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A RANDOMIZED CLINICAL STUDY ON POST-TONSILLECTOMY PAIN RELIEF WITH HONEY

Dr. Shaalini S MBBS, DLO, MS (ENT), Department of Otolaryngology, Head and Neck Surgery, Navodaya Medical College, Raichur, Karnataka, India.

ABSTRACT

Background: Tonsillectomy with or without adenoidectomy is one of the most common surgical procedures performed worldwide, especially for children. Oral honey administration following tonsillectomy in pediatric cases may reduce the need for analgesics via relieving postoperative pain. **Objectives:** The aim of this study was to evaluate the effects of honey on the incidence and severity of postoperative pain in patients undergoing tonsillectomy. **Patients and Methods:** Sixty consecutive tonsillectomy patients randomized to two groups. **Interventions:** The acetaminophen group was treated with antibiotics (amoxicillinclavulonic acid), acetaminophen and placebo,acetaminophen-plus-honey group was treated with antibiotics (amoxicillinclavulonic acid), acetaminophen, and honey. Visual analogue scale (VAS) was applied for subjective assessment of postoperative pains, while the number of painkillers taken daily and awakening at night due to pain were used for objective assessment. The amount of epithelization was used for assessment of tonsillary fossa recovery. Outcome measures: The difference between acetaminophen and acetaminophenplus-honey groups was statistically significant both in terms of VAS and number of painkillers taken within the first 2 postoperative days ($p < 0.001$). Although there was no statistically significant difference between groups regarding the VAS scores on the 3rd postoperative day and after, the number of painkillers taken differed significantly until the 8th postoperative day ($p < 0.001$ for first 7 postoperative days; $p = 0.003$ for 8th day). No significant difference was found between groups regarding the number of awakening at night ($p = 0.36$). Tonsillary fossa epithelization was more rapid in the acetaminophen-plus-honey group ($p < 0.001$). **Results:** The difference between acetaminophen and acetaminophen plus honey groups was statistically significant both for visual analogue scale (VAS), and number of painkillers taken within the first three postoperative days. The consumption of painkillers differed significantly in every five postoperative days. No significant difference was found between groups regarding the number of awaking at night. **Conclusions:** Postoperative honey administration reduces postoperative pain and analgesic requirements in patients after tonsillectomy. As the side effects of honey appear to be negligible, consideration of its routine usage seems to be beneficial along with routine analgesics.

BACKGROUND

Tonsillectomy and adenotonsillectomy are two common surgeries in the ENT (ear, nose, and throat) Generally, tonsillectomy is a safe procedure.1,2 However, complications such as post-tonsillectomy pain, difficulty in swallowing, dry throat, infection, bleeding, airway obstruction, nasopharyngeal obstruction, pulmonary edema, fever, pain to jaw, otalgia, foreign body aspiration, poor healing, and vellopharyngeal insufficiency may occur.3---5 Post-operative pain is the major complication during swallowing due to stimulation of tonsillar nerve endings, pharyngeal muscle spasm, and post-ingestion inflflammation.6 Severe pain may reduce oral nutritional intake, leading to dehydration, impaired or delayed recovery after surgery.7 Based on some studies, antibiotics only are not effective enough to treat pain, even the addition of analgesics and steroids may not reduce pain rapidly and significantly. Another common method of controlling pain is the administration of opioids and Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), which have various adverse effects.8 Therefore, post-operative pain control, requires a method with minimum complications and maximum efficiency.9

One of the non-drug methods to reduce pain is honey, with various methods that have been reported in several studies. Honey has been used since ancient times to treat several ailments. Hippocrates used honey since 400 BC for healing wounds, even the ancient Egyptians used honey to treat corneal and conjunctival inflammation and burns since 5000 years ago.10 Honey has been shown to possess antibacterial and anti-inflammatory properties.11 Antioxidant, anti-inflammatory, and antibacterial properties, as well as accelerated wound recovery and pain relief, are the benefits reported for honey as a natural therapeutic method.11,12 In modern medicine, honey has been used successfully to treat burns, graft donor sites, post-operative wound infections, skin ulcers.13 Moreover, honey has also been reported to benefit wound care of patients undergoing chemotherapy, those with physiological wound disorders, and prolonged injury.13 In previous studies, there is no report for honey side effects in wound healing.14 Allergy to honey is rare, but an allergic reaction to honey's proteins and allergens is possible.13,14

Mechanical or thermal injuries may occur in the tonsillar fossa during tonsillectomy, and this location remains an open wound after surgery.15 Therefore, patients complain about throat pain, particularly during swallowing.16, 17 when used regularly after tonsillectomy, honey may have benefits on tissue repair, thereby reducing post-operative pains.17 The application of honey may reduce inflammation of infected wounds and facilitate the healing time duration.18 These Randomized Controlled Trials (RCTs) aimed to investigate the efficacy of honey gargle on post tonsillectomy pain.

MATERIALS AND METHODS

This study covers 60 consecutive patients who underwent adeno-tonsillectomy with the diagnosis of recurrent tonsillitis and/or obstructive sleep apnea. A random-number generator program was used to randomize patients to the study groups. The research protocol was approved by the institution's ethical committee.

The standard anesthesia protocol was applied in all patients. Tonsillectomy was carried out using the cold dissection technique, and bipolar electrocution was used for control of hemorrhage. The acetaminophen group was treated with antibiotics (amoxicillin—Clavulanic acid 40 mg/kg), acetaminophen (15 mg/kg/dose, maximum 5 times/day), and placebo (serum physiologic prepared with food dyes).

The acetaminophen-plus-honey group was treated with antibiotics (amoxicillin—Clavulanic acid 40 mg/ kg), acetaminophen (15 mg/kg/dose, maximum 5 times/day), and a teaspoon (5 ml) of flower honey (gum tragacanth and thyme honey) every hour when awake. Parents of the children were asked to administer acetaminophen only when they complained of throat pain. Placebo and honey began to be given when the patients began to take orally. No patient allergic to honey was included in the study.

Subjective assessment of postoperative pain was made by

families of the children on daily basis using a form displaying facial appearances scored from 1 to 5 19. On the 14th postoperative day, the forms on which the patients recorded the VAS, the amount of painkillers and number of awakening at night were returned. The patients were reexamined on the 1st, 4th, 7th, 11th, and 14th postoperative days to monitor tonsillary fossa recovery. Depending on the appearance of tonsillary fossa, the following staging was made: I—completely covered with fifibrin; II—beginning of epithelization (epithelia covering less than 30%); III—semi-epithelized (epithelia covering 30— 75%); IV—almost complete epithelization (more than 75%); and V—completely epithelized. Difference between groups in terms of VAS, number of painkillers taken daily, awakening at night due to pain and tonsillary fossa recovery was evaluated by Mann—Whitney U-test. Bonferroni correction was applied for multiple comparisons. Because of the number of tests undertaken, the level of significance is set at 0.006. SPSS for Windows 11.5 was used for statistical analysis.

RESULTS

A total of 60 consecutive patients were included in the study protocol. Three patients from the acetaminophen group and one patient from the acetaminophen-plus-honey group were excluded for being lost to follow-up, whereas one patient was excluded for refusing to take honey. A total of 55 patients, 27 in acetaminophen group and 28 in acetaminophen-plus-honey group, were included in the data analysis. Acetaminophen group were 15 males and 12 females with a mean age of 6.4 2.1 and mean weight of 22.3 6.2 kg, and acetaminophen-plus-honey group were 17 males and 11 females with a mean age of 6.7 2.3 and mean weight of 19.9 6.1 kg (respectively, p = 0.70, 0.62, and 0.15). The patients took 9.3 (S.D. 0.73) teaspoons honey on average per day during 14 days.

On the first 2 postoperative days, the difference between the acetaminophen and acetaminophen plus-honey groups was found to be statistically signifificant regarding both VAS and the amount of painkillers used (p <0.001 for fifirst 2 days) (Fig. 1). On the 3rd postoperative day and thereafter, the difference between groups regarding the amount of painkillers taken was signifificant until the 8th postoperative day (p<0.001 for fifirst 7 postoperativedays; p = 0.003 for 8th day, Fig. 2), although the difference regarding the VAS scores was found to be insignifificant (p = 0.05).

Painkiller intake rates of the patients are displayed in Figs. 2 and 3. While 22% of the patients in the acetaminophen-plus-honey group did not take any painkiller on the operation day, this rate was found to be 0% in the acetaminophen group. In the acetaminophen-plus-honey group, this particular rate was 51.9% on the 2nd day, and 66.7% on the 3rd, while the corresponding rates were 7.1 and 21.4%, respectively, in the acetaminophen group (Fig. 3).

No statistically signifificant difference was found between groups regarding the number of awakenings at night (p = 0.36). Regarding the amount of tonsillary fossa epithelization, statistically signifificant difference was found between the acetaminophen and acetaminophen-plus-honey groups on the 4th, 7th, 11th, and 14th days (p <0.001 for all days). No complication was observed in the acetaminophen-plus-honey group, whereas minor bleedings that did not require surgical intervention were encountered in two patients in the acetaminophen group on the 3rd and 4th postoperative days.

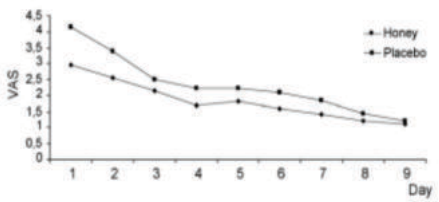

Fig. 1 Intensity of pain.

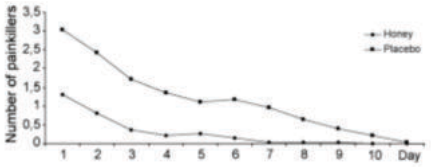

Fig. 2 Rates of the painkiller intake.

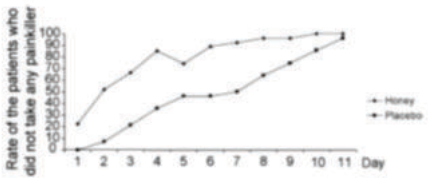

Fig. 3 Rates of the patients who did not take any painkiller.

DISCUSSION

Tonsillectomy is the commonest surgical procedure in the pediatric till now; post tonsillectomy pain often affects the family life for more than a week. New tonsillectomy techniques have been emerged to reduce the intra-operative and post-operative complications. There is also likelihood that reduced the pain and more rapid intake of food would reduce the chance of dehydration and secondary infections.

In recent years, honey has been increasingly used in modern medicine as a "potent agent" in wound healing due to its antibacterial and anti-inflammatory effects. The mechanism for pain relief in wounds is associated with the presence of antioxidants in honey such as flflavonoids, monophenols, polyphenols, vitamin C, and methylsyringate that interfere with the inflammatory amplification process by ROS (Reactive Oxygen Species).20,21,22 The clinical applications of honey, particularly in treating wounds, ulcers, and burns,are pretty striking. Honey has been reported that promotes wound epithelization, reduces inflammation, edema, and exudation, accelerates collagen synthesis, and increases the DNA content of the granulation tissue.20,23,24

After tonsillectomy, the most common morbidities are bleeding, edema, insuffificient oral intake, and pain after tonsillectomy. Despite advances in anesthetic and surgical techniques, post-tonsillectomy morbidity remains a major clinical problem.21 Post-tonsillectomy pain is caused by mechanical and thermal injuries to the tonsillar fossa leading to post-operative inflflammation, nerve irritation, and pharyngeal spasm.25 With these considerations, it could be expected that honey accelerates wound recovery and reduce post-operative pain.25 However, it is not possible to keep honey in continuous contact with the tonsillar fossa as it is in wound dressings. Therefore, the honey application interval is done as often as possible.

In this study, honey was dissolved with water and used with direct administration by gargling then swallowed, so that the honey could reach all areas that experienced post-operative trauma, and it was performed every 6-h. Similar to Raoufian's study, subjects who received honey mixed with normal saline were gargled every 6-h for further contact of honey.26

No adverse effect attributable to honey has been observed in this particular study. However, allergic reactions may rarely develop against some of the pollens included in honey 27. Therefore, the patients receiving honey should be asked whether they are allergic to honey. Another important problem encountered during medical administration of honey is the standardization of honey. In this study, a commercial honey has been used kapok tree honey (C. pentandra). This honey is certifified and easy to obtain. Kapok tree, also known by the name of "Java cotton", is a tropical tree that is widely grown in Asia, America, and Africa.28Kapok

tree honey also known has effectiveness against wounds comparable to manuka honey's properties.

Kapok tree honey has been used in several clinical trials and many studies have been conducted on this honey to demonstrate its superior quality, which has potent antioxidant, anti-inflflammatory, and antibacterial activity.29 However,there have been many other studies examining the use of various types of honey.Therefore, any type of honey can certainly be beneficial.

REFERENCES

1. Tuhanioglu B, Erkan SO. Tonsillectomy pain control withIV dexamethasone, infiltrated dexamethasone and infiltratedbupivacaine; a randomised, double-blind, placebo controlled,prospective clinical trial. J Pak Med Assoc. 2018;68:1002---8.
2. Fayoux P, Wood C. Non-pharmacological treatment of post-tonsillectomy pain. Eur Ann Otorhinolaryngol Head Neck Dis.2014;131:239---41.3.
3. Lazim NM, Abdullah B, Salim R. The effect of Tualang honey inenhancing post-tonsillectomy healing process: an open-labeledprospective clinical trial. Inter J Pediatr Otorhinolaryngol.2013;77:457---61.4.
4. Letchumanan P, Rajagopalan R, Kamaruddin MY. Post-tonsillectomy pain relief and epithelialization with honey. TurkJ Med Sci. 2013;43:851---7.5.
5. Hwang SH, Song JN, Jeong YM, Lee YJ, Kang JM. The efficacyof honey for ameliorating pain after tonsillectomy: a meta-analysis. Eur Arch Otorhinolaryngol. 2016;273:811---8.6.
6. Cheraghi F, Almasi S, Roshanaee G, Behnud F, Tehrani TH. Effectof parents training on controlling of pain due to tonsillectomyin hospitalized children: a randomized clinical trial study. Avi-cenna J Nurs Midwifery Care. 2014;22:52-63.7.
7. Shnayder Y, Lee K, Bernstein J. Management of adenotonsillardisease. In: Lalwani K, editor. Current diagnosis & treatment inotolaryngology-head & neck surgery. fourth edition New York: McGraw Hill; 2020. p. 340---7.8.
8. Meo SA, Al-Asiri SA, Mahesar AL, Ansari MJ. Role of honey inmodern medicine. Saudi J Biol Sci. 2017;24:975---8
9. Raggio BS, Barton BM, Grant MC, McCoul ED. Intraoperativecryoanalgesia for reducing post-tonsillectomy pain: a systemicreview. Ann Otol Rhinol Laryngol. 2018;127:395---401.
10. Ozlugedik S, Genc S, Unal A, Elhan AH, Tezer M, Titiz A. Canpost-operative pains following tonsillectomy be relieved byhoney?: A prospective, randomized, placebo-controlled prelim-inary study. Int J Pediatr Otorhinolaryngol. 2006;70:1929---34.
11. Simon A, Sofka K, Wiszniewsky G, Blaser G, Bode U, FleishchhackG. Wound care with antibacterial honey (Medihoney) in pedi-atric hematology-oncology. Support Care Cancer. 2006;14:91---7.
12. Shahanipour K, Sadeghi M. The therapeutic effects of aloe veraand honey on burn wounds in rats. J North Khorasan Univ MedSci. 2016;8:71---81.
13. Lazim NM, Baharuddin A. Chapter 10 --- Honey --- a natural remedyfor pain relief. In: Nutritional modulators pain aging population;2017. p. 123---34.
14. Khan F, Abadin Z, Rauf N. Honey: nutritional and medicinalvalue. Int J Clin Pract. 2007;61:1705---7.
15. Boroumand P, Zamani MM, Saeedi M, Rouhbakhshfar O, MotlaghSR, Moghaddam FA. Post tonsillectomy pain: can honey reducethe analgesic requirements? Anesth Pain Med. 2013;3:198---202.
16. Nanda MS, Mittal SP, Gupta V. Role of honey as adjuvant therapyin patients with sore throat. Natl J Physiol Pharmac Pharmacol.2017;7:412---5.
17. Al-Waili N, Salom K, Al-Ghamdi A. Honey for wound healing,ulcers, and burns; data supporting its use in clinical practice.Sci World J. 2011;11:766---87.
18. Nanda MS, Kaur M, Luthra D. Role of honey in post-operativetonsillectomy cases. Inter J Contemp Med Res. 2016;3:249---53.
19. H. Silveira, J.S. Soares, H.A. Lima, Tonsillectomy: cold dissection versus bipolar electrodissection, Int. J. Pediatr.Otorhinolaryngol. 67 (2003) 345—351.
20. Lazim NM, Baharuddin A. Chapter 10 --- Honey --- a natural remedyfor pain relief. In: Nutritional modulators pain aging population;2017. p. 123---34.14.
21. Yaghobbi R, Kazerouni A, Kazerouni O. Evidence for clin-ical use of honey in wound healing as an antibacterial,anti-inflammatory antioxidant and anti-viral agent: a review. Jundishapur J Nat Pharm Prod. 2016;8:100---4.
22. Mohebbi S, Nia FH, Kelantari F, Nejad SE, Hamedi Y, AbdR. Efficacy of honey in reduction of post-tonsillectomy pain,randomized clinical trial. Int J Pediatr Otorhinolaryngol.2014;78:1886---9.
23. Raofian H, Nasiri E, Ghafari R, Akbari H. The effect of garglingcold normal saline in comparison to normal saline mixed withhoney on postoperative pain relief in tonsillectomy or adeno-tonsillectomy: a randomized clinical trial. Iran Red CrescentMedical J. 2020;21:1---8.
24. Ayu P, Sundoro A, Sudjatmiko G. Antibacterial activity of indone-sian local honey against strains of P. aeruginosa, S. aureus andMRSA. Jurnal Plastik Rekonstruksi (JPR). 2012;1(2).
25. Molan P, Rhodes T. Honey: a biologic wound dressing. Wounds.2015;27:141---51.
26. Molan P, Rhodes T. Honey: a biologic wound dressing. Wounds.2015;27:141---51.
27. R. Kiistala, M. Hannuksela, S. Makinen-Kiljunen, A. Niinima ki, T. Haahtela, Honey allergy is rare in patients sensitive to pollens, Allergy 50 (1995) 844—847.
28. Rivers MC, Mark J. Ceiba pentandra. IUCN Red Listof Threatened Species. 2017; 2017, http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T617824 38A 61782442.en.
29. Nayaka NMD, Fidrianny I, Sukrasno Hartati R, Singgih M. Antiox-idant and antibacterial activities of multiflora honey extractsfrom the Indonesian Apis cerana bee. J Taibah Univ Med Sci.2020;15:211---7.65