

# The effect of acupuncture on pain and swelling after day case molar teeth extraction under general anaesthesia

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## Abstract

Pain following third molar teeth extraction can be severe and for day case patients, pain can worsen after leaving hospital. The objective of this study was to establish whether acupuncture could reduce post-operative pain and swelling. A total of 40 patients undergoing third molar teeth extraction were randomly allocated to two groups. The acupuncture group received acupuncture before and during general anaesthesia whilst the control group received general anaesthesia alone. Visual analogue scores for pain were measured in recovery and at 2, 18 and 72 h post-operatively, together with measurement of percentage reduction in mouth opening and assessments of swelling. Visual analogue scores at 18 h were significantly reduced from 24.5 mm in the control group to 12.5 mm in the acupuncture group ( $P < 0.05$ ). The two groups were comparable in all other measurements. The study indicates that, in this group of patients, acupuncture can be useful in reducing post-operative pain on the day after surgery. © 1999 Elsevier Science B.V. All rights reserved.

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Extraction of multiple third molar teeth is often associated with severe postoperative pain, trismus and swelling. In day-case patients, these symptoms can be worse after the patient has left hospital [1]. The pain can be treated easily in the immediate recovery period in hospital with analgesic drugs but these are not without side effects including nausea, vomiting and gastric irritation. Good immediate analgesia can be obtained by local anaesthetic infiltration [2]. However this will have only a short term effect, pain scores on the following morning being similar in those who have had local anaesthetic and those who have not [3].

Studies giving contradictory results have been undertaken on the use of acupuncture for acute pain relief both pre-operatively [4] and post-operatively [5,6] after molar teeth extraction. They studied extractions under local anaesthetic only and the trials were not comparable in terms of type of oral surgery or number of teeth extracted.

This study aimed to see whether acupuncture, given before and during bilateral lower third molar teeth extraction under general anaesthetic, could reduce the pain and swelling in the immediate recovery phase and the subsequent days after discharge from hospital.

## 1. Methods

This randomised, controlled study was approved by the local ethics committee and written informed consent was obtained from all patients. A total of 40 ASA grade 1 and 2 patients aged between 18 and 40 were studied. All patients were undergoing extraction of at least both lower third molar teeth under general anaesthesia as day cases. Although some had upper third molar teeth extracted, it was felt that the pain and swelling from straightforward upper teeth extraction was minimal compared with lower teeth extraction and would not affect the results. Patients were not included

if they had taken analgesic drugs or received acupuncture treatment recently, or if they had contraindications to non-steroidal anti-inflammatory drugs. All patients were familiarised pre-operatively with the visual analogue pain scoring method and patient controlled analgesia. Baseline maximum mouth opening was measured as the gap between the tips of the upper and lower incisor teeth with the mouth opened as wide as possible.

All patients were premedicated with diclofenac 100 mg rectally. They were then randomly allocated into two groups. The acupuncture group received acupuncture treatment in addition to a standard general anaesthetic and the control group received the standard anaesthetic alone.

After establishing intravenous access and monitoring, acupuncture needles were inserted in that group. This consisted of four needles, one in each hand (Colon 4) in the muscle between the bases of the first and second metacarpals, and one overlying each jaw (Stomach 6) in the lower part of the masseter muscle. These points were used according to the tenets of pain relief in Traditional Chinese Medicine which require needle insertion in a meridial point locally over the painful area and a distal point connected by the energy meridian to the painful area. The needles were inserted until a dull ache was reported by the patient. Needles were then stimulated electrically at 2.5 Hz for 20 min, the intensity adjusted according to patient comfort. General anaesthesia was then induced and the electroacupuncture was maintained until the end of the operation. The needles were removed before the patient woke.

The anaesthetic technique was standardised: anaesthesia was induced with a propofol/alfentanil mixture (50 ml propofol with 4 ml alfentanil) at a rate of 600 ml  $\text{h}^{-1}$  until loss of verbal contact and eyelash reflex. Nasal intubation with a 6 mm cuffed endotracheal tube was facilitated using a small dose (0.25 mg  $\text{kg}^{-1}$ ) of atracurium. A throat pack was inserted. The patient was then ventilated to normocapnia with an  $\text{O}_2/\text{N}_2\text{O}$  1:2 mixture and anaesthesia was maintained with the propofol/alfentanil infusion, starting at 10 mg  $\text{kg}^{-1}$   $\text{h}^{-1}$  for 10 min, decreasing to 8 mg  $\text{kg}^{-1}$   $\text{h}^{-1}$  for 10 min and to 6 mg  $\text{kg}^{-1}$   $\text{h}^{-1}$  thereafter. The infusion rate was then adjusted depending on the cardiorespiratory response of the patient and their reaction to surgery. At the end of surgery, neuromuscular blockade was reversed with neostigmine/glycopyrrolate as appropriate. No local anaesthetic was used during surgery.

Surgery was performed by two surgeons using the same technique and surgical difficulty was rated for the most difficult lower tooth removed (1, simple elevation; 2, elevation with raising of muco-periosteal flap; 3, raising of a flap and bone removal; 4, bone removal and tooth division).

Post-operatively, patients were given alfentanil, using patient controlled analgesia (PCA), 1.5  $\mu\text{g kg}^{-1}$  with a 3 min lockout, until pain-free and then prescribed co-codamol dispersible, two tablets as required. The co-codamol was continued at home. Ondansetron intravenously was given when the nursing staff considered it was required.

Pain scores using a 100 mm visual analogue score VAS: 0, no pain; 100, worst pain possible) were performed by a recovery nurse, who was unaware of the patient group, at time of recovery before PCA use and at 2 h. Maximal mouth opening was measured at 2 h. The recovery nurse recorded the timing and amount of analgesic administration and the requirement for anti-emetic. At discharge, the patients were given a questionnaire which involved pain scoring, measuring mouth opening and subjective assessment of swelling on the next morning and 48 h later. Total dose of co-codamol taken was also recorded together with a subjective assessment of overall recovery.

Statistical analysis was performed using *t*-tests for independent samples and Mann–Whitney U-tests for non-parametric data. Results were considered statistically significant when  $P < 0.05$ .

## 2. Results

All 40 patients returned their questionnaires by post. The two groups were comparable for demographic data and operative and anaesthetic characteristics (Table 1).

No significant difference was found between the groups in post-operative consumption of PCA alfentanil or time to first dose. Subjects in the acupuncture group had a mean of 3.7 doses of alfentanil (SD 2.32) with a mean time to first dose of 6.56 min (SD 4.12). Subjects in the control group had a median of 2.75 doses of alfentanil (SD 3.11) with a mean time to first dose of 8.19 min (SD 5.65).

Table 1  
Patient data and operative details (mean (SD or range) or number)

Patient data	Acupuncture	Control
Sex (M/F)	7/13	6/14
Age (year)	23.8 (18–35)	25.7 (18–36)
Body mass index	23.4 (2.64)	22.46 (3.52)
Number of teeth extracted (2/3/4)	0/3/17	4/3/13
Difficulty of surgery		
1	9	7
2	3	5
3	6	7
4	2	1
Length of anaesthesia (min)	18.55 (7.93)	19.6 (6.83)
Induction dose of propofol/alfentanil (ml $\text{kg}^{-1}$ )	0.27 (0.048)	0.28 (0.046)
Average infusion rate of propofol/alfentanil (ml $\text{kg}^{-1}$ $\text{h}^{-1}$ )	0.97 (0.17)	0.96 (0.21)

Table 2  
Median visual analogue scores (range) in mm

Time (h)	Acupuncture	Control
0	22 (0–65)	27.5 (0–61)
2	19 (0–42)	23.5 (0–72)
18	12.5 (0–38)*	24.5 (0–78)
72	5 (0–37)	14 (0–71)

\*  $P < 0.05$ .

The visual analogue score was significantly lower in the acupuncture group at 18 h ( $P < 0.05$ ), but there was no difference in VAS between the groups at the other times (Table 2). There was no difference in consumption of cocodamol between the groups, with a mean of 12.75 tablets (SD 6.65) in the acupuncture group and 14.95 tablets (SD 8.85) in the control group.

No significant difference was found in the percentage reduction in mouth opening between the two groups, the values at 2, 18 and 72 h being 34% (SD 23), 31% (SD 22) and 22% (SD 20) in the acupuncture group and 30% (SD 21), 35% (SD 23) and 32% (SD 25) in the control group. The subjective assessment of swelling by the patient is shown in Table 3 and the subjective rating of overall recovery post-operatively is shown in Table 4. The sample size was too small for meaningful statistical analysis of these data.

No significant difference was found in the incidence of nausea between each group, with ondansetron needed in one patient in the acupuncture group and three patients in the control group. All patients were reviewed by the surgeon at 2 weeks and there were no serious post-operative complications.

### 3. Discussion

In this study acupuncture significantly decreased pain compared with the standard postoperative analgesic regime only on the morning after surgery, with no significant effect on pain at other times. Post-operative pain control is probably most important during the first 24 h as the pain is most likely to be intense in this period. The decrease in pain at 18 h was from a median visual analogue score of 24.5 mm in the control group to 12.5 mm with acupuncture. This represents a 49% reduction which is of clinical significance even though the pain score was already quite low [7].

Studies have shown high blood endorphin levels whilst acupuncture is in progress and in the first few hours after treatment [6,8] and that acupuncture has a good analgesic effect at this time [5]. This study did not provide evidence to support this. It is likely that alfentanil blood levels from the anaesthetic were still quite high at the recovery time and perhaps no difference

between the groups would be expected due to this method of anaesthesia.

Patient comfort is one of the criteria for discharge from the day case unit and this study showed no difference between the groups at the 2 h time of discharge. With the availability of analgesia in the form of alfentanil and co-codamol during these 2 h, it is probably unsurprising that the pain scores were similar.

At 72 h the actual pain scores were already low (median 14 mm in the control group) and any further statistically significant reduction in pain score would probably not be clinically significant [7].

Acupuncture is known to increase blood cortisol levels [8]. It was thought that this may diminish the swelling after surgery as studies have shown that steroids can decrease pain and swelling after third molar extraction [9,10]. The evaluation of swelling after teeth extraction is difficult. Although precise measurement of swelling has been attempted using an oedemometer [11] or stereophotogrammetrically [12], these methods would have been impractical for the day patients in this study. As these were day-case patients it was not possible for an observer to perform subjective evaluations of swelling and so assessment by the patient, relating swelling to that on the previous measurement day was used. This subjective assessment of swelling by the patient produced similar results in each group but the sample size was unfortunately too small to draw any statistical conclusions. In one study of swelling after oral surgery [13], it was found that peak swelling was measured on the third day after surgery which was not confirmed in this study.

Swelling itself is only a cosmetic nuisance to the patient whereas trismus can limit normal function such as eating. Trismus results from operative pain and swelling causing protective spasm in the muscles of mastication and can be measured by reduction in mouth opening. Although this study failed to demonstrate any effect of acupuncture on mouth opening at each measurement time, maximal trismus was observed on the first post-operative day in the control group in line with another study [12], whereas in the acupuncture group it was maximal at 2 h.

There is probably a significant psychological aspect in the success of acupuncture. No attempt was made in this study to blind the patient to remove any placebo effect of acupuncture. An investigation of acupuncture placebo [14] failed to show any significant differences between 'true acupuncture' and 'placebo acupuncture', but there is a big problem in finding an unequivocal placebo treatment for controlled trials [15]. Either you insert a needle into the patient, in which case you are giving acupuncture, or you do not; and if you do not, it will not be an equivalent form of treatment to acupuncture. Insertion of needles once the patient is anaesthetised would not be appropriate if following

Table 3  
Subjective assessment by patient of swelling showing number of patients with swelling and a comparison of this swelling with the previous assessment

Time		Swelling present	Swelling compared with previous assessment		
			More	Similar	Less
2 h	Acupuncture	20	—	—	—
	Control	20	—	—	—
18 h	Acupuncture	16	10	5	1
	Control	18	13	4	1
72 h	Acupuncture	16	2	3	11
	Control	16	4	3	8

Traditional Chinese methods requiring patient feedback of needle sensation [16]. The purpose of this study was to investigate the overall effect of acupuncture as compared with the standard analgesic regime. If some of this effect is psychological, it is still an important, integral part of acupuncture treatment in the same way that the positive psychological effect of preoperative reassurance is an integral part of anaesthetic practice. Any positive patient bias towards acupuncture would have been eliminated by the randomisation of patients between the two groups.

The sample size in this study was limited by the number of suitable patients over the 18 month period of the trial who were willing to undergo acupuncture treatment. This is one of the problems with using acupuncture—many people do not like needles despite them being very fine gauge and painless on insertion. It is possible that a greater analgesic effect could have been obtained with the insertion of more needles around the jaw according to Traditional Chinese methods [16]. However this would probably have been more unacceptable to patients and therefore the local point over the lower third molar was chosen as the most valuable acupuncture point. The power of this study was approximately 55% and although this is not high, a significant decrease in pain score on the first post-operative day was achieved. I would suggest that this demands further investigation as randomised, controlled trials in this area of medicine are sadly lacking.

In conclusion, acupuncture treatment in the post-operative period can reduce the pain on the day after operation in day-case patients undergoing lower third molar teeth extractions. Although it is a time consuming procedure on a busy day-case list, further investiga-

tion of its effect may find a more practical solution for using this non-toxic method of pain relief.

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Table 4  
Subjective assessment by patient of overall recovery from surgery (number of patients)

	Excellent	Adequate	Fair	Poor
Acupuncture	6	9	5	0
Control	4	7	6	3

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