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ScienceDirect

British Journal of Oral and Maxillofacial Surgery 56 (2018) 514–519

BRITISH Journal of Oral and Maxillofacial Surgery

www.bjoms.com

Perioperative risk factors that predict complications of radial forearm free flaps in oral and maxillofacial reconstruction

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Accepted 29 April 2018

Abstract

The aim of the study was to find out what perioperative risk factors predicted complications in patients having reconstructions with radial forearm free flaps (RFFF). We organised a retrospective study of 169 patients (mean (range) age 54 (22–86) years, 100 of whom were female) who had oral and maxillofacial tumours resected, and reconstructed with RFFF, from January 2011–December 2016. We recorded predictive variables, subdivided into: personal and clinical (sex, age, weight, coexisting conditions, history of smoking, radiotherapy, and primary lesions); haemodynamic (perioperative concentrations of haemoglobin and albumin, blood loss, blood transfusion, urinary output (ml), and rate (ml/kg/hour), and infusion rates for crystalloids and colloids (ml/kg/hour, and volumes given intraoperatively and postoperatively for 24 hours); and anaesthetic and surgical (American Society of Anesthesiologists(ASA) grade, visual analogue pain score (VAS), and duration of tourniquet and operation). The primary outcome was the presence of a postoperative complication, and the secondary outcome the types of complications (medical and surgical). The significance of differences among the variables was assessed by univariate and multivariate analysis, and probabilities of less than 0.05 were accepted as significant. There were 26 complications, of which 15 were surgical and 11 medical. Risk factors were: preoperative radiotherapy, postoperative haemoglobin and albumin concentrations, VAS for pain, and volume of crystalloids transfused during the first 24 hours. Although reconstruction with a RFFF is a common and safe treatment for patients with oral and maxillofacial tumours, regulating perioperative risk factors, particularly those related to anaesthesia (including VAS and management of fluids) is important in the reduction of the number of complications.

Keywords: Radial Forearm Free Flap; Complication; Risk Factor

Introduction

Oral cancer is the sixth most common oral and maxillofacial malignancy in the world,[1] and resection is the most common treatment. Operations have a considerable impact on the structures and complex functions of the oral and maxillofacial area, and extensive resection of such tumours can lead to disfigurement, malformation, and malfunction. It is particularly important, therefore, for affected patients to have the defects reconstructed with a flap, which can supply complete or partial recovery of both function and aesthetics, and so improve quality of life.

Flaps are either free or pedicled, and we have studied reconstruction with radial forearm free flaps (RFFF). These have many advantages, including being thin and pliable, relatively hairless, and having a long pedicle with a large external diameter.[2] However, postoperative complications are still the main factors that affect the overall prognosis of treatment. As anaesthetists, we have treated many patients being operated on for complications of RFFF.

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https://doi.org/10.1016/j.bjoms.2018.04.015

The purpose of this study was to explore the risk factors that lead to postoperative complications in Chinese patients who are having reconstruction with RFFF after resection of an oral tumour. We hypothesised that some perioperative variables could possibly predict the development of complications of RFFF. The specific aims of the study were: to collect clinical data about Chinese patients who had reconstructions of the oral and maxillofacial region by RFFF during the past six years; to analyse the correlations among perioperative variables, particularly those that are anaesthetic-related and associated with the flap; and to estimate the influence of anaesthetic-related risk factors on complications of the flap.

Patients and methods

We organised a retrospective study of all patients who presented to the Oral and Maxillofacial Surgery Department at the Sun Yat-sen Memorial Hospital, Sun Yat-sen University, Guangzhou, China, for evaluation and management of oral and maxillofacial tumours treated by resection and reconstruction with a RFFF from January 2011 to December 2016. The study was approved by the Ethics Committee of Sun Yat-sen Memorial Hospital.

The primary predictive variables were divided into three groups, the first of which was personal details including sex, age, weight, coexisting diseases (hypertension, diabetes mellitus, and heart disease), smoking history, radiotherapy, and primary lesions. Secondly we recorded haemodynamic variables, including perioperative haemoglobin and albumin concentrations, blood loss and transfusion, urinary output (ml) and rate (ml/kg/hour), and volume and rate of infusion of crystalloids and colloids (ml/kg/hour) both during the operation and the 24 hours postoperatively. Finally we recorded anaesthetic and surgical variables, including American Society of Anesthesiologists' (ASA) classification, visual analogue score (VAS) for pain (recorded by the anaesthetists), duration of the tourniquet, and operating time.

The intraoperative infusion rate was calculated by the anaesthetists according to the patient's arterial blood pressure, the variation in stroke volume, and the volume of urine. Postoperatively the surgeons calculated the rate of postoperative infusion depending on the patient's heart rate, blood pressure, and volume of urine. Blood transfusion was considered when the haemoglobin concentration was less than 70 g/L or packed cell volume less than 0.21. For haemodynamically stable patients, blood transfusion was recommended when: the packed cell volume was less than 0.24 and age less than 40 years; packed cell volume less than 0.27 and age 40–60 years; and packed cell volume less than 0.30 and age over 60 years, respectively.

The primary outcome variable was the presence of a postoperative complication and the secondary one was the type of complication: surgical (total or partial necrosis, haematoma, ecchymosis, dehiscence, fistula, or infection); medical (electrolyte disturbance, hyperglycaemia, pneumonia, dysphoria, and renal dysfunction); or both.

Analysis of data

To aid analysis, some continuous variables were further divided into clinically relevant groups. The ASA classification was combined into two groups: class I and II, and class III and IV. Intraoperative urinary volume was divided into: less than 0.5 ml/kg/hour (low); 0.5–1.5 ml/kg/hour (medium); and >1.5 ml/kg/hour (high). The rates of intraoperative crystalloid or colloid infusion and the rates of crystalloid or colloid infusion during the first 24 hours after operation were divided, using their mean as the cutoff point. We used univariate and multivariate analysis (logistic regression models) to assess the significance of the risk factors for complications, and probabilities of less than 0.05 were accepted as significant. All statistical analyses were made using IBM SPSS Statistics for Windows software (version 19, IBM Corp, Armonk, NY, USA).

Results

Patients' personal and clinical characteristics are shown in Table 1. There were 69 men and 100 women, mean (range) age 54 (22–86) years, and weight 60 (range 37–97) kg. Most

Table 1
Baseline characteristics.

Variables	All patients (n = 169)
Mean (range) age (years)	54 (22–86)
Mean (range) weight (kg)	60 (37–97)
Sex:	
Male	69
Female	100
ASA score:	
II	119
III	50
Smoking:	
Yes	65
No	104
Radiotherapy:	
Yes	8
No	161
No systemic diseases	128
Systemic diseases:	
Hypertension	29
Diabetes	3
Hypertension and diabetes	9
Primary lesion:	
Tongue cancer	89
Carcinoma of floor of mouth	18
Gingival cancer	11
Buccal carcinoma	26
Oropharyngeal cancer	14
Carcinoma of palate	11

ASA = American Society of Anesthesiologists