

ANESTHETIC MANAGEMENT OF A MORBIDLY OBESE PARTURIENT UNDERGOING CESAREAN SECTION

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Introduction

Obesity has reached an epidemic proportion globally with a comparable rise in prevalence among women in the reproductive age¹. Not surprisingly, the number of obese parturients has more than doubled in the last 10 years².

Obesity *per se* has been identified as a significant risk factor for respiratory and infectious complications in general surgery³ and for anaesthesia related mortality in obstetrics⁴. When compared to normal weight parturients obese patients are at increased risk of having either concurrent medical problems or superimposed antenatal diseases including pre-eclampsia and gestational diabetes⁵. Complications during labor such as intrapartum fetal distress, failure to progress, abnormal presentation necessitating instrumental delivery and cesarean section are more common⁵⁻⁷. In addition there is an increased incidence of deep vein thrombosis, hypoxaemia, and wound infections perioperatively^{8,9}. Furthermore, the anaesthetist frequently has to deal with technical difficulties regarding airway management and regional anaesthesia⁸.

This case report of a morbidly obese parturient undergoing cesarean section highlights the complexity and challenges that are associated with the anaesthetic and obstetric surgical care of this patient population.

Case report

We assessed this 42-year-old Afro-American woman, G2 P0 at 30 weeks of gestation. The patient's body weight was 187 kg and her body height was 160 cm (body mass index = 73 kg/m²). She had a history of obstructive sleep apnea, asthma, type 2 diabetes mellitus, and depression. Her medications included inhaled ventolin and flovent, and subcutaneous insulin. The patient's airway appeared unremarkable (Mallampati II, thyromental distance >6 cm) and venous access looked obtainable. Typical anatomical landmarks of the spine were not palpable. Her oxygen saturation was 96% on room air, her echocardiogram showed normal cardiac function with a left ventricular ejection fraction of 65%. Following multidisciplinary discussions involving the obstetrician, anesthesiologist and neonatologist, the plan was made to attempt vaginal delivery under epidural analgesia initiated at an early stage of labour, and, if needed, to perform cesarean section under epidural anaesthesia in an operating theatre equipped for bariatric surgery.

At 39 weeks gestation, the patient was admitted for induction of labour. Two anaesthetists prepared the

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patient for epidural catheter insertion. They placed the patient in the sitting position and retracted the fat pads on her back from the midline using adhesive taps as described elsewhere¹⁰. A 22G Whitacre needle was used to delineate the spinous processes above and below the interspace, presumably at L1/L2. Verbal communication with the patient was used to identify the midline. Using a 12.5 cm Touhy needle the epidural space was located without difficulty at 7.5 cm and the epidural catheter was advanced 7 cm. Following the administration of a test dose of 3 ml lidocaine 2%, a bolus of 25 mg bupivacaine was injected in increments of 5 mg. Continuous epidural infusion of 0.06% bupivacaine with 2 µg/ml fentanyl was started at a rate of 12 ml/h resulting in satisfactory pain control.

After 22 hours failure to progress at 7 cm cervical dilatation prompted the decision to proceed with surgical delivery. The patient was transferred to the operating room and secured on the operating table in the ramped position with a slight left lateral tilt (Fig. 1). She received 30 ml sodium citrate *per os* to lower gastric acidity. Five L/min oxygen was delivered via nasal prongs. Two 16G intravenous catheter were inserted together with a 20G intra-arterial catheter for continuous pressure monitoring. After the intravenous administration of 1000 ml NaCl (0.9%), a total of 15 ml lidocaine 2% with epinephrine 1/200000 were given in the epidural catheter in increments of 5 ml leading to a confirmed bilateral sensory block to the T3 dermatome. Blood pressure was maintained within normal values by continuous infusion of phenylephrine at 500 µg/h, intravenous colloid (1000 ml Pentaspan[®], Bristol-Myers Squibb, Canada) and NaCl 0.9% (1000 ml). The help of four operating room attendants was required to retract the patient's abdominal pannus cephalad to facilitate a horizontal lower segment incision (Fig. 2, 3, 4). A 30° Trendelenburg position was established to improve surgical exposure with little discomfort for the patient. It took a total of 55 min to adequately prepare the patient for surgical skin incision.

Fig. 1

The patient in the ramped position before retraction of the abdominal pannus



Fig. 2

The abdominal pannus retracted manually by the surgeon to expose the incision landmarks



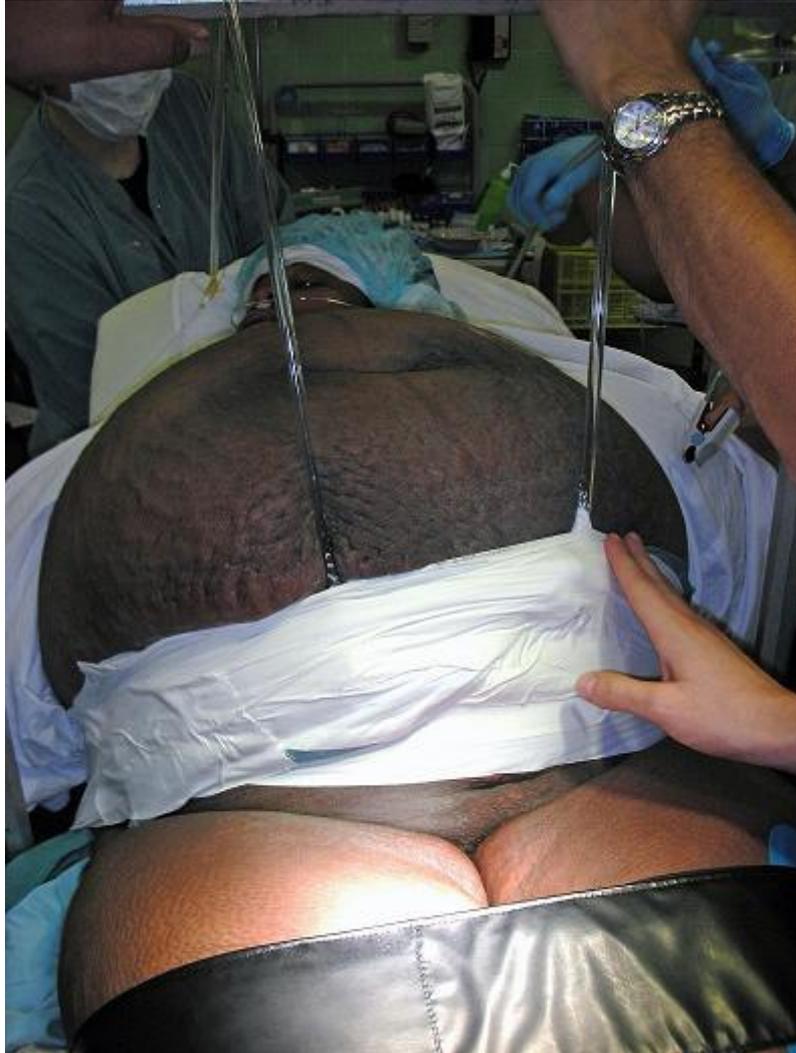
Fig. 3

The abdominal pannus retracted cephalad



Fig. 4

The patient position after retraction of the pannus during surgery



Blood gas analysis was unremarkable (pH: 7.32, pCO₂: 37 mmHg, pO₂: 114 mmHg, SaO₂: 98%). The patient's oxygen saturation was maintained 98-99% throughout the procedure. Intravenous boluses midazolam 0.5 mg, fentanyl 25 µg and ketamine 20 mg were given to decrease the patient's anxiety.

Sixty minutes after skin incision, ventouse application to deliver the baby failed followed by a hypercontracting uterus necessitating the administration of sublingual nitroglycerine. A viable healthy looking baby was delivered by forceps (male, 4,295 grams, APGAR scores 8 and 9). Subsequently intravenous boluses of midazolam 1 mg, ketamine 40 mg, and fentanyl 25 µg were given. In addition two epidural boluses of 5 ml bupivacaine 0.25% were administered together with 3 mg morphine. Oxytocin infusion was started at 100 U/liter and decreased to 50U/liter later resulting in a total intraoperative dose of 250U. Carboprost tromethamine (Hemabate[®]) 250 µg was injected directly into the uterus. Ticarcillin and clavulanate (Timentin[®]) 3.1 gm, ampicillin 1g and heparin 5000U were given. The uterine cavity was closed three hours after skin incision and excellent haemostasis was obtained. Estimated blood loss was 750 ml.

Prior to closure of the peritoneum, suspicious odour led to the diagnosis of a perforated sigmoid colon. Primary repair was performed by a general surgeon who requested complete surgical muscle relaxation for this procedure. Thus, general anesthesia had to be induced. Following airway topicalisation using a technique described by our group previously¹¹ we performed an awake fiberoptic intubation followed by general anesthesia using inhaled sevoflurane and muscle paralysis using rocuronium. After completion of this surgical procedure which lasted another three hours the patient was transferred to the ICU intubated. She was ventilated for 22 hours and the postoperative course was uneventful. Mother and son left the hospital on postoperative day 13.

Discussion

Morbid obesity accentuates the physiological changes associated with pregnancy^{12,13 14}. It is not uncommon in the morbidly obese parturient to see systolic and diastolic dysfunction of the left ventricle, pulmonary hypertension and obstructive sleep apnea^{15,16}. Endothelial dysfunction, a consequence of insulin resistance and dyslipidemias, may predispose these patients to pregnancy induced hypertension^{13,17}. The supine hypotension syndrome associated with pregnancy can be greatly exaggerated because the large panniculus adds to the uterine compression of the vasculature. Not surprisingly there are case reports of sudden death in morbidly obese pregnant patients on assuming the supine position^{18,19}. Prevalence and severity of gastric reflux are increased in the morbidly obese leading to an increased risk of aspiration during anesthesia²⁰. As the anesthetic and surgical care of the morbidly obese parturient is challenging; early and meticulous multidisciplinary planning involving senior anesthesiologists, surgeons, nurses and the procurement of special equipment is mandatory¹⁰.

When this patient was seen by a senior obstetric anesthesiologist at 35 weeks gestation a multidisciplinary team approach was formulated. Although surgical delivery is very likely in the morbidly obese parturient^{2,5} the primary obstetric plan was to induce labour and to attempt vaginal delivery. The anesthesiologist's main concern was to avoid an emergency situation requiring urgent endotracheal intubation.

Notwithstanding the technical difficulties associated with regional anesthesia in the morbidly obese such as patient positioning, identification of anatomical landmarks, and more frequent dislodgment of epidural catheters^{8,10} its successful use for cesarean section has been reported^{10,21}. Epidural anesthesia offers several

advantages, including an easily titratable local anesthetic dose and level of anaesthesia, ability to extend the block for surgical delivery and prolonged surgery, slower and more easily controllable hemodynamic changes, decreased potential for excess motor blockade and its utilization for postoperative analgesia^{22,23}.

We therefore opted to place an epidural catheter before induction of labour.

Probing the subcutaneous tissue and delineating the position of a posterior spinal process above and below a lumbar interspace with a 22-G 8.5 cm Whitacre needle while infiltrating a generous dose of local anesthetic,²⁴ as well as verbal communication with the parturient to direct the needle to midline were instrumental for the successful placement of the epidural catheter in this patient¹⁰. The epidural space was reached at 7.5 cm which is in agreement with other reports in morbidly obese subjects demonstrating that it is rarely deeper than 8 cm in this patient population^{25,26}.

As the presence of epidural fat and increased venous distension from aortocaval compression increases the cephalad spread of epidural local anesthetic the risk of hypotension and respiratory embarrassment is greater when compared to the lean parturient²². In addition surgical retraction of a large panniculus further accentuates the cardiovascular compromise associated with neuraxial regional blockade²⁷.

When preparing for the cesarean section we inserted two large bore intravenous cannulas and an intra-arterial catheter for continuous blood pressure measurement and blood gas analysis because obese parturient are at increased risk of bleeding and hypoxemia^{8,9,10}.

Although we carefully titrated the dose of epidural local anesthetic the injection of three boluses of 5 ml lidocaine 2% led to a fall in systemic blood pressure requiring continuous vasopressor support and fluid resuscitation.

Both pregnancy and obesity increase oxygen consumption and CO₂ production. The stimulated metabolic demand together with limited chest wall compliance increases the work of breathing and decreases respiratory reserve. Supine and Trendelenburg position can cause the patient's functional residual capacity (FRC) to fall below closing capacity resulting in small airway collapse, atelectasis, ventilation perfusion mismatch and hypoxemia²⁸. Supine position in the presence of regional anesthesia, especially when the block extends beyond the umbilicus, may, thus, provoke respiratory and cardiovascular failure if the patient's cardiac reserve is compromised²⁹. On the other hand, pregnancy has been shown to improve FRC in obese subjects because increased plasma levels of progesterone enhance the brainstem's sensitivity to CO₂ and directly promote lower airway dilatation, thereby counteracting the negative effects of obesity on the respiratory system¹². In the present case neuraxial blockade to T3 combined with the cephalad retraction of the abdominal panniculus did not result in respiratory dysfunction as reflected by normal pO₂ and pCO₂ values.

In morbidly obese patients the abdominal wall anatomy is distorted by the large panniculus. Hence, the type of the incision for cesarean section is critical to gain optimal surgical access. The proposed benefits of a transverse incision are a more secure closure, less fat dissection and pain facilitating earlier ambulation and breathing in the postoperative period³⁰. The disadvantage of a low transverse incision is an increased risk of infection. Vertical skin incision allows for better visualization of the operative field, but is associated with greater postoperative pain, a greater likelihood of wound dehiscence and hernia formation³⁰. In severe cases surgical panniculectomy prior to delivering the baby may be considered to facilitate access to the pelvis³¹⁻³³. Some obstetricians favor a midline supraumbilical or transverse incision above the pannus as the abdominal wall is often thinner above the umbilicus³⁴. In the present case the horizontal incision as well as the huge size and weight of the abdominal pannus made only the cephalad suspension feasible. Considering the long time

interval between establishing anesthesia and the uterine incision the avoidance of a prolonged exposure to general anesthetics during the preparation period proved useful and certainly contributed to the excellent APGAR values of the newborn.

Although the patient's airway appeared to be unremarkable several factors prompted us to perform an awake fiberoptic intubation when surgical muscle paralysis was required to repair the bowel. Firstly the confidential inquiry into maternal deaths lists obesity as a major risk factor for failed intubation and aspiration of gastric contents at induction of anesthesia³⁵. The physiological and anatomical changes caused by both obesity and pregnancy increase the potential of an unanticipated difficult airway, impossible mask ventilation and rapid desaturation during the apneic phase. This risk of hypoxaemia was accentuated by the cephalad retraction of the pannus and a further reduced FRC. In addition, the prolonged Trendelenburg position could have induced or worsened a preexisting airway edema. Moreover, the surgery had been already started, which imposed limitations with respect to positioning the patient's head for intubation.

Morbidly obese patients undergoing open abdominal surgery are at increased risk for serious respiratory complications including pulmonary embolism, pneumonia, atelectasis, aspiration and respiratory failure²⁸. These problems are directly related to the obese condition, and/or to co-morbidities such as obstructive sleep apnea³. Hence, in our view it was mandatory to keep this patient on a ventilator and continue invasive monitoring in an intensive care setting postoperatively.

Conclusion

Successful management of the morbidly obese parturient requires a multidisciplinary team approach initiated early in pregnancy. Abdominal pannus retraction strategies include the preoperative consultation of bariatric and plastic surgery services and the consideration of the risks and benefits of upper versus lower segment cesarean section. Epidural anesthesia is an option for cesarean section. If general anesthesia is required the airway should be secured awake by using fiberoptic bronchoscopy ideally performed by an experienced endoscopist.

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