University of the Western Cape
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# Survey on the management of Alveolar Osteitis (Dry Socket) in South Africa

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# Survey on the management of Alveolar Osteitis (Dry Socket) in South Africa

by

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## Declaration

**I, Emmy Ngoakoana Nokaneng,** declare that this mini-thesis is my own work and has not been presented for any other degree at any University:

Signed .....

Date.....



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# Acknowledgements and Dedication

## Acknowledgements

Thank you God for an incredible journey, without a dull moment. Looking back….. there is no way, that I could have made it without your unwavering love. Thank you for the gifts that you have entrusted in me with and the opportunities to be able to enjoy those gifts.

**To Mama**… you have an amazing inner strength that has been my anchor from the day you brought me into this life. I know, it couldn't have been easy to raise a daughter like me. Yes I have come to acknowledge that "ga ke swane le bana ba bangwe", so THANK YOU SO MUCH for putting up with me and giving your unconditional love and support. Ke a go rata ka kudu kudu.

**To Papa** … Thank you for insisting that I should get an education. Ke a leboga Phaahla. Phaahla á Mphela!

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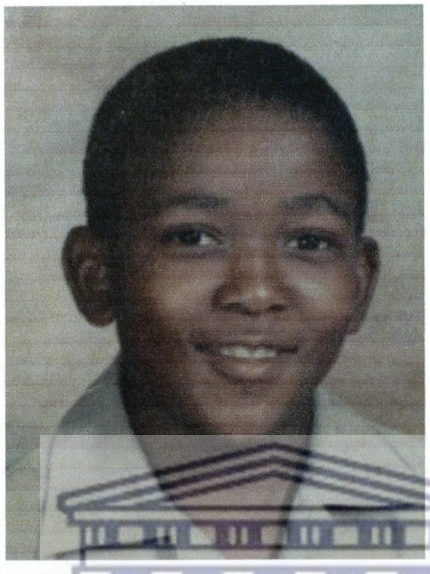
To Prof Kariem and my consultants who took the time to give their valuable advice during my study years.

To Mr Kotze for doing the statistical analysis for this thesis.

And lastly, to all the dental colleagues who took a few minutes of their time from their busy schedules to participate in this survey.

# Dedication



**This dissertation is dedicated to the wonderful memory of my late brother, Tebogo Isaac Mannya Nokaneng. Two decades later, yet your spirit still dwell so strongly among us. We still miss you as if you were taken from us just yesterday.**



**To the late Malome Justice Moleele,** for taking the time to listen.

**To my late grandparents:**

**Tata-tata Nokaneng,** who left a legacy of academics and encouraging us to read all that was available to read.

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And last but not least, to the **late Kgomotso Masebe……** for believing in me even in my moments of doubt.

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# ABSTRACT


## Survey on the management of Alveolar Osteitis in South Africa

Exodontia remains one of the most regularly done procedures in dentistry in South Africa (SA) and alveolar osteitis (AO) is considered one of the most common complications associated with exodontia.

Despite the extensive research done on this clinical entity, the management of AO still remains controversial. Various management protocols have been suggested in the literature, varying from prophylactic to symptomatic management of AO (Blum, 2002). However, none of these management protocols have to date shown any conclusive evidence on the effectiveness and benefit over another protocol.

The author was of the opinion that general dental practitioners (GDPs) in South Africa generally use preventative and treatment protocols based on what they were taught at their alumni dental schools or use protocols modified from their own clinical experience in practice.



The aim of this study was to assess which treatment protocols are routinely used by GDPs in South Africa for the management of AO and suggest a scientifically sound treatment protocol for AO. The study was done in the form of a questionnaire and the participants were randomly selected from the Health Professions Council's register.

The results showed that most of the GDPs in South Africa continued to use the same treatment protocol as their alumni dental school. They were of the opinion that these protocols were still clinically the most effective. Despite the plethora of intra-alveolar medicaments available, Alvogyl® still remains the medicament of choice of GDPs.

As there is no evidence in the scientific literature that suggests that one intra-alveolar medicament or antibiotic is more effective than the other, the author does not encourage the use of the medicaments or antibiotics in the treatment of AO.

However, by following simple measures such as improving patients' oral hygiene and using a pre-operative 0.2% chlorhexidine mouth rinse, the incidence of AO can be reduced significantly.

***Key words: alveolar osteitis, dry socket, treatment protocol***

# CHAPTER 1

## Introduction

Alveolar osteitis (AO) is one of the most common complications associated with exodontia. The literature states that the incidence of AO is 3-4% following routine dental extractions (Rood and Murgartryod, 1979; Halberstein and Abrahmson, 2003). In a survey by Heasman and Jacobs (1984) the overall incidence of AO was 2.9% in 2363 intra-alveolar extractions. The incidence of AO associated with the removal of third molars is often stated in the literature as higher than that associated with the extraction of other teeth. The incidence associated to third molars varies from 1% - 45% (Fridrich and Olson, 1990; Rozanis *et al*, 1977; Schow, 1974). However, Blum (2002) is of the opinion that the great variability in the reported incidences of AO associated with the removal of third molar is to a large extent due to the different diagnostic criteria and methods of assessment used.

AO has remained one of the most controversial clinical entities in dentistry despite considerable literature available on the subject. The controversy of AO has centred on the name, the lack of a proper descriptive term or definition of the condition, the aetiopathogenesis, as well as the management thereof.



The management of AO generally entails both the preventative strategies (use pre-operative mouthwash and/or antibiotic therapy) and the symptomatic management of AO (the use of analgesics and antibiotics or various other intra-alveolar medicaments).

The researcher telephonically confirmed that the dental schools in South Africa each have their own individual management protocols which they teach to their undergraduate students and use in their clinics. It is therefore hypothesised that graduates would be more likely to use the same protocols in their practices as taught in their undergraduate studies.

# CHAPTER 2

## Literature review

Alveolar osteitis, as a complication associated with the extraction of permanent teeth, was first described by Crawford (1896). Since then, similar clinical entities have been described using different terminology such as *dry socket, post-operative alveolitis, alveolitis sicca dolorosa, septic socket, necrotic socket, localised osteomyelitis and fibrinolytic alveolitis.* Blum (2002) is of the opinion that the term *fibrinolytic alveolitis* as used by Birn (1970) is a more descriptive and accurate and should be used for the condition. This is in correlation with the aetiopathogenic mechanisms as described by Birn in 1970 and 1973. In this study, the clinical entity will be referred to as alveolar osteitis (AO).

### DEFINITION OF ALVEOLAR OSTEITIS

The literature is replete with varying definitions of AO (Table 1). This is due to a lack of consistency in diagnostic criteria for AO. In 2002, Blum attempted to give a more descriptive definition that could be used universally for AO. He defined AO as "*post-operative pain in and around the extraction site, which increases in severity at any time between 1and 3 days after the extraction accompanied by a partially or totally disintegrated blood clot within the alveolar socket with or without halitosis*".

Table1
The variety of definitions suggested in the literature for the clinical assessment of AO (Blum, 2002)

| Authors | Definition |
|---|---|
| Crawford (1896) | Severe, neuralgiform, irradiating pain and partial or total disintegration of the blood clot in the socket have to be present simultaneously. |
| Birn (1972) | Partial or complete loss of blood clot, exaggerated pain radiating to the ear and temporal region and a putrid odour |
| Laird *et al* (1972) | Evidence of breakdown of clot together with the characteristic foul odour. |
| Vedtofte *et al* (1974) | Complete or partial loss of blood clot with the denuded bone in the alveolus and severe irradiating pain. |
| Tjernberg (1974) | Disintegrated blood clot in combination with pain that is not adequately relieved by analgesics. |
| Rood *et al* (1979) | A painful socket which is increasing in severity 24hrs after the extraction. |
| Davis *et al* (1981) | Loss of adequate clot and development of delayed pain, 2 to 5 days after the surgery, that was suffice to require active medical intervention. |
| Meechan *et al* (1987) | Pain from extraction site and empty or necrotic material containing socket. |
| Berwick *et al* (1990) | Evidence of denuded socket with or without necrotic debris or foetid breath. |
| Fridrich *et al* (1990) | Absence of a demonstrable clot and symptomatic pain in or around the surgical site 36hrs after surgery that was suffice to require medical intervention. |
| Larsen (1991) | Persistent or increasing post-operative pain beginning after the second day, which is associated with the necrotic tissue in the socket, exposed bone, or loss of the clot on clinical examination. |
| Ritzau *et al* (1992) | The simultaneous presence of severe irradiating pain originating from the empty socket and the disintegration (partial or total) of the socket coagulum. |
| Akota *et al* (1998) | The presence of disintegrated blood clot, and/or increased pain in the socket region, and /or foul odour, and /or exudate or pus in the socket. |
| Hermesch (1998) | Loss of blood clot and /or necrosis of blood clot and persistent or increasing postoperative pain after the surgery, with throbbing pain at the surgical site that is not relieved with mild analgesics. |
| Bloomer (2000) | Complain of pain in the extraction site and the presence of exposed bone or necrotic debris. |



Over the past decades, it was interesting to note that what these definitions all had in common was that alveolar osteitis was described as a clinical entity that presented with

- a complication of a tooth extraction,
- severe pain,
- denuded bone at the extraction site, due to
- disintegration of blood clot, and
- halitosis.

Some patients may complain of intense pain radiating to the ipsilateral ear, temporal region or eye. Rarely, would the patient have regional lymphadenopathy (Blum, 2002). It

is always necessary to exclude any other causes of pain on the ipsilateral side before making the diagnosis of AO.

AO which is also characterised by partial or complete loss of a blood clot from the extraction socket has to be distinguished from other conditions of bone hypovascularity, which may prevent the initial formation of a blood clot in the extraction socket. These conditions include radiation induced osteonecrosis, Paget's disease of bone and osteopetrosis (Vezeau, 2000).

The onset of AO still remains a subject of debate. Studies have reported that the onset of AO varies between 1-3 days and to within a week post-extraction in 95% and 100% of all AO cases (Field *et al*, 1988). According to Birn (1970-1973), the tissue activators which are responsible for the clot dissolution, can only do so once the anti-plasmin which is contained in the blood clot has been consumed. This is usually 24hrs after the tooth extraction. Thus the duration of AO varies and can range between 5-10 days.

## RISK FACTORS OR INDICATORS IN ALVEOLAR OSTEITIS

Various factors have been implicated to be contributory factors in AO. These can be broadly categorised into patient and surgical factors.



### 1. Patient factors

1.1. *Patient's age*

Though there is a general consensus in the literature that the incidence of dry socket increases with age, there is no established evidence that mentions at what age the complication is more likely to occur (Alexander, 2000).

1.2. *Patient's gender*

Studies done in the 1960s suggested that AO was more common in males. However, these findings were refuted by studies done in the 1970s which suggested that AO was more common in females. This was attributed to the increasing usage of oral contraceptives by females. In a randomised prospective study by Chapnick and Diamond (1992), it was shown that females have a higher incidences of AO compared to males regardless of whether they use oral contraceptive or not.

1.3. *Females on contraception*

Females on contraception are more likely to have an alveolar osteitis than those who are not. Ygge *et al* (1969) suggested that oestrogen could indirectly activate the fibrinolytic system and thus contribute to early blood clot dissolution. Catellani *at el* (1980) concluded that there was a probability of an AO increase with an increased in oestrogen dose in the oral contraceptives and furthermore stated that the fibrinolytic activity appears to be lowest between days 23 to 28 of the menstrual cycle.

1.4. *Smoking*

Sweet and Butler (1978) in 400 surgically removed third molars, reported that those who smoked a half-pack of cigarettes a day had a four-to-five fold increase in AO (12% vs. 2.6%), compared to the non-smoking patients. Meechan *et al*, (1988) found that there was a direct correlation between the number of cigarettes smoked and the incidence of post-extraction AO. There is no literature evidence that explains the exact pathological effect of smoking on an extraction socket. It has been further suggested that smoking and the use of oral contraceptives could theoretically result in up to a ten fold increase in the risk of developing AO (Alexander, 2000).



1.5. *Pericoronitis and pre-existing infections*

The role of bacteria in AO has long been postulated and investigated. This hypothesis was supported by various reports of increased incidence of AO in patients with poor oral hygiene (Penarrocha *et al*, 2001), pre-existing infection, local infection, such as pericoronitis and advanced periodontal disease (Rud, 1970). Pre-extraction salivary bacterial counts have been associated with an increased incidence of post-extraction AO (Brown *et al*, 1970). The causative relationship of bacteria in AO was further strengthened by a reduced incidence of AO in conjunction with antibacterial measures.

The overall role of bacteria in AO has been extensively investigated with various attempts to isolate the specific causative micro-organisms. Brown *et al* (1970) studied the microbiology of intra-oral wounds. In their research, the aim was to determine whether there were specific micro-organisms that could be correlated to specific clinical complications associated with extraction of teeth. They assessed the pre-operative and post-operative changes of oral microflora in and around selected wound sites. In their

study, they found that patients, who had high pre-operative *Streptococci* counts at the wound sites, had a higher probability of developing AO. The study also suggested that patients who had high post-operative or those who showed a rapid increase in post-operative counts of *Streptococci* had a greater tendency of developing post-operative wound sepsis.

Nitzan *et al* (1978) suggested that anaerobic organisms could have a possible role in the development of AO. Furthermore, they have shown that micro-organisms such as *Treponema denticola* had plasmin-like fibrinolytic activity which led to the post-extraction fibrinolysis of blood clots in extraction sockets. They highlighted that there was an absence of this organism in children, which further supported the reason that AO does not occur in children. However, several authors have refuted the premise that bacteria do play a role in the pathogenesis of AO (Birn, 1970; Berwick & Lessin, 1990).

## 2. Surgical factors

### 2.1. *Difficulty and trauma during surgery*

Trauma and difficulty of surgery have been shown to play a significant role in the development of AO. Lily *et al* (1974) showed that there was a correlation between the incidence of AO and surgical removal of teeth that involves the reflection of a flap and some degree of bone removal. There is also the opinion among different authors that the surgeon's experience can be correlated with the incidence of AO. Alexander (2000) stated that in his clinical experience, he has witnessed more cases of AO when the post-graduate trainees performed the procedure as opposed to experienced surgeons.

### 2.2. *Root or bone fragments remaining in the wound*

There is lack of scientific evidence to support the suggestion that bone and root fragments could perhaps contribute to the development of AO. In his study, in which he examined histological specimens derived from healing extraction sockets of monkeys, Simpson (1969) found no correlation between bone/root remnants and AO. Birn (1973) suggested the contrary.

2.3. *Excessive irrigation or curettage of alveolus after extraction*

It has been postulated that excessive and repeated irrigation of the mouth after an extraction could interfere with clot formation and subsequently give rise to AO (Birn, 1973). However, there is no scientific evidence to support this premise.

2.4. *The role of blood perfusion and use of local anaesthetics*

Kruger (1973) associated poor local blood supply with the increased incidence of AO in mandibular molar extractions. He suggested that the presence of thick cortical bone resulted in poor blood perfusion and thus it was necessary to add minor perforations into the alveolar marrow cavity post-extraction. This was disputed by Birn (1973) who demonstrated that the mandibular molar regions are one of the most vascularised regions of the mandible.

It has been suggested that perhaps the vasoconstrictors used in local anaesthetics solutions could reduce blood flow post-extraction and thus cause AO (Meechan *et al*, 1987). AO has also been shown to occur in patients who had extractions done under general anaesthetic without the use of vasoconstrictor (Blum, 2002).

2.5. *Physical dislodgement of the blood clot*

There is no evidence that supports the hypothesis that the physical dislodgement of the blood clot either by direct manipulation with the tongue, or applying negative pressure such as in the use of straws, could lead to AO (Houston *et al*, 2002).

## MANAGEMENT OF ALVEOLAR OSTEITIS

The management of AO can be categorised into:

1. Prophylactic management, which is geared towards prevention of AO.
2. Symptomatic management, which is geared towards the relieving symptoms associated with AO.

### 1. **Prophylactic Management of AO**

#### 1.1. *Lavage and mouth rinsing*

As it has been suggested in the scientific literature, that bacteria probably do play a role in the pathogenesis of AO. Therefore studies have been done to determine what role, if any, the pre-operative preparation of the operative site by some kind of antiseptic solution might play in reducing the incidences of AO.

Several studies have suggested that the pre-operative irrigation with chlorhexidine mouthwash or the use of copious irrigation during surgery, do significantly reduce the incidence of AO (Butler and Sweet, 1977; Larsen, 1991). Tjernberg (1979) has suggested that improved oral hygiene and plaque reduction could reduce the incidence of AO.



#### 1.2. *Efficacy of intra-alveolar antibiotics and use of systemic antibiotics*

There is a strong correlation found between poor oral hygiene or pre-existing local infection to high incidences of AO. Specific micro-organisms are also associated with AO, for example, *Treponema denticola* (Nitzan *et al*, 1978). This opened up a whole new avenue and many studies were subsequently done to identify the role if any of the pre- or post-operative administration of antimicrobials on AO.

The penicillins are generally the first drug of choice for odontogenic infections. The systemic use of penicillins has been shown to reduce the incidence of AO (Hellem and Nordenram, 1973; Bystedt *et al*, 1980; Petersen *et al*, 1994). Krekmanov and Hallander (1980) evaluated 112 patients who received a single dose of 800mg penicillin VK orally one hour before surgery. AO developed in 4% of this group but it also occurred in 31.2% of the control group receiving no medication.

Apart from the penicillins, the use of other antimicrobials has been advocated. According to Alexander (2000), sulphur cones were used in the 1970s and early 1980s but were soon found to be associated with numerous complications such as allergic reactions and retardation of healing (Chapnick and Diamond, 1992). This was followed by the use of other antibiotics such as tetracycline (Fridrich and Olson, 1990), clindamycin (Chapnick and Diamond, 1992) and metronidazole (Barclay, 1987). None of the studies done to date can convincingly state that the use of intra-alveolar antibiotics decreased the incidence of AO. In studies using topical antimicrobials, resultant myospherulosis has been observed. The latter has been implicated in delayed healing. Further investigations showed that the myospherulosis was caused by the petroleum based carriers.

Other forms of topical antimicrobials have been evaluated. The topical use of tetracycline powder or aqueous suspensions has been shown to reduce the incidence of AO (Swanson, 1989; van Eeden and Bütow, 2006).

With regard to the use of systemic antimicrobials as prophylaxis for AO, the timing of the administration has been a point of much debate, whether it should be administered pre-operatively or post-operatively. It has also been reported that the pre-operative use of antibacterial agents was more effective than post-operative in reducing the incidence of AO. Oringer (2003) evaluated the combination of oral amoxicillin with clavulanic acid and chlorhexidine mouth rinses in 177 patients who had extraction of third molars. The patients were divided into three groups. The first group rinsed with chlorhexidine before the removal of the tooth and twice daily for 7 days following the extraction. The second group also rinsed with chlorhexidine but had 500mg amoxicillin plus 125mg clavulanic acid prescribed to them for 5 days post-extraction. The third group was a control and had to rinse with sterile saline only.

The incidence of AO was 20.9% in the chlorhexidine-rinse-only group, 8.9% in the chlorhexidine /amoxicillin-plus-clavulanic acid group and 23.7% in the saline-rinse-only group (Oringer, 2003). It is difficult from such a study to discern whether it was the antibiotic or the mouthwash which had a greater effect on the prevention of AO or whether it was the synergistic relationship between the two that reduced the incidence of AO effectively.

In their study, Poeschl *et al* (2004) evaluated the need for post-operative oral antibiotics in the removal of third molar. In the study, patients were divided into 3 groups (a total of 528 lower third molars were removed from 288 patients). In the first group (n=176), the patients were prescribed a combination of amoxicillin and clavulanic acid (1g) for 5 days post-operatively. The second group (n=180) received 300mg clindamycin for 5 days. The third group (n=172) received no antibiotic medication and served as a control group. They found that there was no difference in incidence of AO and concluded that post-operative oral antibiotic prophylaxis after the removal of lower third molars did not decrease the incidence of AO.

1.3. *Use of antifibrinolytic agents*

Following the work by Birn (1972-1973) in which he stated that AO was caused by clot lysis through plasminogen pathways, various investigations have been done to determine the possible role of anti-fibrinolytic agents in preventing AO.

Tranexamic acid (TA) is known to inhibit both plasminogen activators and plasmin. Epsilon-aminocaproic acid (EACA) acts as a competitive inhibitor of plasminogen activators in low doses whereas in high doses, it acts as a non-competitive inhibitor of plasmin. However, the potency of EACA is lower than that of TA. Para-aminomethylbenzoic acid (PAMBA) has a higher potency than TA in the inhibition of plasmin and plasminogen activators.

Studies done on the topical use of EACA and TA in impacted mandibular third molar extraction wounds have shown that these substances do not significantly decrease the incidence of AO (Gersel-Pedersen, 1979). Other studies done on the effect of para-hydroxybenzoic acid (PHBA) have shown a reduction in the incidence of AO when PHBA was packed into the extraction sockets (Vedtofte *et al*, 1974; Ritzau and Swangsilpa, 1977; Ritzau and Therkildsen, 1978). Vezeau (2000) has refuted these finding, implicating the antibacterial nature of PBHA to have contributed to the above findings.

Aprotonin has a potential to decrease fibrinolysis and bradykinin production as well as platelet-stabilising properties. Aprotonin is a bovine derived polypeptide that inhibits plasmin and kallikrein (Vezeau, 2000). Brennan *et al*, (1991) found that when aprotonin is injected into the buccal tissues adjacent to the third molars, it did not have a significant decrease in the incidence AO. There are no current studies to show the efficacy of the topical use of aprotonin in post-extraction sockets.

More recently, platelet-rich plasma has been investigated as an alternative in preventing AO. Rutkowski *et al* (2007) have found that the use of platelet-rich plasma (PRP) reduced the incidence of AO from 9.57% in patients who did not receive PRP to 3.63% in patients who received PRP. According to the authors, not only does PRP initiate clot formation, it also enhances healing by providing the necessary growth factors, as it contains concentrated white blood cells that could potentially inhibit post-operative infection. This author is of the opinion that the high cost of PRP is a disadvantage and thus limits its use in clinical dentistry.

1.4. *Use of other intra-alveolar medicaments*

The use of zinc oxide and eugenol paste has for many decades become the medicament of choice. Bloomer (2000) is of the opinion that packing of post-extraction sockets with gauze that contained 55% petroleum jelly, 36% balsam of Peru (an extract of *Myroxolon balsamum* tree) and 9.0% eugenol decreased the incidence of AO. AO occurred in 8 of 100 packed surgical sites (8%) and 26 of 100 non-packed surgical sites (26%). It is often questioned whether the relief of symptoms brought about by the use of the medicament is worth the complications or side effects associated with use of such intra-alveolar medicaments. Complications such as delayed healing as well as possible myospherulosis have been found to be associated with zinc oxide eugenol (Fridrich and Olson, 1990). Bloomer (2000) did acknowledge that there was delayed healing associated with eugenol. As for the myospherulosis, he recommended that the packing be removed 1 week post-operatively.

The use of organic dye, 9-amino-acride on gelfoam was found not to be as effective as the control where gelfoam was used alone (Johnson and Blanton, 1988).

Pankhurst *et al* (1994), in a study of 50 HIV positive patients, used Trisok® (a combination of chlorotetracycline, aspirin, 2 topical anaesthetics, cinchocaine and amethocaine) in a base of hard and soft paraffin wax and wool fat. The authors noted a 50% reduction in AO from (32% to 16%) and a reduction in delayed healing from 28% in the control group to 0% in the treatment group. However, the criteria for determining the "reduction in delayed healing" were not defined. There has not been any other study to substantiate their findings regarding this product.

1.5. *Intra-oral bandages*

Several authors have investigated the use of intra-oral bandages placed over alveolar socket as a means of protecting the site and reducing the incidence of AO.

Hellem and Nordenram (1973) studied the use of a gauze sponge saturated in Whitehead's® vanish, which is a combination of iodoform, balsam tolutan and Styrax® liquid in a liquid base. This gauze was sutured over the extraction socket which according to the authors, was to reduce the degree of pain, swelling and trismus. The validity of the results was questionable as the patients also had antibiotics prescribed to them.



The efficacy of Formula K® in preventing AO was studied by Mitchell (1986). Formula K® is a paste composed of soluble and insoluble collagens. This paste was compared to zinc oxide and eugenol paste in the control sites. It was found that the socket took 3-4 weeks to heal and some of the patients had to be repacked more than once in the subsequent follow up visits. Due to the lengthy healing period, the product was not very popular and since then no other study has been published on Formula K®.

1.6. *Dextranomer Granules*

Matthews (1982) studied the use of an inert, hydrophilic dextran polymer in a bead form and covered with Orabase® gel. These granules were compared with zinc oxide and eugenol paste which were placed in the sockets. The results were inconclusive. The authors did however note that the dextranomer granules caused delayed healing.

1.7. *Polylactic acid*

Drilac® polylactic acid (a biodegradable ester polymer), which became very popular in the 1980s, was seen as the ultimate solution to AO (Alexander, 2000). It was soon discovered that polylactic acid actually increased the incidence of AO (Moore and Brekke, 1990; Hooley and Golden, 1995). It was also found that polylactic acid caused retardation of healing (Olson *et al*, 1982).

1.8. *Gelatine sponge*

Gelfoam has been used in many protocols as a preferred carrier medium for various solutions/agents into the socket and as well as a clot-stabiliser. Gelfoam is a resorbable gelatine sponge that is prepared from a specially treated and purified gelatine solution that is beaten, dried, sectioned, sealed and dry heat sterilised. The structure of the Gelfoam is such that it cannot be placed passively in the socket. Once compressed into the socket, the foam expands as it absorbs fluids. Gelfoam is reported to be completely resorbed in 4-6 weeks. Petersen *et al* (1984) noted that there was some mild delay in the epithelial healing when the gelatine sponge was used. Studies have been carried out to assess the efficacy of Gelfoam on wound healing and to date the results are contradictory and inconclusive (Alexander, 2000).



1.9. *SaliCept® Patch*

SaliCept® contains acemannan hydrogel (which is derived from the inner clear gel of *Aloe vera L)* and a mixture of other naturally occurring substances which are then freeze dried into a patch. Acemannan hydrogel has been shown to promote wound healing by activating macrophages. Macrophages promote fibroblast infiltration, collagen synthesis, deposition and angiogenesis as well as activate other pro-inflammatory mediators associated with wound healing (Poor *et al*, 2002). It has also been shown that it has a high affinity for keratin on cultured oral buccal mucosa scrapings and for cultured human gingival fibroblast. It is for the above reasons, why Poor *et al* (2002) thought it would be an ideal medium to be placed in extraction sockets to prevent AO. Poor *et al* (2002) compared the use of SaliCept® with gelfoam soaked in clindamycin for the prevention of AO when these two materials were placed in post-extraction sockets. The results of the study suggested that SaliCept® could significantly reduce the incidence of AO. However, this author views their results with scepticism as all the patient received pre-operative dexamethasone (2mg) and clindamycin (300mg). The prescription of the

corticosteroid and the antibiotic were confounding factors which could have had significantly influenced the results.

1.10. *Chlorhexidine gel (0.2%)*

Chlorhexidine mouthwash has been used extensively as prophylaxis for AO in third molar surgery and to such an extent that most authors believe that it does reduce the incidence of alveolar osteitis. More recently, a bio-adhesive chlorhexidine gel has become available. The main advantage of the bio-adhesive gel is that it prolongs the bioavailability of chlorhexidine in the applied site. Torres-Lagares *et al* (2006) in a randomised, double-blind study evaluated the effectiveness of bio-adhesive 0.2% chlorhexidine gel post-operatively after third molar surgery. They found a 63.33% decrease in the incidence of AO in the experimental group. In the control group, the occurrence of AO was 30% compared to the 11% in the experimental group. They suggested that the bio-adhesive 0.2 % chorhexidine gel, applied only once within the alveolus site at the time of third molar, may reduce the incidence of AO following removal of impacted third molars.

Hita-Iglesias *et al* (2008) found that the bio-adhesive chlorhexidine gel decreased the incidence of AO when compared with chlorhexidine rinses in third molar surgery. They observed an overall 70% decrease in AO in the gel group. The post-operative incidence of AO was 25% in the rinse group as compared to 7.5% in the gel group.



1.11. *Gelatine sponge and Covomycin D*

Van Eeden and Bütow (2006) have shown that a Covomycin D (antibiotic/anti-inflammatory medication) coated gelatine sponge packed into alveolar sockets following the removal of third molar surgery could prevent the onset of dry socket. In their study, nineteen subjects had bilateral third molars removed. The patients had one of the socket packed with Covomycin D. Three patients developed dry socket in the non-medicated sockets.

## 2. Symptomatic Management of AO

The goal of symptomatic management of AO is to alleviate the pain and discomfort in shortest period possible. Various protocols have been suggested for the symptomatic management of AO, which mainly involved the placement of several intra-alveolar medicaments. There are many authors that do not encourage the use of intra-alveolar medicaments. The following protocols were found in the literature:

2.1. Socket irrigation with the use of intra-alveolar medicaments (Colby, 1997; Houston *et al*, 2002)

2.2. Socket debridement and irrigation without the use of intra-alveolar medicaments (Alexander, 2000; Blum, 2002)

2.3. Use of pro-inflammatory agents (Halberstein and Abrahamsohn, 2003)

There are arguments for and against these various management protocols. A concern to the author was that these are not all evidence-based protocols.

### 2.1. *Socket debridement and irrigation with the use intra-alveolar medicaments (Colby, 1997; Houston et al, 2002)*



Once the patient is anaesthetised with local anaesthetic, the extraction socket is irrigated with warm saline. Further removal of debris is achieved through aggressive suctioning of the socket. The proponents of this protocol do not encourage the curettage of the extraction socket, as it worsens the patient's symptoms and according to them, "has no benefit" to the patient.

An intra-alveolar medicament is then placed into the socket. Various medicaments have been used: antimicrobials, obtundent pastes, antiseptic pastes and solutions. A common intra-alveolar medicament used is eugenol which is available in different formulations. Eugenol is favoured for its obtundent effect on the bone. Houston *et al* (2002) used iodoform gauze composed of eugenol, petroleum, zinc oxide ointment mixed with 250mg of tetracycline. Colby (1997) suggested a mixture of eugenol and benzocaine in an iodoform paste.

The authors suggested that the medicament should be packed that it fills the entire extraction socket, so that all the walls of the extraction socket are in contact with the medicament. The dressing should be changed in the next 48 to 72 hours until the patient is completely free of pain. Once the patient is pain free, the dressing is discontinued and the patient is instructed to keep the socket clean with daily irrigations. Healing of the extraction socket should be expected within 3 to 4 weeks after the initial onset of symptoms.

The rationale for the use of dressings and antibiotics for symptomatic management of AO has mainly been empirical with no substantial scientific evidence on their efficacy. The empirical use of intra-socket medicaments seems to bring about symptomatic relief and thus their continued use. According to the literature the advantages of using intra-alveolar medicaments are their ability to achieve greater local concentration of the substance(s) than can normally be expected from systemic administration, minimise the possible side effects and sensitisation, as well as obturating the socket to eliminate debris.

*Antimicrobials*

The use of antimicrobials was based on the hypothesis that oral microorganisms do play a role in the pathogenesis of AO. High pre-extraction salivary bacterial counts have been correlated with the increased incidence of post-extraction AO (Brown *et al*, 1970). Oral microbials commonly associated with AO are *Actinomyces viscosus, Streptococcus mutans* (Rozanis *et al*, 1977) and *Treponema denticola* (Nitzan *et al*, 1978). The systemic and topical use of antimicrobials is rather controversial as studies show contradicting results.

Curran *et al*, (1974) evaluated 75 patients who received penicillin systemically both pre-operatively and post-operatively with no antibiotics. They concluded that the use of antibiotics did not decrease the incidence of AO. Other antimicrobials such as a metronidazole (Barclay, 1987), tinidazole (Mitchell, 1986), lincomycin and clindamycin (Fridrich and Olson, 1990) have all shown to be effective in reducing the incidence of AO.

There are no studies that specifically address the efficacy of antimicrobials on the reduction of post-operative symptoms associated with AO. Thus, the use of antimicrobials to manage AO is quite empirical. It is questionable whether it is the

antibiotics that bring relief of the symptoms as they are often prescribed in conjunction with non-steroidal anti-inflammatory analgesics.

*Complications associated with use of post-extraction socket medicaments*

According to Alexander (2000), the exact incidence of complications secondary to placement of medicament in extraction socket is unknown. One should be cognisant of contraindications associated with such medicaments as well as possible complications that may occur with use of intra-alveolar medicaments. Moreover, the advantages of using such medicaments should definitely outweigh the complications thereof. These disadvantages are the multiple visits the patient needs to make in order to alleviate the symptoms of AO and the time the patient spends away from work.

Though there are no studies to substantiate it, the use of intra-alveolar use of antibiotic can potentially cause the emergence of bacterial resistance as is the case with the systemic use of antibiotic. Other known complications associated with antibiotic are minor and major allergic reactions.

Zuniga and Leist (1995) reported a case of nerve dysesthesia following AO treatment with intra-alveolar tetracycline. The surgical exploration of the site showed an encapsulated crystalline tetracycline and intense chronic inflammatory infiltrate consistent with foreign a body reaction.



Moore and Brekke (1990) also reported a similar complication in 18 patients when a powdered tetracycline-coated polylactic acid was used.

Animal studies have shown that Alvogyl® causes retardation in healing (Summer and Matz, 1976). The authors went further to recommend that Alvogyl® should not be used in extraction sockets. Zinc oxide and eugenol has also been shown to retard post-extraction healing. Mainous (1974) reported a foreign body reaction 8 weeks after the intra-alveolar packing of the extraction site with zinc oxide and eugenol paste. He recommended that the paste should not be left *in situ* for lengthy periods. Kozam (1977) noted that eugenol at certain concentrations can extinguish impulse transmission within 3 hours. When used as an endodontic medicament, eugenol can cause a transient paresthesia (Brodin and Roed, 1984).

These reports show that the use of intra-alveolar medicaments was not without problems and that; intra-alveolar medicaments should not be seen as the panacea in managing AO.

### 2.2. ***Socket debridement and irrigation without use of intra-alveolar medicament (Alexander, 2000; Blum, 2002)***

Several authors advocate the "none dressing" intervention and debridement of the extraction socket and allow secondary healing to take place. Analgesics are used as an adjunct.

Once the patient is anaesthetised with local anaesthetic, the socket is debrided and irrigated to remove debris from the socket. The socket is debrided until there is bleeding and a fresh clot forms. Analgesics are then prescribed (Alexander, 2000).

Alexander (2000) argued that since AO had so many aetiological or contributory risk factors, it is unlikely that elimination of one factor through the use of the different medicaments, antibiotics, antifibrinolytic or even pre-operative mouth rinses, will solve the problem. He suggested that the key to management was patient education and reducing the incidence of AO through paid attention to procedural details and surgical skills. As AO occurs in a small group of patients, risk factors could be predictably identified and the patient could be warned to anticipate this complication.



### 2.3. ***The use of pro-inflammatory medications (Halberstein and Abrahamsohn, 2003)***

*Ascorbic acid (Vitamin C)*

Ascorbic acid (Vitamin C) is known to catalyse the production of collagen which is a major connective tissue component (Hata and Senoo, 1989; Ringford and Cheraskin, 1982). Supplemental ascorbic acid is associated with stimulation of the immune system as well as an antioxidant action that reduces infection and inflammation (Brin, 1982). It was on this premise, that Halberstein and Abrahamsohn (2003) evaluated the efficacy of ascorbic acid in the management of AO. In a sample of 696 consecutive extraction patients, 24 patients experienced AO (3.5%). These patients were given supplemental ascorbic acid, 4000mg a day, in four dosages for 5 days. They found that the symptoms

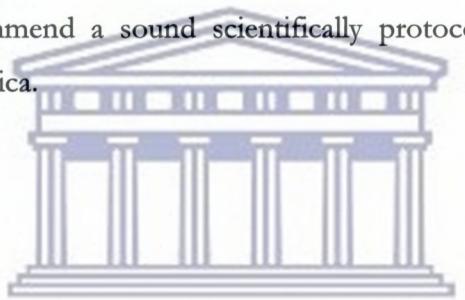
of AO completely subsided within 4 days in every case, with the majority (58.3%) experiencing complete recovery within 48 hours.

## Aim

The general dental practioner will be confronted from time to time with a patient with AO that he must manage. With the myriad of preventative and treatment protocols that have been suggested in literature, it raised the question which protocols were commonly used by GDPs in South Africa?

***Aims of the research***

- To assess whether there was a standardised treatment protocol used by general dental practitioners (GDPs) in South Africa for AO.
- To recommend a sound scientifically protocol that could be used in South Africa.



# CHAPTER 3

## Materials and Methods

The study was done through a survey via telephonic interviews based on a standard questionnaire. The participants were randomly selected from a register list obtained from the Health Professions Council of South Africa. A total of 125 GDPs were requested to participate in the survey.

All the results were captured on data capture sheet. A $\chi 2$ (chi squared) analysis was used. Where the measurements were categorical or ordinal and where applicable, non-parametric tests for the mean were used.

## Results

The total number of GDPs requested to participate in the survey was 125. The respondents were 37. The average years in practice were 16.2 (range 2-35). The total minimum years in practice were 2 and the total maximum years in practice were 35. The GDPs who responded were graduates from University of Pretoria (n=7), University of the Witwatersrand (n=7), University of the Western Cape (n=7) and University of Stellenbosch (n=13). Three were graduates from non-South African universities. There were no participants who graduated from the University of Limpopo (formerly Medical University of South Africa (Medunsa)) (Table 2).



The treatment protocol for AO commonly taught at undergraduate level was debridement of the extraction socket with the use of intra-alveolar medicament (n=32). The commonly used medicament was Alvogyl®. The remaining GDPs (n=6) said they were taught to debride the extraction socket without the use of intra-alveolar medicament (Table 3).

Table 2
Descriptive statistics of "years in practice" of the participants from the different universities and the "treatment used"

| | | Treatment Protocol Taught | | |
|---|---|---|---|---|
| **University** | **Data** | **Debridement with intra-alveolar medicament** | **Debridement without intra-alveolar medicament** | **Total** |
| Khartoum | Count | 1 | | 1 |
| | Average of Years Practice | 7.00 | | 7.00 |
| | Standard Deviation | — | | — |
| | Minimum | 7.00 | | 7.00 |
| | Maximum | 7.00 | | 7.00 |
| Kenya | Count | 1 | | 1 |
| | Average of Years Practice | 8.00 | | 8.00 |
| | Standard Deviation | — | | — |
| | Minimum | 8.00 | | 8.00 |
| | Maximum | 8.00 | | 8.00 |
| Mumbai | Count | 1 | | 1 |
| | Average of Years Practice | 31.00 | | 31.00 |
| | Standard Deviation | — | | — |
| | Minimum | 31.00 | | 31.00 |
| | Maximum | 31.00 | | 31.00 |
| Pretoria | Count | 7 | | 7 |
| | Average of Years Practice | 20.29 | | 20.29 |
| | Standard Deviation | 12.75 | | 12.75 |
| | Minimum | 3.00 | | 3.00 |
| | Maximum | 35.00 | | 35.00 |
| Stellenbosch | Count | 12 | 1 | 13 |
| | Average of Years Practice | 16.83 | 15.00 | 16.69 |
| | Standard Deviation | 11.14 | — | 10.68 |
| | Minimum | 3.00 | 15.00 | 3.00 |
| | Maximum | 31.00 | 15.00 | 31.00 |
| Western Cape | Count | 6 | 1 | 7 |
| | Average of Years Practice | 9.33 | 4.00 | 8.57 |
| | Standard Deviation | 6.50 | — | 6.27 |
| | Minimum | 2.00 | 4.00 | 2.00 |
| | Maximum | 20.00 | 4.00 | 20.00 |
| Witwatersrand | Count | 6 | 1 | 7 |
| | Average of Years Practice | 20.17 | 20.00 | 20.14 |
| | Standard Deviation | 10.09 | — | 9.21 |
| | Minimum | 8.00 | 20.00 | 8.00 |
| | Maximum | 35.00 | 20.00 | 35.00 |
| Total Count | | 34 | 3 | 37 |
| Total Average of Years Practice | | 16.68 | 13.00 | 16.38 |
| Total Standard Deviation | | 10.90 | 8.19 | 10.66 |
| Total Minimum | | 2.00 | 4.00 | 2.00 |
| Total Maximum | | 35.00 | 20.00 | 35.00 |

Table 3
Frequency table of "the treatment protocol taught" versus "treatment protocol used".

| | Treatment Protocol Taught | | |
|---|---|---|---|
| Treatment Protocol Used | Debridement with intra-alveolar medicament | Debridement without intra-alveolar medicament | Total |
| Debridement with intra-alveolar medicament. | 31 | 3 | 34 |
| Debridement without intra-alveolar Medicament | 3 | | 3 |
| Total | 34 | 3 | 37 |

In addition to the debridement of the extraction socket and the use of an intra-alveolar medicament, 21 GDPs reported that they were taught to use antibiotics and 16 respondents were taught not to use antibiotics as adjuncts (Table 4). The commonly used antibiotics reported by the GDPs were metronidazole, amoxicillin and amoxicillin with clavunalic acid. Some GDPs reported that they regarded AO to be a "form sepsis", thus their preference for combination antibiotic regime (amoxicillin/metronidazole or amoxicillin with clavunalic acid/metronidazole.)



Table 4
Frequency table of "the treatment protocol taught with antibiotics" versus "treatment protocol used antibiotics"

| | Treatment protocol taught with antibiotics | | |
|---|---|---|---|
| Treatment protocol used with antibiotics | Antibiotics | No Antibiotics | Total |
| Antibiotics | 18 | 5 | 23 |
| No Antibiotics | 3 | 11 | 14 |
| Total | 21 | 16 | 37 |

The average rate of AO associated with routine dental extractions as reported by GDPs was 2.98%. The maximum ratio of AO reported was 15%. The total number of GDPs reporting no AO was 15 out of 37 (40.5%).

With regard to their current treatment protocol for AO, 59.5% of the GDPs who were taught to treat AO with debridement of the extraction socket with the use of intra-alveolar medicament, have continued using this protocol in their practices. From the group of GDPs who were taught to use debridement of the extraction socket without the use of intra-alveolar medicament, 1 out of 3 was continuing with the same protocol as their alumni protocol.

The percentage of GDPs who were taught to use antibiotics as adjuncts and continued doing so in their practices, was 57.1%. Those GDPs (6.3%) who were taught not to use antibiotics changed their protocol to include the use of antibiotics. With regard to the use of analgesics, 76.5% of GDPs reported that they routinely use analgesics in addition to debridement of the socket with an intra-alveolar medicament (Table 5).

Table 5
Frequency table of 'the treatment protocol taught with analgesic" versus "treatment protocol used with analgesics".

| | Treatment taught. Analgesic added | | |
|---|---|---|---|
| Treatment used: Analgesic | Analgesic added | No Analgesic | Total |
| Analgesic added | 16 | 7 | 23 |
| No Analgesic | 1 | 13 | 14 |
| Total | 17 | 20 | 37 |



The majority of GDPs (n=15) have continued using the same treatment protocol as their alumni as they considered the protocol to be very effective. Two thought that the treatment protocol that they were taught at their alumni school was partially effective and 2 stated it was not effective. A number of GDPs (n=7) used their own modified treatment protocol which they thought was more effective. There were those GDPs (n=5) who have completely changed their treatment protocol from that which they were taught at their alumni school and were of the opinion that their protocol was more effective (Table 6).

Table 6

Frequency table of the "effectiveness of protocol" used by GDPs versus the "protocol taught"

| Count | Protocol Effectiveness* | | | |
|---|---|---|---|---|
| Same as Taught | 1 | 2 | 3 | Total |
| 1 Exactly the same | 15 | 3 | 2 | 20 |
| 2 Slightly different | 7 | 4 | | 11 |
| 3Moderately different | | | 1 | 1 |
| 4Completely different | 5 | | | 5 |
| Total | 27 | 7 | 3 | 37 |
| | | | | |

* 1= very effective, 2= fairly effective, 3=not very effective

Table 7

Frequency table of "effectiveness of the protocol" used by GDPs with respect to "awareness of other protocol"

| Treat Protocol Used | Debridement with intra-alveolar medicament |
|---|---|

| | Protocol Effectiveness* | | | |
|---|---|---|---|---|
| Aware of Other Protocols | 1 | 2 | 3 | Total |
| No | 20 | 6 | 3 | 29 |
| Yes | 4 | 1 | | 5 |
| Total | 24 | 7 | 3 | 34 |



| Treat Protocol Used | Debridement without intra-alveolar medicament |
|---|---|

| | Protocol Effectiveness * | | | |
|---|---|---|---|---|
| Aware of other protocols | 1 | 2 | 3 | Total |
| No | 2 | 0 | 0 | 2 |
| Yes | 1 | 0 | 0 | 1 |
| Total | 3 | | | 3 |

* 1= very effective, 2= fairly effective, 3=not very effective.

# CHAPTER 4

## Discussion

The response of GDPs was not as positive as was expected. The author expected to have more than 100 GDPs participate in the survey and have a reasonable representation of the graduates from all the Dental Schools in South Africa. Despite the small sample of GDPs, there was a fair representation in 4 of 5 the dental schools. Sufficient information was obtained regarding the AO protocols used at the time of their training at various institutions. This correlated well with the protocols requested from the different Dental Schools by the researcher. As shown in the results, the 4 dental schools use more or less the same treatment protocol namely the debridement and irrigation of the extraction socket with the use of intra-alveolar medicaments. The most commonly used intra-alveolar medicament used by the GDPs was Alvogyl®. Most GDPs used Alvogyl® mainly for its obtundent properties. When questioned about the side effects associated with Alvogyl® such as delayed healing and possibly myospherulosis (Fridrich and Olson, 1990; Bloomer, 2000), most GDPs were not aware of such complications.

The variation in the treatment protocol was mainly with regard to the type of antibiotic and the analgesic prescribed. Those GDPs, who advocated the use of antibiotics, based their decision on their conviction that AO was a form of infection. While there was literature to support the view that specific micro-organisms caused AO (Nitzan *et al*, 1978), there was still no evidence in the literature that suggested that AO is a form of "sepsis". The empirical use of antibiotics for AO should not be encouraged as it perpetuates the emergence of antimicrobial resistance and could also result in side effects such allergic reactions.

The commonly used antibiotics in the treatment of AO, as reported by the GDPs, were metronidazole, amoxicillin and amoxicillin with clavunalic acid. This was no different from what that they were taught to use at dental school (metronidazole, amoxicillin and penicillin VK). Though the literature does suggest that antibiotics could possibly prevent the onset of AO when prescribed pre- or post-operatively, there is no evidence to suggest that antibiotics (either systemic or topical use) are effective in relieving AO symptoms or promote the healing of the extraction socket. There is definitely a need for

well randomised controlled prospective studies, to analyse the effect of antibiotics in preventing AO.

It was interesting to note that most GDPs continued to use the same protocol as their alumni dental school in their own practices. Moreover, one would have thought that those GDPs who have been in practice for many years would have tried other protocols mentioned in the literature, but they were quite content to use the same protocol as they believed it worked for them. The GDPs, who were of the opinion that the protocol that they were taught at their alumni dental school was not effective, changed their protocol to one of debridement of the extraction socket without the use of intra-alveolar medicament. They were of the opinion that debridement with curettage of the extraction socket to stimulate the formation of new clot, was more effective. They were also of the opinion that this shortened the healing period of the extraction socket. This was a very valid point as it has been shown that those sockets which have been treated with intra-alveolar medicament such as Alvogyl®, took longer to heal.

The average rate of AO associated with routine extractions reported by GDPs, was higher than reported in literature. There could be two reasons for this discrepancy. Firstly, though it was a randomised sample of GDPs, there was a significant number of GDPs who worked in the public health clinics. These GDPs treat mostly extraction patients; thus are more likely to have more cases of AO than GDPs in private practice. Secondly, the one short coming of this study was that GDPs were asked to give an estimate of what they thought their incidences of AO were. This estimate could definitely have had some degree of subjectivity.

Despite the extensive literature available on AO, most GDPs were not aware of other accepted treatment protocols outside their own protocols. Interesting was the fact that the GDPs were of the opinion that their own protocol for AO was most effective. The survey did not investigate the criteria for the "effectiveness" or whether they experienced any complications associated with their treatment protocols.

# CHAPTER 5

## Conclusion and recommendations.

The study found that most GDPs use the same protocol as their alumni dental school.

The second aim of this survey was to suggest a sound scientific protocol that could be used in South Africa.

In the preamble to such a recommendation, the following aspects noted in the scientific literature should be highlighted:

- That AO is a clinical entity that is brought about by the local fibrinolytic process which overwhelms the formation of blood clot in the extraction socket. Thus there is failure of the extraction socket to heal.
- That AO has a multifactorial aetiology or risk factors associated with it. Thus by possibly eliminating as many as possible risk factors, there is a likelihood that the onset of AO can be prevented. As mentioned in the literature review, these are patient as well as surgical factors. Often the GDP does not have much control over the patient factors such as smoking and patient's oral hygiene or pre-existing infection. The use of pre-operative antiseptic mouthwashes is encouraged to reduce the oral bacterial count. The GDP should at all times use atraumatic extraction technique thus reduce the post-extraction inflammatory reaction and thus not overwhelm the healing process. The removal of any bone spicules should be done all times as these are a potential nidus for infection.
- The use of intra-alveolar medicaments is anecdotal and unfortunately this practise has been carried from one generation to next. According to Alexander (2000), the pharmacologic effects and benefits of the intra-alveolar medicaments are poorly understood and the products are used as they were empirically proposed in the past and recommended throughout the years. As mentioned in the literature there are no controlled blind studies to evaluate the efficacy of one medicament over the other.
- There is no evidence to support the use of antibiotics in the treatment of AO.
- There are many studies in the literature that suggest that a drug (s) is better than the placebo but only a few have compared it with the placement no drug in the extraction socket (Alexander, 2000).

- ❖ With the broad selection of empiric formulations available for the prevention and treatment of AO and the varying data on this matter, it is suggested that no single drug or drug combination is universally successful.
- ❖ PRP (platelet-rich plasma) prophylaxis in AO shows promising results.

***The following protocol is suggested:***

**Prophylactic Management of AO**

- ❖ Improve the oral hygiene status of all patients and especially in patients who are going to have elective procedures e.g. surgical removal of third molars. In cases of emergency procedures, patients should be encouraged to rinse pre-operatively with an antiseptic solution such as 0.2% chlorhexidine gluconate.
- ❖ Atraumatic extraction of teeth should be employed. In the surgical removal of teeth, a good surgical technique/protocol should be followed.
- ❖ Where available, the application of a bio-adhesive chlorhexidine gel should be encouraged.

**Symptomatic Management of AO**

- ❖ Local anaesthetic (with or without a vasoconstrictor)
- ❖ Irrigation of the extraction socket to remove the debris from the socket. Normal saline or 0.2% chlorhexidine is recommended.
- ❖ Curettage of the extraction socket to remove any residual debris on the bone and to stimulate fresh bleeding. Sutures can be placed if deemed necessary.
- ❖ Observe the patient for 10min while pressure is applied to secure the formation of a blood clot.
- ❖ No placement of intra-alveolar medicament or systemic antibiotics.
- ❖ Analgesics for pain.
- ❖ Follow up the patient after 24 hours.

**"The Art of Doing Nothing"**

**"..knowing what not to do and when not to do, it is an art we all have to learn..."**

**Laskin (1985)**

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# ETHICAL STATEMENT

- The above research was carried out according to the standards set out by the Ethics and Research Committee of the University of the Western Cape.
- The telephonic interviews were conducted on a voluntary basis.
- The participation by the general dental practitioner remained anonymous at all times and there was no mention of the names of those involved.
- The information acquired through this research project is available for peer review.

# Questionnare to Study: Alveolar Osteitis (Dry Socket)

**1** Are you a general dental practioner? ☐

**2** How long have you been in practice? ☐

**3** Which dental institution did you qualify from?

| | |
|---|---|
| University of Pretoria | Medunsa |
| University of Stellenbosch | University of Witwatersrand |
| University of the Western Cape | Other |

**4** What was the treatment protocol for AO used at your training institution?

Debridement with irrigation. No intra-alveolar medicament

Debridement with irrigation.With intra-alveolar medicament

Antibiotic of choice _____ Prescribed analgesics _____

No intervention

Other _____

**5** How many extractions have you done in the past month? ☐☐☐☐

**6** How many of those extractions ended as a AO in the past month? ☐☐☐

**7** What is the current treatment modality for AO in your practice?

Debridement with irrigation. No intra-alveolar medicament

Debridement with irrigation.With intra-alveolar medicament

Antibiotic of choice _____ Prescribed analgesics _____

No intervention

Other _____

**8** Is it the same treatment protocol that you were taught at undergraduate level?

| | | | |
|---|---|---|---|
| exactly the same (1) | 2 | 3 | completely different (4) |

**9** In your opinion, do you find your protocol effective?

| | | | |
|---|---|---|---|
| very effective (1) | 2 | 3 | not effective (4) |

**10** Are you aware of any other treatment modalities currently available for treatment of AO?

No Yes

If yes, state the modality _____

_____