Diagnosis and Management of Orofacial Infections: A Retrospective Study of 440 Patients

Orofasiyal Enfeksiyonların Diagnozu ve Tedavisi: 440 Vaka İçeren Retrospektif Çalışma

Hasan Ayberk ALTUĞ,[a]
Özgür ERDOĞAN,[a]
Sermet ŞAHİN,[b]
Metin ŞENÇİMEN,[c]
Kemal Murat OKÇU[d]

[a]Department of dental Services, Formerly Diyarbakır Military Hospital, Diyarbakır
Departments of
[b]Periodontology,
[c]Oral and Maxillofacial Surgery,
Gülhane Military Medical Academy,
[d]Department of Dental Services,
Beytepe Military Hospital, Ankara

Geliş Tarihi/*Received:* 21.10.2008
Kabul Tarihi/*Accepted:* 18.02.2009

This study has been presented as an poster presentation in the XIX European Congress for Cranio-Maxillo-Facial Surgery 9th-12th September 2008 Bologna, Italy.

Yazışma Adresi/*Correspondence:*
Hasan Ayberk AYTUĞ
GATA, Ankara,
TÜRKİYE/TURKEY
aybork@yahoo.com

ABSTRACT Objective: The purpose of this study was to evaluate the characteristics and clinical outcomes of patients with orofacial infections. **Material and Methods:** A retrospective study was conducted in 440 patients with orofacial infections treated in Diyarbakır Military Hospital from September 2004 through June 2008. Demographic data, situation before admission, etiologic factors, imaging studies, involved spaces, microbiology, treatment approach, and hospitalization days were analyzed. **Results:** Of the 440 patients, 374 (85%) were males and 66 (15%) were females. The most common etiologic factor was periapical abscess related to dental caries (n= 225) (51%), followed by pericoronitis (n= 141) (32%), periodontitis (n= 61) (14%), postextraction conditions (n= 8) (2%), and periimplantitis (n= 3) (1%). The involved spaces were the submandibular space (n= 173) (39%), the buccal space (n= 135) (31%), the fossa canina space (n= 97) (22%) and the lateral pharyngeal space (n= 35) (8%). Trismus and dysphagia were present at admission in over 70% of cases. The most commonly isolated bacterial pathogens were the aerobes. Two-hundred eighty three patients required surgical drainage of the abscess. Average length of hospital stay was 7.2 days. All patients recovered completely without any serious complications. None of the patients needed tracheotomy or fiberoptic intubation. The most commonly encountered postoperative sequela was the need of a second operation to correct the extraoral scar due to spontaneously ruptured abscess or a penrose drain. **Conclusion:** Treatment of orofacial infections necessitates accurate diagnosis aided by imaging studies, effective antibiotic therapy, airway maintenance and timely incision and drainage, when indicated. Culture and antibiotic susceptibility testing do not change the treatment approach in immunocompetent patients.

Key Words: Bacterial infections; pericoronitis; trismus; deglutition disorders

ÖZET Amaç: Bu çalışmanın amacı orofasiyal enfeksiyona sahip hastaların genel özelliklerini ve hastalığın klinik sonuçlarını değerlendirmekti. **Gereç ve Yöntemler:** 2004-2008 yılları arasında Diyarbakır Asker Hastanesinde orofasiyal enfeksiyonu olan 440 hastanın retrospektif değerlendirilmesi yapıldı. Demografik bilgiler, işlem öncesi durum, etyolojik faktörler, görüntüleme sonuçları, etkilenen bölgeler, mikrobiyolojisi, tedavi ve hastane yatış süreleri analiz edildi. **Bulgular:** 440 hastadan 374 (%85)'ü erkek, 66 (%15)'sı kadın hasta idi. En sık karşılaşılan etyolojik faktör, diş çürüğüne bağlı periapikal abse idi (n= 225) (%51). Onu perikoronitis (n= 141) (%32), periodontitis (n= 61) (%13), çekim sonrası enfeksiyon (n= 8) (%2), ve periimplantitis (n= 3) (%1) izlemekte idi. En çok etkilenen fasiyal boşluklar sırasıyla submandibular boşluk (n= 173) (%39), bukkal boşluk (n= 135) (%31), fossa kanina boşluğu (n= 97) (%22) ve lateral farengeal boşluk idi (n= 35) (%8). Vakaların %70'inde trismus ve yutma güçlüğü görülmüştür. En çok izole edilen bakteriyel patojenler aeroblar idi. İki yüz seksen üç hastada absenin, cerrahi drenajı yapılmıştır. Hastane yatış süresi ortalama 7.2 gündü. Tüm hastalar ciddi bir komplikasyon olmaksızın tamamen iyileştiler. Hastaların hiç birinde trakeostomi veya fiberoptik entübasyon gerekmemiştir. En sık karşılaşılan postoperatif sorun, kendiliğinden rupture olan abselere bağlı gelişen skar dokusunu düzeltmeye yönelik ikinci bir cerrahi gereksinimi olmuştur. **Sonuç:** Orofasiyal enfeksiyon tedavisinde yeterli bir teşhis, efektif antibiyotik tedavisi, hava yolu idamesi ve gerekli durumlarda insizyon/drenaj yapılması gerekmektedir. Bağışıklık bozukluğu olmayan hastalarda kültür ve antibiyotik duyarlılık testleri tedavi yaklaşımında herhangi bir değişikliğe neden olmamaktadır.

Anahtar Kelimeler: Bakteriyel enfeksiyonlar; perikoronitis; trismus; yutma zorluğu

Turkiye Klinikleri J Med Sci 2010;30(3):1002-8

Orofacial infections manifest primarily as periapical abscesses related to dental caries, periodontitis, pericoronitis, periimplantitis, postextraction conditions, and trauma.[1-4] Various predisposing factors may increase the risk of of severe orofacial infections. Such factors include malnutrition, radiotherapy, poorly controlled diabetes mellitus, immunosuppression and age. When not treated early, orofacial infections may cause life-threatening conditions.[5]

Severe orofacial infections are often characterized by painful soft tissue swelling, malaise, lymphadenitis, trismus, leukocytosis, dysphagia and dyspnea.[2,5-8] The patient must be hospitalized, when one or more of the following situations exist: Trismus, dyspnea (difficulty or distress in breathing), phonatory of swallowing disorders, suspect of deep spaces involvement, progressive compromise in patient's general status and inadequate response to initial treatment.[7]

Radiologic assessment is fundamental in identifying the location and extension of the orofacial infections. Computed tomography (CT), magnetic resonance imaging, orthopantomography and ultrasonography are useful in the diagnosis of infections of the maxillofacial region.[9-12]

Severe orofacial infections are usually polymicrobial, consisting of both anaerobes and aerobes. The most commonly isolated organisms from the orofacial infections are *Streptococcus* spp., *Peptostreptococcus* spp., pigmented or non-pigmented *Prevotella* spp., *Veillonella* spp., *Lactobacillus* spp., *Corynebacterium* spp. and *Actinomyces* spp.[6,13-15] The primary aim in the management of orofacial infections is to eliminate the source of the infection. Administration of antimicrobial agents and incision and drainage are indicated most of the time.

In this study, we aimed to determine characteristics, management and clinical outcome of patients with orofacial infection.

MATERIAL AND METHODS

This retrospective study was based on the records of 440 Turkish patients diagnosed with orofacial infection at Diyarbakır Military Hospital from September 2004 to June 2008. Deep neck abscess or cellulitis, necrotizing fasciitis, infections related to non-odontogenic factors such as tonsillitis, and sinusitis were excluded from the study. The demography, etiology, preadmission variables, imaging studies, involved spaces, microbiology, treatment approach, and duration of the hospital stay were reviewed and analyzed. The study was approved by the Ethical Review Committee of Diyarbakır Military Hospital.

The evaluated demographic and preadmission variables, were; age, gender, previous antibiotic therapy, drug allergies, trismus, smoking, dysphagia, and the causative factor (periapical abscess related to dental caries, pericoronitis, periodontitis, postextraction conditions, and periimplantitis).

Periapical radiographs, orthopantomography, ultrasonography, and CT scans were used for the diagnosis. One hundred and seventy-three contrast-enhanced CT scans were available for review. All CT scans were performed within the first 48 hours after admission. Periapical radiographs and orthopantomographs were taken from all patients. The involved spaces were determined according to the clinical and radiologic examinations.

All patients with an abscess formation underwent intraoral or extraoral incision and drainage to elimination the source of the infection as soon as possible and a penrose type drain was inserted. Pus specimens were collected by aspiration for cultures in 78 patients. The pharmacological treatment consisted of intravenous antibiotic therapy, including ampicillin/sulbactam, clindamycin and gentamicin alone or in combination with clindamycin.

RESULTS

The age distribution of the 440 patients is shown in Table 1. The mean age of the patients was 28.4 (±14.7) years ranging from 16 to 53 years. Of 440 patients, 374 (85%) were males and 66 (15%) were females. Most of the patients (63%) were in the third decade.

The most common etiologic factor was periapical abscess related to dental caries (n= 225) (51%), followed by pericoronitis (n= 141) (32%), periodontitis (n= 61) (13%), postextraction conditions

TABLE 1: Distribution of patients in terms of age and gender.

Age Group (years)	Age	Gender
	n (% of Patients)	n (% of patients)
10-19	24 (6%)	Male 374(85%)
20-29	276 (63%)	Female 66 (15%)
30-39	103 (23%)	
40-49	37 (8%)	
Mean	28.4 (±14.7)	
Total (n)	440	440

TABLE 2: Distribution of the etiologic factors.

Causative factors	No. of Patients (% of cases)
Dental caries	225 (51%)
Pericoronitis	141 (32%)
Periodontitis	61 (13%)
Postextraction conditions	8 (2%)
Periimplantitis	3 (1%)
Previous oral surgery	2 (1%)
Total	440

(n= 8) (2%), periimplantitis (n= 3) (1%) and others (n= 2, infections related to previous oral surgery operations) (Table 2). CT records of the173 patients were evaluated. Differentatiation between abscess and cellulitis, extension and localization of the abscess were determined by the contrasted-enhancement CT examinations (Figure 1).

Thirty-two subjects (7%) were allergic to penicillin. There were 368 (83%) smokers. By the time of admission, dysphagia and trismus were present in 334 (76%) and 322 (73%) cases respectively. Thirteen (3%) patients had a history of controlled diabetes mellitus. None of the patients had an uncontrolled systemic disease (Table 3).

The most commonly involved facial space was the submandibular space (n= 173) (39%) followed by the buccal space (n= 135) (31%), the fossa canina space (n= 97) (22%) and the lateral pharyngeal space (n= 35)(8%) (Figures 2, 3) (Table 4).

The number of the patients who already were on antibiotic treatment by the time of admission was 307 (70%). The infection was characterized by abscess formation in 378 patients, and 283 of them (75%) required surgical drainage of the abscess (Figure 4). In 47 patients (12%), the abscess ruptured spontaneously. The remaining 48 (13%) patients recovered with the elimination of the etiologic factor and antibiotic treatment. Ampicillin/sulbactam was the primary treatment of choice. Clindamycin, gentamicin as monotherapy or in combination with clindamycin were used in patients who were allergic to penicillin.

Various bacterial species were identified in the cultures of 78 patients. Cultures yielded no growth

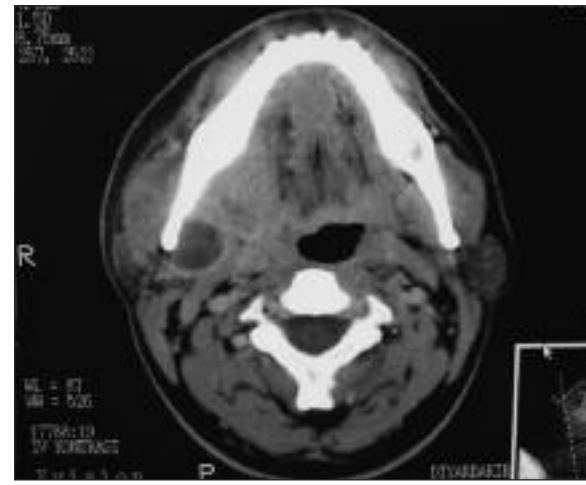

FIGURE 1: Axial computerized tomography image at the level of hyoid bone showing a right parapharyngeal space infection. Note the deviation of the airway to the opposite side.

TABLE 3: Summary of history and physical examination findings.

	No. of Patients (% of cases)	
	Yes	No
Preadmission antimicrobial therapy	307 (70%)	133 (30%)
Drug allergies (Penicillin)	32 (7%)	408 (83%)
Trismus (Mouth opening<20mm)	322 (73%)	118 (27%)
Dysphagia	334 (76%)	106 (24%)
Smoking (average one 10/day)	368 (84%)	72 (16%)

in 29 (37%) of those patients. Eight (10%) cases yielded anaerobic bacteria only, five (%6) cases yielded aerobes only and the remaining 36 (46%) cases yielded a mixed flora. The most commonly identified pathogens were gram-positive cocci. The bacterial isolates were sensitive to ampicillin/sulbactam, clindamycin and gentamicin. None of the

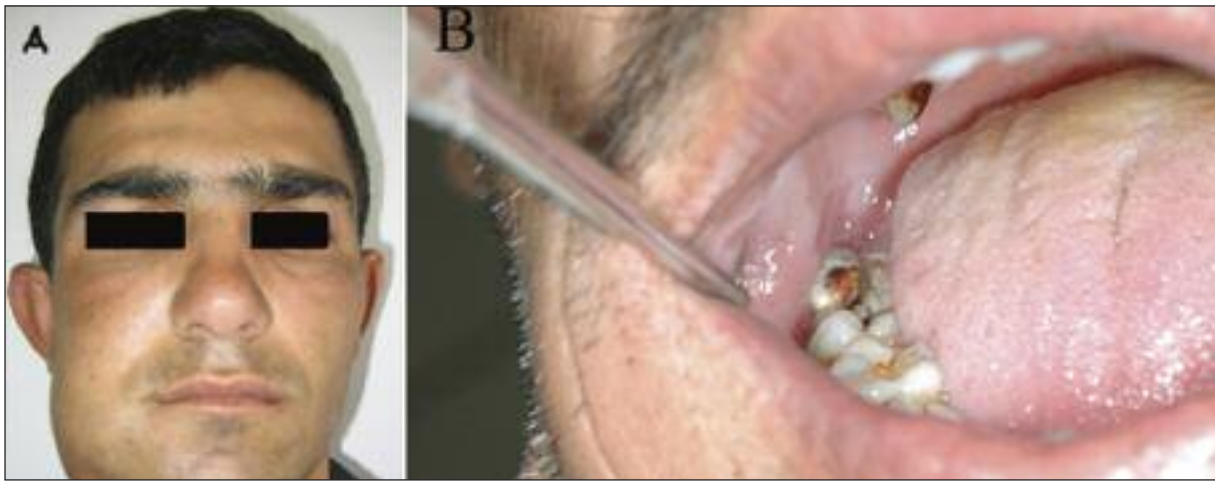

FIGURE 2: Clinical examples for orofacial infections; **A)** extraoral view of a submandibular abscess **B)** intraoral view of a buccal space infection caused by a carious mandibular molar tooth.

FIGURE 3: Clinical examples for orofacial infections a) extraoral appearance of a buccal space infection b) clinical picture for fossa canina abscess.

TABLE 4: Summary of the involved facial spaces.

Involved Spaces	No. of Patients (%)
Submandibular space	173 (39)
Buccal space	135 (31)
Fossa canina space	97 (22)
Parapharyngeal space	35 (8)
Total	440

cases required a modification of the antibiotic treatment, which was empirically given by the time of admission, as a result of the culture. The organisms, which were identified in the cultures, are listed in Table 5.

All patients recovered completely without any serious complications. None of the patients needed tracheotomy or fiberoptic intubation. The most commonly encountered postoperative sequela was the need of a second operation to correct the extraoral scar due to spontaneously ruptured abscess or the penrose drain. The mean length of hospital stay was 7.2 (range, 3 to 21) days.

FIGURE 4: Treatment modalities of orofacial infections by means of drains; a) application of an intraoral and b) an extraoral drain.

TABLE 5: Microorganisms isolated from the cultures.

Microbiological examination of the abscess	No of Isolates
No growth	29
Streptococcus spp.	38
Prevotella spp.	21
Peptostreptococcus spp.	13
Staphylococcus aureus	9
Pseudomonas spp.	5
Klebsiella spp.	4
Total	119 *

*: 119 isolates were obtained from 78 patients.

DISCUSSION

In this study, we retrospectively evaluated a large patient population with orofacial infections. To our knowledge, there is no retrospective or prospective study available, which evaluates the perspective of orofacial infections in Turkish patients. The demographic data of our study were consistent with the other studies published in English literature. The age distribution showed a peak incidence between the twenty and thirty years of age. Kannangara et al. also showed a peak incidence in orofacial infections in the third decades of their patients.[16] As in the previous studies, we found a preponderance of males (63%).[1,16] Although consistent with the previous reports, the reason for this high male predilection may be that the study was established in a military hospital, which serves mainly a male patient population.

A high proportion of the patients were smokers (84%). All patients healed without any serious complication. Trismus and dysphagia were present on admission in over 70% of cases. This result is consistent with the study by Flynn et al.[1] The authors reported 78% dysphagia and 73% trismus in their study group.

Submandibular space has been reported as the most commonly involved facial space in the previous studies, as in our study.[1,2,17-19] However controversial results have also been reported. A study conducted in 44 patients by Kim et al. showed that the parapharyngeal space was the most commonly involved space in infections of odontogenic origin.[20] Our study showed that periapical abscess related to dental caries (51%) was the major etiologic factor followed by pericoronitis (32%) and periodontitis (13%) These results are consistent with the prospective study by Flynn et al., who reported the prevalence of dental caries, periodontitis and pericoronitis as 65%, 22% and 22% respectively.[1]

Computed tomography imaging became the most favorable imaging option for the diagnosis of orofacial infections.[21] The contrasted-enhanced CT scans help making the differential diagnosis between abscess and cellulitis.[12] Ring-enhancement around the central lucency is a characteristic radiologic sign for an abscess.[10] We used CT scans in 173 (39%) patients to examine affected spaces and differentiate between abscess and cellulitis.

The bacteriologic test culture of the present study showed a mixed (both aerobic and anaerobic) growth in about more than half of the culture -positive specimens. Compared to the other studies the number of cultures, which yielded no bacterial growth, was higher. In a retrospective study by Rega et al., just two of the 103 cases yielded no-growth.[22] Similarly, Flynn et al. reported no-growth in two of the 24 patients.[1] There were 29 no-growth in 78 patients in our study (37%). This may be related to the long term antibiotic use before the admission to our hospital, which is a tertiary level military hospital. *Streptococcus* spp., *Prevotella* spp., *Peptostreptococcus* spp. and *Staphylococcus* spp. were the most frequently isolated pathogens in the present study. This finding is consistent with the previous studies.[15,18,21-23] The results of the culture and antibiotic susceptibility testing did not require a modification in the course of antibiotic treatment in any patient. The reason may be that we empirically started a broad spectrum antibiotic treatment for all patients.

In order to minimize the morbidity and mortality, accurate diagnosis, airway maintenance, and prompt surgical and medical management are the essentials in the management of orofacial infections.[18] Our study showed that ampicillin/sulbactam provided an efficient antimicrobial coverage. Ot-

her valuable alternatives are clindamycin and gentamicin as monotherapy or in combination.

The patients in our study group remained hospitalized until all infection symptoms resolved. A cohort study by Storoe et al. showed an average hospital stay of 6.66 days for the patients admitted in 1980s, and 8.27 days admitted in 1990s.[2] Flynn et al. reported an average hospital stay of 5.1 days for the patients with severe odontogenic infections.[23] The present study found an average stay of 7. 2 days (range 3 to 21 days).

Odontogenic infection may cause serious complications including airway compromise, cavernous sinus thrombosis, intracranial infection, septicemia and death.[7,8,24] Spread of infection towards the anatomic voids or the bloodstream leads to systemic symptoms. We did not encounter a severe complication in our patient group. The absence of any severe complication in this study may be due to the patient profile in our study. The patients included in our study mainly comprised of healthy young patients who did not have any kind of immunocompromising systemic disease or a long term drug use. Mild to moderate level systemic symptoms including fever, loss of appetite, dysphagia and fatigue resolved during the treatment period by fluid replacement and antibiotic therapy in all cases. Extraoral scars due to spontaneous ruptures or the drains can be accepted as mild complications of orofacial infections.[25] The patients who had extraoral scars were reoperated for scar revisions.

CONCLUSIONS

Treatment of orofacial infections should consist of accurate diagnosis aided by imaging studies, effective antibiotic therapy, airway maintenance and timely incision and drainage, when indicated. The result of the culture and antimicrobial susceptibility testing make no change in the therapeutic approaches in immunocompetent patients.

Acknowledgement

We thank Dr.Can Murat Beker, Military Hospital, Diyarbakir, for his guidance.

REFERENCES

1. Flynn TR, Shanti RM, Levi MH, Adamo AK, Kraut RA, Trieger N. Severe odontogenic infections, part 1: prospective report. J Oral Maxillofac Surg 2006;64(7):1093-103.
2. Storoe W, Haug RH, Lillich TT. The changing face of odontogenic infections. Oral Maxillofac Surg 2001;59(7):739-48.
3. Wang J, Ahani A, Pogrel MA. A five-year retrospective study of odontogenic maxillofacial infections in a large urban public hospital. Int J Oral Maxillofac Surg 2005;34(6):646-9.
4. Tuncalı D, Barutçu AY, Terzioğlu A, Aslan G. [Epidemiological evaluatıon of hospitalized mid-facial and lower-facial fracture patients]. Turkiye Klinikleri J Med Sci 2005;25(1):51-7.
5. Huang TT, Liu TC, Chen PR, Tseng FY, Yeh TH, Chen YS. Deep neck infection: analysis of 185 cases. Head Neck 2004;26(10):854-60.
6. López-Píriz R, Aguilar L, Giménez MJ. Management of odontogenic infection of pulpal and periodontal origin. Med Oral Patol Oral Cir Bucal 2007;12(2):E154-9.
7. Gutiérrez-Pérez JL, Perea-Pérez EJ, Romero-Ruiz MM, Girón-González JA. Orofacial infections of odontogenic origin. Med Oral 2004;9(4):280-7.
8. Çetin B. [Orofacial infections]. Turkiye Klinikleri J Int Med Sci 2005;1(28):47-54.
9. Dirks SJ, Terezhalmy GT. The patient with an odontogenic infection. Quintessence Int 2004;35(6):482-502.
10. Nagy M, Pizzuto M, Backstrom J, Brodsky L. Deep neck infections in children: a new approach to diagnosis and treatment. Laryngoscope 1997;107(12 Pt 1):1627-34.
11. Ada E. Nasopharynx, oropharynx and oral cavity. Turkiye Klinikleri J Radiol-Special Topics 2008;1(1):57-65.
12. Wetmore RF, Mahboubi S, Soyupak SK. Computed tomography in the evaluation of pediatric neck infections. Otolaryngol Head Neck Surg 1998;119(6):624-7.
13. Gill Y, Scully C. Orofacial odontogenic infections: review of microbiology and current treatment. Oral Surg Oral Med Oral Pathol 1990;70(2):155-8.
14. Chow AW. Infections of the oral cavity, neck, and head. In: Mandell GL, Bennett JE, Dolin R, eds. Principles and Practice of Infectious diseases. 5thed. Philadelphia: Churchill Livingstone; 2000. p. 457-72.
15. Kuriyama T, Karasawa T, Nakagawa K, Saiki Y, Yamamoto E, Nakamura S. Bacteriologic features and antimicrobial susceptibility in isolates from orofacial odontogenic infections. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000;90(5):600-8.
16. Kannangara DW, Thadepalli H, McQuirter JL. Bacteriology and treatment of dental infections. Oral Surg Oral Med Oral Pathol 1980;50(2):103-9.

17. Har-El G, Aroesty JH, Shaha A, Lucente FE. Changing trends in deep neck abscess. A retrospective study of 110 patients. Oral Surg Oral Med Oral Pathol 1994;77(5):446-50.
18. Agarwal AK, Sethi A, Sethi D, Mrig S, Chopra S. Role of socioeconomic factors in deep neck abscess: A prospective study of 120 patients. Br J Oral Maxillofac Surg 2007;45(7):553-5.
19. Ndukwe KC, Ugboko VI, Akinwande JA, Ogundipe OK, Esan TA, Ohadugha CO, et al. Bacterial infections of the head and neck fascial spaces in Nigerians. West Afr J Med 2007;26(2):126-30.
20. Kim HJ, Park ED, Kim JH, Hwang EG, Chung SH. Odontogenic versus nonodontogenic deep neck space infections: CT manifestations. J Comput Assist Tomogr 1997;21(2):202-8.
21. Schuknecht B, Stergiou G, Graetz K. Masticator space abscess derived from odontogenic infection: imaging manifestation and pathways of extension depicted by CT and MR in 30 patients. Eur Radiol 2008;18(9):1972-9.
22. Rega AJ, Aziz SR, Ziccardi VB. Microbiology and antibiotic sensitivities of head and neck space infections of odontogenic origin. J Oral Maxillofac Surg 2006;64(9):1377-80.
23. Flynn TR, Shanti RM, Hayes C. Severe odontogenic infections, part 2: prospective outcomes study. J Oral Maxillofac Surg 2006;64(7):1104-13.
24. Özen T, Şençimen M, Ortakoğlu K. [A fossa canina abscess originated from maxillary sinus: A case report]. Turkiye Klinikleri J Dental Sci 2006;12(2):57-61.
25. Koymen R, Ortakoglu K, Okcu KM, Altug HA, Aydıntug YS. Wound Closure by Skin Traction. Turk J Med Sci 2002;32(2):179-81.