

# Which is Responsible for Pain Relieve in Alveolar Osteitis Patients: Saline or Zinc Oxide Eugenol?

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## Abstract

**Background and objective:** Alveolar osteitis is the most common post-odontectomy complication. Despite saline irrigation followed by Zinc oxide eugenol packing is a recommended treatment method, the literature (up to the best of my knowledge) is deprived of any study to determine if the effect was due to saline or ZOE. The aim of the current study therefore was to evaluate the effect of both agents.

**Materials and methods** A total of 2029 patients were categorized into 4 groups (I, II, III, and IV) according to pain severity (mild, moderate, severe, or agonizing, respectively). Each group was randomly divided into four subgroups according treatment method used: saline cotton pellet (SP), irrigation (Irr), zinc oxide eugenol (ZOE), irrigation and ZOE (I+Z).

**Results:** SP was ineffective for all groups. I (Saline irrigation) depicted better results than that of ZOE. Whereas I and I+Z were palliative in group II (however I+Z was more potent), I+Z was curative in group I. All agents were ineffective in group III and IV.

**Conclusion:** Despite the effect of I+Z might be due to synergistic effect of both agents, saline seemed be more important than ZOE.

**Keywords:** Saline; Zinc oxide; Alveolar; Osteitis

## Introduction

Alveolar osteitis (AO) is the most common complication following dental extraction [1]. Even on considering pain as the most important characteristic for OA according to Fazakerlev and Field [2], a variety of treatment methods have been attempted to treat or alleviate pain resulted in much more controversies [3-5]. Several authors considered the application of Zinc oxide eugenol (ZOE) pack to extraction socket after being irrigated with normal saline as a well-accepted treatment modality [3,5-7].

However, and up to the best of my knowledge, the literature is deprived of any study to investigate if the recorded palliative effect of ZOE was mainly due to ZOE itself or due to the effect of saline irrigation process associated with the use of ZOE.

The aim of the current study was to evaluate the efficacy of both agents in a large scale population of patients utilizing definitive parameters in diagnosis and outcome assessment.

## Materials and Methods

Patients suffering of pain following dental extraction in Hosh Isa district within the period from 2004 to 2008 have been examined.

Patients diagnosed as having Alveolar osteitis (AO) "dry socket" fulfilling the inclusion criteria have been divided into four groups according to pain severity determined in Table 1.

Groups	Severity	Description
I	Mild	Patients had annoying pain during most waking hours) but did not need analgesics.
II	Moderate	Patients had pain that required and was relieved by analgesics.
III	Severe	Patients had pain that was not relieved by analgesics but that did not interfere with normal daily activities (e.g., patients did not have to leave work and did not awaken during sleep).
IV	Agonizing	Patients had pain that was not relieved by analgesics and that interfered with normal daily activities (e.g., the pain caused the patients to leave work or to awaken during the night).

**Table 1:** Pain severity levels used to assign patients to groups.

Patients of every group were then randomly divided into four subgroups termed after the treatment modality applied for each subgroup. All patients have undergone brief saline irrigation of the socket with 2 ml normal saline (0.9% solution) to remove any debris. For the first subgroup, a cotton pellet soaked in normal 0.9% saline (SP) was lightly packed into ES. Irrigating ES with 15 mL warm normal 0.9% saline was the treatment method followed for the second subgroup. However, ES was lightly packed with a cotton pellet impregnated with freshly prepared Zinc Oxide Eugenol (Alamia gp, Cairo, Egypt) paste (ZOE) for the third subgroup. For the fourth subgroup, (I+Z) refers to the treatment method of lightly packing ES

with a cotton pellet impregnated with freshly prepared Zinc Oxide Eugenol (Alamia gp, Cairo, Egypt) paste after Irrigating it with 15mL warm normal 0.9% saline. If any packing necessitated more than one day of application, it was daily replaced.

This study followed the Declaration of Helsinki on medical protocol and ethics and the regional Ethical Review Board of HIMC approved the study.

**Inclusion criteria**

- Patients suffering pain following simple dental extraction (forceps extraction) and diagnosed as having AO (dry socket) within the age range from 25 to 55 years.
- Patients who were devoid any exclusion criteria.

**Exclusion criteria**

- Patients with signs or symptoms of infected socket.
- Patients having systemic or local conditions hindering or affecting healing.
- Patients having any bleeding tendency disorders.
- Female patients had their teeth extracted during peri-menstruation period.
- Pregnant and lactating females or those on contraceptive pills or any other contraceptive containing medications.
- Patients with hormonal disturbances.
- Smoker patients.

Effect of the treatment modality applied was evaluated according definitive criteria as depicted in Table 2.

Designation	Criteria
Curative	Treatment was followed by disappearance of pain without other medication (or pain became too slight to be annoying or to lead the patient to seek medical or dental intervention).
Palliative	Treatment was followed by decreased pain severity but pain remained at least annoying, or treatment was followed by a decrease in the dose of analgesics taken, or both.
Ineffective	Treatment was not followed by noticeable diminution in pain severity (and pain remained at least annoying), or the treatment had a palliative effect that was not maintained to the end of a 5-minute visit.

**Table 2:** Parameters for assessing treatment effectiveness.

The total time period needed for the treatment to lead the patient not to seek medical or dental intervention was registered for each group in order to assess potency of each method. The agent was considered potent if that period was within two days, average if it was more than two days but lesser than four days and weak if it was five days or more. Since the average range for total healing period was recorded to be from seven to ten days [8], an agent was assigned as weak if time period exceeded four days. That agent that was capable of achieving the curative effect within one day; carrying the meaning that as little as once application; was considered very potent and "definitive".

**Results**

The numbers of patients in groups I, II, III, and IV were 867, 691, 391, and 80, respectively. The effectiveness of each treatment modality in each group is shown in Table 3.

Group	Treatment modality**				
	Effect*	SP	Irr	ZOE	I+Z
I	C	0	99	80	200
	P	8	115	121	16
	In	208	3	16	1
II	C	0	2	0	2
	P	1	108	80	120
	In	172	63	93	50
III	C	0	0	0	1
	P	0	2	2	53
	In	98	95	96	44
IV	C	0	0	0	0
	P	0	1	0	4
	In	20	19	20	16

\*Effect C=curative, P=palliative, In=ineffective

\*\*SP=saline pellet, Irr=saline irrigation, ZOE=zinc oxide eugenol, I+Z=saline irrigation+ zinc oxide eugenol

**Table 3:** Number of patients in each treatment subgroup with each level of effect.

Table 4 shows the analysis of those data depicted in Table 3. The palliative, ineffective, palliative/ineffective (when the difference in-between was statistically insignificant) and curative/palliative (when the difference in-between was statistically insignificant) results could be collectively termed as noncurative.

Group	Treatment modality*			
	SP	Irr	ZOE	I+Z
I	In	C/P	P	C
	(<0.001)	-0.3051	0.0046	(<0.001)
II	In	P	P/In	P
	(<0.001)	(<0.001)	0.3616	(<0.001)
III	In	In	In	P/In
	(<0.001)	(<0.001)	(<0.001)	-0.42
IV	In	In	In	In
	(<0.001)	(<0.001)	(<0.001)	-0.01

\*Effect C=curative, NC=non-curative, C/NC=curative or non-curative, P=palliative, In=ineffective, C/P=curative or palliative, P/In=palliative or ineffective.

SP=saline pellet, Irr=saline irrigation, ZOE=zinc oxide eugenol, I+Z=saline irrigation+ zinc oxide eugenol.

P values of Fisher's exact test are shown in brackets.

**Table 4:** Effect of each treatment modality in each group.

The saline cotton pellet immediately relieved pain in group I patients, but the effect was not maintained to the end of the visit, so the treatment was recorded as ineffective. Furthermore, treatment with saline cotton pellet was considered ineffective in all groups.

Whereas saline irrigation (Irr) results in group I oscillated between being curative and palliative (however, the difference was

insignificant), it was palliative in group II and ineffective in more severe pain groups; namely group III and IV.

While ZOE was palliative in group I patients, it failed to depict any positive effect in any other group.

Despite the only curative result was registered for I+Z in group I patients, it was considered as a palliative treatment method in group II. I+Z failed to show any positive results in more severe pain groups.

Although I+Z tended to be of moderate potency either as a curative or a palliative, Irr worked as a low potency palliative. No agent was recorded as definitive therapy.

Tables 5-7 show the potency of the agents.

	1 day	2 days	3 days	4 days	5 days	Median	Potency
I+Z	3	3	76	50	42	4	Moderate
I+Z= I+Z=saline irrigation+ zinc oxide eugenol							

**Table 5:** Potency of curative agents in group I expressed as a total number of days needed not to seek dental intervention.

	1 day	2 days	3 days	4 days	5 days	6 days	Median	Potency *
Irr	0	0	0	2	35	71	6	Low
I+Z	0	0	30	58	28	4	4	Moderate
*Test of difference using Mann Whitney U test was Extremely significant; (U=894, z=-11.2, P<0.01); Irr=saline irrigation, I+Z=saline irrigation+ zinc oxide eugenol								

**Table 6:** Potency of palliative agents in group II expressed as a total number of days needed not to seek dental intervention.

Group	Agent	1 day (once)	>1 day	P value of Fisher's exact test	Decision
I	I+Z	3	171	<0.001	not definitive
Irr=saline irrigation					

**Table 7:** Determination of which curative agent is a definitive therapy in all groups (if only one day is needed not to seek dental intervention).

## Discussion

Since AO is by far the most common complication of odontectomy [1], a plethora of treatment protocols have been suggested to prevent and to treat this condition. However, results are quite controversial [3-5]. Faizel et al. stated that until their study published in 2014 there were no comparative studies for two or more agents for this condition [3]. The application of Zinc oxide eugenol (ZOE) pack to extraction socket after being irrigated with normal saline (I+Z) is a well-known treatment modality [3,5-7]; furthermore, it is the treatment method recommended by several authors [5-7]. However, and up to the best of my knowledge, the literature is deprived of any study to investigate if the recorded palliative effect of ZOE, and more specifically I+Z as referred to as in the current article, was mainly due to ZOE itself or due to the effect of saline irrigation process associated with the use of ZOE. Therefore, the author conducted the current large prospective study to evaluate the efficacy of both agents.

In order to study as homogenous group of patients as possible, the study population was restricted to otherwise healthy patients who underwent simple (forceps) extraction and did not have any known conditions affecting their healing capacities, since AO seems to reflect

an interference with the healing process, resulting in blood clot loss [9]. The inclusion and exclusion criteria were determined accordingly.

To my knowledge, no published studies of AO treatment have classified patients according to pain severity or analyzed the outcome according to definitive assessment criteria. However, in the current study, patients were categorized into 4 major groups according to pain severity. The severity rating was not based on the patient's description (for example, use of words like "mild" or "severe") or on the patient's estimation on a visual pain analogue scale; rather, it relied on behavioral measures: the need for analgesics and whether the condition interfered with daily life. On assessing the outcome of treatment methods in the current study, only three possibilities, all well-defined, were considered. These features, in addition to the size of the population, appear unique to the current study.

In the current research, the immediate unmaintainable palliative effect of SP in group I patients might raise a note of some effect of saline. However, that did not affect the results.

Comparing the effects of SP and Irr, we might speculate that saline has an osmolar effect that was rapidly neutralized in the case of SP but maintained longer by irrigating.

Although ZOE was palliative in group I patients, that palliative effect was lost in more difficult cases (those cases of group II, III and IV).

Surprisingly, and with regard to Tables 4 and 6, Irr depicted better results than ZOE in group I and II. Whereas I+Z was curative in group I, both Irr and I+Z showed comparative results in group II since both were palliative; however, I+Z was more potent. These findings suggest that saline irrigation and ZOE might be synergistic with the main effect seems to be attributed more to saline irrigation.

If pain was considered as a sequela of bare bone layer in the ES, it might be the result of the noxious substances in that bare bone layer. Thus, the palliative effect of ZOE might issue from being an obtundent material reduces sensitivity of the free nerve endings. However, the palliative effect of saline might accordingly be attributed to raising the saline content of the outermost layer of ES, and hence raising osmolarity at that side of ES which could ultimately lead to "recruiting" more blood through the ES wall. Enhanced circulation through the ES wall might have some role in eliminating the noxious stimuli and in providing nourishment and Oxygen to that layer.

These deductions could give reason for the potential synergetic effect of saline irrigation and ZOE where one agent depends on reperfusion and the other depends on acting on nerve responsiveness. Taking into account the results of the current study, saline osmolarity might be more important than the soothing effect of ZOE.

In spite of the notice that the results of current study advocate I+Z as one treatment modality for AO as did other studies [5-7], this recommendation is not absolute. As according to the identifiers considered in defining the severity and in assessing the outcome in the current study, I+Z failed to achieve any positive results in group III or group IV. Heterogeneity of AO population discovered due to the unique structure of the current study, and that perhaps has been overlooked in other studies, has aided in that deduction.

## Conclusion

Treatment of alveolar osteitis is associated with a great deal of debate. Despite various agents that have been proposed for the condition, there has been no generally agreed on treatment of choice. Although I+Z is one of these recommended medications, the literature

(up to the best of my knowledge) is deprived of any study to determine if the effect was due to saline or ZOE. In the light of the current study, saline might be more important than ZOE.

## Conflict of Interest

The author declares no conflict of interest.

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