


CASE REPORT

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# Perioperative management of a morbidly obese patient with multiple myeloma for spine surgery—when the problem doubles up!

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## Abstract

**Background** Multiple myeloma (MM) patients are prone to pathological fractures due to osteolytic bone lesions. With improved perioperative care, outcome of patients with vertebral compression fractures presenting for surgical interventions has become better. However, perioperative care of such patients is challenging for the anesthesiologist.

**Case presentation** Herein, we report the successful perioperative management of a 55-year-old multiple myeloma patient with the compression fracture of lumbar vertebrae 2nd to 5th, for which balloon kyphoplasty was planned in prone position.

**Conclusions** Multiple myeloma patients are at high risk of developing postoperative complications like acute kidney injury (AKI), pneumonia, and infections. In the present case report, we discuss and provide recommendations for better perioperative care to prevent perioperative complications.

**Keywords** Balloon kyphoplasty, Multiple myeloma, Obesity, Perioperative care, Palliative care

## Background

The incidence of multiple myeloma among hematological malignancies is around 13% (Palumbo et al. 2011). It occurs due to the growth of stromal cells within bone marrow leading to anemia, thrombocytopenia, and osteolytic bone lesions. Earlier, these patients had high mortality, but nowadays, overall survival has risen as a result of stem cell treatment and newer chemotherapeutic agents [Myeloma-SEER Relative Survival CSR (1975-2014) n.d.]. Due to the inherent pathophysiology of the illness and increased survival, a growing number

of patients come for surgical intervention. In this case report, we discuss perioperative concerns in a morbidly obese patient with multiple myeloma who underwent spine surgery in a prone position due to a compression fracture in the lumbar spine.

## Case presentation

The written informed consent was taken from the patient for the publication of this case report. A 55-year-old female with class III obesity (body mass index—47 kg/m<sup>2</sup>) presented with chief complaints of back pain and paresthesia in both lower limbs. Magnetic resonance imaging (MRI) spine demonstrated compression fracture of 2nd to 5th lumbar vertebra for which balloon kyphoplasty was planned. She was diagnosed with multiple myeloma from the past 18 months and was on tablet bortezomib and injection zoledronate. The patient also had a history of snoring and dyspnea on exertion with little effort tolerance. The patient did not have any other comorbidities. Laboratory workup showed hemoglobin—12.5 g/dL, total

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leukocyte count—9000/mm<sup>3</sup>, platelet count—1.2 lakh/mm<sup>3</sup>, blood urea—20 mg/dL, serum creatinine—0.8 mg/dL, and serum calcium—12.5 mEq/L. Chest X-ray showed cardiomegaly with multiple old healed rib fractures. On two-dimensional echocardiography, grade 1 left ventricular diastolic dysfunction and mild mitral and tricuspid regurgitation (MR/TR) with the normal systolic function were found. On airway examination, mask ventilation was anticipated to be difficult due to the absence of the teeth. The patient was instructed to keep nil per oral for 8 h for solids and 2 h for clear liquids, and a premedication of tablet ranitidine 150 mg was advised before the surgery.

The patient was taken inside the operation room, and standard ASA monitors (electrocardiogram, pulse oximeter, and noninvasive blood pressure monitor) were placed. A 18-gauge intravenous line was secured in the right upper limb, and ringer lactate was administered at the maintenance rate of 1 mL/kg/h.

Arterial blood pressure was monitored by placing an arterial cannula in the dorsalis pedis artery as we failed to cannulate the radial arteries. The airway was secured with a cuffed endotracheal tube 7.5 mm after rapid sequence induction with video laryngoscope. Intravenous cefuroxime 3 g administered 30 min before incision for antibiotic prophylaxis. Anesthesia was maintained with desflurane/oxygen/air and atracurium boluses, and the patient was made prone for surgery. The temperature was maintained with a warm air blanket and forced-air warming. To optimize perioperative fluid therapy, systolic pressure variation from arterial waveform was used. Intermittent boluses of injection fentanyl were given to manage intraoperative pain. The total duration of surgery was 90 min. The surgery underwent smoothly with no hemodynamic instability and minimal blood loss without any need for blood transfusion. At the end of the surgery, intravenous paracetamol 1 g was given, and to prevent postoperative nausea and vomiting, an intravenous injection of ondansetron at a dose of 0.1 mg/kg was also given. After the completion of surgery, when TOF count was 4 and TOF ratio was 0.9 and looking at clinical parameters, neuromuscular reversal agent, i.e., neostigmine 0.05 mg/kg and glycopyrrolate 0.08 mg/kg IV, was slowly injected after which the patient was extubated and shifted to recovery room uneventfully. Serum calcium levels were within the normal range during surgery. The pain was managed with intravenous paracetamol 1 g 6 hourly. Rescue analgesia was achieved with intravenous fentanyl 30 µg. Later, patient was discharged from hospital on day 5 without any complications.

## Discussion

Both multiple myeloma and morbid obesity are associated with increased perioperative morbidity. The risk factors are heightened when both are concurrently present in a patient. Perioperative challenges were further compounded when such patient undergoes surgery in the prone position.

Multiple myeloma is a malignant transformation of antibody producing plasma B cells in marrow leading to monoclonal antibody production leading to end-organ damage. This leads to cytopenia, fragile brittle bones, and renal failure and risk of developing infection. Increased osteoclastic activity in bone marrow due to nuclear factor kappa-B ligand leads to osteolytic bony lesions and hypercalcemia. Consequently, such patients are predisposed to pathological fractures with considerably high incidence of spine fracture (55–70%) as in this case (Palumbo et al. 2011). Due to the fragility of bones, even trivial trauma can cause fracture. Preoperative serum calcium levels must be obtained in these patients. Additionally, an anesthesiologist should ensure gentle handling of such patients during positioning for surgical procedure.

Renal dysfunction is common in these patients due to damage to renal tubules by free light chains (Bence-Jones proteins) and hypercalcemia. The use of the KIDGO bundle (kidney disease improving global outcomes) is crucial to prevent renal dysfunction perioperatively. It consists of discontinuation of nephrotoxic agents including non-steroidal anti-inflammatory drugs (NSAIDs), ensuring adequate volume status and perfusion pressure, considering the use of functional hemodynamic monitoring such as systolic pressure variation, avoidance of hyperglycemia, and monitoring of urine output and serum creatinine. Avoidance of NSAIDs even if preoperative renal function tests are normal is a must, as done in the index case. Pharmacological agents such as dopamine, fenoldopam, and N-acetylcysteine have a controversial role in the preservation of renal functions (Clark et al. 1999).

Additionally, the presence of anemia and thrombocytopenia poses an increased risk of perioperative bleeding; thus, packed red blood cells and other blood products must be arranged preoperatively (Snowden et al. 2011). Increased blood component transfusion correspondingly increases the risk of adverse events. Our patient had mild thrombocytopenia with minimum blood loss intraoperatively; thus, no blood transfusion was not required.

Occurrence of neutropenia and concurrent use of immunosuppressive drugs predisposed to infections. Hence, the use of prophylactic antibiotics and maintenance of strict asepsis during the surgery are critical (Snowden et al. 2011).

The use of chemotherapeutic drugs like thalidomide and leflunomide increases the risk of thromboembolism, due to which patients often receive antiplatelet and anticoagulant drugs. Patients who are on preoperative anticoagulants need bridging with heparin before surgery. Hence, there is no contraindication for regional anesthesia in these patients. Previous reports have described cesarean sections under central neuraxial block and limb surgeries with peripheral nerve block (Dabrowska et al. 2010; Binici et al. 2016; Kalingarayar et al. 2017).

With the use of newer treatment modalities, 5% patients may have associated extramedullary disease (EMD). EMD of upper respiratory tract is of great concern to the anesthesiologist. Avoidance of nasal intubation due to chances of epistaxis should be considered and gentle oral intubation should be done to avoid bleeding from the gingiva. Preoperative hoarseness of voice, if present, should be documented due to amyloidosis of the larynx. The presence of pain in the mandible region is an indicator of an osteolytic lesion (Shah et al. 2010).

In an index case, the ramp position was made with pillows to facilitate intubation. Although Cormack Lehane grade was 1, mask ventilation proved to be difficult due to the edentulous condition. The sites for peripheral venous

access should be assessed at pre-anesthetic checkups especially in obese people. Arterial BP from the dorsalis pedis artery was recorded as radial artery access proved to be complicated.

Postoperative pain management needs special consideration. Regional anesthesia could not be used due to previous spinal surgery, and NSAIDs were avoided to prevent post-op renal dysfunction. So, postoperative pain was controlled with short-acting opioids and paracetamol. Although remifentanyl infusion is best suited for perioperative pain relief, but it is unavailable in our settings. Erector spinae block, translumbar interfascial plane block, and quadratus lumborum block with catheter placement as patient-controlled analgesia are attractive alternatives.

Multiple myeloma patients are at high risk of developing postoperative complications like acute kidney injury (AKI), pneumonia, and infections compared to patients who do not have multiple myeloma (Park et al. 2016). There are guidelines for supportive therapy of these patients to prevent complications (Terpos et al. 2015). Anesthetists should be aware of these recommendations to provide better perioperative care and prevent perioperative problems as more patients have surgery owing to improved survival.

**Table 1** A summary of anesthetic issues in multiple myeloma

Clinical feature of multiple myeloma <i>CRAB criteria</i>	Anesthesia concerns
<p>Calcium (hypercalcemia, serum Ca &gt; 11 g/dl) 12 mg/dl — no treatment 12–14 mg/dl — chronically high levels, no treatment, acute rise, altered sensorium, treatment &gt; 14 mg/dl — needs treatment irrespective of duration</p>	<p>1) <b>Electrocardiogram monitoring</b> to rule out any arrhythmia's if present 2) Avoidance of drugs which cause hypercalcemia-thiazide diuretics and lithium 3) Adequate saline hydration with target 100–150 ml/h urine output 4) Avoidance of prolonged immobilization 5) Use of drugs such as calcitonin (I.M. or S.C. 4 units/kg) for initial response and zoledronate (I.V. 4 mg over 15 min)</p>
<p>Renal insufficiency Creatinine clearance &lt; 40 ml/min or serum creatinine &gt; 2 mg/dl</p>	<p>Use of <b>KIDGO bundle</b> 1) Discontinuation of nephrotoxin agents 2) Adequate volume status and perfusion pressure 3) Use of functional hemodynamic monitoring 4) Avoidance of hyperglycemia 5) Monitoring of urine output and serum creatinine and electrolytes</p>
<p>Anemia Hemoglobin &lt; 10 g/dl or &gt; 2 g/dl below the lower limit of normal</p>	<p>1) <b>Optimized anesthesia approach</b> — use of euolemia, normothermia, maintenance of acid-base status, use of antifibrinolytics such as tranexamic acid Use of normovolemic hemodilution, autologous blood transfusion, cell salvage techniques 2) <b>Optimized surgical techniques</b> — use of electrocautery, minimally invasive surgery, surgical sutures, staplers, topical hemostatic agents 3) <b>Allogenic transfusion</b> based on clinical parameters 4) <b>Avoidance</b> of prophylactic mild/moderate blood abnormalities 5) Use of <b>point of care laboratory assays</b> for transfusion of blood products</p>
<p>Bony lesion The presence of osteolytic lesions on radio diagnostics such as skeletal X-ray, CT, or PET-CT</p>	<p>1) Gentle handling of patients during positioning, shifting, and transportation 2) Adequate padding of all pressure points</p>
<p><b>Others</b> <b>Use of immunosuppressive agents</b> <b>Peripheral neuropathy</b></p>	<p>1) Strict aseptic precautions 2) Appropriate institutional based prophylactic antibiotics 3) Bridging therapy of anticoagulants 4) Preoperative documentation 5) Proper padding of all pressure points</p>

**Table 2** Review of published case reports on anesthetic care of patients with multiple myeloma

Author	Year of publication	Age/gender	Diagnosis	Associated comorbidities	Type of surgery	Type of anesthesia	Complications
Wang C. J. et al.	2001	58 years/F	Fracture neck of femur	Diabetes	Bipolar hemiarthroplasty	Epidural anesthesia	Intraoperative stroke
Dabrowska D. M. et al.	2010	42 years/F	35-week multi-gravida	Nil	Cesarean section	Spinal + epidural anesthesia	Uneventful
Bisoyi S. et al.	2015	70 years/F	Severe aortic stenosis	Hypertension, kyphosis	Aortic valve replacement	General anesthesia	Uneventful
Binici O. et al.	2016	44 years/F	Fracture femur	Chronic kidney disease	Intramedullary nailing	Combined sciatic-psoas compartment nerve block	Uneventful
Kalingarayar S. et al.	2017	52 years/F	Fracture of right humerus	Diabetes and hypertension	Intramedullary nailing of humerus	Ultrasound-guided continuous interscalene block	Uneventful
Hamal P. K. et al.	2020	53 years/F	Fracture left shaft of humerus	Compression fracture lumbar spine multiple levels, chest wall metastasis, resolving acute kidney injury with chest infection	Open reduction and internal fixation	Ultrasound-guided interscalene brachial plexus block with sedation	Uneventful

A summary of anesthetic issues in multiple myeloma is included in Table 1.

Morbid obesity, along with multiple myeloma for spine surgery, is a big challenge for the anesthetist, and this case report briefly explains the management of such patients coming for surgery. Table 2 summarizes published case reports until now on the anesthetic care of individuals with multiple myeloma.

## Conclusions

As a result of increased survival due to stem cell treatment and newer chemotherapeutic drugs, more multiple myeloma patients presented for orthopedics surgeries as well as spine surgeries, and to conclude, ultimate care should be taken in dealing with these patients to prevent peri- and postoperative complications.

## Abbreviations

ASA	American society of Anesthesiologists
AKI	Acute kidney injury
CRAB	Clinical feature of multiple myeloma
EMD	Extramedullary disease
KIDGO	Kidney disease improving global outcomes
MM	Multiple myeloma
MRI	Magnetic resonance imaging
MR	Mitral regurgitation
NSAIDs	Nonsteroidal anti-inflammatory drugs
TR	Tricuspid regurgitation
TOF	Train of four

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## Prior publication

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## Authors' contributions

SG, initial observation and literature search; SM, literature search and manuscript preparation; AK, initial observation and manuscript editing; and ST, literature search and manuscript editing. All the authors have read and approved the manuscript.

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## Availability of data and materials

All data generated or analyzed during this study are included in this published article (and its supplementary information files).

## Declarations

### Ethics approval and consent to participate

Case report does not require ethical committee approval and registration number. However, the written patient consent was obtained for publication of clinical information and images in order to enhance medical knowledge.

### Consent for publication

The written patient consent was obtained for publication of clinical information and images to enhance medical knowledge.

### Competing interests

The authors declare that they have no competing interests.

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