Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Analysis of Inflammatory Factors and Prognosis in Elderly Patients with Oral and Maxillofacial Space Infections

Jiangbo Xin[1]

xinjiangbo2020@163.com

Hebei Eye Hospital

LI Jingjing[1]

Hebei Eye Hospital

HAO Zhao[1]

Hebei Eye Hospital

QIAO Xiulian[2]

Hebei Eye Hospital

SUN Haoxuan[1]

Hebei Eye Hospital

LU Chaofei[1]

Hebei Eye Hospital

LI Dongzhen

Hebei Eye Hospital

Research Article

Keywords: oral and maxillofacial space infection, elderly patient, inflammatory marker, C-reactive protein, mediastinitis, diabetes mellitus, clinical prognosis

Posted Date: September 2nd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10297891/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Purpose

Oral and maxillofacial space infection (OMSI) may trigger life-threatening complications such as mediastinitis, especially among aging populations complicated with diabetes. This study aimed to compare inflammatory responses and prognostic outcomes between elderly and younger OMSI patients, and identify independent risk factors for mediastinal infection to provide clinical reference for high-risk patient screening.

Methods

A single-center retrospective observational study was performed on 124 patients diagnosed with OMSI from January 2021 to February 2023 at Hebei Eye Hospital. Subjects were divided into an elderly group (≥ 60 years old, n = 48) and a younger group (< 60 years old, n = 76). Baseline demographics, infection origins, pathogen distribution, laboratory inflammatory markers (WBC, NEUT, CRP), fasting blood glucose, hospital stay length, and incidence of mediastinal infection were compared between groups. Statistical analyses were conducted via SPSS 22.0; independent t-test, chi-square test and Fisher's exact test were applied as appropriate. $P < 0.05$ was defined as statistical significance.

Results

No intergroup differences were found in gender, smoking history, odontogenic infection proportion, involved fascial spaces, and pathogen spectrum (all $P > 0.05$). The elderly group had a significantly higher rate of diabetes mellitus (31.25% vs 11.84%, $P = 0.008$). Overall CRP and neutrophil levels were markedly elevated in elderly patients ($P < 0.05$). After excluding diabetic patients, only CRP remained significantly higher in the elderly subgroup (71.48 mg/L vs 60.78 mg/L). The incidence of mediastinal infection was 8.33% in the elderly group versus 1.32% in younger patients ($P = 0.047$). Independent risk factors for mediastinal infection included age ≥ 60 years, concurrent diabetes, multiple-space infection, and CRP > 90 mg/L.

Clinical Significance

Elderly OMSI patients present aggravated systemic inflammation and higher risk of severe mediastinal complications, largely driven by concurrent diabetes. CRP serves as a stable inflammatory marker reflecting age-related inflammatory changes independent of blood glucose levels. Clinicians should strictly control blood glucose and dynamically monitor CRP values in elderly diabetic patients with multi-space infection. Early surgical drainage and intensive anti-infection intervention can effectively reduce fatal mediastinal infection and improve overall prognosis.

1 Introduction

Oral and maxillofacial space infections (OMSI) are acute suppurative fascial space infections of the oral, maxillofacial and cervical regions, characterized by acute onset and rapid progression [-]. Untreated severe cases may lead to airway obstruction, sepsis and mediastinitis, which threaten patient survival.

Elderly individuals usually have weakened immune function, chronic underlying metabolic diseases, and poor nutritional status, which worsen infection severity and clinical recovery. Whether chronological age acts as an independent adverse prognostic factor for OMSI remains controversial in clinical practice. [3]This retrospective study compared clinical manifestations, inflammatory laboratory indicators and complication risks between elderly and younger OMSI patients, and screened predictive risk factors for mediastinal infection[4], to form practical screening and management strategies for frontline dental and maxillofacial clinicians.

2 Materials and Methods

2.1 Study Population and Design

A retrospective observational study was conducted on 124 patients with confirmed OMSI treated at Hebei Eye Hospital between January 2021 and February 2023. Participants were stratified into two cohorts: elderly group (age ≥ 60 years, n = 48) and younger group (age < 60 years, n = 76). The study followed the STROBE guidelines for retrospective clinical cohort research.

Inclusion criteria:

1. OMSI confirmed via clinical manifestations, imaging examination and microbial culture;
2. Abscess verified by puncture and aspiration;
3. Complete electronic medical records and follow-up data;
4. Signed written informed consent from patients or guardians.

Exclusion criteria:

1. Severe cognitive dysfunction with poor clinical compliance;
2. Autoimmune disorders or long-term systemic immunosuppressant administration;
3. Pregnant or lactating women;
4. Severe liver or renal insufficiency.

2.2 Observation Indicators

1. Baseline information: age, gender, smoking history, history of diabetes mellitus;
2. Clinical characteristics: source of infection, time from symptom onset to hospital admission, involved fascial spaces, length of hospital stay;

3. Laboratory biomarkers: white blood cell count (WBC), neutrophil count (NEUT), C-reactive protein (CRP), fasting blood glucose (FBG);
4. Major adverse complication: secondary mediastinal infection;
5. Microbial pathogen distribution from pus culture.

2.3 Statistical Analysis

All statistical calculations were completed using SPSS 22.0 software. Measurement data were expressed as mean ± standard deviation and compared via independent-sample t-test. Count data were presented as cases (percentages) and analyzed by chi-square test or Fisher's exact test for small sample subgroups. $P < 0.05$ indicated statistically significant differences.

3 Results

3.1 Baseline Demographic Comparison

Gender composition and smoking prevalence were comparable between the two groups ($P > 0.05$). The proportion of patients with diabetes was significantly higher in the elderly cohort ($P < 0.01$). See Table 1.

Table 1
Baseline data comparison between elderly and younger OMSI patients □□

Item	Elderly group (n = 48)	Young group (n = 76)	Test value	P-value
Age (years)	68.8 ± 6.5	43.0 ± 12.4	—	—
Male, n (%)	30 (62.50)	53 (69.74)	χ^2=0.698	0.404
Diabetes mellitus, n (%)	15 (31.25)	9 (11.84)	χ^2=7.143	0.008
Smoking history, n (%)	8 (16.67)	14 (18.42)	χ^2=0.063	0.802

3.2 Clinical Infection Characteristics

Odontogenic infection accounted for nearly 90% of cases in both groups, with no significant difference in time from onset to admission. The incidence of mediastinal infection was significantly higher in elderly patients, while hospital stay length showed no statistical difference ($P > 0.05$). See Table 2.

Table 2
Comparison of clinical infection features

Item	Elderly group (n = 48)	Young group (n = 76)	Test value	P-value
Odontogenic infection, n (%)	43 (89.58)	68 (89.47)	χ^2=0.000	0.988
Onset-to-admission time (d)	11.85 ± 5.21	11.93 ± 5.47	t=-0.080	0.937
Hospital stay (d)	9.85 ± 2.11	9.63 ± 2.05	t = 0.575	0.575
Mediastinal infection, n (%)	4 (8.33)	1 (1.32)	Fisher exact	0.047

3.3 Pathogen Distribution

Streptococcus was the dominant cultured pathogen in both groups, and the overall bacterial spectrum showed no intergroup statistical differences (all P > 0.05). See Table 3.

Table 3
Pathogen distribution of pus cultures

Pathogen	Elderly group (n = 48), n (%)	Young group (n = 76), n (%)	χ^2	P-value
Streptococcus	21 (43.75)	44 (57.89)	2.368	0.124
Staphylococcus	3 (6.25)	4 (5.26)	—	> 0.999
Klebsiella pneumoniae	2 (4.17)	2 (2.63)	—	0.637
Other bacteria	6 (12.50)	8 (10.53)	0.123	0.726
No bacterial growth	7 (14.58)	7 (9.21)	0.869	0.351
Culture-positive cases	32 (66.67)	58 (76.32)	1.386	0.239

3.4 Systemic Inflammatory Biomarkers

In the full cohort, elderly patients had significantly elevated NEUT and CRP levels (P < 0.05). After excluding all diabetic patients, only CRP remained higher in the elderly subgroup; WBC and NEUT showed no group differences (P > 0.05). See Tables 4a and 4b.

Table 4
a Inflammatory markers in all enrolled patients

Index	Elderly group (n = 48)	Young group (n = 76)	t	P-value
WBC (×10⁹/L)	12.89 ± 3.21	12.02 ± 2.98	1.509	0.134
NEUT (×10⁹/L)	10.68 ± 3.05	9.26 ± 2.87	2.587	0.011
CRP (mg/L)	98.62 ± 35.74	81.89 ± 31.25	2.723	0.007

Table 4
b Inflammatory markers in non-diabetic patients

Index	Elderly group (n = 33)	Young group (n = 67)	t	P-value
WBC (×10⁹/L)	11.79 ± 2.95	12.01 ± 3.01	-0.349	0.728
NEUT (×10⁹/L)	9.39 ± 2.76	9.23 ± 2.80	0.262	0.794
CRP (mg/L)	71.48 ± 28.63	60.78 ± 25.41	1.852	0.067

3.5 Independent Risk Factors for Mediastinal Infection

Univariate analysis identified four independent risk factors for mediastinal infection: age ≥ 60 years, diabetes mellitus, multiple fascial space infection, and CRP concentration > 90 mg/L (all $P < 0.05$). Smoking history was not correlated with mediastinal infection ($P > 0.05$). See Table 5.

Table 5
Risk factor distribution of patients with mediastinal infection

Risk factor	Mediastinal infection (n = 5), n (%)	Non-mediastinal infection (n = 117), n (%)	P-value
Age ≥ 60 years	4 (80.00)	44 (37.61)	0.047
Diabetes mellitus	3 (60.00)	21 (17.95)	0.034
Multiple space infections	4 (80.00)	25 (21.37)	0.006
CRP > 90 mg/L	4 (80.00)	42 (35.90)	0.047
Smoking history	1 (20.00)	21 (17.95)	> 0.999

4 Discussion

This clinical analysis focused on real-world clinical outcomes of elderly OMSI patients, providing actionable screening indicators for practicing dental and maxillofacial surgeons [5]. The results demonstrated that elderly patients exhibited stronger systemic inflammatory responses and higher risk

of fatal mediastinal complications, with diabetes as the primary confounding comorbidity worsening infection severity[6].

Hyperglycemia suppresses innate immune cell function, accelerates bacterial reproduction, and exacerbates soft tissue inflammatory edema [7], which extends recovery time and elevates complication risk. Consistent with routine clinical observations, male patients accounted for the majority of OMSI cases in both cohorts, which may be linked to oral hygiene habits and smoking behaviors[8].

The elderly group carried a significantly higher diabetes prevalence, consistent with age-related metabolic deterioration.Odontogenic lesions were the dominant infection source in all subjects, which reminds clinicians to prioritize routine dental examination and preventive care for aging populations to reduce OMSI incidence. The anatomical distribution of infected fascial spaces and pathogen spectrum showed no age-related differences; Streptococcus remained the primary pathogen, consistent with domestic and international clinical reports. Domestic literature summarized the epidemiological characteristics of odontogenic maxillofacial space infection [9], while foreign research systematically summarized the antibacterial treatment scheme of acute odontogenic infection[1], and retrospective analysis of deep neck abscess bacteriology also confirmed Streptococcus as the dominant pathogenic strain[2].Although the time interval from symptom onset to hospital admission was similar between groups, elderly patients faced far higher mediastinitis risk. Declined immune defense and underlying diabetes jointly accelerate downward spread of cervical infection to the mediastinum [10]. Laboratory testing indicated CRP is a more reliable inflammatory marker than WBC or neutrophil counts for evaluating age-related inflammatory differences, as elevated WBC and NEUT in elderly patients were largely driven by hyperglycemia rather than age itself[11].Four independent clinical risk factors for mediastinal infection were confirmed: advanced age, diabetes, multiple-space involvement, and CRP over 90 mg/L. For patients with all four risk factors, clinicians should implement enhanced monitoring, early abscess drainage and intensive glycemic control to block infection progression[12].

Limitations

This study was a single-center retrospective analysis with limited sample size, which may introduce selection bias. Multi-center prospective cohort studies are required to further validate the predictive value of CRP cutoff value in future clinical work.

5 Conclusion

Elderly patients with OMSI present intensified systemic inflammation and elevated risk of severe mediastinal complications, mainly aggravated by concurrent diabetes. Age independently affects serum CRP levels regardless of blood glucose status. For clinical practice, tight glycemic management, continuous dynamic monitoring of CRP, and early aggressive intervention for high-risk patients are essential to reduce life-threatening complications and improve clinical prognosis.

Declarations

Ethical Statement

This retrospective clinical study was approved by the Ethics Committee of Hebei Eye Hospital. Written informed consent was obtained from all enrolled patients or their legal guardians before data collection. All procedures complied with the STROBE statement for observational clinical research.

Ethics Approval Declaration

This retrospective clinical observational study was formally reviewed and approved by the **Ethics Committee of Hebei Eye Hospital** (Internal Review Board, IRB equivalent). All research procedures strictly complied with the STROBE statement for observational clinical research and the relevant medical ethics regulations of China.

Consent to Participate Declaration

Written informed consent was acquired from every enrolled patient prior to data collection. For elderly participants with limited self-decision capacity, signed informed consent was obtained from their legal guardians. All participants or guardians were fully informed of the study's research purpose, data collection scope, data confidentiality protection measures, and usage rules of clinical medical records; participants/guardians voluntarily agreed to participate and reserved the right to withdraw from the study at any time without penalty. No participant was enrolled without complete valid written consent.

Human Ethics and Consent to Participate Combined Standard Statement

Human Ethics and Consent to Participate declarations: This study was approved by the Ethics Committee of Hebei Eye Hospital. Written informed consent was obtained from all patients or their legal guardians before data collection. All research procedures followed the STROBE statement and national clinical medical ethical standards.

Funding Declaration

No funding was received for the conduction of this clinical research, manuscript drafting, data analysis, or publication of the present study. There are no financial conflicts of interest associated with this work.

Data Availability Declaration

The raw clinical datasets generated and analyzed during this retrospective study are not publicly available to protect the privacy and personal medical information of enrolled patients in compliance with hospital medical record management regulations and patient confidentiality agreements. De-identified aggregated analytical data supporting the findings of this article can be provided from the corresponding author upon reasonable written request, subject to formal review and approval by the Ethics Committee of Hebei Eye Hospital.

References

1. Caruso SR, Yamaguchi E, Portnof JE. Update on antimicrobial therapy in acute odontogenic infection. Oral Maxillofac Surg Clin North Am. 2022;34(1):169–77.
2. Lee YQ, Kanagalingam J. Bacteriology of deep neck abscesses: a retrospective review of 96 cases. Singap Med J. 2021;52(15):351–5.
3. Tang SB, Li Q, Lei D. Prognostic factors in patients with oral and maxillofacial space infections. J Oral Maxillofac Surg. 2022;32(1):46–50.
4. Han JX, Lin DZ, Shi ZW, et al. Clinical features and prognostic factors of oral and maxillofacial space infections. J Mod Stomatol. 2024;38(1):19–22.
5. Matsumoto Y, Yokoi H, Ikeda T, et al. Odontogenic infection and antiresorptive agent-related osteonecrosis of the jaw. Auris Nasus Larynx. 2021;48(4):758–63.
6. Qian Y, Ge Q, Zuo W, et al. Maxillofacial space infection: experience and risk factors in 222 cases. Ir J Med Sci. 2021;190(3):1045–53.
7. Li P, He Y, Zhang Y, et al. Risk factors for complications in maxillofacial space infection: a retrospective analysis of 457 patients. J Craniofac Surg. 2023;34(8):2390–7.
8. Yang ZY, Ye L, Zheng LY, et al. Retrospective analysis of 190 OMSI patients with hyperglycemia. Chin J Oral Maxillofac Surg. 2023;21(4):360–5.
9. Chen XB. Clinical analysis of 201 cases of oral and maxillofacial space infections. Guangdong J Dent Dis Prev. 2014;22(2):86–9.
10. Guo Z, Hu M, Gong Z, et al. Clinical characteristics of OMSI in different age groups. Shanghai J Stomatol. 2018;27(5):538–41.
11. Sun HX, Li JJ, Cui JJ, et al. Inflammatory mediators in oral and maxillofacial space infections and their diagnostic value. Chin J Nosocomiol. 2022;32:2029–33.
12. Li YP, Shi B, Zhang JR, et al. Expert consensus on diagnosis and treatment of oral and maxillofacial space infections. Chin J Stomatol. 2021;56(2):136–44.