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Original Article / *Original Article*

Seven years of experience in 160 patients with deep neck infection

Derin boyun enfeksiyonu olan 160 hasta ile yedi yıllık deneyim

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ABSTRACT

Objectives: This study aims to evaluate pediatric and adult patients diagnosed with deep neck infection (DNI) in terms of clinical features, etiology, infection or abscess localization, treatment, prognosis, and demographics.

Patients and Methods: This retrospective study included 160 DNI patients (96 males, 64 females; mean age 28.2 years; range 1 to 78 years). Etiological factors, seasonal superiority, complaints, habits such as smoking and alcohol consumption, previous antibiotic usage, radiological and laboratory findings, location of the pathology, culture results, modalities of treatment, complications, and durations of disease and hospital stay were analyzed.

Results: Most frequently observed etiological factor was dental infection. Fifty patients clinically presented with sore throat. Deep neck infections were located in various areas, the most common locations being the peritonsillar, parapharyngeal, and submandibular areas, respectively. Approximately 50% of the patients responded to only empirical ampicillin-sulbactam treatment. One patient with Ludwig's angina died due to decompensated heart failure.

Conclusion: Due to its high mortality and morbidity rates, it is of utmost importance for physicians to be informed regarding the differential diagnosis and treatment of DNI.

Keywords: Antibiotherapy; deep neck infection; incision and drainage; Ludwig's angina; peritonsillar abscess; retropharyngeal abscess; submandibular abscess.

ÖZ

Amaç: Bu çalışmada derin boyun enfeksiyonu (DBE) tanısı konmuş çocuk ve yetişkin hastalar klinik özellikler, etyoloji, enfeksiyon veya apsenin yerleşimi, tedavi, prognoz ve demografik özellikler açısından değerlendirildi.

Hastalar ve Yöntemler: Bu retrospektif çalışmaya 160 DBE hastası (96 erkek, 64 kadın; ort. yaş 28.2 yıl; dağılım 1-78 yıl) dahil edildi. Etyolojik faktörler, mevsimsel üstünlük, şikayetler, sigara ve alkol kullanımı gibi alışkanlıklar, önceki antibiyotik kullanımları, radyolojik ve laboratuvar bulguları, patolojinin yerleşimi, kültür sonuçları, tedavi yöntemleri, komplikasyonlar, hastalık ve hastanede kalış süreleri incelendi.

Bulgular: En sık gözlenen etyolojik faktör diş enfeksiyonuydu. Elli hasta klinik olarak boğaz ağrısı ile başvurdu. Derin boyun enfeksiyonları farklı alanlarda yerleşimliydi ve en yaygın yerleşim yerleri sırasıyla peritonsiller, parafarengeal ve submandibüler alanlardı. Hastaların yaklaşık %50'si tek başına ampirik ampisilin sulbaktam tedavisine yanıt verdi. Ludwig anjinalı bir hasta dekompanse kalp yetmezliğinden kaybedildi.

Sonuç: Yüksek morbidite ve mortalite oranları nedeniyle klinisyenlerin DBE'nin ayırıcı tanısı ve tedavisi hakkında bilgilendirilmesi büyük önem arz etmektedir.

Anahtar sözcükler: Antibiyoterapi; derin boyun enfeksiyonu; insizyon ve drenaj; Ludwig anjinası; peritonsiller apse; retrofarengeal apse; submandibüler apse.

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Deep neck infections commonly originate from the upper aerodigestive system and affect the deep tissues of the neck. With enhanced importance of oral hygiene and antibiotic use over time, the frequency of these infections, morbidity and mortality has decreased.[1] Although most infections are treated by antibiotics or deep neck drainage they may sometimes develop pleural effusion, empyema, pericarditis, mediastinitis, pericardial effusion, venous embolism, respiratory distress, septic shock and disseminated intravascular coagulopathy.[2,3]

We present our patients diagnosed with deep neck infections, their clinical features and our clinical approach and discuss the relevant literature.

PATIENTS AND METHODS

The files of 160 patients (96 males, 64 females, mean age 28.2 years; range 1 to 78 years) diagnosed with deep neck infections (DNI) between June 2007 and July 2013 at the inpatient clinic, Bakirkoy Dr. Sadi Konuk Training and Research Hospital, Ear, Nose and Throat (ENT) Department, Istanbul, Turkey were examined retrospectively. Etiological factors, seasonal predominancy, complaints, patient histories like smoking habits, alcohol consumption, duration of disease and previous antibiotic usage, radiological and laboratory findings, location of the pathology, culture results, modality of treatment, complications and duration of hospital stay were recorded.

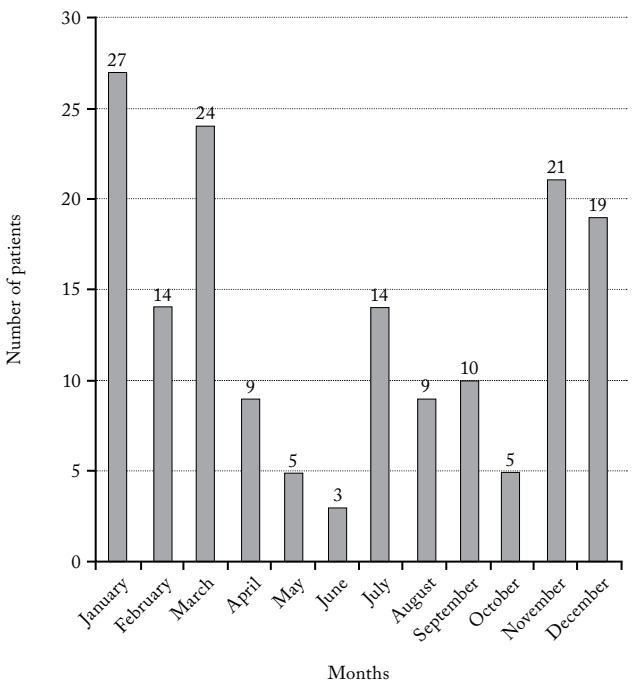

Figure 1. Distribution according to the seasons.

Statistical analysis

Statistical analysis was performed using NCSS (Number Cruncher Statistical System) and Mann-Whitney test. $p<0.05$ was accepted as significant.

RESULTS

The most common etiologic factor was dental infection (28.8%), followed by upper airway infection (15.6%). According to season, the most admissions to hospital with DNI were in winter (December to February) followed by spring, autumn and summer (Figure 1). Common complaints of patients (in order) were sore throat, dysphagia, fever (the most >38 °C), asymmetry in head and neck area, erythema and trismus (Table 1). Thirty-five percent of the patients were smokers, 7% were alcoholic beverage drinkers, and 5% of them were both.

Forty-eight patients (30%) were previously treated in other outpatient clinics with oral antibiotics before they came to us because of the increase in their symptoms.

On admission initial laboratory findings was in favor of high inflammatory status with C-reactive protein (CRP) mean 18 mg/dL (8-42) white blood cell count mean: 21000 (4000-32000) with polymorphonuclear dominance. Decrease in inflammatory status by antibiotherapy was considered success of treatment.

The most commonly used diagnostic tools that we use were computed tomography (CT) (43.7%), ultrasonography (USG) (24.4%) and magnetic resonance imaging (MRI) (5.6%).[4]

The most common DNI locations respectively were the peritonsillar area, parapharyngeal area, submandibular area, floor of the mouth (Ludwig's angina), extended area (more than one anatomical space), submental area, retropharyngeal area and intraparotid (Table 2).

Table 1
Symptoms of deep neck infections

Complaints	Percent
Sore throat/pain of neck	31.3
Difficulty in swallowing	21.3
Fever	19.4
Neck swelling	14.4
Trismus	6.9
Dyspnea	4.4
Neck asymmetry	3.3

Table 2
Neck deep infections according to the settlement distribution

The location of the abscess	Percent
Peritonsillar	32.2
Parapharyngeal	21.5
Submandibular	13.1
Ludwig's angina	10.7
Extended	8.7
Submental	5.8
Retropharyngeal	4.9
Area of the parotid	3.1

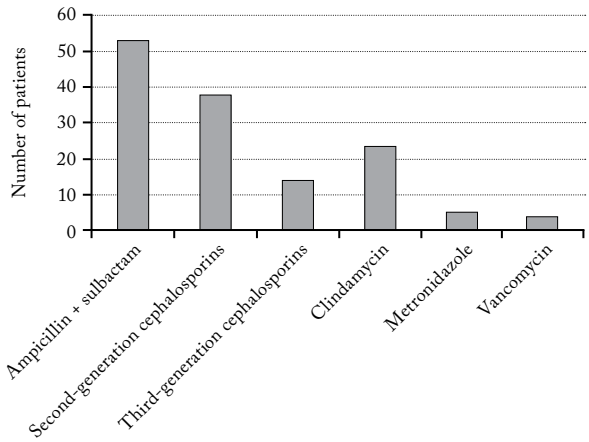

Figure 2. Antibiotic treatments.

Abscess formation was seen in 112 patients (69.9%). On first admission, abscess drainage was performed with 21 gauge needles, except in six patients (3.8%) with abscesses smaller than 1 cm, in 18 patients with inaccessible abscess locations, in five patients with parotid gland abscesses and in two patients (1.2%) in whom spontaneous drainage had happened. All of the abscess materials were examined for bacterial culture. Empirical parenteral antibiotics were given to all patients. The most frequent treatment that we used, alone or in combination, were ampicillin/sulbactam (51.2%), second and third generation cephalosporins (47.6%), clindamycin (21.7%), metronidazole (3.6%), and vancomycin (2.4%) (Figure 2).

The culture was positive in 98 patients (61.7%). Polymicrobial culture was seen in 27 patients (16.6%). *Streptococcus viridans* grew in 19 (11.9%) and *Klebsiella pneumonia* grew in 18 (11.3%) of culture materials of diabetic patients. *Mycobacterium tuberculosis* were seen in two patients (1.2%) and *Candida albicans* in one patient. There was suspicion of iatrogenic infection in 11 patients (6.9%) who had a history of previous surgical operation, culture from four were sterile. In seven patients (4.4%) with iatrogenic DNI, pus material cultures yielded mixed anaerobic infection (3 patients with tooth extraction, 2 patients had tonsillectomy, 1 patient had teeth filling and 1 patient had had diagnostic esophagoscopy. Abscesses were diagnosed in the parotid gland and USG guided drainage was performed in five patients. Cultures were sterile in 33 patients (20.6%) with abscess formation.

One patient who had dilated cardiomyopathy and congestive heart failure treated in the intensive care unit with Ludwig's angina died because of decompensated heart failure. Mean hospital stay was 5.1 days (range 1-32 days). During follow-up, two patients (1.2%) had septicemia with gram negative *Escherichia coli* and five patients had sudden respiratory distress with need for an urgent tracheostomy.

DISCUSSION

Deep neck infections affect various age groups, may have various clinical presentations according to localization, and usually have high complication rates when left untreated. By means of seasonal dominancy, it was observed that trimodal peaks were spread throughout the year. A recent review on the issue by Doležalová et al.[5] reported a trimodal peak according to seasons. Therefore we concluded that deep neck infections can be observed throughout the year. Most of them occur secondary to tonsillitis, pharyngitis, salivary gland infections, tooth decay, tooth abscess, dental operations, head and neck surgery, head and neck trauma, invasive diagnostic procedures like esophagoscopy/bronchoscopy, foreign body aspiration, tiroiditis, congenital anomalies like branchial cleft cysts and thyroglossal duct cyst, laryngopyelocele or nasal cavity infections.[1,2] In our study the most common factor was dental infection. The primary origin may not be discovered in 15-65% of deep neck infections.[2,3] In our study, the primary origin could only be detected in 44.4% of DNI. The most common symptoms of patients with DNI are fever, sore throat, neck asymmetry and dysphagia.[3,4] In our study the most common presentations were sore throat (31.3%) and dysphagia (21.3%).

In a retrospective study with 185 patients, Huang et al.[3] reported that similar to our patients, the most common locations were parapharengeal (33.3%), extended space (15.9%), and Ludwig's angina (14.3%). Radiodiagnostic tools can be used to detect locations,

abscess, expansion of infection, and sometimes, drainage procedures.[4,6] Computed tomography scan is the most important imaging examination for correct evaluation of neck spaces affected by deep neck infections.[7] In our series, we needed to perform CT scans for 43.7% of the patients.

We evaluated the patients' response clinically -- improvement in oral intake, resolution of trismus, decrease in fever and in lesion size -- and with laboratory findings -- CRP (normally 0.01-0.5 mg/dL) and WBC (normally 4-11 $x10^3/mm^3$) count. Higher levels of CRP and WBC on first admission to hospital were found to be related with longer staying times in hospital, which was not statistically significant. Similarly, in a retrospective study of 299 patients, Noda et al.[8] reported a significant relation between CRP levels and longer hospitalization durations.

In our patients, only peritonsillar abscess incidence was higher in smokers than in the normal population. No significant relation was found between alcohol use and DNI in our series, but this may be related to a small sample of patients with alcohol use. Additional factors such as smoking and periodontal disease contributed to peritonsillar abscess according to a 2006 study by Herzon et al.[9] Positivity in culture results was 61.2% in our patients and polymicrobial culture yielded *Streptococcus viridians, Streptococcus milleri group species, Streptococcus pyogenes, Peptostreptococcus spp., Klebsiella pnemoniea, Staphylococcus aureus, Staphylococcus epidermidis, Bacteroides spp., Fusobacterium, Escherichia coli, Mycobacterium tuberculosis and Candida albicans.* Brook et al.[10] reported that the most common infectious agents were *Streptococcus viridians, Streptococcus milleri group species, β-hemolytic streptococci, Neisseria species, Peptostreptococcus, coagulase-negative staphylococci.*

Compared to the reported rates of positivity in culture of 75-85%, the low rates in our study can be attributed to the previous antibiotic therapy that the patients was prescribed.[10,11] All 18 patients who had *Klebsiella pneumoniae* were diabetic. In an analysis of 128 patients, Huang et al.[11] detected *K. pneumoniae* in 54.5% as the most common factor in patients with DM, as we did in our study. In the treatment of DNI, parenteral antibiotic treatment according to antibiotic cultures and abscess drainage is essential. In cases where patients do not respond to treatment and whose routine bacteriologic cultures are sterile, the possibility of atypical agents such as anaerobic microorganisms, mycotic infections and mycobacterial infections must be taken into account.

In our study the first empirical antibiotic therapy was mostly ampicillin-sulbactam only or a combination of ampicillin-sulbactam with clindamycin. In cases where needle drainage is not possible for evaluating the localization and depth of abscess, radiodiagnostic tools should be used and USG guided drainage must be done, if necessary. In this study, abscess drainage was performed in 106 patients (66.2%). In 81 patients (50.6%) needle aspiration was done on the first admission and 18 patients who had localizations that could not be reached by needle were subjected to surgical incision and drainage (8 patients with retropharyngeal abscess, six patients with parapharyngeal abscess and four patients with extended abscess). Only five patients (3.1%) who had abscess in parotid glans were subjected to USG guided drainage. In two patients, spontaneous drainage was seen (1 patient with peritonsillar abscess, and 1 patient with submandibular abscess draining through the canine tooth root into the oral cavity). In the six patients with abscesses smaller than 1 cm (3 peritonsillar, 2 submandibular, 1 parapharyngeal abscess), we did not perform drainage and the abscesses resolved under medical treatment. A high ratio of cellulitis/abscess (3/7) may be related to previous treatments with antibiotics in primary and secondary health services in patients with cellulitis.

As a result of expansion of infection, life-threatening complications like empyema, mediastinitis, pleural effusion, pericarditis, pericardial effusion, carotid artery rupture, and aortopulmonary fistula can be seen. Also, complications such as cranial nerve paralysis of cervical necrotizing fasciitis, jugular vein thrombosis, venous embolism, septic shock, disseminated intravascular coagulation, renal failure, meningitis and epidural abscesses may occur.[7,11,12] In our study, five patients (3.1%) who suffered from sudden respiratory distress because of airway obstruction and laryngeal edema underwent tracheostomy. In two patients (1.2%) septicemia due to gram-negative bacteremia was seen, and their treatment was maintained in the Infectious Diseases Department. The patients who had tracheostomy were decannulated in an average of 13.8±4.2 days.

Conclusion

In spite of all developments in diagnosis and treatment of deep-neck infections, they continue to occupy a large space in life threatening infections. Immediate and efficient management is mandatory for prevention of complications and for increasing survival rates.

Declaration of conflicting interests

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