

Original Research Article

Study on presentation and predisposing factors for pediatric deep neck space infection

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ABSTRACT

Background: Aim were to study the clinical presentation and predisposing factors in children with deep neck space infections and to study the effective mode of management of pediatric deep neck space infections and its complications.

Methods: This prospective study was done in a tertiary care hospital on 163 pediatric patients with deep neck space infections who were thoroughly examined to know the source of the infection. Ultrasonography of neck and Radiological investigations 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 presenting with complications, underwent incision and drainage. Patients, who failed empirical antibiotic therapy and needle aspiration, then underwent incision and drainage.

Results: The most common symptom and sign was neck swelling (85%). The next most common symptom was neck pain (70%). Most of the patients had unknown source of infection and others had history of recurrent sore throat, dental infections, acute cervical lymphadenopathy, parotitis and furuncle over neck.

Conclusions: Deep neck space infections (DNI's) in pediatric population constitutes of medical emergency as it could lead to life threatening complications in a short time. Though with changing times of new diagnostic and therapeutic tools have drastically reduced the incidence of complications.

Keywords: Deep neck space infections, Pediatric, Management of DNI's

INTRODUCTION

Deep neck space infections (DNI'S) are defined as inflammation contained within the fascial planes and spaces of head and neck.¹ Such infections may be of nasal, oral, aural, bony origin, etc.¹ Despite the introduction of antibiotics, deep neck infections still occur. It remains an important disease entity as life threatening complications like acute upper airway

obstruction, mediastinitis, etc. can occur if not managed promptly.² In paediatric patients, the most common identified source is acute tonsillitis with involvement of peritonsillar space and second most common source being dental infections.³ Other sources of neck infections are acute parotitis, acute sialadenitis, Bezold's abscess, and suppuration of deep cervical lymphatics.⁴

The clinical presentation of the patients is dependent on the inflammatory response on the structures within and surrounding the abscess.⁵ Children with deep neck infections have subtler presentation as they are unable to verbalize their symptoms and seldom cooperate with physical examinations.⁵ The most common features are neck mass or swelling, fever and poor oral intake. Other symptoms are neck, pain, irritability, neck stiffness, sore throat, upper airway obstruction.^{6,7} These infections are usually of mixed bacteriological flora including alpha and beta Streptococci, Staphylococcus, Bacteriodes, *E. coli*, Klebsiella.⁸

Paediatric deep neck infections involve a larger portion of the neck due to rapid spread to adjacent spaces. The management of paediatric neck abscesses include high dose of intravenous antibiotics and surgical drainage where ever necessary.² Empirical antibiotic therapies must cover gram positive, gram negative, anaerobes and beta-lactamase producing organisms.

Surgical drainage of the abscess is the definitive treatment for deep neck abscess. Needle aspiration are also done in abscess size less than 1.5 cm. If the abscess size is small with no imminent complications, a trial of conservative management may be attempted.² Tracheostomy is done in patients presenting with upper airway obstruction to secure airway as it is most likely cause of fatality.²

Aim

Aim were to study the clinical presentation and predisposing factors in children presenting with deep neck space infections and to study the effective mode of management of pediatric deep neck space infections and its complications.

METHODS

Design

This study was prospective study.

Setting

This study was being reported from R G Kar Medical College & Hospital (Tertiary care hospital).

Sample size

Sample size of the study was 163 patients.

Sample size justification

One study found that prevalence of paediatric deep neck infections was 4.6%. So, for this study $p=0.046$.

Thus, the number of patients required for this study was 163.10~ 163 with power 87%.

The formula used for sample size calculation is as follows

$$n = 4pq / (L^2)$$

Where, n= required sample size, $p= 0.046$ (as per the study by Kataria et al⁹, $q =1-p$, L=loss % (loss of information)

Calculation

Here $p=0.046$,

$$q=1-p = 1-0.046 =0.954,$$

$$4pq = 4 \times 0.046 \times 0.954 = 0.1755$$

$$L2 = 0.001076$$

$$n = 4pq / (L^2) = 0.1755/0.001076= 163.10= 163$$

Study group

163 patients were taken in our study

Duration

The duration of the study was January 2017 to December 2019.

Inclusion criteria

Inclusion criteria were 1) children from 0 to 12 years of age 2) diagnosis by ultrasonography and computed tomography scan (in some cases) 3) pus culture to know the causative organisms in cases presenting with abscesses.

Exclusion criteria

Exclusion criteria were children above 12 years of age and superficial neck space infection

Ethical clearance

Yes

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, then underwent incision and drainage.

Duration of intravenous antibiotic, type of antibiotic was determined on the clinical response and our clinical judgement.

RESULTS

The most common symptom was neck swelling (85%), followed by pain in the neck (70%), fever (69%), and sore throat (45%) (Table 1).

Table 1: Various symptoms.

Symptoms	No. of patients	%
Swelling in neck	138	85
Pain in neck	114	70
Fever	112	69
Tooth ache	16	10
Sore throat/ dysphagia/ odynophagia	73	45
Trismus	11	7
Torticollis	1	2

Table 2: Various clinical findings.

Clinical findings	No. of patients	%
Swelling in neck	143	88
Oropharyngeal swelling	32	20
Trismus	11	7
Dental abnormality	16	10
Cervical lymphadenopathy	4	3
Furunculosis over neck	1	1
Stridor	1	1

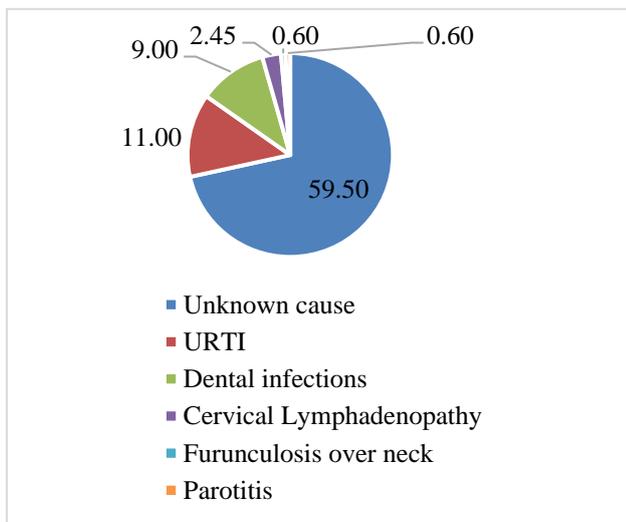


Figure 1: Predisposing factors in percentage of population.

The most common clinical finding was swelling in the neck (88%), followed by oropharyngeal swelling (20%), dental abnormality (10%), trismus (7%). Seventy per cent of the patients were male i.e. 115 patients out of 163 (70%). 70 patients (42%) were in the age group of seven years to nine years (Table 2). The locations of the DNIs/abscess with respect to age group are shown in Figure 2. The source of infection was unknown in about 97 patients (59.5%) while others had history of upper respiratory tract infection in about 18 patients (11%) and dental infections in 16 (9%) patients. Cervical lymphadenopathy was noted in 4 (2.45%) patients (Figure 1).

Furunculosis over neck was noted in 1 (0.613%) patient and parotitis in 1 (0.613%) patient. 12 (7.36%) patients presented with complications. The most common complication was upper airway obstruction, which was seen in 9 patients, followed by mediastinitis in 2 patients, sepsis in 1 patient. Cultures of 70 patients grew bacteria in only 55 patients (78.5% on 70 patients).

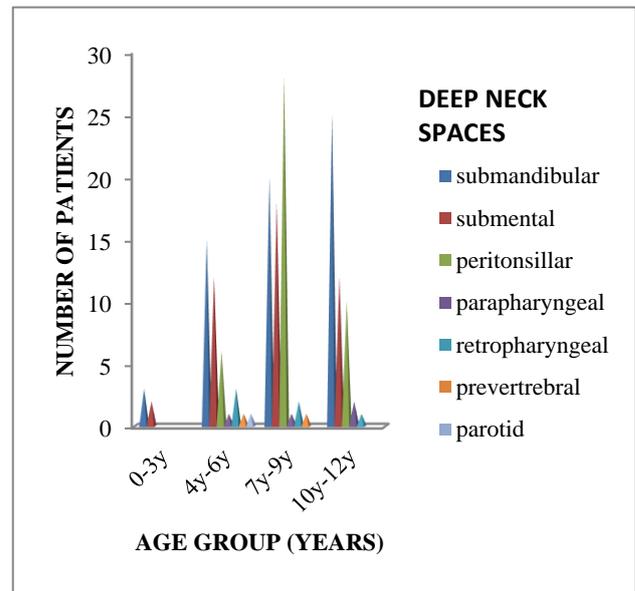


Figure 2: Age group distribution of different sites.

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 (148) were treated by two methods. 45 patients with small abscess (<2cm) underwent needle aspiration followed by empirical antibiotics. Out of 45 patients only 10 responded while 35 failed who later underwent incision and drainage (I and D). 25 patients with large abscess (>2cm) underwent I&D out of which 8 patients had recollection and high-grade fever. Reopening of incision site was done and all responded. 93 patients without frank abscess were treated with empirical antibiotic therapy and all of them responded. There were

5 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. 3 patients had extra pulmonary tuberculosis with neck node lymphadenitis. 2 others 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.^{2,7} It is observed that paediatric DNIs are more predominant in males over females.² The duration of symptoms ranged from 24 hours to maximum of 15 days as in other studies.¹⁰⁻¹²

It was reported that most common symptoms are fever, limited neck mobility, and odynophagia.¹³ In infants it was seen that neck mass is seen in 92% of patients, fever 60%, and dysphagia and/or poor oral intake 36%.¹⁴ In our study submandibular space involvement was most common (38%) followed by submental (26%) and peritonsillar (24%). Cotichia et al where the most common encountered sites were retropharyngeal space or parapharyngeal spaces, followed by anterior and posterior triangle and submandibular and submental spaces.⁷ Parotitis was noted in one patient in our study.

Retropharyngeal abscess was common in 4-6 years of age Yeoh et al reported 16 cases all of them were younger than 6 years due to retropharyngeal lymph nodes.¹⁵ In our study cause of infections remained unknown in 60% which corroborated with other studies.^{3,4} The most known causative factor was upper airway infections followed by odontogenic infections.¹⁶

In our study, cultures of 70 patients were taken, out of which only 55 grew organisms. Gram positive organisms were seen in 32 patients and 18 patients showed gram negative organisms and 5 patients showed polymicrobial organisms similar to a study by Brook et al.¹⁷ methicillin resistant staphylococcus aureus (MRSA) was the most common organism in our study followed by klebsiella.¹⁸ 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.¹⁹

Complications

We found a high incidence of MRSA infection in patients who had complications. Out of 12 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.⁶ 3 patients out of 9 patients with upper airway obstruction had MRSA, one patient with sepsis had MRSA.²⁰ 66% (8 out of 12) of patients with complications had MRSA infection similar to a study done by Wright et al.²¹ Imaging and physical examinations have sensitivity and specificity of 33 % and 81% respectively in detecting presence of an abscess.¹ 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 identifying abscess versus cellulitis and can be helpful to avoid incision and drainage in cellulitis.^{1,22}

Treatment

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.¹⁹ The surgical approach is determined by the location of the abscess and its relation to important surrounding structures. In peritonsillar 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.

Limitations

The sample size is small. In my study only 163 patients were included. The study was done in a single centre. Since the study was done in a single tertiary care centre hence hospital bias cannot be ruled out.

CONCLUSION

The diagnosis and management of paediatric DNIs have continued to evolve. Improvements in imaging techniques with emphasis in minimizing the dose of radiation, antibiotic stewardship, and airway management have resulted in a significant decrease in the overall morbidity and mortality. It is, however, still important to understand the anatomical relations and clinical features of DNIs because these uncommon infections with subtle clinical presentations may be associated with airway compromise or complications due to involvement of contiguous vital structures.

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