Original Article

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Comparative Evaluation of Efficacy of Green Tea vs Normal Saline on Post-Operative Swelling and Pain in Third Molar Surgery

Sehrish Liaqat, Ahsan ullah, Shahzad Nasir, Muhammad Abi Waqas, Shaheen Anjum, Namal Pervez

[1]Associate Professor and HOD oral Medicine at NID Multan, [2]School of Dentistry SZABMU Islamabad
[3]Assistant Professor, HOD OMFS Margalla College of Dentistry, [4]Dental Materials department, MMDC Multan
[5]Assistant Professor Oral and Maxillofacial Surgery Nishter Institute of Dentistry, Multan,[6] de'Montmorency College Lahore

Author`s Contribution

[1,5]Substantial contributions to the conception or design of the work; or the acquisition, [1,2]Final approval of the study to be published,[6]Active participation in active methodology, analysis, or interpretation of data for the work, [3,4]Drafting the work or revising it critically for important intellectual content

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Address of Correspondent
Dr Ahsan ullah
Dept of OMFS
School of Dentistry SZABMU
Islamabad
ahsan_rush@hotmail.com

ABSTRACT

Objective: To find effectiveness of green tea mouthwash while comparing it with normal saline in lowering postoperative edema and alleviating pain following impacted mandibular third molars.

Methodology: The study was conducted at Nishtar Institute of Dentistry in Multan from June 30, 2021, to January 31, 2023, and comprised 56 individuals (28 in each group) aged 18-30 with impacted third molars. The study included both males and females between the ages of 18 and 30 who had impacted third molars unilaterally or bilaterally and required extraction. Teeth associated with fracture and pathologies were excluded from study. Panoramic radiography evaluated surgery sites. The study included both males and females between the ages of 18 and 30 who had impacted third molars unilaterally or bilaterally and required extraction. Teeth associated with fracture and pathologies were excluded from study.

Results: The research had 56 participants, with a similar age and gender distribution across the two groups. There were no significant variations in pain levels, edema, surgery length, or post-operative analgesic use between the groups. Group 1 had a significant link between age and pain (p=0.035), but Group 2 did not. Table I-VI includes the full facts.

Conclusion: Rinsing with mouthwash made from green tea daily may help with postoperative issues, like as discomfort, after impacted molar surgery, perhaps minimizing the need for analgesics and preventing adverse effects from antibiotics, NSAIDs, or chlorhexidine mouthwash.

Keywords: Extraction, Green Tea, Pain, Surgery, Swelling.

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Introduction

Following surgical extraction of mandibular third molars, the most frequent unwanted complications are edema, soreness, and trismus.[1] In addition to providing appropriate treatment and restoring function, the primary goal of dental and oral specialties is to relieve pain and improve the function of their patients as early as possible.[2] Lifestyle modifications, on the other hand, have manifested as reduced human jaw size that leads to inadequate room for the third molars to erupt into arch properly. As a consequence, the prevalence of third molar impaction considerably increased and postoperative discomfort after surgically removing third molar teeth has remained a major source of concern for many dentists.[3] Aside from the discomfort, a patient's attitude toward dentistry may change because of the suffering.[4]

Several medicines have been used to relieve postoperative pain after the surgical removal of impacted molar teeth.[5] Analgesics like Paracetamol, Diclofenac Sodium, and NSAIDs (non-steroidal anti-inflammatory drugs) have been often used to manage postoperative pain.[6] NSAIDs on the other hand, have been linked to gastrointestinal and renal problems.[7] Synthetic corticosteroids have anti-inflammatory effects, such as reducing vascular dilation, liquid transudation, and edema formation, and are thus commonly used to regulate or reduce the inflammatory

response after mandibular third molars surgical extraction.[8]

Since 3000 B.C., green tea (Camellia sinensis), a dried leaf product, has been a common therapeutic beverage in East Asian countries. Green tea, which is abundant in Asia, is also one of the most widely consumed beverages worldwide. Green tea is high in polyphenols, such as catechins, which have antioxidant, anti-mutagenic, antiviral, antibacterial, and anti-inflammatory activities[9-11] They could also prevent exaggerated collagen production and accumulation and induce changes in immune responses. Epicatechin, Epicatechin gallate, Epigallocatechin, and Epigallocatechin gallate are just a few of the antioxidant components found in green tea, and only a small amount of these can help wounds heal.[12,13] These chemicals (e.g. epigallocatechin gallate) have now been employed to aid in the reproduction and differentiation of keratinocytes. Its anti-fibrinogen properties have also been confirmed in animal models.[14]

Epigallocatechin gallate (EGCG) was found to be the most significant element, accounting for more than thirty percent of entire catechins, and it was proven to decrease dentin wear during oral mouth cleaning under abrasive/erosive conditions.[12] Several pro-inflammatory molecules are inhibited or blocked by EGCG, including peroxynitrite, ROS (reactive oxygen species), Cyclooxygenase-2, and nitric oxide synthase, which is assumed to affect on cell's anti-inflammatory activity.[15]

Epithelial gingival cells and macrophages induce severe tissue response to inflammatory cytokines like interferon, or oral bacterial LPS (lipopolysaccharides). When macrophages are activated, inflammatory mediators, commonly referred to as pro-inflammatory cytokines, may be produced. [16] Green tea has been demonstrated to be effective in preventing periodontal disease and cariogenic effects.[17] Green tea ingredients have been studied in the management of postsurgical complications in exodontia, but only a few studies have been conducted on a limited population sample.[18] The purpose of this study was to investigate how effective green tea mouthwash while comparing with normal saline in minimizing postoperative edema and alleviating pain following impacted mandibular third molars by .

Methodology

The study was conducted in the Department of Oral and Maxillofacial Surgery, Nishtar Institute of Dentistry Multan. from 30th June 2021 to 31 Jan 2023 after getting ethical approval from the Institutional Review Board. All participants gave informed written consent after being assured that their names would not appear in the final results. The study included both males and females between the ages of 18 and 30 who had impacted third molars unilaterally or bilaterally and required extraction. Teeth associated with fracture and pathologies were excluded from study. Panoramic radiography was used to analyze the relationship between the inferior alveolar nerve, ramus, and adjacent tooth before surgery.

A sample size of 56 (28 in each group) was calculated through the computer-based software WHO Sample size calculator.90% power of the test, the confidence level is 95%, the anticipated population mean is 9.69, the test value of the population mean was 4.03, and the population variance was 28.35.[12] All patients who did not have a green tea allergy, who hadn't taken any medicine or herbal remedies in the last 2 weeks, who didn't have any bleeding disorders or immune disorders, who hadn't had a recent acute or uncontrolled surgical infection, and who hadn't taken any analgesics, corticosteroids, or antibiotics in the previous two weeks were included in the study. Smokers, pregnant or nursing mothers, and those having a lesion at the operating site on a radiograph were excluded from the study. Patients who were diabetic, immunocompromised, or refusing to take part in the research were also excluded. An oral and maxillofacial surgeon used a standardized technique to accomplish all third molar tooth extractions.

Basic aseptic measures were taken before using 2% lidocaine and 1.100000 epinephrine to anesthetize the inferior alveolar and long buccal nerve blocks. The patient's data, including age, gender, and the level of complexity of the surgery, were documented accordingly. The participants were separated into two groups of 30 individuals in each group using consecutive sampling and the simple lottery method. Green Tea Group 1 study participant groups and Group 2 were Placebo Mouthwash (Normal Saline). Following surgery, patients were observed on the third and seventh days to evaluate the outcome variables of pain and edema.

The primary outcome included self-reported pain (based on a VAS scale of 0–10, 0 no pain to 10 severe) and swelling measured from the tragus to the angle of the mouth and from the anterosuperior margin of the zygomatic arch to the lower border of the mandible at the angel area. A single observer recorded pre- and postoperative differences. Swelling is taken into account when there is a post-operative increase of more than 5 mm, and pain is evaluated when it exceeds 3 on the Visual Analog Scale. Duration of postoperative analgesia and

surgical time was also assessed in both groups to find its significance and correlation.

Appropriate descriptive statistics (including mean, frequency, and standard deviation) were computed for each variable. Mean and Standard deviation for both groups were determined for quantitative variables including swelling, postsurgical pain scale, and age with a 95% confidence interval. Confounding factors such as age and gender were regulated by stratification. Post-stratification Chi-square test was used and the P-value was calculated and a p-value equal to or less than 0.05 was considered significant.

Results

A total of 56 participants who fulfilled the basic criteria of inclusion were included in the study. The mean age with SD of participants of Group 1 was 23.5 ± 3.426 and the mean age and SD of Group two was 23.07 ± 3.887. There were 12(42.9%) male and 16(57.1%) female in group 1 and 16(57.1%) male 12(42.9%) female in group 2. Age, and gender, did not significantly differ between the two groups as shown in Table I.

With a P-value of 0.290, we did not find any differences in pain levels between the two groups throughout the first week following surgery. Cross-tabulation of the groups were shown in Table II. There was no statistical difference between the groups when the mean values of the two groups were evaluated for swelling (P=0.111, Table III).

When grouping was taken into account for post-operative analgesic 14(50%) of participants took analgesics for the first 24 hours, 12(42%) for 48 hours and only 2(07%) took analgesics for more than 72 hours while in group two 16(57%) took for first 24 hours, 8(28%) for 48 hours and 4(14.3%) took analgesics for more than 72 hours. The surgical duration of the procedure did not significantly differ between the two groups P- value 0.481. In addition, both groups showed no significant correlation in terms of post-operative analgesics p-value of 0.275. Cross-tabulation of both surgical duration and post-surgical analgesics mentioned in Table IV.

When both groups were stratified for pain with age and gender group 1 participants showed a significant relation with age and pain (p-value 0.035), and no significant relation with gender. Group two didn't show any

Table I: Demographic Data of Patients According To Age And Gender In Both Groups.

		Group 1			Group 2			
Age	Age Groups	N	%	Mean age ±SD	N	%	Mean age ±SD	P Value
	18-22	11	39.3	23.5 ± 3.426	14	53.33	23.07 ± 3.887	0.596
	23-26	13	46.4		08	46.47		
	27-30	04	14.3		08			
Gender	Male	16	42.9		12	57.1		0.250
	Female	12	57.1		16	42.9		

Table II: Comparison of pain between both Groups (n=56).

		Group 1		Group 2		
		No. of Patients	%age	No. of Patients	%age	**P value**
Post-Operative Pain	No pain	07	25	05	17.9	0.290
	Mild pain	14	50	13	46.4	
	Moderate pain	05	17.9	08	28.6	
	Severe pain	02	7.1	02	7.1	

Table III: Comparison of swelling between both Groups. (n=56)

		Group 1		Group 2		
		No. of Patients	%age	No. of Patients	%age	**P value**
Post-Operative Swelling	No swelling	10	35.7	11	39.3	0.111
	Mild swelling	13	46.4	12	42.9	
	Moderate swelling	03	10.7	04	14.3	
	Severe swelling	02	7.1	01	3.6	

Table IV: Comparison of surgical time and post-operative analgesics in both groups. (n=56)

	Time	**Group One**	**Group Two**	**P value**
Surgical Time	≤ 1 hour	20	15	0.481
	≥ 1 hour	05	12	
	≥ 2 hours	03	01	
Post-Op Analgesics	First 24 hours	14	16	0.275
	≥ 24 hour ≤ 48 hours	12	08	
	≥ 72 hours	02	04	

Table V: Stratification of Pain With Age And Gender In Both Groups. (n= 56)

		Pain				P value
		No pain	Mild	Moderate	Severe	
Age Group One	18-22	3	6	2	0	**0.035**
	23-26	3	7	3	0	
	27-30	1	1	0	2	
Age Group Two	18-22	3	6	4	2	0.688
	23-26	2	4	1	1	
	27-30	0	3	3	0	
Gender Group One	Male	2	9	1	0	0.123
	Female	5	5	4	2	
Gender Group Two	Male	5	5	4	2	0.064
	Female	0	8	4	0	

Table VI: Stratification of Swelling with Age and Gender in Both Groups. (n= 56)

		Swelling				P value
		No swelling	Mild	Moderate	Severe	
Age Group One	18-22	3	6	2	0	**0.025**
	23-26	6	6	1	0	
	27-30	1	1	0	2	
Age Group Two	18-22	4	8	2	0	0.163
	23-26	5	1	2	0	
	27-30	2	3	0	1	
Gender Group One	Male	3	8	1	0	0.247
	Female	7	5	2	2	
Gender Group Two	Male	7	6	2	1	0.736
	Female	4	6	2	0	

Table VI: Stratification of Swelling with Age and Gender in Both Groups. (n= 56)

		Swelling				P value
		No swelling	Mild	Moderate	Severe	
Age Group One	18-22	3	6	2	0	**0.025**
	23-26	6	6	1	0	
	27-30	1	1	0	2	
Age Group Two	18-22	4	8	2	0	0.163
	23-26	5	1	2	0	
	27-30	2	3	0	1	
Gender Group One	Male	3	8	1	0	0.247
	Female	7	5	2	2	
Gender Group Two	Male	7	6	2	1	0.736
	Female	4	6	2	0	

significant relation with age and gender as shown in Table V. Details of stratification of age and gender with swelling in both groups showed no significant relation mentioned in Table VI.

Discussion

The current study's objective was to determine if green tea mouthwash was effective in lowering the incidence of post-operative discomfort and swelling following surgical removal of the impacted third molar. Pain is a subjective experience, making its measurement challenging. According to Bijur PE et al. the visual analogue scale (VAS) is a sensitive and trustworthy tool for assessing pain after surgically extracting impacted third molars.[19] However, after using two different types of mouthwash, each participant's pain scale was compared to his or her own discomfort. In the present study, postoperative pain for both groups was stratified with age and gender and we have found the statistical significance of pain and age (P=0.035) of patients in the green tea group while Saline group didn't show any significance with age and gender. The findings of our study are consistent with those of prior research that was conducted by Eshghpour et al.[14]

The effectiveness of green tea rinse for postoperative pain management was assessed in a double-blind randomized controlled trial with split-mouth design on 44 participants for extraction of an impacted wisdom tooth. Results revealed that using this mouthwash daily during the first seven days following surgery considerably reduces the amount of pain medication needed and the intensity of the discomfort.[14] Another Randomized Control Trial of 97 individuals with acute pericoronitis of mandibular third

molars to green tea mouthwashes showed a substantial reduction in pain score and frequency of analgesic usage and a non-significant change in mouth opening.[20]

Green tea rinses were also effective in the treatment of acute pericoronitis, according to Shahakbari et al. Through microbial cell membrane damage, an antagonistic action on the gyrase enzyme, and the destruction of the microbial cytoplasmic membrane, green tea's antimicrobial action has been linked to its EGCG and other components.[22] Therefore, the bacterial as well as fibrinolytic cause would be the reduction in the likelihood of experiencing post-operative pain.

After using green tea rinse, there was less post-operative discomfort and edema than when using a placebo. However, there was no statistically significant difference in the frequency of discomfort and swelling between the two groups (P=0.239). The antibacterial properties of green tea may account for its efficacy.[21] The bacterial activity that enhances fibrinolysis and dislodging clot of the extraction socket is one of the hypothesized etiologies for the development of post-operative discomfort and swelling.[21]

The ability of green tea to reduce inflammation has been investigated in several in vivo studies. According to a study on type 1 diabetic rats, extract of green tea reduces the release of tumor necrosis factor-alpha and the receptor activator of nuclear factor kappa-B ligand, which slows alveolar bone resorption in comparison to the control group.[23] Another animal study utilizing green tea extract on albino rats showed a significant decrease in the injuries inflicted by nicotine in terms of inflammatory cell infiltrates in the buccal mucosa.[24] The main mechanism by which EGCG exerts its anti-inflammatory effects is the down regulation of Cyclooxygenase-2 through the inhibition of interleukin-1b-dependent pro-inflammatory signal transduction and the expression of the genes for interleukin-6, interleukin-8, and tumor necrosis factor at inflammation sites.[22,25] Such findings suggested the potential advantages of tea mouthwash formulations in clinical settings.

According to previous studies, the degree of trauma during the procedure directly influences the intensity of postoperative pain.[26] The extraction difficulty score (based on a radiograph) and the length of the procedure are two indicators of trauma in molar extraction surgery. However, in our study, we did not find a significant difference between the green tea group and the normal saline group (p=0.481) Table IV. Additionally, the surgeon's experience may have an impact on the degree of trauma and, consequently, postoperative problems.[27] This factor was avoided by performing all procedures by an experienced qualified surgeon.

Based on the findings of our study, fewer participants utilized analgesics for pain relief in the green tea group than in the saline group. Multiple types of analgesics are used to improve the quality of life after surgical exodontia.[28] The usefulness of green tea in reducing pain intensity could be the focus of this. Additionally, because the control group used more analgesics overall and during the first two days following surgery, there was a non-significant change in VAS on day seven. According to the previous study's findings, after the rinse began, green tea extract significantly decreased postoperative discomfort because of its chemical constituents. which have been demonstrated to have anti-inflammatory effects when they are present.[29]

The present study included several limitations as well. Since we started mouthwash use on the day one of surgery, rinsing on the day of surgery may dislodge the blood clot and further aggravate potential problems and we use analgesics to decrease pain because pain peaks after 6 to 12 hours. Also, procedures are performed by different surgeons that may cause different surgical traumas. These limitations can be addressed in future studies on a larger sample size. The results of the current study indicated that daily rinsing with green tea may be beneficial to control postoperative complications of impacted molar surgery including pain. Moreover, the need for analgesics would become less, and side effects following using antibiotics, NSAIDs, or chlorhexidine mouthwash could be escaped.

Conclusion

Rinsing with mouthwash made from green tea daily may help with postoperative issues, like as discomfort, after impacted molar surgery, perhaps minimizing the need for analgesics and preventing adverse effects from antibiotics, NSAIDs, or chlorhexidine mouthwash.

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