



The use of negative pressure therapy in the treatment of defects resulting from failed reconstruction in the neck region

Negative pressure therapy in the neck region

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Abstract

Aim: Reconstruction of defects after tumor excision in neck region is very difficult because fistula formation between oral cavity/pharyngeal space and defects is frequently encountered. Salivary swelling through the fistula disrupts wound healing. This study aims to show the effectiveness of negative pressure treatment (NPT) in the treatment of neck defect with fistula formation. **Material and Method:** Patients who had neck defects with orocutaneous or pharyngocutaneous fistula and treated with NPT between January 2012 and January 2015 were included in the study. **Result:** 9 patient who had neck defects with orocutaneous or pharyngocutaneous fistula treated with NPT between January 2012 and January 2015. With the application of an average of 6.11 sessions NPT treatment, the salivary secretion terminated and the formation of granulation tissue was provided. With NPT, secondary healing was observed in 2 patients, and the defect was reconstructed with a local flap in the other 7 patients. **Discussion:** It is recommended that NPT can be used to repair the defects with orocutaneous or pharyngocutaneous fistules in neck region

Keywords

Neck; Fistula; Negative Pressure Therapy

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Introduction

Reconstruction of defects after tumor excision in the head and neck region is very difficult due to the irregularity of the region's surface, inadequacy of local tissues, and frequent infection depending on proximity to the mouth flora. The most commonly used method for reconstruction of defects in the head and neck region is flap reconstruction. In the treatment of cancers in the head and neck region, preoperative or postoperative radiotherapy is mostly used in addition to surgical excision of the tumor. Radiotherapy increases the incidence of partial or total flap loss and causes the failure of reconstruction since it disrupts the skin circulation in this area [1,2]. After radiotherapy, a fistula connecting the oral cavity and the pharyngeal space is frequently encountered in defects in the neck region. The secretions in the mouth and pharynx accumulate in the dead space created by these fistulas after tumor excision and neck dissection, and this situation increases mortality and morbidity by causing complications such as deep neck infection, rupture of large vessels, and flap loss [1,2].

In 2008, Andwers et al. used negative pressure therapy (NPT) for the first time in the repair of defects in the neck region and reported to achieve successful results [3,4]. NPT is an active wound closure method used in the treatment of acute, subacute, chronic and infected wounds. Thanks to NPT, large defects can be closed with a simpler surgery method, and small defects can be closed without surgery [5]. Many studies have shown that NPT is effective in the various types of wounds (e.g. trauma, burn, oncologic resection, radiation, and vascular insufficiency) in different locations such as the abdomen, perineum, trunk, and limbs [2].

This study is aimed to share our experience with the use of NPT in the treatment of defects accompanied by orocutaneous and pharyngocutaneous fistulas, which developed following failed reconstruction after tumor excision in the tissues of the neck where radiotherapy was applied.

Material and Method

After institutional review board approval, patients who underwent tumor excision and neck dissection and were treated with radiotherapy between January 2012 and January 2015 were examined retrospectively. Patients who had orocutaneous and pharyngocutaneous fistulas and defects after failed reconstruction in the neck region and who underwent NPT for the treatment of these defects were included in the study. The age, gender, primary disease, duration of NPT and reconstruction method of the patients were determined.

All patients underwent NPT using the vacuum assisted closure (VAC) device (Kinetic Concepts, Inc., San Antonio, Texas, USA). After the polyurethane sponge was cut according to the wound size, it was placed on the wound surface so that the entire surface would be filled but not over the wound. Then, it was sealed with an adhesive sheet to create an airtight environment. A hose was attached to a small hole opened on the sponge, and the other end of the hose was connected to the collection container in the device. The pressure was set at 125 mmHg. It was applied in a continuous mode during the first 24 hours and then in

an intermittent mode (5:1). The VAC sponge was changed every three days.



Figure 1. A 65-year-old male patient underwent tumor excision with simultaneous neck dissection and radiotherapy due to the floor of the mouth cancer. Necrosis was seen in neck flaps 1 week after surgery, and the salivary flow was observed in the suture line. After surgical debridement, the opening of fistula in the patient's mouth base was sutured, and NPT was started. The defect was obliterated after 6 sessions of NPT and salivary secretion terminated. The defect of the patient was reconstructed with local flaps.

Table 1. Demographical, clinic and treatment characteristics of patient

No	Gender	Age	Diagnosis	Type of fistula	Number of NPT session	Type of Reconstruction
1	M	52	Larynx Cancer	Pharyngocutaneous	4	Secondary healing
2	M	56	Larynx Cancer	Pharyngocutaneous	5	Local Flap
3	M	65	Oral Cancer	Orocutaneous	8	Local Flap
4	M	69	Oral Cancer	Orocutaneous	6	Secondary healing
5	M	71	Larynx Cancer	Pharyngocutaneous	5	Local Flap
6	M	58	Larynx Cancer	Pharyngocutaneous	6	Local Flap
7	M	51	Oral Cancer	Orocutaneous	9	Local Flap
8	M	63	Oral Cancer	Orocutaneous	7	Local Flap
9	M	67	Larynx Cancer	Pharyngocutaneous	5	Local Flap

Result

There were 9 male patients who had orocutaneous and pharyngocutaneous fistulas and defects after failed reconstruction in the neck region and who underwent NPT for the treatment of these defects between January 2012 and January 2015. The mean age of the patients was calculated as 61.33 years. Five patients were operated due to laryngeal carcinoma, and 4 patients were operated due to the cancer of the mouth floor in the Department of Otolaryngology. Each patient underwent modified radical neck dissection. All patients underwent radiotherapy before surgery. In the postoperative period, a pharyngocutaneous fistula developed in patients operated due to larynx carcinoma, and orocutaneous fistula developed in patients operated due to the floor of the mouth cancer. No large vessels were seen on the floor of the defect in any of the patients.

The wounds of all patients were debrided under general anesthesia, and orocutaneous and pharyngocutaneous fistulas were sutured so that mucosal side was airtight and waterproof. Then, NPT was started. NPT was applied for an average of 6.11 sessions until the dead spaces within the wound became obliterated, the salivary secretion terminated, and the formation of granulation tissue was provided. Secondary healing with NPT was observed in 2 patients, and the defect was reconstructed with a local flap in the other 7 patients.

Discussion

In NPT, the negative pressure is applied equally to the entire wound surface with the help of a sponge made of polyurethane foam. With the negative pressure applied, excess exudate and edema are absorbed, and turgor pressure is reduced. Thus, the vessels around the wound are dilated, and blood flow and oxygenation to the wound area increase [4].

The negative pressure also reduces the bacterial load on the wound and creates an equal amount of mechanical force against the tissues around the wound [5,6]. Mechanical force induces angiogenesis and tissue growth in the tissues and allows the surrounding tissues to move towards the center of the defect, and eventually, the wound sizes are getting smaller [7]. It was shown that NPT increased the formation of granulation tissue 4 times compared to the moist wound dressing and increased the healing rate by shortening the wound healing process [8,9]. In defects occurring after tumor resection in the neck region, orocutaneous and pharyngocutaneous fistulas can develop due to the proximity of the defect to the oral cavity and the pharyngeal wall [1,2]. Orocutaneous and pharyngocutaneous fistulas mainly develop due to the poor circulation in the tissues in the region after radiotherapy and the improper suture techniques [1]. Saliva flows into the defects through orocutaneous and pharyngocutaneous fistulas. Saliva that accumulates here also leads to infection or soft tissue necrosis, resulting in the failure of reconstruction. Thus, failed reconstruction causes defects to occur again.

In the treatment of orocutaneous and pharyngocutaneous fistulas, it is first necessary to suture the mucosa as airtight and waterproof. The system will not work if there is air leakage in the environment during NPT. Therefore, the fact that the system actively works shows that it is sutured so that mucosal side

is airtight and waterproof. This situation further accelerates wound healing by ensuring that the salivary secretion does not occur [1,3].

125 mmHg negative pressure was used in our study. When the effects of different amounts of the negative pressure on the wound were examined, it was determined that the optimal negative pressure was 125 mmHg [10]. High negative pressure disrupts wound healing by creating ischemia. Conversely, low negative pressure does not adequately increase microvascular blood flow. The balance between high and low negative pressure can be achieved by assessing the patient's microvascular blood flow, the patient's ability to tolerate it, and detection of lymphatic drainage. In our study, 125 mmHg negative pressure applied to the neck region was easily tolerated by all patients and accelerated wound healing. Since NPT is portable, the patients were not required to adhere to the bed during our study. The fact that wound dressing was changed every 3 days significantly reduced the workload of the healthcare team. Previous studies have shown that the cost of NPT was lower than that of conventional therapy [1,11].

Some complications such as adhesion of sponges to wound region, pain, and damage of vessels that are exposed can be seen after NPT, but these adverse complications were not seen in any of the patients in our study [1].

In our study, orocutaneous and pharyngocutaneous fistulas were obliterated with NPT in all patients, and wound healing was shown to be faster. All defects could be reconstructed as secondary or by local flaps.

Conclusion

It was observed that use of NPT accelerated wound healing and healing of orocutaneous fistula in the head and neck region which is a difficult reconstruction site. For these reasons, it is recommended to be used in the repair of defects in the head and neck region.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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