Anaesthetic management of a super morbidly obese patient for total abdominal hysterectomy: a few more lessons to learn

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Abstract

Background: The prevalence of obesity is on the upward trend world-wide. This epidemic has challenging implications for anaesthetists, following the anthropometric changes associated with the disease.

Objective: To highlight some of the challenges, the management and the lessons learnt during the management of this patient.

Methods: This is a case report of a 52-year old super morbidly obese, diabetic, and hypertensive patient that presented for total abdominal hysterectomy. Surgery was carried out under a single-shot spinal anaesthesia with bupivacaine/fentanyl.

Results: Under bupivacaine/fentanyl anaesthesia, she became very drowsy and had moderate to severe respiratory depression. She was arousable but had an obstructive sleep apnoea**.** Surgery was carried out successfully

Conclusion: A better understanding of the pathophysiology and complications that accompany obesity is needed to manage an obese patient under anaesthesia.

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Introduction

The prevalence of obesity is on the upward trend world-wide[1, 2]. In the United States of America, the incidence of obesity has doubled over the past 20 years[1]. The extent of obesity is usually quantified through the body mass index (BMI), which is defined as the relationship between height and weight (weight [kg]/height^2 [m^2]). The BMI is divided into five categories: <25 kg/m^2 = normal, 25-30 kg/m^2 = overweight, >30 kg/m^2 = obesity, >35 kg/m^2 = morbid obesity, >55 kg/m^2 = super morbid obesity [3].

Obesity is frequently associated with challenges during anaesthesia. Following this, the use of regional anaesthetic techniques for obese patients is increasing in popularity as this offers distinct advantages over general anaesthesia for these patients. Regional anaesthesia (RA) offers several advantages when treating obese patients, including minimal airway intervention, less cardiopulmonary depression, improved postoperative analgesia[4, 5], decreased opioid consumption, decreased postoperative nausea and vomiting (PONV) [5, 6], and therefore reduced post-anaesthesia care unit (PACU) [7] and hospital length of stay[5]. Moreover, RA has been associated with improved postoperative analgesia[5], particularly when long-acting local anaesthetics [8], or continuous peripheral nerve blocks[9], are used. Despite these advantages, RA can be technically challenging in the obese. These challenges are related to difficulties in patient positioning, identifying the usual bony and muscular landmarks, and the depth of needle penetration[2]. However, the limitations of regional anaesthesia and the technical difficulties encountered with its use in obese patients must be carefully considered.

We report a super-morbidly obese woman that presented for a total abdominal hysterectomy. The anaesthetic management is discussed and the learning points highlighted.

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Case report

A 53 year old super morbidly obese female, total body weight 165 kg, with a height of 168cm (BMI=58.5), presented with a history of bleeding per vaginam and abdominal mass of 3 years duration. She had both severe hypertension and moderately controlled type 2 diabetes mellitus for which she had been on treatment for more than 10 years with

amlodipine 10mg, glibenclamide 5mg twice daily, metformin 1000mg thrice daily, atorvastatin 10 mg daily and low dose aspirin 75mg daily.

She had two previous caesarean sections and an appendectomy. Further history revealed over five years of witnessed snoring, relative difficulty staying awake during the day, choking and coughing bouts at night, awakening from sleep multiple times during the night, and morning fatigue suggestive of obstructive sleep apnoea. Sleep study could not be performed in our centre to confirm the degree of sleep efficiency and apnoea/hypopnoea index.

Figure: Showing the posterior view of the patient

Examination of the lower back could not reliably show a normal vertebral column and bony landmarks as a result of massive fatty tissues. Airway examination revealed an apparently normal dentition and Mallampati classification III. Following inadequate thyro-mental and sterno-mental distances and, an excessive breast mass difficulty in laryngoscopy and tracheal intubation were anticipated. The patient was classified as American Society of Anaesthesiologists physical status Class IV.

The electrocardiographic findings were a tall R wave (greater than 25mm in V6), a deep S waves in V1, inverted T waves in V5 and ST depression; the QRS was slightly prolonged in keeping with left ventricular hypertrophy and left axis deviation. Fasting blood glucose on the morning of surgery was 7.5 mmol/L (normal 5.2-7.0 mmol/L; *ONETOUCH Ultra2*, Lifescan, Inc, Milpitas, USA). All other biochemical parameters were normal.

On the day of surgery, she had her routine amlodipine and atorvastatin tablets only. Two extra-long laryngoscope blades with short barrel handles, a cricothyrotomy set, and laryngeal mask airway were made ready for anticipated difficult airway instrumentation and access. Following the expected airway difficulties, regional anaesthesia was planned although we were fully prepared for tracheal intubation and full ventilatory support should she develop any respiratory problems. Details of the techniques chosen were discussed with her. After securing 18 G intravenous line on the dorsum of the left hand, we attched monitors such as pulse oximeter, precordial stethoscope and non-invasive blood pressure monitor. She was also tested and confirmed for adequacy of mask ventilation.

Pre-induction of anaesthesia baseline variables showed that the blood pressure was 160/105 mmHg, pulse-102/min, and SPO_2 was 94-95% on room air. The "no insulin, no glucose" technique was decided to be used within the intraoperative period. Half a litre of normal saline was commenced as preload. For the induction of spinal anaesthesia, she was positioned sitting with the feet resting on a stool. While observing asepsis, and using the L3/4 intervertebral space, the subarachnoid space was located after three attempts with an extra-long (115 mm long) 25-gauge pencil-point spinal needle passed through a size 20 G Tuohy needle as a guide. Spinal anaesthesia was carried out using bupivacaine heavy 10 mg/fentanyl 25 micrograms. After a light dressing was placed at the puncture site, she was returned supine with 20^o head up and 15^o left lateral tilt. Diclofenac suppository 200 mg was inserted for pre-emptive analgesia before she was cleaned and draped and, skin incision made. A maximum T5/T6 sensory level was achieved after 5 minutes. Oxygen (3-4 L/min) was administered to her via a face mask.

Intraoperatively, she was found to be very drowsy, and was assessed to be on the RAMSAY Sedation Score (RSS) 5 (Sluggish response to stimulus). She however, had fairly stable cardiovascular parameters. The mean arterial blood pressure was between 85 and 110 mmHg with normal heart rates. An intermittent brief period of rise in systolic blood pressure was observed. This corresponded to the periods of obstructive apnoea. An oropharyngeal airway size 5 was eventually passed while oxygen by face mask was maintained. During

the periods of verbal contacts, she confirmed having adequate intraoperative analgesia but complained of severe drowsiness. The surgery lasted for 168 mins. She was transferred with the aid of 8 hospital staff to the theatre trolley and then to the ward. Oxygen by face mask continued until the drowsiness subsided. Opioid analgesia was avoided throughout the postoperative period. She was managed with diclofenac 200 mg suppository 12 hourly and intravenous paracetamol 400 mg 6 hourly for 48 hours. She also received enoxaparin 40 mg 12 hourly for 48 hours and encouraged for early mobilisation. She was however discharged from the hospital on the 9th day postoperative.

Discussion

Obese surgical patients pose multiple challenges to the anaesthetist. One of the challenges is as a result of the anthropometric changes associated with the disease. Obesity is also associated with an increased incidence of medical co-morbidities; including non-insulin dependent diabetes, hypertension, and decrease in sleep efficiency associated with sleep apnoea, cardiopulmonary disease, venous thrombo-embolism, and psychosocial disease. Our patient had a BMI of 58.5 and had been on treatment for diabetes and severe hypertension.

One of the frequent complications associated with this degree of obesity is obstructive sleep apnoea (OSA). The diagnosis of OSA could not be made as our centre is not equipped to carry out sleep study to ascertain the degree of sleep efficiency and apnoea/hypopnoea index. A high index of suspicion of OSA was based on five years of witnessed snoring, relative difficulty staying awake during the day, choking and coughing bouts at night, awakening from sleep multiple times during the night, and morning fatigue. However this disease entity may be replicated following a high spinal anaesthesia as the de-afferentation of peripheral stimuli results in an altered level of arousal. This is an important consideration in our patient as the disease could have manifested itself for the first time during the course of anaesthesia.

The option of regional anaesthesia was chosen following an anticipation of a difficult airway management, although we were fully prepared for tracheal intubation and full ventilatory support should she develop any respiratory compromise. Regional anaesthesia offers several advantages when treating obese patients, including minimal airway intervention, less cardiopulmonary depression, improved postoperative analgesia[4, 5], decreased opioid consumption, decreased postoperative nausea and vomiting (PONV) [5, 6], and therefore reduced post-anaesthesia care unit (PACU)[7] and hospital length of stay[5]. Despite these advantages, RA can be technically challenging in the obese. These challenges are related to difficulties in patient positioning, identifying the usual bony and muscular landmarks, and the depth of needle penetration[2]. In our patient, the challenge of the depth of needle penetration was overcome with the use of a size 20 G Tuohy needle as a guide to pass the 115 mm long pencil point spinal needle.

Another challenge encountered during the intraoperative anaesthetic management of this patient was the maintenance of adequate peripheral tissue oxygenation. The peripheral oxygen saturation was very low inspite of oxygen by mask. This could be due to respiratory depression following the administration of the intrathecal bupivacaine/fentanyl mixture. It has been demonstrated that opioid and sedative drugs cause respiratory depression in the morbidly obese[10] and are probably best avoided, although one study failed to demonstrate an increased risk of oxyhaemoglobin desaturation with benzodiazepines[11]. The intramuscular and subcutaneous routes, however, should be avoided, since absorption is very unreliable[10, 12]. The aim of introducing the intrathecal opioid was to produce a synergistic and more prolonged effect from the local anaesthetic agent. Although it prolonged the duration of analgesia in our patient, the opioid produced an additional challenge to us. One important lesson to learn from the management of this patient is the ability to prevent, recognize early, and treat respiratory depression following the use of this combination of agents. Treatment protocols and mechanisms to ensure a rapid response to respiratory events should also be in place.

Our experience also leads us to suggest that all patients who have received neuraxial anaesthesia along with opioid, should also be monitored with capnometer, regardless of their past medical history. This is also true if an intravenous sedation will be required, as it has been shown that patients with spinal anaesthetics exhibit increased sensitivity to sedating agents[13].

Non-obstetric studies report an incidence of respiratory depression after neuraxial opioids of 0.01%–7%.[14, 15] Retrospective, observational studies may under-estimate the true incidence. Also, the fact that there is no standard definition of respiratory depression[16] may contribute to under-/over-

estimating the incidence. Respiratory rate, hypercarbia, low SpO_2, sedation, depressed ventilatory response to hypoxia or hypercarbia, and naloxone treatment have all been used as indicators of respiratory depression[16]. Our patient was very drowsy and had moderate respiratory depression. The introduction of an oropharyngeal airway relieved the obstruction that accompanied the respiratory depression.

Our patient displayed an altered level of consciousness, bradypnoea, and hypoxemia that required both treatment and more intensive monitoring until the symptoms resolved. Although supplemental oxygen was available and administered, its routine use is not recommended, because it may increase the duration of apnoea and reduce the sensitivity of pulse oximetry for detecting hypoventilation[17]. Naloxone was indicated in this patient but was not used. Its use would have reversed the effect of the intrathecal opioid on the duration of intraoperative analgesia, hence the use of prompt mask ventilation with oxygen source and the readiness for tracheal intubation. It is also worthy to note that the routine administration of prophylactic naloxone is not recommended[18].

The use of opioid analgesics may be hazardous in the obese patient. Acute opioid use reduces vital ventilatory chemoreflexes as well as upper airway patency; therefore Obstructive Sleep Apnoea (OSA) is a major risk factor for postoperative morbidity and mortality. However, there is a large inter-individual variability among OSA patients and normal individuals in response to opioids. It is important to develop a clinically useful approach to identify those individuals most vulnerable to opioid-induced respiratory depression. The intramuscular route for opioid administration is not recommended as it is unpredictable and has been shown to provide poorer analgesia than other routes[19, 20]. Our patient received diclofenac suppository alternating with intravenous paracetamol for postoperative pain relief. This was as a result of the observed intraoperative event of respiratory depression and hypoxaemia. However, if the intravenous route is to be used, then a Patient-Controlled Analgesia System (PCAS) is probably the best option[21]. This analgesic delivery device was not available in our setting. The PCAS has been shown to provide effective analgesia in the obese, although respiratory depression has also been reported[22]. Doses should be based on ideal body weight of the patient[23]. Supplemental oxygen and close observation, including pulse oximetry monitoring, are recommended.

Another major challenge in the course of the anaesthetic management of our patient was her transfer to and from the operating room. The safest transfer of an obese patient is probably one where the un-premedicated patient climbs off their hospital bed and positions themselves on the Operating Table (OT). The patient is then anaesthetised on the OT table (versus in induction room). Our patient was encouraged to walk into the operation room and she eventually climbed the OT with minimal support. The ability to do this minimizes injury to both the patient and staff involved. Once on the OT, all pressure points were carefully padded to avoid pressure sores and neurological injury. It is known that morbidly obese patients are at an increased risk for compression and neurological injuries [24]. She was adequately padded at the pressure points and areas prone to injury.

In the supine position, the Functional Residual Capacity (FRC) is markedly decreased, and this together with an already reduced FRC, expiratory reserve volume, and total lung capacity, results in a ventilation perfusion mismatch and significant increases in oxygen consumption, cardiac output, and pulmonary artery pressures. The reverse trendelenberg position (20 degrees) was best tolerated in our patient. This position results in unloading of the diaphragm, having the same effect as positive end expiratory pressure[25]. The left lateral tilt displaced the huge uterine mass to avoid inferior vena caval compression.

Conclusion

Obesity is no longer an epidemic in the western world, but rather a worldwide pandemic. Clearly the conduct of anaesthesia in a morbidly obese patient can pose a formidable challenge to the anaesthetist and intensive care staff. A better understanding of the pathophysiology and complications that accompany obesity may improve their care and outcome.

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