Renal Cell Carcinoma in Pregnancy: Radical Nephrectomy and the Use of Dexmedetomidine

Abstract

Renal cell carcinoma is sinister cancer, uncommon during pregnancy. A 26-week period of gestation, primigravida pregnant women presented with painless hematuria and left flank fullness. She was found to have left-sided renal cell carcinoma, with no metastasis or vascular invasion. All her preoperative investigations were within normal limits, except for mild anemia. An obstetric evaluation was unremarkable, with normal fetal heart sounds. Perioperative care of pregnant patients for oncosurgery poses great challenges, affecting both the mother and the fetus. Preoperative tocolytic therapy was started to prevent preterm labor, and an obstetrician was kept standby during surgery. A combined general anesthesia with rapid sequence induction and cricoid pressure along with preinduction epidural catheter was administered, followed by the insertion of invasive monitoring lines. Dexmedetomidine use is also highlighted, as it has several beneficial effects and has been safely used in pregnant patients. The tumor was successfully removed, and the patient was transferred to the high-dependency-care unit after extubation. We hereby describe the perioperative anesthetic challenges in this unique case report.

Keywords: *Dexmedetomidine, fetal monitoring, obstetric anesthesia, renal cell carcinoma*

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Introduction

Renal cell carcinoma, though rare in woman of reproductive age, is the most common renal neoplasm occurring in pregnancy.[1] Malignancy during pregnancy is an uncommon event. It is estimated that <0.1% of pregnancy are complicated by any type of neoplasm and only 0.0013% by urinary cancer[2] and the estimated incidence of pregnant woman requiring nonobstetric surgery is around 1%–2%.[3]

Anesthesia for surgical management of renal cell carcinoma during pregnancy requires modification of anesthetic and obstetric practices. The major clinical goal is to achieve optimal safety of both the mother and fetus. Maternal alterations during pregnancy may complicate anesthetic management and increase monitoring requirements for a positive impact on both the mother and fetus.[4] The following case report highlights the anesthetic management of a pregnant woman posted for the left radical nephrectomy. Maintenance of maternal perfusion with replacement of blood loss, adequate oxygenation with optimization of acid–base status, normothermia, and normocarbia are the pivotal pillars of management. An important aspect was the use of dexmedetomidine and ritodrine in the intraoperative period for a successful perioperative outcome.

Case Report

A 25-year-old female patient, gravid-2, para-1, with 26-week period of gestation, weighing 62 kg, was referred to our tertiary center from a primary health center for evaluation of a renal mass. The mass has been detected after onset of flank and loin pain along with hematuria. The surgical team made a clinical diagnosis of left renal cell carcinoma. Magnetic resonance imaging urography revealed a large heterogeneous signal intensity mass lesion, involving the left kidney, partially exophytic, with areas of cystic and hemorrhagic degradation within it, with dimensions of approximately 8.6 cm × 6.8 cm × 5.5 cm, causing compression of renal artery and vein medially, with no involvement of the inferior vena cava.

A full blood count, blood sugar, liver and renal function tests (urea, creatinine, and electrolytes) were within normal limits. She was posted for left radical nephrectomy at 26 weeks of gestation, after a thorough

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preanesthetic evaluation. Before surgery, there was a discussion between the surgical, obstetric, and anesthesiology teams regarding multiple perioperative considerations. A fetal ultrasound was performed by the obstetrician in the preoperative period and a beta-agonist tocolytic injection ritodrine hydrochloride, was started prophylactically, before surgery and continued intra- and postoperatively as well, for the prevention of preterm labor. An intravenous (IV) solution was prepared by adding ritodrine hydrochloride (tocolytic, beta-2 agonist), 150 mg in 500 ml of 5% dextrose fluid and infused at a dose of 0.05 mg/min (12 ml/h, 3 h before surgery and continued during surgery), with continuous maternal heart rate charting and frequent chest auscultations. Fetal heart rate (FHR) monitoring was continued till the start of surgical incision and an obstetrician was kept standby during the perioperative period. FHR monitoring was restarted on surgical wound closure and continued in the postoperative period.

Risk of preterm labor, miscarriage, and risks to the fetus were explained to the patient, along with informed written consent. Preanesthetic evaluation was normal, with hematological and biochemical parameters found within normal limits. A bedside electrocardiogram (ECG) was done (in view of starting tocolytic therapy) and was found to be normal. The patient was premedicated with oral ranitidine hydrochloride 150 mg and oral metoclopramide (prokinetic) 10 mg on the previous night and on the morning of surgery (as part of aspiration prophylaxis).

In the operation theater, initial monitoring consisted of ECG, pulse oximeter, noninvasive blood pressure, and capnography. Two large bores 16G and 18G peripheral IV cannula were secured. A wedge was placed under the right buttock to avoid aortocaval compression and supine hypotension syndrome. Under all aseptic precautions, a lumbar epidural catheter was inserted with an 18G epidural needle at L_1/L_2 inter-vertebral space in the lateral position (preinduction), using loss of resistance to saline technique for perioperative analgesia. After full preoxygenation, rapid sequence induction with cricoid pressure was performed using injection thiopentone sodium 5 mg/kg (IV hypnotic), fentanyl citrate 2 mcg/kg (opioid), and succinylcholine 2 mg/kg (depolarizing muscle relaxant). The trachea was intubated with an 8-mm cuffed endotracheal tube. An invasive left radial arterial line (20G) and right internal jugular central line (7 Fr) were inserted after intubation, under sterile conditions. Anesthesia was maintained with isoflurane and oxygen. Nitrous oxide was avoided due to possibility of bowel distension, postoperative nausea vomiting, gas embolism, and expansion of air spaces. IV dexmedetomidine (an alpha-2 agonist) infusion was started in the maintenance dose of 0.4–0.5 mg/kg/h for supplementing general anesthesia and to blunt perioperative hemodynamic responses, started during the time of intubation and stopped transiently at the time of operative blood loss. Intermittent boluses of vecuronium bromide (nondepolarizing muscle relaxant) were given for muscle relaxation. Intraoperatively, IV ritodrine infusion was continued. Apart from the standard American Society of Anesthesiologists monitoring, additional monitoring included urinary catheter for hourly urine output, esophageal temperature probe, invasive arterial blood pressure, central venous pressure (CVP) monitoring, capnography (end-tidal CO_2) and airway pressures.

The procedure lasted for 5 h, during which 4000 ml of crystalloids, 500 ml of colloid, 4 units of packed cells, and 2 units of fresh frozen plasma were infused. Estimated blood loss was 3000 ml and the urine output was maintained at >1 ml/kg/h. Intraoperative arterial blood gas (ABG) analysis showed values as below: pH 7.27, pCO_2 37.9 mmHg, pO_2 111 mmHg, HCO_3 16.9 mmol/L, and O_2 sat 97.6%. IV sodium bicarbonate was given to correct metabolic acidosis as per requirements and repeat ABG done at the end of surgery, which was within the normal limits. Hemodynamic stability was maintained on low-dose inotropic support (IV nor-adrenaline tartrate 0.1 mg/kg/h and dopamine hydrochloride 5 mg/kg/min infusions), which were gradually tapered and stopped at the end of the surgery. The mean arterial pressure was maintained above 80 mmHg, and CVP was maintained above 8 mmHg throughout the procedure. All other vital parameters were within normal limits, except for transient tachycardia during the episode of blood loss and temporary increase in airway pressure during uterine retraction done for tumor manipulation.

In addition to local anesthetic wound infiltration, IV paracetamol (1 g, 6 h) was administered for analgesia. The FHR was audible, and there was no evidence of fetal distress. The patient was extubated after ensuring hemodynamic stability and acceptable blood gas parameters, with the administration of reversal agents (IV neostigmine with glycopyrrolate), with the patient fully awake and having good respiratory efforts. The patient was shifted to the high dependency care unit for intensive monitoring and observation. Excellent post-operative pain management was done by epidural infusion with dilute local anaesthetic (avoiding opioid) and promoting early recovery. IV ritodrine infusion was continued for the 1st postoperative day with continuous maternal and fetal monitoring, followed by 6 hourly intramuscular injections on the 2nd day and switching to oral medication from the 3rd day. Fetal status, as assessed by cardiotocography and ultrasound was normal. After a steady recovery, she was shifted to the ward 48 h postsurgery, after the removal of invasive lines and epidural catheter. The patient was discharged later, with a stable feto-maternal condition and advised to follow-up regularly at the antenatal clinic as well as with the uro-onco-surgeons. The gross histopathological examination report of the specimen was as follows: "External surface of the cut-open specimen of left radical nephrectomy shows an ulcero-proliferative

growth over middle pole and is 4 cm from the upper pole. Adjacent perinephric fat is hemorrhagic. On cutting open, a tumor is seen in the middle pole, measuring 6.5 cm × 5.5 cm × 7 cm and is seen to infiltrate into the renal sinus and pelvicalyceal system. Tumor is graywhite to brown (variegate) with area of hemorrhage and necrosis. Tumor is 1 cm away from the hilar structures. Rest of the kidney is normal. No lymph nodes were identified. Stump of ureter and vessel identified." The histologic type of the tumor is "Papillary renal cell carcinoma – Type 1, with no sarcomatoid features." The histologic tumor grade is "Fuhrman nuclear Grade G3," with tumor extension to renal sinus and pelvicalyceal system with capsular breach. The hilar vessels, renal vein margins, and the ureteral margins are free. No lymphovascular invasion was identified (pathologic staging: pT3a, pNx).

Discussion

An average of 1%–2% of pregnant women are subjected to anesthesia for nonobstetric surgery with a range of 80,000 procedures/year.[5] Although renal cell carcinoma accounts for 3% of all adult malignancies, it is rare in woman of childbearing age.

Extensive multidisciplinary planning between the surgeons, anesthesiologist, and obstetricians is essential to ensure good fetal and maternal well-being throughout the perioperative period. Special attention must be paid to prevent premature labor, triggered by surgical procedure or drugs administered during anesthesia. This was done by starting tocolytic therapy[6] preoperatively, to be continued in the perioperative period. The side effects of beta-2 agonists must be kept in mind and vigilant monitoring done for the development of tachycardia, arrhythmias, pulmonary edema, chest tightness, dryness, or drowsiness. The anesthetic considerations in this case revolved around maintaining adequate perfusion pressure and oxygenation, normothermia, and normocarbia. It is important for the anesthesiologist to understand the physiologic and anatomic changes in the mother, as well as the maternal and fetal implications of anesthetic agents. The management of operative renal cell carcinoma is a real challenge[7] due to sparse literature and lack of formal, validated guidelines. In view of the ethical issues involved in conducting studies on pregnant women with cancer, it will be a long time before large, randomized trials are conducted and consensus guidelines published. Anesthesiologists must ensure, as for any other nonobstetric surgery, aspiration prophylaxis and rapid sequence intubation. Avoiding aortocaval compression, maintaining uteroplacental circulation and adequate oxygenation, aggressive management of blood loss, prevention of hypothermia, early recognition and correction of acid–base or electrolyte imbalances, along with circumventing preterm labor, are mandatory. Blood and blood products must be arranged preoperatively, and the blood bank alerted for the possibility of massive transfusion.

Dexmedetomidine hydrochloride has been safely used previously in the obstetric population.[8] In view of its sympatholytic effects, it can effectively blunt hemodynamic responses and supplement general anesthetic action. It also has analgesic and uterotonic properties, which was beneficial in our patient.

Conclusions

Renal cell carcinoma, though rare in pregnancy, can be an anesthetic challenge. Maternal safety is of primordial importance. Radical nephrectomy is the treatment of choice, which is a major nonobstetric surgery with risks of massive blood loss, preterm labor, fetal loss, and maternal cardiorespiratory embarrassment. Close communication between the anesthesiologist, operating surgeon, obstetrician, intensivist, and neonatologist must be ensured for a positive feto-maternal outcome.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. The patient understand that names and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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