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Assessment the Effect of 1% Hyaluronic Acid and 0.2% chlorhexidine on the Healing of Soft Tissue after Tooth Extraction (Clinical Comparative Study)

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Abstract

Background: The most frequent procedure a dentist performs is dental extraction, which involves removing the diseased tooth without harming the surrounding tissue to promote the best possible healing.

Aims: The goal of the current study was to estimate the impact of local application of hyaluronic acid gel treatment on soft tissue healing following mandibular molar extraction.

Patients and Methods: This study was conducted in the Department of Oral and Maxillofacial Surgery at the University of Tikrit's Faculty of Dentistry; the trial was conducted from February to May 2023. The research included a total of 30 healthy patients with asymptomatic teeth at the time of extraction (nineteen male and eleven female) between the ages of 18 and 35 were included in the study. Patients were split into two groups at random; Group one received an extraction site treatment of Perio KIN Hyaluronic 1%® gel (1% hyaluronic acid and 0.2% chlorhexidine) while Group two (control group) received no treatment. A numerical periodontal probe was used to grade the patients at the first and seventh postoperative days.

Results: Buccolingual width were maximum on the first postoperative day and then progressively declined in the seventh postoperative day for both the Control and hyaluronic acid groups. On the seven postoperative days, the buccolingual widths of the Control and hyaluronic acid groups differed significant statistically.

Conclusions: The study's findings demonstrated that hyaluronic acid accelerated soft tissue healing subsequent tooth extraction.

Introduction:

Dental extractions are among the most common treatment procedures that dentists conduct. The patient's health, medical history, lifestyle, and systemic and local factors might all contribute to multifactorial extraction complications. Problems like pain, discomfort, incapacity to function, and delayed socket healing might arise after routine dental extractions (1). Alveolar osteitis is a well-known side effect that occurs following tooth extraction or surgery. The disease commonly referred to as "dry socket" continues to be a prevalent postoperative issue that causes excruciating pain and frequent practice/hospital visits (2). Alveolar osteitis (Dry Socket) happens when there is insufficient tissue covering the socket or when the original blood clot is lost, leaving the bone exposed. Applying medicinal dressings to encourage healing and irrigating the socket with saline or chlorhexidine gluconate to remove debris are two aspects of management (3). In order to determine when healing has been compromised, the physician should be aware of how a typical healing socket looks. After an extraction, there is a notable alteration in both histology and clinical appearance. Between the healing stages, there are distinct phases that can be seen both histologically and clinically (4).

Reducing patient discomfort during the postoperative phase following tooth extraction is the primary goal of a successful procedure. Unpleasant symptoms like pain, swelling, trismus, fever, and dry socket can make it difficult for patients to chew, speak, practice good oral hygiene, and change other aspects of daily life (5).It is important to remember that the speed of healing is variable between individuals with significant factors impairing the speed regeneration such as older age, compromised medical status such as diabetes, anemia, also type of extraction whether normal or surgical extraction when a tooth cannot be extracted using forceps or elevators typically because of impaction, misalignment, or both (6).

One of the main ingredients of the extracellular matrix, which is found in many tissues, including skin, cartilage, tendons, eyes, synovial fluid, and the majority of bodily fluids, is hyaluronic acid. Hyaluronic acid has been investigated in recent decades as a potent biocompatible substance for tissue engineering procedures such as morphogenesis and tissue repair (7).By promoting re-epithelialization and angiogenesis, preventing damaging inflammation, and promoting early granulation tissue formation, hyaluronic acid has been shown to play a major role in improving wound healing, and helps to lessen inflammation and swelling following surgery also promoting the migration, adhesion, and proliferation of undifferentiated mesenchymal cells into osteoblastic cells, It has an important effect on bone healing (8).

Applications of hyaluronic acid in dentistry are still little understood, despite the fact that it has been widely employed as an alternative treatment for numerous conditions in various medical specialties. While chlorhexidine binds the cells in the wound area greatly accelerated wound healing level (9), the purpose of this study was to assess the therapeutic effects of hyaluronic acid on extracted sockets.

Patients and Methods

This was randomized controlled trial; each patient's unique information was entered onto a case sheet created especially for this study while acquiring written approval from the patients. A total of thirty medically healthy patients, aged between 18 and 35 years, were assigned at random. Of these, nineteen were male and eleven were female. This study was conducted in the Department of Oral and Maxillofacial Surgery at the University of Tikrit's Faculty of Dentistry, the trial was conducted from February to May 2023. Clinical examinations and conventional intraoral periapical radiographs were used to diagnose the tooth.

Among the inclusion criteria were:

1.At the time of surgery, the selected teeth were asymptomatic and free of tissue infection and inflammation.

2. Medically fit patients, free of allergies, and not taking any drugs that might conflict with the research medications.

Exclusion criteria included:

1. History of allergic reactions, impaired health, or hypersensitivity to the drugs used during the procedure.
2. Female patients who are nursing or pregnant.
3. Patients who refused to participate in the study were unable to attend follow-up appointments, or utilize other medicines during the study period.

Patients were randomized to one of the two therapy groups. Fifteen patients were assigned to 1% hyaluronic acid with 0.2% chlorhexidine gel treatment material as seen in figure one allocated into group I, the other fifteen patients without hyaluronic acid therapy were part of Group II. Local anesthesia was obtained by injecting 1.8 ml of 2% lidocaine with 1:80,000 adrenaline into the lingual, long buccal, and inferior alveolar nerves. The indicated teeth, lower first and second molar, were extracted during this procedure. The teeth were extracted using elevators and dental forceps in accordance with normal protocol. The buccolingual width of the socket was measured using a periodontal probe after extraction and recorded in mm noticed in figure two. Simple interrupted sutures were then employed, and passive suturing was carried out observed in figure three to create a platform for the application of Perio KIN Hyaluronic 1%® gel (1% hyaluronic acid and 0.2% chlorhexidine) of about 1 ml volume using a syringe illustrated in figure four. One week following the hyaluronic acid application, a follow-up appointment was held to measure the buccolingual width using a periodontal probe and recorded in mm done by the same operator as noticed in figure five. All patients were told not to rinse their mouth on the first postoperative day and to follow a soft, cold diet for the first twenty-four hours following surgery. For five postoperative days, all patients were provided 500 mg of paracetamol tablet on need.

Statistical analysis

The statistical package for social sciences, or SPSS software version 26, was used to examine the study's findings with descriptive statistics including mean and standard deviation while the analytical statistics performed using independent-samples T test. P value of <0.05 was consider statistically significant.

Results

The mean and standard deviation of socket margins buccolingual width values were calculated for each study group, immediately post extraction and seven days after the procedure as demonstrated in Table (1). The mean for both groups immediately posts extraction have almost comparable before the application of therapeutic material while the lowest mean was noticed in group I one week post extraction after application of material.

To test and evaluate if any statistically significant difference exists in the mean buccolingual width among groups independent samples T test was performed in Table (2) and Table (3), and the results indicated that the study groups differed statistically at (P-value < 0.05). In Table (2) the findings demonstrated that there are statistically significant differences among group I values in comparing the values immediately post extraction and seven days after the procedure, However, when comparing the data immediately post-extraction and seven days after the extraction, there are no statistically significant changes between group II values.

Table (3) demonstrated that while there were no statistically significant differences in buccolingual width between the groups when comparing the values immediately following extraction, there were statistically significant differences between the groups one week after extraction, following the insertion of therapeutic material in group I patients. In order to illustrate the results, the buccolingual width values from the research groups were demonstrated using the chart in Figure six.

Discussion

The extraction of teeth, which is primarily associated with trismus, facial swelling, and postoperative pain, is one of the most common procedures performed by oral and maxillofacial surgeons (10). The dental extraction procedure with the resultant post extraction problems that every dentist aims to lessen these complications to ensure optimum wound healing and minimize discomfort to the patient so when compared to not covering the extraction site to hasten soft tissue healing, coverage is linked to better outcomes (11). Patients typically experience pain, trismus, and edema as a result of the immediate inflammatory response. After surgery, the clinical signs of a postoperative inflammatory reaction peak 1-2 days later and usually go away by the end of the week (12). Consequently, when taking into account related factors influencing the early stages of wound healing, the first postoperative week is crucial. In order to assess the short-term effects of HA on soft tissue healing, we looked into alterations after a week (13).

It seems that hyaluronic acid application promotes wound healing because it has been demonstrated to have anti-inflammatory, anti-edematous, osteo-inductive, and pro-angiogenetic qualities to fasten, promote and accelerate wound healing (14). Perio KIN® gel (1% hyaluronic acid and 0.2 chlorhexidine) was used in this study to promote early wound healing and reduce the risk of postoperative morbidities after extraction of teeth. The aim of this study was to evaluate the effects of applying hyaluronic acid on wound healing following tooth extraction. Evidently, the study found that hyaluronic acid treatment had a good impact in the very early post-operative days. In particular, hyaluronic acid treatment considerably decreased pain and fastens wound healing, when compared to the control group; the study group I score went up significantly. Thus the results of the current study come in agree with study by Maria de Souza et al. (15), Alcântara CEP et al. (16), Mendes RM et al. (17) and Yazan M et al. (18) who concluded that human dental sockets recover more quickly when 1% hyaluronic acid gel is used after tooth extraction thus speeds up and improves the repair time, these outcomes could be explained by hyaluronic acid's function in phagocytosis and the removal of invasive bacterial components, which would enhance the wound-healing process (19). Because of its various qualities, hyaluronic acid is a perfect molecule to promote wound healing by reducing inflammation and promoting the creation of early granulation tissue, besides being a naturally occurring part of the extracellular matrix, hyaluronic acid aids in regeneration by providing hydration, a structural framework, and a non-immunogenic environment (20). Thus, hyaluronic acid has the ability to modulate the inflammatory response in a variety of ways, hyaluronic acid-based hydrogel-injected groups showed leucocyte infiltration, angiogenesis, and collagen content with an increase in new vessel development and a decrease in collagen deposition also role in phagocytosis and the removal of invasive bacterial components, which would enhance the wound-healing process. (21) in addition to synergistic effect and the antibacterial qualities of chlorhexidine, which lower the quantity of microorganisms at the surgical site, may have an analgesic impact. Consequently, this reduces the quantity of inflammatory mediators released as a result of bacterial activity, which in turn lessens the experience of pain and promotes healing (22).

In contrast, a study conducted by Eeckhout C. et al. (23) and Cosola S. et al. (24) found that, following a follow-up period the intra- or post-operative use of hyaluronic acid gel had no beneficial effect on healing post extraction and failed to promote wound resolution as compared to no hyaluronic acid gel treatment. In addition to the results of the current research contradicted those of Mostafa et al. (25) and Aebli et al. (26), who claimed that hyaluronic acid treatment had no discernible impact on healing time or repair ability, these unfavorable outcomes could be caused by the low concentration of hyaluronic acid (0.2 %) and the way it

was applied to the surgical site after suturing.

Conclusion

Applying 1ml of Perio KIN Hyaluronic 1%® gel intra-socket can be a useful primary strategy to improve and accelerate soft tissue healing following extraction of the mandibular molar teeth. Early soft tissue healing significantly improved when compared to the control group.

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Authors' Contributions: All had confirmed responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation

Figure (1): Hyaluronic acid 1% with chlorhexidine 0.2% gel used in the study.

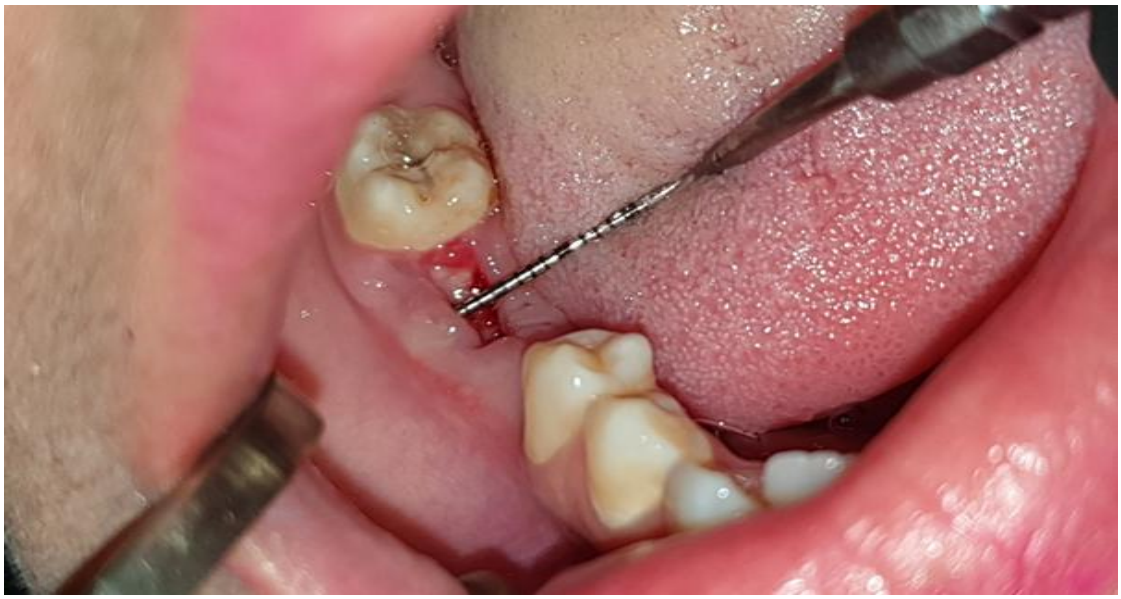

Figure (2): Buccolingual width assessment of the socket.

Figure (3): Simple interrupted suturing procedure.

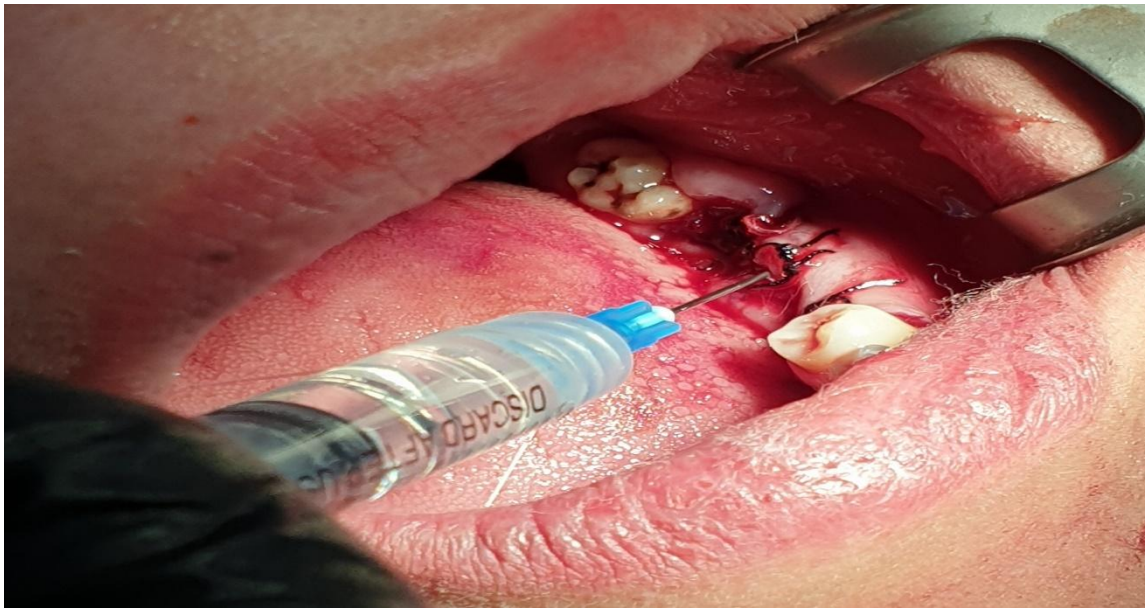

Figure (4): Application of Hyaluronic acid with chlorhexidine gel.

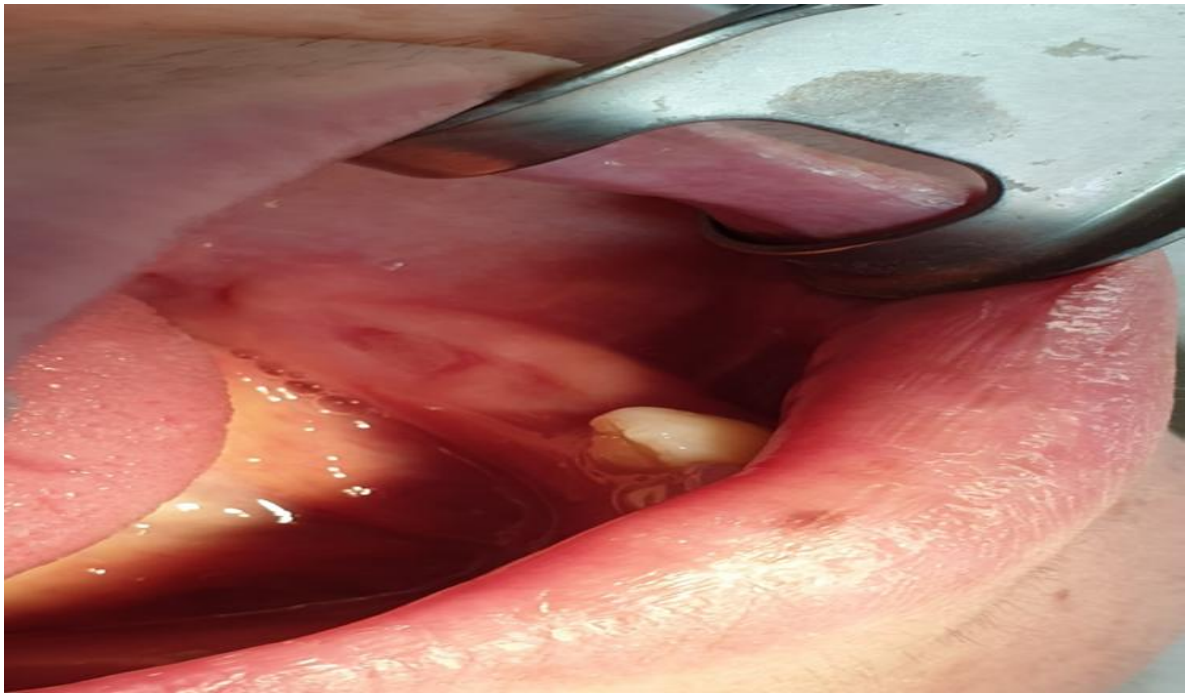

Figure (5): Evaluation of socket healing after one week.

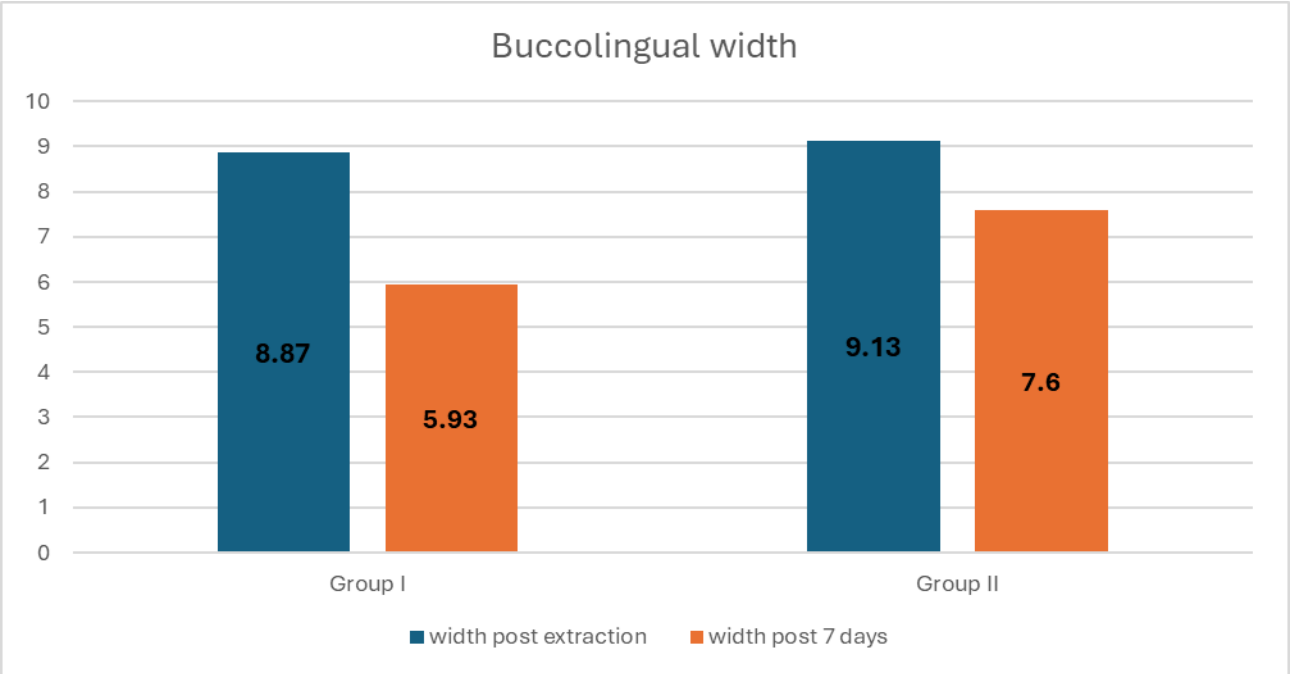

Figure (6): The chart illustrates the results among the groups.

Table (1): The mean and standard deviation of the socket healing.

	Type	N	Mean in mm	Std. deviation	Std. error
Buccolingual width post extraction	Group I	15	8.87	1.302	0.336
	Group II	15	9.13	1.302	0.336
Buccolingual width after 7 days of extraction	Group I	15	5.93	1.033	0.267
	Group II	15	7.60	1.183	0.306

Table (2): Independent-Samples T Test of the 2 groups.

Variable	N	Buccolingual width post extraction mean ± SD.	Buccolingual width after 7 days of extraction mean ± SD.	P value
Group I	15	8.87±1.302	5.93±1.033	0.000
Group II	15	9.13±1.302	7.60±1.183	0.650

Table (3): Analytical statistics test results comparison among 2 groups.

Variable	N	Group I	Group II	P value
Buccolingual width post extraction mean ± SD.	15	8.87±1.302	9.13±1.302	0.579
Buccolingual width after 7 days of extraction mean ± SD.	15	5.93±1.033	7.60±1.183	0.001

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