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Clinical Paper
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Pre-surgical regional blocks in orthognathic surgery: prospective study evaluating their influence on the intraoperative use of anaesthetics and blood pressure control

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Abstract. In orthognathic surgery, maxillary (CNV2) and mandibular (CNV3) divisions of the trigeminal nerve can be blocked successfully prior to surgery. In this study, it was hypothesized that regional blocks (nerve block over a particular region: bilateral CNV2 and CNV3 divisions of the trigeminal nerve) would decrease the total requirement for intraoperative anaesthetic agents and facilitate the process of hypotensive anaesthesia. Local anaesthesia containing 1/100,000 epinephrine and 10 ml 0.5% levobupivacaine was injected into the planned incisions in 50 patients. Twenty-five patients (group A) underwent orthognathic surgery without regional blocks and another 25 patients (group B) underwent surgery with regional blocks. The anaesthetic protocol was the same in both groups and administered by a single anaesthesiologist. The mean arterial pressure was recorded at several points throughout the operation, as well as all the medications used. The blood loss and the amounts of medications administered were lower in group B than in group A. In patients receiving regional blocks, the amounts of fentanyl and nicardipine required were significantly lower. The use of pre-emptive anaesthesia in orthognathic surgery may reduce the overall amounts of medications required for hypotensive anaesthesia, facilitate the intraoperative control of blood pressure, and decrease intraoperative blood loss.

Key words: orthognathic surgery; pre-emptive analgesia; regional block.

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The concept of pre-emptive analgesia was first introduced by Crile in 1913.[1] Since then, this concept has been accepted widely for the treatment of patients in virtually every surgical discipline. Several studies have demonstrated that postoperative pain can be decreased with the use of a combination of general anaesthesia and regional block.[2–6] In orthognathic surgery, the maxillary and mandibular divisions of the trigeminal nerve can be blocked successfully prior to surgery. Theoretically, if the afferent input is blocked before the surgical incision is made, peripheral and central sensitization may be prevented.[2,3] Many studies have demonstrated improvements in postoperative pain and decreased patient dependence on opiates.[3]

Despite anecdotal and clinical evidence from research studies, the mechanism of pre-emptive analgesia is still not well understood. It is possible that pre-emptive analgesia may facilitate intraoperative blood pressure control and the administration of general anaesthesia by decreasing the total amount of intraoperative medication required. In this study, it was hypothesized that pre-emptive analgesia would (1) decrease the total requirement for intraoperative anaesthetic agents, and (2) facilitate the control of blood pressure during surgery, demonstrated by a reduction in the total amounts of hypotensive medications required.

Patients and methods

A prospective, triple-blind, randomized controlled trial was performed between July 2011 and July 2012. The institutional review board (IRB) of the hospital approved the protocol and the study was registered at ClinicalTrials.gov (NCT01418183). Written informed consent was obtained from each participant. In this trial, 50 patients underwent bimaxillary surgery either with or without pre-emptive analgesia. The group of 25 patients who did not receive pre-emptive anaesthesia was recruited into the present study (group A). The other 25 patients who received pre-emptive anaesthesia were excluded from the analysis as they only had a unilateral (split mouth) block. Therefore, a further 25 patients (group B) who received pre-emptive analgesia were recruited from August to December 2012, using the same inclusion criteria, but without randomization or blind administration. This second protocol was also approved by the IRB.

Inclusion criteria were age between 20 and 40 years and the requirement for bimaxillary surgery for the correction of a maxillofacial deformity. Osteotomies were performed via an intraoral approach using well-established and previously published techniques.[7,8] More specifically, surgical techniques included the standard Le Fort I total maxillary osteotomy and bilateral sagittal split mandibular osteotomy (BSSO) using Yu-ray Chen's procedures, comprising a modification of the Hunsuck technique. A single-splint technique was used for all patients.[9] Exclusion criteria were the requirement for multiple-piece osteotomies, cleft patients, status post-trauma, craniofacial syndromes, and unexpected fracture or inferior alveolar nerve transection during surgery.

Anaesthesia

Intravenous propofol (2 mg/kg), cisatracurium (0.2 mg/kg), and fentanyl (2 μg/kg) were administered for induction. The muscle relaxant (cisatracurium) was used only at induction. Sevoflurane was used for the maintenance of general anaesthesia. After full induction and preparation of the patient, 30 mg ketorolac tromethamine was administered intravenously. In both groups, a mixture of 1/100,000 epinephrine and 10 ml 0.5% levobupivacaine was infiltrated into the areas of planned incisions. In group B, another 5 ml 0.5% levobupivacaine was used for each regional block bilaterally. The CNV2 distribution was blocked via a high tuberosity approach, while the standard intraoral inferior alveolar nerve approach was used for the lower CNV3 distribution.

In order to achieve hypotensive anaesthesia with a mean arterial pressure (MAP) around 55–60 mmHg, inhalation anaesthesia with sevoflurane was carried out at a minimal alveolar concentration (MAC) of between 1.5 and 2.0. Intravenous fentanyl (1 μg/kg), labetalol (10 mg), and nicardipine (0.3 mg) were administered during surgery only if needed in order to maintain stable/hypotensive anaesthesia. The following protocol was used: when blood pressure was starting to rise during surgery (by approximately 5–10 mmHg), labetalol was administered as a first-line agent in order to decrease the possibility of intraoperative bleeding. In addition, fentanyl was used prior to an expected increase in surgical stimulation, more specifically prior to bimaxillary osteotomies, or as the second-line drug during periods of elevated blood pressure. Nicardipine was used only in patients whose blood pressure was persistently above the target level despite the use of fentanyl and labetalol.

The MAP was recorded both prior to induction and before incision. The highest MAP during osteotomy of the mandible and maxilla (both right and left) and the MAP while splitting the mandible were documented for each patient.

Results

The mean age, male to female proportion, and body weight were similar in the two groups (Table 1). Fifteen patients in group A and 22 patients in group B underwent an additional genioplasty (Table 2). The mean surgical time was 367.4 min in group A and 370.6 min in group B, with no statistically significant difference.

The MAPs of patients in groups A and B during surgery were relatively stable and well-maintained without prominent fluctuations. The MAP in group A was slightly higher at some time points, but this was not statistically significant except at the time of right BSSO ($P = 0.041$) (Fig. 1, Table 3).

Additional doses of labetalol, fentanyl, and nicardipine were required in both

Table 1. Demographic and clinical data for group A and group B.[a]

	Age (years)	M/F	Body weight (kg)	Genioplasty	Surgical time (min)	Blood loss (ml)
Group A	26.6	8/17	55.4	15	367.4	901
Group B	26.6	6/19	53.5	22	370.6	657

M, male; F, female.
[a] Group A: without pre-emptive analgesia; group B: with pre-emptive analgesia.

Table 2. Clinical data for group A and group B according to additional genioplasty treatment.[a]

	Genioplasty	Number of cases	Surgical time (min)	Blood loss (ml)
Group A	With	15	372.8	911
	Without	10	359.3	886
Group B	With	22	369.6	648.4
	Without	3	377	720

[a] Group A: without pre-emptive analgesia; group B: with pre-emptive analgesia.