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# Closed suction drainage for deep neck infections

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ABSTRACT

*Purpose:* There have been various incision and drainage methods for deep neck infection (DNI). Closed-suction drainage (CSD) has been used to decrease hematoma or to drain pus in other forms of medical surgery. The purpose of this investigation was to evaluate the usefulness of CSD for DNI.

*Patients and methods:* This study consisted of 30 patients who underwent CSD after incision and drainage for DNI between January 2006 and December 2011. The patients' demographics, systemic diseases, methods of airway control, involved spaces, incision, CSD results, duration of hospitalization, and complications were investigated.

*Results:* CSD was used to treat 30 DNI patients. Eleven patients (37%) had underlying systemic diseases like diabetes mellitus, hypertension, hepatitis, asthma, etc. Twenty four patients (80%) had odontogenic infections in the mandibular molar region. Tracheostomy was performed in 5 patients (17%). The involved spaces were various from parapharyngeal space to mediastinum (mean: 4.8 spaces), and CSD was applied with drainage lines (mean: 3; 2–7 drains) over the course of 4–37 days (mean 14.6 days). The total amount of drained pus was 8–1344 cc (mean: 406 cc) and the daily amount was 1–61 cc (mean: 28 cc) from each patient. The mean length of hospital stay was 26 days, with a range of 9–83 days. Wound rupture happened in 7% of 56 total incision sites and spontaneous removal of the drain tube occurred in 3% of 91 total tubes. Four patients died because of cardiac arrest, pulmonary edema, and hypoxia. A statistical significance was accepted about total and daily amount of drainage at Pearson's correlation test ($p < 0.001$).

*Conclusion:* Accurate diagnosis, safe airway management, and early surgical drainage were important in DNI treatment. Compared to other drainage systems, CSD is clinically useful for treating DNI due to minimal incision, convenience of post-operative management, and less postoperative complications.



## 1. Introduction

Deep neck infection (DNI) used to have high fatality and mortality. Its serious complications have considerably decreased, however, with advances in microbiology, haematology, diagnostic techniques, including computed tomography (CT) and magnetic resonance imaging (MRI), antibiotics, medical treatment, and surgical techniques (Levine et al., 1986; Parhiscar and Har-El, 2001; Sethi and Stanley, 1994; Har-El et al., 1994). However, DNI may still be life-threatening because of the risk of airway obstruction due to swelling, and of transmission of infection to critical organs such as the mediastinum due to their close proximity (Laskin, 1964). Deep neck spaces have contact with each other, thus infection in one space may easily spread to adjacent spaces. DNI involves the parapharyngeal spaces or retropharyngeal spaces, and its possible causes include upper respiratory infection, odontogenic infection, peritonsillar abscess, parotitis, oral or pharyngeal trauma, aspiration of a foreign object, congenital brachial cleft cyst, and thyroglossal duct cyst (Levine et al., 1986; Bryan et al., 1974; Haug et al., 1990; Nour et al., 2011; Huang et al., 2004). In some cases, however, the aetiology is uncertain (Huang et al., 2004; Mayor et al., 2001; Gidley et al., 1997), and studies have reported that systemic factors such as diabetes, infection with the human immune deficiency

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virus, chemotherapy, and post-organ transplantation use of an immunosuppressant may have an impact on the aetiology (Huang et al., 2004; Peterson, 1993). It has been reported that blood monocytes influence the infection persistence and treatment outcome of orofacial abscesses (Tzermpos et al., 2013). For the treatment of DNI, intravenous injection of broad-spectrum antibiotics and surgical drainage should be performed after securing the airway (Flynn, 1991). In addition, intensive supportive treatments, including intravenous supply of fluid, glucose, and other nutrients, are required, as oral intake of nutrients becomes insufficient (Van der Linden et al., 1981). Although a Penrose drain is used for continuous drainage, it has a risk of scar formation and of detachment, and is difficult to sterilize.

A closed suction drainage (CSD) is used mostly to reduce hematoma and for drainage after abdominal surgery, orthopaedic surgery, oral surgery, or neurosurgery (Jackson and Pratt, 1971; Moore et al., 1975; Browett et al., 1978; Wackym et al., 1987; Flynn, 2000). The use of CSD in the craniocervical area is an important part of the post-operative management of DNI, as it helps to promote fitness of the flap, wound healing, and revascularization, and reduces postoperative wound infection (Flynn, 2000). As such, CSD was used to drain pus as part of the treatment procedure of DNI, and yielded a good outcome, which is presented and discussed in this paper.

## 2. Patients and methods

### 2.1. Patients and surgical techniques for CSD

30 patients underwent CSD under general anaesthesia after being diagnosed with DNI in the Department of Oral and Maxillofacial Surgery in Gachon University Gil Hospital, between January 2006 and December 2011.

2% lidocaine (with epinephrine 1:100,000) was first infiltrated into the incision site, after which the submandibular approach was used for the submandibular space, parapharyngeal spaces, posterior pharyngeal or prevertebral spaces, depending on the case. To approach Ludwig's angina or the submental space, an additional incision was made in the submental area. If the infection had spread to the lower neck area, pretracheal space or to the mediastinum, a 3 cm-long skin incision was made along the anterior margin of the sternocleidomastoid muscle, and the spaces that were infected, as confirmed by CT, were approached through dissection while minimizing the damage on the anatomy and avoiding wide patency if possible (Fig. 1). Drainage of pus and gas was observed after penetrating the identified fascia. While the infected spaces were being observed, finger dissection was performed to prevent damage of the anatomy, and then inter-space connection was observed (Fig. 2). All the exposed spaces reached were intensively irrigated; a

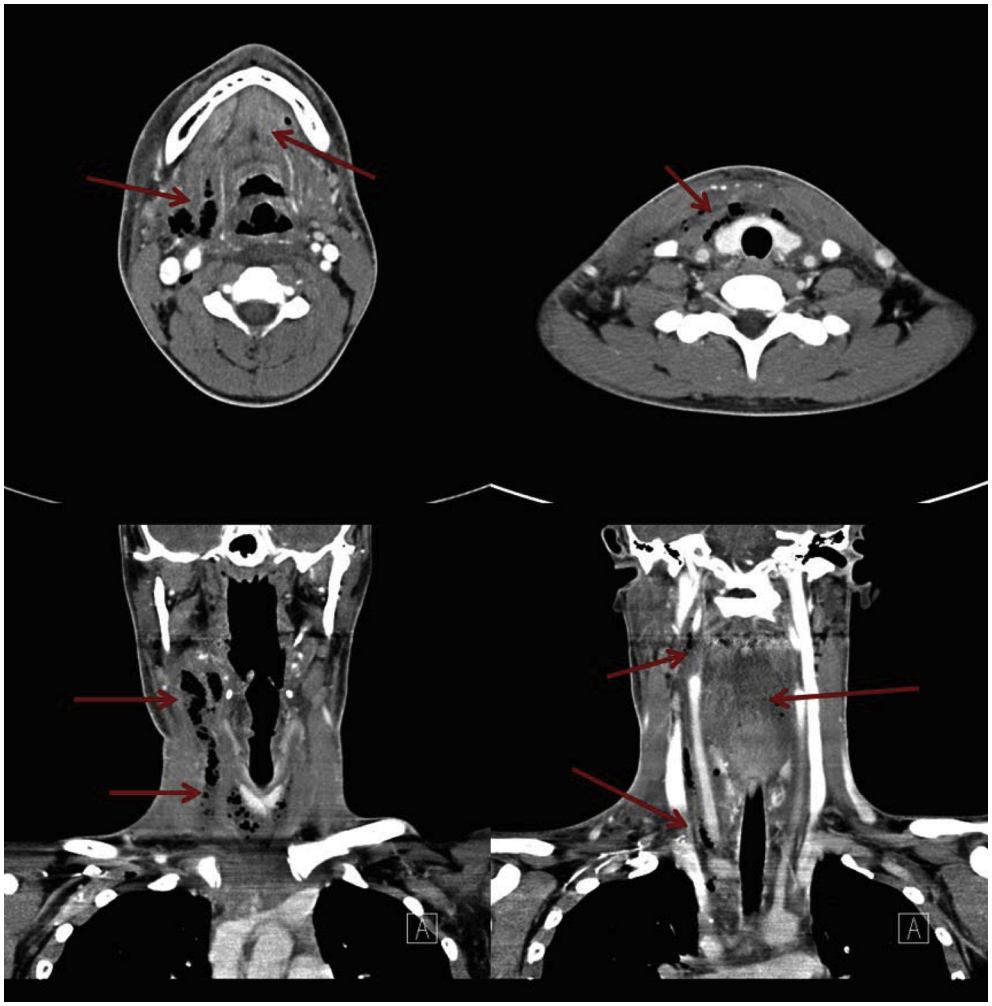

**Fig. 1.** This scans show the deep neck infection which was spread to the anterior mediastinum.