

# EFFECTIVENESS OF HYALURONIC ACID GEL IN THIRD MOLAR SURGEON

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## Abstract

**Background:** Common surgical procedure done by maxillofacial surgeon is Surgical extraction of impacted third molar mostly it is associated with postoperative sequelae which cause discomfort and affects day to day activities of patients. This study aims at assessing the efficiency of topical application of Hyaluronic acid gel in wound healing of impacted mandibular third molar (IMTM).

**Materials and Method:** A sample of 30 patients who have been presented with Pell and Gregory class II IMTM were included in this study. Samples have been divided into two groups - study group (n=15) and control group (n= 15). Topical application of 0.2% Hyaluronic acid gel in the study group. Wound healing was assessed with a modified laundry scale on the third and seventh postoperative day. The data was analyzed using SPSS for Windows [SPSS ver 22.0, IBM Corp., Armonk, NY]. Categorical data was compared between the groups using Chi square test.

**Result:** The mean age of the participants was 26.67 years. Out of which 62% (19 patients) were male and 48% (11 Patients) were female. A statistically significant improvement in wound healing is observed on the seventh day while no significant improvement (p=0.07) in wound healing is observed on the third postoperative day (p=0.01).

**Conclusion:** The study result revealed that topical use of 0.2%Hyaluronic acid gel is a simple method which is effective enhance wound healing on the seventh postoperative day in IMTM surgery. However, the intensity of pain was comparable between study and control group.

**Keyword:** Hyaluronic Acid Gel, Third Molar Surgeon, IMTM Surgery, Pain

## INTRODUCTION

According to the definition given by Archer, Impacted tooth are ones which are interrupted either completely or partially and are positioned against either tooth or bone or soft tissue so that its further eruption is unlikely. Mandibular third molar are the common teeth to be impacted. Teeth impactions are due to space deficiencies, third molar angulation, ectopic position, erupting pathway obstruction, follicles collision etc. Impacted mandibular third molar (IMTM) can be symptomatic or asymptomatic.

IMTM surgical extraction is one of the most common procedures performed by oral surgeons, causing an exaggerated inflammatory process which is usually associated with postoperative discomfort like pain, swelling and trismus which disturbs patient's day today activity. Alveolar Osteitis (AO) otherwise known as dry socket or fibrinolytic osteitis which occurs due to disruption of blood clot is one of the complications associated with surgical extraction of IMTM which presents with pain and halitosis at 2nd postoperative day (48 hours). These postoperative sequelae negatively affect patient's quality-of-life which disturbs their day to day activity postoperatively. Therefore clinically it is important for the development of newer techniques to reduce. Studies targeting to minimize the morbidity of patients, to increase comfort by different protocols of medications have been formulated. Medications such as nonsteroidal anti-inflammatory, corticosteroid and anti-inflammatory have a anti- inflammatory effect. Alternative

therapies for anti-inflammatory action in IMTM surgery are investigated.

Hyaluronic acid (HA) is a high molecular weight glycosaminoglycan in extracellular matrix of tissues like synovial fluid, vitreous humour, skin, and connective tissue that have an important role in tissue regeneration process. It plays an important role in wound healing of both mineralised and non-mineralised tissues. Topical application of HA are widely used for treating several inflammatory conditions [13], which act via HA specific receptors which modulate inflammation, cellular migration, and angiogenesis, which are the main phases of wound healing. Studies stated that HA properties depend on molecular size. High molecular weight HA displays anti-inflammatory and immunosuppressive properties, whereas low molecular weight HA is a potent proinflammatory molecule.

This study aimed in evaluating effectiveness of Hyaluronic acid in reducing post op complications in impacted third molar extraction.

## MATERIALS AND METHOD

**Source of Data:** Patient reported to the Department of Oral and Maxillofacial surgery, Saveetha Dental College and hospital for management of IMTM.

**Data Extraction Method:** A healthy individual above 18 years with Pell Gregory's class II impacted mandibular third molar and with no systemic disorder or comorbidities from May 2023 to December 2023 were included in this study after assessing inclusion and exclusion criteria. Informed consent is obtained

from the patient. Sample population was divided into study (n=15) and control group (n=15). Topical application of 0.2% HA was done after closure in the study group.

**Inclusion Criteria:** Clinically healthy individuals who undergone surgical extraction of impacted mandibular third molar were included in this study.

**Exclusion Criteria:** Any pathology associated with impacted mandibular third molar, known TMJ disorder, bleeding disorder, systemic illness and immunity and compromised patients or patients with habits like smoking were excluded from this study. PICO approach has been used to define the inclusion criteria. Participants: patient who underwent surgical removal of third molar.

Intervention: 0.2% Hyaluronic acid gel application in extraction socket.

Comparator: No Hyaluronic acid spray.

Outcomes: postoperative wound healing is assessed.

### SURGICAL PROCEDURE:

All surgical procedures are performed by the same surgeon. Under aseptic conditions local anesthesia are administered with 2% lignocaine with 1:200000 adrenaline, inferior alveolar nerve block is given, full thickness mucoperiosteal flap elevated after placing modified ward's incision and accordingly buccal, medial and distal bone guttering done. If needed tooth is splitted and tooth was elevated. Extracted socket is thoroughly cleaned to remove granulation tissue and bony spicules, 4-0 braided black silk sutures are used for closing the socket. 0.2% HA are applied with applicator tip after suturing.

Wound healing is assessment by modified laundry scale. Tissue color, bleeding on probing (William's periodontal probe was used), presence of granulation tissue and nature of incision margin were noted and then categorized to either very poor, poor, good, very good and excellent category. Wound healing assessment was done on 3rd and 7th postoperative day.

Very poor	Tissue color: $\geq 50\%$ of gingiva red Response to palpation: Bleeding Granulation tissue: Present Incision margin: Not epithelialized, with loss of epithelium beyond incision margin Suppuration: Present
Poor	Tissue color: $\geq 50\%$ of gingiva red Response to palpation: Bleeding Granulation tissue: Present Incision margin: Not epithelialized, with connective tissue exposed

Good	Tissue colour: $\geq 25\%$ and $<50\%$ of gingiva red Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed
Very good	Tissue colour: $<25\%$ of gingiva red Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed
Excellent	Tissue color: All tissues pink Response to palpation: No bleeding Granulation tissue: None Incision margin: No connective tissue exposed

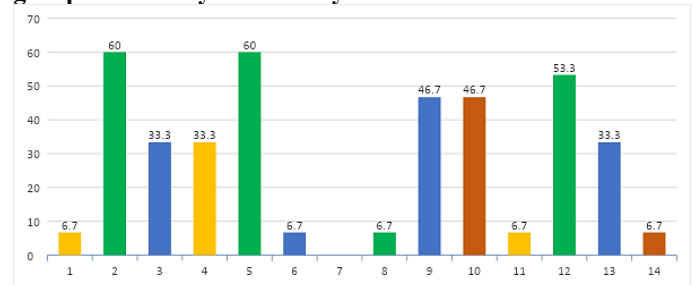
### STATISTICAL ANALYSIS

The data was analyzed using SPSS for Windows [SPSS ver 22.0, IBM Corp., Armonk, NY]. Categorical data was compared between the groups using Chi square test. The data was presented using graphs and tables. The level of significance was set at  $p < 0.05$ .

### RESULT

Total of 30 patients were included in this study. The mean age of the participants was  $25.67 \pm$ . Out of which 62% (19 patients) were male and 48% (11 Patients) were female. Regarding classification of impacted mandibular third molar 30% (9 patients) was diagnosed with class II Mesioangular impaction, 20% (6 patients) was diagnosed with class II horizontal impaction, 16% (5 patients) was diagnosed with Distoangular impaction and 33% (10 patients) was diagnosed with vertical impaction. (Graph 1)

**Graph 1: Wound healing among participants between the groups on 3<sup>rd</sup> day and 7<sup>th</sup> day**



**Table 1: Comparison of Wound healing among participants between the groups on 3<sup>rd</sup> day and 7<sup>th</sup> day**

3 <sup>rd</sup> Day	Poor	Good	Very Good	Excellent	Total	Chi square	P value
Group	N (%)	N (%)	N (%)	N (%)			
Study	1 (6.7)	9 (60)	5 (33.3)	0	15	5.33	P = 0.07
Control	5 (33.3)	9 (60)	1 (6.7)	0	15		NS
7 <sup>th</sup> Day	Poor	Good	Very Good	Excellent	Total	Chi square	P value
Group	N (%)	N (%)	N (%)	N (%)			
Study	0	1 (6.7)	7 (46.7)	7 (46.7)	15	11.2	P = 0.01**
Control	1 (6.7)	8 (53.3)	5 (33.3)	1 (6.7)	15		

N-Number; %-percentage; NS-not significant \*\* $P < 0.01$  using chi square test

On the 3rd day, it was found that 60% of participants had good wound healing and 33.3% of participants had very good wound healing in the study group, whereas, 60% of participants had good wound healing and 6.7% of participants had excellent wound healing in the control group. This distribution was not statistically significant ( $P = 0.07$ ).

On the 7th Day, it was found that 46.7% of participants had excellent and very good wound healing in the study group, whereas 6.7% of participants had excellent wound healing and 33.3% of participants had very good wound healing in the control group. This distribution was statistically significant ( $P = 0.01$ ). (Table 1)

## DISCUSSION

One of the most common surgery done by oral surgeons is surgical extraction IMTM, causing an exaggerated inflammatory process which is usually associated with discomfort in postoperative period like pain, swelling and trismus which affects patient's day today activity.

Other postoperative consequence include alveolar osteitis, injury to nerve, alveolar bone fracture, and delayed healing. Corticosteroids decreases pain and edema but they have side effects like adrenal suppression, delayed wound healing, and increase chances for infections

Vascularization and collagen matrix formation are important steps required in wound healing. Traction produced by angiogenesis remodels extracellular matrices. Rapid healing of surgical wounds is fundamental to reducing the chances of infection and postoperative sequelae. Topical application of medical components aids in repair, enhances wound healing and reduces prostaglandin. So, inflammation and pain are reduced and collagen is improved which in turn promotes tissue repair.

HA a biocompatible, biodegradable, hygroscopic, muco-adhesive, and viscoelastic [13] which lubricates tissue and interacts with growth factors, cell migration, tumour metastasis and also osmotic pressure are being regulated. There are two mechanisms of action of HA. First, it acts like a passive structural and signaling molecule. In second mechanism, HA modulates hydration, osmotic balance, and the physical properties of ECM, which is a hydrates and stabilises extracellular space. In between HA and other proteins determines opposite actions, like pro-inflammatory and anti-inflammatory activities, promotion and cell migration inhibition, and regulation of cell division and differentiation

HA, a naturally occurring linear polysaccharide of unbranched glycosaminoglycans, with repeated di-saccharide units of N-acetyl-D-glucosamine and D-glucuronic acid.

CD44 receptor in cell-cell interactions regulates cytokine production and interaction of HA. Tumor necrosis factor induces gene 6 protein by a negative feedback control mechanism influences pro-inflammatory cytokines and of HA, Infiltration of leukocyte, angiogenesis, and collagen induces inflammatory reaction. HA by their anti-inflammatory properties inhibits tissue destruction. Longinotti et al. stated that the anti edematous effects are because of osmotic buffering capacity. Action of HA is enhanced by leukocyte and platelet rich fibrin.

Koray et al in 2014 in his study Compared HA and benzydamine hydrochloride in reducing pain, swelling, and improving mouth opening after surgical extraction of IMTM result of this study stated HA significantly reduced Edema and improved mouth opening. Anti inflammatory and antioxidant effect of HA after extraction of IMTM is assessed by Gocmen et al. At 1 or 2 nd Postoperateday inflammation is at peak and gradually resolves by the end of 1 week, The HA group showed less leucocyte infiltration, more angiogenesis inflammatory inhibition and early granulation tissue than the control group [14].

HA role on hemostasis after surgical extraction of IMTM is assessed by Gokhan et al, tissue fluid level and bleeding time are primary assessed, secondary visual analog scale score for pain measurement, maximum inter-incisal opening, and swelling are also assessed. Bayoum et al in 2018 assessed cross-linked HA use which reduces postoperative swelling, pain, and limited mouth opening. HA crosslinked with polymer increases its retention period for up to 7 days, longer availability of HA at the wound site can reduce postoperative symptoms. These cross-linked HA are used in various sites and circumstances in the oral cavity. HA gel aids in easing symptoms of mouth ulcers as.

Dubovina et al in 2016 concluded that the use of HA with or without aminocaproic shows a statistically significantly faster reduction in pain, symptoms and signs of dry socket otherwise known as alveolar osteitis compared with Alvogyl®. Bayoumi et al stated that non-cross-linked HA have no effect on pain reduction or dry socket prevention after tooth extraction and it mostly dissolves by first 12 hours [12].

Romeo et al showed efficiency of combination of topical application of HA gel and amino acids to enhance the healing by secondary intention after excision of oral biopsy [12]. Dry socket is treated, unwanted excessive degradation are prevented by acting as a coagulum stabilizer. Fibrin threads forms a matrix for the platelet clot formation, HA molecules penetrate these fibrin matrix and stimulate cell migration, specifically fibroblast fibroblasts, production of new collagen and stabilizes the coagulum all in turn encourages wound healing.

In oral tissues HA stimulates and regulates oral fibroblast proliferation and activities by genes involved in wound healing, like type III collagen and growth factor-β3.

Post surgical Edema is because of accumulated of fluids, HA by their hydrophilic nature helps in faster resolution of edema by osmotic activity which reduces prostaglandins and metalloproteinases [13]

In our study statistically significant improvement in wound healing was observed on the seventh postoperative day

On the other hand, HA may increase bleeding time by their inhibitory action on platelet aggregation and their antithrombotic activities [13].

no statistically significant difference Topical applications of an amino acid and sodium hyaluronate gel after extraction of IMTM shows [15]. Further studies are needed to get clear knowledge regarding the side effects or complication of using HA.

## CONCLUSION

It can be concluded that 46.7% of participants in the study group had excellent wound healing when compared to 6.7% in the control group. This was found to be statistically significant (P = 0.01).

Many available literature supports using hyaluronic acid. But further comparative studies with larger sample size with longer follow up are required to come to a definitive conclusion and to formulate a definitive protocol for their clinical application.

## References

1. Petronis Ž, Zigmantavičius J, Gervickas A. Various wound closure ways after impacted lower wisdom teeth removal: A review. *Stomatologija*. 2020;22(4):107-115.
2. Hamzani Y, Chaushu G. Evaluation of early wound healing scales/indexes in oral surgery: A literature review. *Clin Implant Dent Relat Res*. 2018;20(6):1030-1035. doi:10.1111/cid.12680
3. Raghavan SL, Panneerselvam E, Mudigonda SK, Raja KKB. Protection of an intraoral surgical wound with a new dressing: a randomised controlled clinical trial. *Br J Oral Maxillofac Surg*. 2020;58(7):766-770. doi:10.1016/j.bjoms.2020.03.017
4. Gorrela H, Siripuram H, Sirivore A. Role of Resopac® as an intraoral dressing material for the surgical wound: A randomized controlled clinical trial. *J Oral Biol Craniofac Res*. 2022;12(5):604-609. doi:10.1016/j.jobcr.2022.07.004

5. Jones TM, Cassingham RJ. Comparison of healing following periodontal surgery with and without dressings in humans. *J Periodontol.* 1979;50(8):387-393. doi:10.1902/jop.1979.50.8.387
6. Allen DR, Caffesse RG. Comparison of results following modified Widman flap surgery with and without surgical dressing. *J Periodontol.* 1983;54(8):470-475. doi:10.1902/jop.1983.54.8.470
7. Meghana MVS, Deshmukh J, Devarathanamma MV, Asif K, Jyothi L, Sindhura H. Comparison of effect of curcumin gel and noneugenol periodontal dressing in tissue response, early wound healing, and pain assessment following periodontal flap surgery in chronic periodontitis patients. *J Indian Soc Periodontol.* 2020;24(1):54-59. doi:10.4103/jisp.jisp\_105\_19
8. Kakar A, Lamba AK, Tandon S, Faraz F, Ahad A. Gingival Tissue Response Following Placement of a Light Cure Dressing and a Non-eugenol Dressing after Periodontal Flap Procedure: A Comparative Clinical Study. *J Nat Sci Biol Med.* 2018;9(1):65-71. doi:10.4103/jnsbm.JNSBM\_75\_17
9. Kumar MBV, Narayanan V, Jalaluddin M, Almalki SA, Dey SM, Sathe S. Assessment of Clinical Efficacy of Different Periodontal Dressing Materials on Wound Healing: A Comparative Study. *J Contemp Dent Pract.* 2019;20(8):896-900. Published 2019 Aug 1.
10. Monje A, Kramp AR, Criado E, et al. Effect of periodontal dressing on non-surgical periodontal treatment outcomes: a systematic review. *Int J Dent Hyg.* 2016;14(3):161-167. doi:10.1111/idh.12130
11. Kadkhodazadeh M, Baghani Z, Torshabi M, Basirat B. In Vitro Comparison of Biological Effects of Coe-Pak and Reso-Pac Periodontal Dressings. *J Oral Maxillofac Res.* 2017;8(1):e3. Published 2017 Mar 31. doi:10.5037/jomr.2017.8103
12. Shuborna NS, Chaiyasamut T, Sakdajeyont W, Vorakulpipat C, Rojvanakarn M, Wongsirichat N. Generation of novel hyaluronic acid biomaterials for study of pain in third molar intervention: a review. *J Dent Anesth Pain Med.* 2019;19(1):11-19. doi:10.17245/jdapm.2019.19.1.11
13. Maria de Souza G, Elias GM, Pereira de Andrade PF, Andrade Sales KN, Galvão EL, Moreira Falci SG. The Effectiveness of Hyaluronic Acid in Controlling Pain, Edema, and Trismus After Extraction of Third Molars: Systematic Review and Meta-Analysis. *J Oral Maxillofac Surg.* 2020;78(12):2154.e1-2154.e12. doi:10.1016/j.joms.2020.07.005
14. Gocmen G, Gonul O, Oktay NS, Yarat A, Goker K. The antioxidant and anti-inflammatory efficiency of hyaluronic acid after third molar extraction. *J Craniomaxillofac Surg.* 2015;43(7):1033-1037. doi:10.1016/j.jcms.2015.04.022
15. Guazzo R, Perissinotto E, Mazzoleni S, Ricci S, Peñarrocha-Oltra D, Sivoletta S. Effect on wound healing of a topical gel containing amino acid and sodium hyaluronate applied to the alveolar socket after mandibular third molar extraction: A double-blind randomized controlled trial. *Quintessence Int.* 2018;49(10):831-840. doi:10.3290/j.qi.a41157