

The effects of bioadhesive hyaluronic acid gel versus diclofenac after surgical removal of impacted wisdom teeth.

Ziad H. Deleme.¹
Abdul Hammed N.¹

Affiliations: ¹Department of Oral and Maxillofacial surgery, College of Dentistry, Mosul University – Ninavah-Iraq.

Corresponding author: Ziad H. Deleme. Dept of Oral and Maxillofacial surgery, College of Dentistry, Mosul University – Ninavah, Iraq. Phone: (964) 47706627951 E-mail: ziaddeleme76@gmail.com

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Abstract: Surgical extraction of impacted lower wisdom teeth is a frequent minor intraoral surgical process. It is regularly linked with aching and postoperative consequences as pain and swelling. The aim of this study is to evaluate the efficacy of two methods in reducing swelling and pain subsequent to the removal of impacted wisdom teeth. This randomized study incorporated 20 patients with impacted wisdom teeth of different surgical complexity. Topical hyaluronic acid gel 2g/2ml with aloe vera (Kin[®]Care) was given to the patients to be applied to the surgical area three times a day, or diclofenac sodium tablet 50mg (Voltaren[®]) to be taken every eight hours, for one week. Swelling was estimated using a strip gauge technique, and pain with a visual analogue scale. Evaluations were made on day one of surgical treatment and on 72hrs and one week later. Statistically no significant differences were identified regarding the swelling and pain values between the two treatment groups on the third and seventh day after surgery. Hyaluronic acid gel was as efficient as diclofenac tablets in reducing the two parameters. The use of hyaluronic acid may be advantageous in medically compromised patient such as those with hypertension, chronic asthma, gastric ulcers or in those with any contraindications to using non-steroidal anti-inflammatory drugs, or in pregnant patients to reduce pain and swelling subsequent to impacted wisdom teeth surgery.

Keywords: *Hyaluronic acid; anti-inflammatory agents, non-steroidal; tooth extraction; tooth, impacted; molar, third.*

INTRODUCTION.

Surgical extraction of impacted lower wisdom teeth is a frequent minor oral surgical process.¹ Pain is a warning sign sent from the CNS indicating a tissue has been damaged.² Hyaluronic acid (HA) Kin[®]Care gel was introduced into the markets many years ago and it exerts an anti-inflammatory effect through intraoral injury healing, and is usually useful following tooth extraction. Previous studies concerning this topic have focused on tissue inflammatory reactions after extrinsic HA Kin[®]Care gel application. It has been hypothesized that HA Kin[®]Care gel raises cell motility and acts as a scavenger of prostaglandins, metalloproteinases and other bio-active molecules.^{3,4}

HA has two significant functions throughout wound-healing. It produces a short-term structure throughout the early stages of healing, and most significantly, it triggers cell proliferation and migration.⁵

This study aims to determine the outcome of topical application of HA as Kin^oCare gel on the expected post-operative complications, pain and swelling, following the surgical extraction of lower wisdom teeth, compared with diclofenac sodium (Voltaren^o 50mg tablets) and local measures.

MATERIALS AND METHODS.

This study was carried out at the Faculty of Dentistry, University of Mosul in the Oral and Maxillofacial Surgery Department. After obtaining approval from the scientific committee, the study run from October 2017 to April 2018. A case sheet specially designed for this study was filled for each patient.

Twenty medically healthy patients were randomly assigned, their age ranged from 18 to 32 years, and included both males and females. The diagnosis of wisdom tooth impaction was based on clinical examination and standard intraoral periapical and panoramic radiographs. Inclusion criteria included:

1. Unilateral partial or complete impacted lower wisdom teeth with Class I, II or III and position A, B or C; all angulations of impacted lower wisdom teeth.
2. Free of inflammation and infection of opercular tissue at the time of the surgical procedure.
3. Medically fit, not allergic, not taking any medication that could interfere with the study drugs.

Exclusion criteria included:

1. History of compromised medical health, history of allergic reactions or hypersensitivity to the medications used in the operative work.
2. Pregnant or lactating women.
3. Patients rejection in being involved in the research or those who could not commit to follow up visits or those who used other drugs during the research period.

To avoid operator mediated errors all cases were performed by one oral surgeon. Impacted teeth were surgically extracted under local anesthesia gained by inferior alveolar nerve, lingual and long buccal nerve block injections using 3.6ml of 2% xylocaine with 1:80,000 adrenaline.

The surgical removal of the impacted teeth was performed following the standard procedure including modified flaps. Following tooth removal the socket

was irrigated with chlorhexidine 0.2%. Suturing of the raised flap was done by simple interrupted suture.

The patients were arbitrarily allocated to one of the two treatment groups: group I included ten patients allocated diclofenac sodium 50mg tab (Novartis, UK) every 8hrs for three days; group II included ten patients in whom the internal side of flap was glued using HA as Kin^oCare gel which also contains propylene glycol, aqua, carbomer, sodium hydroxide, sodium methylparaben, sodium hyaluronate, PEG-40 hydrogenated castor oil, disodium EDTA, aloe barbadensis, rosmarinus officinalis leaf oil, sodium ethylparaben, and d-limonene in addition to 2g/2ml hyaluronic acid. Simple interrupted sutures were used and a post-operative supply of Kin^oCare gel (21 tubes given) to be used three times daily topically. At completion of surgery all patients were given amoxicillin 500mg capsules (SDI, Iraq) every 8hrs daily for three days for both group I and II. Both groups were compared in regards to healing by clinical assessment to determine degree of complications.

Post-operative pain was assessed subjectively using the visual analogue scale (VAS), which is comprised of a 10cm line labelled at one end 'No pain' and at the opposite end labelled 'Worst imaginable pain'. The patient indicated the spot in the line continuum where their pain was positioned, which is then calculated. Assessment of swelling was also subjectively assessed as follows:

Grade 0: No swelling.

Grade 1: Edema of alveolar mucosa buccally and/or lingually (intraorally).

Grade 2: Edema of alveolar mucosa buccally and/or lingually and involve the cheek (extraorally) to the body of the mandible.

Grade 3: Edema of alveolar mucosa buccally and/or lingually and involve the cheek (extraorally) below the body of the mandible.

Data for pain and swelling were recorded on day one, three and seven post operatively.

Statistical analysis of the data was performed using independent t-test. Analyses were performed using SPSS program version 22 for Windows 2013. A highly significant difference was considered at $p \leq 0.0001$.

Table 1. Descriptive statistics of tested parameters in the hyaluronic acid and diclofenac sodium groups.

Parameter and time	Treatment	N	Mean	Std. Deviation	Std. Error Mean
Pain day 1	Hyaluronic Acid (Kin®Care)	10	3.70	1.059	0.335
	Diclofenac sodium 50mg tablet	10	4.30	1.160	0.367
Pain day 3	Hyaluronic Acid (Kin®Care)	10	1.30	1.059	0.335
	Diclofenac sodium 50mg tablet	10	1.40	0.516	0.163
Pain day 7	Hyaluronic Acid (Kin®Care)	10	0.20	0.422	0.133
	Diclofenac sodium 50mg tablet	10	0.40	0.516	0.163
Swelling day 1	Hyaluronic Acid (Kin®Care)	10	1.50	0.527	0.167
	Diclofenac sodium 50mg tablet	10	1.60	0.699	0.221
Swelling day 3	Hyaluronic Acid (Kin®Care)	10	0.40	0.516	0.163
	Diclofenac sodium 50mg tablet	10	0.70	0.675	0.213
Swelling day 7	Hyaluronic Acid (Kin®Care)	10	0.00	0.000	0.000
	Diclofenac sodium 50mg tablet	10	0.10	0.316	0.100

Table 2. Comparison of pain and swelling between hyaluronic acid and diclofenac sodium groups.

Parameter and time	Treatment	p-value	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Pain Day 1	Hyaluronic Acid (Kin®Care)	0.783	0.243	0.600	0.497
	Diclofenac sodium 50mg tablet		0.243	0.600	0.497
Pain Day 3	Hyaluronic Acid (Kin®Care)	0.101	0.791	0.100	0.373
	Diclofenac sodium 50mg tablet		0.793	0.100	0.373
Pain Day 7	Hyaluronic Acid (Kin®Care)	0.081	0.355	0.200	0.211
	Diclofenac sodium 50mg tablet		0.356	0.200	0.211
Swelling Day 1	Hyaluronic Acid (Kin®Care)	0.303	0.722	0.100	0.277
	Diclofenac sodium 50mg tablet		0.723	0.100	0.277
Swelling Day 3	Hyaluronic Acid (Kin®Care)	0.471	0.279	0.300	0.269
	Diclofenac sodium 50mg tablet		0.280	0.300	0.269
Swelling Day 7	Hyaluronic Acid (Kin®Care)	0.037	0.331	0.100	0.100
	Diclofenac sodium 50mg tablet		0.343	0.100	0.100

RESULTS.

Male to female ratio was 2:1, mean age was 26.3 years. The removal of a wisdom tooth was due to pain reported by the patient in all cases. Analysis between usage of HA Kin®Care gel and control group using diclofenac tablets showed no significant differences related to pain and swelling at day 1, day 3 and day 7 as analyzed by independent t-test. (Table 1)

There was no significant difference in pain at day 1 (0.783), day 3 (0.101) and day 7 (0.081) between two

groups, nor for swelling at day 1 (0.303), day 3 (0.417) and day 7 (0.037). (Table 2)

DISCUSSION.

HA is a natural constituent of the extra-cellular matrix, it provides structure and hydration, and thus produces a non-immunogenic scenario that helps in renewal and healing.⁶ It affects the clinical outcomes of inflammation, supporting wound-healing. Koray, *et al.*,⁷⁻⁸ reported reduced pain after wisdom teeth removal in patients using hyaluronic acid.

Hanci *et al.*,⁹ reported pain relief after tonsils removal and accelerated wound-repair with hyaluronic acid gel application. This is in agreement with our study, although another study reported HA was associated with increased swelling.¹⁰

Koray *et al.*,⁶ reported statistically significant differences for swelling and trismus standards on the second postoperative day. On the other hand, there was no statistically significant difference in VAS scores.

Even though no confirmation of a drop in pain intensity was observed, hyaluronic acid appears to have benefits

for the management of swelling and trismus during the instantaneous post-operative phase subsequent to impacted wisdom tooth surgical procedures, in agreement with our study. Our results confirm the hypothesis that HA has an anti-inflammatory effect following wisdom tooth removal. However, hyaluronic acid (Kin®Care) gel can be used as an adjuvant therapy in medically compromised patients like those with hypertension, gastric ulcers or with chronic asthma, and in pregnant patients or in those patients with contraindications of using NSAIDs commonly prescribed to manage pain and swelling.

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