

ORIGINAL STUDY

Factors associated with complications and mortality of deep neck abscesses in adults

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ABSTRACT

OBJECTIVE. Our objective was to evaluate the factors associated with complications and death in patients with abscesses of the deep spaces of the neck.

MATERIAL AND METHODS. An observational, cross-sectional, analytical, retrospective study was conducted from 2017 to 2022. Demographic variables, comorbidities, affected spaces, management, need for tracheostomy, ICU care, presence and type of complications and death were collected. Descriptive statistics were applied as measures of central tendency and measures of dispersion, for inferential analysis; Pearson's Chi-square or Fisher's exact tests, odds ratio for risk analysis, binary logistic regression test to evaluate the predictor variables were used.

RESULTS. We included 46 cases; mean age 44.41 ± 13.84 years; 60.87% male patients. As comorbidities, we found diabetes alone and diabetes with hypertension as the most frequent. Three affected neck spaces were in 44% of patients. 46% needed a tracheostomy, this parameter being significantly associated with complications ($p=0.037$) and mortality ($p=0.037$). The need for intensive care and complications revealed a $p=0.000$ and with a $p=0.005$ for mortality; days of hospitalization ≥ 11 days was significantly associated with complications ($p=0.005$) and death ($p=0.013$). Hospital stay ≥ 11 days were risk factors for complications (OR=1.357, 95%CI 1.037-1.776) and death (OR=1.267, 95%CI 1.004-1.598); the need for ICU and complications had an OR=78.00 (95%CI 5.726-1062.546), ICU and death had an OR=39.000 (95%CI 3.046-499.323). The variables ICU admission, tracheotomies and hospital stay ≥ 11 days were predictors of complications and death.

CONCLUSION. The need for tracheostomy, ICU admission, hospitalizations ≥ 11 days are associated with complications and death in patients with deep neck abscesses. The same variables were risk factors and predictors of mortality and complications.

KEYWORDS: abscess, neck, bacterial infections, patient severity, mortality records, adult.

INTRODUCTION

Deep neck abscesses (DNAs) are a collection of pus in one or more potential spaces between the neck fascia caused by the spread of infection from various sources, such as the teeth, mouth, throat, sinuses, middle ear, and neck¹. DNAs can lead to complications, such as mediastinitis, airway obstruction, empyema, and sepsis, leading to death²⁻⁵. Different factors have been described to influence the prognosis and completion of this entity, increasing its risk of complications and death, such as age, comorbidities, type and number of affected spaces⁶. The severity of this infection refers to the risk of dissemination, through

these spaces and fascial planes, to the mediastinum, especially the posterior, producing descending necrotizing mediastinitis⁷⁻¹⁰ with a lethality rate between 17.5% and 50%. In addition, other complications may occur, namely: septic shock, pleural empyema, acute airway obstruction, pericarditis, pericardial effusion, jugular vein thrombosis, septic embolism, acute renal failure, respiratory distress syndrome, brain abscesses, and disseminated intravascular coagulation^{7,11-15}.

Our objective was to evaluate the factors associated with complications and death in patients with abscesses of the deep spaces of the neck, as well as to identify the predictive factors.

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MATERIAL AND METHODS

An observational, cross-sectional, analytical, retrospective study was conducted prior to review. The study was approved by the Ethics Committee and Health Research Committee with registration number R-2022-2602-064. In the period 2017 to 2022, the variables age, gender, comorbidities, type and number of neck spaces affected, treatment (surgical management, only antibiotics or both), the need or not for tracheostomy, the need or not for ICU (intensive care unit), the presence and type of complications and death were collected from the patients' records. The study was reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist¹⁶.

The cases that met the inclusion criteria were chosen, such as Files of patients of any gender, age from 16 to 90 years, diagnosed with deep neck abscess and with CT image study.

Statistical analysis

Descriptive statistics were applied as measures of central tendency and measures of dispersion, for inferential analysis. Pearson's Chi-square or Fisher's exact tests were used to evaluate the association between qualitative variables with complications and mortality, odds ratio was applied for analysis of the risk of complications and mortality. We used the binary logistic regression test to evaluate the predictor variables of complications and death, considering a value of $p \leq 0.05$ as significant. The statistical analysis was performed with SPSS version 24 program for Windows.

RESULTS

Between 2017 and 2022, a total of 62 records of patients with neck abscess admitted in the Otorhinolaryngology Service were reviewed, of which 46 met the inclusion criteria. The patients included in the study presented a mean age of 44.41 ± 13.84 years, with 28 male patients (60.87%) and 18 female patients (39.13%) (see Table 1).

The comorbidities found were diabetes alone and diabetes with hypertension (7 patients, representing 15.22%, each), followed by cancer with 5 patients (10.86%), hypertension alone and tuberculosis 2 patients each (4.35%) each, and 23 patients (50%) without comorbidities (see Table 1).

When descriptively analysing the other variables, such as the number of comorbidities, 23 patients (50%) did not present any comorbidities, 11 patients (23.92%) presented only one comorbidity, two and three comorbidities were found in 6 patients each (13.04%) (see Table 1). Within the spaces involved, the submandibular space was the most common with 26 cases (56.52%), followed by peritonsillar in 9 cases (19.57%), retropharyngeal 4 cases (8.69%); in other 7 cases (15.22%) multiple spaces were involved.

Regarding the number of affected spaces, in 20 patients (43.48%) only one was affected, two neck spaces in 6 patients (13.04%) and three neck spaces in 20 patients (43.48%) (see Table 1).

From the treatment point of view, in 35 cases (76.08%) a combined management, surgery and antibiotics, was performed, and only antibiotics were indicated in 11 patients (23.91%) (Table 1). 21 patients (45.65%) included in the study needed tracheostomy, while in 6 cases (13.04%) an ICU admission and treatment was needed (see Table 1).

Complications were diagnosed in 10.4% of cases, represented by Lemire syndrome (1 patients) and 4 descending mediastinitis (4 patients). In our study, the mortality rate was 8.6% (see Table 1).

When performing inferential analysis (Table 1) in search of association of the variable gender with complications, Fisher's exact test showed no statistically significant association ($p = 0.365$), in the same way gender and mortality ($p = 0.284$). The same observation was made when analysing the association between comorbidities and complication rates (Pearson's Chi-square test, $p = 0.145$) and with mortality and morbidity ($p = 0.577$). A not statistically significant association was indicated when evaluating the "number of affected spaces" variable and "complications" (Pearson's Chi-square test p -value = 0.57) and "mortality" (Fisher's exact test p -value = 0.720) as well as between "types of treatment" variable and "complications" (Fisher's exact test p -value = 0.317) and "mortality" (Fisher's exact test p -value = 0.559) (Table 1).

The variables "need or not for tracheostomy" were found statistically significant associated with "complications" (Fisher's exact test p -value = 0.037) and "mortality" (Fisher's exact test p -value = 0.037) (Table 1). The need for ICU care presented a high association with the presence of complications (Fisher's exact test $p = 0.000$) and mortality rate (Fisher's exact test $p = 0.005$). The same observation was made for "days of hospitalization" variable for both complication and mortality rates (Pearson's Chi-square test $p = 0.005$, $p = 0.013$ respectively, for more than 11 days).

The variables ICU admission ($p = 0.000$), tracheotomy ($p = 0.010$) and hospital stay ≥ 11 days ($p = 0.005$) were predictors of complications. In the same way, ICU admission ($p = 0.000$), tracheostomy ($p = 0.022$), hospital stay ≥ 11 days ($p = 0.013$) and age ≥ 50 ($p = 0.029$) were predictors of death.

Analysing the odd ratio to assess the risk for complications and death (Table 2), we found that gender, hospital stay (≤ 10 to ≥ 11 days) and ICU need represented significant risk factors for both complications and death. Age (49 or less / over 50 years) seems to be a risk factor for death (OR = 1.174, 95%CI 0.177 - 7.790) but not for complications (OR = 0.750, 95%CI 0.096 - 5.89). The same observation can be made when analysing the influence of the number of spaces affected (for death

Table 1. Evaluated parameters of the patients included in the study (Source: ENT Department, HE No.2, IMSS, Ciudad Obregón, Sonora, Mexico).

Variable	Number	Standard deviation	
Age	44.41	±13.25	
Days of hospital stay	44	±11.18	
	NUMBER	%	p- value
GENDER			Mortality and Gender Fisher's Exact Test p= 0.284 Complications and Gender Fisher's Exact Test p = 0.365
Female	18	39.13	
Male	28	60.87	
TYPE OF COMORBIDITIES			Mortality and Comorbidity Pearson's chi-square test p= 0.145 Complications and Comorbidity Pearson's chi-square test p= 0.577
No	23	50	
Cancer	5	10.86	
Diabetes Mellitus alone	7	15.22	
Arterial hypertension alone	2	4.35	
Arterial hypertension and Diabetes Mellitus	7	15.22	
Pulmonary tuberculosis	2	4.35	
NUMBER OF SPACES AFFECTED			Mortality and Affected spaces Fisher's exact test p= 0.720 Complications and Affected spaces Pearson's chi-square test p= 0.57
One	20	43.48	
Two	6	13.04	
Three or more	20	43.48	
TREATMENT			Mortality and Treatment Fisher's Exact Test p=0.559 Complications and Treatment Fisher's Exact Test p=0.317
Antibiotics only	11	23.91	
Combined surgery and antibiotics	35	76.09	
NEED FOR TRACHEOSTOMY			Mortality and Tracheostomy Fisher's Exact Test p=0.037 Complications and Tracheostomy Fisher's Exact Test p=0.037
Yes	21	45.65	
No	25	54.35	
NEED FOR INTENSIVE CARE UNIT (ICU)			Mortality and ICU Fisher's Exact Test p=0.005 Complications and ICU Fisher's Exact Test p = 0.000
Yes	6	13.04	
No	40	86.96	
COMPLICATIONS			
Yes	5	10.87	
No	41	89.13	
DEATH			
Yes	4	8.7	
No	42	91.3	

OR = 1.333, 95%CI 0.171 – 10.389; for complications OR = 0.852, 95%CI 0.128 – 5.653), as seen in Table 2. The presence of comorbidities did not present a significant risk factor for neither death (OR = 0.303, 95%CI 0.029 – 3.155) nor complications (OR = 0.216, 95%CI 0.022 – 2.102). However, “the need or not for tracheostomy” represented a protective factor for both complications and death (see Table 2).

DISCUSSIONS

The deep neck abscesses represent a pathology of great importance for the otolaryngologist. Currently, this pathology has an incidence of about 10 cases per 100,000 inhabitants per year, with a tendency to increase¹⁷. Our results indicate a number of 46 cases in 5 years, where the average age was lower than that described by Boscolo-Rizzo et al.¹⁸ with 51.1 years, but similar to what was found by Adovica et al.¹⁹ with 44 years. The gender distribution was similar to that described by Boscolo-Rizzo et al.¹⁸ where the male gender predominated with 68.8% and similar to Adovica et al.¹⁹ where the male gender prevailed with 57%. Our finding was similar to what Araceli et al.²⁰, Palacios et al.²¹ and Treviño-Gonzalez et al.²² reported for our country.

Within the comorbidities, diabetes mellitus represented the most common comorbidity found in our study group, similar to what was found by Boscolo-Rizzo et al.¹⁸ and Obregon-Guerrero et al.²³, but different from what was found by Brito et al.¹⁷ in Brazil. In this last study, the authors reported a predominance of hypertension followed by diabetes mellitus¹⁷.

The submaxillary space was the most involved, similar to that found by Obregon-Guerrero et al.²³ with 68%, Adovica et al.¹⁹ and Treviño-Gonzales et al.²², but different from those described by Boscolo-Rizzo et al.¹⁸ and Lee et al.²⁴ where on the first place was the parapharyngeal space (56.3% of cases), followed by the submandibular space (35.4%) and the retropharyngeal space.

In our study, 76.09% of the patients benefited from surgical drainage and antibiotherapy. Our results were similar to those reported by Huang et al.²⁵ with 72.2%, but different from those reported by Adovica et al.¹⁹ with 93.50%. 21 patients (45.65%) needed tracheostomy, the percentage being higher than that described by Obregon-Guerrero et al.²³ with 5% and by Brito et al. (17) with 16.8%. In 203 cases included in their study, Chen et al.²⁶ reported 29.7% cases with tracheostomy. In a study performed in Brazil by Garcia et al.²⁷, 30% of patients with deep neck abscesses needed a tracheostomy. We must emphasize that, sometimes, tracheostomy decisions are based on the judgment of the doctor in each particular case, the condition of the floor of the mouth, the pharynx status. The risk of airway involvement is associated with increased need for tracheostomy. Chen et al.²⁶

found in their research that a tracheostomy in DNA was associated with severe clinical presentations, advanced age (≥ 65 years), multiple involved spaces (≥ 3 spaces) and the presence of mediastinitis.

Among the patients included in our study, the need for ICU (13.04%) was higher than the percentage reported by other studies^{26,27} (for example, Adovica et al.¹⁹ only with 6.10%), but lower than that found by Obregon-Guerrero et al.²³ with 45%.

Regarding the percentage of complications, the results of our research (10.87% complication rate) was similar to that found by Adovica et al.¹⁹ with 11.40%, but lower than that published by Huang et al.²⁵ with 16.2% and Boscolo-Rizzo et al.¹⁸ with 15%. After airway obstruction, the most frequent complication was descending mediastinitis, similar to that reported by Salom-Covenas et al.²⁸, Adovica et al.¹⁹ and Brito et al.¹⁷.

Our mortality rate of 8.69% was similar to that reported by Obregon-Guerrero et al.²³ with 9%, but higher than that described by Brito et al.¹⁷ of 1.98% and Huang et al.²⁵ of 1.6%.

The hospitalization time (mean of 44 ± 11.18 days) was longer than that reported by Brito et al.¹⁷ – 9.7 days (14.8 days in case of complications), Solom-Covenas et al.²⁸ – 9.64 days. Treviño-Gonzalez et al.²² reported a hospital stay of 9.13 ± 7.2 days, the BMI, comorbidities and ICU admission being associated with a longer stay.

Lee et al.²⁴ on a study on 158 cases found that the presence of comorbidities and especially diabetes mellitus increased the risk for complications and longer hospital stay. In our results, the number of affected spaces was associated with complications rates and longer stay. Yantí et al.¹ did find association but in opposition to our results. However, Hidaka et al.²⁹ found no relationship as a significant risk factor in 4,949 cases. They also found that age between 50 and 74 years, tracheostomy, admission to the ICU, in addition to mechanical ventilation, were risk factors for mortality²⁹, similar to our results, and also similar to those described by Treviño-Gonzalez et al.²² in Monterrey. Apparently, admission to ICU, tracheostomy, hospital stay ≥ 11 days were risk factors and predictors of complications, while ICU, tracheostomy, hospital stay ≥ 11 days and age ≥ 50 years could be predictive factors of death^{1,22-26,29}.

CONCLUSIONS

Our results indicate that the male gender is the most affected by the deep neck abscesses, diabetes mellitus is the most common comorbidity, followed by hypertension, the submaxillary space is the most involved. A good number of cases are managed with tracheostomy. After airway obstruction, the most frequent complication was descending mediastinitis. The hospitalization time was longer in our cases. Tracheostomy, ICU admission, and

prolonged hospital stay were associated and were predictors of complications. In the same way, tracheostomy, ICU admission, and prolonged hospital stay and age ≥ 50 years were associated and were predictors of death.

Limitations: Being a retrospective study, the under registration and loss of files reduced the number of cases included. So, our conclusions limit the generalization of our results. We propose a better registration and management of data in the files, as well as evaluate the prospective capture of the cases to be able to perform an analysis with greater robustness for its generalization.

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