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Research Article

Approach to Deep Neck Infections: A Single-Center Experience

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ABSTRACT

Objective: The aim of this retrospective study is to describe the clinical features and management of patients diagnosed with deep neck infection (DNI) and hospitalized in our clinic, and to share our experience, together with a review of the current literature.

Methods: Patients who were diagnosed with DNI and treated in our clinic between January 2020 and June 2025 were retrospectively analyzed. Inclusion criteria: age > 18 years, complete medical records, diagnosis confirmed by clinical, laboratory, and imaging findings. Exclusion criteria: immunosuppressed patients, missing data, and pediatric cases. Diagnosis was based on clinical examination, laboratory tests, and imaging. Intravenous antibiotics were administered to all patients: incision and drainage or repeated aspiration was performed when abscesses were detected. Patients were followed for at least 3 months after discharge.

Results: Sixty-two patients, 36 male and 26 female, were included in the study. Analysis of the etiological factors causing DNI revealed that 25 (40%) cases were odontogenic in origin and 19 (30.6%) derived from tonsillitis. Surgical drainage was required in 50% of patients. The overall complication rate was 9.7%, and no mortality occurred.

Conclusion: Odontogenic infections were the leading cause of DNIs, followed by tonsillitis. Complete recovery was achieved with antibiotics alone in 50% of patients, and surgical intervention was successful in all remaining cases, resulting in 100% overall cure without recurrence. Early diagnosis and prompt combined management are key to excellent outcomes.

Keywords: Antibiotic therapy, complications, deep neck infection, treatment

INTRODUCTION

Deep neck infection (DNI) is an infection of the potential spaces of the neck, accompanied by abscess formation or cellulitis of the cervical fascia.[1] It typically arises from odontogenic sources, tonsils, salivary glands, or lymph nodes. With the widespread use of antibiotics, dental infections have become the leading cause of odontogenic issues. Symptoms may be subtle, resulting in delayed diagnosis. The most common findings are neck swelling, trismus, dysphagia, dyspnea, limited neck movement, and fever.[2] Physical examination may reveal pharyngeal wall asymmetry, tonsil or soft palate displacement, and cranial nerve palsies.[3] DNIs are usually polymicrobial, most commonly involving *Streptococcus* species, *Staphylococcus aureus,* and anaerobes.[4] Potential complications include mediastinitis, airway compromise, pleural empyema, and jugular vein thrombosis.[5] Diagnosis is aided by computed tomography (CT) or magnetic resonance imaging (MRI), and treatment consists of prompt intravenous antibiotics with surgical drainage when indicated.[6] This study aimed to evaluate the etiology, clinical features, treatment approaches, and outcomes of patients with DNI and to compare our results with the current literature.

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MATERIAL AND METHODS

The Erzincan Binali Yıldırım University Clinical Research Ethical Committee approved this study under decision no: 2025-14/01, dated 24.07.2025. The research was conducted in compliance with the principles of the Declaration of Helsinki. This study involved patients who were hospitalized and followed up with diagnoses of DNI at the Erzincan Binali Yıldırım University between January 2020 and June 2025. Patient files were evaluated retrospectively, and those with detailed medical history and examination findings were included in the study. Patients with missing data: isolated salivary gland infections, tuberculosis-related abscesses, superficial neck infections, and head and neck tumors were excluded. Gender, age, presenting complaint, the location of the neck infection, the etiological factors (if any) identified, the accompanying comorbidities, previous antibiotic use, whether abscess drainage was performed, the types of antibiotic used in treatment, the microorganisms grown if cultures were submitted, radiological images, length of hospital stay, and complications were recorded.

Our diagnostic, treatment, and follow-up algorithm was as follows: all patients first underwent detailed history-taking and physical examination, followed by routine laboratory tests, including complete blood count. In our study, all patients underwent at least one imaging modality, specifically ultrasonography (US) and/or contrast-enhanced CT. Additionally, MRI was performed in selected cases with suspicion of deep or atypical involvement. Empirical intravenous antibiotic therapy was initiated immediately after diagnosis. In patients with abscess formation, surgical drainage or needle aspiration was performed, and antibiotic regimens were subsequently adjusted according to culture results. Patients were monitored during hospitalization until clinical stabilization and scheduled for weekly follow-up visits in the early post-discharge period, with longer intervals thereafter, for a total follow-up ranging from 3 weeks to 6 months. The data obtained are discussed in the light of the current literature.

Statistical Analysis

Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) Statistics Version 23.0 (IBM Corporation, Armonk, NY, USA). The data obtained were subjected to statistical analysis. Categorical variables were expressed as numbers and percentage.

MAIN POINTS

- Odontogenic infections were the leading cause of deep neck infections, followed by tonsillitis.
- Complete recovery was achieved in all 62 patients, with 50% treated successfully with antibiotics alone and the rest requiring surgical intervention.
- Early diagnosis and combined medical-surgical management are crucial to prevent life-threatening complications and ensure excellent outcomes.

RESULTS

Sixty-two patients, 36 male and 26 female, with a mean age of 44.6 years (range, 7-82 years), were included in the study. Dental infections were the most frequent cause, accounting for 40% of cases, followed by tonsillitis (30.6%). No etiological factor was identified in 20.9% of patients (Table 1).

The most common presenting symptom was swelling of the head and neck (46.7%), followed by sore throat, and dysphagia. A smaller number of patients presented with restricted neck mobility or tongue swelling. These symptoms were observed both in isolation and in combination. Some patients also exhibited systemic symptoms such as fever, muscle and joint pain, and fatigue (Table 2).

The mean duration from symptom onset to hospital admission was 5.3 days (range, 2-21). Antibiotic therapy had already been initiated in 88.7% of patients. The submandibular and peritonsillar regions were the most commonly affected sites, followed by the parapharyngeal, retropharyngeal, and lateral cervical spaces. Less frequent involvement was observed in the tongue and suboccipital region (Table 3).

Table 1. Etiology of Deep Neck Infections

Etiological factor	Number of patients (n)	Percentage (%)
Odontogenic infection	25	40
Tonsillit	19	30.6
Upper respiratory tract infection	3	4.8
Wound infection	2	3.2
Idiopathic	13	20.9

Table 2. Symptoms of Patients with Deep Neck Infection

Symptom	Number of patients (n)	Percentage (%)
Swelling in the head and neck	29	46.7
Sore throat	20	32.2
Difficulty swallowing and impaired oral intake	19	30.6
Limited neck movement	3	4.8
Swollen tongue	2	3.2

Table 3. Infection Sites in Patients with Deep Neck Infection

Injection sites	Number of patients (n)	Percentage (%)
Submandibular	25	40.3
Peritonsillar	19	30.6
Parapharyngeal	5	8
Retropharyngeal	5	8
Lateral neck regions	5	8
Tongue	2	3.2
Supoccipital	1	1.6

The most frequently employed antibiotics were clindamycin (52%) and penicillin (25%). Tetracyclines, cephalosporins, and vancomycin were less frequently used. US alone was used for diagnosis in 16 (25.8%) cases, CT alone in nine (15%) cases, and both ultrasound and CT in 21 cases. MRI was performed in addition to CT in six (9.6%) cases.

Eighteen (29%) patients underwent incision and drainage, and 13 (20.9%) patients underwent repeated aspiration. Bacterial growth was detected in 50% of the 31 patients who underwent aspiration or drainage. Complete clinical recovery was achieved with antibiotic therapy alone in 31 patients (50%). Surgical drainage or aspiration was performed in 31 patients, and treatment was successful in all of them. Overall, infection resolved without recurrence in all 62 patients. *Streptococcal* species constituted 68.7% (n=11) of these, followed by *Klebsiella* species (6.2%) and *Bacteroides* species (6.2%). In addition, tularemia testing was performed in 17 patients with clinical suspicion, and five of them (29.4%) tested positive.

Hypertension was present in 14 of these patients, diabetes mellitus in 10, coronary artery disease in nine, and pulmonary disease in seven. Our patients' mean length of hospital stay was 7.1 days (range, 3-14). Complications included mediastinitis in two patients, acute respiratory distress in three, and pleural effusion in one (Figure 1). No mortality due to DNI occurred.

Patients were monitored regularly during hospitalization and were scheduled for weekly follow-up visits in the early post-discharge period, followed by progressively longer intervals thereafter, for a total follow-up period ranging from 3 weeks to 6 months. During follow-up, clinical improvement, resolution of infection, and recurrence were assessed.

DISCUSSION

In our study, odontogenic infections were the most common etiological factor (40%), followed by tonsillar infections (30.6%). These findings are consistent with recent reports indicating that odontogenic infections have replaced tonsillitis as the leading cause of DNI in adults. Tonsillitis, however, remains the most common etiology in pediatric populations.[7] An idiopathic etiology was observed in 20.9% of our patients, which is comparable to previously published series reporting up to 20% of DNI cases with no identified cause, the majority of which were children.[8] In addition, our findings are consistent with previous reports indicating that tularemia, although rare, should be considered in the differential diagnosis of cervical masses.[9]

The subdivisions of DNI generally consist of the submandibular, parotid, peritonsillar, parapharyngeal, and retropharyngeal spaces. It is generally agreed that the submandibular space is the most frequently affected area. This is likely due to the proximity of odontogenic infections, the most common etiological factor, to the submandibular region.[10] In their study of 270 DNI patients, Gujrathi et al.[11] reported that the submandibular region was the most frequently affected area at 30%, followed by the peritonsillar region at 13%. In another study, of 300 patients, Desa et al.[12] described the submandibular region as the most frequently affected area, at 55%, followed by the paraphageal space, at 45%. Those authors also reported the presence of tonsillar infections beneath the parapharyngeal abscesses. In the present study, the submandibular region was the most frequently affected area at 40.3%. The etiological factor in the majority of these patients was odontogenic infections. We also observed that parapharyngeal abscesses generally develop after tonsillopharyngitis infection.

The most common symptoms of DNI include neck swelling, fever, shortness of breath, dysphagia, odynophagia, trismus, limited neck movement, and voice changes. In advanced cases, the abscess may rupture spontaneously, either intraorally or externally, and the patient may present with a discharge complaint. US can facilitate diagnosis due to its high accessibility. However, because evaluation of deep structures such as the retropharyngeal, parapharyngeal, and mediastinal areas can be difficult with this method, detailed evaluation with contrast-enhanced neck CT, or MRI is required, especially in patients with severe infection.[13] This method permits differentiation between cellulitis and abscesses, avoids unnecessary surgical interventions, and allows a clear assessment of the extent of the disease and its proximity to important structures.[14]

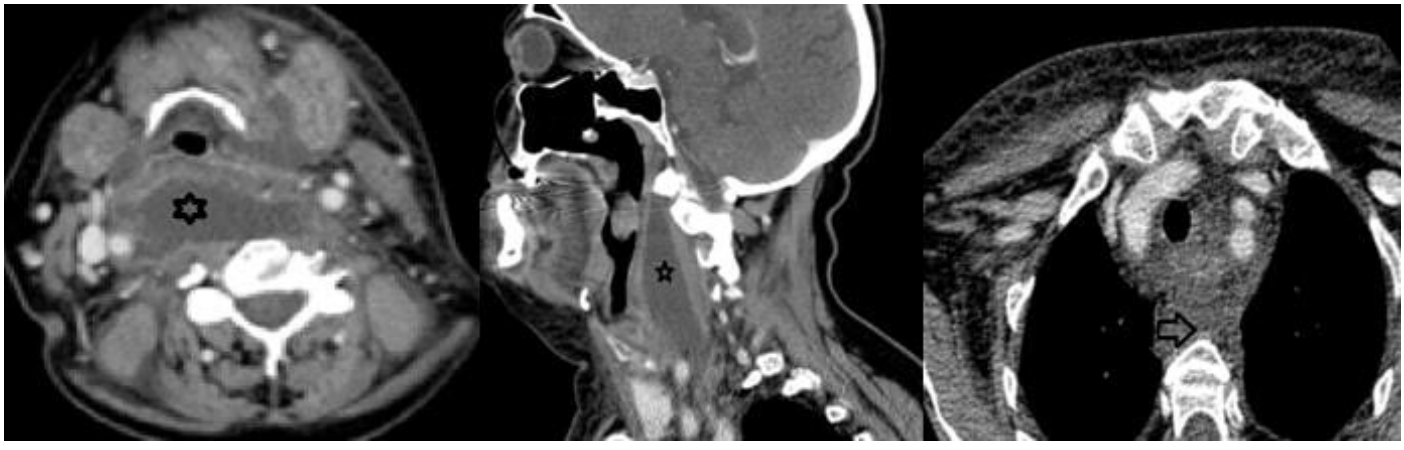

Figure 1. Axial and sagittal CT images of a patient with retropharyngeal abscess and mediastinitis (asterisk, retropharyngeal abscess; arrow, mediastinitis).

CT, computed tomography.

The most frequently isolated microorganisms in patients with DNI are *Streptococcus pyogenes* and *Staphylococcus aureus*, together with agents such as *Fusobacterium necrophorum* and *Actinomyces*, and more than half of cases are polymicrobial.[15] In the present study, we primarily employed contrast-enhanced CT imaging as a diagnostic tool. We also observed that ultrasound was potentially misleading in one patient who developed a retropharyngeal abscess. *Streptococcal* species were the most frequently isolated agents.

Complications of DNI include jugular vein thrombosis; airway obstruction; acute respiratory distress; sepsis and disseminated intravascular coagulation; mediastinitis; pleural effusion; cranial nerve palsies; carotid artery necrosis; thrombophlebitis, and these also represent the causes of morbidity associated with these infections.[16] Mortality rates in patients with these complications can be as high as 40%. Early recognition and prompt intervention are therefore vitally important. Close monitoring of these patients and the ability to anticipate potential complications are also crucial. When such complications develop, it is essential to manage the process in collaboration with other relevant medical specialists.

In terms of treatment, empiric therapy, which may vary regionally, should be initiated until culture and antibiogram results are available. The antibiotics employed should cover Gram-negative, Gram-positive, aerobic, and anaerobic bacteria. Penicillins, third-generation cephalosporins, metronidazole, and clindamycin are generally preferred for initial treatment.[13] Antibiotherapy can be modified if necessary based on culture results. In cases with abscesses, especially those involving multiple sites, drainage protects the patient from potential complications and shortens both hospitalization and treatment. Furthermore, the effectiveness of antibiotic treatment can be evaluated based on the culture results of the material obtained. Incisional drainage was once a routine practice. However, aspiration, especially in isolated cases, has recently been shown to be as effective as incision. Alzaid et al.[17] reported in their meta-analysis that ultrasound-guided aspiration was as effective as incision, and also described aspiration as less costly and causing fewer cosmetic problems. We performed drainage on a total of 31 (50%) patients, including 18 (29%) with open drainage and 13 (20.9) with aspiration. We have also seen that uncommon abscesses can be treated with repeated drainage.

Study Limitations

The limitations of this study include its retrospective nature, which necessitated a medical record-based evaluation, and the relatively small number of patients.

CONCLUSION

Odontogenic infections were the leading cause of DNIs, followed by tonsillitis. Complete recovery was achieved with antibiotics alone in 50% of patients, and surgical intervention was successful in all remaining cases, resulting in 100% overall cure without recurrence. Early diagnosis and prompt combined management are key to excellent outcomes.

Ethics

Ethics Committee Approval: The Non-Interventional Clinical Research Ethics Committee of Erzincan Binali Yıldırım University approved this study under decision no. 2025-14/01, dated 24.07.2025.

Informed Consent: Retrospective study.

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Footnotes

Author Contributions

Concept Design – S.A., A.K., M.C.D., İ.S.; Data Collection or Processing – S.A., A.K., M.C.D., İ.S.; Analysis or Interpretation – S.A., M.C.D.; Literature Review – S.A., A.K.; Writing, Reviewing and Editing – S.A., A.K., M.C.D., İ.S.

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