Comparison of the Efficacy of Gastric Tubes Indwelling in Pre- and Post-Operative Patients with Oral and Maxillofacial Malignancies

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1. Abstract

In order to explore the optimal timing of gastric tubes indwelling in patients with oral and maxillofacial malignancies. We chose eighty patients with oral and maxillofacial malignancies who met the inclusion and exclusion criteria and were hospitalized in the Department of Oral and Maxillofacial Surgery in our hospital from January 2021 to February 2022, were selected and divided into the pre-operative gastric tube indwelling group and post-operative indwelling group randomly. In the pre-operative indwelling group, 40 patients were placed with nasogastric tubes in the mornings before operations and then X-rays were carried out to confirm the position of the gastric tubes. The patients were observed for nausea, vomiting, abdominal distension and other discomforts, once discomfort occurred in certain patients, they would be administered with anti-vomiting treatment and nasal Nutritional Supplement (ONS) of 50-100 ml immediately. If there were any discomforts, patients would be given ONS of 50-100 ml nasally every 3 hours according to their tolerance. The remaining 40 patients were assigned to the post-operative gastric tube indwelling group, patients were indwelled with nasogastric tubes and X-rays were carried out to confirm the positions of the tubes, and then nasal enteral nutrition was given according to the above method subsequent to complete awakening and exclusion of gastrointestinal complications of patients. During the fasting periods, patients were given intravenous rehydration according to their outputs and daily physiological needs. The weights of the patients in both groups were measured before and after operations, the number of inpatient days was counted and the pre-operative and post-operative levels of hemoglobin and plasma albumin were compared at the 1st day, 3rd day and 7th day. In this study there was no statistical difference between the two groups in terms of weights after surgery. The number of inpatient days in the pre-operative indwelling group (15.25 ± 5.18 days) was significantly lower than that in the post-operative indwelling group (21.10 ± 9.74 days). The post-operative levels of hemoglobin and plasma albumin in both two groups were statistically significantly lower than the pre-operative levels (P < 0.01). Postoperatively, the levels of hemoglobin and plasma albumin in pre-operative indwelling group recovered to the preoperative levels in the 7th day approximately, the levels of hemoglobin and plasma albumin were of no statistical significance in the in pre-operative indwelling group before and after operation (P > 0.05), while the results in the post-operative indwell-
ing group were of statistical significance (P < 0.01). Moreover, the plasma albumin levels of both groups were statistically significant compared to the pre-operative levels since 3rd day postoperatively (P < 0.001). With this, we consider that pre-operative nasogastric tubes indwelling can ensure early post-operative administration of gastrointestinal nutrition to patients, promote the post-operative plasma albumin recovery and shorten the number of hospital days.

2. Introduction

Oral and maxillofacial malignancies such as tongue, gingival and lip cancers have a certain degree of mastication and swallowing impairment due to their lesions in the first station of the digestive tract, the oral cavity [16, 27, 28]. Patients are unable to ingest food by mouth immediately after surgery, and the long-term nutrition consumption of patients stricken with oral malignant tumors prone to be rapidly mal-nutritive than that with other types of tumors [8, 24, 36]. The incidence of malnutrition in patients with oral and maxillofacial tumors has been reported to be 48.9% overseas [11, 36], and similarly, data from China suggest that malnutrition accounts for 20.45% [5], with the risk of malnutrition rising from 7.5% to 78.8% on the first day after surgery, and all nutritional indicators being significantly reduced [40]. Several Enhanced Recovery After Surgery (ERAS) studies have shown that early post-operative oral feeding can promote recovery of intestinal function, protect intestinal mucosal function, prevent dysbiosis, reduce post-operative complications and shorten postoperative hospitalization days [3, 5, 18, 29, 35]. Therefore, “clinical nutrition therapy” has aroused increasing attentions of medical staffs. Affected by surgery, postoperative changes in the anatomical structure of the maxillofacial region in patients with oral and maxillofacial malignancies can lead to difficulties in the placement of nasogastric tubes, patients’ inability to cooperate with the retention of tubes due to wound pain, and the failure to take timely X-rays to confirm the right positions of tube placement may delay patients’ postoperative enteral nutrition [1, 15, 32]. Therefore, how to ensure early postoperative nutrition therapy has become a key concern for oral and maxillofacial surgery medical staffs [7]. In this study, nasogastric tubes were left in place before surgery and the patients were given warm water nasally as soon as he was fully awake after surgery, with a gradual transition to nasal feeding of whole nutrients. This method can shorten the patient’s inpatient days and promote rapidly the recovery of the patients’ nutritional indicators compared to postoperative nasogastric tubes placement, which is a safe and reliable care strategy under the guidance of ERAS concept.

3. Materials and Methods

3.1. Clinical Data

Eighty patients with oral and maxillofacial malignancies who met the inclusion criteria and were hospitalized in our department from January 2021 to February 2022 were then selected and divided into two groups by the split-random number method. The first group was named as post-operative nasogastric tubes indwelling group, with 40 patients. And the other group was named as post-operative nasogastric tubes indwelling group, with the rest 40 patients. Among the patients, the numbers of males are 50, and the females are 30, the ages of which are of (58.33±38.31) years old. All the patients were diagnosed with oral and maxillofacial malignancies: tongue cancer of 50 cases, gingival cancer of 12 cases, palate cancer of 2 cases, mandibular cancer of 8 cases and lip cancer of 8 cases. The basic conditions of the patients in both groups are shown in Table 1. Inclusion criteria: (1) pathologically diagnosed oral and maxillofacial malignant tumors and the need for nasal feeding diet after surgery; (2) no radiotherapy or chemotherapy treatment before surgery; (3) no digestive system diseases; (4) the same group of staffs that perform health care for pre-operative and post-operative patients; (5) no transfusion of blood products during hospitalization. Exclusion criteria: (1) presence of severe anemia (hemoglobin < 60g/L) in the pre-operative examination; (2) combination of malignant tumors from other sites of the body; (3) transfer to ICU for further treatment after surgery; (4) transfusion of blood products during pre-operative period and the first 7 days after surgery; (5) combination of liver cirrhosis, liver failure, glomerulonephritis, nephrotic syndrome, renal failure, long-term dialysis and other wasting diseases; (6) other postoperative complications.

<table>
<thead>
<tr>
<th>Items</th>
<th>Pre-operative (n=40)</th>
<th>Post-operative (n=40)</th>
<th>p-value</th>
<th>t-value / X²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (M/F)</td>
<td>27/13</td>
<td>23/17</td>
<td>0.489</td>
<td>0.48</td>
</tr>
<tr>
<td>Ages (years)</td>
<td>58.33 ± 11.74</td>
<td>58.00 ± 15.61</td>
<td>0.916</td>
<td>0.105</td>
</tr>
<tr>
<td>Admission weights (kg)</td>
<td>57.69 ± 12.07</td>
<td>57.39 ± 10.43</td>
<td>0.906</td>
<td>0.119</td>
</tr>
<tr>
<td>Preoperative hemoglobin (g/L)</td>
<td>124.50 ± 18.03</td>
<td>128.02 ± 16.13</td>
<td>0.36</td>
<td>-0.922</td>
</tr>
<tr>
<td>Preoperative plasma albumin (g/L)</td>
<td>38.70 ± 3.55</td>
<td>37.54 ± 3.22</td>
<td>0.128</td>
<td>1.54</td>
</tr>
</tbody>
</table>

3.2. Methods

3.2.1. Post-Operative Group: Patients in the post-operative group were fasted for 12 hours preoperatively and 6 hours postoperatively, then the nasogastric tubes were placed in the patients in the 1st day after operations under the circumstance of being awake, cooperative with medical staffs and without gastrointestinal complications. If there were any discomforts, the patients were given 50-100 ml of ONS nasally every 3 hours according to the patients’ tolerance conditions [1]. During the fasting period, rehydration was administered according to the patient’s output and physiological needs.
3.2.2. Pre-Operative Group: Patients in the pre-operative group were fasted for 12 hours and deprived of water for 6 hours before operations. In the mornings before operations, nasogastric tubes were placed in the patients, further the radiological checks were carried out to confirm and adjust the positions of the tubes.

3.3. Observation Indicators

Fasting weights of patients were measured at the time of admissions and at the time of discharges in both groups. Fasting blood of the patients was drawn for the tests of hemoglobin and plasma albumin at the time of admissions, and in the mornings of the 1st, 3rd and 7th days postoperatively for both groups respectively. The data were collected for further analysis of the total inpatient days of both groups.

3.4. Statistical Methods

All data were analyzed with SPSS statistical software (version 22.0). The results of continuous variables were showed as mean ± standard deviation and the data were compared using paired samples t-test; P < 0.05 was considered statistically significant.

4. Results

4.1. Clinical Characteristics of the Both Two Groups of Patients

As the data shown in Table 1, there was no statistical difference between the two groups in terms of general information, admission weights, the levels of pre-operative hemoglobin and plasma albumin (P > 0.05) (Table 1).

4.2. Comparison of Early Postoperative Nutritional Indicators and Inpatient Days

As shown in Table 2, all patients had no postoperative complications and there was no statistical difference in weight change between the two groups at the time of admission and discharge. Moreover, no statistical difference in hemoglobin concentration existed except on the 3rd days postoperatively (P = 0.020). However, statistically significant difference was found in plasma albumin concentration on 3rd and 7th days postoperatively (P < 0.001), and the number of inpatient days was significantly shorter in the preoperative group than that in the postoperative group (P = 0.001) (Table 2).

Table 2: Comparison of nutritional indicators and length of hospital stay between the two groups

<table>
<thead>
<tr>
<th>Items</th>
<th>Time points</th>
<th>Pre-operative (n=40)</th>
<th>Post-operative (n=40)</th>
<th>p-value</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (g/L)</td>
<td>At admission</td>
<td>124.50 ± 18.03</td>
<td>128.02 ± 16.13</td>
<td>0.36</td>
<td>-0.922</td>
</tr>
<tr>
<td></td>
<td>Postoperative 1st day</td>
<td>103.22 ± 18.03</td>
<td>105.83 ± 14.39</td>
<td>0.429</td>
<td>-0.796</td>
</tr>
<tr>
<td></td>
<td>Postoperative 3rd day</td>
<td>109.08 ± 13.31</td>
<td>101.95 ± 13.51</td>
<td>0.02</td>
<td>2.376</td>
</tr>
<tr>
<td></td>
<td>Postoperative 7th day</td>
<td>117.67 ± 13.09</td>
<td>106.58 ± 11.01</td>
<td>&lt; 0.001</td>
<td>4.104</td>
</tr>
<tr>
<td>Plasma albumin (g/L)</td>
<td>At admission</td>
<td>38.70 ± 3.55</td>
<td>37.54 ± 3.22</td>
<td>0.128</td>
<td>1.54</td>
</tr>
<tr>
<td></td>
<td>Postoperative 1st day</td>
<td>30.51 ± 3.09</td>
<td>30.41 ± 3.44</td>
<td>0.896</td>
<td>0.131</td>
</tr>
<tr>
<td></td>
<td>Postoperative 3rd day</td>
<td>34.51 ± 2.03</td>
<td>31.54 ± 2.51</td>
<td>&lt; 0.001</td>
<td>5.823</td>
</tr>
<tr>
<td></td>
<td>Postoperative 7th day</td>
<td>38.19 ± 2.24</td>
<td>33.13 ± 1.97</td>
<td>&lt; 0.001</td>
<td>10.72</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>At admission</td>
<td>57.69 ± 12.07</td>
<td>57.39 ± 10.43</td>
<td>0.906</td>
<td>0.119</td>
</tr>
<tr>
<td></td>
<td>At discharge</td>
<td>57.56 ± 11.58</td>
<td>54.02 ± 9.87</td>
<td>0.145</td>
<td>1.471</td>
</tr>
<tr>
<td>Length of inpatient (days)</td>
<td>---</td>
<td>15.25 ± 5.18</td>
<td>21.10 ± 9.74</td>
<td>0.001</td>
<td>-3.352</td>
</tr>
<tr>
<td>Timing of post-operative food intake</td>
<td>Post-operative time (h)</td>
<td>5.70 ± 1.22</td>
<td>22.5 ± 2.49</td>
<td>&lt; 0.001</td>
<td>-38.343</td>
</tr>
</tbody>
</table>

4.3. Dynamic Changes in Nutritional Indicators and Weight

As the data shown (Table 3, Figure 1, Figure 2, Figure 3), there was no statistically significant difference between the preoperative group and the preoperative weight at discharge (P = 0.565). Nevertheless, a significant difference existed between the postoperative group and the preoperative weight at discharge (P < 0.001). As for plasma albumin levels, there was a significant difference between the preoperative and postoperative groups on the 1st day compared to the preoperative (P < 0.001), but no statistically significant change between the two groups (P = 0.244). Besides, there was no statistically significant difference in plasma albumin levels on the 7th day postoperatively in the preoperative group compared to preoperative (P > 0.05), but a statistically significant difference in plasma albumin levels on the 7th day postoperatively existed in the postoperative group compared to preoperative (P < 0.001) (Table 3).
Table 3: Comparison of nutritional indicators and body weight between the two groups of patients with oral and maxillofacial tumors with different nutritional modalities.

<table>
<thead>
<tr>
<th>Items</th>
<th>Time points</th>
<th>Pre-operative</th>
<th>Post-operative</th>
<th>p-value (t-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Intra-group</td>
<td>Intra-group</td>
<td>Between-group</td>
</tr>
<tr>
<td></td>
<td></td>
<td>p-value</td>
<td>p-value</td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>Discharge vs Admission</td>
<td>-0.12 ± 1.40</td>
<td>0.575 (0.565)</td>
<td>-3.36 ± 2.56</td>
</tr>
<tr>
<td></td>
<td>7th days post-op vs admission</td>
<td>-6.82 ± 9.56</td>
<td>&lt; 0.001 (4.513)</td>
<td>-21.45 ± 10.65</td>
</tr>
<tr>
<td></td>
<td>7th days post-op vs 1st days after admission</td>
<td>14.45 ± 8.36</td>
<td>&lt; 0.001 (-10.927)</td>
<td>0.75 ± 9.00</td>
</tr>
<tr>
<td></td>
<td>7th days post-op vs 3rd days after admission</td>
<td>8.60 ± 5.75</td>
<td>&lt; 0.001 (-9.466)</td>
<td>4.62 ± 5.27</td>
</tr>
<tr>
<td></td>
<td>3rd days post-op vs admission</td>
<td>-15.43 ± 11.08</td>
<td>&lt; 0.001 (8.807)</td>
<td>-26.08 ± 13.13</td>
</tr>
<tr>
<td></td>
<td>3rd days post-op vs 1st day post-op</td>
<td>5.85 ± 7.47</td>
<td>&lt; 0.001 (-4.952)</td>
<td>-3.88 ± 9.17</td>
</tr>
<tr>
<td></td>
<td>1st day post-op vs admission</td>
<td>-21.27 ± 12.51</td>
<td>&lt; 0.001 (10.754)</td>
<td>-22.20 ± 11.34</td>
</tr>
<tr>
<td>Hemoglobin (g/L)</td>
<td>7th days post-op vs admission</td>
<td>-0.52 ± 4.16</td>
<td>0.435 (0.789)</td>
<td>-4.41 ± 3.08</td>
</tr>
<tr>
<td></td>
<td>7th days post-op vs 1st day after admission</td>
<td>7.68 ± 3.28</td>
<td>&lt; 0.001 (-14.809)</td>
<td>2.72 ± 2.61</td>
</tr>
<tr>
<td></td>
<td>7th days post-op vs 3rd days after admission</td>
<td>3.67 ± 2.24</td>
<td>&lt; 0.001 (-10.351)</td>
<td>1.58 ± 1.38</td>
</tr>
<tr>
<td></td>
<td>3rd days post-op vs admission</td>
<td>-4.19 ± 3.48</td>
<td>&lt; 0.001 (-7.624)</td>
<td>-5.99 ± 3.20</td>
</tr>
<tr>
<td></td>
<td>3rd days post-op vs 1st day post-op</td>
<td>4.01 ± 3.21</td>
<td>&lt; 0.001 (7.900)</td>
<td>1.13 ± 2.28</td>
</tr>
<tr>
<td></td>
<td>1st days post-op vs admission</td>
<td>-8.20 ± 4.41</td>
<td>&lt; 0.001 (11.751)</td>
<td>-7.13 ± 3.73</td>
</tr>
</tbody>
</table>

**Figure 1:** Intra-group comparison of body weight in two groups of patients with oral and maxillofacial tumours under different nutritional modalities.
Notes: ***: *P<0.001; **: *P<0.01; *: *P<0.05

**Figure 2:** Intra-group comparison of haemoglobin in two groups of patients with oral and maxillofacial tumours under different nutritional modalities.
Notes: ***: *P<0.001; **: *P<0.01; *: *P<0.05
With the development of ERAS, more and more scholars have started to pay attention to the early postoperative nutrition of patients. Prospective studies have shown that postoperative gynecological patients can be given a light liquid diet on the first postoperative day [14, 21, 25], furthermore, some scholars have shown that it is safe and feasible to start gradually giving a liquid diet to children with a postoperative awakening scores more than 7 in infant laparoscopic surgery in urology, which can reduce the crying rates and shorten the number of postoperative inpatients days [4, 20, 31]. Xiong ZY et al (ZY and Ke et al., 2021). summarized the best evidence on oral nutritional supplementation in perioperative patients: early resumption of oral feeding after surgery is not only safe and beneficial, but also is effective in reducing the incidence of postoperative complications such as infectious diseases. And oral feeding within 24 hours after surgery is advocated worldwide [10, 26, 39]. In this study, the patients in the preoperative nasogastric tubes indwelling group recovered better than that in the postoperative group in all nutritional parameters. In view of the fact that if the postoperative gastric tubes were to be indwelled in patients, the patients must be fully awake, have no gastrointestinal complications and be cooperative with medical staffs. In addition, the postoperative patients’ swallowing functions impaired due to anesthesia and the change of anatomical structures, which makes the gastric tubes difficult to be indwelled and delays early nutrition intake postoperatively.

5.3. Preoperative Gastric Tubes Indwelling Possess Advantages Over Postoperative Gastric Tubes Indwelling in Terms of Ease of Handling and Gastric Tubes Positioning.

The hearing of gurgling sound method has been proven that it can’t be used for initial positioning of the gastric tube in several studies [19, 23, 38]. The American Association of Critical Care Nurse (AACN) 2016 publication “Initial and ongoing validation of feeding tube placement in adults” states that the gold standard for gastric tube positioning is radiographic radiography [6] and that patients need to be radiographically positioned to confirm gastric tube locations after gastric tubes indwelling, whereas the excision and simultaneous reconstruction of oral and maxillofacial tumors last for a fairly long time (about 8–10 hours). Furthermore, there exists safety threats in the patients’ postoperative transport when they are moved to take X-rays, moreover, pain and other discomforts could arise. And filming X-rays at the bedside can expose other patients in the same ward to radiation damage, which is hazardous. This study suggests that preoperative gastric tubes placement has the following advantages: Firstly, the anatomical structures are normal which is easy for tubes placement. Secondly, patients are awake and can cooperate with the nurses. Thirdly, the tubes do not interfere with the patient’s movement, and the patient can move by themselves to radiological departments to confirm the positions of the tube on his own. Last but not least, there were no complications of patients from anesthesia due to the placement of the gastric tubes. Hence, we believe that it is safe and better to...
place the gastric tube preoperatively.

6. Summary
This study used the ERAS concept to implement early postoperative enteral nutrition by changing the timing of the patient’s gastric tubes indwelling, which could effectively improve the patient’s nutritional parameters and maximize the patient’s benefits. However, the ERAS concept covers three aspects of the patient: preoperative, intraoperative and postoperative. This study is limited to the implementation of early postoperative enteral nutrition measures, which still has certain limitations, and full cooperation with anesthetists and dieticians is still needed in the future to improve the patient’s perioperative nutrition and promote the level of postoperative recovery.

7. Relevance for Clinical Practice
In previous clinical work, patients undergoing surgery for oral and maxillofacial malignancies would have a post-operative gastric tube inserted. In this controlled clinical trial, it was found that advancing the placement of patients’ gastric tubes to the preoperative period would ensure ease of operation for the nurses, ensure safety after placement and most importantly, ensure early postoperative feeding and provide an effective means of postoperative nutritional support for patients. The comparison revealed that the patients’ postoperative nutritional indicators were significantly better than those of the postoperative gastric tube placement group, which was conducive to postoperative recovery, shortening the length of hospital stay and improving patients’ treatment outcome and satisfaction.

6. Acknowledgements
The authors thank all of the patients analysed in this study. All of the authors have final responsibility for the decision to submit this manuscript for publication.

References


