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## Editorial

# Postoperative drainage in head and neck surgery for oral cancer

### ARTICLE INFO

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### ABSTRACT

**Objective:** Previous reports regarding postoperative drainage have documented complications associated with the drainage volume (DV). However, there is little information available concerning the postoperative and operative factors that influence postoperative DV. In this study, we retrospectively investigated the relationship between postoperative drainage and various risk factors in patients undergoing head and neck surgery for oral cancer.

**Methods:** This study included 136 patients (88 males, 48 females, mean age  $67.2 \pm 12.9$  years) who underwent head and neck surgery for oral cancer. We retrospectively investigated the following variables: age, sex, subsite, medical history, surgical procedure, operative time, blood loss, duration of drain retention, DV, and postoperative complications.

**Results:** DV after reconstruction with a pectoral major musculocutaneous flap was significantly higher than DV after reconstruction with a forearm flap ( $p < 0.05$ ). DV was significantly greater in cases involving a large amount of blood loss or a long operative time ( $p < 0.05$ ). DV was significantly greater after modified radical neck dissection than after supraomohyoid or submandibular neck dissection ( $p < 0.05$ ). DV was significantly greater in patients receiving antithrombotic therapy than in patients without ( $p < 0.05$ ). Multiple regression analysis revealed that total DV was positively correlated with older age, antithrombotic therapy, type of surgery (advanced surgery), and type of neck dissection (wide range).

**Conclusions:** DV was greater in those with older age, antithrombotic therapy, advanced surgery, and wide-ranging neck dissection. Therefore, clinicians should consider these risk factors and pay special attention to the postoperative management of drains in such cases.

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## 1. Introduction

In head and neck surgery for oral cancer involving large areas and neck dissection (ND), adequate postoperative management is mandatory to minimise postoperative complications due to the large amount of drainage volume (DV). Postoperative DV is associated with operative factors, such as the amount of blood loss, surgical method, reconstruction method, operative time, and area of ND. Large DV after head and neck surgery is associated with postoperative complications including haematoma, seroma, wound infection, and delayed healing [1–3]. Closed drainage removes tissue fluids and eradicates the dead space postoperatively, and thus reduces complications [2,4,5].

Generally, surgeons determine the timing of drain removal based on the DV, usually measured over a 24-h period. Some investigators have reported that the drain should be removed when the DV is  $\leq 25$  ml over a 24-h period (approximately 1 ml/h) [6–8]. Therefore, if DV per day does not decrease, the total DV will increase and prolong the timing of drain removal. However, the drainage tube causes discomfort to the patient, and long-term drainage may result in wound infection via the drainage route [9,10]. Also, some reports have documented complications associated with the

DV, such as the formation of salivary or chylous fistulae [11,12]. Therefore, it is likely that there are other factors associated with the DV and postoperative complications. However, there is little information available concerning the postoperative and operative factors that influence postoperative DV. In the current study, we retrospectively investigated the relationship between postoperative drainage and various factors in patients undergoing head and neck surgery for oral cancer.

## 2. Patients & methods

The Institutional Review Board of Kobe University Graduate School of Medicine approved the study. Between April 2008 and March 2013, 142 patients with oral cancer underwent major head and neck surgery with ND at the Department of Oral and Maxillofacial Surgery, Kobe University Hospital. Six patients who underwent reoperation of a free flap due to thrombosis were excluded. Therefore, a total of 136 patients (88 males and 48 females) were evaluated. Mean patient age was  $67.2 \pm 12.9$  years (range 27–88 years). Only two patients underwent excision and ND twice because of tumour recurrence. Patients underwent wide excision of the primary tumour and/or ND, with either radical ND, modified radical

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ND, or selective ND. The sternocleidomastoid muscle was preserved in selective ND. Primary tumour resection (TR) plus ND was performed in 125 cases, and ND only was performed in 13 cases. TR plus ND was conducted using a pull-through operation in 104 cases. The patients' medical histories included cerebrovascular disease (n = 9), diabetes mellitus (n = 34), hypertension or coronary heart disease (n = 61), renal dysfunction (n = 9), psychosis or dementia (n = 15), respiratory disease (n = 11), others (n = 94), and nothing particular (n = 20); some patients had history of more than one of these conditions.

A portable, closed, active vacuum drainage system (J-Vac® Ethicon, St Louis, MO) was used in all cases. The amount of drainage was recorded in the nursing records every 24 h, and the DV from all neck drains was measured each day at 6 AM. In cases involving bilateral procedures, the DVs of the left and right sides were recorded separately. If more than one drain was inserted on a side, the total DV for all drains on that side was calculated. The drains were routinely left in place until the 24-h total DV was 25 ml or less. If the total DV was still more than 25 ml after more than 7 days postoperatively, the drain was removed at the discretion of the doctor. We investigated the following variables: age, sex, subsite, medical history, surgical procedure, operative time, blood loss, duration of drain retention, DV, postoperative complications (seroma or haematoma, chyle, wound dehiscence with abscessation, and wound dehiscence alone without infection), and postoperative blood parameters (amylase). Superficial wound dehiscence was the only postoperative complication that was excluded. The patients were divided into two groups based on the operative time (less than 12 h and more than 12 h), and the amount of blood loss (less than 800 ml and more than 800 ml).

### 2.1. Statistical analysis

Data collection and statistical analyses were carried out with SPSS 22.0 software (SPSS Inc., Chicago, IL) and StatView J-4.5 software (Abacus Concepts, Berkeley, CA). The association of each variable with the DV was tested with the Welch-T test for two groups of ordinal variables, with the Steel-Dwass test following the Kruskal-Wallis test for multiple comparisons of ordinal variables, and with Fisher's exact test for categorical variables. A value of  $p < 0.05$  was considered statistically significant. Postoperative complication was not an independent variable; therefore, this variable was excluded from the regression model. The rest of the variables were added as independent variables in the regression model. Variables with a variance inflation factor greater than 10 were excluded.

### 3. Results

The DV per day generally decreased until postoperative day (POD) 5 and then decreased slightly after POD 6 (Fig. 1). The timing of drain removal is described in Fig. 2. The timing of drain removal ranged from POD 2–9. Drain removal was most commonly performed on POD 6 (58 of 136 cases (42.6%)). The DV after TR, ND, and reconstruction with a pedicle flap was significantly greater than in all other groups ( $p < 0.05$ ). The DV after TR, ND, and reconstruction with a free flap was significantly greater than the DV after TR plus ND ( $p < 0.05$ ). The DV after reconstruction with a pectoral major musculocutaneous flap was greater than in all other reconstruction methods. The DV after reconstruction with a pectoral major musculocutaneous flap was significantly greater than the DV after reconstruction with a forearm flap ( $p < 0.05$ ). The DV was significantly greater in cases involving a large amount of blood loss or long operative time ( $p < 0.05$ , Table 1). The DV after radical ND tended to be greater than that after all other ND methods; however, this difference was not significant. The DV after modified radical

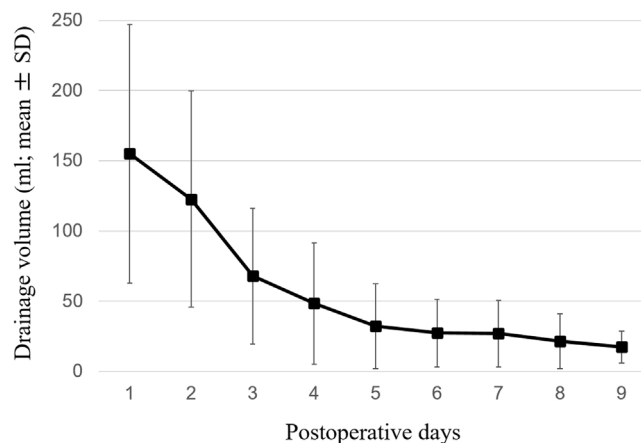


Fig. 1. Mean neck drainage volume (DV) on each postoperative day (POD) after oral cancer surgery. The DV is expressed as the mean  $\pm$  SD (ml). The DV per day mainly decreased until POD 5 and then decreased slightly after POD 6.

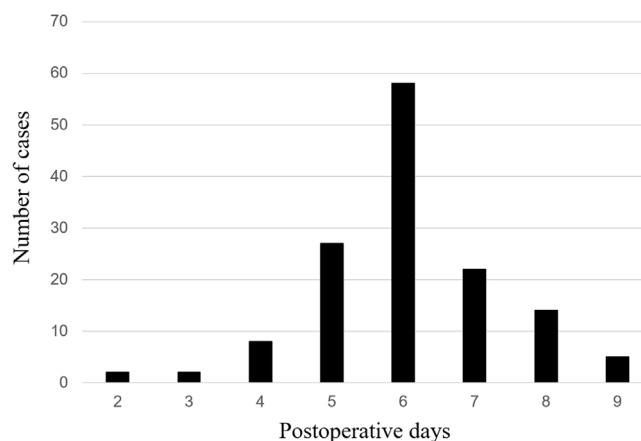


Fig. 2. Timing of neck drain removal after oral cancer surgery. The average duration of drain retention was  $6.1 \pm 1.3$  days.

ND was significantly greater than the DV after supraomohyoid ND or submandibular ND ( $p < 0.05$ , Table 1). The DV in patients with antithrombotic therapy was significantly greater than the DV in patients without ( $p < 0.05$ , Table 1).

Postoperative complications were noted in nine of the 138 cases (6.5%). The DV in cases with complications was significantly greater than the DV in those without complications ( $p < 0.05$ , Table 1). The details of postoperative complications are described in Table 2.

Table 3 presents the standardised regression coefficients and adjusted R-square for operative factors affecting the total DV after oral cancer surgery in the multiple regression analysis. The total DV was positively correlated with older age, the presence of antithrombotic therapy, type of surgery (advanced surgery), and type of ND (wide range). The combination of these variables explained 47.9% of the variance in the regression analysis of total DV.

### 4. Discussion

Several studies have investigated postoperative drainage management, and early drain removal has been conducted in an attempt to improve the rates of wound infection and shorten hospitalisation [13,14]. However, there are no standard criteria for the management of drainage after head and neck surgery. In particular, the most effective management of drainage after oral cancer remains controversial. Generally, surgeons determine the timing of drain

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