Dry socket: an infectious process treated by Ciprofloxacin: Case Studies

Abstract

Dry socket is considered as the most common complication following tooth extraction. It is mainly manifested by severe irradiating pain that starts 1 to 4 days after dental extraction where the socket becomes denuded. Based on findings following previous bacterial culture, we proposed a new pathogenesis theory based on infectious process. Accordingly, antibiogram was done and we proposed a new treatment consisting of ciprofloxacin. In this paper, we present a serial of 6 cases of dry socket unresponsive to topical conventional treatment. All 6 patients were ASA1 and none has allergy to ciprofloxacin where the later was prescribed at 500 mg 3 times per day for 5 days. All patients were totally relieved in 12 to 24 hours after antibiotic intake. This clinical result, in addition to previous laboratory findings, support more the infectious process in the pathogenesis of dry socket.

Introduction

Dry socket is considered as the most common complication following tooth extraction, and it's one of the most studied complications in dentistry (1). Dry socket, or alveolar osteitis, is manifested by severe post-operative pain in and around the site of extraction with increasing intensity. It may start at any time between the first and fourth days after extraction. It originates with a partially or totally disintegrated blood clot within the extraction socket, with or without halitosis (1).Clinically, the alveolus becomes denudated, tender to touch, exposed, and might be covered by a greyish tissue layer, lymphadenitis might be present .The pain ,it causes, is usually resistant to analgesics and radiates to ear and neck. Through the literature, all studies that tried to explain the pathophysiology of dry socket have reached that it is mainly caused by lack of formation, abnormal formation, or early disintegration of blood clot (2). Several preventive measures were mentioned in the literature that would help reduce the incidence of dry socket such as using local hemostatic agents, gelatin sponge, plasma rich in growth factor, laser

application (3). Concerning its treatment, multiple studies suggest to start by removing debris from the socket by applying 0.2% chlorhexidine or saline. Then sedatives like eugenol may be applied to reduce the pain (4).The efficacy of systemic antibiotic, like penicillin, have been controversial (5). Recently, the application of laser and the use of plasma rich in growth factor with gelatin sponge have been also mentioned (6,7).

Case report

Based on previous findings of bacterial culture and antibiogram on 3 reported cases of dry socket (8), this paper presents a serial cases of dry socket of 6 patients aged 18 to 65 years old. For these patients, a topical treatment based on socket irrigation with saline followed by topical sedative dressing of eugenol was inefficient.

All these patients were treated by ciprofloxacin 500 mg 3 times per day(20mg/kg/day) for a period of 5 days, and were relieved 12 to 24 hours after the antibiotic intake. 3 cases were related to mandibular wisdom teeth, among which 2 presented with previous pericoronitis and associated with surgical removal. The 3 remaining cases were related to simple extractions with previous periapical infections and are described as the following: 1 left mandibular second premolar, 1 left upper first premolar, and 1 right first molar (table 1).

The diagnosis of dry socket was based on clinical signs and symptoms which were manifested mainly by pain onset ranged from day 1 to day 4 with resistance to pure analgesics and NSAIDS. All patients presented with denuded and exposed socket.

Medical records of all patients were noncontributory and patients were ASA1. Also none had a history of allergy or hypersensitivity to ciprofloxacin.

Table 1: Description of cases included in the study

	Tooth	**Age**	**Gender**	**Simple Extraction**	**Surgical Extraction**	**Presence of infection**	**Medical history**

Case 1	46	60	female		X	+	ASA1
Case 2	48	23	male	X		-	ASA1
Case 3	35	38	female	X		+	ASA1
Case 4	14	55	female	X		+	ASA1
Case 5	48	65	male		X	+	ASA1
Case 6	38	18	female		X	+	ASA1

Discussion

Dry socket is considered as one of the most common and painful complications associated to dental extraction.

Regarding microbiological aspect of dry socket, yet, none have mentioned that bacteria is the causal agent and the main contributor in the pathogenesis of dry socket. However, 2 authors have described the potential role of bacteria in socket healing process by affecting the C-reactive protein (10), or by delaying the normal process (10,11).

Dry socket management has always been challenging. Some preventive measurements have been described in order to reduce its incidence such as antibiotics prescription , chlorhexidine application, or the use of gelatin sponge… (3). Prophylactic antibiotic has been suggested as preventive measure to reduce dry socket incidence. Many molecules have been used such as penicillin, mainly amoxicillin in 500 mg or 2 g doses, which is considered the most commonly used one (1). However, the systematic review done by Arteagoitea et al. in 2015 showed that the use of amoxicillin alone does not reduce the risk of dry socket, thus it's use was not justified. Yet, they mentioned that amoxicillin should be rather used with clavulanic acid to lower the chance of dry socket (9). In addition, azithromycin was mentioned to be effective when given 1 hour before third molar extraction surgery to prevent dry socket (10). It has been also effective when given post-operatively with single dose of 500 mg per day for 3 days after extraction (11). Also, the use of nitromidazoles was mentioned in the literature, and it showed a lower efficacy in

decreasing the risk of dry socket than penicillin (12). In addition, some have described the used of lincomycin for the prevention of alveolar osteitis and to avoid the formation of trismus and pain after extraction (13).

As for the treatment of dry socket, curative antibiotic prescription has not been described as a principal treatment and has not been prescribed to target specific bacteria, however, it was used as a management for post-operative complications mainly after surgical removal of third molars. For this purpose, amoxicillin has been the most commonly used molecule for treatment as it is the situation for prophylaxis against dry socket (5,14). Through the literature, the treatment was rather based on local socket management such as saline irrigation followed by antiseptic and/or sedative dressing (15). In addition, several treatment options were mentioned in the literature such as the use of suture and local hemostatic agents, low level laser, alvogyl® and Salicept® patch, the placement of eugenol on a gauze with local anesthetics, and the use of plasma rich in growth factors (3).

In our reported cases, systemic antibiotic prescription using ciprofloxacin in 6 rebellion cases showed efficacy for all patients. This result confirmed our previous observations and findings regarding the infectious aspect of dry socket.

Pseudomonas aeruginosa appeared in the bacterial culture was sensitive to ciprofloxacin antibiotic (8). However, due to its broad-spectrum activity, the efficacy of ciprofloxacin is not limited to *Pseudomonas aeruginosa*, therefore, other species can be suspected in the pathogenesis of dry socket. Since blood clot disorder has been thoroughly described and demonstrated as a mechanism in dry socket incidence, candidate bacteria that might be suspected and involved in the pathogenesis of dry socket should have the ability to affect the blood clot.

Pseudomonas aeruginosa has shown the ability to induce infection in addition to intrinsic fibrinolytic properties. To explain, *Pseudomonas aeruginosa* has the ability to bind to plasminogen and transform it to plasmin (16). Also, it can affect coagulation and fibrinolysis by inducing p38MAP kinase (17). This effect can eventually lead to expose the alveolus leading to dry socket.

Based on our previous laboratory findings as well as on our clinical results, we propose some preventive measurements:

1-Improve oral hygiene before any dental extraction to reduce the bacterial load.

2- Mouth washing with 2% Chlorhexidine for 30 seconds before extraction.

3- Prescribe prophylactic antibiotics and in particular cases associated with local predisposing factors including difficult or traumatic extractions, pre-existing infection like pericoronitis and periodontitis, and poor oral hygiene (18). And systemic predisposing factors including age, smoking, the use of oral contraceptives and anti-inflammatory drugs, the presence of comorbidities such as diabetes and chemotherapy (18,19).Women are at higher risk. In particular the first 3 weeks of the menstrual cycle (20).The best prophylactic molecule seems to be azithromycin or ciprofloxacin.

4- Irrigate the socket copiously after extraction, using 2% Chlorhexidine and 5% Iodine.

As for treatment we propose local treatment that consist of copious irrigation using 2% chlorhexidine and 5% iodine followed by eugenol application used as sedative agent in addition to its antiseptic and biofilm disruptor properties.

Systemic curative antibiotic prescription should be limited to rebellion cases to topical treatment. ciprofloxacin seems to be efficient, further exploration are needed to confirm the efficacy of other molecules

Conclusion

According to our previous laboratory findings and to our clinical results, the efficacy of prescription of ciprofloxacin in treating rebellion case of dry socket has been clearly shown. In addition, infectious process has solid facts in the pathogenesis of dry socket and this finding should be implemented in our practice in dry socket management

Further microbial investigations on large number of cases is necessary to explore potential involvement of other microbial agents mainly, bacteria, in dry socket pathogenesis as well the efficacy of other antimicrobial agent.

ETHICAL APPROVAL

As per international standard or university

standard written ethical approval has been

collected and preserved by the author(s).

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