

EFFICACY OF OXIDIZED CELLULOSE FOAM IN PREVENTING ALVEOLAR OSTEITIS

¹Rakesh Kumar Verma and ²Anil Pratap Singh

¹Department. of Oral & Maxillofacial Surgery, Purvanchal Institute of Dental Sciences, Purvanchal University, Gorakhpur, India)

²Faculty of Dental Sciences, King George's Medical University, Lucknow,

DOI: <https://doi.org/10.5281/zenodo.17285815>

Abstract

In achieving hemostasis in 40 out of 208 cases of third molar extraction in Dept. of Oral & Maxillofacial Surgery, Purvanchal Institute of Dental Sciences, Gorakhpur UP, Oxidized cellulose foam (OCF) was used, The incidence of Alveolar Osteitis (AO) in OCF treated sockets was found to be 5% (2/40) which was significantly lower than the non-OCF treated sockets 12% (20/168). The use of Oxidized cellulose (OCF) was found to be associated with decreased incidence of Alveolar Osteitis in mandibular third molar extraction cases.

Keywords: Alveolar Osteitis, Extraction, Mandibular Third Molar, Oxidized Cellulos Foam.

I. Introduction

The term Alveolar Osteitis (AO) or Dry Socket is attributed to an American dentist James Young Crawford and is one of the most frequent complications that happened after dental extraction. It is especially prevalent after mandibular third molar extraction. There is intense pain in the extraction zone commencing at any time between the first and fourth day post extraction accompanied by a partial or total disintegration and loss of blood clot from the alveolar socket¹. Various names are used for this painful post-operative condition such as localized osteomyelitis, acute alveolitis, and alveolitis sicca dolorosa etc.

The overall incidence of AO post dental extraction ranges from 2-5%. This is increased to 20-30% for mandibular third molar extractions.^{2,3,4} The peak age was 20- 40 years, with increased incidence among females.^{5,6} Fibrinolysis with subsequent loss of blood clot is believed to be the general cause, with a primary role of bacteria in this process has been reported (Birn's Hypothesis)^{18,25}.

No clear etiology has been acknowledged; however, numerous risk factors have been proposed and tested. Multivariate analysis revealed operator experience, perioperative crown and root fractures, periodontal disease, posterior teeth, and, interestingly, the use of mental health medications to be significant independent risk factors for the development of alveolar osteitis. Other factors that have been implicated including frequent changing of pressure dressing gauze, frequent mouth rinsing¹⁹, underlying infection^{26,27,28}, smoking²⁹, undue surgical trauma^{10,17,21,22,30} & excessive amounts of local anaesthetics³¹. No alveolar osteitis was reported in patients taking antibiotics, the oral contraceptive pill, bisphosphonates, or oral steroid drugs⁷.

Several methods have been used time to time to reduce the incidence of Alveolar Osteitis.^{8,9,10,11,12} These include the use of chlorohexidine mouthwashes ^{10,12}, the placement of medicated packing into the extraction sockets^{12,13} and the prophylactic use of antimicrobials^{14,15}.

Oxidized cellulose foam (OCF) is a haemostatic packing agent that accelerates the clotting by various mechanism ^{15,24}. The material, when soaked with blood, swells to form a gelatinous mass that plugs the bleeding site, it also causes 1. Rapid formation of platelet plug by surface interactions with proteins and platelets, 2. Activation of extrinsic and intrinsic pathways of clotting cascade and hence stops bleeding. OCF is one of the most commonly used bioabsorbable topical haemostatic agents used in general surgery. In periodontal surgery it was found to enhance healing.¹⁶

OCF is frequently used in oral surgery practice and the indication of use is when there is bleeding that cannot be controlled by simple packing measures and suturing.

In the Department of Oral and Maxillofacial Surgery, Purvanchal Institute of Dental Sciences, Gorakhpur UP, it was noticed that none of the 126 patients who underwent chair side third molar extraction under local anaesthesia between the periods of July 2009 to February 2010 reported Alveolar Osteitis. The records of these patients showed that in many cases OCF was placed in the tooth socket following tooth extraction to enhance & achieve haemostasis. It was therefore decided to investigate the relationship between the occurrence of AO among these patients who had their third molar extracted surgically and the use of OCF.

II. Methods

This study comprised of 172 patients having mandibular third molars- erupted , impacted or partially impacted, attending out-patient department of Oral & Maxillofacial Surgery of Purvanchal Institute of Dental Sciences, Gorakhpur UP between the period February 2010 to December 2010. The patients were taken up randomly irrespective of age, sex, caste & creed.

Exclusion criteria- Patients with debilitating diseases, uncontrolled diabetes, acute infections; Pericoronitis, periapical pathosis associated with third molar were excluded from the study (however although carious third molars without periapical pathosis and third molars with treated pericoronitis were included). Informed consent was taken to participate in the study preoperatively. Detailed & relevant medical/ dental history was recorded. Routine investigations were carried out like complete hemogram with glycemic index & viral marker screening for HIV, Australian Antigen & HCV.

One person (an oral and maxillofacial surgeon) performed all the surgical procedures. A full thickness trapezoidal mucoperiosteal flap was raised using standard Ward's incision and a posterior relieving incision. The bone around the tooth was osteotomized using high torque low speed electrical drill using carbide bur of nos under copious saline irrigation. Some sockets had OCF placed into them to achieve haemostasis. 3-0, Black silk suture was used to close the wound edges after tooth delivered from the socket. All patients had an antibiotic cover of Amoxycillin 500 mg, Metronidazole 400 mg together with Ibuprofen 200 mg each 8 hourly for 5 days & chlorhexidine mouth rinse se to be used every 8 hours, beginning the

next day following the operation. Sutures were removed after 5 days. The results were analysed using the chi-square test.

III. Results

The study included 171 patients (95 males, 76 females); Total 208 extractions of mandibular third molars done. Mesioangular impaction was the commonest type of impaction removed, followed by distoangular and horizontal impaction (58%, 31% and 11% of the patients respectively). The age of the patients ranged from 20 to 48 years. Of the 208 mandibular third molar extractions, 40 sockets had OCF placed into them to achieve hemostasis.

Overall 22 patients reported to the oral surgery clinic after 2–4 days complaining of severe pain at the site of surgery. Clinical examination revealed that all these patients had developed Alveolar Osteitis (AO). Of the 22 patients, 13 were males and the remaining 9 were females. None of the females who developed this complication were taking oral contraceptives. The rest of the patients had an uneventful recovery. The overall incidence of AO was 10.6% (22/208 teeth removed) (TABLE). Of the teeth extracted and treated with OCF, 5% (2/40 teeth) showed AO (TABLE). In the teeth extracted and treated without OCF, 12.0% (20/168 teeth) developed AO, an incidence which is significantly higher than the OCF-treated group (Chi-Square test, $P < 0.02$).

Table- Effect of Oxidized Cellulose Foam pack on incidence of Alveolar Osteitis in mandibular third molar extractions

S. No.	No of Mandibular Third Molars Extracted	No of Cases (Sockets) reported with Alveolar Osteitis (AO)	Incidence (%)
With out Oxidized Cellulose Foam (OCF) pack	168	20	12%
With Oxidized Cellulose Foam (OCF) pack	40	02	05%
Total	208	22	10.6%

IV. Discussion

Alveolar Osteitis (AO) results from a disruption of the normal healing mechanism. The incidence rate of this event is variable, ranging from 4.1% to 32%, and associated with a number of predisposing factors as well as the type of prophylaxis used ^{17,18,19}. In this study the overall incidence of AO after third molar extraction was 10.6%, which is similar to other findings previously reported ^{17,20,21,22,23}. The incidence of dry socket among the OCF-treated teeth was significantly lower (5.0%) than in the non-OCF treated teeth (12.0%).

OCF is one of the most common biodegradable materials used to facilitate haemostasis and control bleeding. The material causes haemostasis by multiple mechanisms like Blood absorption, surface interactions with proteins & platelets, activation of both extrinsic & intrinsic pathways & it has bacteriostatic properties owing to its low p^H along with its hypoallergenicity²⁴.

The phenomenon of AO in patients in whom OCF was used is probably reduced by its bacteriostatic properties which inhibits/prevents the fibrinolytic cascade triggered by the underlying infection^{26,27,28} (Birn's

Hypothesis)²⁵, other probable suggested mechanism may be more clot stability at extraction socket site as it provides a scaffold which swells by absorption of blood & prevents clot dislodgement due to frictional grip which has been found to dislodge during pressure dressing changes and frequent oral rinses.

However, this was a simple study and a properly designed experimental study is needed to take account of the many confounding factors, such as the type of eruption pattern of the tooth, the degree of impaction of the tooth if present, the amount of surgical trauma rendered, and the amount of debridement and socket washing performed.

In summary, OCF is a potent haemostatic agent, the application of which in extraction sockets was associated with a decrease in the incidence of Alveolar Osteitis after mandibular third molar extraction. Routine use of OCF in all extraction sockets prophylactically is still questionable as it requires a comprehensive & properly designed experimental cohort study.

References

Sancbis JM, Saez U, Penarrocha M, and Gay C. Tetracycline compound placement to prevent dry socket: A postoperative study of 200 impacted mandibular third molar. J Oral Maxillofacial Surg 2004; 62: 587-91.

Larsen PE. Alveolar osteitis after surgical removal of impacted mandibular third molars. Oral Surg Oral Med Oral Pathol 1992;73: 393-97.

Hermesch CB, Hilton TJ, Biesbrock AR, Baker RA, Cain-Hamilton J, McClanahan SF, et al. Perioperative use of 0.12% chlorhexidine gluconate for the prevention of alveolar osteitis. Oral Surg Oral Med Oral Pathol 1998; 85: 381-87.

Charles R Bloomer. Alveolar osteitis prevention by immediate placement medicated packing. Oral Surg Oral Med Oral Pathol Oral Radiol endod 2000; 90: 282-84.

Berwick JE, Lessin ME. Effect of a chlorhexidine gluconate oral rinse on the incidence of alveolar osteitis in mandibular third molar surgery. J Oral Maxillofac Surg 1990; 48: 444-48.

- Delilbasi C, Saracoglu U, Keskin A. Effect of 0.2% chlorhexidine gluconate and amoxicillin plus clavulanic acid on the prevention of alveolar osteitis following mandibular third molar extraction. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2002; 94: 301-04.
- Oqinni FO, Fatusi OA, Alaqba AO. A Clinical evaluation of dry socket in Nigerian teaching hospital. *J Oral Maxillofac Surg*. 2003; 61(8): 871-76.
- Sweet JB, Butler DP, Drager JI. Effect of lavage techniques with third molar surgery. *Oral surgery, oral medicine, and oral pathology*, 1976, 41:152-8.
- Sweet JB et al. Nitroblue tetrazolium and Limulus assays for bacteremia after dental extraction: effect of topical antiseptics. *Journal of the American Dental Association*, 1978, 96:276-82.
- Hermesch CB et al. Perioperative use of 0.12% chlorhexidine gluconate for the prevention of alveolar osteitis: efficacy and risk factors analysis. *Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics*, 1998, 85(4): 381-7.
- Triegeer N, Schlagel GD. Preventing dry socket. A simple procedure that works. *Journal of the American Dental Association*, 1991, 122:67-8.
- Bloomer CR. Alveolar osteitis prevention by immediate placement of medicated packing. *Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics*, 2000, 90(3):282-4.
- [1] Rood JP, Murgatroyd J. Metronidazole in the prevention of —dry socket|. *British journal of oral surgery*, 1979, 17:62-70.
- Yoshii T et al. Differences in postoperative morbidity rates, including infection and dry socket, and differences in healing process after mandibular third molar surgery in patients receiving 1-day or 3-day prophylaxis with lenampicillin. *Journal of infection and chemotherapy*, 2002, 8(1): 87-93.
- Essential product information: Surgicel, Surgicel Fibrillar and Surgicel Nu-Knit absorbable hemostats (oxidized regenerated cellulose). Piscataway, New Jersey Johnson & Johnson, (http://www.jnjgateway.com/public/USENG/SURGICEL_FIBRILLAR_Labeling_Information.pdf, accessed 8 January 2006).
- Galgut PN. Oxidized cellulose mesh. I. Biodegradable membrane in periodontal surgery. *Biomaterials*, 1990, 11(8):561-4.

- Oginni FO, Fatusi OA, Alagbe AO. A clinical evaluation of dry socket in a Nigerian teaching hospital. Journal of oral and maxillofacial surgery, 2003, 61(8):871–6.
- Quinley JF et al. —Dry socket|| after mandibular odontectomy and use of soluble tetracycline hydrochloride. Oral surgery, oral medicine, and oral pathology, 1960, 13:38–42.
- Sweet JB, Butler DP. Predisposing and operative factors: effect on the incidence of localized osteitis in mandibular third-molar surgery. Oral surgery, oral medicine, and oral pathology, 1978, 46: 206–15.
- Jaafar N, Nor GM. The prevalence of post-extraction complications in an outpatient dental clinic in Kuala Lumpur Malaysia—a retrospective survey. Singapore dental journal, 2000, 23(1):24–8.
- Turner PS. A clinical study of —dry socket||. International journal of oral surgery, 1982, 11:226–31.
- Sisk AL et al. Complications following removal of impacted third molars: the role of the experience of the surgeon. Journal of oral and maxillofacial surgery, 1986, 44:855–59.
- Krekmanov L, Hallander HO. Relationship between bacterial contamination and alveolitis after third molar surgery. International journal of oral surgery, 1980, 9:274–80.
- Seyednejad H , Imani M , Jamieson T, Seifalian AM. Topical hemostatic agents British Journal of Surgery 2008; 95: 1197–1225 [25] Birn H. Aetiology and pathogenesis of fibrinolytic alveolitis (dry socket). International journal of oral surgery, 1973, 2:211–63.
- Rud J. Removal of impacted lower third molars with acute pericoronitis and necrotizing gingivitis. British journal of oral surgery, 1970, 7:153–60.
- Nitzan DW. On the genesis of —dry socket||. Journal of oral and maxillofacial surgery, 1983:41:706–10.
- Sorensen DC, Preisch JW. The effect of tetracycline on the incidence of postextraction alveolar osteitis Journal of oral and maxillofacial surgery, 1987, 45:1029– 33.
- [26] Sweet JB, Butler DP. The relationship of smoking to localized osteitis. Journal of oral surgery, 1979, 37:73-5.
- Hansen EH. Alveolitis sicca dolorosa (dry socket): frequency of occurrence and treatment with trypsin. Journal of oral surgery, anaesthesia and hospital dental service, 1960, 18:409–16.
- Lehner T. Analysis of one hundred cases of dry socket. Dental practice, 1958, 8:75