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Pain relief following oral day case surgery: a pilot study

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Abstract

One hundred consecutive, adult patients attending for bilateral mandibular third molar removal utilising standardised surgical and day case general anaesthetic protocols were recruited into a pilot study to investigate the effectiveness of different peri-operative analgesic regimes. Patients were randomised into five study groups using various pre- or post-operative combinations of non-steroidal anti-inflammatory drugs (NSAID) and/or LA block. Pain scores were recorded pre-operatively and at 30 min intervals for 2 h after surgery, as were details of the first dose of 'escape analgesia' (codeine/paracetamol compound preparation). There was no statistically significant difference in overall pain experience between the groups, although the results suggested better pain relief was achieved in those patients who received both post-op NSAID and post-op LA. Further research is required to improve post-operative pain relief for patients undergoing third molar surgery.

Keywords: Day surgery; Post-operative pain

1. Introduction

Impaction of mandibular third molar teeth and ensuing pericoronal infection is a common disorder requiring surgical intervention. Pain, trismus and swelling are common post-operative sequelae and although their severity varies between patients significant morbidity is known to occur [1]. In particular, pain following surgical removal of third molar teeth is recognised as a major problem and whilst the majority of day units supply patients with analgesics for use at home, several studies have shown patients often experience inadequate analgesia post-operatively [2].

Whilst the surgical removal of impacted third molars has become an internationally accepted clinical pain model, there are still no agreed protocols for optimum post-operative analgesia [1–3]. Indeed, most research projects have been designed to compare different types of analgesic medication, or to contrast the efficacy of different local anaesthetic agents or their formulations in patients undergoing surgery [4].

Analgesics such as peripherally-acting non-steroidal anti-inflammatory drugs (NSAIDs), commonly ibuprofen 400 mg, or compound paracetamol 500 mg/codeine phosphate 30 mg preparations are widely prescribed following third molar surgery [1]. Likewise, many operators use local analgesic injections at the site of surgery although there remains controversy over the optimum timing of injection. Whilst some studies have shown better pain control following pre-operative local analgesia administration in patients undergoing third molar surgery under general anaesthesia, these effects do not appear to be long lasting and it remains unclear how long afferent blockade should be continued for maximum effect [5–7].

This preliminary investigation was undertaken to examine the practicality of comparing the efficacy of different peri-operative analgesic and/or local anaesthetic regimes in patients attending for day case surgical removal of impacted third molars.

2. Method

Following local ethical committee approval and informed patient consent, 100 consecutive adult patients attending the

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Oral Surgery Day Case Unit at Newcastle Dental Hospital for bilateral mandibular third molar removal under general anaesthesia were recruited into the study. All subjects were American Society of Anaesthesiologists (ASA) class I or II, and judged to be suitable for day stay following assessment at the nurse-led pre-admission clinic [8]. Patients in which NSAIDs were contra-indicated (those with gastro-intestinal disease, asthma or known to be hypersensitive) were excluded from the study.

All patients were asked to record a pre-operative visual analogue scale (VAS) pain score as a baseline, and post-operative VAS scores were determined at 30, 60, 90 and 120 min after surgery. A ruler with a 10 cm line marked 'no pain' to 'worst pain imaginable' and a moveable marker was used, and patients were asked to position the marker at a point on the line corresponding to the intensity of their pain; a 100 mm numerical scale on the other side of the ruler (not seen by the patient) allowed quantitative scores to be documented at each time point.

A 'lip numbness score' was also recorded for each patient, both pre-operatively and again at 30, 60, 90 and 120 min post-operatively, using the following scale: 0 normal lip sensation, 1 tingling, 2 partly numb or 3 complete numbness, in order to monitor the efficacy of LA administration during the study.

Patients underwent a standardised anaesthetic administered by one consultant anaesthetist (IRF), whilst surgery was carried out by two experienced surgeons (PJT and CBH) working to an agreed protocol (Table 1).

The patients were randomly allocated into five treatment groups (20 patients per group), each of which followed a different analgesic regimen (Table 2). Random permuted blocks were used, with allocation made in theatre using opaque, sealed, serially numbered envelopes. Groups 1, 2 and 3 received 75 mg of diclofenac sodium (Voltarol®) orally with bilateral inferior dental nerve LA block injections using 2% plain lignocaine (2.5 ml each side) in varying pre- or post-operative combinations. Lignocaine without a vasoconstrictor was chosen to limit the expected local analgesic effect to the immediate post-operative observation period, thus facilitating direct comparison of pre-and post-surgical LA efficacy. Groups 4 and 5 were designed to utilise only one of the analgesic techniques: post-operative LA or pre-operative diclofenac.

All patients were cared for by the day unit nurse co-ordinating their ambulatory care, and a record made of the time of use of any additional (escape) analgesia; two tablets of co-codamol (codeine phosphate 8 mg, paracetamol 500 mg per tablet) were available for this purpose.

Table 1
Standardised surgical and anaesthetic protocols

Surgical protocol	Bilateral impacted mandibular third molar teeth 'Envelope' muco-periosteal flap reflection Bone removal with burs Vertical tooth sectioning (if required) Closure with resorbable sutures
Anaesthetic protocol	Induction with Fentanyl (1 μg/kg) and Propofol (2–4 mg/kg) Muscle relaxation using Mivacurium (0.15 mg/kg) Nasal incubation with 'polar' tube (6.5 mm males, 6.0 mm females) Saline-moistened throat pack Maintenance with N_2O, O_2 + Sevoflurane (1–4%) Spontaneous respiration, using a CO_2 absorber No additional intra-operative analgesics

Table 2
Treatment groups

Group	Designation	Analgesic regimen
1	Pre V/Pre LA	Voltarol® 75 mg orally 45 min pre-op GA Bilateral I.D. Block LA (2% Plain Lignocaine) prior to surgery
2	Pre LA/Post V	GA Bilateral I.D. Block LA (2% Plain Lignocaine) prior to surgery Voltarol® 75 mg orally 45 min post-op
3	Post LA/Post V	GA Bilateral I.D. Block LA (2% Plain Lignocaine) immediately post surgery Voltarol® 75 mg orally 45 min post-op
4	Post LA	GA Bilateral I.D. Block LA (2% Plain Lignocaine) immediately post surgery
5	Pre V	Voltarol® 75 mg orally 45 min pre-op GA

3. Results

Ninety-six complete study records were available for analysis; four patients were excluded due to incomplete data recording. Sixty-seven female and 29 male patients (age range 17–38 years; mean 26.3 years) were thus recruited into the study.

The 'lip numbness scores' confirmed efficacy of LA administration. Pre-operative LA became less effective at around 60 min post-operatively, whilst post-operative LA was effective until approximately 90 min.

Fig. 1 shows that mean VAS pain scores recorded over 120 min for the five experimental groups all followed very similar patterns, whilst Table 3 summarises VAS means computed from each patient over the 30–120 min post-operative period. Comparison of means between treatments, using an analysis of covariance, indicated there was no evidence of a difference between treatment means ($P = 0.72$).

The means computed in Fig. 1 ignore when escape analgesia was taken. Fig. 2 therefore shows the means

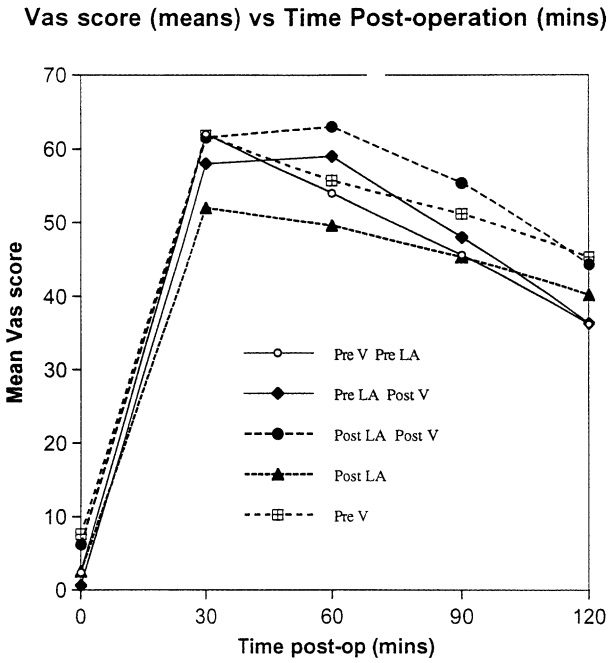

Fig. 1. Mean VAS scores vs. time post-operation (min) for treatment groups (uncorrected for use of escape analgesia).

Table 3
Mean VAS scores (30–120 min post-op)

Treatment	No. of patients	Mean VAS[a]
Pre V/Pre LA	20	50
Pre LA/Post V	20	51
Post LA/Post V	19	55
Post LA	18	47
Pre V	19	53

[a] Standard error of difference = 6.

separately, by the time escape analgesia was taken. Those taking escape analgesia at 30 min had rather higher VAS values at the 30 min post-operative period than, for example, those not taking escape before 120 min. The pattern for those taking escape at 90 min is unclear as few patients fell into this group.

Table 4 lists the proportion of patients in each experimental group requiring escape analgesia and the median time post-operatively to first use of escape analgesia; there was no significant difference between treatments (chi−squared = 1.91, $P = 0.75$).

Table 5 shows the number of patients in each group versus the time of last recorded VAS prior to use of escape analgesia.

Whilst there are no statistically significant differences between treatments, Pre V/Pre LA and Pre V patients exhibit poorer results. In particular, a high proportion (0.74) of Pre V patients required escape analgesia with a short median time to analgesic use (50 min). Indeed, 12 out of the 15 Pre V patients using escape did so within the first 30 post-operative minutes. In contrast, patients in the Post LA/Post V group exhibited the lowest proportion requiring analgesia (0.53) and the longest median time to first use escape (115 min).

Table 6 summarises mean VAS results at 24 h post-operatively (results available for only 88 patients). The number of non-responders at 24 h was not significantly different between groups ($P = 0.07$) and analysis of variance comparing the VAS scores revealed no difference between the treatment groups ($P = 0.65$).

4. Discussion

The management of post-operative pain is of considerable importance in ambulatory surgery. Recent studies have shown that 50% of patients experience pain for up to one

Table 4
Use of escape analgesia

Treatment	No. of patients	No. using escape analgesia <120 min	Proportion using escape analgesia	Median time post-op to use of escape analgesia (min)
Pre V/Pre LA	20	13	0.65	65
Pre LA/Post V	20	13	0.65	85
Post LA/Post V	19	10	0.53	115
Post LA	18	12	0.67	95
Pre V	19	14	0.74	50

Table 5
Number of patients using escape analgesia vs. time post-op

Time of last VAS before escape analgesia (min)	All treatments	Pre V/Pre LA	Pre LA/Post V	Post LA/Post V	Post LA	Pre V
0	10	2	3	1	1	3
30	30	7	4	4	6	9
60	13	3	4	4	2	0
90	11	1	2	3	3	2
120	1	0	0	0	0	1

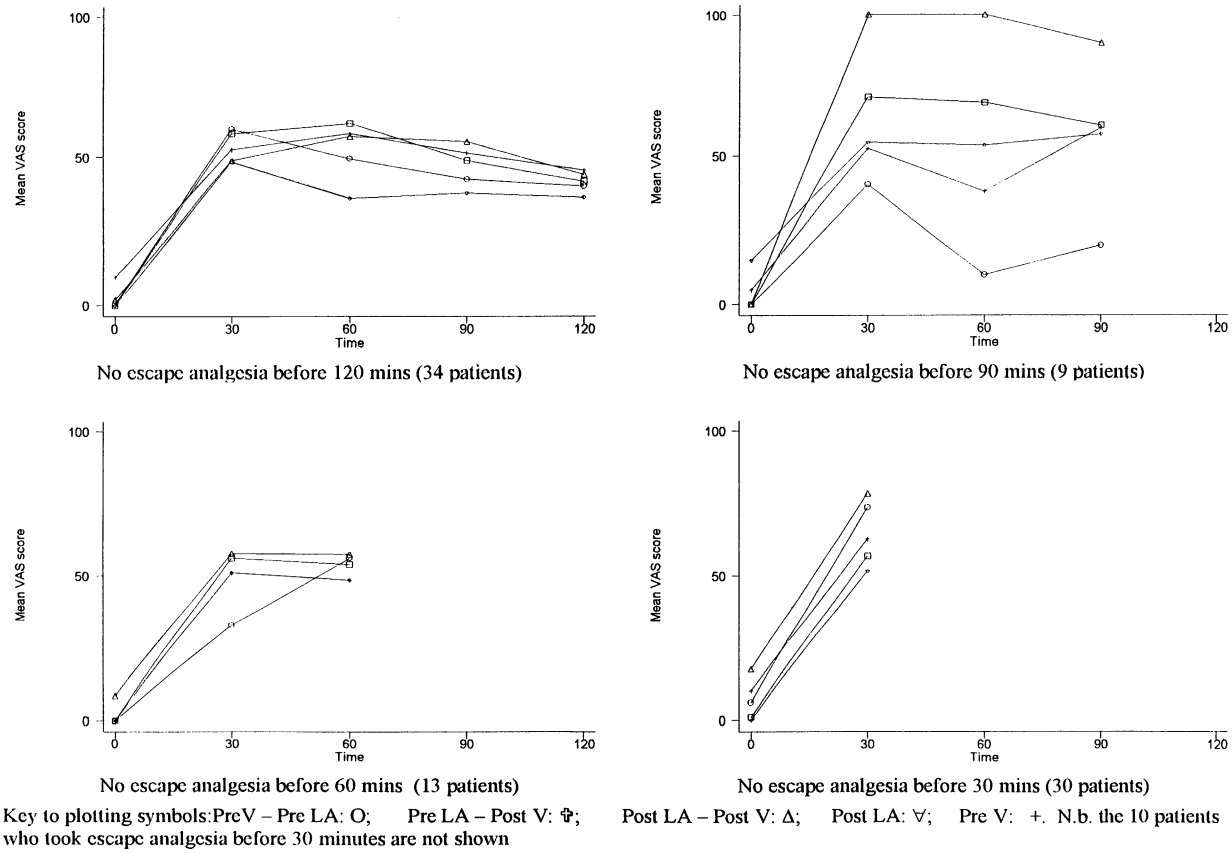

Fig. 2. Mean VAS scores vs. time post-operation (min) for treatment groups (separated by time escape analgesia was taken).

week following third molar surgery, whilst a significant deterioration in quality of life has also been demonstrated during this period [9,10]. There is clearly a need to provide improved pain control for such patients.

The purpose of this preliminary study was to investigate the efficacy of differing peri-operative analgesic regimes for day patients having bilateral mandibular third molar removal under general anaesthesia. Utilising NSAIDs and LA in different, structured combinations (Table 2) together with a codeine/paracetamol 'escape' we hoped to define an effective and practical analgesic regimen.

Daniels et al. [11] considered that the current standard of care for alleviating acute pain after third molar surgery relies principally upon NSAIDs or opioid/analgesic combination products, whilst Seymour et al. [12] recently demonstrated the efficacy of soluble aspirin compared with paracetamol post-operatively.

Table 6
Mean VAS scores (at 24 h post-op)

Treatment	No. of patients	No. of responders at 24 h	Mean 24 h VAS score
Pre V/Pre LA	20	16	46
Pre LA/Post V	20	17	40
Post LA/Post V	19	19	46
Post LA	18	18	46
Pre V	19	18	54

There are few studies in the literature which specifically investigate different analgesic and/or local anaesthetic agent combinations. Mellor et al. [13] carried out a direct comparison of pre-operative bupivacaine versus intra-venous ketorolac in third molar removal, and found no significant difference in post-operative pain scores. Campbell et al. [14] noted that the combined use of pre-emptive analgesia with bupivacaine, tenoxicam and alfentanil did not appear to reduce post-operative pain experience.

We also found little evidence for the effectiveness of pre-emptive analgesia in our study, although there was a trend (albeit statistically non-significant) for better post-operative pain relief in patients receiving analgesic medication post-operatively, particularly when this was combined with post-op LA (Table 4).

An obvious criticism of this conclusion is that the overall pain experience may not be reduced but simply that the onset of post-operative pain is delayed by the later administration of analgesics. This may be a significant problem following ambulatory surgery when patients return home before significant pain becomes apparent. In our project we deliberately chose short acting 2% plain lignocaine to facilitate the study, and it is interesting to note that those groups receiving post-operative LA did in fact demonstrate the longest times to first use of escape analgesia, although overall showed no significant difference in pain experience (Table 4).

Pain is an inherently individual and complex sensation, and difficulties arise in attempting to quantify and compare different patients' pain experiences. There is no doubt that oral day surgery patients consistently report pain and swelling as significant problems following surgery, and that better pain relief is an integral part of improving the quality of care in ambulatory surgery [15].

It may be that by combining pre-operative analgesia, post-operative LA immediately upon completion of surgery, and a further analgesic administered during the recovery period we can enhance patients' overall pain relief. Having defined our research methodology during this pilot, we are currently undertaking further studies in an attempt to elucidate the best pattern of analgesic management for oral surgery day stay patients.

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