

DIABETESE MELLITUS AND OSTEOMYELITIS OF THE JAWS

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ABSTRACT

The Diabetes Mellitus is a prevailing medical condition worldwide (6%) and also in Pakistan. Infection in the orofacial wounds of these patients is common. The aim of the study was to determine the effect of diabetes mellitus on the healing process of alveolar sockets / bone after tooth removal.

Eighteen diabetic patients with chronic jaw bone infections were examined and managed in oral and maxillofacial surgery department of de, Montmorency College of Dentistry, Lahore from 2009 to 2013. All patients gave history of tooth extraction about two months earlier. Orthopantomograph (OPG) were used to confirm the diagnosis. Fourteen patients (77.77%) were on oral hypoglycemic agents, four did not know their diabetic status, four patients (22.22%) were on intermediate acting insulin. All patients were managed under general anesthesia for involucrum sequestrectomy followed by primary closure. One insulin dependent patient with radiated lower jaw developed osteomyelitis after tooth extraction and was also on bisphosphonate medication followed by breast cancer surgery. This patient was operated twice to resolve the osteomyelitis of the lower jaw in follow up six months. It was concluded that diabetes effects the healing of sockets after tooth removal.

Key Words: Post extraction osteomyelitis, Diabetic patients.

INTRODUCTION

Osteomyelitis is an inflammatory condition of the bone with its medullary infection and may extend to the periosteum of the bone.¹ With the advancement of recent antimicrobial antibiotic drugs, the osteomyelitis of the jaws became rare except in medically compromised patients. The recent chemotherapeutic agents, advance surgical management options, better socioeconomic status, education and use of hyperbaric oxygen therapy have greatly influenced the incidence and prognosis of this disease.² Immuno compromised hosts with conditions like diabetes mellitus, HIV infections, immuno-suppressive and bisphosphonate drugs; radiotherapy and malnutrition are possible candidates of osteomyelitis after jaw surgery in these patients.³ It

is a well-established fact that the osteomyelitis affects maxilla less frequently than mandible due to collateral blood flow in the midface and its porous nature.⁴

The diabetes mellitus is a prevailing condition in elderly patients whereas juvenile type is present in young patients.⁵ Mucormycosis (fungal disease) is also seen in uncontrolled diabetic infections of the upper jaw with maxillary sinus involvement.⁶ Osteomyelitis of the jaws is common in elderly patients as a sequela of severe periodontal disease or periapical infection of the teeth. The infection originates commonly from the oropharyngeal anaerobic flora like actinomyces, Eikenella, and Peptostreptococcus species. Blood culture results are usually negative whereas abscess culture is positive. Regular plain films or panoramic radiographs of the jaw are diagnostic and nuclear scanning or CT images are usually unnecessary.⁷ Treatment of osteomyelitis includes removal of the offending teeth and debridement of the involved bone. The microbial flora of osteomyelitis in patients with diabetes mellitus included staph aureus, group B streptococci, aerobic gram-negative bacilli, and B. fragilis. Importantly, all patients present with a swelling or tenderness of the jaw, regional lymphadenopathy, and low-grade fever in some patients. A bone biopsy under aseptic conditions confirms through media culture about the use of specific antibiotic therapy.⁸

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Broad spectrum antibiotics are effective against the usual pathogens in chronic osteomyelitis of the diabetic jaw and are used before the culture results in acute osteomyelitis but chronic type cannot be cured with antimicrobial therapy alone as this alone is ineffective because the infected bone sequestra have no blood supply. The antibiotics are unable to penetrate these floating islands of infected bone to eradicate the infection.⁹ The definitive treatment of chronic osteomyelitis with diabetes depends on adequate surgical debridement and removal of sequestrum. Patients with chronic osteomyelitis may develop local suppurative complications, such as surrounding cellulitis, or systemic complications such as bacteremia.¹⁰

The aim of the study was to determine the effect of diabetes mellitus on the healing of socket/bone after tooth extraction.

METHODOLOGY

Eighteen patients were diagnosed with chronic oro-facial infection and necrosis of the jaw bones from 2009 to 2013. Age of patients ranged from 40 to 65 years. Eleven patients were female and seven were male. Out of them only one patient was with mandibular jaw involvement. All patients were of low socioeconomic status and were from rural areas. These patients gave history of tooth extraction at least 2 months before presenting to this unit. All the patients had mobile teeth or exposed jaw bone with no serious complaints or cellulitis. Necrosis and osteomyelitis of the jaw bones were clinically assessed and required investigations were carried out. Special care was taken to record the blood sugar as all the patients were diabetic. Four patients did not know of their diabetic status and four were on insulin therapy whereas all others were on oral hypoglycemic agents. Two patients presented with draining sinus on the cheeks and one at the left submandibular area. CT scan was performed in 3 patients whereas routine radiographs were taken of all patients. All patients were operated at oral & maxillofacial surgery unit of de Montmorency college of dentistry under general anesthesia with protocol shift of oral anti-diabetic drugs to systemic hypoglycemic agents. Strict diabetic control was achieved during hospital stay and broad spectrum antibiotics were given to all patients particularly prior to surgical sequestrectomy. Standard regime of clavulanated amoxicillin (augmentin) 1.2 gm I/V twice a day along with metronidazole 500mg I/V 8 hourly for 7 days were given and none of the patients was allergic to this regime.

All patients were given postoperative 0.01% chlorhexidine mouth washes twice a day for one week. Thorough toileting of the wound was performed before primary closure with synthetic resorbable 3/0 sutures.

Follow up of all patients was weekly for first month and then for three months on monthly basis.

RESULTS

Eleven patients out of 18 patients were females and 07 were males with 1:1.57 male to female ratio. The age ranged from 40 years to 65 years with a mean 53.88 years whereas, the mean male age was 57.28 comparative to 51.90 years of females (Table 1-2). Higher incidence of osteomyelitis was found in maxilla compared to mandible. (94.44%) and 16.66% respectively. 71.43% male patients gave history of tobacco smoking as compared to 18.18% females. The history and clinical assessment confirmed that etiological factor of onset of infection was odontogenic in all study patients. 77.77% patients had confirmed history of hypertension and were on anti-hypertensive drugs. 22.22% patients were either not aware of their diabetic status or were not using any anti-diabetic drug. 72.22% patients showed poor diabetic control and it was about 82% in females. Two female patients were on bisphosphonate drug out of them one was on injectable therapy. These females had been previously operated upon for breast cancer and later on went through tooth extraction during bisphosphonate therapy. Both patients had got their teeth removal about 6 months earlier. In one of these patients sequestrectomy was performed after 3 months of stoppage of bisphosphonate therapy whereas, other patient with mandibular lesion, the surgery was performed after one year of discontinuation of injectable bisphosphonate. During intermediate time, the patient was kept on supportive therapy and observation. Two relatively young patients with history of unknown diabetes presented with previous history of tooth extraction about six months earlier and gradually developed mobility in all upper teeth. One was male and other female. History and clinical examination suggested further biochemical evaluation followed by incisional biopsy of maxillary sinuses. The results of both patients confirmed elevated blood glucose level and fungal mucormycosis infection. Patients were managed for high glucose level and were also given antifungal drugs for two months (Amphotericin B 50mg in normal saline was given intra-venously for initial five days followed by itraconazole 400mg/day orally for 8 weeks, under supervision of consultant infectious diseases. No change was observed in mobility of the jaw and radiographs and CT scans confirmed the necrosis of jaws. Sequestrectomy was done in both patients and primary closure was achieved. In three patients, resultant maxillary defect lead to oro-antral fistula which was repaired successfully later on without obturator. Average duration of hospitalization was 12.2 days with maximum stay of radiated mandibular jaw patient for 28 days.

TABLE 1: DISTRIBUTION OF AGE & GENDER

Serial No.	Age in Years	No. of Patients	Gender	Site	Side	Medications Used
1	40	1	Female	Maxilla	Both Maxillae	Insulin
2	44	1	Female	Maxilla	Right Maxilla	No Medications
3	48	2	Female	Maxilla	Right Maxilla	No Medications
4	49	1	Female	Maxilla	Left Maxilla	Oral Hypoglycemic
5	50	1	Male	Maxilla	Left Maxilla	No Medications
6	53	2	Female	Maxilla	Right Maxilla	Oral Hypoglycemic
7	55	4	3 Male 1 Female	Maxilla Mandible	Right Maxilla Left Mandible	Oral Hypoglycemic Insulin/Bisphosphonate
8	58	3	1 Male 2 Female	Maxilla Maxilla	Both Maxillae Right Maxilla	Insulin Oral Hypoglycemic
9	63	2	1 Male 1 Female	Maxilla Maxilla	Left Maxilla Left Maxilla	Oral Hypoglycemic Insulin/Bisphosphonate
10	65	1	Male	Maxilla	Both Maxillae	Oral Hypoglycemic

TABLE. 2 GENDER PERCENTAGE AND ASSOCIATED COMPROMISED HOST STATUS

Table of Findings	Male	Male %	Female	Female %	Total Pts	Total %
Total Patients	07	38.89	11	61.11	18	100
Poor Oral Hygiene	05	71.43	10	90.91	15	83.33
Smoking Habits	05	71.43	02	18.18	07	38.88
Diabetes in Pts.	07	100	11	100	18	100
Pt. No Diabetic Medication	01	14.28	03	27.27	04	22.22
Pt. Oral Diabetic Medication	05	71.43	05	45.45	10	55.55
Pt. Insulin Diabetic Medication	01	14.28	03	27.27	04	22.22
Good Diabetes Control	03	42.85	02	81.81	05	27.7
Poor Diabetes Control	04	57.14	09	81.81	13	72.22
Associated Hypertension	06	85.71	08	72.72	14	77.77
Associated Mucormycosis	01	14.28	01	9.09	02	11.11
Bisphosphonate Medication	00	00	02	18.18	02	11.11
Radiated Mandible	00	00	01	9.09	01	5.55

In all in-patients healing was very good. Strict post-operative blood sugar control was achieved. The mean follow up period was 2.07 year. One patient with history of injectable bisphosphonate in lower jaw necrosis was further operated upon for extended mandibular lesion after six months with encouraging results. Majority of patients continued with antibiotics therapy post-operatively for 7 days and after three months of successful surgery, the patients were referred to prosthodontist for functional rehabilitation. (Fig 1-22)

DISCUSSION

The term osteomyelitis is a clinical condition with an inflammation and infection of the bone and bone marrow. The condition is common after tooth extraction

particularly in medically compromised patients. The low socioeconomic status and unavailability of aseptic and atraumatic conditions for surgery at remote areas is common most explained reason for osteomyelitis after tooth extraction whereas, the use of antibiotic in modern era has improved this condition especially in rural areas.

Although plenty of literature is available on current topic but this article particularly reports the jaw osteomyelitis in medically compromised patients with history of tooth extraction.¹¹ Radioisotope Tc99m methylene diphosphonate bone scans have been used to identify occult areas but it seemed ineffective diagnostic tool, being poor in resolution. CT scans of the jaw bones help to explain the extent of lesion and were used only in



Fig 1: Osteomyelitis of the left maxilla after teeth extraction



Fig 2: Paranasal sinus (PNS) X-Rays of Osteomyelitis of the left maxilla



Fig 3: Osteomyelitis and sinus formation on right cheek after extraction



Fig 4: Osteomyelitis after teeth extraction, intraoral view

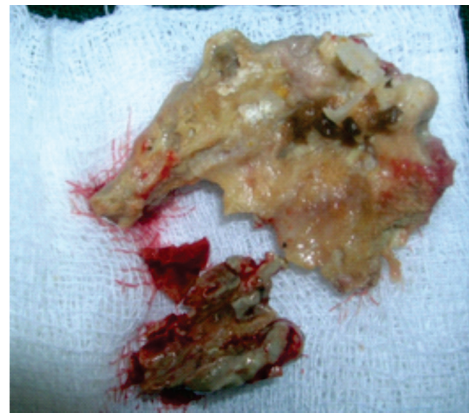


Fig 5: Sequestrectomy



Fig 6: Osteomyelitis and sinus formation after teeth extraction



Fig 7: CT scan section of the upper jaw with osteomyelitis

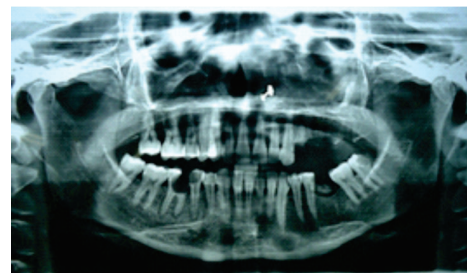


Fig 8: Orthopantomograph (OPG) of maxillary osteomyelitis



Fig 9: Surgical procedure in upper jaw

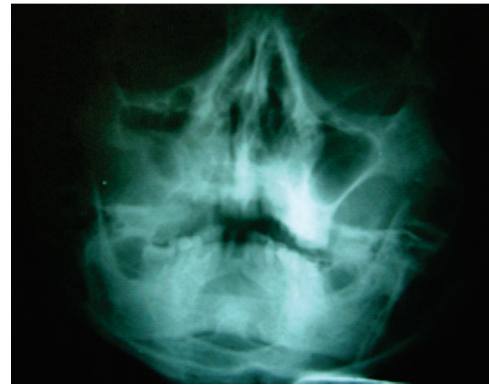


Fig 13: Radiograph (PNS) of sequestrum (right maxilla)



Fig 10: Intraoperative view after removal of sequestrum from maxilla



Fig 14: Sequestrum in left maxilla after tooth extraction



Fig 11: Surgically exposed sequestrum



Fig 15: Surgically sequestrum removal



Fig 12: Surgically removed sequestrum



Fig 16: Primary wound sutured after removal of sequestrum left maxilla



Fig 17: Sequestrum formation after tooth extraction

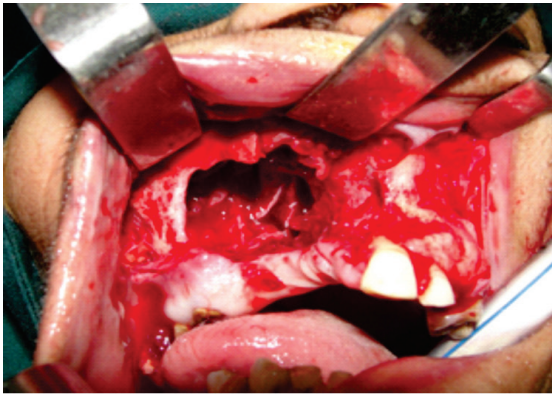


Fig 18: Sequestrum removal after surgery right maxilla jaw



Fig 19: Sequestrum formation after tooth removal

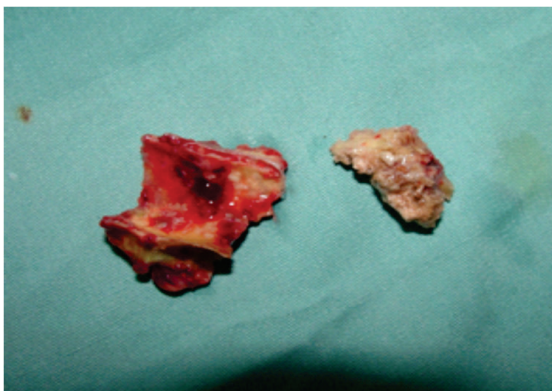


Fig 20: Sequestrum removal after surgery



Fig 21: Sequestrum formation after extraction



Fig 22: Sequestrum formation after teeth removal

few patients. Recent Positron Emission Tomography (PET) scan has shown greater promising results by differentiating metabolic activity of normal bone from the affected bone.¹² In this study, due to unavailability of this extremely expensive tool in public sector, the test was not applied. It was not possible to draw out the exact duration of the complaints among study patients but history, clinical features like mobile teeth, discharging pus, exposed bone and pain in associated jaw suggested a chronic disease process.

In the present study, the male to female ratio (1:1.57) was not supported by other studies (5.2:1).^{13,14} Perhaps poverty and low educational status resulted in noncompliance of medical treatment in females particularly. In one study a definite odontogenic component (74%) was found as the source of infection whereas in current study all the patients had history of previous tooth extraction. The mean age of presenting illness in the study patients was found above 50 years whereas in other studies it was mainly 4th & 5th decades of life.¹⁵

A female patient developed osteomyelitis of mandible after tooth extraction but she was on bisphosphonate therapy at the time of tooth extraction. This patient was operated upon twice in one year to achieve desirable results. The bisphosphonate osteonecrosis has been reported after tooth extraction in different studies.¹⁶

One significant finding in present series was the high incidence of maxillary osteomyelitis comparative to mandible (17:1) whereas other studies suggest that maxillary osteomyelitis was relatively uncommon in comparison to mandible due to the porous nature of

the maxillary bone, significant collateral blood flow and thin cortices.¹⁷ This high maxillary osteomyelitis ratio in this study may be due to traumatic maxillary teeth extractions at peripheral area or due to less mandibular teeth extraction rate in patients seen in this center.

In this study, diabetes mellitus was present in 100% patients. Diabetes mellitus results in suppression of host immune response and uncontrolled diabetes results significantly in osteomyelitis of jaw bones after tooth extraction. Association of diabetes mellitus with osteomyelitis is a significant finding (100%) in present series of patients and dissimilar results are present in other studies.^{20,21} This seems to be the result of the alteration in the vascularity of the maxillary bone in diabetic patients.

In present studies high rate of maxillary jaw necrosis has been seen after tooth extraction in diabetic patients with poor diabetic control (72.22%) comparative to diabetic control group (27.77%). Similar results are seen in some other studies.²²

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