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ORIGINAL ARTICLE

Deep neck infections in children



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Abstract *Background/Purpose:* Deep neck infections (DNIs) often have a rapid onset and can progress to life-threatening complications. There are only a few reports on pediatric DNIs' clinical manifestations, diagnostic clues, and etiology in Taiwan.

Methods: A retrospective chart review of patients (aged ≤ 18 years) diagnosed with DNI from January 2005 to December 2014 was performed. DNIs were classified into retropharyngeal, parapharyngeal, peritonsillar, submandibular, and multispace abscesses.

Results: A total of 52 patients with DNI were identified. The most common site of DNI was the parapharyngeal space ($n = 22$, 42.3%). The most commonly associated antecedent illness was preceding upper respiratory tract infection (30.8%). The most common clinical presentation was neck mass or swelling (82.7%) and fever (75%). Pus drainage or needle aspiration was performed to obtain pus samples from the infection site for pus culture ($n = 31$). The most commonly isolated pathogen was *Staphylococcus aureus* ($n = 7$). Amoxicillin–clavulanic acid (56.6%) was the most commonly used antibiotics, followed by penicillin (15.1%). There was no long-term morbidity or mortality.

Conclusion: When a patient (regardless of age) presents with neck mass or swelling, the DNI should always be included in the differential diagnosis. The low culture rate in Taiwan and previous partial treatment of infections may have affected identification of pathogens in cultures. Performing Gram staining and acid-fast staining of pus, instead of culture alone, as early as possible before initiating the initial antimicrobial therapy are thus crucial. The recurrence of DNI should alert the physician to the possibility of an underlying bronchogenic cyst. Excision surgery is required to cure recurrent infections.

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Introduction

Deep neck infections (DNIs) often have a rapid onset and can progress to life-threatening complications, such as airway obstruction, jugular vein thrombosis, mediastinal involvement, pericarditis, pneumonia, and arterial erosion. Thus, timely diagnosis of DNI is important to improve patient survival.^{1,2} Based on the anatomic sites of infection pathogenesis, the disease can be categorized as retropharyngeal, parapharyngeal, and peritonsillar abscess.³ However, accurate diagnosis of DNI remains a challenge to pediatricians owing to its insidious clinical symptoms and signs.⁴ There are only a few reports on pediatric DNIs' clinical manifestations, diagnostic clues, and etiology in Taiwan.^{5–7} The aim of this study was to present our experience of the clinical course and bacteriological data of DNI encountered in our department in the past 10 years and compare it with those reported in the available literature.

Methods

Study patients

A retrospective chart review of patients, aged younger than 18 years, diagnosed with DNI (retropharyngeal, parapharyngeal, peritonsillar, or submandibular abscess) in Taichung Veterans General Hospital, Taichung, Taiwan, from January 2005 to December 2014, was performed. The diagnosis of DNI was based on clinical characteristics, imaging studies [contrast-enhanced computed tomography (CT), X-ray, and neck sonography], and surgical finding. Based on site of infection, DNI was classified into retropharyngeal, parapharyngeal, peritonsillar, and submandibular abscesses for analysis. The abscess formation around the tonsils is defined as a peritonsillar abscess, and is usually unilateral. Parapharyngeal abscess is anatomically located around the pharynx, the carotid sheath posteriorly, and the styloid process laterally. Retropharyngeal abscess is located just behind the pharynx, and may extend downward to the mediastinum.⁸ The submandibular abscess, located in the submandibular space, is bounded by a superficial layer of deep cervical fascia inferiorly and by lingual mucosa superiorly.⁵ If two or more spaces were concurrently involved in a significant way, they were classified as "multispace abscess."

Patients' characteristics

Demographic data, including age, sex, underlying medical condition, clinical manifestations, antecedent illness, laboratory data (white cell count, platelet, and C-reactive protein), radiology study findings, and length of hospital stay, were collected. The bacteriology results, management, complications, and outcome were also collected for analysis. Complications of DNI identified in these patients included prevertebral abscess, purulent thyroiditis, parotid gland abscess, airway compromise, jugular vein thrombosis, mediastinal involvement, pericarditis, pneumonia, arterial erosion, and bacteremia.^{1,2} The clinical characteristics and laboratory data were compared among patients with

retropharyngeal, parapharyngeal, peritonsillar, submandibular, and multispace abscess.

Statistical analysis

Data are presented as mean \pm standard deviation and median. Hypothesis testing using Chi-square test was performed to assess differences between patients of the five groups (i.e., retropharyngeal, parapharyngeal, peritonsillar, submandibular, and multispace abscesses). Continuous variables were compared using Mann–Whitney *U* test. A *p* value < 0.05 was considered statistically significant.

Results

During the 10-year study period, a total of 52 patients with DNI were identified, including 29 boys (55.8%) and 23 girls (44.2%). The mean age of these patients was 8.81 ± 6.29 years. A summary of their clinical features are presented in [Table 1](#). The most common site of DNI was the parapharyngeal space ($n = 22$, 42.3%), followed by the submandibular space ($n = 12$, 23.1%), the retropharyngeal space ($n = 7$, 13.5%), and the peritonsillar space ($n = 6$, 11.5%). Multispace abscess occurred in five cases (9.6%). The most common known antecedent illness was upper respiratory tract infection (30.8%), followed by dental infection (15.4%) and congenital anomalies, such as congenital cysts (15.4%). Neck mass or swelling (82.7%) and fever (75%) were the most common symptoms. CT scans with contrast enhancement was performed in 44 patients (84.6%). The mean length of hospital stay was 7.50 days (7.50 ± 4.12 days). Thirty-four (66.7%) patients received surgical management, including incision and drainage, excision, and resection. Pus drainage or needle aspiration was performed to obtain pus samples from infected sites for culture. One patient was admitted to the pediatric intensive care unit due to airway compression, and one patient received emergent surgery due to airway obstruction. Six (11.6%) patients developed complications, including mediastinal abscess, prevertebral abscess, acute purulent thyroiditis, bacteremia, and a fistula into the external ear canal. There was no mortality.

The sites of DNI were found to be different among different age groups ([Figure 1](#)). All the patients with peritonsillar abscess and most patients with parapharyngeal abscess were aged between 7 years and 18 years (school-going children). The length of hospital stay and laboratory data were not different between the age groups.

The clinical characteristics and management of different infected sites are presented in [Table 2](#). Among the five groups, there was no significant difference in age distribution and hospital stay. All patients with submandibular abscess had neck mass or swelling. This symptom was also frequently found in patients with parapharyngeal abscess (90.9%, $p = 0.024$). All patients afflicted with peritonsillar abscess and multispace abscess had fever. Fever was also common in patients with retropharyngeal abscess (85.7%). Sore throat or dysphagia ($n = 11$, 21.2%) occurred occasionally, but these conditions were not observed in patients with submandibular abscess ($p = 0.026$). Symptoms such as

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