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ARAŞTIRMA YAZISI / RESEARCH ARTICLE

ÇOCUKLARDA DERİN BOYUN ENFEKSİYONLARI; ÜÇÜNCÜ BASAMAK HASTANESİ VERİLERİ

DEEP NECK INFECTIONS IN CHILDREN; DATA FROM A TERTIARY HOSPITAL

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ÖZ

AMAÇ: Derin boyun enfeksiyonları (DBE) boyun bölgesinin fasya tabakaları arasında kalan potansiyel boşluklarda gelişen enfeksiyonlardır. Selülit, miyozit gibi erken bulgulardan flegmon, apse gibi ilerlemiş DBE'ye doğru bir seyir izlenebilir. Geç tanı, hızlı progresyon ve hayatı tehdit edici komplikasyonlar nedeniyle DBE kritik önem taşır. Bu tanımlayıcı çalışmanın amacı hastalarımızın klinik ve laboratuvar özelliklerine dayanarak yedi yıllık DBE verilerimizi sunmaktır.

GEREÇ VE YÖNTEM: Çocuk Enfeksiyon Hastalıkları Kliniğinde DBE tanısıyla Ocak 2010 – Ocak 2017 tarihleri arasında yatırılarak izlenen 58 hastanın anamnez ve fizik muayene bulguları, laboratuvar ve görüntüleme sonuçları, medikal ve cerrahi tedavileri, klinik seyirleri geriye dönük olarak incelendi.

BULGULAR: Hastaların 30'u (%51,7) erkekti, yaş ortalaması 5,6±4,9 yıldı. En sık başvuru yakınması ve fizik muayene bulgusu boyunda şişlik (%96,5) olarak belirlendi. Vakaların %93'ünde C-reaktif protein yüksekliği, %89'unda lökositoz, %72'sinde sedimantasyon yüksekliği saptandı. Başvuru anında genel durum ve klinik bulgulara dayanarak ciddi DBE düşünülmeyen (=selülit aşaması) hastalara ultrasonografik görüntüleme yapıldığı (n=26), ciddi DBE düşünülen (=apse) hastalara bilgisayarlı tomografi (BT) çekildiği (n=28), BT cihazı arızalı ise manyetik rezonans görüntüleme yapıldığı (n=4) belirlendi. Apse izlenen hastalarda en sık yerleşimin parafarengeal bölge olduğu (%75) saptandı. Ultrasonografi bulgularına göre en sık submandibüler bölgenin (%46) tutulduğu görüldü. DBE gelişiminde en sık iki etiyolojik neden olarak akut tonsillofarenjit (%34) ve odontojenik nedenler (%10) saptandı, hastaların %51'inde etiyoloji bulunamadı. Hastaların ortalama hastanede kalış süresinin 9,7±5,9 gün olduğu; %55'inin intravenöz ampisilin sulbaktam, %43'ünün intravenöz klindamisin tedavisi aldığı görüldü. Yirmi iki (%38) hastanın medikal tedavi ile iyileştiği, 36 (%62) hastaya medikal tedavi yanında cerrahi drenaj uygulandığı, drenaj örneğinden alınan kültürde üremesi olan hasta sayısının 18 (%50) olduğu belirlendi. İki hastada (%3,4) havayolu obstruksiyonu ve mediastinit olmak üzere komplikasyon geliştiği, mortalite görülmediği saptandı.

SONUÇ: Boyunda şişlik-ağrı ve ateş yakınmaları olan çocuklarda DBE akla getirilmeli ve tonsiller, dental muayene dikkatli yapılmalıdır. Ciddi DBE şüphesi varlığında kontrastlı BT çekilmelidir ve apse saptanan hastalara cerrahi drenaj uygulanmalıdır. Havayolu açıklığını tehdit eden DBE çocuk hastalarda önemli morbidite ve mortalite nedeni olabilir. Erken tanı, uygun antibiyoterapi ve gerektiğinde cerrahi drenaj ile prognoz iyileştirilebilir.

ANAHTAR KELİMELER: Boyunda şişlik, Çocuk, Derin boyun enfeksiyonu, Drenaj, Parafarengeal apse

ABSTRACT

OBJECTIVE: Deep neck infections (DNIs) are the infections developing in potential spaces between the layers of deep servical fascia. Clinical course may progress from early manifestations such as cellulite, myositis to serious DNI such as phlegmon and abscess. DNIs have crucial importance because of delayed diagnosis, fast progression, and severe complications. In this descriptive study, we aimed to present our seven-year experience about pediatric DNIs based on the clinical and laboratory characteristic of our patients.

MATERIAL AND METHODS: Data of 58 hospitalized children who diagnosed with DNI between January 2010 and January 2017 in Pediatric Infectious Diseases Clinic were analysed retrospectively. Patients' medical history and physical examination findings, laboratory and radiological imaging results, treatment modalities, and clinical courses were evaluated by reviewing medical records.

RESULTS: Thirty (51.7%) of the patients were male, average age was 5.6±4.9 years. The most common symptom and physical finding was neck swelling (96.5%). Rates of C-reactive protein elevation, leucocytosis, and sedimentation elevation were 93%, 89%, and 72% respectively. By considering clinical condition, ultrasound scan was performed on patients with nonserious DNI (=cellulite phase) (n=26), computed tomography scan was performed on patients with serious DNI (= abscess) (n=28), and magnetic resonance imagination was performed (n=4) if CT scanner is out of order. In patients with abscess formation parapharyngeal localization (75%) was the most common. According to ultrasound scan, submandibular involvement (%46) was the most frequent region. The most common two etiology were acute tonsillopharyngitis (34%) and odontogenic factors (10%), and unknown etiology rate was 51%. Average duration of hospitalization was 9.7±5.9 days, 55% of patients were treated with intravenous ampicillin-sulbactam whereas 43% were treated with intravenous clindamycin. Twenty-two (38%) patients healed with medical treatment. Surgical drainage was performed on 36 (62%) patients in addition to medical treatment. There were bacterial growths in 18 (50%) drainage material cultures. Two (3.4%) patients were complicated with airway obstruction and mediastinitis while there was no mortality.

CONCLUSIONS: Children with neck swelling and fever should be evaluated in terms of DNI, and also dental and tonsillar examinations should be done carefully. Contrast CT scan should be performed for pre-diagnosis of cases with serious DNI and surgical drainage should be performed in cases with abscess formation. DNIs threatening airway patency may cause severe morbidity and mortality, so early diagnosis, appropriate antibiotic therapy with or without surgical drainage may improve prognosis.

KEYWORDS: Neck swelling, Child, Deep neck infection, Drainage, Parapharyngeal abscess

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INTRODUCTION

Deep neck infections (DNIs) are the infections developing in the potential spaces between the fascial layers of the neck. DNIs may follow a course from early symptoms such as the subcutaneous adipose tissue changes and skin thicken-ing (cellulite) to serious symptoms such as the increase in the muscle thickness and edema (myositis), developing phlegmon and well-demarcated localized collections (abscess) (1).

DNI frequently originates from a septic focus in the mandibular teeth, tonsils, the parotid gland, deep cervical lymph nodes, the middle ear or sinuses (2). DNI diagnosis may be delayed due to the decrease in the frequency of infection development in the deep cervical spaces with antibiotic era, the absence of fever, systemic toxicity and local inflammation symptoms due to prevalent use of antibiotics and/or the presence of immunodeficiency. DNI demonstrates a rapid onset and may progress towards life-threat-en-ing complications (3). Therefore it is nec-es-sa-ry to be careful in the diagnosis, treatment and clinical course of DNIs.

The purpose of this descriptive study is to present 7-year DNI experience of our clinic along with the literature.

MATERIALS AND METHODS

This study was carried out through the retrospective analysis of 58 patients' data who diagnosed with DNI in Mersin University Hospital Clinic of Pediatric Infectious Diseases between January 2010 and January 2017. The patients' demographic characteristics, medical histories, physical examination findings, and laboratory, bacteriological culture, radiological imaging results, antibiotic and surgical treatments, complications were examined.

Data were evaluated with SPSS 18.0 packaged software. Percentages, mean and SD values were given as descriptive statistics. Student's t-test was used to compare independent two groups. The results were considered statistically significant if P values were less than 0.05.

ETHICAL COMMITEE

Ethics committee approval was received for this study from Mersin University Clinical Research Ethical Committee on May 11, 2017 (approval number:154).

RESULTS

We studied 58 patients' data. Thirty (51.7%) patients were male, and the mean±SD age was 5.6±4.9 years (the min-max ages were 1.5-16 years). The most frequent initial complaint was neck swelling (96.5%). The average period of time to apply to hospital after the symptoms emerged was 5.4±4.6 days. The most common physical examination findings were neck swelling (96.5%) and movement restriction in the neck (48.3%), respectively. General characteristics of the patients are seen in Table 1.

Twenty-six patients (44.8%) had a history of ambulatory antibiotic treatment for a median value of 6.5 days before they were hospitalized. The prior treatments were oral amoxicillin-clavulanate (46.1%), oral amoxicillin-clavulanate and intramuscular ceftriaxone (23%), intramuscular ampicillin-sulbactam and ceftriaxone (15.3%), oral ampicillin-sulbactam (7.4%), intramuscular cefazolin (7.1%), intramuscular ceftriaxone and oral metronidazole (%1). The length of hospital stay was similar in the patients with and without ambulatory treatment history (11.3±6.8 vs 8.4±4.8 days, p=0.188).

Among the computed tomography (CT) finding-s accepted to be significant for the DNI diagnosis, there was cellulite in 8 (28.5%), an increase in the adipose tissue density in 16 (57.1%), obliteration in adipose plans in 22 (78.5%), myositis in 12 (42.8%), necrotic lymphadenopathy (LAP) in 8 (28.5%) patients. Neck CT, magnetic resonance imagination (MRI), and ultrasound scan (USG) results are seen in Table 1.

By using detailed anamnesis, physical examination, and laboratory findings the most common etiology of DNIs was defined as acute tonsillopharyngitis (34.4%), **(Table 1)**.

Table 1: General characteristics of the patients

Characteristics	Patients (n)	Percent (%)
Female	28	48.3
Male	30	51.7
Initial complaint		
- Neck swelling	56	96.5
- Fever	46	79.3
- Neck pain	18	31.0
- Odinophagia	6	10.3
Physical examination		
- Neck swelling	56	96.5
- Neck movement restriction	28	48.3
- Hyperaemic-hypertrophic tonsils	22	37.9
- Trismus	4	6.9
Ambulatory antibiotic treatment	26	44.8
Laboratory		
- CRP elevation (> 5 mg/L)	54	93.1
- Leucocytosis (> 10000/mm^3)	52	89.6
- ESR elevation (> 20 mm/h)	42	72.4
- Thrombocytosis > 500000/µL)	18	31.0
- MPV increase (> 11 fL)	10	17.2
Radiological imagination		
Neck CT	28	48.3
- Parapharyngeal abscess	20	71.4
- Peritonsillar abscess	4	14.3
- Retropharyngeal abscess	2	7.1
- Parapharyngeal and retropharyngeal abscess	2	7.1
Neck USG	26	44.8
- Submandibular involvement	12	46.1
- Posterior servikal involvement	6	23.1
- Parotis involvement	4	15.3
- Anterior servical involvement	4	15.4
Neck MRI	4	6.9
- Parapharyngeal abscess	4	100
Etiology		
- Acute tonsillopharyngitis	20	34.5
- Odontogenic	6	10.3
- Post-Varicella	2	3.4
- Unknown	30	51.7
Treatment		
- Medical	22	37.9
- Surgical drainage and medical	36	62.1
Drainage material culture		
- No growth	18	50.0
- Staphylococcus aureus	12	33.3
- Streptococcus spp.	4	11.1
- Klebsiella spp.	2	5.6
Complication	2	3.4
- Mediastinitis	1	1.7
- Airway obstruction	1	1.7

CRP, C-reactive protein; CT, computed tomography; ESR, erythrocyte sedimentation rate; MPV, mean platelet volume; MRI, magnetic resonance imaging; USG, ultrasonography

All of the patients in whom odontogenic e-ti-ol-o-gy was determined had a history of decayed tooth extraction, and their average age was 7.3±1.4 years. The average age of the patients with the other etiologies was 4.9±4.1 years. The difference between the average ages of these groups was statistically insignificant (p=0.066).

Overall the length of hospital stay was 9.7±5.9 days. Thirty-two (55.1%) patients were treated with intravenous ampicillin-sulbactam, and 25 (43.1%) patients were treated with intravenous clindamycin. Broad spectrum multi-antibiotic treatment was administered to 1 patient (1.7%) in whom mediastinitis developed. Twenty-two patients (37.9%) healed with medical treatment. Surgical drainage was performed in 36 patients (62.1%) in whom abscess was developed. There was no growth in blood cultures of the patients.

There was bacterial growth in 18 (50%) drainage material cultures. As a complication, airway obstruction developed in 1 patient (1.7%), mediastinitis developed in 1 patient (1.7%). There was no mortality.

The groups in terms of abscess formation were statistically similar in leucocyt, platelet, CRP, ESR, mean platelet volume values, and duration of symptoms (p=0.400, p=0.972, p=0.071, p=0.344, p=0.483, p=0.278, respectively). Length of hospital stay was longer in patients with abscess than patients without abscess formation (11.6±6.3 vs 7.0±4.1 days, p=0.027). **Table 2** shows mean values of clinical and laboratory characteristics.

Table 2: Mean values of clinical and laboratory characteristics

Characteristics	Mean±SD
Age (year)	5.6±4.9
Average symptomatic period before hospital application (day)	5.4±4.6
Duration of hospitalization (day)	9.7±5.9
- Ambulatory treated group	11.3±6.8 [1]
- Ambulatory untreated group	8.4±4.8 [1]
Group with abscess on	4.6±3.8 [2]
- Duration of symptoms (day)	11.6±6.3 [3]
- Length of stay in hospital (day)	6.5±5.5 [2]
Group without abscess on	7.0±4.1 [3]
- Duration of symptoms (day)	
- Length of stay in hospital (day)	
Leucocyte (x10^3/mm^3)	18.5±7.5
CRP (mg/L)	106±9.24
ESR (mm/h)	48.1±34.4
Thrombocyte (x10^3/mm^3)	413±117.2
MPV (fL)	9.1±2.1

CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; MPV, mean platelet volume; SD, standard deviation

1=0.188, 2=0.278, 3=0.027; Student T test

DISCUSSION

Deep neck infections may lead to life-threat-en-ing complications by exhibiting a rapid onset and course, so early diagnosis increases the survival rate (3, 4).

About 52% of the patients were males in this study. Some other DNI studies stated that the number of male patients was greater in Turkey (5 - 8). In the literature, also, there are studies demonstrating that DNIs are more frequent in female infants (9 - 11). The relation between DNI and gender could not have been explained yet. The average age of our patients was consistent with the literature, as it was 5.9, 5.6 and 3.1 years in the other studies from Turkey (8, 12, 13).

DNI may not be diagnosed in the early period because of non-specific symptoms and find-ing-s at the beginning (14). Therefore detailed anamnesis and physical examination are important for early diagnosis. In this study, the most frequent initial complaint and the physical exam-i-na-tion finding was neck swelling regardless of the location of DNI. Similarly, there are publications reporting that the most frequent initial complaint is neck swelling (8, 11, 15, 16). Dissimilarly, Belet et al. and Larawin et al. reported fever to be the most frequent initial complaint (13, 17). The loss of appetite, neck pain, limitation of neck movement, odynophagia, trismus, dysphagia, dyspnea are other symptoms and findings observed in DNIs. In addition, uvular deviation or asymmetrical tonsil size

may be a hint in the DNI diagnosis (18). Tooth decay should be paid attention in the physical examination. The tooth decay was demonstrated to be at the rate of 29-35% in children with DNI (8, 12). In this study, there were 6 patients (10.3%) with the history of tooth decay, and these patients were at the elementary school age. When it is compared with the literature, tooth decay and odontogenic DNI were determined at a lower rate in our patients. This result may indicate that the awareness of the oral and dental health of children has increased in the society. The mean period of applying to hospital after the symptoms began was 5.4 days in this study. Similarly, it was 5.2 and 5.9 days in other studies (8, 12). Forty-five percent of our patients re-ceived ambulatory antibiotic treatment before they were hospitalized. Kaya et al. determined 25%, and Bottin et al. determined 52% of the patients received ambulatory antibiotic treatment before hospitalization and this situation prolonged the hospitalization duration (8, 10).

The mean hospitalization duration was 9.7 days in this study. This period was 6.6 days in a study in which submandibular involvement was more frequent and abscess development was less frequent, and it was 13.1 days in a study in which parapharyngeal abscess was determined to be the most frequent finding (8, 19). The greater number of the patients with parapharyngeal abscess might be a factor prolonging hospitalization in this study. There was no delay in the diagnosis and treatment owing to the fact that our hospital is easily accessible for patients and this possibility might to be a factor shortening hospitalization.

Leucocytosis and CRP elevation are the laboratory findings supporting the DNI diagnosis. Belet et al. reported CRP elevation at 100 %, Kaya et al. reported CRP elevation at 95.3 % and leucocytosis at 89.5 % rate (8, 13). The fact that CRP value was higher than 100mg/L was shown to be related with complications prolonging the duration of hospitalization (20). In this study, CRP elevation was at 93.14 %, leucocytosis was at 89.61 % rate. Moreover, the highest CRP value of 359 mg/L was determined in the patient with mediastinitis.

Ultrasonography is cheap, portable, radiationless and provides sufficient information about the structure, location, and size in 96% of inflam-ma-to-ry neck masses, so it is suggested to be first line imaging method in the differantial diagnosis (21). Computed tomography (CT) provides valuable information about the location, origin, spread of the infection. The sensitivity of contrast CT in the DNI diagnosis is 95 %, its specificity is 53 %. Contrast CT provides correct anatomical information about the cervical space where the infection develops, and guides surgical drainage. Especially, CT should be performed in patients with worsening clinical findings and airway patency (21, 22). In this study, USG was performed in the patients with cellulite and/or myositis in whom serious DNI was not considered in terms of clinical features, and CT imaging was performed in the patients with the pre-diagnosis of serious DNI. Magnetic resonans imagination was performed in 4 patients due to malfunction in the CT device.

According to the ultrasonographic findings, the most frequent involvement was in the submandibular region, and this result was consistent with literature (8, 22, 23). Deep neck abscess was detected in all of the patients in whom contrast CT was performed, and these abscesses were most frequently parapharyngeal. Similarly, Ekşioğlu et al. reported that parapharyngeal involvement was the most frequent (1). Huang et al. reported parapharyngeal location at 42% rate and associated this frequency with the fact that infections in the peritonsillar, submandibular and parotid regions can spread to the parapharyngeal region due to anatomical connections (18). Peritonsillar abscesses are frequent in school-age children and adolescents, and they usually begin as exudative tonsillitis and progress to an abscess (13).

Classically, the most frequently anticipated abscess type is peritonsillar. Most probably, we determined peritonsiller location at a secondary frequency because of fewer number of adolescent cases in our study. Retropharyngeal abscesses are observed in the cavity extending from the skull base to the upper mediastinum and in various studies, the retropharyngeal re-gion was reported to be the most frequent

involvement (12, 24). In this study, the retropharyngeal involvement was determined at the least frequency.

The most common causes of DNIs in children are reported to be upper respiratory infections, odontogenic causes, congenital anomalies (12, 20, 25). Otorhinolaryngological infections may spread to the deep neck spaces and lymph nodes directly or through lymphatic drainage. In this study, the etiological cause was acute tonsillopharyngitis in 34.48% of the patients. Kaya et al. determined that the average age of patients with odontogenic DNI was significantly higher than the average age of patients with DNI due to other causes, and explained this result by the fact that the frequency of upper respiratory infections decreases after the age of 6 years and lymph nodes regress (8). In this study, the mean ages of the patients with odontogenic DNI and the patients with DNI due to acute tonsillopharyngitis were statistically similar.

Cellulite and myositis are among the infectious complications of varicella. In this study, two patients in whom DNI developed in the form of submandibular cellulite had histories of varicella. DNIs are polymicrobial infections. Prevotella, Porphyromonas, Fusobacterium and Peptostreptococcus are the most frequently isolated anaerobic; group A Streptococcus (Streptococcus pyogenes), Staphylococcus aureus and Haemophilus influenzae are the most frequently isolated aerobic microorganisms. When cultivated in the appropriate culture, anaerobic bacteria may be isolated from various abscesses. More than 2/3 of deep neck abscesses contain microorganisms producing beta-lactamase (26). In this study, aerobic and anaerobic cultures of 36 drainage materials were performed, growth was detected in 18 (50%), anaerobic microorganism growth was not observed.

Systemic antibiotic treatment at high doses must be initiated as soon as the DNI diagnosis is made and it must be completed within 2 or 3 weeks. Intravenous antibiotic treatment may be therapeutical in the cellulite period. In cas-es with abscess surgical drainage should be performed as an addition treatment regimen to antibiotherapy (22). The healing rate with the medical treatment without surgical drain-age was reported to be below 20% in the past, nowadays this rate has got closer to 80% with the more effective use of antibiotics (8, 13, 27). In this study, surgical drainage was performed in 62% of the patients, 28% of patients were recovered with the medical treatment alone.

A delay in the diagnosis and treatment, the presence of a systemic disease or immunodeficiency increase the frequency of complications. Airway obstruction, jugular vein thrombosis, mediastinal spread, pericarditis, pneumonia, arterial erosion, ruptured abscess, sepsis are the complications of DNIs (26). The complication rates were reported as 14%, 16%, and 10% in previous studies (11, 18, 28). In this study, mediastinitis developed in 1 patient, airway obstruction developed in 1 patient, and the complication rate was 3.44%. Baldassari et al. reported young age, retropharyngeal location and S. aureus growth to be the factors increasing the complication risk (29). In this study, S.aureus grew in the culture of the drainage materials of 2 patients with complications. Owing to the advancements in the diagnosis and treatment methods, the mortality rate in DNI has regressed from 42% to 11% in fifty years (30). In our study, there was no mortality.

The retrospective design can be considered as a limitation of this study.

In conclusion, children with neck swelling and fever should be evaluated in terms of DNI, dental and tonsillar examinations should be done carefully. Contrast CT scan should be per-formed for pre-diagnosis of cases with serious DNI and surgical drainage should be performed in cases with abscess formation. DNIs threatening airway patency may cause severe morbidity and mortality. Early diagnosis, appropriate antibiotic therapy with or without surgical drainage may improve prognosis.

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