdominal discomfort and shortness of breath. The patient had a history of threatened abortion at 7 weeks of gestation and obstetrical ultrasound showed low-lying placenta. Her overall physical examination was normal, and she had an average built. Abdominal examination revealed a mass arising from the pelvis, extending up to the lower epigastrium with restricted mobility and no ascites. Rectovaginal evaluation revealed free rectal mucosa, a mass arising from the pelvis extending up to the lower epigastrium, a grossly normal cervix, a uterus of 14 weeks in size without any Pouch of Douglas (POD) nodules. The diagnosis of a large complex ovarian mass with 14 weeks of pregnancy was made and decision for laparoscopic evaluation followed by robotic-assisted/open excision of ovarian mass, frozen evaluation and definitive surgery as per frozen section report was taken. The patient was counseled regarding the risks of surgery, anaesthesia as well as the risks of conservative management. Obstetrician was included for peri-operative care.

The patient was positioned in a lithotomy with Trendelenburg. A nasogastric tube was placed on suction. Neither cervical nor vaginal manipulation was performed. Veress needle was used to create pneumoperitoneum through Palmer's point. Laparoscopic evaluation was done using 5 mm telescope, upper abdomen was evaluated. The gravid uterus was 14 weeks old and the right ovary was replaced by a large ovarian mass with smooth surface and fallopian tube was stretched over it (Fig. 2). A similar cystic lesion of ~3 × 3 cm was noted in left ovary and the left fallopian tube was found to be grossly normal. Decision of proceeding with robotic-assisted excision of right large complex ovarian mass along with fallopian tube and the left ovarian cyst, and frozen section was taken.

A 12 mm visiport was used to place the first port nearly 4 cm above the left anterior superior iliac spine under laparoscopic guidance. The secondary trocars were placed under direct visualization sufficiently above the ovarian mass. Four instruments were used including prograsp. The pneumoperitoneum was limited to 12 mmHg pressure. The large ovarian mass was placed in the endobag with difficulty using prograsp and fenestrated bipolar (Fig. 3). A controlled aspiration was done within the bag and retrieved through the assistant port to prevent any spillage. The frozen section and final pathology reports confirmed the diagnosis of serous cystadenofibroma ovary, with the pelvic washings being negative (Fig. 4). The estimated blood loss for the procedure was 10 mL. Total console time for the procedure was 3 hours and 30 minutes where the Trendelenburg position was reversed twice at intervals of one and a half hour. The patient received peri-operative tocolytic therapy. Intra- and postoperative pneumatic compression devices were used for venous thromboembolic prophylaxis. Surgically, she recovered the very next day but was monitored for fetal well-being and discharged after two days. An obstetrical ultrasound was done post-operatively which was normal. Two follow up visits at 4 weeks interval were normal. Unfortunately, the patient experienced premature rupture of membranes at 24 weeks which resulted in preterm labour. The fetus was unable to be resuscitated.

2.2 Case 2

A 29-year-old primigravida was referred by the obstetrician with pain lower abdomen and an ultrasound report showing a large suspicious right ovarian mass measuring 10 × 7.8 cm in size, with internal echoes and incomplete septae. The values of tumor markers were; CA125: 306 U/mL, CEA: 1.85 ng/mL, CA 19.9: 416.8 U/mL, AFP: 3.39 ng/mL, Lactate dehydrogenase (LDH): 184 IU/L, βHCG: 128 mIU/mL. An

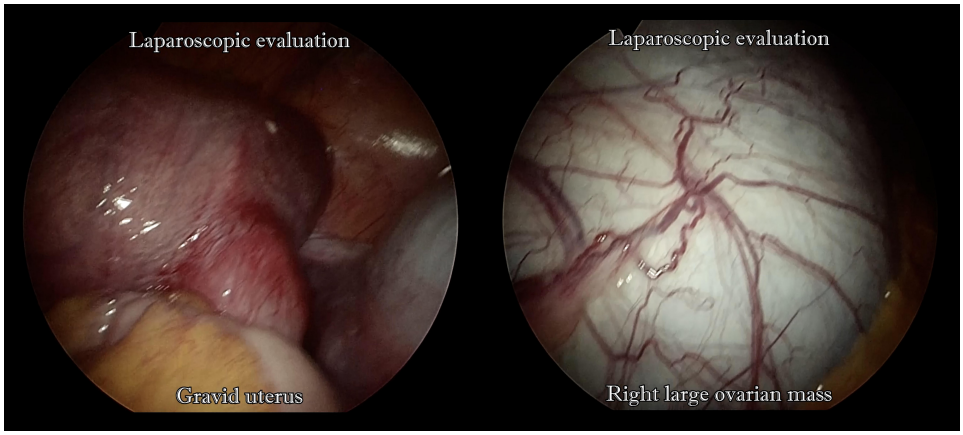

FIGURE 2. Case 1—Gravid uterus (left) & right large ovarian mass (right) on laparoscopy.

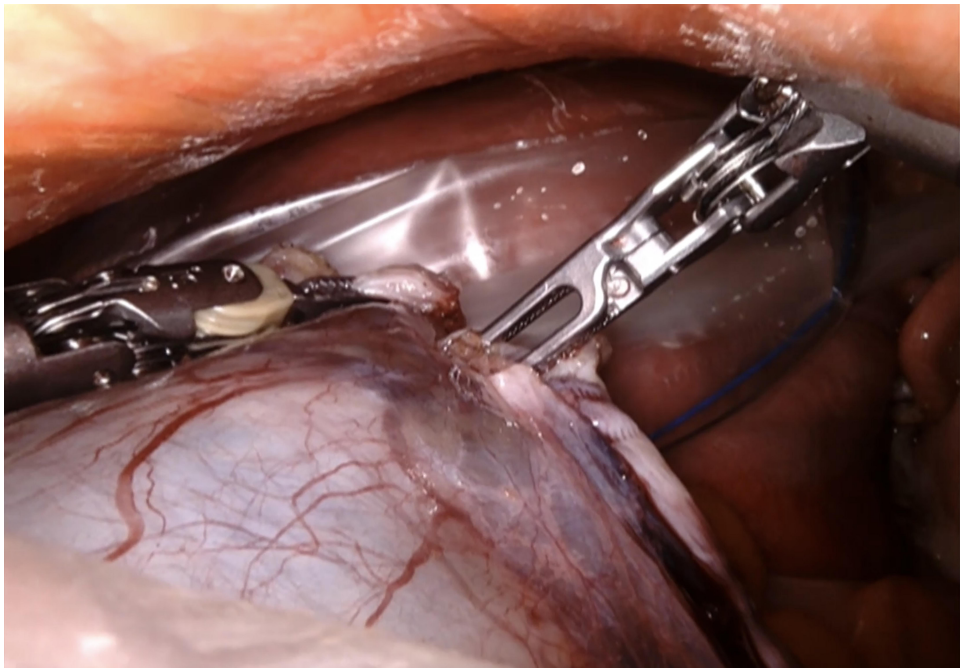

FIGURE 3. Case 1—Intact excised ovarian mass being placed within endobag using prograsp.

FIGURE 4. Case 1—Right ovarian mass excised with fallopian tube.

MRI revealed a single live intra-uterine fetus with a large cystic lesion measuring 12 × 10 × 6.7 cm with multiple thin septations in the right adnexal region, extending anterosuperior to the uterus with hemorrhagic content. Her general physical examination was normal, and she was of average built. The abdominal examination revealed a mass that originated from the pelvis and extended up to the umbilicus. Rectal examination revealed free rectal mucosa, a uterus of 14 weeks in size, a mass arising from the pelvis to the umbilicus with restricted mobility and no POD nodule. A clinical diagnosis of a suspicious ovarian mass at 14 weeks of pregnancy was made and a decision to proceed with surgery was taken after explaining the risks. Pneumoperitoneum was created through Palmer's point using Veress needle. Laparoscopic evaluation was carried out by a 5 mm telescope and robotic ports were placed at higher positions as compared to normal settings under direct visualization. Upper abdomen was evaluated, uterus had a size of 14 weeks and the right ovarian cystic, multiloculated mass with intact capsule was adherent to the right pelvic peritoneum, posterior uterine surface, and right ureter (Fig. 5). The right fallopian tube looked completely normal and extended across the tumor. The left ovary and fallopian tube were grossly normal.

Based on these findings, a decision was made to perform robotic-assisted surgery, and the right ovarian mass and fallopian tube were removed after dissecting from the pelvic peritoneum, right ureter, and posterior uterine surface by gently manipulating it using prograsp (Fig. 6). Minimum use of hot shears was done. A controlled aspiration of the mass was done within the bag and the specimen was retrieved through the assistant port to avoid any spillage. The frozen section was reported to be a benign ovarian cyst. The estimated blood loss was around 5 mL. Total console time for the procedure was 2 hours and 30 minutes with reversal of Trendelenburg position twice for 7 to 10 minutes. The patient received perioperative tocolytic therapy. She recovered well and was discharged the very next day after undergoing an obstetric ultrasound which was normal. Final histopathology reported a right ovarian endometriotic cyst. At 39 weeks, the patient gave birth to a healthy full-term baby weighing 3.2 kg with an Apgar score of 9 at 5 minutes through vaginal delivery.

3. Discussion

Adnexal mass complicates one in every 600 pregnancies and has become increasingly common with the advent of routine obstetrical ultrasound. Glanc *et al.* [14] found that the incidence of adnexal masses increased by 5.3% and 1.5%, respectively, between 8–10 weeks and 12–14 weeks of gestation. This is consistent with our findings as our two cases also developed adnexal masses within 14 weeks of pregnancy. During pregnancy, there are challenges in interpretation of tumour markers also decision of surgical technique as concerns are regarding both quality of life of patient as well as the obstetrical outcome.

An ultrasound is the initial imaging method used to examine an adnexal mass, whether it is with or without pregnancy. Despite its sensitive nature, the false-positive rate ranges from 68% to 93% [15]. Ovarian masses with thick septation, nodules, papillary excrescences, or solid components should be further investigated for malignancy and considered for surgical intervention [6]. When the ultrasound results are equivocal, non-contrast MRI, which is safe for the fetus, can provide valuable information. It enhances soft tissue resolution, particularly when distinguishing decidualized endometriomas from malignancy [16]. It also aids in the diagnosis of other pathologies such as appendicitis, diverticulitis, and inflammatory bowel disease [6]. In both of our patients, an MRI confirmed the findings of the ultrasound.

Tumor markers such as CA-125, AFP, LDH and HCG are non-specific and less reliable for pregnant women compared to non-pregnant women, giving inconsistent results [5]. In the event of a radiologically suspicious mass with elevated tumor markers, it may aid in the decision-making process for surgical management. Furthermore, these markers may serve as preoperative and postoperative baselines and help in monitoring these patients during adjuvant treatment. We also noted that, while the tumor markers in one of our patients were within normal limits, some tumor markers were elevated in the second patient which could be correlated with the final histology of endometriotic cyst.

Surgical management is recommended for patients who have ovarian torsion or are hemodynamically unstable secondary to cyst rupture, or complex masses suspicious of malignancy, or large adnexal masses predisposing to the above-mentioned complications and labor dystocia. The removal of large pelvic tumors and enlarged uteri by Minimally Invasive Surgery (MIS) is more effective with less complications than open surgery [5]. Unless there is an emergency, it is recommended to have surgical procedures in the second trimester to prevent the risk of first-trimester abortion or third-trimester preterm labor. However, the Society of American Gastrointestinal Endoscopic Surgeons now advocates for the safety of laparoscopy in any trimester [17]. An ovarian cancer case was reported in the 14 weeks of pregnancy, with the fetus being saved through robotic-assisted surgery [18]. Both our patients with large complex ovarian masses were successfully managed by RALS extending quality of life to the mother. The first patient already had an obstetrical risk factor for preterm labour as she had a history of threatened abortion in first trimester. Her follow up visits till the next 8 weeks were normal, thus, suggesting RALS is safe in pregnancy.

In our experience, both patients received perioperative tocolytics. For thromboprophylaxis, both intra- and postoperative pneumatic compression devices were utilized. A Veress needle was used to generate pneumoperitoneum through Palmer's point, and all trocars were placed under direct visualization at a higher-than-typical setting. Cervical and uterine manipulation was not performed in any of the cases. Prograsp was used for handling the masses with minimal use of hot shears. Controlled aspiration was done within the endobag to prevent spillage while adhering to oncological principles, and retrieval was accomplished through the assistant port. There was very little blood loss and no postoperative surgical or obstetric complications. The robotic system offers 14-fold magnification, a bioptic scope with 3-dimensional imaging, and tools with over 500 degrees of motion, resulting in no or

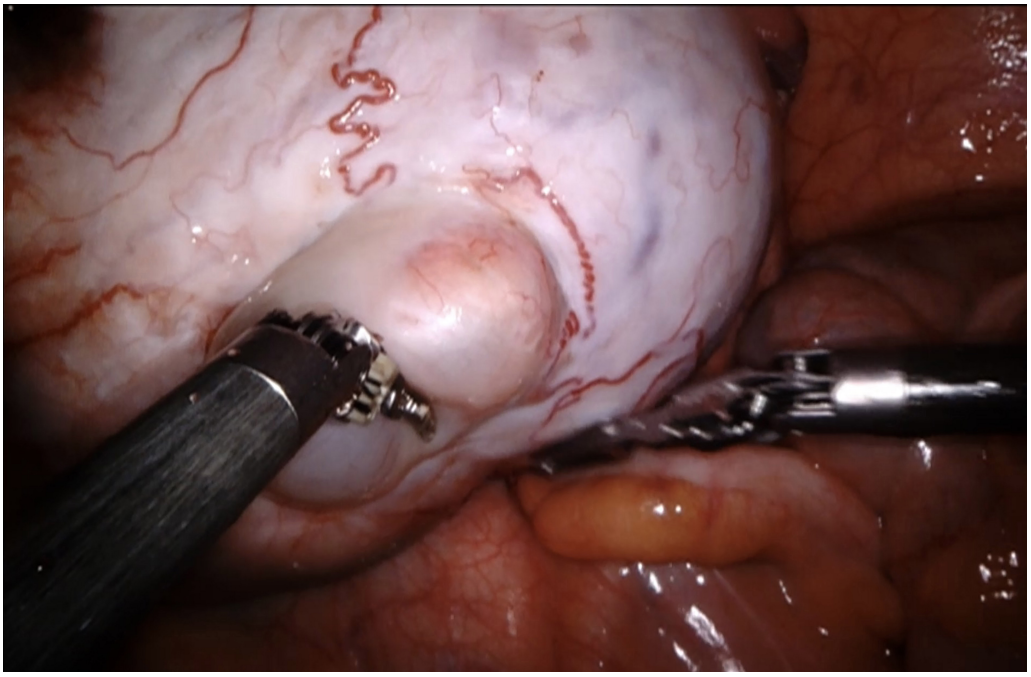

FIGURE 5. Case 2—Ovarian mass in pelvis.

FIGURE 6. Case 2—Gravid uterus with excised ovarian mass.

less uterine manipulation, better visualization, more precise dissection, less blood loss, and fewer laparotomies. A retrospective study comparing 19 pregnant women undergoing robotic resection of adnexal tumors with 50 laparoscopic controls found that robotic surgery reduced hospital stay and blood loss without affecting pregnancy outcomes [5]. A paucity of data on the obstetric population and the expense of robotic surgery are the main obstacles to its application. Despite the increasing use of robotic surgery in gynecology, its utility in obstetrics is limited, and more robust studies are needed to establish its superiority over alternative approaches.

4. Conclusions

RALS may be a safe and feasible alternative for obstetric patients with large ovarian masses in facilities with this technology in experienced hands.

AVAILABILITY OF DATA AND MATERIALS

All data generated or analyzed during this study are included in this published article.

AUTHOR CONTRIBUTIONS

RJ—designing the treatment plan, patient management, data collection, and paper writing. RRB and TS—patient management and data collection. TS—data analysis and paper writing. All authors have read and approved the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval is not required for this study in accordance with local or national guidelines. Written informed consent was obtained from the patient for publication of the details of their medical case and any accompanying images.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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