

## Application of figure-of-eight suture for mandibular third molar surgery: A prospective cohort study

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### Abstract

**Objective:** To compare figure-of-eight suture with interrupted suture in closing the wound of impacted third molar extraction.

**Methods:** In this study, one hundred and ninety-nine impacted third molars referred for surgical extraction were eligible for inclusion. They were randomized into two groups: figure-of-eight suture (n=107) and interrupted suture (n=92). Hemorrhage, alveolar osteitis, pain, swelling and trismus were observed.

**Results:** Our results indicated that figure-of-eight suture could not remarkably decrease postoperative hemorrhage, but it reduced the occurrence of alveolar osteitis. No differences were observed in pain, swelling or trismus. Interestingly, we found that the time to take out stitches was much less in the figure-of-eight suture group than in the interrupted suture group.

**Conclusion:** The findings indicated that the technique of figure-of-eight suture may be an effective method for closing the wound from extraction of impacted third molars.

**Keywords:** Suture, Mandibular, Molar surgery

### INTRODUCTION

Extraction of impacted teeth has become a routine method in oral surgery. The common complications include pain, swelling, alveolar osteitis, and limitation of mouth opening postoperatively (Friedman JW 2007). Many clinicians have emphasized a need to decrease pain, swelling, alveolar osteitis, and trismus in patients who undergo third molar surgery (Aydintug YS, et al. 2012; Crincoli V, et al. 2009). A series of

improvements to the surgical approach have been explored, which have greatly reduced the surgical trauma and the occurrence of postoperative complications (Donlon WC; Truta MP 2007; Osunde OD, et al. 2011; Wang Y, et al. 2012). Recently, closure techniques that relieve operation trauma have become a focus in third molar surgery (Chisci G, et al. 2013; Ghoreishian M, et al. 2009; Waite PD; Cherala S 2006).

The less suture technique has been considered an effective method for impacted third molar wounds (Hashemi HM, et al. 2012; Osunde OD, et al. 2012). However, reports have shown that the suture-less technique can lead to delayed wound healing (Osunde OD, et al. 2012), which may be recognized as a risk factor for the development of postoperative complications and poorer quality of life after third molar surgery (Chisci G 2013). Waite and Cherala have reported that this suture-less technique may only be suitable for the application of a small flap in removing impacted third molars (Waite PD; Cherala S 2006), but didn't justify the routine use of suture-less techniques for extraction of any third molar (Chisci G, et al. 2013). Therefore, the suture-less technique is still controversial in the process of removing all impacted teeth (Chisci G 2013; Chisci G, et al. 2013).

It is well known that postoperative complications have not only certain extent correlation with methods of third molar extraction, but also correlation with different suture methods. Effective sutures can prevent pain, bleeding, swelling, trismus, and alveolar osteitis after the removal of third molar. Figure-of-eight suture is a useful method of closing wound in surgery, which is often used in deep tissue suture. However, to date, there is no report applying the technique in third molar surgery. To establish new suture techniques for reducing postoperative complications and the anxiety of removing sutures for third molar surgery, we first applied a figure-of-eight suture technique for closing the wound in the treatment of impacted third molar and explored the application's prospect.

## PATIENTS AND METHODS

### *a) Study design and participants*

We designed a single-center, double-blind, randomized clinical trial with parallel groups (figure-of-eight suture and interrupted suture groups) for impacted teeth extraction. The study was approved by the Independent Ethics Committee of the Ninth People's Hospital of Shanghai, being in accordance with approved guidelines for the Declaration of Helsinki (IECNPHS No. 2012/0901/SHTE). The procedures and risks involved with participation in this study were discussed with the volunteers, and written informed consent was obtained from each included participant.

Between May 11, 2013, and Mar 10, 2015, one hundred and ninety-nine impacted third molars referred for surgical extraction were eligible for inclusion. The clinical trial was carried out in the Oral Surgery, Ninth People's Hospital, Shanghai Jiao Tong University School of Medicine. Indications included pericoronitis and orthodontics. The inclusion criteria were patients with mesioangular and horizontal impactions (Class II - III and Class B - C according to Pell & Gregory classification). The impacted third molars were selected consecutively as they presented and were randomized into two groups. Patients in the first group underwent the figure-of-eight suture and those in the second group underwent the routine suture. All enrolled patients provided written informed consent to enroll in the study.

### *b) Randomization, allocation concealment, and sample size calculation*

A computer-generated table randomly assigned patients to the two groups. The

randomization table was managed by a researcher who was not directly involved in the experiment. Allocations were concealed in opaque envelopes numbered progressively from 1 to 230. The envelopes were opened at the day of the surgery and at the end of the trial. Randomization ensured that patient and procedure-related variables were uniformly distributed within the two groups. Considering a drop-out rate, a total of 230 patients were recruited. The test group included 107 patients and the control group included 92 patients.

### c) Procedures

The surgical procedure was performed with the patient under local anesthesia by the researcher. A 3-sided mucoperiosteal flap was raised. The incision was begun at a point down the buccal sulcus, at the middle of the second molar, and then extended upward to its distobuccal angle. The incision was continued along the gingival sulcus to a point just distal to the third molar. Then bone was removed, the tooth was elevated using a straight Coupland elevator. The flaps were closed according to the treatment group.

Figure-of-eight suture: First, start on the side opposite from surgeon. Go through the full thickness of tissues on that side and then finish the first half of the stitch by going from bottom to top on the opposite side. The needle should now be back on top of the tissue. Second, enter the first side (going from top to bottom) just across from the suture on the other side. Again go through the full thickness of the tissue and come out on the undersurface of the tissue. Third, enter the undersurface of the other side even with the first suture and come out on top. Finally, the suture can now be easily tied

(Figure. 1). The routine method is interrupted suture. After seven days, the suture was removed. The times for suturing and taking out stitches were recorded in the chart.

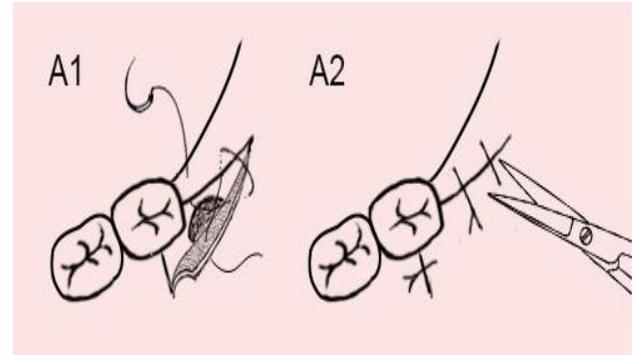


Fig.1. Schematic model of figure-of-eight suture

Both groups received oral antibiotics, analgesics, and a short course of steroids. The patients were followed up through the network (Tencent QQ group 369178209) postoperatively to assess the degree of pain, swelling, and trismus. The pain was evaluated using the Visual analogue scale, swelling was evaluated by measuring postoperative length from soft tissue pogonion to mandibular angle subtracting preoperative length (Figure 2), and trismus was assessed by measuring the distance between the mesial-incisal corners of the upper and lower right central incisors at maximum mouth opening. All three measurements were taken at the first, third, fifth, and seventh postoperative days. The patients were also advised to report to the clinic on any day in the case of any unusual discomfort such as uncontrolled pain, nausea, or hemorrhage. All data above were recorded.

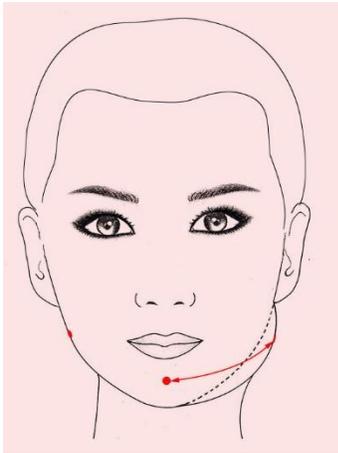


Fig.2. Facial swelling evaluation

### STATISTICAL ANALYSIS

The data were analyzed using an SAS 6.12 statistical software package (Cary, NC, USA). The  $\chi^2$  test was used to compare the proportion of descriptive variables (gender, impaction type) between two groups. The Fisher exact test was used for the categorical variables, such as alveolar osteitis and hemorrhage, while the grouped t test was used to compare the means of continuous variables (pain, swelling, trismus, and the time of suture) between both groups. A p-value of less than 0.05 was considered significant.

### RESULTS

One hundred and ninety-nine subjects who were divided into two groups (figure of eight suture and interrupted suture) participated in the present study. Eighty patients were male, and one hundred and nineteen were female. As Table 1 shows no significant differences were found between

the figure-of-eight suture and interrupted suture groups in age ( $P=0.679$ ), gender ( $P=0.559$ ), or impaction type ( $P=0.465$ ). Inferential statistics for pain, swelling, and trismus were no significant differences at days 1, 3, 5, and 7.

As for the occurrence of alveolar osteitis in the two groups, we found that there were 7 patients suffering from alveolar osteitis among 92 patients; by comparison, only 1 patient with alveolar osteitis occurred among 107 patients. There was a statistically significant difference between the figure-of-eight suture and interrupted suture groups (Fisher's Exact Test,  $P = 0.026$ ). The relative risk (RR) of alveolar osteitis was significantly lower in the figure-of-eight suture compared with interrupted suture group (RR=0.1228) (Table 2). The results above indicated that figure-of-eight suture may reduce the occurrence of alveolar osteitis.

As table 3 shows, hemorrhage was observed in 8/92 in the interrupted suture group, and only 1/107 patient experienced hemorrhage in the figure of eight suture group. The relative risk of hemorrhage was 0.1075 in the figure-of-eight suture group compared with the interrupted suture group, and Fisher's Exact Test showed that the two-sided  $p$  value was 0.013. The results above also indicated that figure-of-eight suture may decrease hemorrhage in impacted teeth extraction.

**Table- 1:Demographic, operative, and baseline patient characteristics**

Description	Figure of eight suture	Interrupted suture	P-value
Age	30.54±10.07	31.15±8.92	0.679 (t)
Gender			0.559 (X <sup>2</sup> )
male	41	39	
female	66	53	
Impaction type			0.464 (X <sup>2</sup> )
Mesioangular	62	58	
Horizontal	45	34	

**Table-2: Comparison of the occurrence of alveolar osteitis in two groups.**

	Impacted teeth extraction		Total
	alveolar osteitis	No alveolar osteitis	
Figure of eight suture	1	106	107
interrupted suture	7	85	92
Total	8	191	199

Fisher exact test: Two-sided P = 0.026, RR=0.1228

**Table-3: Comparison of the occurrence of hemorrhage in two groups**

	Impacted teeth extraction		Total
	hemorrhage	No hemorrhage	
Figure of eight suture	1	106	107
interrupted suture	8	84	92
Total	9	190	199

Fisher exact test: Two-sided P = 0.013. RR=0.1075

**Table 4. Comparison of time of Suture and suture removal in two groups**

Description	Figure of eight suture	interrupted suture	P-value (t)
Time of Suture	1.39±0.37	1.64±0.42	0.221
Time of suture removal	0.71±0.16	1.51±0.33	0.011

Then we analyzed the time of suturing and taking out stitches, and we found that there was no difference in the time of suturing; however, the time of taking out stitches was significantly shorter in the figure-of-eight suture group than in the interrupted suture group (Table 4).

## DISCUSSION

In this study, we demonstrated that figure-of-eight suture might be an effective method

for closing wounds from impacted teeth. Figure-of-eight suture is a useful method for bringing together underlying tissues, having obtained good effects in closing muscle, fascia, and extensor tendon wounds (Cigna E, et al. 2008; Traullé S, et al. 2016; Yazar M, et al. 2008). However, whether it can be applied in the closure of impacted teeth extraction and reducing alveolar osteitis and hemorrhage remains unknown. In this present study, we compared the effect of

figure-of-eight suture and interrupted suture on the removal of impacted teeth, and we observed postoperative hemorrhage, alveolar osteitis, pain, swelling, and trismus in the two groups. Our results indicated that figure-of-eight suture could remarkably decrease postoperative hemorrhage and alveolar osteitis, and no differences were found with pain, swelling, or trismus.

Alveolar osteitis and hemorrhage are the common complications in the extraction of impacted teeth (Bowe DC, et al. 2011; Freudenthal N, et al. 2015; Kolokythas A, et al. 2010). Reports have documented that alveolar osteitis is an inflammation of the alveolar bone, which often occurs in about 13.1% of extractions of impacted mandibular third molars (Blum IR 2002). The reason may be associated with the suture creating a one-way valve and allowing food debris to enter the socket, which results in local infection, inflammation, edema, clot necrosis, and alveolar osteitis (Waite PD; Cherala S 2006). This specific type of alveolar osteitis can not only increase the pain of postoperative impacted teeth removal but also delay the healing time. Though sutureless closure reported can facilitate drainage, improve wound hygiene and reduce the occurrence of alveolar osteitis (Waite PD; Cherala S 2006), it may also have a risk of hemorrhage at the impacted tooth wound. Furthermore, both the suture-less suture and the interrupted suture can delay wound healing and give rise to severe or moderate complications (Chisci G 2013; Chisci G, et al. 2013). Therefore, further approaches to apply for impacted tooth removal sutures are still needed.

In the current study, we found that figure-of-eight suture could not only reduce the occurrence of alveolar osteitis, but also decrease bleeding. As is shown in table 3, among a hundred and seven patients, there were only two patients with alveolar osteitis

in the figure-of-eight suture group. By comparison, in the interrupted suture group, the occurrence was 6/92. Among 107 patients, one patient was observed with hemorrhage in the figure-of-eight suture group; however, 8/92 patients in the interrupted suture group presented bleeding, which was dramatically higher than the experimental group. Figure-of-eight suture firmly stitched deep tissue at the region of the impacted tooth and avoid the formation of one-way valve at the wound of third molar. As a result, figure-of-eight suture prohibited food debris entering the socket, and reduced the occurrence of alveolar osteitis. Thus, figure-of-eight suture may be an effective approach for preventing the complication of mandibular third molar extraction.

According to Table 4, we compared the time for suturing and removing stitches, and no difference was found between the two groups in suturing ( $P=0.221$ ); however, the time for taking out stitches was significantly shorter in figure-of-eight suture than interrupted suture ( $P=0.011$ ), because the distal stitch is cut first and then the stitch is taken out easily at the mesial knot in figure-of-eight suture. Removing stitches became more convenient, even with limited mouth opening, which can not only relieve the pain in taking out stitches but also overcome much of the patient's anxiety.

Despite the obvious advantages and convenience of figure-of-eight suture, several points have to be emphasized. First, the alveolar socket should be repeatedly rinsed, and residual root and cracked crown should be prevented before wound suture. Second, the suture goes through the full thickness of the tissues on all four suture sites and includes muscle and ligament at two distal sites. Third, sutures should be approximately 3–4 mm from the skin edge (two distal sutures: 4–5 mm) and 5–10 mm apart, as a wider skin edge makes discomfort

of the buccal tissue and dehiscence of the wound more likely. Finally, the suture tension should not be too great; otherwise, it might cause local bloating.

In conclusion, figure of eight suture is an effective approach for closing the wound from an impacted third molar. Using this method, we can reduce the bleeding after the removal of impacted teeth and decrease the occurrence of alveolar osteitis. The removal of stitches became more convenient, which may be favorable to overcome much of patients' anxiety in taking out stitches.

### **CONFLICTS OF INTEREST**

No potential conflict of interest relevant to this article was reported.

### **ACKNOWLEDGEMENT**

This work was supported by Science and Technology Commission of Shanghai Municipality (19411962000 and 18441903000).

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