

Anaesthetic Considerations during Surgery in Cancer Patients

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ABSTRACT

Cancer is beginning to outpace cardiovascular disease as the primary cause of death in the world. The quality and lifespan of patients with malignancies has improved with the newer and advanced chemotherapeutic agents. These patients are often posted for various types of elective and emergency surgeries. The anaesthesiologist faces a challenging task, as these patients have gross physiological derangements due to radiotherapy, toxicity of chemotherapeutic agents and potential drug interactions. Thorough preoperative assessment, optimization of physiological milieu, vigilant intraoperative monitoring, anticipation of potential complications and postoperative pain control plays important role in reducing perioperative mortality and morbidity in these patients.

Keywords- anaesthesia, cancer, surgery.

INTRODUCTION

Cancer is second only to cardiovascular disease as the most frequent cause of death among adults in the developed nations. Its incidence has increased tremendously over the last few decades. Malignancy as a group accounts for about 13% of all deaths per year with the most common sites being lung, colorectal, breast and prostate. ^[1] The most common types of malignancies found in children are leukaemia (34%), brain tumours (23%) and lymphoma (12%). ^[2] Although cancer does occur in children and young adults, nearly 75% of cases occur in individuals aged 60 years and older, and more than one-third in those aged 75 years and older. As a consequence, anaesthesiologists face numbers of patients presenting for cancer surgery along with various comorbidities due to old age. Due to multitude of effects of malignancy on various systems in the

body and effects of radiotherapy and chemotherapeutic agents, these patients pose a great challenge to the anaesthesiologist. The patients with malignancy can present with myriad of physiological alterations in body systems which place these patients at an extra risk during the perioperative period as compared to the normal population. These patients can present for various surgeries for resection of primary tumour, diagnostic procedures for unknown primary or emergency surgery for complication of malignancy. The risks increase to a greater extent if such patients present with untreated co-morbid diseases. ^[3]

James Cottrell defined anaesthesiologists as "... doctors who keep patients alive while surgeons do things that would otherwise kill them." ^[4] But could our choice of anaesthesia increase the risk of cancer recurrence that could kill the patient, or could a more appropriate choice

of drug decrease the risk of recurrence after cancer surgery? There is increasing evidence from experimental studies and a limited number of clinical studies that some anaesthetics and opioids may be contributing to the development of metastases after cancer surgery. [5] Volatile anaesthetics induce apoptosis in lymphocytes, reduce natural killer cells (NK) cytotoxicity, and alter the release of cytokines by NK cells in response to tumour cells. [6] On the positive side, some anaesthetics are cytotoxic to poorly differentiated human carcinoma cell lines and might help counteract the spread of cancer cells. [7] However, it would seem prudent to limit the use of inhaled anaesthesia in patients undergoing cancer surgery. Gottschalk et al. [5] proposes 2 alternatives: regional anaesthesia and total IV anaesthesia (TIVA) with propofol. Although several studies have suggested that regional anaesthesia preserves immune defences against tumour progression by attenuating the surgical stress response, most have been retrospective and have investigated regional combined with general anaesthesia. [8] Propofol, the most popular hypnotic used in TIVA, attenuates the surgical stress-induced adverse immune response to surgery and has antitumor activity, possibly related to inhibition of cyclooxygenase. [9,10] Unfortunately, propofol is not a complete anaesthetic and needs to be combined with an opioid when used in TIVA. Opioids have several actions that can promote the dissemination of malignant cells. They stimulate angiogenesis, a key factor in the growth and dissemination of cancers, in part by activating cyclooxygenase-2 (COX-2), increasing production of prostaglandin E₂, which promotes angiogenesis and tumour progression. [11]

Preoperative Assessment

For a careful and thorough preoperative assessment, the anaesthesiologist should have knowledge of the physical condition

of the patient, the stage of malignancy and the risk involved with the surgery and toxicity of radiotherapy and chemotherapeutic agents.

1. The assessment of the nutritional status of the patient is essential as these patients are usually poorly nourished because of the malignancy. The nutritional status must be improved for a positive postoperative outcome and can be achieved with hyperalimentation or parenteral nutrition.
2. These patients usually have electrolyte abnormalities which should be corrected preoperatively for better intra and postoperative management.
3. Assessment of cardiopulmonary status is very important. The cardiovascular system is often involved by malignancy, by the radiotherapy or chemotherapeutic agents. Any involvement of cardiovascular system should undergo echocardiography and exercise stress testing and further invasive testing with angiography. [12]
4. Endocrine problems usually found in these patients include diabetes mellitus, diabetes insipidus, hypopituitarism, thyroid dysfunction, adrenal cortical and medullary dysfunction. [13-15] Preoperative review and management of all these condition is essential for preventing intra and postoperative complications. Such patients may require intensive care monitoring during postoperative period.
5. Patients having co-morbid psychiatric and psychological disorders are difficult to manage. The preoperative evaluation is extremely challenging in these groups of patients as the elicitation of proper history and relevant clinical examination is difficult. [16]
6. An altered haematological profile is usually encountered in these patients. Correctable causes of such abnormalities should be identified and

appropriately treated before administering anaesthesia for a better postoperative outcome. [17]

7. All patients with malignancy should have extensive preoperative testing which should include complete haematological profile, coagulation profile, liver function test, renal function test, electrolytes, 12 lead electrocardiogram and chest radiograph.
8. Airway assessment is very important for an anaesthesiologist especially in head and neck malignancies to anticipate any difficulties in intubation and to plan accordingly.

Intraoperative Management

1. These patients should be monitored with the standard intraoperative monitors including non-invasive blood pressure, central venous pressure, electrocardiogram, pulse oximeter, end-tidal carbon dioxide monitor, temperature probe and urine output.
2. These patients are prone to develop serious intraoperative cardiovascular complications due to their disturbed homeostasis.
3. As these patients are more prone to develop hypothermia, intraoperative temperature monitoring is mandatory to maintain the temperature. Forced convective air warming devices should be used to maintain normothermia and to prevent ill effects of hypothermia in the postoperative period. [18] Shivering is a very unpleasant phenomenon in postoperative patients. Numerous drugs have been used to control the incidence of postoperative shivering with a varying level of success. Dexmedetomidine is the newer addition to the anesthesiologist's armamentarium for control of this postoperative menace. [19]
4. Endotracheal intubation in patients with head and neck malignancies is usually difficult. The decision of awake fibreoptic guided intubation or elective

tracheostomy should be based on clinical assessment of airway by the anaesthesiologist.

5. Positioning of these patients are very important. There are different types of positions which are employed by the surgeons depending upon type of surgery like supine, lateral decubitus, prone etc. So proper padding of all the pressure points should be done. Care should be taken to avoid excessive stretching of the nerve plexuses especially in upper limbs. Proper protection of eyes should be given and compression on abdomen should be avoided when surgery is done in prone position.
6. Blood component therapy in these patients should be guided by clinical judgement. Risk of transmission of infection in these immunocompromised patients should be weighed with the benefits of blood transfusion. A value of 6–8 g/dl for haemoglobin is considered a threshold for patients without any preoperative risk factors and 10–11 g/dl for those with significant risk factors. [20]
7. Blood conservation strategies should be employed to prevent excessive intraoperative blood loss. Intraoperative cell salvage can increase the risk of spreading the cancerous cells systemically. So use of filtration and irradiation technique can reduce tumour load of the salvaged blood. [21] Antifibrinolytics can be used which can significantly reduce the intraoperative blood loss. There is no significant risk of venous thrombosis in these cases. [22]
8. Benzodiazepines have been found to reduce the cytokines release causing alteration of the immunological response to stress due to surgery, so it may be beneficial. [23]
9. General anaesthesia interferes with functioning of immunological cells like natural killer cells (NK),

macrophages and can increase the mortality associated with postoperative wound healing. [24] So one should administer minimal dose of anaesthetic drugs by addition of adjuvants like dexmedetomidine, clonidine or fentanyl which will reduce the dose requirement of analgesics and anaesthetic drugs. [25] Total intravenous anaesthesia can be a better alternative for a rapid and smooth recovery from anaesthesia particularly in day care surgery. [26]

10. Regional anaesthesia reduces stress response to surgery which reduces the occurrence of metastasis in advanced malignancies. [27,28] Minimal dose of local anaesthetics should be used in regional anaesthesia. This can be achieved by adding adjuvants like dexmedetomidine, fentanyl, clonidine. [29] Regional anaesthesia can be challenging in patients with suspected metastasis to the spine. If paraesthesia is elicited during administration of epidural regional anaesthesia, then it should be discarded and general anaesthesia to be administered.

Postoperative management

Careful postoperative monitoring of these patients in an intensive care unit is vital. Prognosis and costs involved in the treatment of such patients should be thoroughly explained to the patient's relative. [30] Alleviation of acute postsurgical pain is of utmost importance in the postoperative period. The patients those are on long term oral opioids should be replaced with parenteral formulations with carefully dose titration. Additional 30% of the dose added for the acute postoperative pain over and above the usual dose of opioids. [31] The nutritional aspects should be taken care in all postoperative patients especially in preoperative malnourished and aged patients. The nutritional supplements

should be continued during the postoperative period. [32]

Thromboprophylaxis

Venous thromboembolism is the most serious postoperative complication in patients with malignancy. The incidence of deep venous thrombosis is 45–69% without any prophylaxis. With use of various mechanical and pharmacological methods, the incidence of deep vein thrombosis can be reduced to 4%. [33,34] The various pharmacological methods are use of warfarin, low-dose heparin, low molecular weight heparin and aspirin. Full- leg or half leg -leg pneumatic compression devices can be used as an alternative. During the use of thromboprophylaxis the anaesthesiologist should follow the guideline to place or remove the epidural catheter at an appropriate time period to prevent development of any epidural haematoma.

CONCLUSION

A thorough preoperative assessment with correction of nutritional status and electrolyte abnormalities, choosing ideal anaesthetic technique and drugs is important. Careful intraoperative and intensive postoperative monitoring and relief of acute postoperative pain, is essential for a positive outcome of the patient. But we cannot ignore the possibility that anaesthesia may contribute to the recurrence of cancer, months or even years after cancer surgery. There is a possibility that anaesthesia could activate dormant cancer cells in an individual undergoing noncancer surgery which may lead to development of an overt cancer. Regional anaesthesia should be used, when feasible, alone or in combination with general anaesthesia, to minimize the amount of opioid administration. We must consider using NSAIDs, especially specific COX-2 for pain relief. Anaesthesiologists plays important role not only in the operating room and intensive care unit, but also in pain and

palliative care centers which can impact the lives of millions suffering from cancer.

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