Available online at www.sciencerepository.org

Science Repository

Research Article

Clinical Update on Anaesthetic Management of Free Flap Surgery in Cervico Facial Cancer Patients

Cyrus Motamed*, Stéphanie Suria and Lauriane Bordenave

Gustave Roussy Cancer Campus, Villejuif, France

ARTICLE INFO

Article history:
Received: 16 May, 2020
Accepted: 28 May, 2020
Published: 3 June, 2020

Keywords:
Free flap
cervico facial cancer
peripheral catheter
opioid free anaesthesia

ABSTRACT

Intraoperative anaesthesia management in oro-facial cancer surgical patients requiring free flap tissue transfer is evolving. In this paper we updated our intraoperative clinical protocol using our own experience in combination with the latest literature. The main areas of change include videolaryngoscopic awake intubation in case of difficult airway management, combination of regional anaesthesia with peripheral catheter to decrease intraoperative opioid consumption, and postoperative pain and finally opioid free anaesthesia techniques using dexmedetomidine.

Introduction

Tumor excision of cervico-facial cancer followed by complex reconstructive microvascular surgery of free flap to replace defect or secondary reconstruction after removal of damaged tissues such as osteoradionecrosis are complex challenges in cervicofacial cancer patients. Our institution is a major leading hospital in Europe for cervicofacial cancer and reconstructive surgery in Europe. We started free flap reconstruction in 1993, with a current annual rate of 150 per year and 6 percent total graft failure [1]. Most of the time a double team of cervico-facial and reconstructive surgery surgeons perform simultaneously alongside the anaesthesiologists.

It is generally accepted that factors influencing final success of these procedures are mainly related to surgery and the patient itself such as vessel caliber, while anaesthesia related factors have a lesser impact [2]. However, duration of anaesthesia which in fact is related to duration of surgery has a negative impact [3]. Nevertheless, this does not mean the anaesthetic technique has no effect at all since according to Hagen Poiseuille equation blood flow to the flap has a direct relation to systemic blood pressure [4]. In addition to free flap failure other complications such as haemorrhage, infection (local or sepsis) or respiratory insufficiency can at least increase the length of stay in the hospital without compromising the flap itself. Postoperative management can also be a confounding factor in the overall general process. In this paper we briefly elaborate an updated practical anaesthetic management for pre and intraoperative anaesthetic management for this specific surgery.

The Clinical Protocol Update

I Preoperative Assessment / Anaesthesia Consultation

Special focus on airway management and road map for possible difficult intubation should be traced and discussed with the patient (mainly awake fibreoptic, awake videolaryngoscopy, cricothyroid puncture/ jet ventilation). In addition, the possibility of postoperative tracheostomy should be discussed with surgeons and patients. The site and side of the planned graft should be verified and confirmed with patient and surgeon. Laboratory test: cell blood count, electrolytes, clotting tests should be prescribed and checked and eventually adjusted several days before surgery.

Information on bleeding and transfusion risk should be clearly given. Regional anaesthesia with peripheral catheter proposition should be

**Correspondence to: Dr. Cyrus Motamed, M.D., Gustave Roussy Cancer Campus, Rue Camille Desmoulins, Villejuif, Cedex 94080, France; Tel: 33142114436; E-mail: cyrus.MOTAMED@gustaveroussy.fr*

http://dx.doi.org/10.31487/j.ACR.2020.01.03

discussed for postoperative analgesia under sedation with remifentanil TCI (target controlled infusion) before general anaesthesia.
The following sites are mainly used:

i. For Fibula graft: Sciatic bloc.
ii. Thigh anterolateral: Femoral block + lateral thigh.
iii. Ante-brachial (Chinese flap): Axillary block.
iv. Latissimus dorsalis or scapula: Paravertebral block.
v. Jejunum: Transverse Abdominal Plain (TAP) block, epidural anaesthesia is not performed because of low molecular weight heparin injection before graft vessels clamping.

Morphine Patient Controlled Analgesia, and visual analogic pain scale information. Application for pre-rehabilitation in the case of non-weaned addictions or severe malnutrition. Surgical intensive care information (a 72h stay).

II Intraoperative Anaesthetic Management

i Upon Arrival in the Operating Room

18/16 G peripheral venous catheter with multiple entry for vasoactive drug if needed. Perform regional anaesthesia with peripheral catheter guided and implemented with the help of ultrasound at the flap harvesting site. Bolus of 200-400 mg of ropivacaine 2%. Most of these blocks can be performed before anaesthesia and surgery under remifentanil TCI.

ii Induction of Anaesthesia

Pre-oxygenation followed by propofol IV or hypnomidate if cardiac insufficiency and non-depolarizing muscle relaxants. Classic oral or nasal intubation depending on site, or awake fibreoptic/videolaryngoscope intubation or cricothyroid puncture for jet ventilation under remifentanil TCI in case of predicted difficult intubation. Placement of ultrasound-guided invasive arterial line on the side opposite the flap (radial if negative Allen test or femoral or failure). Pulse wave analysis monitoring for major surgery (EV1000®, pulsioflex®). Bispectral index and train of four monitoring of muscle relaxant, urinary catheter with thermal probe and external air heating.

If a jejunum flap: A tunnelled femoral central venous catheter guided by ultrasound for postoperative parenteral nutrition should be placed, alternatively jejunostomy/ ending gastrostomy. Antibiotics for prevention of infection such as Amoxicillin/acid clavulanic should start before incision but need to be re-injected every 2h and followed for 24 h maximum 12g per 24h.

iii Maintenance of Anaesthesia

Remifentanil TCI
Opioid Free Anaesthesia (OFA): Dexmedetomidine (DEX) 0.3-0.5 µg/kg in 15 min followed by DEX 0.2 to 1 µkg/kg/h and a stepwise decrease every 2h in 0.2µg/kg/h and to be stopped 20 min before end of surgery. Ketamine 0.3 mg/kg followed by 0.15 mg /kg/h to be stopped 1 hour before the end. Lidocaine 1.5 mg/kg if no regional anaesthesia is used intraoperatively followed by 1 mg/kg/h, to be stopped 1 hour before the end of the procedure. Sevoflurane 1 mac or Desflurane 1 mac if body mass index (BMI) > 35.

Protective positive ventilation strategy: FiO2 to reach SpO2 > 95%, tidal volume: (6 to 8 ml/kg) PEP ≥ 5 cmH2O. Recruitment maneuvers in the absence of hemodynamic instability.

Intraoperative hemodynamic management: A mean arterial pressure (map) > 64 mmHg as part of goal directed therapy should be emphasizing. Hypertension > 150 mmHg systolic should be avoided. Transfusion if blood hemoglobin's blood drop to 9 g/dl especially after anastomosis. Enoxparin 30UI/kg before clamping.

iv Anticipation of Postoperative Analgesia

1 hour before the end of surgery. Paracetamol, Non-Steroidal Anti-Inflammatory Drugs, Nefopam, at the end morphine 0.05 to 0.2 mg/Kg monitored by the respiratory frequency. If tracheostomy is not needed every emergency aspect adapted to the local structure should be emphasized including the possibility of emergency intubation in case of an emergency surgery while difficult extubation should be anticipated with the presence of the surgeon and or devices such as Cook exchange catheter. Overnight intubation might also be organized with the ICU if necessary.

Discussion

This later clinical protocol update is derived from a combination of our clinical experiences and scientific publications. The major updates are concern regional anaesthesia for postoperative pain, and OFA. Indeed, benefits of these techniques are outranking related risks. Regional anaesthesia: The positive effect of regional anaesthesia on postoperative pain scores and decreased opioid consumption or length of hospital stay is documented [5, 6]. OFA with DEX appears to be an acceptable alternative to remifentanil-based analgesia; benefits include lesser pain scores at the ICU, hemodynamic stability, less opioid consumption; however, OFA with DEX does not prevent complications due to addiction [7-9].

Airway control (induction and extubation) are specifically the critical periods for anaesthesiologists in these patients, while awake fibreoptic intubation remain a standard approach and awake videolaryngoscopy might also be useful when mouth opening is adequate [10]. Extubation difficulty after surgery is not related to tumor but major concern in these situations is oedema related to surgery, acute postoperative hemorrhage, or the necessity of rapid surgery due flap failure. Several protocol may permit a smooth extubation including tracheotomy, overnight intubation, or cook airway exchange catheter extubation; however, all of these techniques may have complications for example the cook exchange catheter has a rate of failure around 16% with airway complication such as pneumothorax around 8% , therefore careful assessment with benefice risk is necessary before its use in this context [11-13].

With a transfusion risk of 28% in free flap cervicofacial surgery optimizing transfusion is a major concern in order to maintain adequate oxygen delivery to the new graft, consequently we dropped our optimum haemoglobin level from 10 to 9 g/dl as as a hb of 8.75 g/dl

appears to be the optimum cut off for flap survival [14-16]. Goal directed therapy with a MAP of 65 mmHg appears to be the accepted cut-off for adequate peripheral perfusion and cardiac output monitoring [16-18]. The use of Vasopressors in free flap surgery is debated, however we believe that there is no impact of vasopressors on free flap viability [19-21].

On the contrary hemodynamic instability will probably affect graft survival and might also yield cardiovascular complications it must also be emphasized that hypertension can yield hematoma [22, 23]. Assessment of geriatric patients by oncogeriatrician is gaining momentum because a growing number of these patients are candidate for this type of reconstruction this assessment may permit to detect frail subjects and eventually prepare them for such a challenge in order to permit a better outcome including a faster recovery [24-26]. And finally, body mass index is reported not to affect free flap failure, however in a prospective case-controlled study we could detect a positive correlation with higher BMI and flap failure [15, 27].

In Summary

Anaesthesia for microvascular flap cancer surgery has specific considerations and should only be performed in specialized centers. The anaesthesia protocol should include the optimization of patient's conditions for flap survival without increasing non-surgical morbidity. In addition, preoperative conditioning and intraoperative specific management in collaboration with cervico facial and plastic surgeons are mandatory to permit successful cancer treatment and reconstruction with minimum morbidity.

References

1. Germain MA, Demers G, Launois B, Julieron M, Gayet B et al. (1993-1994) Salvage Esophagoplasty Using Free Jejunal Transplant After Repeated Failure of Other Esophagoplasties. 25 Cases. *Chirurgie* 119: 672-680. [Crossref]
2. Gooneratne H, Lalabekyan B, Clarke S, Burdett E (2013) Perioperative Anaesthetic Practice for Head and Neck Free Tissue Transfer -- A UK National Survey. *Acta Anaesthesiol Scand* 57: 1293-1300. [Crossref]
3. Kim BD, Ver Halen JP, Grant DW, Kim JY (2014) Anesthesia Duration as an Independent Risk Factor for Postoperative Complications in Free Flap Surgery: A Review of 1,305 Surgical Cases. *J Reconstr Microsurg* 30: 217-226. [Crossref]
4. Schrey A, Kinnunen I, Vahlberg T, Minn H, Grenman R et al. (2011) Blood Pressure and Free Flap Oxygenation in Head and Neck Cancer Patients. *Acta Otolaryngol* 131: 757-763. [Crossref]
5. Ruan QZ, Diamond S, Zimmer S, Iorio ML (2018) Assessing the Safety and Efficacy of Regional Anesthesia for Lower Extremity Microvascular Reconstruction: Enhancing Recovery. *J Reconstr Microsurg* 34: 293-299. [Crossref]
6. Jayaram K, Rao P, Gurajala I, Ramachandran G (2018) Evaluation of the Effect of Regional Anaesthesia on Microvascular Free Flaps. *Turk J Anaesthesiol Reanim* 46: 441-446. [Crossref]
7. Beloeil H (2019) Opioid-free Anaesthesia: The Need for Evidence-Based Proofs. *Anaesth Crit Care Pain Med* 38: 455. [Crossref]
8. Grape S, Kirkham KR, Frauenknecht J, Albrecht E (2019) Intra-operative Analgesia With Remifentanil vs. Dexmedetomidine: A Systematic Review and Meta-Analysis With Trial Sequential Analysis. *Anaesthesia* 74: 793-800. [Crossref]
9. Yang X, Li Z, Gao C, Liu R (2015) Effect of Dexmedetomidine on Preventing Agitation and Delirium After Microvascular Free Flap Surgery: A Randomized, Double-Blind, Control Study. *J Oral Maxillofac Surg* 73: 1065-1072. [Crossref]
10. Richardson PB, Hodzovic I (2012) Awake Tracheal Intubation Using Videolaryngoscopy: Importance of Blade Design. *Anaesthesia* 67: 798-799. [Crossref]
11. Henry CJ, Halligan M, Bozic A, Barry CP (2019) Overnight Endotracheal Intubation in Patients Who Have Free-Flap Reconstruction of the Head and Neck: A Cautionary Note. *Br J Oral Maxillofac Surg* 57: 796-797. [Crossref]
12. Ghimouz A, Rodriguez J, Abdelhafidh K, Goater P (2016) Avoiding a Tracheostomy After Mandibulectomy and Free Flap Reconstruction Using a Staged Reintubation Catheter. *Anaesth Intensive Care* 44: 783-784. [Crossref]
13. McLean S, Lanam CR, Benedict W, Kirkpatrick N, Kheterpal S et al. (2013) Airway Exchange Failure and Complications With the Use of the Cook Airway Exchange Catheter®: A Single Center Cohort Study of 1177 Patients. *Anesth Analg* 117: 1325-1327. [Crossref]
14. Nguyen A, Shin H, Saint Cyr M, Verheyden C (2018) Blood Loss and Transfusion Rates in Microsurgical Head and Neck Reconstruction. *Plast Reconstr Surg Glob Open* 6: e1988. [Crossref]
15. Guye ML, Motamed C, Chemam S, Leymarie N, Suria S et al. (2017) Remote Peripheral Tissue Oxygenation Does Not Predict Postoperative Free Flap Complications in Complex Head and Neck Cancer Surgery: A Prospective Cohort Study. *Anaesth Crit Care Pain Med* 36: 27-31. [Crossref]
16. Kim HJ, Kim EJ, Lee HJ, Min JY, Kim TW et al. (2018) Effect of Goal-Directed Haemodynamic Therapy in Free Flap Reconstruction for Head and Neck Cancer. *Acta Anaesthesiol Scand* 62: 903-914. [Crossref]
17. Lahtinen SL, Liisanantti JH, Poukkanen MM, Laurila PA (2017) Goal-directed Fluid Management in Free Flap Surgery for Cancer of the Head and Neck. *Minerva Anestesiol* 83: 59-68. [Crossref]
18. Chalmers A, Turner MW, Anand R, Puxeddu R, Brennan PA (2012) Cardiac Output Monitoring to Guide Fluid Replacement in Head and Neck Microvascular Free Flap Surgery-What Is Current Practice in the UK? *Br J Oral Maxillofac Surg* 50: 500-503. [Crossref]
19. Ibrahim AM, Kim PS, Rabie AN, Lee BT, Lin SJ (2014) Vasopressors and Reconstructive Flap Perfusion: A Review of the Literature Comparing the Effects of Various Pharmacologic Agents. *Ann Plast Surg* 73: 245-248. [Crossref]
20. Kelly DA, Reynolds M, Crantford C, Pestana IA (2014) Impact of Intraoperative Vasopressor Use in Free Tissue Transfer for Head, Neck, and Extremity Reconstruction. *Ann Plast Surg* 72: S135-S138. [Crossref]
21. Chen C, Nguyen MD, Bar Meir E, Hess PA, Lin S et al. (2010) Effects of Vasopressor Administration on the Outcomes of Microsurgical Breast Reconstruction. *Ann Plast Surg* 65: 28-31. [Crossref]
22. Wang KY, Yang KC, Su FY, Chen YC, Hsieh YH et al. (2019) Association Between Blood Pressure and Postoperative Hematomas in the Patients Undergoing Head and Neck Cancer Reconstruction. *Head Neck* 41: 3241-3246. [Crossref]

23. Ekin Y, Gunusen I, Ozdemir OY, Tiftikcioglu YO (2019) Effect of Coagulation Status and Co-Morbidity on Flap Success and Complications in Patients with Reconstructed Free Flap. *Turk J Anaesthesiol Reanim* 47: 98-106. [Crossref]
24. Sierakowski A, Nawar A, Parker M, Mathur B (2017) Free Flap Surgery in the Elderly: Experience With 110 Cases Aged ≥70 Years. *J Plast Reconstr Aesthet Surg* 70: 189-195. [Crossref]
25. Hempenius L, Slaets JP, van Asselt D, de Bock GH, Wiggers T et al. (2013) Outcomes of a Geriatric Liaison Intervention to Prevent the Development of Postoperative Delirium in Frail Elderly Cancer Patients: Report on a Multicentre, Randomized, Controlled Trial. *PLoS One* 8: e64834. [Crossref]
26. Hempenius L, Slaets JP, van Asselt D, de Bock TH, Wiggers T et al. (2016) Long Term Outcomes of a Geriatric Liaison Intervention in Frail Elderly Cancer Patients. *PLoS One* 11: e0143364. [Crossref]
27. Khan MN, Russo J, Spivack J, Pool C, Likhterov I et al. (2017) Association of Body Mass Index With Infectious Complications in Free Tissue Transfer for Head and Neck Reconstructive Surgery. *JAMA Otolaryngol Head Neck Surg* 143: 574-579. [Crossref]