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# Effectiveness of green tea mouthwash in comparison to chlorhexidine mouthwash in patients with acute pericoronitis: a randomized clinical trial

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*Abstract.* The objective of this study was to evaluate the effectiveness of green tea mouthwash in controlling the pain and trismus associated with acute pericoronitis in comparison to chlorhexidine (CHX) mouthwash. Ninety-seven patients with acute pericoronitis underwent debridement and received 5% green tea mouthwash (study group) or 0.12% CHX mouth rinse (control group). Pain (visual analogue scale; VAS), number of analgesics, maximum mouth opening (MMO), and number of patients with trismus were determined. There were no significant differences in demographic variables ($P > 0.05$), or baseline VAS ($P > 0.006$), MMO ($P > 0.017$) or number of patients with trismus ($P > 0.017$) between the two groups. The mean VAS score of the study group was statistically lower than that of the control group between post-treatment days 3 and 5 ($P < 0.006$). A significantly lower number of analgesics were taken by the study group ($P < 0.05$). Although the MMO of the study group was significantly lower on day 3 ($P < 0.017$), no significant difference was observed on day 7 ($P > 0.017$). Fewer of the patients rinsing with green tea had trismus on days 3 and 7, but the difference was non-significant ($P > 0.017$). Hence, green tea mouth rinse could be an appropriate and effective choice for the control of pain and trismus in acute pericoronitis.

Key words: *Camellia sinensis*; acute pericoronitis; mouthwash; trismus; pain..

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Pericoronitis is the inflammation of the tissue surrounding the crown of the tooth while it is erupting into the oral cavity or is impacted in soft tissue. As the most commonly impacted tooth, the mandibular third molar is most prone to developing pericoronitis.[1,2] The mandibular third molar usually erupts between the ages of 18 and 24 years, hence pericoronitis is mostly observed in young adults.[3,4]

Pericoronitis is triggered by the accumulation of food debris under the operculum that overlies the impacted tooth; this situation provides appropriate shelter for bacterial growth. Various studies have shown that the microbial flora in pericoronitis is mostly anaerobic.[1,5–7] In addition, trauma caused by the opposing teeth during occlusion may enhance the inflammation.[1]

Based on clinical features, pericoronitis can be divided into acute and chronic forms. Acute pericoronitis is characterized by severe pain, swelling of the operculum, trismus, regional lymphadenitis, painful swallowing, halitosis, pyrexia, and pus discharge. In the chronic form, the patient faces a dull pain that lasts for 1–2 days, followed by a period of remission lasting several months. The treatment of acute pericoronitis includes debridement and irrigation of the under-surface of the operculum to eliminate bacterial accumulation.[8] Conventionally, chlorhexidine (CHX) mouthwash is prescribed during the first week after debridement for its antibacterial properties.[9] It should be noted that the main aim of treatment in the acute phase is to diminish the signs and symptoms of inflammation.[8,9]

Green tea (*Camellia sinensis*) is a popular drink in Eastern countries and is rich in polyphenols, compounds that possess various properties including antioxidant, anti-diabetic, anti-mutagenic, antiviral, antibacterial, and anti-inflammatory.[10] Various studies have shown the benefits of green tea in periodontal disease, oral surgery, and caries.[11–14] To date, there has been no research to evaluate the effectiveness of green tea in pericoronitis.

The aim of the current study was to investigate whether green tea mouthwash is effective in controlling pain and trismus in patients with acute pericoronitis. The study hypothesis was that the green tea mouthwash is as effective as CHX mouthwash in controlling pain and trismus in acute pericoronitis.

## Materials and methods

The study was performed in the oral and maxillofacial clinic of the study university. The study protocol was approved by the university ethics board, and all participants provided signed detailed informed consent.

### Study sample

The study population consisted of 101 patients (34 males and 67 females) who were referred to the oral and maxillofacial clinic due to acute pericoronitis of the mandibular third molar between March 2011 and June 2012. Patients were excluded from the study if they had any chronic disease (e.g., chronic diabetes, renal disease), had taken an antibiotic regimen over the past 3 months, had the chronic type of pericoronitis, had periodontal disease in the region of the pericoronitis, were pregnant or lactating, were smokers, or were allergic to amoxicillin.

### Study variables

The predictor variable was the type of mouth rinse (green tea or CHX) used in each group. The outcome variables were self-reported pain (based on a visual analogue scale; VAS), number of analgesics taken, maximum mouth opening (MMO), and number of patients with trismus. The other study variables were demographic variables including age and sex.

### Green tea mouthwash preparation

The green tea extract was prepared in the pharmacology laboratory of the study university. The preparation procedure consisted of the following stages: *Camellia sinensis* leaves were dried at 40 °C for 45 min and then powdered in an electric mortar grinder. Next, 100 g of the powder was mixed with 500 ml of water. After 48 h this mixture was filtered and the sediment was removed. The remaining solution was stored at room temperature for 4 days; after this period, the green tea extract powder was obtained.

In order to prepare the green tea mouthwash at 5% concentration, 5 g of the extract was dissolved in 100 ml distilled water.

### Treatment protocol

All patients underwent thorough debridement and irrigation of the underlying surface of the operculum. All of the debridement procedures were performed by a single calibrated operator. Each patient received a 250-ml dark bottle containing the mouthwash and was instructed to rinse with this mouthwash twice a day for 7 days. All patients were instructed to take a full regimen of amoxicillin (500 mg, $n = 21$, three times daily) and an optional analgesic regimen (acetaminophen, 500 mg, $n = 15$, three times daily).

### Patient allocation

Following debridement and irrigation, the patients received a single bottle of either chlorhexidine 0.12% (control group) or green tea 5% (study group) mouth rinse based on the flip of a coin. The patients had no idea of the mouthwash type provided.

### Data collection

To measure the pain level, patients were instructed to mark their pain on a 100-mm VAS, with 0 indicating no pain and 100 indicating the most severe and worst pain. Patients were asked to record the VAS each morning for 7 consecutive days prior to rinsing or taking their medication. In addition, the patients were instructed to record the number of analgesics they had taken during the first post-treatment week.

To measure the amount of MMO, the inter-incisal distance between maxillary and mandibular right central incisors was recorded using a calliper. Three measurements were performed for each patient, the first before debridement and the second and third on days 3 and 7 of therapy. Measurements were made by the second calibrated operator who had no idea to which group the patient had been assigned. Patients were recorded to have trismus if the MMO was less than 40 mm.[15]

### Statistical analysis

Appropriate descriptive statistics (including mean, standard deviation, and frequency) were computed for each variable. To analyze the data, repeated measures analysis of variance (ANOVA), independent sample *t*-tests, and $\chi^2$ tests were performed using SPSS software version 11.5 (SPSS Inc., Chicago, IL, USA). In order to reduce the risk of type 1 error in multiple independent sample *t*-tests of VAS and MMO, the significance level of 0.05 was divided by the number of comparisons to make the *P*-value $<0.05$ stricter.

## Results

A total of 101 patients met the inclusion criteria; however, four patients – three in the green tea group and one in the CHX group – did not attend follow-up sessions