



Postoperative considerations in patients following oral cancer resection and surgical reconstruction: a review

Catherine Stretton, Jennifer Service

Department of Anaesthesia and Critical Care, NHS Lothian, Livingston, UK

Contributions: (I) Conception and design: Both authors; (II) Administrative support: Both authors; (III) Provision of study materials or patients: Both authors; (IV) Collection and assembly of data: Both authors; (V) Data analysis and interpretation: Both authors; (VI) Manuscript writing: Both authors; (VII) Final approval of manuscript: Both authors.

Correspondence to: Catherine Stretton, MBChB. Department of Anaesthesia and Critical Care, St John's Hospital, Howden Road West, Livingston, EH54 6PP, UK. Email: catherine.stretton@nhslothian.scot.nhs.uk.

Abstract: Wide institutional variation exists in the immediate care of patients following major oral cavity, pharyngeal or laryngeal resection for oral cancer. This is a vulnerable patient cohort, where age, comorbidity and frailty combine with potentially prolonged and complex resection and reconstructive surgical procedures. The environment in which these patients receive their immediate postoperative care can vary depending on the institution, but the key is that the patients are cared for in a facility which is familiar with the surgical procedure and the patient cohort. Patients who have undergone free flap reconstruction are at risk of flap failure due to venous or arterial compromise or wound dehiscence. Early identification of flap compromise is vital, regardless of the methods used to monitor the flap. Airway compromise is also a risk that needs to be carefully monitored. Clear communication between the surgical and ward teams will decrease the risk of a critical airway following tracheal extubation. Postoperative nutrition must be addressed early. These patients are at risk of becoming malnourished, if not already so. Their caloric requirements should be calculated to include the metabolic demands of wound healing and the stress response to surgery. Involving a dietician allows for a tailored feeding regime to be established by whichever route is available e.g., oral, via a nasogastric tube or via a percutaneous gastrostomy tube. Other considerations for the postoperative care of these patients include the importance of clear documentation and handover from surgical to ward based teams. On admission to the ward, a systematic review should be carried out and issues such as hypotension or anaemia should be dealt with. Venous thromboembolism prophylaxis, management of substance withdrawal, identification and management of delirium and pain management are all important areas of post operative care. Due consideration should also be paid to the psychological impact of these major operations. This review article provides a comprehensive and detailed overview of evidence-based postoperative considerations for patients following major surgery for oral cancer.

Keywords: Postoperative management; airway emergency; oral cancer; critical care

Received: 31 October 2022; Accepted: 17 May 2023; Published online: 12 June 2023.

doi: 10.21037/joma-22-34

View this article at: <https://dx.doi.org/10.21037/joma-22-34>

Introduction

Background

Most patients undergoing major oral cavity, pharyngeal or laryngeal resection for oral cancer are elderly (age >65 years) with a degree of frailty, often with comorbid

conditions, including cardiovascular, neurovascular, and peripheral vascular disease, chronic obstructive pulmonary disease, diabetes mellitus and anaemia—commonly linked to lifestyle risk factors of chronic alcohol consumption, tobacco smoking and sometimes other substance misuse (1-3). Therefore, the postoperative care of these patients can be

challenging, particularly given the duration and complexity of surgery, which may include free flap reconstruction (transfer of patients' own tissue from one anatomical site to another, along with its vascular supply) with the purpose of optimising function and cosmesis following tumour resection. Not only are these complex patients subjected to the physiological insult of major surgery, but significant functional impairments of the aerodigestive tract are common in the postoperative period, such as the inability to speak or eat. These challenges can contribute to major psychological and physical challenges during recovery (4,5).

Rationale and knowledge gap

In other surgical disciplines (e.g., gynaecological oncology and cardiac surgery), a standardised approach to postoperative care has been shown to improve patient outcome and reduce organisational costs (6,7). The expert consensus statement in 2021 from the Society for Head and Neck Anaesthesia for the perioperative management of patients undergoing major head and neck surgery provides the basis for such an approach, with many of the recommendations directly applicable to patients having oral cancer surgery (8). This article hopes to provide a more detailed description of the evidence available regarding many aspects of the post operative care for these patients. Importantly, it hopes to tie together the case-based evidence regarding postoperative flap monitoring in the immediate postoperative period.

Objective and methods

This review article draws upon the consensus guideline from the Society for Head and Neck Anaesthesia and other recent studies to provide an evidence-based approach to achieving high quality postoperative care of this challenging patient cohort (9).

Discussion

Immediate postoperative care facility

It has typically been perceived that patients having undergone major head and neck surgery may benefit from specialised care and monitoring in an intensive care unit (ICU) environment for the immediate postoperative period (9,10). This is with the aim of facilitating holistic management of patients with complex medical comorbidities,

as well as providing an enhanced level of monitoring, in order to maximise free flap graft survival (3). Approximately 10% of free tissue transfers fail due to arterial or venous anastomotic thrombosis, and early recognition of any issues and prompt intervention are paramount in enhancing flap survival (11). Indeed, the 2021 consensus statement agreed that the postoperative care of patients who have undergone oral cancer surgery requires specialist input and monitoring to ensure both patient recovery, and flap survival. Whilst institutional variation exists, many healthcare systems find this enhanced level of monitoring can most consistently and easily be provided in an ICU setting. However, a recent retrospective cohort study, which investigated 338 patients undergoing microvascular free flap reconstructive surgery for head and neck surgical defects, found no differences in flap survival, re-operation rate or other postoperative complications when comparing ICU with a protocol-driven non-ICU ward setting (12). The cost of care delivered was statistically significant and considerably higher for the ICU cohort (12). Whilst not all patients who have undergone oral cancer surgery may require enhanced monitoring for flap observation, it is clear that the postoperative care of these patients is best delivered by a team consisting of highly skilled nursing and surgical personnel, familiar with these types of patients, and capable of delivering the appropriate level of monitoring required—which depending on the institution, may be provided in a specialist ward or ICU environment.

Early identification of flap compromise

The immediate detection of a surgical complication in the postoperative period is vital for patients who have undergone major surgery for oral cancer, particularly those who have had free flap reconstruction. Free flaps are at risk of failure from either a compromised arterial supply or venous thrombosis or congestion, and therefore close monitoring of the vascular status of free flaps has become a mainstay of care in the immediate postoperative period. Venous compromise is the most common cause of flap failure (13,14), but arterial thrombosis and wound dehiscence also contribute to the 2–5% overall flap failure rate (15).

Wide institutional and clinician variation exists as to the mode of flap monitoring employed, with regular clinical assessment being the most commonly utilised technique as it is inexpensive, risk-free and efficient. Other non-invasive monitoring methods include intermittent cutaneous Doppler ultrasound, tissue oximetry and surface

temperature monitoring. Invasive techniques for free flap monitoring are employed in most specialist centres, usually comprising an implantable continuous Doppler device. Doppler is the most widely used invasive technique because it enables early detection of flap compromise, leading to increased success of operative re-exploration procedures to salvage failing flaps following major head and neck reconstructive surgery (16).

Airway management considerations

Previously, the routine perioperative care of patients that had undergone major cancer resection and free flap reconstruction for oral cancer surgery involved continued mechanical ventilation beyond the completion of surgery. It was thought that this would ameliorate the risks associated with the high burden of patient comorbidity, and prolonged surgical and anaesthetic time, and that this would improve free flap graft survival. However, since 2011, there has been increasing evidence to support immediate tracheal extubation where possible, with this more recent approach being associated with improved morbidity (from reduced incidence of postoperative pneumonia and other nosocomial infections), decreased ICU and hospital length of stay (17-19). Therefore, it is recommended to consider whether each patient having oral cancer surgery may be suitable for tracheal extubation at the end of surgery and aim to achieve this in a safe and controlled manner where possible (19). In patients for whom immediate tracheal extubation is medically contraindicated, daily assessment for weaning of ventilatory support and safe tracheal extubation should be priorities of ongoing care, whether that be from oral endotracheal tube, or temporary tracheostomy.

When planning for tracheal extubation of these patients, communication between the anaesthetic and surgical teams is critical for success. These patients have an increased risk of potentially life-threatening airway complications (20). Acute bleeding, haematoma formation and/or oedema could all potentially necessitate emergency re-intubation, presenting both a physiologically and anatomically difficult airway to manage. Should this situation arise, a clear airway management strategy (that includes patient preparation, equipment preparation, role allocation, expectations of any difficulty, and contingency planning), that is shared between the surgical and anaesthetic teams, is essential in enhancing patient safety (19,21). Similarly, complications with airway management can arise as a result of postoperative delirium, necessitating ongoing definitive airway support until

the patient is assessed as ready for extubation. Patients with signs of postoperative delirium may benefit from tracheostomy, to facilitate airway support whilst weaning from sedative medications

The individualised airway management strategy for each patient should be clearly documented and immediately available (at the bedside) to the ward or ICU teams providing postoperative care. This information may be vital in assisting the attending personnel during an unexpected airway emergency.

Postoperative handover and evaluation

As outlined above, clear documentation is vital in aiding communication between anaesthetic, ICU, surgical, nursing and ward teams, and in reducing the risk posed to patients from airway related adverse events following oral cancer surgery (22). Indeed, improved patient outcome may be associated with the use of structured notes in an electronic patient record (23,24), as well as the use of bed head signage (such as those available from the UK National Tracheostomy Safety Project) and clear verbal handover processes (8,23). Furthermore, structured handover tools have been shown to improve the transfer of patients' care between teams (25).

Of critical importance, these patients are more likely to have postoperative airway oedema, obstruction, or limitations to airway access. If future airway management is predicted to be difficult in the immediate postoperative period, regular airway assessment should be undertaken and provision should be made to ensure the necessary equipment and adequately trained personnel are available at the point of care.

Information relating to the surgical procedure performed should be clearly documented, including the indication for surgery, and detail about surgical resections, diversions, anastomoses, transplantations, use of prosthetic materials, and any other intraoperative findings. The type, anatomical location, and desired postoperative management of any surgical drain should also be clearly communicated, allowing the postoperative care provider to accurately measure, interpret and act upon any drain output.

Other essential handover information should include the patient's age, comorbidities, pre-existing regular medications, and allergy status. Relevant perioperative medications (including dose and time of administration), especially neuromuscular blocking agents, should be highlighted, along with any surgical requirement for

ongoing antimicrobial prescription. Contact details of patients' next-of-kin, and the content of any prior conversations between surgical or anaesthetic teams and patients' relatives should be documented, along with assessment of patients' capacity to consent for their ongoing ward or ICU treatment. This is particularly relevant to the oral cancer patient, given the extensive comorbidities and frailty common to this patient cohort (for more detail on preoperative assessment, prehabilitation and risk stratification, please see the dedicated article, "Anaesthetic preoperative considerations for oral cancer surgery" in this special series on anaesthesia for oral cancer).

Immediately following transfer to the postoperative care facility (ICU or specialist ward), a systematic assessment of the patient should be undertaken, focussing on each organ system. Special attention should be paid to the adequacy of patients' fluid status and cardiovascular parameters in view of the importance of optimising free flap perfusion. Hypotension should be treated promptly, first with judicious correction of any intravascular fluid depletion, anaemia, or electrolyte abnormalities, prior to commencing vasopressor therapy (8,26). Institutional variation exists regarding the preferred pharmacological agent for blood pressure support. Previously the source of much debate, there has been no association found between failure of free flap transfer and the use of vasopressor infusions (26), with current opinion favouring vasopressor usage over excessive fluid administration—which is associated with deleterious outcomes (8). Maintenance of euvolemia throughout the entire perioperative period should be the target for clinicians managing these patients, since both hypo- and hypervolaemia may contribute to morbidity (27). Thus, decisions regarding postoperative fluid therapy are crucial, such that invasive methods of volume status assessment should be considered (such as arterial waveform-based analysis or serial echocardiography) to guide goal-directed fluid therapy (28). Postoperative blood tests (which may be incorporated into standard order sets) are routine in most units following major oral cancer surgery, and blood transfusion should be guided by previously agreed thresholds between surgical and ward/ICU personnel.

Nutritional status

Optimising nutrition is a particular challenge in this patient population. Patients may be malnourished prior to surgery, due to lifestyle risk factors (chronic alcohol consumption), the negative effects of chemo-radiotherapy, or the presence

of a mass obstructing or compressing the aerodigestive tract. In the postoperative phase, patients' nutritional requirements must meet the increased metabolic demands of wound healing and the stress response to surgery. However, resumption of oral intake may be hindered by the presence of a temporary tracheostomy or the effect of surgery on pharyngeal reflexes/swallowing function, compounded by impaired bowel function secondary to opioid analgesic regimens (29-31).

Poor nutritional status is associated with a wide range of morbidity, including poor postoperative wound healing and increased wound infection, increased hospital length of stay, increased incidence of delirium, as well as increased mortality (5,32). Therefore, patients undergoing major surgery for oral cancer are likely to benefit from nutritional assessment (pre- and postoperatively) and specialist dietician input (8).

By providing the substrate for metabolic processes through early postoperative resumption of feeding (orally or enterally,) catabolism of patients' protein stores can be reduced, minimising net protein loss. Early nutritional supplementation (within 7 days of surgery) is advised in patients who are unlikely to achieve adequate oral intake, or in those patients already malnourished—ideally via an oral route. Where this is not available, feeding via a nasogastric nasojejunal tube or percutaneous gastrostomy should be initiated as this has been demonstrated to reduce morbidity and length of hospital stay (9). Overnight slow continuous feeding regimes may lead to patients complaining of persistent hunger, which can be addressed by utilising daytime bolus regimes instead.

Postoperative blood glucose control can also become a challenge in patients who have had oral cancer surgery. Hyperglycaemia may occur as a result of pre-existing diabetes mellitus, or due to the release of stress-related counter regulatory mediators. Persistent hyperglycaemia is associated with an increased risk of myocardial infarction, stroke, polyneuropathy, increased postoperative wound infections and poor wound healing due to defective collagen formation (33). Early involvement of dieticians (and specialist diabetes services, if applicable) to provide guidance on oral/enteral feeding content/rates, alongside use of variable rate insulin infusions can assist in reducing the incidence of hyperglycaemia in the postoperative period.

General ICU care

Preventing complications is a key component of the

Table 1 Risk factors for delirium

Patient factors	Perioperative factors	Critical care factors
Advanced age	Length of surgery	Substance withdrawal
Dementia	Dehydration	Acute infection
Low educational level	Electrolyte imbalance	Pain
High comorbidity burden	Anaemia	Invasive devices
Frailty		Immobility
Visual and hearing impairment		Prolonged ventilation
Depression		Deep sedation
Substance misuse		Physical restraint
Poor nutrition		Polypharmacy
History of delirium		Opioids
		Sleep deprivation
		Inability to communicate
		Day/night disorientation

postoperative care of patients who have undergone major surgery for oral cancer.

The risk of venous thromboembolism can be stratified according to the modified Caprini score (34), and is dependent upon the nature of the surgery undertaken and patient factors including cancer, age, obesity, smoking history and history of previous deep vein thrombosis or pulmonary embolism. In the absence of particular concerns regarding postoperative bleeding, prophylactic low molecular weight heparin should be administered (or a suitable alternative), alongside the use of mechanical prophylaxis with intermittent pneumatic devices and graduated compression stockings (unless contraindicated by pre-existing peripheral vascular disease).

A history of chronic substance use and/or dependency (alcohol, smoking, illicit drugs) is common to the oral cancer patient. Substance withdrawal is therefore a significant problem, and may contribute to major morbidity, including prolonged length of hospital stay and increased postoperative complications, and increased mortality. Depending upon the postoperative care facility, staff may also have limited experience in managing substance related issues (35). Initial risk assessment, continual monitoring and prompt management of alcohol, or other substance, withdrawal syndrome is therefore a key component of the postoperative care of these patients, with the use of protocolised strategies for symptom management markedly

improving outcomes (36,37). Common to these strategies is regular bedside monitoring for signs and symptoms of substance withdrawal, including consideration of both objective physiological parameters and patient's subjectively experienced symptoms, with pharmacological treatment graduated to the severity of withdrawal syndrome.

Alongside assessing and managing patients at risk of substance withdrawal, daily assessment of patients for the presence of delirium should form part of the routine postoperative care of these patients, since it is associated with significant morbidity and mortality. Both hypo and hyperactive subtypes exist, with delirium affecting 80% of all comers to ICU (38). Delirium is a multifactorial condition with varying pathology and clinical presentation, with the predominant risk factors including advanced age, history of cognitive deficit, metabolic abnormalities, and polypharmacy (*Table 1*).

The mainstays of management can be divided into non-pharmacological and pharmacological interventions, with the first focussing upon repeated reorientation of patients, early removal of in-dwelling catheters and vascular access lines, normalisation of day/night-time routines, optimisation of pain management and provision of patients' normal glasses and hearing aids. Pharmacological management of delirium remains relatively controversial—a multicentre randomised controlled trial of 566 patients demonstrated that haloperidol and the antipsychotic

ziprasidone failed to reduce incidence of delirium, duration of mechanical ventilation, ICU or hospital length of stay, and mortality when compared with placebo, and a Cochrane review of pharmacological interventions for the treatment of delirium in critically ill adults did not identify a difference in mortality, delirium severity or time to delirium resolution compared with placebo (39,40). Nevertheless, adequate management of postoperative pain can reduce the burden of delirium for patients, and distressing agitation can be treated with antipsychotic medications (38,41). Strict attention to maintenance of homeostasis in terms of fluid balance, correction of electrolyte disturbance, reduction in burden of polypharmacy, early physiotherapy and visits from family or friends is advised (38). In patients requiring ongoing definitive airway management post operatively, tracheostomy may be preferable to ongoing oral tracheal intubation, to reduce the burden of critical care associated risk factors for delirium.

Provision of multimodal analgesia has been shown to lead to a better pain experience, shorter hospital stay, and reduction in side-effects following major surgery (8,42,43). Institutional variation exists in terms of analgesic approaches for patients undergoing surgery for oral cancer, but may include operative infiltration of local anaesthetic or continuous infusion of local anaesthetic via a wound catheter, as well as multimodal systemic analgesia, which generally includes intravenous and/or enteral opioid medications for major cancer resections. In a retrospective cohort study of 866 patients over the age of 66 years having major head and neck surgery, the prevalence of persistent postoperative opioid use (defined as a prescription collected for opioid medications at 90 days and 180 days postoperatively) was 18% in patients who were opioid naïve preoperatively (44). Therefore, daily review of adequacy of pain control and assessment for stepwise reduction in analgesia is advised to reduce the burden of long-term opioid use in patients who have undergone major surgery for oral cancer.

Psychological support

Patients who have undergone major head and neck surgery are often left with considerable loss of function of the aerodigestive tract. Short-term issues with swallowing and resumption of oral nutrition have been addressed earlier, as well as the potential problems surrounding substance addiction and dependency, that may require specialist input from addiction services and/or psychiatric liaison teams in the immediate postoperative period. However, patients

must also be supported in their long-term adjustment to life following major head and neck procedures, which may have long lasting impact upon normal speech and eating function, cosmetic appearance and social interaction.

In a study of 558 head and neck cancer patients, prevalence of high-level distress at 12-month postoperatively was 17%, with a 9% prevalence of both anxiety and depression (45). These symptoms were associated with higher use of mental health services, and a higher cost of patient care. Patients' utilisation of all types of healthcare has been shown to increase. Patients with poorer clinical status may be more likely to develop psychological problems in the postoperative period, however, those with postoperative psychological problems are less likely to fully comply with treatments and maintain a healthy lifestyle (46). It is estimated that 60% of cancer patients with high-level distress accept psychological treatment when offered (47), which may reduce the longer-term psychological sequelae of major head and neck surgery.

Strengths and limitations

The strength of this review is the inclusion of the most up-to-date studies and contemporary evidence in the area of postoperative management of patients following oral cancer surgery. The main limitations are that the subject matter is wide ranging; there are many different aspects to the provision of excellent postoperative care for these complex patients, with significant institutional variability in practices; and, there is paucity of high quality evidence to clearly support specific recommendations. There are very few randomized controlled trials relevant to this topic, such that a narrative or systematic review is not justified, with this conventional review therefore largely based upon expert consensus and small clinical studies.

Conclusions

The quality of care that patients receive following major head and neck surgery with free flap reconstruction is essential to their recovery. This article describes the major considerations for caring for these patients postoperatively, not only with regard to the complex nature of the surgical procedure, but to the general care of, often frail or multi-comorbid, patients in the ICU or specialist ward setting. Optimisation of all these factors reduces the morbidity and mortality associated with these significant operations and facilitates a timely recovery.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the Guest Editors (Patrick Ward and Michael Irwin) for the series “Anaesthesia for Oral Cancer” published in *Journal of Oral and Maxillofacial Anesthesia*. The article has undergone external peer review.

Peer Review File: Available at <https://joma.amegroups.org/article/view/10.21037/joma-22-34/prf>

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at <https://joma.amegroups.org/article/view/10.21037/joma-22-34/coif>). The series “Anaesthesia for Oral Cancer” was commissioned by the editorial office without any funding or sponsorship. JS Service declares the support from NHS for study leave budget and maternal critical care module on critical care MSc from University of Edinburgh. The authors have no other conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Open Access Statement: This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

References

1. US Cancer Statistics Working Group. Department of Health and Human Services, Centres for Disease Control and Prevention and National Cancer Institute. US Cancer Statistics Data Visualizations Tool. Based on 2019 Submission Data (1999 – 2017) [Internet]. 2020 [cited 2022 Sep 12]. Available online: www.CDC.gov/cancer/dataviz
2. Genther DJ, Gourin CG. The effect of alcohol abuse and alcohol withdrawal on short-term outcomes and cost of care after head and neck cancer surgery. *Laryngoscope* 2012;122:1739-47.
3. Kinzinger MR, Bewley AF. Perioperative care of head and neck free flap patients. *Curr Opin Otolaryngol Head Neck Surg* 2017;25:405-10.
4. Imai T, Asada Y, Morita S, et al. Preoperative prognostic nutritional index as a method to predict postoperative complications after major head and neck surgery with free tissue transfer reconstruction. *Jpn J Clin Oncol* 2020;50:29-35.
5. Makiguchi T, Yamaguchi T, Nakamura H, et al. Impact of skeletal muscle mass on postoperative delirium in patients undergoing free flap repair after oral cancer resection. *J Plast Surg Hand Surg* 2020;54:161-6.
6. Bisch SP, Wells T, Gramlich L, et al. Enhanced Recovery After Surgery (ERAS) in gynecologic oncology: System-wide implementation and audit leads to improved value and patient outcomes. *Gynecol Oncol* 2018;151:117-23.
7. Engelman DT, Ben Ali W, Williams JB, et al. Guidelines for Perioperative Care in Cardiac Surgery: Enhanced Recovery After Surgery Society Recommendations. *JAMA Surg* 2019;154:755-66.
8. Healy DW, Cloyd BH, Straker T, et al. Expert Consensus Statement on the Perioperative Management of Adult Patients Undergoing Head and Neck Surgery and Free Tissue Reconstruction From the Society for Head and Neck Anesthesia. *Anesth Analg* 2021;133:274-83.
9. Dort JC, Farwell DG, Findlay M, et al. Optimal Perioperative Care in Major Head and Neck Cancer Surgery With Free Flap Reconstruction: A Consensus Review and Recommendations From the Enhanced Recovery After Surgery Society. *JAMA Otolaryngol Head Neck Surg* 2017;143:292-303.
10. Varadarajan VV, Arshad H, Dziegielewski PT. Head and neck free flap reconstruction: What is the appropriate post-operative level of care? *Oral Oncol* 2017;75:61-6.
11. Jones NF. Postoperative monitoring of microsurgical free tissue transfers for head and neck reconstruction. *Microsurgery* 1988;9:159-64.
12. Yalamanchi P, Thomas WW, Workman AD, et al. Value of Intensive Care Unit-Based Postoperative Management for Microvascular Free Flap Reconstruction in Head and Neck Surgery. *Facial Plast Surg Aesthet Med* 2021;23:49-53.
13. Brown JS, Devine JC, Magennis P, et al. Factors that

- influence the outcome of salvage in free tissue transfer. *Br J Oral Maxillofac Surg* 2003;41:16-20.
14. Qian Y, Li G, Zang H, et al. A Systematic Review and Meta-analysis of Free-style Flaps: Risk Analysis of Complications. *Plast Reconstr Surg Glob Open* 2018;6:e1651.
 15. Kohlert S, Quimby AE, Saman M, et al. Postoperative Free-Flap Monitoring Techniques. *Semin Plast Surg* 2019;33:13-6.
 16. Schmulder A, Gur E, Zaretski A. Eight-year experience of the Cook-Swartz Doppler in free-flap operations: microsurgical and reexploration results with regard to a wide spectrum of surgeries. *Microsurgery* 2011;31:1-6.
 17. Allak A, Nguyen TN, Shonka DC Jr, et al. Immediate postoperative extubation in patients undergoing free tissue transfer. *Laryngoscope* 2011;121:763-8.
 18. Tamplen ML, Ricceri S, Hemmat S, et al. Benefits of Immediate Extubation Following Free Tissue Transfer for Head and Neck Reconstruction. *J Reconstr Microsurg* 2016;32:533-9.
 19. Clemens MW, Hanson SE, Rao S, et al. Rapid awakening protocol in complex head and neck reconstruction. *Head Neck* 2015;37:464-70.
 20. Cavallone LF, Vannucci A. Review article: Extubation of the difficult airway and extubation failure. *Anesth Analg* 2013;116:368-83.
 21. Frerk C, Mitchell VS, McNarry AF, et al. Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. *Br J Anaesth* 2015;115:827-48.
 22. Pohlenz P, Klatt J, Schmelzle R, et al. The importance of in-hospital mortality for patients requiring free tissue transfer for head and neck oncology. *Br J Oral Maxillofac Surg* 2013;51:508-13.
 23. McGrath BA, Calder N, Laha S, et al. Reduction in harm from tracheostomy-related patient safety incidents following introduction of the National Tracheostomy Safety Project: our experience from two hundred and eighty-seven incidents. *Clin Otolaryngol* 2013;38:541-5.
 24. Matava C, Caldeira-Kulbakas M, Chisholm J. Improved difficult airway documentation using structured notes in Anesthesia Information Management Systems. *Can J Anaesth* 2020;67:625-7.
 25. Petrovic MA, Martinez EA, Aboumatar H. Implementing a perioperative handoff tool to improve postprocedural patient transfers. *Jt Comm J Qual Patient Saf* 2012;38:135-42.
 26. Harris L, Goldstein D, Hofer S, et al. Impact of vasopressors on outcomes in head and neck free tissue transfer. *Microsurgery* 2012;32:15-9.
 27. Thacker JK, Mountford WK, Ernst FR, et al. Perioperative Fluid Utilization Variability and Association With Outcomes: Considerations for Enhanced Recovery Efforts in Sample US Surgical Populations. *Ann Surg* 2016;263:502-10.
 28. Kendrick JB, Kaye AD, Tong Y, et al. Goal-directed fluid therapy in the perioperative setting. *J Anaesthesiol Clin Pharmacol* 2019;35:S29-34.
 29. Skoretz SA, Anger N, Wellman L, et al. A Systematic Review of Tracheostomy Modifications and Swallowing in Adults. *Dysphagia* 2020;35:935-47.
 30. Giannitto C, Preda L, Zurlo V, et al. Swallowing Disorders after Oral Cavity and Pharyngolaryngeal Surgery and Role of Imaging. *Gastroenterol Res Pract* 2017;2017:7592034.
 31. Farmer AD, Drewes AM, Chiarioni G, et al. Pathophysiology and management of opioid-induced constipation: European expert consensus statement. *United European Gastroenterol J* 2019;7:7-20.
 32. Mascarella MA, Richardson K, Mlynarek A, et al. Evaluation of a Preoperative Adverse Event Risk Index for Patients Undergoing Head and Neck Cancer Surgery. *JAMA Otolaryngol Head Neck Surg* 2019;145:345-51.
 33. Kotagal M, Symons RG, Hirsch IB, et al. Perioperative hyperglycemia and risk of adverse events among patients with and without diabetes. *Ann Surg* 2015;261:97-103.
 34. Obi AT, Pannucci CJ, Nackashi A, et al. Validation of the Caprini Venous Thromboembolism Risk Assessment Model in Critically Ill Surgical Patients. *JAMA Surg* 2015;150:941-8.
 35. Dixit D, Endicott J, Burry L, et al. Management of Acute Alcohol Withdrawal Syndrome in Critically Ill Patients. *Pharmacotherapy* 2016;36:797-822.
 36. Lansford CD, Guerriero CH, Kocan MJ, et al. Improved outcomes in patients with head and neck cancer using a standardized care protocol for postoperative alcohol withdrawal. *Arch Otolaryngol Head Neck Surg* 2008;134:865-72.
 37. Fang CY, Heckman CJ. Informational and Support Needs of Patients with Head and Neck Cancer: Current Status and Emerging Issues. *Cancers Head Neck* 2016;1:15.
 38. Wilson JE, Mart MF, Cunningham C, et al. Delirium. *Nat Rev Dis Primers* 2020;6:90.
 39. Girard TD, Exline MC, Carson SS, et al. Haloperidol and Ziprasidone for Treatment of Delirium in Critical Illness. *N Engl J Med* 2018;379:2506-16.
 40. Burry L, Hutton B, Williamson DR, et al. Pharmacological

- interventions for the treatment of delirium in critically ill adults. *Cochrane Database Syst Rev* 2019;9:CD011749.
41. Devlin JW, Skrobik Y, Gélinas C, et al. Clinical Practice Guidelines for the Prevention and Management of Pain, Agitation/Sedation, Delirium, Immobility, and Sleep Disruption in Adult Patients in the ICU. *Crit Care Med* 2018;46:e825-73.
 42. Lee TS, Wang LL, Yi DI, et al. Opioid sparing multimodal analgesia treats pain after head and neck microvascular reconstruction. *Laryngoscope* 2020;130:1686-91.
 43. Vu CN, Lewis CM, Bailard NS, et al. Association Between Multimodal Analgesia Administration and Perioperative Opioid Requirements in Patients Undergoing Head and Neck Surgery With Free Flap Reconstruction. *JAMA Otolaryngol Head Neck Surg* 2020;146:708-13.
 44. Saraswathula A, Chen MM, Mudumbai SC, et al. Persistent Postoperative Opioid Use in Older Head and Neck Cancer Patients. *Otolaryngol Head Neck Surg* 2019;160:380-7.
 45. van Beek FE, Jansen F, Baatenburg de Jong RJ, et al. Psychological Problems among Head and Neck Cancer Patients in Relation to Utilization of Healthcare and Informal Care and Costs in the First Two Years after Diagnosis. *Curr Oncol* 2022;29:3200-14.
 46. Carlson LE, Bultz BD. Efficacy and medical cost offset of psychosocial interventions in cancer care: making the case for economic analyses. *Psychooncology* 2004;13:837-49; discussion 850-6.
 47. Brebach R, Sharpe L, Costa DS, et al. Psychological intervention targeting distress for cancer patients: a meta-analytic study investigating uptake and adherence. *Psychooncology* 2016;25:882-90.

doi: 10.21037/joma-22-34

Cite this article as: Stretton C, Service J. Postoperative considerations in patients following oral cancer resection and surgical reconstruction: a review. *J Oral Maxillofac Anesth* 2023;2:16.