ORIGINAL STUDY

Prevalence, morbidity and mortality of deep neck abscess in a tertiary hospital from Northwestern Mexico

Alejandra Pineda-Alvarado[1], Juan Antonio Lugo-Machado[1], Edwin Canché-Martin[1], Jaime Zuleyka Quintero[2], Irene Arellano-Ridriguez[1], Lorenzo Lizárraga Lizárraga[1]

[1]"Luis Donaldo Colosio Murrieta" Specialty Hospital No 2, Mexican Institute of Social Security, Sonora, Mexico
[2]Technological Institute of Sonora, Sonora, Mexico

ABSTRACT

BACKGROUND. Neck abscesses are defined as processes of infectious origin, which form a collection of purulent material through the deep planes of the neck, formed by fasciae. It may involve one or more spaces of the cervical region. In addition, they can be localized or disseminated and generate extremely serious and life-threatening complications.
OBJECTIVE. To identify the prevalence of deep neck abscess in our tertiary hospital center.
MATERIAL AND METHODS. A retrospective, analytical, observational, and cross-sectional study was carried out from January 2015 to May 2019. The data observed during the care of the patients with a diagnosis of deep neck abscess were collected from the clinical records. Descriptive statistics were performed, and the odd ratio was used for the risk probability analysis.
RESULTS. A prevalence of 42 cases was found in 5 years, with 8.4 annual cases, average age of 45.2 years, male gender predominance in 53% of the cases. Descending mediastinitis was the most common complication and a mortality of 8.33% was presented. Type 2 diabetes mellitus and the involvement of 3 or more spaces represented a higher risk for complications compared to healthy patients who presented involvement of ≤2 spaces.
CONCLUSION. In the Northwestern region of Mexico of IMSS beneficiaries, we have a prevalence of 42 cases in 5 years, 8.4 per year. The average age of our series is 45.2 years and there is no difference regarding the affection by gender. The involvement of two or more than three spaces represents the majority of cases. More than half of our cases underwent surgical drainage. Type 2 diabetes mellitus alone or accompanied with other comorbidities was the most common associated pathology; this same entity and the involvement of 3 or more spaces presented a higher risk of complications
KEYWORDS: nasal respiratory performance, nasal respiratory work, nasal resistance, four-phase rhinomanometry.

INTRODUCTION

Deep neck abscesses are defined as processes of infectious origin, which form a collection of purulent material through the deep planes of the neck, formed by fasciae. They can involve one or more of the spaces of the cervical region[1]. It is a common emergency in otorhinolaryngology that can be life-threatening since it can cause airway obstruction, descending mediastinitis, or jugular vein thrombosis[2].

Some authors have stated that deep neck abscesses are currently less frequent than in the past, because of the advent of antibiotics and the improvement in oral hygiene[3]. This infection still occurs with considerable frequency and can be associated with a high morbidity and mortality[4].

They represent approximately 3,400 hospitalizations annually in the United States. The incidence is around 10 cases per 100,000 inhabitants[5], whilst the incidence of retropharyngeal abscess is 0.22 / 10,000 and that of parapharyngeal abscess was 0.14 cases / 10,000[6].

There are some epidemiological studies on the prevalence of deep neck abscesses. In Taiwan in 2003, in a tertiary care hospital, Wang et al.[1] observed 32 patients annually. For their part, Campos et al.[7], in 2009, reported 57 patients with this diagnosis in one year. Meanwhile, Obregón-Guerrero[8] in the article "Deep neck abscess. Factors associated

Corresponding author: Dr. Juan Antonio Lugo-Machado, Prolongación Hidalgo y Sahuaripa S / N, Ciudad Obregón, Sonora, Mexico
e-mail: otorrinox@gmail.com
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with reoperation and mortality", found an annual rate of 87 patients. Recently, Brito et al., in 2017 in Brazil, recorded a total of 16 cases per year[4].

In relation to age, deep neck abscesses have been shown to be more serious in adults than in children, having greater multispace participation and leading to more complications[4]. Mortality rates vary from 1.6% to 7.6% with an associated cost burden for the health system[5,9].

There are several factors that can influence the evolution of the disease and increase morbidity and mortality: age, comorbidities, number and type of affected space[10].

Among the main comorbidities, we find Diabetes Mellitus (DM). These patients have a greater predisposition to infections, and therefore to this condition; a decrease in the immune response is argued (deficiency in phagocytosis, chemotaxis, or adherence of the polymorphonuclear cells, poor cytokine response, and damage to the antioxidant system)[4].

Other comorbidities are represented by immunological diseases (HIV infection, treatment with steroids or chemotherapy)[11]. These patients have a higher risk of atypical presentation (various clinical manifestations) that progress into more serious complications, so they must be identified early and treated adequately to minimize the risk[12].

The most accepted mechanism of dissemination is the lymphatic spread of the infection from the oral cavity, the face and the superficial compartment to the deep spaces of the neck. This dissemination results in cervical lymphadenopathy that can lead to suppuration and abscess formation, and penetrating injuries, which can introduce infection into the deeper spaces of the neck. This infection can spread through the fascial planes, and the accumulated pus can expand the potential spaces between the different layers of the deep cervical fascia[13].

It has been estimated that 50-70% of cases originate from an odontogenic infection, although other causes include: upper airway infection, trauma, parotitis, foreign bodies in the airway, a history of instrumentation and the application of intravenous drugs[14]. Meanwhile, the approximately unknown etiology varies in the literature and remains between 8 and 57% of cases[3,7].

Reports of pus culture from deep neck abscess are polymicrobial, primarily reflecting oral flora; aerobic and anaerobic organisms are isolated, and both Gram-positive and Gram-negative organisms are cultured[13,15].

On the other hand, in relation to its location, we must consider the complex anatomy of the head and neck, due to the numerous spaces connected to each other[14]. 11 deep spaces have been described according to their relationship with the hyoid bone. These spaces can be classified as follows: spaces located above the hyoid level (peritonsillar, submandibular, parapharyngeal, buccal, parotid, masticatory); spaces that involve the entire circumference of the neck (retropharyngeal, dangerous space, prevertebral and carotid); and the anterior or pretracheal visceral space, below the hyoid bone[15].

Deep neck abscesses can cause rapid airway involvement (descending mediastinitis)[16], internal jugular vein thrombosis, arterial erosion, pneumonia, meningitis, and intracranial extensions.

MATERIAL AND METHODS

We present a cross-sectional, observational, analytical and retrospective study, performed on 36 patients diagnosed with deep neck abscess, between 2015 and 2019.

The inclusion criteria were records of patients over 18 years of age, any gender, with the diagnosis of deep neck abscess that included a tomographic study, and had surgery and follow-up in our hospital.

Incomplete, lost files, or files that had not continued the treatment and the follow-up in our service were excluded from the study.

In all cases, the diagnosis was based on clinical with physical examination, laboratory results, simple and contrast computed tomography of the neck with or without extension to the thorax if required.

The records of all the patients from the Otolaryngology Service of the Specialty Hospital No.2 were collected. We evaluated variables such as: age, gender, comorbidities, location, therapeutic approach, performance of tracheostomy, empirical antibiotic therapy, admission to Intensive Care Unit (ICU), days of hospital stay and mortality.

All data were collected in an Excel spreadsheet for Microsoft Office 2019 for Windows and later the statistical analysis was performed using the IBM SPSS Statistics 24 package in Spanish. For the statistical analysis, measures of dispersion (standard deviation, range) and central tendency (mean, percentage) were used and the analysis was be made based on these thorough descriptive statistics. The results were represented in graphs and tables. For the risk probability analysis, Odd ratio or odds ratio was used in search of risk among patients with diabetes and other comorbidities and healthy patients, as well as the risk of complications and the number of spaces involved.

RESULTS

A prevalence of 42 cases was found from 2015 to 2019, corresponding to 8.4 cases per year. 42 files were identified, of which 36 met the inclusion criteria.

In the study group, the average age was 45.2 years (range 25 to 66), 17 patients were female (47.22%) and 19 were male (52.78%).

The number of affected spaces were distributed as follows: 1 space in 15 cases, 2 occurred in 6 cases and 3 or more spaces in 15 cases. Table 1 and Table 2 summarize the name of the spaces involved.

From the complications point of view, in our study group, there were five described as follows: 4 patients with descending mediastinitis and one patient with Lemierre's syndrome (Table 3). We include a coronal section tomography image of one of the four patients with descending mediastinitis (Figure 1).

In empirical antibiotic management, coverage against Gram +, Gram - and anaerobic bacteria was used. The double scheme was granted in 30 cases (83%) and the triple scheme in 6 (17%) cases. The third-generation cephalosporin Ceftriaxone combined with Metronidazole or Clindamycin was the most frequent as a double scheme with 23 (63.88%) cases, whilst Piperacillin-tazobactam and Meropenem was like the triple scheme with 4 (11.11%) cases. In the other schemes, there were variations in the type of antibiotics.

17 cases, 47.22%, required a tracheostomy to secure the airway, and of these, more than 90% were performed under local anaesthesia due to the difficulty in intubation, 19 patients (52.78%) did not require tracheostomy. In 25 patients

Table 1. Number of affected spaces in 36 patients with deep neck abscesses at Specialty Hospital No 2, IMSS (Source: Otolaryngology Service, IMSS, Cd Obregón, Sonora).

Spaces	n	%
spaces i1	15	41.67
spaces i2	6	16.66
spaces i≥3	15	41.67
Total	36	100

Table 2. Spaces involved in 36 deep neck abscesses, Specialty Hospital No 2, IMSS (Source: Otolaryngology Service, IMSS, Cd Obregón, Sonora).

Number of spaces	Name of the space	n	%
Single space	Retropharyngeal	4	11.11
	Peritonsillar	5	13.89
	Submaxillary	6	16.66
Two spaces	Submaxillary + parapharyngeal	1	2.78
	Peritonsillar + parapharyngeal	1	2.78
	Visceral + pretracheal	1	2.78
	Submental submaxilla	2	5.56
	Masticator + parotid	1	2.78
Three or more spaces	Submaxillary+ submental +sublingual +retropharyngeal + prevertebral + carotid + pretracheal danger space	1	2.78
	Parotid + masticator + submaxillary	2	5.56
	Submental + submaxillary + parapharyngeal	6	16.66
	Submental + submaxillary + visceral + pretracheal	6	16.66
	Total	36	100

Table 3. Evolution of 36 deep neck abscesses, Specialty Hospital No 2, IMSS (Source: Otolaryngology Service, IMSS, Cd Obregón, Sonora).

Evolution	n		%
No complications		31	86.11
With complications	Type of complication		
	Descending mediastinitis	4	
	Lemierre's syndrome	1	
	Subtotal	5	13.89
Total		36	100

Figure 1. Contrast CT of the neck and chest (coronal slice) in one of our cases that was complicated by mediastinitis, in which the extension of the infection to the pleural space was evidenced; the patient died.

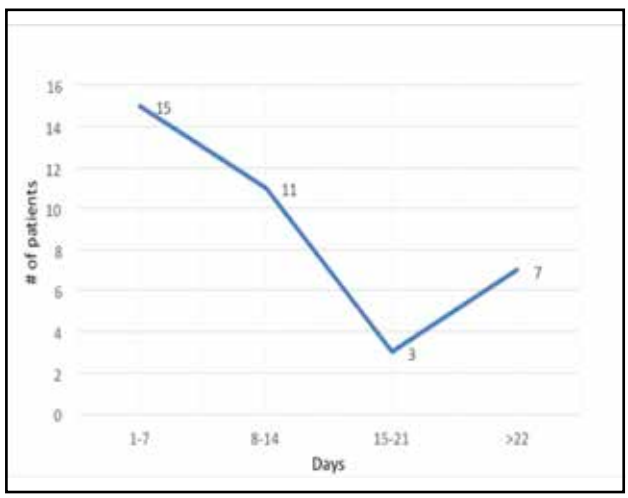

Figure 2. Days of hospital stay in 36 patients with deep neck abscess, Specialty Hospital No 2, IMSS (Source: Otolaryngology Service, IMSS Cd Obregón, Sonora).

(69.44%), the surgical drainage of the abscess was performed, and 11 patients (30.56%) benefited only from medical treatment.

Of the 36 patients, 17 (47.22%) presented an associated pathology and 19 (52.78%) had none. Type 2 diabetes mellitus alone or with another disease occurred in 27.78% of the cases (10 patients), multiple myeloma, arterial hypertension and alcoholism were reported in 1 case each, while cancer and tuberculosis with two cases each.

Considering the number of days, the patients included in our study were hospitalised, most of them stayed between 1 and 7 days (15 patients) and 14 days (11 patients). 7 patients needed more than 22 days of hospitalisation (Figure 2).

Of all the cases, five (13.88%) required admission to therapy Intensive Care Unit. Our mortality rate was 3 in 36 cases (8.33%).

Odds ratio were used to perform the risk probability analysis on the complications among diabetic patients and other comorbidities compared to the healthy ones. In case of associated comorbidities, the relative risk of developing complications was 2.08 times higher than in healthy patients.

To weigh the risk of complications with the involvement of ≥3 or ≤2 spaces, we found that patients who had 3 or more spaces involved presented a relative risk equal to 7.08 higher for complications compared to those involving only 2 or less spaces.

DISCUSSIONS

In our series, we found a prevalence of 8 cases per year (42 in 5 years), lower than that observed by Wang et al.[1] with 32 cases in one year and Campos et al.[7] who in 2009 found 57 patients in one year. This situation may possibly be related to the fact that our hospital is a referral center where the

most complex cases are sent, while the other cases are attended at the first and second level hospitals.

Forty-two files were identified, 36 of which met the inclusion criteria, with the average age in our series of cases of 45.2 years, similar to that reported by Obregón-Guerrero et al.[8] with 49 years. The sex distribution in our study group (47.22% females and 52.78% males) was similar to the one reported by Obregón-Guerrero et al.[8] (50.5% women and 49.4% men).

The most common space, alone or with the involvement of others, was the submaxilla with 18 cases, representing 50%, similar to that reported by Obregón-Guerrero et al. with 68%[8]. Referring to the number of affected spaces, our findings were in accordance with those described by Campos et al.[7]. In 57 cases, they found a space in 14 patients, two spaces in 13 patients, three spaces in 16 patients.

Considering the empirical antibiotic management, it is very heterogeneous and is limited to the availability in each hospital center[6,15]. However, the use of coverage against Gram-positive, Gram-negative and anaerobic bacteria is desirable.

In 17 cases, 47.22% of patients, a tracheostomy was performed to secure the airway, the reported being greater than that reported by Campos et al.[7] (5 cases out of 57 in their series). 25 patients (69.44%) from our study required surgical drainage of the abscess, less than what Kauffmann found in his study (81%)[15].

Of the 36 patients, 47.22% (17 patients) presented an associated pathology, of which type 2 diabetes mellitus alone or with another disease occurred in 10 patients (27.78%). Our results were similar to those reported by Obregón-Guerrero[8] with 34% and Palacios et al.[17] with 38.4%.

Regarding the days of hospital stay, just over 72.2% had a stay between 1 to 14 days, similar to that reported by Campos et al.[7] with 9.6 days in a series of 57 cases. Of all cases, 5 (13.88%) required admission to Intensive Care Unit, less than that described by Obregón-Guerrero[8] with 45%. Our mortality percentage was 8.33%, lower than that reported by Palacios with 23% and similar to that reported by Obregón-Guerrero with 9%. The most common complication in our series was descending mediastinitis, similar to that identified by Manzo Palacios[17]. As for the probability analysis of risk of complications between diabetic and non-diabetic patients, a 2.08 times higher probability rate for complications was found in diabetics compared to non-diabetics. Our results are in accordance with that reported by Lee et al.[18]. To weigh the risk of some state of immunosuppression and affection of ≥2 spaces, Odds ratio of 1.04 was found with a small risk of involvement of ≥2 spaces in immunosuppressed patients, where diabetes mellitus was the main one, similar to that recorded by Kalpana Sharma et al.[13] and Lin et al.[19].

CONCLUSIONS

In the Northwestern region of Mexico of IMSS beneficiaries, we have a prevalence of 42 cases in 5 years, 8.4 per year. The average age of our series is 45.2 years and there is no difference regarding the affection by gender. The involvement of two or more than three spaces represents the majority of cases. More than half of our cases underwent surgical drainage.

Type 2 diabetes mellitus alone or accompanied with other comorbidities was the most common associated pathology; this same entity and the involvement of 3 or more spaces presented a higher risk of complications.

The limitations of our study are represented by the fact that it is a retrospective study on a small population, which provides us with limitations to forcefully generalize our results; our hospital is a third-level referral center, with cases of greater complexity and difficulty to manage, while a large number of cases of deep neck abscesses are managed in first and second level hospitals.

Conflict of interest: All authors declare that there are no conflicts of interest in this work.

Contribution of authors: All the authors have equally contributed to this work.

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