Journal of Cranio-Maxillo-Facial Surgery 42 (2014) 250–254

Contents lists available at SciVerse ScienceDirect

Journal of Cranio-Maxillo-Facial Surgery

journal homepage: www.jcmfs.com

Comparison of general anaesthesia versus regional anaesthesia with sedation in selected maxillofacial surgery: a randomized controlled trial

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ARTICLE INFO

Article history:
Paper received 2 September 2012
Accepted 7 May 2013

Keywords:
Regional anaesthesia
Maxillofacial surgery
sedation
General anaesthesia
Peripheral nerve stimulator

ABSTRACT

Background: The airway is the foremost challenge in maxillofacial surgery. The major concerns are difficulty in managing the patient's airway and sharing it between the anaesthetist and surgeons. General anaesthesia, with endotracheal intubation, is the commonly used technique for maxillofacial procedures.

We assessed the efficacy and safety of a regional block with sedation technique in certain maxillofacial operations, specifically temporomandibular joint (TMJ) ankylosis and mandibular fracture cases, and compared it with conventional general anaesthesia. We compared the time to discharge from the post anaesthesia care unit (PACU) and the occurrence of side effects, as well as surgeon and patient satisfaction with the anaesthetic technique, between the two groups.

Materials & Methods: We enrolled 50 patients of ASA grade 1 or 2, aged 15–50 years, scheduled for maxillofacial surgery (mandibular fracture or TMJ ankylosis). The patients were divided into two groups of 25 each, to receive sedation with a regional block with the use of a peripheral nerve stimulator in group I and general anaesthesia in group II. We observed haemodynamic parameters, intraoperative and postoperative complications and the amount of surgical bleeding in the two groups. Total anaesthesia time, patient and surgeon satisfaction, time to rescue analgesia, the number of rescue doses required, and the time to discharge from the PACU were compared.

Results: The groups were comparable with respect to demographic profile, intraoperative haemodynamic parameters, surgical time, and amount of blood loss. Postoperative pain was assessed using the visual analogue score (VAS). Patients in group I had lower VAS scores after surgery and remained pain-free for longer than those in group II. The mean pain-free interval in group I was 159.12 ± 43.95 min and in group II was 60.36 ± 19.77 min ($p < 0.005$). Patients in group I required lower doses of rescue analgesia than those undergoing the surgery under general anaesthesia ($p < 0.005$). Patients receiving regional blocks also had fewer episodes of postoperative nausea and vomiting ($p = 0.005$). These results led to earlier discharge of patients in group I from the PACU.

Conclusions: Regional block with sedation is a safe alternative technique for patients undergoing surgery for mandible fracture or TMJ ankylosis, with clear advantages over general anaesthesia.

1. Introduction

Mandibular fractures and temporomandibular joint (TMJ) ankylosis require special attention to the patient's airway. These patients frequently present with difficulty in ventilation and intubation. Moreover, anaesthetists and surgeons have to share the patient's airway during surgery (Vas and Sawant, 2001; Raval and

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http://dx.doi.org/10.1016/j.jcms.2013.05.010

Rashiduddin, 2011). General anaesthesia is the conventional way of managing these patients. This involves exposing the patients to the stress of 'awake' airway manipulation and has its own set of postoperative problems (Batra and Mathew, 2005). Previous reports showed that surgery for TMJ ankylosis and mandibular fractures under regional anaesthesia can be safe and effective (Walz et al, 1996; Gajiwala, 2008).

To our knowledge, no reported study has compared the efficacy and safety of general anaesthesia and regional anaesthesia with sedation in these cases. We propose that regional anaesthesia techniques may provide better postoperative analgesia, along with a decreased incidence of side effects, and thus earlier discharge from the postoperative care unit (PACU), than the use of general anaesthesia, in patients undergoing surgery for mandibular fractures or TMJ ankylosis.

2. Patients and Methods

After approval from the institutional ethics committee, 50 patients between the ages of 15 and 50 years, undergoing surgery for mandibular fracture or TMJ ankylosis, were randomly allocated using computer-generated random numbers to two groups: Group I (regional block with sedation) and group II (general anaesthesia with endotracheal intubation), for the prospective study. Patients with an allergy to local anaesthetics, coagulation dysfunction, and ASA grade $\geq$3 were excluded. We also excluded patients with other traumatic fractures in addition to mandibular fractures, fractures of bilateral parasymphysis or condyle of the mandible and patients with significant obstructive sleep apnoea (OSA), who might have difficulty maintaining their airway in a supine position. We explained the entire procedure to the patient, and obtained their written consent.

Patients in both the groups were uniformly premedicated with injection midazolam (0.03 mg/kg) and injection glycopyrrolate (0.004 mg/kg) intravenously. Preoperatively, both the groups received dexamethasone I.V. (0.08 mg/kg) to prevent airway oedema. Monitoring included five lead ECG, pulse oximetry, capnography, temperature and non-invasive blood pressure. We kept the difficult airway cart ready at all times. Once the patient was moved into the operating room (OR), baseline vital signs such as blood pressure, pulse rate, body temperature and oxygen saturation were recorded and induction was started according to the patient's allotted group. We recorded the total time taken to induce the patient at the start of the procedure and the complete surgical time, and compared them between the groups.

2.1. Group I

Patients in group I received mandibular and maxillary nerves blocks, with a solution made up of 14 ml of 0.5% bupivacaine, diluted in normal saline. The preauricular region was first infiltrated with 2 ml of the solution. The mandibular nerve was blocked by the coronoid approach, identifying the coronoid notch on the side of the block by opening or closing the mouth or by locating midpoint of the zygomatic process. A Stimuplex^{R} A (B.Braun Medical Pvt Ltd), 22G (50 mm) needle was inserted perpendicular to the median sagittal plane until it contacted the lateral pterygoid plate. It was then withdrawn slightly and reinserted, so that it moved inferiorly and posteriorly. After elicitation of paraesthesia and observing contractions of the masseter muscle with current value as low as 0.5 mA with Stimuplex^{R} HNS 12 (B.Braun Medical Pvt Ltd) nerve stimulator, 3–5 ml of the drug solution was injected with intermittent negative aspiration. The temporal region, auricle, external auditory meatus, TMJ, salivary glands, floor of the mouth, anterior two-thirds of the tongue, mandible, lower teeth, gingiva, buccal mucosa, and the inferior portion of the face was anesthetized following the injection. The needle was then withdrawn back to the level of the lateral pterygoid plate, directed superiorly and anteriorly, and advanced for 0.5–1 cm, until the development of paraesthesia over the maxillary nerve. Then, 5–10 ml of the local anaesthetic solution was injected to block the maxillary nerve. Use of the peripheral nerve stimulator allowed us to block the mandibular nerve with precision and after sedating the patient, thus providing greater patient comfort. The surgeon infiltrated the line of the incision with 2% adrenalized lignocaine solution (5–10 ml).

After a bolus of propofol (40 mg if $<$60 kg or 60 mg if $>$60 kg), propofol infusion was started at the rate of 50 μg/kg/min and titrated to achieve and maintain a Modified Observer's Assessment of Alertness/Sedation Scale (MOAA/S) of 2. A nasopharyngeal airway (number 8 for males and 7 for females) was inserted in one nostril, after proper lubrication with lignocaine jelly. An FG 8 catheter was inserted through the airway and connected to an oxygen source for insufflation with humidified oxygen. Surgery was started after confirming satisfactory surgical anaesthesia. In case of block failure, we planned to proceed as per the anaesthesia protocol for group II, and to exclude the patient from the study. Patients were moved to the PACU after surgery.

2.2. Group II

Patients in this group received general anaesthesia with nasotracheal intubation. We assessed their airway preoperatively and decided on the technique of airway access.

Patients with a mandibular fracture have trismus due to pain and generally have some mouth opening after induction of anaesthesia. In these patients, anaesthesia was induced with injection propofol (2.0 mg/kg), injection fentanyl (4 μg/kg). Considering the difficult airway in these patients, we used injection succinylcholine (1.5 mg/kg) to facilitate nasotracheal intubation.

All patients with TMJ ankylosis underwent fiberoptic intubation while awake. The procedure was explained to them at the preanaesthetic check-up, and any anxiety was allayed. Airway anaesthesia for these patients was provided with lignocaine jelly and gargles, and transtracheal block, along with 'spray as you go' technique.

Anaesthesia and muscle relaxation were maintained with intravenous propofol (50–150 μg/kg/minute) and vecuronium (0.1 mg/kg bolus followed by 1 mg every 30 min) and the patients' lungs were ventilated with an oxygen-air mixture (1:1). All patients were extubated after reversal with neostigmine (0.05 mg/kg) and glycopyrrolate (0.01 mg/kg), using standard criteria of reversal (sustained head lift for 5 s and sustained handgrip for 5 s along with adequate spontaneous respiration). Patients were then moved to the PACU.

Intramuscular diclofenac (75 mg) was given to both groups at the time of skin closure for postoperative analgesia. The severity of postoperative pain was measured and recorded using a 10-cm Visual Analogue Scale (VAS) score, where 0 = no pain and 10 = the worst imaginable pain. Intravenous paracetamol 1 g was used as rescue analgesia in the PACU if the VAS score was more than 3. Injection of tramadol (1.5 mg/kg intravenously) was given if the patients required another rescue before 4 h after paracetamol. All patients were studied for 24 h for the level of analgesia and the incidence of postoperative nausea and vomiting (PONV) and sore throat.

Patients were monitored every 15 min in the PACU and every 4 h for the next 24 h in the ward. The Post Anaesthesia Discharge scoring System (PADSS score) was assessed by a doctor in the PACU and patients were moved when the PADDS score became $>$9. The length of PACU stay was recorded.

We studied 25 patients in each group, which achieved a power of 80% for a difference of 30 min in the PACU length of stay at a