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Original research article

An observational study to determine the presenting features and associated etiologic factors for deep neck space infection among 0-12 year's old children.

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Abstract

Aim: To determine the presentation and predisposing factors for paediatric deep neck space infection.

Methods: A prospective observational study was conducted in the Department of ENT, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 11 months. 100 Children from 0 to 12 years of age were studied. Diagnosis was made by ultrasonography and computed tomography scan (in some cases). Pus culture was done to know the causative organisms in cases presenting with abscesses. Ultrasonography of neck and Radiological investigations (x-ray soft tissue neck and CT Scan) were done to determine the location and extent of the abscesses. All patients were started on empirical antibiotic therapy of amoxicillin and clavulanic acid and metronidazole.

Results: 65% of the patients were male and 35% were female. Most of the patients were in the age group of 6-9 years. The most common symptom was neck swelling (83%) followed by pain in the neck (71%), fever (68%), and sore throat (44%). The most common clinical finding was swelling in the neck (90%) followed by oropharyngeal swelling (22%), dental abnormality (11%), trismus (9%). The source of infection was unknown in about 58 patients (58%) while others had history of upper respiratory tract infection in about 12 patients (12%) and dental infections in 10 (10%) patients. Cervical lymphadenopathy was noted in 3 (3%) patients. 10 (10%) patients presented with complications. The most common complication was upper airway obstruction, which was seen in 8 patients followed by mediastinitis in 1 patient and sepsis in 1 patient.

Conclusion: we concluded that the Deep neck space infections (DNSI) in paediatric population constitute a medical emergency as it could lead to life threatening complications in a short time.

Keywords: Deep neck space infections (DNSI), Paediatric, Mediastinitis, Sepsis

Introduction

Fascia is a dense connective tissue. Neck is draped with layers of fascia with potential spaces between them referred as neck spaces. Deep Neck Space Infections (DNSI) implies infection in the potential spaces either with abscess formation or with cellulitis. In the past the incidences of DNSI were more common. The advent of broad spectrum antibiotics has significantly brought down the incidence of these infections[1]. Antibiotics usage at adequate strength and duration has brought a significant decrease in the occurrence and progression of

the disease. These infections are severe and inadequate treatment may lead to progression and can be associated with high morbidity and mortality. The primary sources of DNSI are the dentition and tonsils, other sources may be from salivary glands, malignancies and foreign bodies. Commonly DNSI follows infections like dental caries, tonsillitis, and trauma to head and neck or in intravenous drug abusers. Odontogenic infection is one of the most common causes especially in developing countries[2]. Before the antibiotic era, tonsil and peritonsillar region were the source of infection in almost 70% cases[3] of DNSI, but now dental origin is considered the most common cause[4]. The odontogenic infections like periapical lesions with pulp necrosis and bacterial invasion into periapical tissues and periodontal lesions associated with periodontal pockets cause DNSI. As to bacteriology of DNSI the common organisms implicated are Streptococci, Staphylococcus aureus, Peptostreptococcus species and anaerobes[5, 6]. Mostly they are polymicrobial. Clinical manifestations depend upon the spaces involved and include fever, pain, fatigue, swelling, malaise, odynophagia, dysphagia, dyspnea, otalgia, trismus[7]. In immunocompromised patients with diabetes mellitus, patients on steroid therapy, chemotherapy or those with HIV infection the course of the disease may be more rapidly progressive with sometimes a fatal outcome. DNSI even with extensive and adequate antibiotic therapy still remains serious and can cause significant morbidity, 10-20% of cases go for life threatening complications[9, 10]. Dreaded complication includes Descending necrotizing mediastinitis resulting from retropharyngeal extension of infection into the posterior mediastinum. Septic shock is associated with 40-50% mortality rate[11, 12]. Cardiac tamponade resulting from pleural and pericardial effusion may also be seen. Suppurative thrombophlebitis of internal jugular vein associated with pulmonary embolism, thrombosis of cavernous sinus and erosion of carotid artery have also been reported[13]. Prompt surgical drainage of the abscess followed by antibiotics is the main line of treatment. In cases of cellulitis non-surgical management with appropriate antibiotics is given[14]. Surgical treatment of odontogenic infections with the aim of removing the source is important[15].

Material and Methods

A prospective observational study was conducted in the Department of ENT, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India, for 11 months, after taking the approval of the protocol review committee and institutional ethics committee.

Inclusion criteria

- 100 Children from 0 to 12 years of age
- Diagnosis by ultrasonography and computed tomography scan (in some cases) .
- Pus culture to know the causative organisms in cases presenting with abscesses.

Exclusion criteria

- Children above 12 years of age and superficial neck space infection.

Methodology

Patients presenting with deep neck space infections were thoroughly examined to know the source of the infection. Ultrasonography of neck and Radiological investigations (x-ray soft tissue neck and CT Scan) were done to determine the location and extent of the abscesses. All patients were started on empirical antibiotic therapy of amoxicillin and clavulanic acid and metronidazole. Patients with small abscess were blindly aspirated with wide bore needle, while incision and drainage were done for large abscess. The pus samples from both were sent for culture and sensitivity. Patients, who presented with complications, underwent incision and drainage. Patients, who failed empirical antibiotic therapy and needle aspiration, underwent incision and drainage. Duration of intravenous antibiotic, type of antibiotic was determined on the clinical response and our clinical judgment.

Results

65% of the patients were male and 35% were female. Most of the patients were in the age group of 6-9years (Table1).

Table 1: Gender distribution of patients

Gender	Number of patients	Percentage
Male	65	65
Female	35	35

The most common symptom was neck swelling (83%) followed by pain in the neck (71%), fever (68%), and sore throat (44%) (Table2).

Table 2: Various symptoms

Symptoms	No.of patients	%
Swelling in neck	83	83
Pain in neck	71	71
Fever	68	68
Toothache	11	11
Sore throat/ dysphagia/ odynophagia	44	44
Trismus	8	8
Torticollosis	3	3

Table 3: Various clinical findings

Clinical findings	No. of patients	%
Swelling in neck	90	90
Oropharyngeal swelling	22	22
Trismus	9	9
Dental abnormality	11	11
Cervical lymphadenopathy	4	4
Furunculosis over neck	2	2
Stridor	2	2

The most common clinical finding was swelling in the neck (90%) followed by oropharyngeal swelling (22%), dental abnormality (11%), trismus (9%). The source of infection was unknown in about 58 patients (58%) while others had history of upper respiratory tract infection in about 12 patients (12%) and dental infections in 10 (10%) patients. Cervical lymphadenopathy was noted in 3 (3%) patients (table 4).

Table 4: Predisposing factors in percentage of population

source of infection	Number of patients	Percentage
Unknown	58	58
History of upper respiratory tract infection	12	12
Dental infections	10	10
Cervical lymphadenopathy	3	3
Furunculosis over neck	1	1
Parotitis	1	1

10 (10%) patients presented with complications. The most common complication was upper airway obstruction, which was seen in 8 patients followed by mediastinitis in 1 patient, sepsis in 1 patient. Cultures of 100 patients showed bacterial growth only in 74 patients (74%).

Table 5: The locations of the DNSI/abscess with respect to age group

Parameter	Below 3 years	3-6 years	6-9 years	9-12 years	Total
Submandibular	3	7	12	18	40
Submental	2	7	11	7	27
Per tonsillar	-	5	13	7	25
Para pharyngeal	-	1	1	1	3
Retropharyngeal	-	2	1		3
Prevertrebral	-	1		-	1
Parotid	-	1	-	-	1

In our study submandibular space involvement was most common (40%) followed by submental (27%) and per tonsillar (25%). This was due to the fact that most of the patients had received at least one course of antibiotics before presenting in our clinical setup. Patients who had abscess with complications underwent incision and drainage and empirical antibiotic therapy. Patients without complications (90) were treated by two methods. 35 patients with small abscess (<2cm) underwent needle aspiration followed by empirical antibiotics. Out of 35 patients only 10 responded while 25 failed who later underwent incision and drainage (I&D). 15 patients with large abscess (>2cm) underwent I&D out of which 5 patients had recollection and high-grade fever. Reopening of incision site was done and all responded. 40 patients without frank abscess were treated with empirical antibiotic therapy and all of them responded. There were 4 cases where CT was suggestive of abscess while on incision and drainage no abscess was seen. It was observed that few patients had associated systemic diseases. 1 patient had chronic otitis media squamosal type which presented with bezolds abscess. 2 patients had extra pulmonary tuberculosis with neck node lymphadenitis. 1 other patient had branchial cleft sinus which presented with recurrent infections and neck abscess.

Discussion

The data from our study shows that younger children have uncharacteristic presentations of DNIS that closely mimic signs and symptoms of viral upper respiratory tract infections like

agitation, cough, lethargy, and rhinorrhoea, increasing the difficulty in establishing accurate diagnosis.[16, 17]. It is observed that paediatric DNIS are more predominant in males over females[16]. The duration of symptoms ranged from 24 hours to maximum of 15 days as reported in other studies[18-20]. It was reported that most common symptoms are fever, limited neck mobility and odynophagia[21]. In infants it was observed that neck mass was present in 92% of patients, fever in 60%, and dysphagia and/or poor oral intake in 36%[22]. In our study submandibular space involvement was most common (40%) followed by submental (27%) and per tonsillar (25%). Coticchia et al. observed that the most common encountered sites were retropharyngeal space or para pharyngeal spaces, followed by anterior and posterior triangle and submandibular and submental spaces[17]. Parotitis was noted in one patient in our study. Retropharyngeal abscess was common in 3-6 years of age. Yeoh et al. reported 16 cases; all of them were younger than 6 years due to retropharyngeal lymph nodes[23]. In our study cause of infections remained unknown in 58% which corroborated with other studies[24, 25]. The most known causative factor was upper airway infections followed by odontogenic infections[26]. In our study, cultures of 100 patients were taken, out of which only 74 grew organisms. Gram positive organisms were seen in 40 patients and 30 patients showed gram negative organisms, 4 patients showed polymicrobial organisms similar to a study by Brook et al[27]. Methicillin resistant staphylococcus aureus (MRSA) was the most common organism in our study followed by klebsiella[28]. MRSA in our study was sensitive to clindamycin, gentamycin, vancomycin, linezolid similar to a study by Kathryn Ossowski et al. and resistant to Trimethoprim-Sulfamethoxazole.[29]

We found a high incidence of MRSA infection in patients who had complications. Out of 10 patients with complications 8 patients had MRSA infection. 2 of our patients who had mediastinitis had MRSA similar to a study by Thomason et al. who found mediastinitis highly associated with MRSA associated deep neck space infections[30]. 2 patients out of 8 patients with upper airway obstruction had MRSA whereas 2 patients with sepsis had MRSA. 80% (8 out of 10) of patients with complications had MRSA infection similar to a study done by Wright et al[32]. Imaging and physical examinations have sensitivity and specificity of 33 % and 81% respectively in detecting presence of an abscess[33]. CT is the most widely used imaging procedure. CT is helpful both in determining the presence and location of neck infections in children. It is less helpful in differentiating abscess from lymphadenitis and cellulitis. MRI gives improved soft tissue definition without the use of radiation. USG also seems more effective than CT in differentiating abscess versus cellulitis and can be helpful to avoid incision and drainage in cellulitis[33, 34].

Incision and drainage were considered in patients who did not respond to empirical antimicrobial therapy. After obtaining imaging and depending on the location of the abscess, an intraoral or external approach was used. The patients who had undergone surgical management had longer stay than those managed conservatively[29, 19]. The surgical approach is determined by the location of the abscess and its relation to important surrounding structures. In per tonsillar abscesses, needle aspiration is a widely accepted therapy. In patients with larger abscesses, a more invasive approach, such as intraoral incision and drainage may be warranted.

Conclusion

We concluded that the Deep neck space infections (DNIS) in paediatric population constitute a medical emergency as it could lead to life threatening complications in a short time. Though with changing times new diagnostic and therapeutic tools have drastically reduced the incidence of complications.

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