

## Osteosarcoma in a 20 Year Old Male Posted for Tumor Excision and Total Knee Replacement: Anaesthetic Concerns with Review of Literature

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### Abstract

### Case Report

Osteosarcoma is the most common bone sarcoma having an incidence of 4.6 per million occurring more commonly in the adolescent age group. Treatment of osteosarcoma consists of neoadjuvant chemotherapy for about 10 weeks before and after the reconstructive surgery carried out to salvage the affected limb. The limb saving surgical treatment of osteosarcoma consists of tumour resection and limb reconstruction with a bone graft or endoprosthesis. We hereby discuss the anaesthetic management of a young adult with distal femur osteosarcoma posted for tumour resection and implant of an endoprosthesis with the help of general anaesthesia with adequate perioperative pain management with systemic opioids, paracetamol and epidural analgesia. Optimal haemodynamic management with the help of invasive monitoring helped us not only to manage the perioperative fluid requirements but also kept us vigilant against any untoward side effects of bone cement implantation syndrome. Use of low molecular weight heparin also helped us achieve adequate thromboprophylaxis in the post-operative period.

**Keywords:** Osteosarcoma, limb reconstruction, general anaesthesia.

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## INTRODUCTION

Osteosarcoma is the most common bone sarcoma having an incidence of 4.6 per million people with the majority of the patients between 10 and 19 years of age<sup>1</sup>. Most of the tumours develop on the metaphysis, gradually involving the epiphysis and eventually the whole joint space. In lower limb it is most commonly seen in the distal femur and proximal tibia [2]. In recent years the preoperative diagnostic procedures like MRI helps in staging of the tumour apart from clinical examinations and histopathology grading [3]. Treatment of osteosarcoma has improved in the recent past which consists of neoadjuvant chemotherapy for about 10 weeks before and after the reconstructive surgery carried out to salvage the affected limb [4]. Radiation therapy does not play a big role in high grade osteosarcoma as the cancer cells require high energy beams to destroy them which bears the complications of radiation therapy; however residual tumours after surgery have favorable outcome with radiation therapy [5]. The limb saving surgical treatment of osteosarcoma consists of tumour resection and limb reconstruction with a bone graft or endoprosthesis.

Anaesthetic management of such a case with endoprosthesis insertion is challenging which consist of preoperative patient preparation (considering the chemotherapy, psychological status of such young age, preoperative pain control), intraoperative management (blood loss due to and after tourniquet release, injury of vessels, usual concerns of bone cement), and postoperative management (pain control, high drain output etc.). We hereby present to you the anesthetic management of a young adult with distal femur osteosarcoma posted for tumour resection and implant of an endoprosthesis.

## CASE REPORT

A 20 year old, 55 kg male diagnosed with osteosarcoma of left distal femur with no distant metastasis was posted for resection of the tumour and total knee replacement with endoprosthesis in our institute. Preoperative chemotherapy was given with high dose methotrexate and doxorubicin. Preoperative hemoglobin of the patient was 10.8mg/dl, platelets 2.7 lakhs/mm<sup>3</sup> and total WBC count 5600. The liver function and kidney function tests were within normal limits along with a good cardiopulmonary reserve. He had a pain score of 3/10 on NRS and was not on any medications for pain. He was admitted one day prior to

surgery. Alprazolam 0.5 mg was given the night prior to surgery as an anxiolytic. Standard ASA (American Society of Anaesthesiology) I monitors were attached (5 lead echocardiogram, NIBP, Spo<sub>2</sub>, temperature probe). Preoperative vitals of the patient were stable. Intravenous access was secured with a standard 18G cannula in the left upper arm. Piperacillin and Tazobactam (4.5 g) was given 15 minutes prior to induction as antibiotic prophylaxis after negative skin test. He was premedicated with glycopyrolate 0.2 mg IV, fentanyl 100 mcg IV and palonosetron 75mcg IV followed by 20G epidural catheter insertion at the level of L2-3 under local anaesthesia. The right radial artery was cannulated with a 20G arterial catheter and the right internal jugular vein was cannulated with a 7French double lumen catheter under local anesthesia. Induction was achieved with intravenous propofol 110mg. The airway was secured with an 8 mm cuffed endotracheal tube with vecuronium bromide 6 mg IV. Anaesthesia was maintained with oxygen, nitrous oxide, sevoflurane and intermittent bolus of vecuronium bromide. Intravenous paracetamol 1g was given 15 minutes prior to incision over 15 minutes. Intraoperative analgesia was maintained with epidural infusion of 0.2 % isobaric ropivacaine at 4ml/hr. Tranexemic acid 500mg was used intraoperatively as an antifibrinolytic. After about 2 hours of surgery, bone reaming was completed and bone cement (surgical simplex P, Stryker) was applied which was followed by endoprosthesis insertion. Inspired oxygen concentration was increased at the time of cementation. The total duration of surgery was 7 hours and estimated blood loss was about 800ml. Replacement was done with 3000 ml of crystalloids and 350ml of packed red blood cells. Tourniquet was used during the surgery and inflated to a pressure of 210mm of Hg and deflated after resection of the tumour after two hours and thirty minutes. The vitals of the patient were stable throughout the operation and he was extubated after adequate reversal of muscle block. Epidural infusion with 0.1 % isobaric ropivacaine at 4ml /hr was continued postoperatively along with intravenous paracetamol 1g and tramadol 50mg thrice daily for 72 hours to achieve multimodal analgesia. Subcutaneous enoxaparin 30mg was started 24 hours postoperatively as deep vein thrombosis prophylaxis and continued for 5 days. The postoperative period was uneventful and patient was discharged on post-operative day 7.

## DISCUSSION

Resection of the tumour with endoprosthesis is frequently done as a management of osteosarcoma of the distal femur [6]. Limb-salvage by endoprosthesis reconstruction is equally efficacious as amputation for most patients as better device manufacturing and biomaterials have become widely available [7]. The concept of induction or neoadjuvant chemotherapy arose in concert with the evolution of limb-sparing surgery and is often given to most osteosarcoma patients while awaiting definitive surgery due to the

time required for fabricating custom metallic endoprostheses [8].

Most patients receive neoadjuvant chemotherapy with doxorubicin, cisplatin or methotrexate [9]. Doxorubicin is known to cause cardiotoxicity and is important to check the cardiac function in terms of functional capacity and simple investigation like resting echocardiography and an electrocardiogram. Cisplatin can cause nephrotoxicity and methotrexate can cause myelosuppression. Preoperative renal function tests and complete haemogram are therefore of utmost importance.

Osteosarcoma involving knee joint is most common in adolescent male/female [6], anxiety related to surgery is known to increase the perioperative stress in such age group [10,11]. We used preoperative anxiolytics in the form of benzodiazepines to attenuate this response. Adequate perioperative analgesia in the form of opioids, paracetamol and epidural analgesia was given in order to address concerns regarding the management of postoperative challenges due to inadequate pain management.

Invasive arterial and central venous pressure monitoring was done for early detection of cardiovascular instability and rapid resuscitation in case of BCIS (bone cement implantation syndrome) [12]. The concentration of oxygen was increased at the time of cementation to decrease the vapour concentrations of sevoflurane which may be associated with greater haemodynamic compromise with the same embolic load [13]. Tranexemic acid was used as an antifibrinolytic to reduce blood loss and decrease the risk of thrombus formation [14].

Multimodal analgesia was used in this patient with epidural anaesthesia with isobaric ropivacaine in addition to systemic analgesics. The use of multimodal analgesia is highly efficacious in relieving postoperative pain, decreases opioid requirements and its side effects and facilitates early recovery [15]. Moreover regional anaesthesia decreases the incidence of deep vein thrombosis (DVT), pulmonary embolism besides reducing intraoperative blood loss. Monitoring the hemodynamics carefully was paramount to manage this case as severe hypotension is very common in case of massive blood loss during surgery as well as following tourniquet release [16]. Postoperative low molecular weight heparin was started to prevent deep venous thrombosis.

The anaesthetic management of such a case is not difficult but it is quintessential to follow the standard precautions of perioperative care. Knowing the preoperative condition of the patient including medications and proper alignment of the anaesthetic goals to the patient's condition will go a long way in

providing safe anaesthesia and a favorable perioperative outcome.

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