

The Effects of Using Hyaluronic Acid on the Extraction Sockets

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Received date: 19 October 2015; Accepted date: 28 Nov 2015; Published date: 5 Dec 2015.

Citation: Bayoumi AM, Jan A, Amoudi WA and Shakir M (2015) The Effects of Using Hyaluronic Acid on the Extraction Sockets. Int J Dent Oral Health 2(1): doi <http://dx.doi.org/10.16966/2378-7090.157>

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Abstract

Aims: The aim of this study is to evaluate the effectiveness of using Hyaluronic Acid (HA) clinically in extraction sockets related to the incidence of dry socket and the severity of post extraction pain.

Methods: This randomized clinical trial included 98 extraction sockets. Combination of HA with Gelfoam scaffolds were applied to (28) sockets. Gelfoam scaffolds without HA were placed in another (21) sockets. No intervention was done for the remaining (49) sockets. The occurrence of dry socket and patients' pain levels (VAS) were assessed at the first, second and seventh postoperative days.

Results: Pain score was highest on the operation day according to VAS scores and decreased gradually in all groups on the 2nd and 7th postoperative days. There were no statistically significant differences in VAS scores between the three groups on the three postoperative days. A total of 5 patients had dry socket (5.1%). Also, there was no statistically significant difference in terms of dry socket formation ($P = 0.891$) between the extraction sites of the three groups during the three postoperative days.

Conclusions: The results showed that HA administration did not decrease either the incidence of dry socket formation nor postoperative pain.

Introduction

Dental extraction can affect quality of patient daily life because it is usually followed by pain, which may continue for several days after the procedure [1]. There are also many other post extraction sequelae. Dry socket [2] - also known as alveolar or fibrinolyticosteitis- [1] is a self-limited complication associated with 0.5% to 5% of routine extractions. Crawford was the first who described "dry socket" in 1896 [3]. It is reported to occur more often after extraction of mandibular molars especially impacted thirdmolar [4]. It is an acute inflammation of the alveolar bone of the extracted tooth [5].

It results from partial or complete [4] degradation of blood clot making a denuded socket [5] with severe pain starting from the first to the third postsurgical days, which does not respond to analgesics [1]. The pain usually radiates to the ear, temple and neck [4]. Headache, insomnia and dizziness may be seen [6]. Some patients may also suffer from bad odor as a result of impaction of food debris in the empty socket [1].

Dry socket can be a burden for both patient and dentist because treatment of such extremely painful condition often requires several lengthy visits. It also results in loss of a patient's productivity, and working days, which might affect patient's health and finance. Thus, it is helpful to find an easy applicable way to reduce the pain and prevent occurrence of dry socket.

Different measures have been proposed for prevention or reduction of postoperative inflammation and symptoms. These include systemic Analgesics [7], Corticosteroids [2], systemic antibiotics such as (penicillin, clindamycin, erythromycin and metronidazole), topical Antibiotics as (topical tetracycline), irrigation with different agents such as 0.12% chlorhexidine rinse, or applying materials as intra-alveolar or over-the-

wound treatment as Para-Hydroxybenzoic Acid and Tranexamic Acid (an anti fibrinolytic agent), Polylactic Acid (a clot supporting agent), Eugenol Containing Dressing and Lavage [2]. Although the results have been debated.

Hyaluronan or hyaluronic acid (HA) is a biomaterial that has been introduced as an alternative approach to enhance wound healing [2]. It is one of the largest extra cellular matrix components, which consists of a basic unit of two sugar, glucuronic acid and N-acetyl-glucosamine [8]. It can be found in many tissues [2] with its highest concentrations in soft connective tissues including the synovial fluid in human and all tissue and body fluids of vertebrates. The Association of hyaluronic acid with a collagen scaffold may improve bone healing in critical-size bone defects [9]. In addition, it has been reported to play critical roles in wound healing by inducing early granulation tissue formation, inhibiting the destructive inflammation during the healing phase, and promoting re-epithelialization and also angiogenesis [2]. Thus, HA has been used to prevent or reduce postoperative inflammation and associated symptoms. Its non-immunogenicity and non-toxicity effects make it a safe material to be used in many medical fields, such as ophthalmology, dermatology, and rheumatology. HA is available in gel or liquid forms to be applied topically in the oral cavity [2].

In addition to the previous proposed measure to reduce and prevent the occurrence of dry socket, knowledge of the dry socket risk factors might help the clinician to decrease the incident of dry socket by identifying high-risk patients, discussing relevant risk factors with such patients and making reliable treatment plan for them [10]. These risk factors might include nicotine smoking habit, alcohol drinking, presence of periodontal problems, poor oral hygiene, extraction site, advanced age, female gender, taking oral contraceptives [7], difficulty of the extraction [5], excessive curettage of the extraction socket [6].

The aim of this study is to evaluate the effectiveness of using Hyaluronic Acid (HA) clinically in extraction sockets related to the incidence of dry socket and the severity of post extraction pain.

Methodology

Study design

Randomized clinical trial: Selected sample were selected from surgery session in King Abdulaziz University Dental Hospital from January 2015 to March 2015.

The study sample composed of 108 patients between the ages of 18-60 who were having permanent teeth extraction. They were all physically healthy with no underlying systemic diseases, history of allergy, or bleeding problems.

Patients who meet the above criteria were randomized to the following three groups: the patient was given after operation either:

1. Hyaluronic acid with Gelfoam scaffold after extraction (28 sockets)
2. Only Gelfoam scaffold after extraction (23 sockets)
3. No intervention (57 sockets)

Undergraduate dental students at King Abdulaziz University dental hospital in Jeddah performed all of the extractions.

Surgical protocol

All extractions were performed under local anesthesia, 4% Articaine, with epinephrine 1:100,000. The extraction sockets were randomly filled by Gelfoam scaffold "with or without Hyaluronic acid" or left empty without intervention (Figures 1 and 2).

The treatment with Hyaluronic acid was accomplished by using 0.3 ml of non-cross-linked Hyaluronic acid (Hyadent[®]) (Figure 3) in Gelfoam

and applying this to the socket (Figure 4) Gelfoam was held in place by figure of eight suture with 4.0 resorbable suture materials. A piece of folded gauze was applied to the wound to aid hemostasis.

Evaluation of surgical difficulty

Surgical difficulty was rated on a 3-class scale: I, simple extraction requiring forceps only; II, extraction requiring Tooth sectioning; III, extraction requiring tooth sectioning and osteotomy.

Clinical evaluation

severity of postsurgical pain assessed using a 10-point visual analogue scale (VAS), that the patient completed at home 24 hours, 48 hour and 7 days after extraction (at approximately the same time of day as the operation). In the VAS, the leftmost end represented no pain '0'. The rightmost end represents severe / worst pain '10'.



Figure 2: Post-extraction sockets after application of Gel foam



Figure 1a: Pre extraction of 14 and 24.



Figure 3: Non-cross-linked Hyaluronic Acid



Figure 1b: Extraction sockets immediately post-extraction after application of Hyaluronic acid with Gel foam.

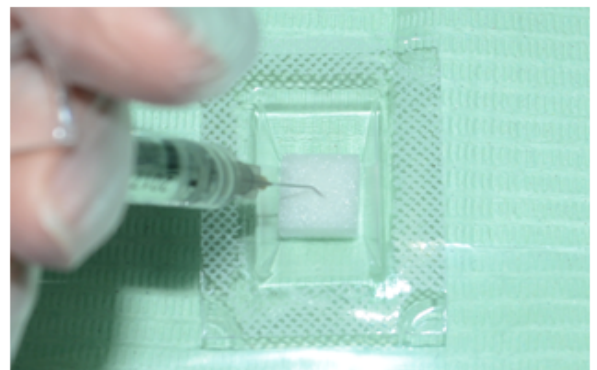


Figure 4: Application of 0.3 ml HA in the Gelfoam.

Study variables

In present study, predictor variable was the application of Hyaluronic acid with Gel foam or Gel foam only in the extraction socket. Outcome variable was the frequency of Dry socket and post-operative pain.

Diagnosis was determined by the clinical symptoms. Criteria for diagnosing dry socket were progressive and severe pain during the first postoperative week, foul taste, or halitosis.

Moreover, data regarding demographic variables (age, gender), preoperative variables (type of extracted tooth and difficulty of the extraction) were collected.

Ethical consideration

The research ethics committee of the faculty of dentistry, King Abdulaziz University approved the research under the proposal No. 035-14 and accordingly informed consents were obtained from participants. Full information about research including reasons they have been chosen to participate was given to the participants. Participants' privacy, confidentiality and anonymity were guaranteed.

Results

Ten of the initially enrolled 108 patients were excluded from the study: Eight cases did not answer for the post extractions follow up and two others turned into surgical extraction. So 98 patients (40 males, 58 females; mean age 36.02 ± 14.02 years) completed the present study (Figure 5).

Most of the extractions done were simple extraction (61.1%) (Figure 6).

With regard to VAS scores, pain was highest on operation day and decreased gradually in all groups on postoperative 2nd and 7th days. There were no statistically significant differences in VAS scores between the three groups on the day of the operation or on 2nd or 7th postoperative days (Table 1).

Intensity of the pain during 1st, 2nd and 7th days were comparable with respect to the difficulty of extraction. Although the difficulty of extraction and intensity of pain were insignificantly associated in the 2nd and 7th day (P value > 0.05), the severity of pain was significantly increased as the difficulty of extraction increased on the 1st postoperative day ($P = .017$).

According to VAS, Most of the simple extractions (34.5%) have Troublesome Pain ranging from [3-4]. In contrast, difficult cases (30.8%) have more Intense Pain [7,8] (Table 2).

A total of 5 patients had dry socket (5.1%) in compared to 93 with no dry socket. Incidence of dry sockets was higher in the female patients than males (80.0%) but with no significant relationship, $P > 0.05$, 0.331, and most of the patients (60.0%) were in the fourth decade ($P = 0.109$).

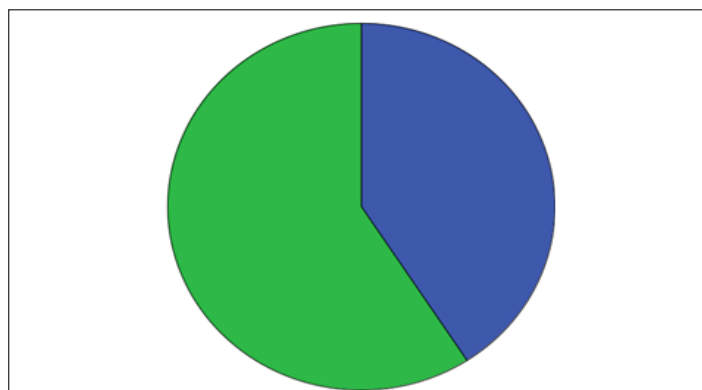


Figure 5: Comparison between male and female number (40 male and 58 female)

Dry socket occurred in 3/49 empty sockets (60.0%), in 1/21 sockets filled with the Gel foam (20%) and in 1/28 sockets treated with the Hyaluronic acid with Gel foam (20%) (Figure 7). There was no statistically significant difference between the sites ($P > 0.05$).

Discussion

The present study was conducted to evaluate the efficacy of HA on the control of post-surgical pain and dry socket following closed tooth extraction. This study showed similar result to M. Koray et al. study which aim to evaluate the efficacy of hyaluronic acid spray on swelling, pain and trismus after surgical extraction of impacted mandibular third molar regarding postoperative pain in which there were no statistically significant differences in VAS scores between the different treatments modalities on the 1st, 2nd and 7th postoperative days [2].

There are studies reporting that difficulty of the extraction can affect the postoperative pain [2,11]. In this study, HA-treated sockets had large number of difficult cases in compared to control groups, which explain the higher pain level in the patient who treated with HA on the 1st day.

Following routine extraction, Dry socket may occur in 0.5% to 5% of patients [12]. This finding was consistent with those reported in the study. The topical application of Gel foam with or without HA is considered to reduce this incidence.

Many studies confirmed that traumatic or difficult extractions could increase the frequency of Dry Sockets [7]. In this study, Dry Socket increased as the difficulty of extraction increased. This explains why Dry Socket occurred more frequently on molar teeth where the possibility of dry socket is more common due to more difficult extractions.

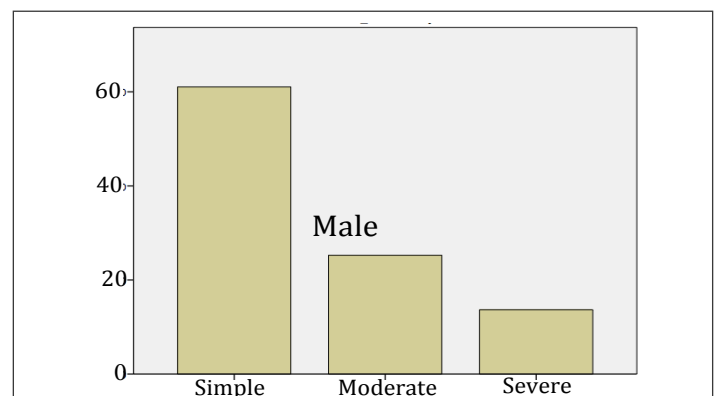


Figure 6: Severity of extractions among all groups

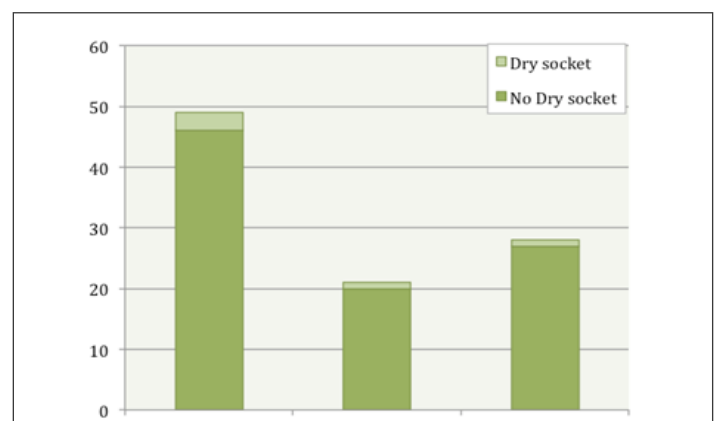


Figure 7: Incidence of dry sockets among all groups.

Day	Procedure	Intensity of pain						Total	Chi-Square Value	P Value
		No pain (0)	Mild pain (1-2)	Troublesome Pain (3-4)	Distressing Pain (5-6)	Intense Pain (7-8)	Worst Pain (9-10)			
1 st Day	Empty Socket	8 (16.3%)	3 (6.1%)	19 (38.8%)	12 (24.5%)	3 (6.1%)	4 (8.2%)	49	16.229 ^a	0.093
	Gel Foam	1 (4.8%)	8 (38.1%)	6 (28.6%)	5 (23.8%)	1 (4.8%)	0 (0.0%)	21		
	GF + HA	4 (14.3%)	5 (17.9%)	5 (17.9%)	9 (32.1%)	3 (10.7%)	2 (7.1%)	28		
2 nd Day	Empty Socket	20 (40.8%)	14 (28.6%)	8 (16.3%)	2 (4.1%)	3 (6.1%)	2 (4.1%)	49	7.566 ^a	0.671
	Gel Foam	9 (42.9%)	6 (28.6%)	5 (23.8%)	0 (0.0%)	1 (4.8%)	0 (0.0%)	21		
	GF + HA	12 (42.9%)	5 (17.9%)	7 (25.0%)	0 (0.0%)	4 (14.3%)	0 (0.0%)	28		
7 th Day	Empty Socket	42 (85.7%)	4 (8.2%)	1 (2.0%)	0 (0.0%)	0 (0.0%)	2 (4.1%)	49	5.407 ^a	0.493
	Gel Foam	21 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	21		
	GF + HA	88 (89.8%)	7 (7.1%)	1 (1.0%)	0 (0.0%)	0 (0.0%)	2 (2.0%)	28		

Table 1: Pain level among all groups in the 1st, 2nd and 7th postoperative day

Extraction difficulty	Intensity of pain in the 1 st day						Total
	No pain (0)	Mild pain (1-2)	Troublesome Pain (3-4)	Distressing Pain (5-6)	Intense Pain (7-8)	Worst Pain (9-10)	
Simple	7 (12.1%)	10 (17.2%)	20 (34.5%)	19 (32.8%)	1 (1.7%)	1 (1.7%)	58 (100.0%)
Moderate	3 (12.5%)	5 (20.8%)	6 (25.0%)	5 (20.8%)	2 (8.3%)	3 (12.5%)	24 (100.0%)
Difficult	3 (23.1%)	1 (7.7%)	3 (23.1%)	1 (7.7%)	4 (30.8%)	1 (7.7%)	13 (100.0%)
Chi-Square Value= 21.642^a P Value= .017							

Table 2: Intensity of pain level with respect to the difficulty of extraction

Main drawback of this study

1. Follow up depended on phone calls and the diagnosis was determined by the clinical symptoms. As reported in some studies, alveolar osteitis does not generally show symptoms. Therefore, possibilities of missed cases with dry socket may occur.
2. Small sample size.
3. It is preferred to examine the different treatments on the same patient to eliminate the pain threshold differences among patients.

Conclusions

The results showed that HA administration did not decrease either the incidence of dry socket formation nor postoperative pain. Therefore, it may be valuable to re-evaluate the effect of HA on larger sample clinical study in the same patient mouth. Nevertheless, none of the tested agents had a negative effect on the patient when applied on the socket.

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