

EFFECT OF TETRACYCLINE ON POSTOPERATIVE PAIN AND WOUND HEALING: A COMPARATIVE PROSPECTIVE STUDY

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Abstract

Background: The anti-inflammatory nature of tetracycline can be useful in the reduction of postoperative sequelae following extraction. It has also been reported that, gelatin sponge too reduces postoperative complications after oral surgical wounds. Gelatin sponge serves as a mechanical hemostatic agent which obliterates dead space which hastens healing of wound.

Aim and objectives: this study aims towards the effect of tetracycline capsule on postoperative pain and wound.

Methodology: Seventy-two patients requiring mandibular teeth extraction of the age group of 18 and above who reported to the Department of Oral and Maxillofacial Surgery, from January 2022 to April 2022 were included in the study. A small piece of collagen membrane was used on the superior surface of the socket after placement of the medicament (Tetracycline+Gelatin Sponge). Pain and status of wound healing was recorded after 1 day, 7 days and 14 days postoperatively. Systemic antibiotics were not prescribed in any of the group, in Control group, patients were given oral analgesics (Tab Zerodol sp) twice daily for 3 days and from first postoperative day onward whereas in the Treatment group, oral analgesics were given SOS.

Results: Comparison made on the 1st day showed statistically significant correlation between the study (2.19±0.401) and control group (2.00±0.00) (p=0.005). On the 7th day, comparison made between the groups showed statistically significant correlation between the study (4.22±0.591) and control group (3.28±0.882) (p<0.0001). After 14 days, comparison made between the groups showed statistically significant correlation between the study (5.00±0.00) and control group (4.78±0.422) (p=0.002).

Conclusion: The present study concludes that tetracycline compound placement after the surgical extraction of mandibular tooth yielded less pain and inflammation than in the controls who received no such treatment.

INTRODUCTION

Local Anaesthetic solution is responsible in making the procedure of extraction of tooth or exodontia painless but there are many postoperative complications according to researches. Researches have highlighted that pain, swelling, dry socket and difficulty in opening of mouth are the common complications after the extraction of

teeth[1]. Management of pain and infection preoperative and postoperative is of equal importance. Painless postoperative period is a major requirement following routine dental extractions. Therefore, emphasis should be given to the procedures and agents that help reduce the complications for better postoperative recovery. Intra-socket antibiotics are applied to reduce the postoperative complications after extraction of teeth. Topical Tetracycline placed in the intra-socket post extraction gives reduction of postoperative pain compared to the one's undergoing routine dental extraction without its placement[1,2]. Tetracycline discovered in early 19th century are primarily bacteriostatic, against a wide variety of microorganism including both Gram positive and Gram negative bacteria. Mechanism of action of tetracycline is that it inhibits protein synthesis by binding to 30s Ribosome in susceptible organism. Subsequent to such binding, attachment of amino acyl t- RNA to the m- RNA Ribosome complex is interfered with Matrix metalloproteinase (MMPs) are a group of >20 Zn dependent enzymes which regulate inflammation[1-3]. Pathologically, the elevation of MMP's causes connective tissue and bone loss in various inflammatory diseases. Tetracyclines are effective inhibitors of mammalian MMPs. Tetracyclines can inhibit both intracellular and extracellular MMPs. Tetracycline inhibits MMPs on specific sites that has been identified as the Calcium and Zinc-binding site at C-11 and 12. The anti-inflammatory nature of tetracycline is utilized in the various dermatological diseases and in periodontitis too[4-9]. The anti-inflammatory nature of tetracycline can be useful in the reduction of postoperative sequelae following extraction. It has also been reported that, gelatin sponge too reduces postoperative complications after oral surgical wounds. Gelatin sponge serves as a mechanical hemostatic agent which obliterates dead space which hastens healing of wound[5-10] . There is no comparative study available in the literature to evaluate the efficacy of tetracycline and tetracycline + gelatin sponge to reduce postoperative pain and surgical site infection after extraction in patients without any systemic antibiotic coverage . Although studies regarding the use of topical tetracycline as well as gelatin sponge independently placed in the extraction socket have been done but no comparative study is available in literature to evaluate their combined usage in extraction socket. This particular study hypothesized that tetracycline capsule has performed comparatively better than usage of systemic antibiotics on post operative extraction with respect to pain and wound. Hence, this study aims towards the effect of tetracycline capsule on postoperative pain and wound.

MATERIALS AND METHODS

Aims and Objectives

Assessment of post extraction pain and wound in patients after mandibular tooth extraction divided into two groups (treatment -tetracycline+gelatin sponge and control- without tetracycline+gelatin sponge)

Seventy-two patients requiring mandibular teeth extraction of the age group of 18 and above who reported to the Department of Oral and Maxillofacial Surgery, from January 2022 to April 2022 were included in the study. Written informed consent was obtained in a given format before the treatment. Institutional ethical clearance was obtained before the study was conducted. Patients were divided into two groups in a random manner:

Treatment Group- Patients treated with intra-socket Tetracycline+Gelatin Sponge (n= 36)

Control Group- Patient treated without intra-socket medicament(n= 36)

Patient requiring transalveolar/ surgical extraction, those who are already on per-operative antibiotic coverage, pregnant and lactating women, patients belonging to ASA Category \geq II, patients who are less than 18 years of age, mentally challenged patients, or patients unable to communicate were excluded from the study . Third molars requiring bone guttering or sectioning of the tooth were excluded too.

Patients undergoing single mandibular tooth intra-alveolar extraction, patient willing for follow up, those who subjected with no known allergy to Tetracycline, patients belonging to ASA Category I and those who are 18 and above years of age were included in the study.

Preoperative analysis was done using the intraoral periapical radiograph. Under strict aseptic condition, surgical procedure was carried out by the same operator. Tetracycline capsule(250 mg) was mixed with 0.5ml of saline and

placed in the socket, this mixture was impregnated on gelatin sponge which was cut according to the extraction socket size and was placed in the same. This is the procedure of the treatment group. Another group was kept as control. Extra-oral skin scrub was also done. The oral surgeries, that is, extraction of teeth were performed under local anaesthesia (Lignocaine 2% with adrenaline 1:80000)

Extraction was done carefully, while preserving the alveolar bone plates around the teeth under aseptic conditions.

Reflection of mucoperiosteal flap

A periosteal elevator is used to elevate the mucoperiosteum surrounding the tooth. The loosening of the soft tissues around the tooth also permits the elevators or forceps to be applied more apically.

Luxation of the tooth using elevator(in case of root stumps)

An appropriate elevator was used to detach the tooth from its soft tissue attachment. The elevator was applied to expand the alveolar socket and tear the periodontal ligament which helps in the luxation of the tooth from its socket.

Adaptation of forceps and removal of the tooth

Appropriate forceps were chosen depending upon the shape and location of the tooth, appropriate forceps were delivered and the extraction was completed.

There was no need of surgical bone removal in any of the cases.

After extraction, thorough debridement of the extraction socket was done with fine curettes. Visible granulation tissue was curetted from the socket. Irrigation was done with sterile saline and Betadine.

A small piece of collagen membrane was used on the superior surface of the socket after placement of the medicament (Tetracycline+Gelatin Sponge). Socket was closed by figure of 8 sutures with 3 black silk suture in two groups mentioned.

Pain and status of wound healing was recorded after 1 day,7days and 14 days postoperatively. Systemic antibiotics were not prescribed in any of the group, in Control group, patients were given oral analgesics (Tab Zerodol sp) twice daily for 3 days and from first postoperative day onward whereas in the Treatment group, oral analgesics were given SOS. For pain, scores were taken on a Visual Analog Scale (VAS) of 10cm, from the patient, after 1,7and 14 days.

RESULT

A total of 72 patients requiring mandibular tooth extraction were enrolled as the study participants. The data was recorded in the Microsoft excel 2016 and analyzed using IBM SPSS Version 25. Individual follow up scores were calculated using Descriptive statistics. It was presented in terms of Mean and SD. One Way ANOVA statistics were calculated to compare the independent groups. Over the period of time comparison was made using Paired t test statistics. P Value was kept at <0.05.

Table 1: Descriptive statistics for the Visual Analogue Scale for both the groups

VAS Scores	Study Group		Control		F Score	P Value
	Mean	SD	Mean	SD		
1 st Day	0.83	1.056	4.17	0.845	218.750	<0.0001*
7 th Day	0.00	0.00	1.44	0.504	295.750	<0.0001*
14 th Day	0.00	0.00	0.00	0.00	-	-

*statistically significant

Table 1 states the descriptive statistics for the VAS scores for both the groups.

Comparison made on the 1st day showed statistically significant correlation between the study (0.83±1.056) and control group (4.17±0.845) (p<0.0001). On the 7th day, comparison made between the groups showed statistically significant correlation between the study and control group (1.44±0.504) (p<0.0001). After 14 days there was no pain reported by any of the group.

Table 2: Intra group comparison for the Visual Analogue Scale for both the groups

Group		Paired Differences					P Value	
		Mean	Std. Dev	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
Study Group	VAS_1st Day - VAS_7th Day	.833	1.056	.176	.476	1.190	4.737	<0.0001*
	VAS_1st Day - VAS_14th Day	.833	1.056	.176	.476	1.190	4.737	<0.0001*
Control Group	VAS_1st Day - VAS_7th Day	2.722	1.003	.167	2.383	3.062	16.282	<0.0001*
	VAS_1st Day - VAS_14th Day	4.167	.845	.141	3.881	4.453	29.580	<0.0001*
	VAS_7th Day - VAS_14th Day	1.444	.504	.084	1.274	1.615	17.197	<0.0001*

*statistically significant

Over the period of time VAS comparison was made comparing individual follow ups have been tabulated in Table 2. A statistically significant difference was noted between the 1st and 7th day (p<0.0001), 1st day and 14th day (p<0.0001) and also between 7th day and 14th day follow up (p<0.0001).

Table 3: Descriptive statistics for the Wound Healing scale for both the groups

Wound healing Scores	Study Group		Control		F Score	P Value
	Mean	SD	Mean	SD		
1 st Day	2.19	0.401	2.00	0.000	8.448	0.005*
7 th Day	4.22	0.591	3.28	0.882	28.493	<0.0001*
14 th Day	5.00	0.000	4.78	0.422	10.00	0.002*

*statistically significant

Table 3 states the descriptive statistics for the Wound Healing scores for both the groups. Comparison made on the 1st day showed statistically significant correlation between the study (2.19±0.401) and control group (2.00±0.00) (p=0.005). On the 7th day, comparison made between the groups showed statistically significant correlation between the study (4.22±0.591) and control group (3.28±0.882) (p<0.0001). After 14 days, comparison made between the groups showed statistically significant correlation between the study (5.00±0.00) and control group (4.78±0.422) (p=0.002).

Table 4: Intra group comparison for the Wound healing Scale for both the groups

Group		Paired Differences					P Value	
		Mean	Std. Dev	Std. Error Mean	95% Confidence Interval of the Difference			
					Lower	Upper		
Study Group	WH_1st Day WH_7th Day	-2.028	.654	.109	-2.249	-1.806	-18.602	<0.0001*
	WH_1st Day WH_14th Day	-2.806	.401	.067	-2.941	-2.670	-41.938	<0.0001*
	WH_7th Day WH_14th Day	-.778	.591	.098	-.978	-.578	-7.897	<0.0001*
Control Group	WH_1st Day WH_7th Day	-1.278	.882	.147	-1.576	-.979	-8.693	<0.0001*
	WH_1st Day WH_14th Day	-2.778	.422	.070	-2.920	-2.635	-39.528	<0.0001*
	WH_7th Day WH_14th Day	-1.500	.971	.162	-1.829	-1.171	-9.269	<0.0001*

*statistically significant

Table 4 shows an intra-group comparison for the wound healing scale for the groups. A statistically significant difference was noted between the 1st and 7th day (p<0.0001), 1st day and 14th day (p<0.0001) and also between 7th day and 14th day follow up (p<0.0001).

DISCUSSION

Pain is the most common symptom of disease, which accompanies us from an early age. It is a protective mechanism to which the body responds to harmful stimulus. The definition of pain states that it is a subjective sensory and emotional experience. It is connected to the stimulus that it invokes and is also based on the observation of psychological interpretation of the phenomena taking place. Pain is individual for each person. Pain after extraction is a common complication. Post extraction pain occurs in extraction wound and this pain results from the inflammation at the site of extraction which is a part of normal wound healing and healing is a complex biological process which involves participation of many cells and growth factors. The platelets are activated by coagulation cascade, particularly thrombin and subendothelial collagen [9-18]. These platelets contain several growth factors, which stimulates biological functions such as chemotaxis, angiogenesis, proliferation, differentiation, and modulation, which affects the wound healing and regeneration. In a study of human immunodeficiency virus infection-positive patients. According to research antibiotic use (penicillin and tetracycline) in post extraction sockets may reduce swelling and trismus, although this postulate has not been confirmed in recent years. Further research shows that the most useful medications to prevent socket healing derangements include broad-spectrum antibiotics, specifically clindamycin and tetracycline, but possibly germane to the subject of clot stabilization and healing, is consideration of resorbable substances such as gelatin sponge, polylactic acid, and methylcellulose as clot-stabilizing socket implants.

CONCLUSION

The present study concludes that tetracycline compound placement after the surgical extraction of mandibular tooth yielded less pain and inflammation than in the controls who received no such treatment.

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