Enhanced recovery after surgery for major head & neck surgery—a narrative review

Jason Patel, Chris Jones

Department of Anaesthesia, Royal Surrey Hospital, Guildford, UK

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

Correspondence to: Dr. Chris Jones, MBBS, FRCA, MD(Res). Department of Anaesthesia, Royal Surrey Hospital, Egerton Road, Guildford, GU2 7XX, UK. Email: chrisjones9@nhs.net.

Background and Objective: Enhanced recovery after surgery (ERAS) has a large evidence base from colorectal surgery and is associated with reduced length of stay (LOS), lower cost, fewer complications and improved outcomes. Evidence for the benefit of ERAS across all disciplines within head and neck surgery is now emerging in the literature. This article aims to give an overview of current evidence in the literature supporting the use of ERAS based interventions in head and neck surgery.

Methods: A PubMed search for 'enhanced recovery AND head and neck' and 'enhanced recovery AND maxillofacial' published between 2017 and 2022 was performed. Titles identified were subsequently reviewed. Those with full text available that were deemed relevant and written in English were selected. References for these articles were also reviewed and again those deemed relevant selected.

Key Content and Findings: Our review covers the available evidence for ERAS interventions in head and neck surgery in the preoperative, intraoperative and postoperative setting.

Conclusions: There is good evidence to support the use of ERAS principles in head and neck surgery. Preoperatively there is focus on good patient education and nutritional assessment and optimisation, Intraoperatively, it is important to maintain physiological norms. Patients may have a difficult airway, requiring coordinated teamwork and planning. Multimodal analgesia and antiemetic prophylaxis will help to improve patient satisfaction and avoid postoperative complications. Free flap monitoring is vital in the first 24 hours following surgery. Routine admission to intensive care unit (ICU), tracheostomy insertion and delayed enteral nutrition for more complex cases have now become outdated. Admission to specialist areas, avoidance of tracheostomies and early nutrition are encouraged and have been shown to reduce LOS with no compromise in outcomes.

Keywords: Enhanced recovery; head and neck; enhanced recovery after surgery (ERAS)

Received: 20 April 2023; Accepted: 25 August 2023; Published online: 06 September 2023.
doi: 10.21037/joma-23-15
View this article at: https://dx.doi.org/10.21037/joma-23-15

Introduction

Background

Enhanced recovery after surgery (ERAS) pathways have become a popular concept in modern clinical practice. Major surgery induces physiological stress, the magnitude of which correlates to postoperative complications and length of stay (LOS) (1). Utilising ERAS pathways ensures a standardised and evidence based approach to care, which in turn can reduce LOS, cost and overall complications (2). This in turn will help facilitate increased bed availability, avoid cancellation, improved patient outcomes and improved patient satisfaction (2).

Rationale and knowledge gap

There is a large body of evidence from colorectal surgery to support the use of ERAS (1). In addition, there is evidence from randomized trials that ERAS principles can be extrapolated with good effect to other surgical specialties (3).

However, there are no randomised studies in ERAS for head and neck surgery, but there are several cohort studies which have been published in recent years. A study by Jandali *et al.* [2020], compared the implementation of a specific head and neck ERAS protocol, comprising of 27 elements, to a retrospective control group (4). They were able to show a significantly lower opiate usage and pain scores in the ERAS groups in the first 72 hours postoperatively, and shorter time to ambulation (1.4 *vs.* 2 days) (4). They were also able to demonstrate a shorter LOS (7.8 *vs.* 9.7 days), although there was no significant difference in LOS in intensive care (4). Bertazzoni *et al.* [2022] introduced an ERAS protocol for adult patients undergoing head and neck surgery for primary or recurrent stage III/IV squamous cell cancer. They were again able to show a significantly shorter LOS in the ERAS group (14 *vs.* 17.5 days), and although there were less complications in the ERAS group, this was not shown to be statistically significantly likely due to the small sample size (5). However, a larger study by Kiong *et al.* [2021], which compared the introduction of an ERAS protocol in patients undergoing oncological head and neck surgery to a control group, was able to demonstrate significantly fewer overall complications (18.6% *vs.* 27%) in the ERAS group (6). In addition, they were also able to demonstrate fewer planned intensive care admissions (4% *vs.* 14%), a shorter mean LOS (7.2 *vs.* 8.7 days) and significantly reduced opiate requirement in the first 72 hours postoperatively (6). Thus, the application of ERAS protocols extrapolated from colorectal surgery and applied to the head and neck population can provide great benefits to both the patients and the health institution overall. Obayemi *et al.* [2022] conclude similarly in their recent evidence based review of ERAS protocols in craniomaxillofacial surgery, stating that with modification this population group can benefit (7).

Objective

This narrative review aims to give an overview of current evidence in the literature supporting the use of ERAS based interventions covering the full scope of major head and neck surgery. This could be used to help institutions set up their own ERAS protocols and identify potential areas for further research. We present this article in accordance with the Narrative Review reporting checklist (available at https://joma.amegroups.com/article/view/10.21037/joma-23-15/rc).

Methods

A PubMed search for 'enhanced recovery AND head and neck' and 'enhanced recovery AND maxillofacial' published between 2017 and 2022 was performed. Titles identified were subsequently reviewed. Those with full text available that were deemed relevant to head and neck surgery based upon the title and written in English were selected. References for these articles were also reviewed and again those deemed relevant by title selected (*Table 1*). We did not rate levels of evidence or judge the risk of bias in determining which literature to include. This is therefore a limitation of this review. We also acknowledge this search strategy is not extensive and does not identify a specific type of head and neck surgery. There is potential that the literature identified is focused on oncological and reconstructive surgery and may not be representative of the head and neck surgical population overall.

Discussion

Preoperative

Patient education

An important tenet of enhanced recovery is empowering the patient to play an active role in the perioperative pathway. Thus, it is essential that we provide patients with the appropriate education prior to their surgery. In doing so, this has been shown to reduce associated psychological stress and anxiety, which may have an impact on wound healing complications and even cancer recurrence (8). It will also allow patients to manage their own expectations of the perioperative process, which can facilitate better recovery and patient experience (1). When providing patient education, it is important to consider the health literacy of the local population to facilitate better patient understanding and adherence (9,10). There is some debate however regarding the timing and details of the education delivered to patients. Evidence from the paediatric population suggests that a shorter time between

Table 1 The search strategy summary

Items	Specification
Date of search	11/02/2023
Databases searched	PubMed
Search terms used	‘Enhanced recovery AND head and neck’ and ‘enhanced recovery AND maxillofacial’
Timeframe	Between 2017–2022
Inclusion criteria	English language
	Full text available
	Relevance from title
Selection process	Selection by one author
Additional considerations	References of selected articles were also reviewed and included if they met the above selection criteria

counselling and the procedure provided greater retention of information (11,12). However, specific data related to head and neck surgery is lacking (11).

Nutrition

Head and neck cancer patients are often malnourished due to their underlying condition (1). Malnutrition is associated with poor wound healing, infection and increased LOS (1). Once enteral intake is established postoperatively, this can also put malnourished patients at high risk of developing a refeeding syndrome (1). Consequently, it is essential that patients at risk of malnutrition are routinely assessed preoperatively using validated tools so that they can be identified and acted upon early (13). Input from a dietician may be required to establish a nutrition plan during the perioperative period (1). In extreme cases, surgery may even be delayed until proper nutrition is established (1). This could be facilitated with the insertion of a feeding tube or percutaneous endoscopic gastrostomy ahead of the proposed surgery (14).

Day of surgery

Pre-medication

Administration of pre-emptive analgesia has been associated with reduced pain scores in the perioperative period in head and neck patients (1). Interestingly, the timing of the analgesia does not appear to affect the postoperative pain quality (11,15). However, premedication with nonsteroidal anti-inflammatory drugs (NSAIDs) has been shown to delay the time to first analgesia and reduce total analgesic use postoperatively (15).

In the pre-op visit, it is important to consider patient anxiety, given this can have a negative impact on outcome as discussed previously (8). Non-pharmacological measures can often be trialled first such as clinician reassurance or reduced starvation time (16,17). However, if anxiety is still of concern, anxiolytic medication may be considered. Short acting benzodiazepines are preferred to minimise any postoperative effects but do carry the risk of short term impairment of psychomotor function (11,18). Benzodiazepines provide the additional benefit of increasing the seizure threshold, which could be useful given concerns for potential lidocaine toxicity if airway topicalization is required (1). However, their routine use for this indication is not recommended.

Carbohydrate loading

Excessive starvation times prior to surgery can cause dehydration and induce the stress response resulting in a catabolic state which increases insulin resistance and risks perioperative hyperglycaemia (19). Carbohydrate loading drinks 2 hours prior to surgery have been advocated in ERAS protocols (1). They have been shown to reduce the incidence of dehydration, preoperative gluconeogenesis, glucagon depletion and insulin resistance (1). In addition, it can also help to reduce patient anxiety, thirst and hunger, and thus facilitate a better patient experience (20). There is limited data from patients with diabetes, but current information suggests that gastric emptying is similar to controls in well controlled diabetes, so it is safe to use in this population group (21).

The role of immunonutrition has also been explored with nutrients such as arginine and glutamine, which have been shown to have an immune modulating effect (11). However, systematic reviews have currently not shown any benefit of immunonutrition in the preoperative setting when compared with standard nutritional support in patients undergoing head and neck surgery and is hence currently not recommended (11).

Antibiotics

In clean contaminated head and neck surgery or surgeries where the development of a surgical site infection (SSI) would have significant consequence e.g., free flap surgery, antibiotics within 1 hour of surgery and continued for 24 hours is well established practice (1). There is no evidence to support longer courses of antibiotics (1). Topical antimicrobial decolonisation through oral rinses of chlorhexidine have been shown to reduce bacterial colony by 85% and may reduce the incidence of SSI (22).

Intraoperative

Airway management

Head and neck surgery lends itself to patients with challenging airway anatomy. It is essential that both the surgeon and anaesthetist communicate and plan effectively in cases where the airway anatomy is of concern (1). Tracheostomy insertion should not be performed routinely and considered on a case by case basis (1). Although not specifically indicated in head and neck surgery, the principles of lung protective ventilation extrapolated from thoracic surgery are likely to offer some benefit to this patient population (1,23). These measures include tidal volumes 4–6 mL/kg ideal body weight, positive end-expiratory pressure (PEEP) 5–10 cmH_2O and peak pressures <30 cmH_2O (1,23).

Fluid management

The aim of goal directed fluid therapy (GDFT) is to titrate intravenous fluid administration against haemodynamic variables, with a view to keep the patient at the peak of the Frank-Starling curve maximizing cardiac output and oxygen delivery (1). Inappropriate fluid administration has been linked to prolonged LOS, reduced renal perfusion, ileus, coagulopathy, microvascular graft thrombosis and pulmonary and cardiac complications (24,25). An oesophageal doppler probe to guide GDFT is not ideal in head and neck surgery patients, given it often requires frequent adjustment by the anaesthetist to optimise the probe position (26). Using pulse contour analysis monitors (such as LiDCO™ or FloTrac™) may be better suited depending on local resources and familiarity (26).

Vasoconstrictors are often used intraoperatively to maintain blood pressure under anaesthesia. There is concern that this can compromise perfusion in flap surgery. However, intermittent vasoconstrictor use has not been associated with detrimental outcomes during free tissue transfer (27,28). Alternative options to maintain blood pressure can also be considered, such as dobutamine, which has been shown to improve mean and maximum blood flows through arterial anastomoses in head and neck surgery (29).

A restrictive strategy is also suggested with blood transfusion in free flap patients (30). Although blood transfusion did not affect the flap survival, it was associated with increased perioperative complications, with significant increases in infection and death when controlled for age, preoperative haemoglobin and albumin, cancer stage and adverse pathological features (31,32).

Maintenance of anaesthesia

Ideally, anaesthesia should be maintained with short acting agents to promote quicker recovery form anaesthesia and earlier return to premorbid function (1). There is some evidence in the literature that volatile anaesthetics can affect cancer morbidity and mortality (33). It therefore may be beneficial to move towards a total intravenous anaesthesia (TIVA) technique (1).

Multimodal analgesia

This is a major tenet of ERAS. Although opioids can offer good analgesia, they are associated with other negative effects. These include sedation, nausea, vomiting, urinary retention, ileus, and pruritus (1,9). It is therefore important we aim to minimise the usage of opiates during the perioperative period and utilise other analgesic agents. There is no consensus regime of multimodal agents in head and neck patients, so their use will largely depend on evidence extrapolated from other sources in the literature along with local expertise, experience and availability of medication (34). Examples of multimodal agents include paracetamol, NSAIDs, COX-2 inhibitors, alpha-2 agonists, lidocaine, magnesium and ketamine. The perioperative use of gabapentin is still up for debate with a systematic review by Tiippana and colleagues [2007] concluding that gabapentin provides good perioperative pain relief and reduces postoperative opioid consumption, although caution is advised as it can cause sedation (35). However, a more recent systematic review and meta-analysis by Verret and colleagues [2020] concluded there was no clinically significant analgesic benefit perioperatively (36). Regional anaesthesia can be considered depending on the site of surgery e.g., superficial cervical plexus block (37-39). Otherwise, local anaesthetic infiltration could be performed by the surgeon and has been shown to delay the time to first analgesia and reduce total analgesic usage (15).

Normothermia

Hypothermia is associated with poor outcomes, infection, bleeding, cardiac events, increased LOS and cost of care (40,41). It is therefore essential perioperative normothermia is maintained. Patients can be warmed preoperatively, which has been shown to increase core temperature and therefore reduce the incidence of intraoperative hypothermia (42). Intraoperatively, warming should be continued and can be delivered in several ways including a forced air warmer or warming mattress (43). Insulating blankets alone are not likely to be sufficient to avoid patient hypothermia but could be used in addition to other measures (43). Warming intravenous fluids can keep patients warm and avoid post-op shivering, although it was not shown that warming wash out fluids made a significant difference (44). Post-op shivering is of particular concern, as it increases the metabolic oxygen requirement which can risk flap hypoxia (1). It therefore is prudent to continue monitoring patient temperature postoperatively and continuing warming measures as appropriate.

Monitoring and measuring temperature intraoperatively can be challenging. The surgery site may preclude the use of temperature probes in the nasopharynx/oesophagus, and access to the tympanic membrane may be difficult (11). A urinary bladder thermistor has been shown to correlate well with pulmonary artery thermistors and could be considered in these cases (45).

Postoperative nausea and vomiting (PONV) prophylaxis

PONV prophylaxis should be routinely administered in head and neck surgery patients (1,11). It is essential to avoid any retching or vomiting in flap surgery as this may lead to graft failure and/or compromise a newly created airway (46). Typically, a combination of ondansetron and dexamethasone are used, and have been shown to have good efficacy (47). If any rescue anti-emetic is required, then an alternative drug class of anti-emetic should be used (48). In addition, other intraoperative measures previously discussed will help reduce the incidence of PONV, such as using TIVA and avoidance of opiates (9,49).

Postoperative

Free flap monitoring

The current success rate for flaps is 90–99% but pedicle thrombosis and ischaemia remain key concerns (1). There is no formal consensus on monitoring flaps so practice varies between institutions (1). Bedside monitoring includes observing the flap colour, capillary refill time, turgor, temperature and pinprick testing (50,51). Head and neck flaps which are buried require modification of the flap design to allow for an external skin paddle for conventional clinical bedside monitoring. Alternatively surface or implantable doppler could be used to monitor buried flaps (1). Additional aids to facilitate flap monitoring such as near-infrared spectroscopy, laser doppler flowmetry and implantable oxygen partial pressure monitors have all undergone experimental testing and may improve flap salvage rate (51,52). However, they are costly, not widely available and lack a strong evidence base to support their use when compared to clinical bedside monitoring (51,52). Evidence from the literature suggests that flap compromise is most likely to occur in the first 24 hours (1). Yang *et al.* concluded that 55% flap compromises occurred in the first 24 hours, with 38% from 24–48 hours and only 6% after 48 hours (53). They therefore recommend intensive flap monitoring every 1–4 hours for the first 24–48 hours postoperatively. In any case, if ischaemia is suspected, early re-exploration should be considered (1).

Venous thromboembolism (VTE) prophylaxis

VTE prophylaxis is well established and has a good evidence base to support its use (1,11). There is no antiplatelet or anticoagulant which has been shown to increase free flap survival, and in fact this carries additional complication of bleeding (54,55). Similarly, regular aspirin use without any specific cardiac indication did not appear to have any impact on flap survival and increased bleeding risk, so is therefore not recommended (56). In those patients who may be using an anticoagulant for another health indication undergoing free flap surgery, decisions based around the usage of their anticoagulant must be individualised (11,57).

Analgesia

As discussed previously, a multimodal approach is vital to reduce the unwanted effects of opioids (1,9). It is also essential to facilitate patient return to premorbid function, by facilitating ability to deep breath and mobilise. NSAIDs provide good analgesia without significant increase bleeding risk when used alone (58). However, if used in combination with pharmacologic VTE prophylaxis and/or aspirin, there is a synergistic increase in bleeding (1). Therefore in these circumstances caution is advised and decisions should be taken on individualised risk assessment.

Reflux

Administration of proton pump inhibitors (PPIs) can reduce the acidity of any reflux. In doing so, this ensures any reflux causes less tissue damage and therefore promotes wound healing (59). In one randomized control trial, total laryngectomy patients were administered 14 days of a PPI postoperatively and they found that this significantly reduced the incidence of pharyngocutaneous fistula from 32% to 5% (60).

Nicotine replacement therapy (NRT)

Smoking can have a negative impact on patient outcome, and it is hoped that the need for surgery may be used as a teachable moment to patients and motivate them to change their negative health behaviours. In the elective setting, there is ample time to delay surgery until smoking cessation measures have been taken. However, this is not the case in cancer surgery where time is critical. Nicotine itself is a vasoconstrictor which risks tissue hypoxia and flap ischaemia, reduced anastomotic patency, impaired bone healing and failed osteointegration of implants (1). Studies looking at NRT after coronary bypass surgery or in patients admitted to intensive care have shown a dose-dependent increase in wound healing complications in smokers based on their preoperative cotinine (primary metabolite of nicotine) levels (61,62). Therefore the current consensus is that NRT is not recommended after head and neck surgery.

Early mobilisation

This should be encouraged as much as possible postoperatively (26). Barriers to early mobilisation related to head and neck surgery include lower limb donor site morbidity, but this can be overcome with good analgesia and multidisciplinary team input (1). Postoperative pulmonary complications should also be considered in this population group, particularly in longer surgeries (26). Strategies utilised from other specialties include spirometry, deep breathing exercises and intermittent positive pressure breathing and could be considered, although care must be taken particularly with the latter as this may compromise free flaps (63).

Nutrition

Previously it was not unusual to keep patients nil by mouth (NBM) for 6-12 days postoperatively (64). However, more recently there has been a shift towards introducing enteral nutrition early. One retrospective review found that free flap patients fed before postoperative day 5 had a significantly shorter LOS (11.9 *vs.* 18 days) and no difference in complication rate (64). Similarly, oral nutrition introduced on postoperative day 1–5 following total laryngectomy with primary closure did not show any increase in pharyngocutaneous fistula formation and did not show any increase in LOS (65,66). As mentioned previously, given patients can be malnourished preoperatively, it is important to be aware of the risk of refeeding syndrome and to involve specialist dietician input as needed (1). In some cases, it may be prudent to consider inserting a feeding gastrostomy tube if it is anticipated prolonged nutritional support is going to be required (14). Although limited, there is also some evidence to support the use of immunonutrition, which was shown to reduce the risk of fistula formation in one study, but more evidence is required to support this (11).

Tracheostomy

Given concerns of airway oedema and/or bleeding, patients undergoing free flap surgery often went to the intensive care unit (ICU) intubated or with a tracheostomy *in situ* (11,26). However, tracheostomies are associated with an increase in lower respiratory tract infections, dysphagia, feeding tube dependence and prolonged LOS in hospital (67). It is therefore suggested that they are avoided as much as possible. Brenner *et al.* [2020] and McGrath *et al.* [2020] have published further specific guidance extending beyond the scope of this review on tracheostomy insertion and aftercare, which readers should refer to for further information (68,69). In cases where tracheostomy is deemed essential, it is important to aim for early cuff deflation, capping trial and decannulation (11,26). There is also evidence to suggest that surgical closure of the strap muscles and tracheostomy incision under local anaesthetic following decannulation can decrease LOS, facilitate swelling recovery and fewer long-term tracheal complications (70).

Routine ICU admission

ICU admission following head and neck surgery should be based on individualised risk assessment and not considered the norm (1). Studies have shown similar or improved outcomes with patients admitted to high level specialty specific areas, with a decreased total cost (71). There is no agreed consensus regarding specific surgical indications warranting ICU admission, so this will depend on local expertise, experience and availability of specialist units. However, ICU is indicated in those patients carrying increased risk due to underlying comorbidity or requiring invasive respiratory/haemodynamic support postoperatively (71).

Other considerations

Implementation of ERAS protocols

Enhanced recovery requires a diverse skillset and will involve numerous members of a multi-disciplinary team (MDT) (72). Each team member will play a key role in the perioperative journey of the patient and should be well rehearsed and familiar with the principles of enhanced recovery (72). This requires appropriate education and training of relevant staff members (72). It is vital for the success of ERAS that protocols are adhered to (5,73). This has been a repeated limitation in several studies. Ongoing data collection and monitoring of performance will help to determine the success of ERAS protocol implementation locally, so that any barriers can be identified and addressed accordingly (72).

Conclusions

In conclusion, ERAS has a strong evidence base, particularly from colorectal surgery. However, there is now evidence to support the use of ERAS principles in head and neck surgery. Appropriate staff training and adherence to protocols by MDT members is essential for the successful implementation of ERAS. Preoperatively there is focus on patient education and nutritional assessment and optimisation, which may lead on to continued benefits postoperatively. Intraoperatively, it is important to maintain physiological norms as much as possible. These patients can have challenging airway anatomy, which requires coordinated teamwork and planning to mitigate these risks. Multimodal analgesia and antiemetic prophylaxis will help to improve patient satisfaction and avoid potential postoperative complications. Of particular concern postoperatively is free flap monitoring, which should be actively done in the first 24 hours, when the risk of free flap failure is highest. Routine admission to ICU, tracheostomy insertion and delayed enteral nutrition have now become outdated. Admission to specialist areas, avoidance of tracheostomies and early nutrition is now encouraged where possible and has been shown to reduce LOS with no compromise in outcomes. Potential areas for future research include the timing and information provided as part of patient education, the role of immunonutrition, the role of TIVA versus volatile anaesthesia, the use of agents such as gabapentin and the role of aids to facilitate flap monitoring.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Journal of Oral and Maxillofacial Anesthesia* for the series "Anaesthesia for Maxillofacial Surgery". The article has undergone external peer review.

Reporting Checklist: The authors have completed the Narrative Review reporting checklist. Available at https://joma.amegroups.com/article/view/10.21037/joma-23-15/rc

Peer Review File: Available at https://joma.amegroups.com/article/view/10.21037/joma-23-15/prf

Conflicts of Interest: Both authors have completed the ICMJE uniform disclosure form (available at https://joma.amegroups.com/article/view/10.21037/joma-23-15/coif). The series "Anaesthesia for Maxillofacial Surgery" was commissioned by the editorial office without any funding or sponsorship. CJ serves as an unpaid editorial board member of *Journal of Oral and Maxillofacial Anesthesia* from November 2022 to September 2023 and the unpaid Guest Editor of the series. CJ is also the website editor and appointed officer to the executive committee of the ERAS Society (unpaid). 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.

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doi: 10.21037/joma-23-15
Cite this article as: Patel J, Jones C. Enhanced recovery after surgery for major head & neck surgery—a narrative review. J Oral Maxillofac Anesth 2023;2:24.