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Case Report

A Patient with Multiple Myeloma for Prophylactic Interlocking Nailing of Shaft Humerus: What's in Anaesthesiologist's Box?

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Abstract

Multiple myeloma (MM) is also known as skeletal related events and includes bone pain, osteoporosis, pathological fractures, osteolytic bone lesions, spinal instability, spinal cord and nerve root compression and extramedullary plasmacytoma. It is now generally accepted that patients with these complications usually require surgical management and that such treatment is safe and effective. The anaesthesiologist should continue the optimum supportive care received by these patients in the perioperative period also, by understanding the pathophysiology of the disease, the adverse effects of the chemotherapeutic agents and the guidelines for their supportive care. The aims of surgical interventions are to alleviate pain, improve quality of life, treat potential or existing pathological fractures, decompress the spinal cord and nerve roots, and reestablish bone continuity. Anaesthesia in such patients have important considerations. We report the perioperative management of a 55 years old female patient with MM and discuss the perioperative anaesthetic considerations scheduled for interlocking right humerus nailing.

Keywords: *Multiple Myeloma; Interlocking Right Humerus; Anaesthesia; Fracture*

Introduction

Multiple myeloma is a plasma cell dyscracia characterised by abnormal accumulation of monoclonal paraprotein (M protein), imbalance of osteoblastic - osteoclastic activity and suppression of haematopoietic cell progenitors [1]. It belongs to the clinical spectrum progressing from monoclonal gammopathy of undetermined significance to plasmacytoma. The clinical manifestation includes bone marrow suppression, painful pathological fractures, hypercalcaemic renal failure and heightened susceptibility to infections with overall decreased quality of life [2]. We report successful anaesthetic management of case of multiple myeloma posted for prophylactic Interlocking nailing of shaft of humerus and highlight the various concerns in the course of its management.

Case Report

A 55 year old female, weighing 54 kg had complains of pain in the right arm with generalised body ache and was diagnosed to have Multiple myeloma upon investigatory findings three years back. She was undergoing treatment at a tertiary care institute. She was advised tab. zoledronic acid and tab calciferol for bone strengthening but, did not receive any chemotherapeutic agents.

Currently, she presented to the orthopaedic department at the institute with increase in intensity of pain in both upper limbs and right thigh. Radiological findings were suggestive of osteolytic bony lesion in the shaft of both humerus and right proximal femur. Detailed pre-anaesthetic check up was done and history revealed that the patient had pain in both upper limbs and right lower limb for 2 weeks. Patient was planned for prophylactic interlocking right humerus nailing. Pre-operatively investigations were: haemoglobin- 8.8 g/dl, leucocyte count- 5800/cumm, platelet count- 3.9 lks/l, peripheral smear showed normocytic normochromic cells with adequate platelets, serum calcium-10.5 mg/dl, serum phosphate- 6.8 mg/dl, urea- 35 mg/dl, creatinine- 0.7 mg/dl, sodium- 141 mmol/l, potassium- 4.5 mmol/l, PT/INR- 17 sec and 1.21 and albumin of 2.8 mg/dl. Her 24 hour urinary proteins was grossly elevated (2907 mg). Serum protein electrophoresis report revealed abnormal M spike in gamma band. She also has technicium-99 bone scan done which revealed abnormal increased radiotracer concentration at multiple sites in the axial skeleton and long bones which was classical of multiple myeloma pattern.

On the pre-operative visit, history and investigatory findings were noted. Airway findings were normal. Patient was advised clear liquid intake for up to 2 hrs before the procedure and adequate blood products were reserved. Premedication with tab. famotidine 20 mg and tab. alprazolam 0.25 mg were advocated. Written informed consent for general anaesthesia and interscalene block were obtained. On the day of procedure, ASA standard monitors were attached and warm Plasmalyte primed intravenous line was connected to 18 gauge i.v cannula taken in the right hand. Inj. ceftriaxone 1g was administered as antibiotic prophylaxis. After preoxygenation for 3 minutes, patient was induced with Inj. fentanyl 100 mcg, inj. propofol 100 mg and Inj. vecuronium 6 mg. Intubation was performed with 7 size endotracheal tube, fixed at 20 cms. Anaesthesia was maintained intraoperatively with oxygen+ air + sevoflurane. Boluses of muscle relaxant were timed to train of four response with maintaining TOF count of 1-3. Temperature was maintained to 36°C with forced air warmers and fluid warmers. All the pressure points were adequately padded. Additionally, we had performed ultrasound guided right interscalene block with 0.25% ropivacaine of 15 ml for analgesia. Surgery lasted for 4 hours. Total intake was 2 litres with one-unit compatible PRBC transfusion and output was 550 ml. For analgesia 1g of paracetamol was also administered. The patient was extubated smoothly and transferred to post anaesthetic care unit. Patient was followed up for 72 hours and there were no major complications.

Discussion

Multiple myeloma (MM) is a B cell neoplasm with immortalised expansion of the plasma cells in the bone marrow. The incidence varies between 2% - 10%, commonly affecting population of aged above 60 years at diagnosis [1]. There have been recent amendments in the diagnostic criteria according to CRAB (hypercalcemia, renal failure, anaemia and bony lesions) with inclusion of biomarkers and radiological characteristics to identify the high-risk asymptomatic individuals [2]. Contrary to bony metastases, osteoclastic abnormalities are evident in patients affected with MM. Accumulation of neoplastic cells within the bone marrow causes activation of osteoclasts, release of calcium in the blood and consequent bone erosions resulting in pathological fractures [3]. The incidence of osteolytic lesions as index presentation is found to be 70% - 80% with heightened risk of skeletal related events (SRE) with impairment in survival and increased treatment cost [4]. Highly vascularised areas of the skeleton are most affected sites for the painful osteolytic bony lesions with vertebral spine, ribs and proximal femur in the decreasing order [5].

The role of anaesthetists in the management of MM in peri operative period cannot be enough emphasised upon.

Anaemia is present in 73% of patients with MM manifesting as anaemia of chronic disease with deficient erythropoietin levels and presence of inflammatory cytokines [6]. Most of the patients develop anaemia of moderate severity (7 - 10 gm/dl) and is found to have poor prognostic value [7]. Our patient had Hb of 8.8 gm/dl and was already on erythropoietin weekly injection. Erythropoietin is shown to have anti-myeloma properties in mice models and have shown significant improvement in quality of life and survival benefit [7]. We had reserved adequately cross matched blood and blood products and targeted a transfusion threshold of 8 mg/dl. Though our patient was not on chemo therapeutic treatment, side effects of medical management are anaemia, febrile neutropenia and thrombocytopenia all

leading to increased propensity for thrombosis and infections. Dose modification with haematologist may be considered if any of the adverse effects persist [8]. We administered antibiotic 30 minutes prior to surgical incision according to standard protocol and complied to strict asepsis throughout. American society of haematology (ASH) 2021 guidelines conditionally recommends mechanical over pharmacological thromboprophylaxis in cancer patients without prior venous thromboprophylaxis undergoing surgery with due risk of bleeding [9]. We applied bilateral lower limb compression stockings intra operatively and prophylactic dose of low molecular weight heparin was initiated in the post operative period.

Transportation of patients and positioning of such patients must be smooth because of increased vulnerability to fractures due to bony fragility. Additionally, adequate padding of the joints and pressure points should be provided along with maintenance of normothermia.

Renal system involvement is seen in 50% of newly diagnosed multiple myeloma cases in the form of decreased creatinine clearance with almost 10% developing dialysis dependency [10]. Though most common cause of renal failure is accumulation of toxic immunoglobulins causing myeloma cast nephropathy, factors such as analgesic abuse for painful lesions, dehydration, hypercalcemia, bisphosphonate therapy can contribute to renal failure [11,12]. We had encouraged our patient to consume clear liquids until 2 hours prior to surgery to prevent dehydration induced pre-renal injury. Further, urine output > 1 ml/kg/hour and mean arterial pressures > 70 mm hg were maintained for adequate renal perfusion and all the possible nephrotoxic agents were avoided. We preferred using normal saline fluid administration because sodium counteracts calcium entry into the cell. Proteinuria with albuminuria is a common laboratory finding with clinical significance of altered pharmacokinetics of anaesthetic drugs. Neuromuscular monitoring using Train of Four avoids unwarranted administration of muscle relaxants enhancing superior post operative pulmonary functions.

Painful osteolytic lesions adversely affects the quality of life and daily functional activity. A study was performed by WHO that showed that conservative pain management did not relieve pain in 45% of this population [13]. Multimodal analgesic regimen was followed in our case.

All the precautionary measures followed at pre and intra operative period must be continued in the post operative period with close monitoring of patient status and laboratory investigations. Appropriate pre-operative optimisation and meticulous intra and post operative management helps in preventing long term complications in these cohorts.

Conclusion

Multiple myeloma is multisystemic disease with painful bony lesions being the most common presentation. The number of these patients seeking preventive orthopaedic intervention has increased in the last few years with decreased morbidity. Appropriate care in the peri-operative period and supportive treatment of the myeloma symptoms can considerably influence the quality of life in these patients.

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