Review Article



# Anaesthetic preoperative considerations for oral cancer surgery: a clinical review

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**Abstract:** Patients with oral cancer form a very-well defined cohort with similar comorbidities due to comparable exposure to risk factors responsible for development of oral cancer. This review aims to inform clinicians of the considerations required to mitigate mortality and morbidity when patients undergo surgery for oral cancer. It focuses specifically on preoperative evaluation, optimisation, and risk stratification. This article forms part of a series on oral cancer and therefore does not look at other aspects of management (e.g., intraoperative techniques) as these are dealt with in different articles that are part of the series. The literature is reviewed to provide a foundation for evidence-based practice in preoperative optimisation for anaesthesia for surgery in oral cancer. The incidence, anatomical site, aetiology, and prognosis of oral cancer as well as common comorbidities that are associated with oral cancer are also reviewed as these influence prognosis and management. The common risk factors that lead to oral cancer also affect patient's general health and it is of utmost clinical importance to deal these issues to improve patient outcomes by reducing the incidence of complications when undergoing a surgical procedure. We aim to consolidate available evidence which highlights approaches that are associated with reduced morbidity. Units caring for these patients should adopt interventions in the form of a bundle to tackle addiction to alcohol and nicotine especially, improve the nutritional status of patients, optimise their cardiovascular and respiratory physiology, improve their psychological state, and choose the best surgical procedure for that particular patient. Marginal improvements in all of these aspects and others will hopefully lead to improvement in the care of these patients.

**Keywords:** Anaesthesia; oral cancer; preoperative optimisation; risk stratification

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## Introduction

Oral cancer is the 6$^{th}$ most common cancer worldwide. Geographical variations mean that in some areas like Western Europe it accounts for 2–6% of all cancers, while in India and southeast Asia it is extremely prevalent and may contribute to up to 25% of all cancers (1).

As for all cancers, the earlier the diagnosis, the better the prognosis. However, it is particularly important in oral cancer because 'normal' functions of the oral cavity can be retained with relative ease if significant resection is not required. Worldwide, 50% of patients with oral cancer already have advanced disease at diagnosis (1). The role of screening for oral cancer is beyond the scope of this article but emphasis should be placed upon early recognition since it is crucial to improving survival.

The psychosocial impact of oral cancer can be significant. Late presentation requires extensive surgical treatment and is associated with substantial alteration in appearance and potential disfigurement, nutritional deficiency, speech and language problems, social isolation, fatigue, fear of

recurrence and depression (2).

## Rationale and knowledge gap

There are multiple surgical procedures that can be performed when treating patients with oral cancer (the details of which go beyond the scope of this article). These include examinations under anaesthesia, biopsies including lymph nodes and minor resections which are short operations and assuming there is no airway compromise are associated with little morbidity. Larger resections, neck dissections and free flap reconstructions are larger undertakings associated with longer procedures and higher morbidity.

A variety of guidelines on management of head and neck cancer exist (3-5). These do not focus solely on oral cancer and include throat and neck cancer as well. While they provide prescriptive recommendations to improve the systems that manage patients with oral cancer, they do not focus solely on anaesthesia and do not necessarily give the information needed to tailor care to a specific patient.

## Objective

The aims of this review are to quantify factors that might improve patient outcome and balance these with those associated with increased morbidity. Information from a variety of sources is brought together to enable anaesthetists to access evidence which will allow them to tailor a management plan for a specific patient; hoping this will provide the best outcome with least risk.

We specifically are not looking at information related to the intraoperative or postoperative period, anaesthetic technique or airway management as these will be looked at in other articles as part of this series on oral cancer.

This review adds information to the optimisation of patients cardiovascular, respiratory status preoperatively. It also discusses the importance of managing nutrition, addictions to tobacco and alcohol as well as improving the psychological status of patients who are undergoing treatment for oral cancer. We also look at the outcomes and complications certain procedures have on patients and thus allow clinicians to weigh up the risks and benefits of that procedure to decide if it is suitable for their individual patient.

## Aetiology and survival

Over 90% of oral cancers are squamous cell carcinoma (SCC), but malignancy can develop from any tissue in the oral cavity including odontogenic tissue, salivary glands, muscle or bone, lymphatic tissue or melanoma. The anatomical distribution of oral cancer is approximately 32% in the buccal mucosa, 22% in the tongue, 11% in the lower lip, 11% in the palate, 8% in the vestibule, 5% in the alveolus, 5% in the floor of the mouth, and 3% in the gingiva (3).

Incidence follows a male predominance, with a male: female ratio of 1.5:1 for oral cancer and 2.8:1 for oropharyngeal cancer (1). These ratios have narrowed over the past few years suggesting that lifestyle changes influence incidence more than gender, especially in the younger population (6). Most diagnoses occur in patients who are over 50 years old, although the disease is on the rise in young adults; in the UK, 6% of all oral cancers are registered in those under 45 years of age. However, it appears that the disease is no more aggressive than in older populations (6).

The aetiology is multifactorial. Smoking or chewing tobacco, snuff dipping, alcohol misuse and areca or betel nut chewing are well established risk factors (1). The Human Papillomavirus (especially HPV 16) could play a role in around 25–30% of oral cancers, particularly, in the tonsils and oropharynx (7). Other viruses like Herpes Simplex type 1 and Epstein-Barr have also been implicated, though the evidence of causality is less convincing (7). Ethnicity, immune deficiency, periodontal disease, as well as a positive family history have also been implicated as risk factors (1).

Early treatment and diagnosis are crucial in improving survival rates—stage I tongue cancer for example has an 80% 5-year survival which reduces to less than 20% if the patient presents at stage III/IV (1). Survival rates vary somewhat depending on the exact location of the cancer—the lip being the site with the best survival rates, and hypopharynx the worst (1). Although conflicting evidence exists, it seems that in recent years improvement in treatment of oral cancer has positively influenced survival rates, with overall survival at 5 years reaching 70% (8).

Females, younger patients, and those from higher socioeconomic backgrounds report better survival rates, while males, patients treated with radiotherapy alone and those patients that continue to expose themselves to risk factors (e.g., continued smoking) have worse outcomes (1).

## Disease staging and treatment options

The details of staging techniques and the full range of surgical treatments available is beyond the scope of this article; however, the importance of employing

a multidisciplinary approach must be emphasised. A collaborative approach involving surgeons, oncologists, radiologists and histopathologists is advised to accurately classify the type, size, spread and p16 expression of the cancer in question, to determine the best treatment modality. This approach should be ubiquitous for every patient and for every surgical intervention.

Computed tomography, magnetic resonance imaging and positron emission tomography remain the mainstay of imaging techniques. These assessment modalities are used to evaluate stage of disease and presence of any synchronous malignancies; they also provide vital information to anaesthetists in assessment and planning of an airway management strategy. Finally, a short examination under anaesthesia or panendoscopy (and biopsy) is sometimes necessary to confirm tissue diagnosis, fully evaluate tumour size and spread, and plan definitive treatment.

## Preoperative assessment

The preoperative management of the patient should include both assessment of the patient and their comorbidities and optimisation of their physiology prior to undergoing surgery to minimise the risk of perioperative complications. The preoperative visit also provides the opportunity to undertake an informed discussion with the patient and their next of kin about the predicted risk of morbidity and mortality associated with the various treatment options, including no treatment.

Of paramount importance in the preoperative assessment of the patient with oral cancer is a thorough evaluation of the airway, and formulation of a safe and comprehensive airway management strategy. Predictors of difficult facemask ventilation, supraglottic airway insertion, laryngoscopy, tracheal intubation and front of neck access should be actively sought to develop a plan for oxygenating the patient under anaesthesia.

Pathology of the base of tongue, the presence of trismus, and previous treatment with radiotherapy are well known risk factors in increasing difficulty in airway management and should be taken into account. Review of relevant imaging should complement bedside assessments in formulating the airway management strategy. Additionally, it is common practice for patients with oral cancer (especially those with suspected pathology in the posterior oral cavity) to undergo flexible naso-endoscopy at the surgical outpatient clinic. This can provide valuable information when assessing the airway, the specific site of the tumour and the degree of any associated anatomical distortion present. This may further inform the decision-making of the anaesthesia and surgical teams, such that an awake technique (including awake tracheal intubation or awake tracheostomy) may be indicated. Patients should be counselled and prepared for these techniques. (For further detail on advanced airway management techniques and the importance of human factors in airway management, please see the dedicated articles on these topics, included in this special series on anaesthesia for oral cancer).

Evaluation of patients' comorbidities is also fundamental to the preoperative assessment. Smoking and alcohol consumption are independently (and synergistically) associated with an increased risk of oral cancer (9), therefore chronic conditions associated with these should be sought and assessed fully. Notably, population-based studies have demonstrated that patients with oral SCC have a significantly higher comorbidity burden at diagnosis, and a higher risk of developing additional comorbidities after diagnosis, when compared with the general population (10). The most commonly identified comorbidities include secondary non-metastatic malignancy (3,10), chronic obstructive pulmonary disease and peripheral vascular disease (PVD), with an additional risk of developing moderate to severe liver disease after diagnosis (10).

For all patients with significant comorbidities, where major surgical intervention is proposed, it is recommended that baseline haematological investigations are undertaken, including full blood count, iron studies and coagulation studies, as well as a biochemical profile including renal function, liver function and screening for diabetes mellitus. An assessment of exercise tolerance (physiological reserve) and an electrocardiogram (ECG) are recommended, and in the presence of any ECG abnormalities or symptoms and signs of cardiac disease such as angina, syncope or a cardiac murmur, prompt referral to cardiology should be made (along with an urgent echocardiogram) as per international guidelines (11,12). Further investigations such as arterial blood gas analysis, pulmonary function tests or cardiopulmonary exercise testing may be indicated based upon history, examination and initial investigations. Imaging studies used during work-up (staging) of the disease should also be reviewed, as this may provide additional information (e.g., identifying pulmonary bullous disease on computed tomography; or diagnosing severe PVD during lower limb angiography performed to assess suitability for fibula flap reconstruction) which will further inform perioperative risk assessment.

## Preoperative optimisation

In addition to assessment of patient comorbidities, optimisation of pre-existing conditions also plays a crucial part in the preoperative management of patients with oral cancer.

### *Pulmonary disease and smoking*

Where pulmonary disease is evident, respiratory function should be optimised prior to surgery to reduce the incidence of postoperative pulmonary complications, which are common in this cohort that is associated with increased morbidity and mortality, prolonged ventilatory support and increased length of hospital stay (13). The optimisation process should be multidisciplinary in nature, extending beyond pharmacological treatment of pulmonary disease to chest physiotherapy and smoking cessation strategies.

Various physiotherapy techniques have been used to optimise respiratory muscle function, such as inspiratory muscle training and incentive spirometry. Physiotherapy aims to increase the endurance strength and performance of the inspiratory muscles; however, these techniques have not been shown to independently reduce the incidence of postoperative pulmonary complications (13).

Patients should be advised to stop smoking prior to surgery. Early referral to nicotine dependence services and smoking cessation has been associated with improved patient outcomes (4). Specifically, smoking cessation for ≥2 months prior to elective surgery has been found to be a beneficial intervention, though postponement of surgery for this duration may not be suitable for urgent cancer patients. Nevertheless, patients should be encouraged to stop smoking for as long as possible prior to surgery: abstinence for just 24 hours has been shown to decrease carboxyhaemoglobin levels to near normal, increasing oxygen carrying capacity and abstinence for ≥2 weeks leads to increased endobronchial ciliary function, resulting in improved mucous clearance and decreased sputum production (13).

### *Alcohol dependence*

Alcohol abuse and chronic alcohol consumption are strongly linked to the development of head and neck cancers, and are associated with preoperative malnutrition, organ dysfunction and the development of postoperative complications. In patients with alcohol dependency, abrupt reduction in alcohol intake (which commonly occurs perioperatively) after a period of excess consumption may lead to the development of alcohol withdrawal syndrome. In the absence of medical management, this may cause agitation, seizures, delirium tremens and even death (14). Thus, if a significant history of alcohol intake (more than 10–15 units per day) is elicited at preoperative assessment, patients should be considered at risk of withdrawal, and referral to specialist addiction services is warranted (15). Detoxification is usually achieved with a reducing regimen of long-acting benzodiazepines administered in a controlled setting, which can be achieved either in the community or in hospital, depending upon the local setup and degree of alcohol intake. It is also important to have a postoperative plan in place for these patients, aimed at preventing alcohol withdrawal, but also to ensure prompt treatment of delirium secondary to alcohol withdrawal should it occur (15).

### *Psychologcial assessment*

Oral cancer can be particularly psychologically debilitating amongst other things due to potential disfigurement, loss of function and associated social isolation it can cause. Patients with the disease are also more likely to have dependence issues with alcohol and nicotine as discussed above; these might be mitigated by offering early psychological support.

It is important to assess patient psychology and identify patients with psychological difficulty. Indeed, both the National Institute for Health and Care Excellence (NICE) and the United Kingdom National Multidisciplinary Guidelines for head and neck cancer advocate early engagement with psychological services and indeed suggest improved outcomes if patients have a good psychological state (4,5).

### *Nutritional status*

At the time of presentation, up to 60% of patients diagnosed with head and neck cancer are considered malnourished, or at high risk of malnutrition (16). Nutritional deficits can result from the underlying factors relating to the disease (such as poor diet and excess alcohol intake), the detrimental impact of disease processes on oral intake, as well as the substantial side-effects associated with certain treatments, e.g., chemo-radiotherapy causing dysphagia, odynophagia, oral mucositis, xerostomia, trismus, taste changes and nausea. Preoperative malnutrition can have a negative impact on treatment tolerance and is an independent risk factor for

infection, poor wound healing, increased risk of perioperative complications and increased mortality (17). Interventions such as screening for malnutrition and early nutritional support can mitigate these effects, prevent significant weight loss and enable patients to better withstand the side-effects of treatment.

The head and neck cancer guidelines produced by NICE in the UK recommend that all patients have nutritional screening by a clinician at presentation and input from a specialist dietitian throughout their care (4). Nutritional prehabilitation is indicated if the body mass index (BMI) is less than 18.5 kg/m$^2$, if weight loss is greater than 10% of body weight, or if inadequate food intake is likely after surgery. Indeed, regular dietician input has been shown to improve outcomes (18). Nutritional status can be optimised in several ways, including counselling/advice, high calorie supplements, and if required enteral feeding via nasogastric, nasojejunal or percutaneous feeding tubes. Each strategy must consider the individual patient's current nutritional status, their social support, and likely issues with feeding postoperatively. International guidelines in oncology and head and neck cancer recommend estimating energy requirements of ≥30 kcal/kg/day and protein requirements of ≥1.2–1.5 g/kg/day of body weight. Some studies suggest that the energy and protein requirements of patients undergoing treatment is greater due to the considerable loss of lean mass (18).

### *Blood management*

There has been a recent international trend in proactively treating iron deficiency anaemia preoperatively (19), and indeed postoperatively. There is an argument that administering intravenous iron to patients meeting specific criteria for iron deficiency anaemia can reduce the need for allogeneic blood transfusion and its potentially deleterious effects. However, a recent randomized controlled trial (20) failed to demonstrate that administration of intravenous iron reduced the rate of blood transfusion in anaemic patients (albeit that these patients were anaemic but not necessarily iron deficient, and were undergoing abdominal surgery rather than head and neck procedures).

### *Enhanced recovery programmes*

A relatively recent development in the perioperative care pathway of oral cancer patients is the introduction of enhanced recovery after surgery (ERAS) and prehabilitation programmes. These have been implemented with some success already in other surgical specialities, and in 2017 the ERAS society published guidance (21) specifically for head and neck cancer patients. The preoperative suggestions for ERAS focus upon patient education, optimising analgesic regimens, avoidance of prolonged fasting and improving nutrition. There is some evidence that following a protocolised ERAS pathway can reduce length of stay (22,23).

Taking into account the recommendations for preoperative assessment and optimisation outlined above, it is clear that a comprehensive treatment pathway should be tailored to the individual patient, and guided by multidisciplinary input from surgery, oncology, radiology, anaesthesia, and many others. The selected treatment is dependent upon the stage of disease at diagnosis, the patient's level of fitness (physiological reserve), the patient's likely compliance with the proposed treatment(s) and the degree of expected morbidity. It is important that a multidisciplinary patient-centred approach is undertaken from the outset; from initial consultation through to treatment and recovery. Patient education is crucial in maximizing their engagement with the aforementioned specialties, as well as with respiratory physiotherapists, restorative dentists, speech and language therapists, smoking and alcohol addiction services and dieticians, in order to optimise their overall outcome.

## Risk stratification and clinical decision-making

In keeping with an individualised approach to patient preoperative assessment and optimisation, it is important to identify patients at an increased risk of perioperative morbidity and mortality so that clinicians and patients can participate in informed shared decision-making to select the most appropriate treatment option. Several scoring systems are available to predict patient perioperative morbidity and mortality, based upon input of a varying number and selection of perioperative variables developed from large (varied) population studies. Unfortunately, all these scoring systems have differing limitations, and few are validated specifically for head and neck surgical patients. It is beyond the scope of this article to explore all of the existing scoring systems, however, Lee's Revised Cardiac Risk Index (RCRI) and the American College of Surgeons National Surgical Quality Improvement Project (NSQIP) surgical risk calculator are two commonly used prediction tools.

### *Risk prediction tools*

Lee's RCRI is a well-established tool used to predict the risk of postoperative cardiac complications after non-cardiac surgery, based upon six independent factors (high-risk surgery—intraperitoneal, intrathoracic, or suprainguinal vascular procedures; ischaemic heart disease; congestive heart failure; cerebrovascular disease; diabetes mellitus on insulin; and preoperative serum creatinine >176 µmol/L) (24). The risk index only predicts mortality and does not predict morbidity, which may limit its value in shared patient-clinician decision-making. Also of note, oral cancer resection with free flap reconstruction may not be classified as "high-risk" surgery according to the index definitions. Being validated mostly for general surgical procedures, the sensitivity of the index for oral cancer may also be reduced, as demonstrated in a small retrospective study (25).

The NSQIP risk calculator (https://riskcalculator.facs.org/RiskCalculator/index.jsp), on the other hand, predicts procedure-specific morbidity in addition to mortality, as well as a variety of postoperative outcomes, including likelihood of hospital readmission and postoperative discharge to a long-term care facility. It is based upon the largest data pool compared with other existing risk prediction tools, with data derived from 500 hospitals and 2.7 million operations performed in the US (though notably, exclusively from the private healthcare sector). It compares a patient's predicted risk to the average, providing helpful contextual information that may inform clinical decision making.

### *Cardiopulmonary exercise testing (CPET)*

Postoperative oxygen consumption associated with the surgical stress response following body cavity surgery typically rises up to 5 mL/kg/min (26). If this increased demand is not met by compensatory physiological changes, local or global ischaemia can develop leading to inevitable organ dysfunction and associated complications. CPET is the gold standard in objectively measuring the body's ability to achieve this extra demand, as well as diagnosing respiratory or cardiac insufficiency. There is little published data to reliably recommend specific values for CPET indices [such as peak oxygen consumption (VO2 max), VO2 at anaerobic threshold (AT), or ventilatory equivalents (VE/VCO2)] for major oral cancer surgery. Nevertheless, a recent study in 187 patients showed that a peak VO2 of 12 mL/kg/min or an AT of less than 10 mL/kg/min could be used to stratify risk in these patients—with complications, morbidity and length of stay in critical care areas being higher in patients who do not reach these targets (27). This finding is in keeping with well-established values for CPET in predicting mortality for high-risk surgery in other surgical specialties. Even though the sensitivity of CPET was around 64% in this study, CPET can be considered a useful adjunct in decisions surrounding perioperative risk and in planning the appropriate level of postoperative care facility. There is no convincing data that links CPET to outcomes related to reconstructive flap survival, however, it seems logical to presume that systemic complications/organ ischaemia is also likely to lead to compromised flap perfusion and tissue hypoxaemia.

### *Frailty assessment and complications*

Frailty can be considered a syndrome characterized by reduced physiological reserve of all organ systems. It is associated with higher rates of perioperative morbidity and mortality, which increases with age, and is present in approximately 40% of cancer patients (28). There are different classification systems of frailty, based upon physical assessment parameters alone or multi-domain evaluation. One such assessment tool is the modified frailty index score 11 (mFI-11), with higher index scores associated with increased complications, morbidity and mortality in head and neck cancer (includes all head and neck cancer, not limited to oral cancer specifically): 30-day mortality in patients scoring an mFI-11 of 0, 0.36 and >0.44 were 0.2%, 2.6%, and 11.9% respectively (29). A number of other studies have shown similar findings, with increased frailty associated with increased perioperative complications, morbidity and mortality (28,30,31). It is currently unclear whether there is benefit to enrolling cancer patients with frailty to specific prehabilitation programmes in reducing complication rates (31).

### *Analysis of risk data*

Knowledge of the factors that influence postoperative morbidity, mortality and complication rates can influence preoperative decision-making, and affect the chosen treatment modality for an individual patient.

Overall, 30-day surgical mortality for head and neck cancer is quoted as approximately 1% of cases (32), but this is strongly influenced by stage of disease and the particular surgical procedure undertaken (such that the range lies between 0.15% and 3.6%). Age <50 years, absence of

comorbidities, node-negative malignancies, smaller size of tumour at presentation and the avoidance of postoperative oro-cutaneous fistulae are all associated with improved survival. A review of outcomes at a tertiary head and neck centre demonstrated that at 30 months post-surgery, 60% of patients were alive and disease free, 12% were alive with disease and 18% had died due to their cancer (32).

Complication rates are somewhat more difficult to define, predict or evaluate, but overall rates are quoted to be between 36% and 50% of cases (32). Of the non-surgical complications, pulmonary and cardiovascular sequelae are the most common. Decreased lung function, smoking, advanced age, hypertension and tracheostomy formation are all strongly related to pulmonary complications (33). Low preoperative serum albumin levels, evidence of lymph node involvement and increased tumour burden, prolonged duration of surgery >4 hours, and significant perioperative blood loss are also independent risk factors for pulmonary and cardiac complications (25,33-35). These are all important preoperative considerations when selecting the most appropriate treatment option for an individual patient.

## Procedure-specific considerations

There is a range of surgical (and non-surgical) options available for patients with oral cancer. The surgical strategy is tailored to tumour size, location, and confirmed/suspected presence of lymph node involvement. The aim is to resect the tumour with appropriate margins and reduce tumour load (e.g., in the form of synchronous neck dissection) facilitating adjuvant oncological treatments and improving overall survival rates (3).

### *Flap reconstruction*

After major cancer resection, a microvascular tissue or bony free flap reconstruction of the defect is the gold standard for achieving the best aesthetic and functional outcomes. Microvascular flaps are denervated and require a raised cardiac output state to ensure adequate tissue perfusion, as well as a target haematocrit of approximately 30% to maximise flow—by reducing viscosity without compromising oxygen carrying capacity (36). The requirement for this relative hyperdynamic circulation must be considered when assessing patients' preoperative cardiorespiratory reserve. Patients with significant valvular disease, left ventricular dysfunction and/or significant ischaemic heart disease may benefit from a less onerous form of reconstruction.

Surgical complications are more common with microvascular free flaps: free flap failure can occur in up to 8% of cases compared with 1.7% in pedicled flaps and seroma formation is more likely with free flaps, reported in 11.4% cases compared to 7.7% in pedicled flaps (32). Non-surgical complications are also more commonly reported, with 11.6% of patients developing postoperative pneumonia following free flap reconstruction compared with 4.5% when no free flap was undertaken (35). Microvascular flaps are generally performed in patients requiring larger resections, often with greater premorbid burden of disease, necessitating prolonged surgery and anaesthesia, which all undoubtedly influence the complication rates. Donor site complications must also be considered—which are largely dependent upon the anatomical site of the donor tissue, and as such have their own specific associated morbidity.

In high-risk patients, a pedicled flap may be considered more suitable, accepting potentially worse functional and aesthetic outcomes, but minimising the risk of significant morbidity or mortality by undergoing a shorter less physiologically demanding surgical procedure. (For further detailed information on major cancer resection and free flap reconstructive surgery, please see the article on intraoperative considerations, in this special series on anaesthesia for oral cancer).

### *Tracheostomy formation*

The main indication for tracheostomy formation in the context of oral cancer surgery, is the temporary "covering" tracheostomy, performed at the time of surgery to provide a protected, secure airway whilst postoperative oedema subsides, where significant swelling (and restricted access) is anticipated to persist >48 hours such that ongoing mechanical ventilation via a tracheal tube is deemed less favourable or less safe. Rarely is a tracheostomy required solely to permit intraoperative surgical access, which can usually be facilitated by nasotracheal or submental intubation. The complications associated with tracheostomy are numerous, and beyond the scope of this article (for further detailed discussion of tracheostomy management, please see the article on postoperative considerations, in this special series on anaesthesia for oral cancer). However, of special note, is that pneumonia can occur in up to 20% of tracheostomised patients compared to approximately 11% of patients without tracheostomy (33,34), with the incidence

increasing with the length of time the tracheostomy remains *in situ* (34).

Consequently, the decision to perform a tracheostomy is not insignificant, and it must be undertaken after careful consideration of patient comorbidities, the ill-effects of prolonged sedation and intubation, the particular anatomical site and extent of surgery planned, the anticipated degree of postoperative swelling, the type of flap, clinician experience and the service provision of the particular institution (e.g., provision of critical care/specialist head and neck ward areas and appropriately trained staff). Scoring systems exist for prediction of tracheostomy requirement (37), though these have not shown to be particularly accurate.

Approximately 69% of UK specialist centres surveyed in 2008 reported routine elective tracheostomy formation in free flap reconstruction (38). The chosen airway management strategy must be individualised, based upon multidisciplinary consideration of the immediate and long-term advantages and disadvantages for each patient. Where possible, a short period (<48 hours) of mechanical ventilation and delayed tracheal extubation is usually preferable, but where tracheostomy is preferable, this should be managed in an appropriate environment where early, safe decannulation can be facilitated.

Consideration of the specific postoperative requirements, the required level of monitoring, and availability of appropriately trained personnel is a crucial aspect of the preoperative assessment and planning.

## Conclusions

Thorough preoperative assessment is essential in guiding the decision on the most appropriate treatment pathway for oral cancer patients. The following aspects need to be considered to reduce patient morbidity:

- The specific underlying pathology, burden of disease and prognosis;
- Patient comorbidities, their functional reserve and degree of frailty; the latter being an increasingly important predictor in outcomes;
- Optimisation of nutrition, respiratory and cardiovascular function, psychological status, cessation of use of addictive substances (especially alcohol and smoking) and anaemia all need to be addressed individually;
- A thorough airway assessment and plan to manage this;
- The type and length of surgical procedure that will offer the best benefit to risk ratio;
- Management of post operative nutrition, complications related to withdrawal from addictive substances;
- Management of the postoperative airway.

The risk of complications, morbidity and mortality associated with each of the various surgical options must be considered, along with the intent of planned treatments (curative or palliative), and the role of non-surgical therapies (chemotherapy, radiotherapy etc.) as adjuncts or alternatives.

### *Strengths and limitations*

We have focused on information relevant to the preoperative care aimed towards anaesthetists using up to date available literature targeted towards oral cancer. We feel that the review provides a practical approach for anaesthetists to adopt deliverable and holistic interventions when caring for these patients.

A multitude of sources have been used to gather evidence related to complications, morbidity and mortality. No scoring system is perfect, but the ones offered here focusing on frailty and post operative outcomes other than mortality, will enable clinicians to have an informed discussion with their patients on a variety of outcomes including the likelihood of patients requiring help with their activities of daily living.

One of the major limitations of the data available is that it is incredibly complex to ascertain which specific interventions will make significant differences to patient outcomes. The multifactorial nature of treating patients with this disease means that the evidence leading to improved outcomes is based on multiple interventions. If a unit delivering care to these patients had reduced resources, it would be difficult to delineate which single intervention is most impactful in improving outcomes and therefore we would suggest small improvements in all areas of care. We would urge units seeking to optimise preoperative care to adopt these interventions in the form of a bundle.

This is also since there is a paucity of hard evidence in the form of randomised controlled trials. There are some consensus documents which have been reviewed in the manuscript—we build on this using any new evidence available to further inform the discussion around the topic.

A multidisciplinary, evidence-based approach is advocated, where decision-making is shared between the patient and the relevant clinical teams (surgery, anaesthesia,

 

oncology, radiology etc). Pre-optimisation of smoking and alcohol dependency, cardiorespiratory function and nutritional deficiency is recommended. Risk prediction tools should be used to guide clinicians' decision-making and aid in their preoperative discussions with patients, though their limitations must be recognised. Fewer postoperative complications are associated with shorter surgery, reduced intraoperative blood loss, and avoidance of free flap reconstruction and tracheostomy procedures. Planning of patients' postoperative care and the specific requirements of the postoperative care facility is a fundamental part of the preoperative evaluation.

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