

Treatment of chronic osteomyelitis of mandible by photodynamic therapy

Case Report

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ABSTRACT

Chronic osteomyelitis of mandible some times resists the antibiotic and surgical treatment trials. Photodynamic therapy has showed promised results in diabetic foot and its mechanism of killing microorganisms now clearly understood. Osteomyelitis in other hand is a challenging condition for both patient and doctor. In majority of cases surgery is suggested as the treatment of choice for osteomyelitis, but in some areas of the body surgery may have huge impact on patients quality of life. In this case report, we are discussing a case of chronic osteomyelitis of mandible that was not responsive to antibiotic and none resection surgical treatment. Going with some guidelines of this type of treatment, we have applied a protocol of ten visits of ten minutes of photodynamic therapy complete healing of the site with subsequent implanting has been gained. Conclusion: photodynamic therapy may offer a new treatment modality for osteomyelitis of mandible that not responsive to other treatment modalities.

Key Words: Photodynamic therapy; osteomyelitis; mandible; none surgical therapy of bone

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INTRODUCTION

The incidence of osteomyelitis has dramatically decreased since the introduction of antibiotics. Moreover, osteomyelitis of the head and neck skeleton is rare, particularly in the jaws.^[1]

As a treatment systemic antibiotics, hyperbaric oxygenation, roxithromycin, intravenous pamidronate and surgical debridement has been suggested.^[2, 3] However, difficulty of control and frequent recurrence has been reported. Photodynamic therapy has proved its efficacy in controlling many resistant conditions like diabetic foot.^[4] Here, we are presenting a case of a case osteomyelitis of mandible treated with new method and had very good outcomes.

CASE REPORT

Short history

A 21 years old female referred to us by orthopedic surgeon. She was complaining of a brownish mass of the face. She claimed that she has this mass for more than one year. She had the consultation and treatment trials of dermatologists and general surgeons. Pain, episodic discharges and fever were the main complains

Clinical examination

There was a brownish soft tissue mass, about 1*0.5 cm in size, exophytic,, at the border of submental and mental regions of the chin. By exploring examination we found a tract going deep to the outer surgafe of mandible in chin region. No discharges at that time. No lymph nodes were palpable. No caries and/or deep gingival pockets were visible. No tenderness on percussion of lower frontal teeth.

Radiography

The periapical and orthopantomogram (OPG) views showed large radiolucent lesion at the center of mental protuberance. The lesion surrounded by radioopacity which extended to lower border of mandible inferiorly, and laterally from 33 to 43 teeth. (Figure 1 OPG)

Treatment

As a treatment, excision of the soft tissue mass down to the bone has been carried out, with excavation and shaving of the bony lesion at the outer surface of mandible just apical to lower incisors. No teeth were involved in the lesion. Irrigation by normal saline, followed by 1% pavodine iodine, and again normal saline. Layer by layer closure of the site done.

After 7 days from operation the intraoral part of the site, started to have a discharge with no specific odor. Antibiotics (Amoxicilline capsules 500mg and Metronidazole tabs 500 mg three times per day were prescribed) and daily dressing where not successful in controlling the condition.

Reopening of the site done, exploration done and a piece of dead bone inside the soft tissue overlaying the site was found and removed. After 24 hours, everything was looking normal and healing went forward.

Histopathology

The histopathological examination concluded as foreign body granuloma (Figure 2).

Follow up

Two months after surgery and healing of the site, she got sever pain in her 31st tooth. Root canal treatment (RCT) done for that tooth and she became well. Fifteen days later, she got sever pain of 41st tooth, RCT done for that tooth too and the pain subsided. Twenty days later she developed another attack of toothache. This time was from 32nd tooth, RCT done, pain subsided. Two weeks later same picture repeated with 42nd tooth

Six months later she came back with severe pain and pus discharge at 32nd tooth. Periapical x-ray showed widening of PD space. Antibiotics were not helping. So extraction of that tooth carried out. Three months later, she developed same attack of pain and pus discharge, but from 42nd tooth, so we did extraction. The condition seemed to be under control with silent clinical picture, so a crown and bridge prosthesis done to replace the missed teeth.

Five months later, she came back with same presentation: sever pain and pus discharge at 31st and 41st gingivodental junction. In a dental meeting in Khanzad Teaching Center for Oral and Dental Care in Erbil city of Iraq, we have presented the case. The recommendations were to exclude multiple sclerosis and accessory canals of 31st and 41st teeth. Multiple sclerosis excluded by therapist and neurologist in Rizgari Teaching Hospital. Accessory canals where found by cone beam computed tomography (CBCT) and were treated properly in the same center. But unfortunately, the results where worse, more pain, pus, and necrosis of gingiva and bone. (Figure 3)

Culture and sensitivity test

The antibiotics were stopped for one week and swabs taken sent for culture and sensitivity test (Figure 4). The culture and sensitivity test showed Streptococcus species which was sensitive to a lot of antibiotics. We tried those antibiotics with no desirable outcomes.

Third surgery

A complete blood count test was done. Apart from high ESR (35 mm/hr) there was nothing significant (Figure 5). Under local anesthesia extraction of 31st and 41st teeth with good curettage of the site down to the healthy bone carried out. During surgery,

a small piece of soft tissue which was immersed in the bone just like a tree root surrounded by dens bone was noted and excised for biopsy (Figure 6). Seventy two hours after surgery, she developed a severe pain, pus discharge with necrosis of what was healthy tissue.

We thought about specific infections like tuberculosis, syphilis and actinomycosis. The lab results for the first two was negative (Figure 6). While for actinomycosis was positive. What got our attention was the type of bacteria found in the second C&S test. The population was changed to anaerobic bacilli, namely: fucoseform bacteria and bacteroid. Trimethoprim/sulfamethoxazole tablets 80mg/400mg twice daily prescribed for one week with no obvious improvement.

Second CBCT was done, on which there was clear opacification of bone surrounding the lesion of radiolucency (figure 7).

There were two options for treatment to do block resection of mandible, which needs fixation by plate with or without bone grafting; and second, to do photodynamic therapy (PTD) for the site. We choose PDT.

Photodynamic Therapy

Materials that were used are red LED light source with 200mV and 660 (AFS Polironik,Russia); solution of Chlorine E6 as topical photosensitizer; Alveogyl as dressing pads; normal saline for washing; pens and gauzes.

The protocol of PDT was daily 10 minutes exposure and 10 visits. The procedure was as follow: after careful debridement, washing by normal saline, application of photosensitizer and waiting for 5 minutes, then the light source applied (Figure 8). Every single visit ended by putting Alveogyl in to the wound as a dresser.

After 3rd visit, there was less pain, the amount of pus was half of usual, extension of necrosis stopped, but still having it at the center of the lesion (Figure 9). During PDT period, she was on Azithromycin tabs 500mg once per day and Amoxicilline vials 500mg three times per day.

At the 10th day of PDT the site was closed (except for small shallow cavity) with no discharges and pain. The antibiotic coverage changed to Pencilline V 1gm orally four times per day one week. On 14th day from first PDT session she did CBC test (Figure 10) that showed high ESR (58 mm/hr). On day 25th the site was closed completely (Figure 11)

Three months later the CBCT showed acceptable replacement of the sites with what seems to be normal one. Eight months later dental implants have been placed in to the site for future prosthesis.

Figure 1: OPG of the case, round radiolucent area at apical area of lower incisors

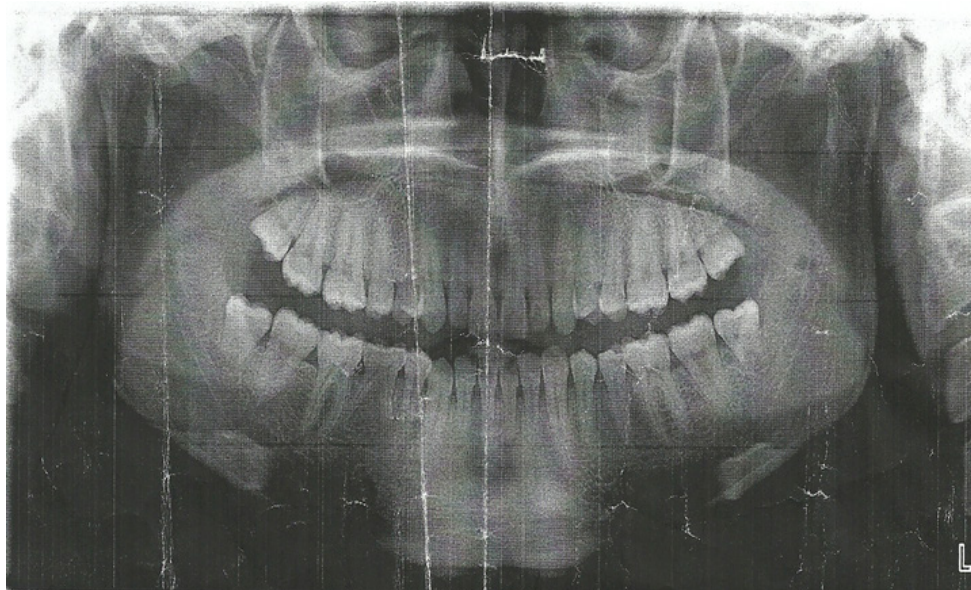


Figure 2: Histopathological examination after first surgery



Figure 3: clinical picture of infection site and CBCT view



Figure 4: culture and sensitivity result

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Name: یوسف تارا
Date: 23/6/2012
Specimen: gingival swab
Cultur: growth of *Streptococcus* spp. isolated

Gram Stain: gram positive cocci

Antibiotic	Antibiotic		
Amikacin (AK)	Clindamycin (DA)	S	R
Nalidixic acid (NA)	Vancomycin (VA)	S	S
Erythromycin (E)	Ceftazidime (CAZ)	S	S
Tobramycin (TOB)	Piperacillin (PRL)	S	S
Rifampicin (RA)	Cefixime (CFM)	S	S
Tetracycline (TE)	Ceftriaxone (CRO)	S	S
Gentamycin (GN)	Amoxicillin/clavulanic acid (AMC)	S	S
Ciprofloxacin (CIP)	Imipenem (IPM)	S	S
Nitrofurantion (F)	Aztreonam (ATM)	R	R
Cephalothin (KF)	Co-Trimoxazole (GOT)	R	R
Cephadrin (CE)	Cefoxitin	S	S

S-Sensitive
R-Resistant
M=Intermediate

Figure 5 : CBC before third surgery

Name: تارا یوسف
Patient Id: 00003
Sample Id: 00003
Type: STREPTOCOCCUS

Operator ID: Date: 01/07/2012 06:44:175 Sex: 00004

Result	Flags	Unit	Normal limits
WBC		10 ⁹ /L	4.0 - 12.0
RBC		10 ¹² /L	4.0 - 5.0
HGB		g/L	12.0 - 16.0
HCT		%	37.0 - 47.0
PLT		10 ⁹ /L	150 - 400
MPV		fL	7.0 - 11.0
PCT		%	0.200 - 0.300
PDW		%	10.0 - 16.0

ESR: 35 mm/hr

Figure 6 : second culture test results for specific infection

مختبر المصطفى
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العيادة: العرسل من خولقة خولقة الحضر

Oral swab for direct examination

Direct Z.N Film : Acid Fast Bacilli not seen.

Direct Gram Film : Pus cells 10-12/hpf

Gram (+) Branching Bacilli morphologically resembling Actinomyces seen.

Large numbers of Gram (-) (Pointed Bacilli) (Fusiform Bacteria) Seen.

Gram (-) Pleomorphic Rods (Bacteroides) seen.

All are anaerobic bacteria responsible for oral ulcers and are sensitive to sulphonamides.

V.D.R.L. Test : Negative
T.P.H.A. : Negative

With Thanks

Figure 7: second CBCT showing radiolucent lesion surrounded by radioopacity

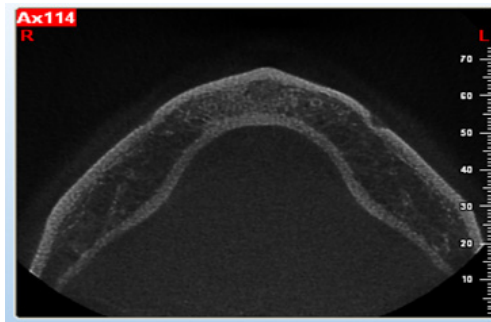


Figure 8 : PDT session



Figure 9 : 3rd day after PDT



Figure 10: CBC 14 days from first PDT session

CBC		DIFFERENTIAL	
WBC	RBC	NEUT	LYM
15.8	4.5	78	22
12.5	4.2	75	25
11.8	4.1	72	28
11.2	4.0	70	30
10.5	3.9	68	32
10.0	3.8	65	35
9.5	3.7	62	38
9.0	3.6	60	40
8.5	3.5	58	42
8.0	3.4	55	45
7.5	3.3	52	48
7.0	3.2	50	50
6.5	3.1	48	52
6.0	3.0	45	55
5.5	2.9	42	58
5.0	2.8	40	60
4.5	2.7	38	62
4.0	2.6	35	65
3.5	2.5	32	68
3.0	2.4	30	70
2.5	2.3	28	72
2.0	2.2	25	75
1.5	2.1	22	78
1.0	2.0	20	80
0.5	1.9	18	82
0.0	1.8	15	85

ESR: 15 mm/hr

- Normochromic normochromic RBCs
- Mature WBCs
- Normal Plts

Figure 11: 25th day from first PDT session



DISCUSSION

Chronic osteomyelitis is a challenging condition. In our case the challenges came from first, undetermined cause of disease, second, presence of actinomyces strains in the infection site, three, absence of response to antibiotics and surgical debridements.

For the first point, since teeth were sound (no obvious caries and/ periopockets), there was no trauma, surgeries, and irradiation in history. However, when she came to us, she already treated by dermatologists and general surgeons, but they said that the lesion was the same even before that. We may suggest a dermatological cause that the patient even forget about or unknown source of infection that made the bone to react. Anyhow, presence of sinus tract and bony lytic lesion both indicates the chronic nature of the disease.

The finding of Actinomyces strains in the site by itself makes the condition as a rear disease of head and neck. Sezer et al (2017) and Gupta et al (2020) when describing clinical picture of this disease, they are focusing on hard swelling, multiple sinus tracts and yellowish discharge, together with polymicrobial population especially anaerobic one as characteristic features of the pathology.^[5, 6]

In our case we could not find any of three mentioned sings, except for the polybacterial culture result. The bacterial culture reports we had two, when it comes to the type of bacteria found, they are very different that leads to suspicion about their accuracy. From other hand, the two histopathology reports did not mentioned features of actinomycosis in their reports. The last statement can be used as an argument for the validity of both bacterial culture test and presence of actinomayces strains in the first place. However, we tried to give the patient antibiotics that may work on this microorganism, but we did not get a positive result.

According to Van Merkesteyn and Bakker^[7] a combined antibiotic and surgical approach is the treatment of choice in chronic suppurative osteomyelitis. Bamberger^[8] reported that at least 4 weeks of antibiotic therapy are required after surgery, whereas Marx^[9] stated that there was a need for at least 2 weeks of antibiotic therapy after surgery. In our case, neither antibiotics, nor surgical debridement were able to stop the infection. Antibiotics in first treatment trial were broad spectrum and later according to C&S test. The absence of effect can be explained by two points: the C&S test was not accurate, or, they could not reach the site because of increased density of the bone around the lesion as it was seen on cbct.

Bernier S. et al, stated that surgical therapy consists of sequestrectomy or decortication with saucerization of the affected bone, as well as the removal of necrotic tissues.^[10] we did surgical debridement three times with no significant positive results.

Merkesteyn et al (1984) has tried hyperbaric oxygenation to help in controlling the CO and increase the effect of antibiotics. Since this type of treatment was not available, and we had experience with PDT with good results in inflammation case of skin and gingiva, it was tried. The same treatment modality was suggested as good option for all kinds of none responsive infection including osteomyelitis.^[4] The PDT is working by type I and II mechanisms. Type I mechanism is characterized by an initial electron transfer reaction and type II by an energy transfer to molecular oxygen forming singlet oxygen.^[4] The free radical oxygen is capable to kill microorganisms.

Such capability have been studied carefully and explained in detail in the work of Hamblin et al (2004).^[11] Photodynamic therapy in our case confirmed its efficacy in controlling such resistant condition of bone. So it is wise to be investigated in detail.

CONCLUSION

photodynamic therapy can be used as useful tool in cases of chronic osteomyelitis but needs further investigation.

Here by we declaring that we have no conflicts of interest, no financial, no relationships and no affiliations issues that may need to be mentioned here.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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