

Deep Neck Space Infections: Contrast-Enhanced Computed Tomography as a Life-Saving Diagnostic and Prognostic Tool - A Prospective Observational Study

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Abstract: ***Background:** Deep neck space infections (DNSIs) are rapidly progressive infections involving the potential fascial compartments of the neck. Despite the availability of broad-spectrum antibiotics, these infections remain associated with significant morbidity and mortality due to airway obstruction, septicemia, mediastinitis, and vascular complications. Early and accurate diagnosis is crucial for reducing adverse outcomes. **Objective:** To evaluate the diagnostic accuracy, clinical utility, and prognostic value of contrast-enhanced computed tomography (CECT) in patients with deep neck space infections.*

Keywords: Deep neck space infections (DNSIs), Peritonsillar abscess, Parapharyngeal abscess, Ludwig's angina, CECT

1. Introduction

Deep neck space infections are infections involving the potential spaces created by the deep cervical fascia. These spaces include the peritonsillar, parapharyngeal, retropharyngeal, prevertebral, and submandibular spaces.

Common entities include:

- 1) Peritonsillar abscess
- 2) Parapharyngeal abscess
- 3) Ludwig's angina

The fascial planes permit rapid vertical and horizontal spread of infection, sometimes extending into the mediastinum.

Why DNSIs are dangerous:

- 1) Airway compromise
- 2) Septic shock
- 3) Internal jugular vein thrombosis
- 4) Descending necrotizing mediastinitis
- 5) Carotid artery erosion

Clinical diagnosis may be challenging due to:

- 1) Deep anatomical location
- 2) Obesity
- 3) Trismus
- 4) Overlapping symptoms

Hence, imaging plays a decisive role in management.

2. Review of Literature

Historically, DNSIs were primarily odontogenic or tonsillar in origin. The incidence has reduced with antibiotic use but remains clinically significant.

Literature reports:

- 1) Male predominance
- 2) Peak incidence in 2nd–4th decade
- 3) Mortality rate historically up to 20% (before imaging era)

Studies show:

- 1) CT sensitivity for abscess detection: 85–95%
- 2) MRI superior for soft tissue contrast but less accessible in emergency settings
- 3) Early imaging reduces surgical delay and ICU admission rates

CECT advantages:

- 1) Rapid acquisition
- 2) Excellent anatomical detail
- 3) Detection of gas formation
- 4) Vascular involvement identification

3. Aims and Objectives

Primary Aim

To determine the diagnostic and prognostic value of contrast-enhanced CT in deep neck space infections.

Secondary Objectives

- 1) To assess pattern and distribution of DNSIs.
- 2) To evaluate CT accuracy in detecting abscess.
- 3) To identify complications using imaging.
- 4) To correlate imaging findings with surgical outcomes.
- 5) To assess impact on hospital stay and morbidity.

4. Materials and Methods

Study Design

Prospective observational study.

Study Location

Tertiary care teaching hospital (ENT & Radiology departments).

Study Duration

12 months.

Sample Size

50 patients.

Sampling Method

Consecutive sampling.

Inclusion Criteria

- 1) Fever >38°C
- 2) Neck swelling
- 3) Trismus
- 4) Dysphagia
- 5) Clinical suspicion of deep neck infection

Exclusion Criteria

- 1) Known malignancy
- 2) Traumatic swelling
- 3) Contrast allergy
- 4) Pregnancy

Imaging Protocol

64-slice CT scanner
 Intravenous iodinated contrast
 Axial, coronal, sagittal reconstructions
 Slice thickness: 3 mm

Radiological Parameters Evaluated:

- 1) Site of infection
- 2) Rim enhancement
- 3) Gas locules
- 4) Multi-space involvement
- 5) Airway narrowing
- 6) Vascular complications
- 7) Mediastinal extension

Statistical Analysis

Data analyzed using descriptive statistics
 Percentages and proportions calculated
 Sensitivity, specificity, PPV calculated
 Data represented using pie charts

5. Results

Demographic Distribution

Age group: 20–40 years (majority)
 Male: Female ratio = 1.6:1

Distribution of Infection Types

Peritonsillar abscess – 48%
 Parapharyngeal abscess – 28%
 Ludwig’s angina – 24%

Peritonsillar abscess was most common due to tonsillar infections.

Radiological Findings

Abscess formation – 70%
 Cellulitis – 20%
 Multi-space involvement – 10%

CT successfully differentiated drainable abscess from diffuse cellulitis.

Complications Detected

Airway narrowing – 18%
 Mediastinal extension – 2%
 No major complications – 80%
 Correlation with Surgery

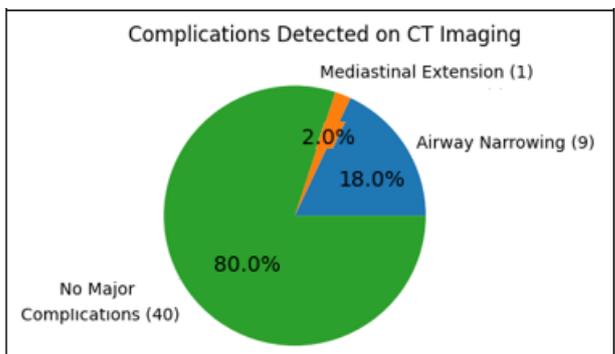
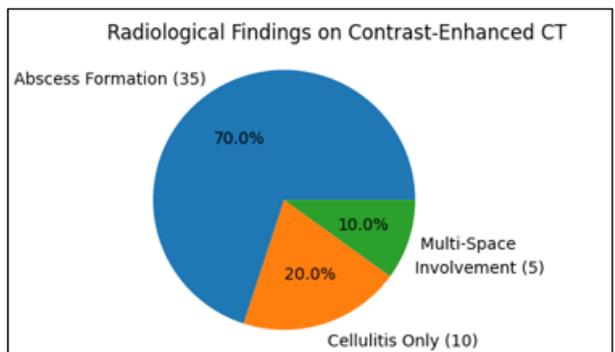
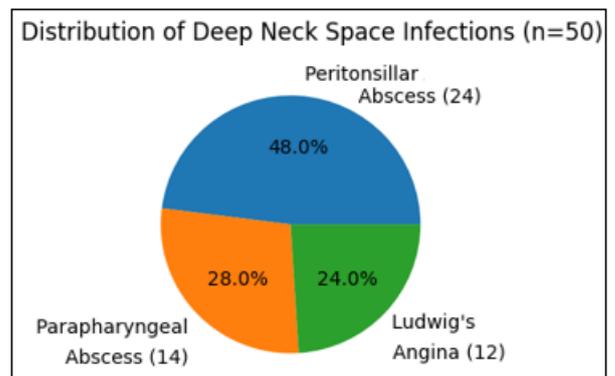
CT-detected abscess confirmed intraoperatively: 92%

False positives: 4%

False negatives: 4%

Sensitivity = 92%

Specificity = 88%



6. Discussion

The present study highlights the indispensable role of CECT in diagnosing DNSIs.

Key Observations:

- 1) Early CT reduced delay in surgical drainage
- 2) Identified airway compromise before clinical deterioration
- 3) Detected mediastinal extension early

In Ludwig's angina, CT was critical in assessing:

- 1) Submandibular space involvement
- 2) Tongue elevation
- 3) Airway narrowing

Comparative literature shows similar diagnostic accuracy.

- 1) Why CT is superior clinically:
- 2) Rapid diagnosis in emergency
- 3) Clear surgical roadmap
- 4) Identification of hidden abscess pockets
- 5) Prevention of blind drainage

7. Limitations

- 1) Small sample size
- 2) Single-center study
- 3) No long-term follow-up
- 4) Lack of MRI comparison

8. Clinical Implications

- 1) Mandatory CT in suspected DNSIs
- 2) Early imaging protocol implementation
- 3) Improved ICU triaging
- 4) Reduced mortality

9. Conclusion

Contrast-enhanced CT is a life-saving diagnostic tool in deep neck space infections. It:

- 1) Enables early and accurate diagnosis
- 2) Differentiates abscess from cellulitis
- 3) Detects complications
- 4) Guides surgical intervention
- 5) Reduces morbidity and mortality
- 6) Routine early CECT should be part of standardized management protocol for all suspected deep neck space infections.

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