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# Submandibular Space Abscess: A Clinical Trial for Testing a New Technique

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## Abstract

**Objective.** In this study, the authors compare the external cervical approach with their new minimally invasive technique of intraoral drainage for submandibular space abscesses.

**Study Design and Setting.** In a randomized clinical trial, 40 patients with submandibular abscess entered the study in Amiralam Hospital of Tehran.

**Subjects and Methods.** Subjects were randomly divided in 2 groups of the classic external approach with skin incision in the submandibular area and the intraoral approach for abscess drainage. The data, including demographic details, need for a repeated surgery, days of postoperative hospitalization, scar formation, and possible complications, were recorded and analyzed.

**Results.** The patients required an average of 5.5 and 5.4 days of postoperative intravenous (IV) antibiotics in the intraoral and external approaches, respectively, and were discharged from the hospital 1 day after the cessation of the IV antibiotics. There was no significant difference between the 2 groups in terms of postoperative hospitalization and days of intravenous antibiotics administration. No patients had weakness in their marginal mandibular nerve or skin scarring postoperatively in the intraoral approach group.

**Conclusion.** This study reveals that submandibular abscess in selected cases can be successfully treated with an intraoral drainage approach, which is a better choice than the external technique in terms of better cosmetic outcome. Postoperative care in these patients is much easier because there is no need for daily irrigation and dressing of the wound. Also, there is possibly no risk for injury to surrounding nerves.

## Keywords

submandibular space abscess, deep neck infection, intraoral drainage

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The submandibular space is limited above by the oral mucosa of the floor of the mouth and below by the superficial layer of the deep cervical fascia as it extends from the mandible to the hyoid bone. Submandibular space is frequently involved in odontogenic infections<sup>1-4</sup> as well as a consequence of submandibular gland sialadenitis, lymphadenitis, trauma, or surgery.

Open surgical incision and drainage are considered the mainstay of treatment for submandibular space abscesses and Ludwig angina. Currently, our philosophy is to treat all patients with high doses of broad-spectrum intravenous antibiotics.<sup>5</sup> In cases of large abscesses or multiple space involvement, an open surgical incision and drainage are promptly performed. The external cervical approach is most often used when draining the submandibular space.<sup>6</sup> Minimally invasive techniques have been used more recently for well-defined, unilocular abscesses in patients who do not have airway compromise.<sup>7</sup> In this study, we compared the external cervical approach with our new technique of intraoral drainage of submandibular space abscess.

## Methods and Materials

In this randomized clinical trial, 40 patients with submandibular abscess referred to Amir-Alam Hospital affiliated with Tehran University of Medical Sciences from 2005 to 2010 entered the study. Inclusion criteria consisted of 16 to 45 years of age; presence of submandibular abscess signs and symptoms, including pain and swelling and occasional erythema of the submandibular area with or without trismus; appearance of pus during aspiration of the submandibular area; and presence of fluid collection greater than 2 cm and less than 4 cm in the greatest dimension in an axial computed tomography (CT) scan with contrast suggestive of abscess formation within the limits of the submandibular space. All patients with involvement of potentially dangerous deep neck spaces, including anterior visceral space, carotid space, and retropharyngeal space; patients with simultaneous Ludwig angina; immunosuppressed patients; and especially patients

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with diabetes or any underlying situation with more than a moderate risk of general anesthesia were excluded from the study. Informed consent was obtained from all of the patients, and the study was approved by the ethics committee of the Otorhinolaryngology Research Center of Tehran University of Medical Sciences.

The subjects were then divided into 2 groups using a random allocation chart. Because of the nature of the procedure, blinding was not possible in this study. We used the classic external approach with skin incision in the submandibular area for group 1 and an intraoral approach for group 2 for abscess drainage.

In the intraoral approach, the patients were intubated using a fiber-optic bronchoscope. An incision was made in the inferior gingiobuccal sulcus (lateral to the mandible) next to the second premolar tooth and extended posteriorly (to preserve the mental nerve). Then the incision was extended deep to the periosteum of the lateral aspect of the mandible. The periosteum was then elevated using a periosteum elevator, and the dissection proceeded toward the inferior border of the mandible. As the elevator reached the inferior border of the mandible, the instrument was turned and tilted toward the medial side, which made it possible to easily enter the space in which the abscess resided with minimal pressure. From this point, blunt dissection was performed by the surgeon's fingers. After complete drainage, the abscess cavity was irrigated using 0.9% saline solution. No catheters were placed for further postoperative irrigation. The incision was left open for secondary repair.

In the external approach, an incision was made within 2 finger-widths and parallel to the inferior border of the mandible. Blunt dissection was used to explore the involved space. The tip of the hemostat was advanced to hit bone at the inferior border of the mandible. It was then directed medially and somewhat anteriorly to drain the submandibular space. The cavity was irrigated with 0.9% saline, and suction catheters were placed in the cavity in a gravity-dependent position and fixed to the skin adjacent to the incision.

Intravenous antibiotics, including penicillin G (20-24 million units/d in 4 divided doses) and metronidazole (500 mg 3 times a day), were prescribed for all patients after admission and were continued postoperatively. Drains were rinsed twice a day using 100 cc of 0.9% saline for the patients with external surgery, and the dressings were changed whenever needed. The drains were removed 3 to 5 days after surgery based on the amount of secretion after rinsing.

Mouth rinse with chlorhexidine was prescribed for the patients in the intraoral approach. Oral antibiotics, including penicillin V (500 mg 4 times a day) and metronidazole (500 mg 3 times a day), were prescribed for 10 days after discharge in all patients.

All of the patients were visited every 2 months for 1 year after their discharge on a regular basis. The data, including demographic details, need for a repeated surgery, duration of hospitalization, scar formation, and possible complications or recurrences, were recorded and analyzed using SPSS for Windows version 17 (SPSS, Inc, an IBM Company, Chicago, Illinois).

**Table 1.** Baseline Demographic Data of the Patients Defined by Groups of Allocation

Allocated Approach	Sex, No. (%)		Age, y, Mean (SD)
	Male	Female	
External	13 (65)	7 (35)	32.7 (6.8)
Intraoral	11 (55)	9 (45)	29.1 (8.0)
Total	24 (60)	16 (40)	30.9 (7.6)

## Results

Of 56 patients with submandibular abscess, 40 met our inclusion criteria and were divided into 2 groups according to intraoral drainage or an external approach. There were no patients lost to follow-up.

From the patients of the intraoral drainage group and the external approach group, 55% and 65% were male, respectively. Baseline demographic data of the subjects are depicted in **Table 1**. We found no statistically significant difference between the 2 groups in terms of age ( $P = .13$ ). Also, preoperative symptoms were similar in both groups due to our strict inclusion criteria. The preoperative signs and symptoms, such as pain, swelling, erythema of the submandibular area, and appearance of pus during aspiration of the submandibular area, were present in all patients in both groups. According to this similarity, it can be assumed that the severity of the disease was also similar in both groups.

The patients required an average of 5.5 and 5.4 days of postoperative intravenous antibiotics in the intraoral and external approaches, respectively, and were discharged from hospital 1 day after the cessation of the intravenous (IV) antibiotics. There was no significant difference between the 2 groups in terms of postoperative hospitalization or days of IV antibiotics administration ( $P = .64$ ).

Three patients had weakness in their marginal mandibular nerve postoperatively in the external approach group, but the nerve remained intact in all of the intraoral approach group patients ( $P = .48$ ). It is important to mention that all of the operations were performed by one surgeon, so there were no differences in the surgical technique.

There were no complications such as osteomyelitis or abscess recurrences in the intraoral group. It is worth noting that all of the patients in the external group had skin scars due to incision and catheter placement in the wound, a consequence that occurred in none of the intraorally drained abscesses. Also, no drain was applied in the intraoral group. Therefore, their postoperative care was less complicated. We did not calculate the exact amount of hospitalization and treatment expenses for each patient.

## Discussion

Intraoral drainage reduced postoperative wound care, including dressing and irrigation twice a day, compared with external drainage. We did not find any significant difference between the postoperative hospitalization days.

Intraoral drainage may yield a few complications, such as fistula formation, blunting of the vestibular sulcus, injury to the mental nerve, and difficulty in early commencement of oral intake, none of which occurred in our patients.

No persistence or recurrence of abscess was detected in either group. The intraoral approach did not lead to any vascular injuries, nor was there a need for a second procedure because of inadequate drainage. The safety and efficacy of similar procedures in other deep neck infections were also confirmed by Amar and Manoukian<sup>6</sup> and Choi et al<sup>8</sup> in their studies of patients whose parapharyngeal abscesses were drained successfully through an intraoral approach.

Other benefits of the intraoral approach include the absence of a skin incision with the possibility of hypertrophic scars or keloids. The risk of injury to the marginal mandibular nerve is also eliminated. In our study, 3 patients who underwent the external approach experienced impaired movement in the innervations area of the marginal mandibular branch of the facial nerve, a complication that did not occur in the intraoral drainage approach group because of the nature of the technique. Of the 3 patients with marginal mandibular nerve injury, the nerve recovered its complete function after 8 and 12 months in 2 patients, in whom we believed the weakness had been caused by excessive tension on the nerve branch during the operation. The nerve was transected in 1 patient of the external approach group because of improper estimation of the location of the incision due to swelling around the rim of the mandible. Although a significant difference between the 2 groups regarding marginal mandibular nerve injury was not identified ( $P = .48$ ), our small sample size may limit the ability to detect the difference, especially given that all nerve injuries were isolated to the external approach.

It is our experience that, in selected cases, provided that a CT scan obtained preoperatively shows the abscess to be medial to the mandible, intraoral drainage provides several advantages over the external approach.

In this study, we did not apply the intraoral approach in cases of immune-compromised patients and diabetics in particular or patients with engagement of dangerous deep neck spaces, which have high mortality and morbidity risks. Therefore, further studies are needed to assess the efficacy of this approach in these groups.

## Conclusion

This study reveals that submandibular abscess in selected cases can be successfully treated with an intraoral drainage approach, which is a better choice than the external technique in terms of better cosmetic outcome. Postoperative care in these patients is much easier because there is no need for daily irrigation and dressing of the wound. Also, there is minimal risk for injury to surrounding nerves, but studies with bigger sample sizes may be needed to prove this matter.

## Author Contributions

**Mojtaba Mohamadi Ardehali**, conception of the study, performing the surgeries, final approval of the version to be published; **Mehrdad Jafari**, designing, analysis and interpretation of data, drafting the article, revisions; **Ali Bagheri Hagh**, designing, selecting the patients, performing the surgeries, acquisition of data, final approval of the version to be published.

## Disclosures

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