

Pre-Anesthetic Evaluation of the Patient undergoing Head and Neck Surgery

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Abstract

Head and neck cancer patients have anatomic and physiologic changes due to the disease itself and those associated with treatments like chemotherapy and radiotherapy that makes anesthetic management of these patients a challenge. The most important aspect of pre-anesthetic evaluation of these patients is assessment for difficult airway. Appropriate assessment of associated co-morbid conditions should be done. Laboratory and special studies should be guided by patient's history and physical examination. Specialty consultations should be sought only if it alters anesthetic plan considerably as these may cause unwarranted delay in surgery. This review article highlights special points in the comprehensive preoperative evaluation of the head and neck cancer patients so that optimal anesthetic care can be ensured.

INTRODUCTION

The term "head and neck cancer" comprises of a wide range of tumors that occur in several anatomical areas of the head and neck region, including the nasal cavity, sinuses, oral cavity, oropharynx, larynx, salivary glands, and the thyroid gland. Skin cancers of the scalp, face, or neck are also considered in head and neck cancers. Head and neck cancer can develop sporadically, but people who use tobacco including cigarettes, cigars, pipes, and smokeless tobacco, snuff, drink alcohol excessively, have genetic susceptibility or exposure to certain chemicals are much more likely than others to develop the disease. In India, oral cancer rate for males and females is 12.8 and 7.5 per 100,000 respectively as compared to 6.3 and 3.7 per 100,000 in United States (1). The disproportionately higher head and neck cancer in India as compared to other malignancies may be additionally due to low socioeconomic conditions, poor oral hygiene and diet, and rampant viral infection (2).

Many cancers of the head and neck can be cured, especially if they are diagnosed early. Treatment varies according to the type, severity, and location of the disease. It may include surgery (the primary treatment method), radiation therapy, or chemotherapy (3). Patients with cancer may present for anesthesia and surgery for variety of procedures like major surgical resection, interstitial brachytherapy, enteral access like gastrostomy and ileostomy, and emergency surgery. Patient's comprehensive pre-anesthetic evaluation becomes

utmost important as he may present in significant immunosuppression state or cachexia due to preoperative radiation therapy or chemotherapy or previous surgery (4). Precise assessment of physical status and appropriate anesthetic plan for the cancer patient represents a great challenge to the anesthesiologist. This review article highlights comprehensive approach to the preoperative evaluation for optimal peri-anesthesia management in head and neck cancers.

PREANESTHETIC EVALUATION

Head and neck cancer patients pose major anesthetic challenges due to local effects of a tumor or subsequent effects of tumor therapy or by a group of paraneoplastic syndromes. Furthermore, since cancer is a disease most commonly seen in the elderly, many of these patients have the added susceptibility to complications associated with the advanced age.

Pre-anesthetic evaluation of these patients can be broadly subdivided as:

1. Medical History
2. Physical Evaluation
3. Laboratory and Special Studies
4. Consultation

5. Informed Consent

HISTORY

Incidence of head and neck cancers is highest in persons over the age of 60 (5). The medical history and physical evaluation of typical adult patient with head and neck cancers should include looking for evidence of chronic obstructive pulmonary disease (COPD), bronchitis, hypertension, coronary artery disease and diabetes mellitus along with the elicitation smoking and alcohol abuse history (6). Thus the anesthesiologist frequently encounters a patient with multiple co-existing medical problems planned for head and neck cancer surgeries that are lengthy, and require complete and easy access to either the airway itself or adjoin anatomical areas (7). The medical history and physical evaluation including airway evaluation should focus especially on upper airway, respiratory, cardiovascular, renal and hepatic systems. There are very few conditions that present greater airway management challenges than head and neck oncologic surgeries. These patients are at highest risk of potentially difficult mask ventilation or endotracheal intubation following induction of general anesthesia.

Pre-operative indicators of difficult airway consequent to induction of general anesthesia are:

1. Changes in the characteristics of patient's voice
2. History of dyspnea
3. History of exercise intolerance
4. History of dysphagia or inability to handle oronasal secretions
5. History of radiation to head and neck region
6. History of peri-anesthesia difficult airway or endotracheal intubation
7. Previous head and neck surgery
8. Tumors and edema of pharynx and hypopharynx (8, 9)

History of troubled breathing in supine position but not in lateral or prone position may indicate a pharyngeal, neck or anterior mediastinal mass (10). Prior radiation therapy causes distortion of airway anatomy along with edema and swelling of the tissues. Fibrosis of airway tissues can lead to difficult airway in these patients. Careful physical examination of

tissues particularly between the submental region and hyoid bone can provide clues to potential difficult airway. Prior radiation therapy can also obliterate lymphatics, resulting in increased postoperative edema (11). Patients may present with acute side effects of radiotherapy in the form of inflammatory reaction leading to epidermitis and oral mucositis. Patients with oral mucositis have more susceptibility to infection and bleeding during airway manipulation. Irradiation of salivary glands may produce xerostomia. Oral cavity radiotherapy has significant effect on dentition. Dental health should be inquired in pre-anesthetic evaluation (3).

The use of chemotherapy in head and neck cancers is also expanding, especially in cases that previously would have been considered untreatable. Chemotherapy is often used to enhance the response of cancer cells to radiation therapy, and often makes it possible to preserve organs, such as the larynx. Chemotherapy drugs used include cisplatin, fluorouracil, methotrexate, carboplatin, and paclitaxel. These drugs especially methotrexate, paclitaxel and docetaxel cause myelosuppression leading to thrombocytopenia and neutropenic fever (12,13,14). Paclitaxel and carboplatin in a prospective randomized clinical study produced a significant but clinically silent decrease of more than 20% in diffusion capacity of carbon monoxide which persisted for five months after completion of chemotherapy (15). Reckzen et al described interstitial pneumonia in patients treated with paclitaxel combined with radiotherapy due to lymphocytopenia (16). Cisplatin and docetaxel may produce central nervous system toxicity which manifests in the form of nausea and vomiting (14, 17). Gastrointestinal toxicity as seen with methotrexate may present with oral mucositis, diarrhea, weight loss and electrolyte imbalance (17, 18).

Cancer patient receiving opioids usually express variety of cognitive dysfunction ranging from delirium, sedation to unconsciousness (19). In this patient each mental alteration should be properly examined in terms of underlying metabolic disorder, infection, hypoxia, other psychotropic drug overdosing or brain metastatic process (12). Anesthesiologist should be aware of insidious impaired cardiac, renal or hepatic dysfunction that may be associated or unrelated to preoperative anticancer therapy.

PHYSICAL EVALUATION

The elderly malnourished patients with associated co-morbid conditions have increased peri-operative mortality. Care of the elderly head and neck cancer patients present a dilemma

(^{20,21,22}). The tendency to deny a patient optimal treatment due to patient's advanced years should be avoided. In a study by McCruit and Davis, operative mortality was 4% in patients more than 65 years of age and not significantly differing than those less than 65 years (²¹). A prospective case control study by Kowalski et al in elderly patients undergoing head and neck cancer surgery failed to identify any increased frequency of postoperative complications or mortality as compared with younger patients (²⁰). The choice of treatment should not be predicted with the age of the patient; instead, it is the patient's general condition that remains the most critical consideration.

Another important consideration preoperatively in these patients is assessment of nutritional status and pre-operative nutritional support. Several authors report the common finding of malnutrition in head and neck cancer patients (^{23,24,25}). Severe malnutrition has been identified in over 25% of these patients (²³). Furthermore the presence of severe malnutrition is associated with increased operative mortality (²⁵).

The physical evaluation of the patient's upper airway should be done thoroughly and systematically. It is possible to recognize 90% of difficult tracheal intubations on preoperative clinical evaluation (²⁶). Still it is seen that 50% of these are not picked up in pre-anesthetic evaluation (²⁷). Various methods have been described to recognize difficult airway and predict possibility of difficult tracheal intubation.

During examination, following points should be kept in mind:

1. Examination of the oral cavity to determine site, size and friability of the tumor. If necessary, indirect laryngoscopy is advisable to assess the patency of airway and for susceptibility to bleeding or tumor aspiration during airway manipulation (²⁸).
2. See for mouth opening of the patient. Normal mouth opening is 5-6 cm. For successful laryngoscopy, mouth opening should be at least 3 cm.
3. Mallampati grading. The visualization of soft palate, uvula and faucial pillars has been correlated to the ease of laryngoscopy (^{29, 30}). This can be graded as grade 1 - all three structures are visualized; grade 2 - soft palate and faucial pillars

are visualized; and grade 3 - only soft palate is visualized.

4. Size of the mandibular space. This is measured from mentum to hyoid bone. This hyomental distance should be more than 6 cm. If this space is small, larynx is predicted to be anteriorly placed.
5. Assessment of comfort in sniffing position. This helps in axis alignment to glottic opening
6. Adequacy of mask ventilation. It should be assessed by the size and site of the growth. Some big tumors like those involving lip or mandible may render mask ventilation difficult.

Patients presenting for second stage reconstructive surgery have distorted airway anatomy and fibrosis due to previous surgery and postoperative radiation therapy (³¹). General physical indicators of a difficult airway include obesity, short-neck, a limited mouth opening which may be due to trismus or swelling, micrognathia, overbite, a large tongue, an enlarged thyroid and limited mobility of cervical spine (⁷). Head and neck cancer patients who have received radiation therapy often have limited jaw motion, rigid immobile cervical spine secondary to radiation fibrosis. In addition larynx and trachea may become resistant to manipulations with external digital pressure during tracheal intubation. These patients have difficult intubations with conventional techniques (³²).

LABORATORY AND SPECIAL STUDIES

Preoperative laboratory assessments are important in proper planning of peri-operative management of the patient. Ideally, a laboratory test is justified to evaluate a sub-clinical co-morbid condition that poses significant risk and to assess for known adverse hematological and biochemical affects of preoperative anti-cancer therapy (³³). Hematocrit and hemoglobin concentration can be defined as an acceptable range rather than the normal range. Hematocrit of 30% is acceptable as opposed to 37% for anesthesia purposes in cancer patients (³²). The anesthetic implications of laboratory examination are varied and peri-operative corrections should be made when anesthetic management is directly affected. Certain electrolyte abnormalities can predispose the patient to cardiovascular and central nervous system dysfunctions. Head and neck malignancies are associated with hypercalcemia (³⁴). Creatinine is indicative of renal function and guides the management of fluids intraoperatively but

cannot be generally improved preoperatively. Serum bilirubin, serum albumin and serum glutamic pyruvic transaminase concentrations are general indicators of hepatic function that is pre-anesthetically relevant in patients who have received chemotherapy. Low serum albumin levels affect metabolism and duration of anesthetic drugs (27). Laboratory studies of patients with history of prior chemotherapy or alcohol intake must include complete blood count, serum electrolytes, liver function tests and a coagulation profile. A chest radiograph and a 12-lead electrocardiograph are needed.

Dyspnea from upper airway obstruction must be distinguished from that of COPD. Flow volume (FV) loops may be useful in differentiating the two. A decrement in the inspiratory portion of FV loop indicates extrathoracic lesion whereas a decrement in expiratory portion of FV loop indicates an intrathoracic lesion (28, 35, 36). Thyroid cancers can cause upper airway obstruction by local invasion of trachea, tracheomalacia, mass effect causing distortion of trachea and involvement of recurrent laryngeal nerve. Involvement of this nerve may jeopardize an already compromised airway by causing additional narrowing at the glottic opening (28). Routine preoperative indirect laryngoscopy to evaluate vocal cords of all the patients presenting for thyroid surgery is important for medical and medico-legal reasons (28).

Lefor et al advised preoperative review of the CT scan of the neck as some large tumor may be relatively asymptomatic prior to attempts at intubation, but may make intubation extremely difficult. CT scan can also give an idea of tracheal compression, if any, by large neck tumor and patient may require awake fiberoptic intubation (11). CT and MR imaging is helpful to quantify cartilage and soft tissue erosion along with tumor extension and to evaluate tracheal compression and selecting a proper plan of tracheal intubation accordingly (28, 37).

Londy et al stressed on the importance of radiographic studies for airway evaluation of patient with head and neck cancer (38). Apart from radiographic evaluation, Ovassapian et al suggested baseline acid base analysis to quantify degree of hypoventilation and hypoxemia preoperatively in patients with history of COPD, smoking and bronchitis, and FV loops in case of partial airway obstruction to distinguish the location of the obstruction and determine whether it is fixed or variable (10).

Impact on the choice and management of anesthesia is

mainly based on history, review of symptoms, physical examination and specially indicated laboratory and diagnostic tests rather than isolated abnormal laboratory values (32). Preoperative assessment must take into account that some organ damage during the initial course of the therapy may not have been apparent at the time of preoperative anticancer treatments like clinically silent cardiac or pulmonary fibrosis (39). These injuries may deteriorate significantly months or years after receiving radiotherapy.

CONSULTATION

From the anesthesiologist's perspective, preoperative specialty consultation can result in a complete definition of patient's current physical status and recommendations for improvement of that status prior to surgery (40). The medical oncologist who prescribes chemotherapeutic regimen should be involved during the preoperative assessment and postoperative care (12). Clear communication among the surgeon, anesthesiologist and other consultants like dental surgeons is of utmost value in proper peri-operative management of the patient. It should always be kept in mind that cancer surgery is an urgent surgery. For this reason, it is imperative to avoid unwarranted delay in surgery because of specialty consultations that may not have significant effect on the anesthetic plan and peri-operative management.

INFORMED CONSENT

Last but not the least, patient should be explained beforehand about the treatment he is going to receive with all the benefits and shortcomings. Coping with the side effects of treatment both physically and emotionally is a challenge to the patient, the family and the medical team. Oral cancers are further complicated by the fact that surgery most often leads to disfigurement. The patient may need reconstructive and plastic surgery for the bones or tissues of the mouth or may require prosthesis to restore satisfactory swallowing and speech. Laryngectomy leaves the person without speech and permanent tracheostomy. These all aspects should be explained to the patients in preoperative visits so that postoperative depression and unfavorable outcomes can be avoided.

CONCLUSION

The head and neck cancer patients for surgery should be in an optimal medical condition before surgery. Airway evaluation forms the major component of the pre-anesthetic evaluation in these patients. Medical history and careful physical examination are the most important steps to detect

difficult mask ventilation and difficult tracheal intubation. Anesthesiologist should have thorough knowledge of chemotherapeutic agents with their adverse effects and radiation effects for safe peri-operative management and better survival of the patient. Appropriate laboratory and special studies should be conducted preoperatively for optimal preparation of the patient. Specialty consultation, when essential, along with the informed consent of the therapy go a long way in the positive peri-operative outcomes.

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