

# Deep neck space infections - A retrospective study

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## Abstract

**Aim:** To evaluate the etiology and prevalence, distribution within sexes and various age groups, prevalence of micro-organisms, various types of investigations and to study about the mainstay of treatment of deep neck infections. **Materials and Method:** A retrospective study involving 118 patients with deep neck space infections were analysed in the Department of Otorhinolaryngology, SRM Medical college hospital and Research institution from June 2012 to June 2016. **Result:** (1) Among the 118 cases of deep neck space infections the most common was peritonsillar abscess (Quinsy) followed by Ludwig's angina, retropharyngeal abscess, parapharyngeal abscess, submandibular abscess, parotid abscess, buccal space abscess, anterior visceral space abscess and acute necrotizing fasciitis. (2) Staphylococcus aureus was the commonest organism causing deep neck space infection. (3) Among 118 cases, 83 cases had Incision and Drainage for peritonsillar abscess, retropharyngeal abscess, parotid abscess, anterior visceral space abscess, acute necrotizing fasciitis and few cases of parapharyngeal abscess. Remaining 33 cases were treated by culture sensitive antibiotics. (4) Among 118 cases, 2 cases had airway compromise and underwent tracheostomy. **Conclusion:** Surgical drainage and broad spectrum antibiotics remain the mainstay of treating deep neck space infections.

**Key Words:** deep neck space infection.

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## INTRODUCTION

Deep neck infections have a tendency to produce severe complication. Deep neck infections are the infections which develop in the various space and compartments formed by the cervical fascia in the neck. In relation to the hyoid bone, Deep neck spaces are divided into three groups (i) above the level of hyoid: Peritonsillar space, Submandibular space, Parapharyngeal space, Masticator/temporal space, Buccal space, Parotid space. (ii) Below the hyoid: Anterior visceral space/Pretracheal space. (iii) which involve the entire length of the neck:

Retropharyngeal space, Danger space, Prevertebral space, Carotid space<sup>1</sup>. The spread of infections, complications and treatment for deep neck space infections are based on the site of the deep neck spaces and the fascial layers<sup>2</sup>. It can lead to a dreaded complications and life threatening illness or even death if not treated appropriately<sup>1</sup>. The most common Symptoms are fever, sore throat, neck pain, neck swelling, symptoms often overlap with those of other common clinical pictures like, pharyngitis, tonsillitis and torticollis<sup>3,4</sup>. The early diagnosis and treatment is mandatory. Due to increasing incidence in DM, TB, odontogenic infections, increasing resistant bacterial strain and poor oral hygiene, there are increasing cases of deep neck space infections<sup>(2)</sup>. Early management and airway management are important aspects of treatment<sup>5</sup>. Proper antibiotic coverage and early surgical drainage for abscesses are mandatory. Radiological investigations and appropriate laboratory investigations play a vital role. Regarding the treatment, it involves medical and surgical treatment. Medical treatment involves broad spectrum antibiotics<sup>6</sup>. Surgical management involves intra oral drainage, external incision and drainage. Tracheostomy is indicated only if

there is a airway compromise<sup>2,7</sup>. Deep neck space infections can be fatal and mandates an aggressive management protocol. Dreaded complications are such as airway obstruction, cervical necrotising fasciitis, jugular vein thrombosis, disseminated intravascular coagulation, empyema, mediastinitis, aspiration pneumonia to thrombosis/aneurysm of carotid. Risk factors are infections, foreign bodies, trauma, immunosuppression and addiction to intravenous drugs<sup>(1)</sup>. The clinical presentations vary and depend on the involved cervical spaces. The purpose of this study is to evaluate the aetiology, prevalence, distribution within sexes and various age groups, microorganism cultured and the management in our centre.

**MATERIAL AND METHODS**

This retrospective study was conducted in SRM Medical College Hospital and Reseach Institute, Chennai, from June 2012 to June 2016. A total of 118 patients with deep neck space infections who were admitted in the Department of Otorhinolaryngology were analysed during the study period. Cases with fever, sore throat, odynophagia, dysphagia, neck swelling, neck pain, neck tenderness and change in voice were selected. Patients less than 12 years of age and patients with pre-existing malignancy were excluded from this study. All cases underwent a thorough history taking and a detailed clinical examination. When deep neck space infection was suspected, the cases were examined thoroughly with X- ray neck lateral and anteroposterior view, Chest X-ray, Computed tomography scan and microbiological studies. Basic blood and urine test were done. The patients were then started on broad spectrum antibiotics later changed to appropriate antibiotic based on culture and sensitivity. If the abscess was more than 3 cm in diameter involving peritonsillar space, prevertebral, anterior visceral, carotid spaces or that involving more than or equal to two spaces, according to computed tomography scan were, surgically incised and drained<sup>8</sup>. Open surgical procedures were indicated in cases with airway compromise, descending infections, patients with diabetes mellitus and patients with no improvement after 48 hours of parental antibiotics and their management results were analysed<sup>1,2,7,9</sup>.

**RESULTS**

There were 83 (70.3%) male and 35 (29.7%) female patients with a male: female ratio of 2: 1.

**Table 1: Distribution of sex**

Gender	No. of patients	Percentage
Male	83	70.3%
Female	35	29.7%

Among the 118 cases of deep neck infections the most common was Peritonsillar abscess - Quinsy (35.60%) followed by Ludwig’s angina (27.12%), Retropharyngeal abscess (15.26%), Parapharyngeal abscess (10.17%), Submandibular abscess (3.39%), Parotid abscess (2.54%), Buccal space abscess (2.54%), Anterior visceral space abscess (2.54%) and deep neck space infections with acute necrotizing cervical fasciitis with multiple space involvement (0.84%)

**Table 2: Location of Abscess**

Deep neck infections	No of patients	Percentage
Peritonsillar Abscess	42	35.60%
Ludwig’s angina	32	27.12%
Retropharyngeal Abscess	18	15.26%
Parapharyngeal Abscess	12	10.17%
Submandibular Abscess	4	3.39%
Parotid Abscess	3	2.54%
Buccal space Abscess	3	2.54%
Anterior visceral space abscess	3	2.54%
Acute necrotizing cervical fasciitis with multiple space involvement	1	0.84%

There were 42 cases of Peritonsillar abscess out of which, 30 (71%) was male and 12 (29%) was female. It is more common between 21 to 30 years of age in male. All cases presented with complaints of fever and sore throat, 36 (86%) cases with odynophagia and 41 (98%) cases with change in voice. There were 32 cases of Ludwig’s angina out of which, 17 (53%) was male and 15 (47%) was female. It is more common between 51-60 years of age in male. The most common cause was poor oral hygiene and dental caries in 27 (84%) cases followed by diabetes mellitus in 3 (9%) cases and dental root abscess in 2 (6%) cases. All cases presented with fever and neck swelling, 26 (81%) cases with odynophagia, 20 (63 %) cases with dysphagia. There were 18 cases of Retropharyngeal abscess out of which, 15 (83%) was male and 3 (17%) was female. It was more common between 41-50 years of age in male. The most common cause was odontogenic infections in 13 (72%) cases followed by diabetes mellitus in 3 (17%) cases and foreign body in 2 (11%) cases. All patients presented with fever, 13 (72%) with dysphagia, 3 (17%) with neck pain, 14 (78%) with neck swelling and 1 (5.5%) with airway compromise. There were 12 cases of Parapharyngeal abscess out of which, 11 (92%) was male and 1(8%) was female. It is more common between 21-60 years of age in male. All patients presented with fever and truisms, 10 (83%) with neck pain and neck swelling. There were 4 cases of Submandibular abscess out of which, 3 (75%) was male and 1 (25%) was female. It was more common between 41-50 years of age in male. All patients presented with fever, truisms, odynophagia and dysphagia. There were 3

cases of Parotid abscess out of which, 1(33%) was male and 2(67%) was female. All patients presented with fever, cheek swelling and trismus. There were 3 cases of Buccal space abscess, of which, 3 (100%) was male. All patients presented with fever and cheek swelling. There were 3 cases of Anterior visceral space abscess out of which, 2 (67%) was male and 1(33%) was female. All patients presented with fever, neck pain and neck swelling. There was 1 case of Deep neck space infections with acute necrotising fasciitis, aged between 41-50 years male. Patient presented with fever, dysphagia, neck pain, neck swelling and airway compromise. The most common etiology and risk factors for deep neck infections are dental caries and poor dental hygiene in 74 (62.71%) cases followed by, chronic pharyngitis in 36 (30.51%) cases, foreign body in 4 (3.40%) cases (artificial dentures associated with chronic retropharyngeal abscess), diabetes mellitus in 2 (1.69%) cases, dental root abscess in 1(0.85%) case and trauma in 1 (0.85%) case.

**Table 3: Etiology of abscesses**

Aetiology	No. of patients	%
Dental caries and poor dental hygiene	74	62.71%
Chronic pharyngitis	36	30.51%
Foreign body	4	3.40%
Diabetes mellitus	2	1.69%
Dental root abscess	1	0.85%
Trauma	1	0.85%

All the 118 cases after a complete clinical examination underwent X- ray neck- soft tissue (anteroposterior and lateral), X- ray chest and culture and sensitivity of the aspirate. 81 (69%) cases underwent computed tomography scan to evaluate the size of abscess and involvement of other spaces and to look for impending airway.

**Table 4: Micro-organisms**

Micro organism	No. of patients	%
Staphylococcus aureus	31	26%
Streptococcus progenies and pneumoniae	24	20%
Klebsiella pneumoniae	19	16%
Coagulase negative Staphylococcus aureus	18	15%
Gram negative organisms like E.coli-6 and proteus-6	11	9%
Methicillin resistant Staphylococcus aureus	9	8%
No growth	4	3%

The most common organisms found in deep neck space infections are Staphylococcus aureus in 31(26%) cases, followed by Streptococcus progenies and pneumoniae in 24 (20%) cases, Coagulase negative Staphylococcus aureus in 18 (15%) cases, Klebsiella pneumoniae in 19 (16%) cases, Gram negative organisms like E.coli-6 and

proteus-6 in 11 (9%) cases, Methicillin resistant Staphylococcus aureus in 9 (8%) cases and no growth in 4 (3%) cases. Combination of Antibiotic was given most commonly based on cultural and sensitivity of aspirate in 70 (60%) cases Cefotaxime+Metronidazole+Garamycin followed by Cefoperazone Sulbactam in 19 (16%) cases, Amoxicillin + Clavulanic acid in 11(9%) cases, Ciprofloxacin in 11(19%) cases and Amikacin in 7 (6%) cases. Among 118 cases, 83 (70%) cases had incision and drainage for peritonsillar abscess, retropharyngeal abscess, anterior visceral space abscess, acute necrotising fasciitis and few cases of parapharyngeal abscess. Remaining 33 (28%) cases were treated by broad spectrum antibiotics. Among 118, patients, 2 (2%) cases had airway compromise and underwent tracheostomy.

**Table 5: Most commonly use Antibiotics according to culture and sensitivity**

Antibiotics	No. of patients	%
Cefotaxime+ Metronidazole+ Garamycin	70	60%
Cefoperazone Sulbactam	19	16%
Amoxicillin + Clavulanic acid	11	9%
Ciprofloxacin	11	19%
Amikacin	7	6%

**Table 6: Treatment in patients with deep neck abscesses**

Treatment	No. of patients	%
Broad spectrum antibiotics	33	28%
Incision and drainage with Broad spectrum antibiotics	83	70%
Tracheostomy	2	2%

## DISCUSSION

This study found that deep neck space infections are more common in male (70.3%), consistent with studies by Sethi and Stanley<sup>12</sup>, Meher *et al*<sup>11</sup> and Parischar and Harel<sup>10</sup>, all of which showed male predominance. All the 118 patients were aged below 60 years. Majority of the patients were in their third decade of life, which correlates with the studies done by Parischar and Harel<sup>10</sup> and Meher *et al*<sup>11</sup>. These infections are more frequent in younger ages and middle aged adults. IN our study the most common presentation was Peritonsillar abscess 35.60% followed by Ludwig's angina 27.12%, Retropharyngeal abscess 15.26%, Parapharyngeal abscess 10.17%, Submandibular abscess 3.39%, Parotid abscess 2.54%, Buccal space abscess 2.54%, Anterior visceral space abscess 2.54% and deep neck space infections with acute necrotizing cervical fasciitis with multiple space involvement 0.84%. Ludwigs angina, peritonsillar abscess and anterior visceral space abscess accounts for 65.26% of patients in our study, similar to the study by Khode *et al*<sup>13</sup> with about 60% cases under the same

category. Various other studies show that the most common presentation of deep neck space abscesses is Ludwig's angina followed by peritonsillar and submandibular abscess. The major cause of deep neck space abscesses in our study was dental caries and poor dental hygiene (odontogenic cause) in 62.71% cases, consistent with studies done by Parischar and Harel<sup>10</sup> in 2001, Bottin *et al*<sup>14</sup>, Huang *et al*<sup>9</sup>, Marioni *et al*<sup>16</sup> and Eftekharian *et al*<sup>15</sup> in 2009. The second most common cause in our study is chronic pharyngitis in 30.51% cases, followed by foreign body in 3.40% cases, diabetes mellitus in 1.69% cases, dental root abscess in 0.85% cases and trauma in 0.85% cases. Odontogenic infections most commonly involves the lower molar teeth, since the mandibular plate is relatively thin at this site. Poor oral hygiene affects the host's vulnerability to systemic diseases by forming a subgingival biofilm which acts as a reservoir of gram negative bacteria, and through the periodontium acting as a reservoir of inflammatory mediators<sup>17</sup>. The most common presenting complaint in our study is fever followed by dysphagia and odynophagia, neck pain and swelling which is similar to other studies<sup>14,15</sup>. In our study all the 118 patients were first started on Intravenous broadspectrum antibiotic (Inj. Amoxicillin+ Clavulanic acid) along with other supportive measures, later the preferred antibiotic was given according to culture and sensitivity.



**Figure 1:** Patient with anterior visceral space infection

In our study majority of the cases reported with culture of organism *Staphylococcus aureus* 26% which is consistent with the studies of Ridder *et al*<sup>18</sup>, Parischar and Harel<sup>10</sup>, Mumtaz *et al*<sup>19</sup> and Gidley *et al*<sup>20</sup>. The second most common organism cultured was *Streptococcus progenies* and pneumonia 20%, followed by *Klebsiella pneumonia* growth 16%, Coagulase negative *Staphylococcus aureus* growth 15 %, Gram negative organisms like *E.coli-6* and *proteus-6* growth 9%, Methicillin resistant *Staphylococcus aureus* growth 8 %. No growth was found in 3%, which was probably due to the use of antibiotics at the time the culture was sent. 60% of cases received Cefotaxime+ Metronidazole+ Garamycin.



**Figure 2:** Patient with parapharyngeal abscess (after surgical drainage)

If there is a small amount of abscess and no impending complications are noted, medical therapy may be sufficient. In our study, 28% of cases were managed by medical treatment. Surgical intervention (incision and drainage) was necessary in about 70% of cases despite intravenous antibiotic therapy according to culture and sensitivity. Study done by Mumtaz *et al*, Eftekharian *et al* and Parischar and Harel required surgical intervention in 78%, 79%, and 100% cases respectively. Computed tomography was done in 69% of cases which was helpful in knowing the exact extent of the abscess. The main life threatening complications include descending mediastinitis, respiratory obstruction, pleural effusion, pneumonia, pericarditis, jugular vein thrombosis, venous septic emboli, carotid artery rupture, hepatic failure, adult respiratory distress syndrome, septic shock and disseminated intravascular coagulopathy.



**Figure 3:** Patient with anterior visceral space infection

In our study two (2%) cases underwent tracheostomy as the patient's airway was compromised, one in retropharyngeal abscess and the other in acute necrotising fasciitis. On the other hand study by Eftekharian *et al*<sup>15</sup> showed that 8.8% cases required tracheostomy. Tracheostomy must always be considered whenever there is respiratory difficulty. Sometimes attempting intubations can worsen an already damaged airway<sup>21</sup>.



Figure 4: Patient with anterior visceral space infection

## CONCLUSION

Deep neck space infections remain a common and challenging disease for otorhinolaryngologist, despite the wide use of antibiotics. In our study odontogenic infections was the most common etiological factor, prevention of the same can be achieved by awareness of dental and oral hygiene. The three keys to successful management of deep neck space infections are (i) protection and control of airway, (ii) Antibiotic therapy, (iii) Surgical drainage.

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