EDITORIAL VIEW

Intravenous patients controlled analgesia versus maxillary nerve block in unilateral maxillary surgery

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ABSTRACT

Objective: The aim of the present study was to compare perioperative pain relief with intravenous patient controlled analgesia using morphine and maxillary nerve block in patients undergoing unilateral maxillary surgery.

Methodology: Sixty patients, ages between 17 and 70 years, ASA I and II, undergoing unilateral maxillary surgery (cystectomy, odontogenic tumour excision and orodental fistula repair), were recruited in the study and divided into two equal groups. In Group-A patients were administered general anesthesia plus maxillary nerve block with bupivacaine, and in Group-B patients were anesthetized with general anesthesia and morphine followed by PCA. Blood pressure, heart rate and SpO_2 were measured intraoperatively every 15 min. VAS was used postoperatively every 4 hours during first 24 hours. Satisfaction of the patient, conscious level, and complications, e.g. nausea, vomiting, itching and urine retention, were recorded in both groups.

Results are presented as mean ± standard deviation (SD). Statistical analysis was performed with SPSS software version 16. The unpaired students t-test was used to compare the results of both groups. Complications are presented as percentage. P value <0.05 is considered significant.

Results: The hemodynamic parameters were increased in group B in comparison to group A. No significant changes in oxygen saturation during intraoperative period were observed between both groups or within groups. Regarding pain score (VAS), there were no statistically significant difference between both groups at (0) hour but difference was statistically significant between both groups after 4, 8, 12, 16, 20 and 24 hours, VAS score being more in Group B in comparison to Group A. Only 10% and 3.3% of patients in Group A suffered from nausea and drowsiness respectively. In group B, 30%,10%, 10% , 20 %and 10% of patients suffered from nausea, vomiting, Pruritus , drowsiness and urine retention respectively. This part needs to be described in a better way.

Conclusion; Perioperative pain relief in cases of unilateral maxillary medium sized maxillary pathology removal achieved by maxillary nerve block is better than intravenous patient controlled analgesia due to hemodynamic stability, better pain control and lower side effects

Key words: maxillary nerve block, hemodynamic parameters, pain control, patient controlled analgesia

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INTRODUCTION

Regional techniques are an important part of pain management of patients undergoing surgery of the oral cavity. These techniques can be performed with general anesthesia, so reduce the dosage of simultaneously administered inhaled or injectable anesthetics, minimizing their depressive effects on cardiovascular and respiratory functions. Using regional anesthesia block combined with general

anesthesia reduces the dosage of opioid and opioid side effects like postoperative vomiting, excitement, sedation, delayed recovery, and respiratory depression especially for old age.[1]

The maxillary nerve is entirely sensory and passes through the foramen rotundum as it exits from the cranium. The nerve passes through the pterygopalatine fossa, medial to the lateral pterygoid plate, on its way to the infraorbital fissure. It carries sensation from the lower eyelid and cheek, the nares and upper lip, the upper teeth and gums, the nasal mucosa, the palate and roof of the pharynx, the maxillary, ethmoid and sphenoid sinuses, and parts of the meninges. The maxillary nerve is divided into three branches: the zygomatic, pterygopalatine (or sphenopalatine), and posterior superior alveolar nerves. Blocking maxillary nerve in pterygopalatine fossa preoperatively reduced stress and pain intraoperatively and postoperatively in maxillary involved surgery cases.[2]

The aim of the present study was to compare perioperative pain relief with intravenous patient controlled analgesia using morphine and maxillary nerve block in patients undergoing unilateral maxillary surgery.

METHODOLOGY

Approval for this randomized control study was given by the institutional ethics committee and written informed consents were obtained from all patients included in the study. Inclusion criteria were patients ages between 17 and 70 years, ASA I and II, undergoing unilateral maxillary surgery, e.g. cystectomy, odontogenic tumor excision and orodental fistula excision. Patients with severe renal or hepatic impairment, heart failure, chronic respiratory disease, contraindications to regional anesthesia, and inability to understand the use of a patient controlled analgesia (PCA), were excluded from the study.

Sixty patients were recruited in the study and were allocated randomly to one of the two equal groups according to a computerized randomization list. In Group A, patients were administered general anesthesia (GA) plus ipsilateral maxillary nerve block with bupivacaine before general anesthesia; and in Group B, patients were Given GA plus IV morphine followed by PCA. The day before surgery, all patients were familiarized with a PCA device and a standard visual analogue scale (VAS) for pain (0=no pain, 10=worst pain imaginable). Heart rate, non-invasive blood pressure, oxygen saturation and electrocardiogram were monitored before induction with inj. fentanyl 1 μg/kg, propofol 1 mg/kg and 0.5 mg/kg atracurium to facilitate intubation. Maintenance of anesthesia was done by isoflurane 1.4 MAC and atracurium 10 mg every 30 min. Analgesia was obtained by one of the two methods according to the group allocation.

Group A patients received maxillary nerve block under aseptic technique. After local infiltration with lidocaine 1% at the midpoint of the zygomatic arch, a 16G IV cannula was inserted at the midpoint of the lower margin of the zygomatic arch and advanced perpendicularly until it contacted the lateral pterygoid plate. For maxillary nerve block, the cannula was then withdrawn slightly and advanced cephaloanteriorly 1 cm to enter the pterygopalatine fossae. The stylet was then removed and an 18G epidural catheter (Portex™) was advanced 0.5 cm past the cannula tip. The cannula was removed, and the catheter was anchored and a filter was attached. After negative aspiration, a 2 ml test dose of lidocaine 2% with epinephrine (1 in 200,000) was injected. As there was no evidence of intravascular injection, 8 ml of 0.25% bupivacaine was subsequently administered through the catheter. A top up dose of 4 ml 0.25% bupivacaine was injected every 12 hour or on patients feeling pain.

In Group B, 5 mg morphine was injected IV followed by continuous intravenous controlled analgesia after induction of general anesthesia. Protocol used for pain management in this group was using Accufuser® (disposable silicon balloon pain pump, Woo Young Medical Co. Ltd, Korea), filled with containing morphine 60 mg, ketorolac 180 mg and granisetron 2 mg, dissolved in 300 ml normal saline, set infusion rate at 2 ml/hour, PCA bolus 1 ml, and lock out time 15 min. PCA was withheld if respiratory rate was less than 12 /min, or oxygen saturation was less than 90% or the patient was not easily aroused.[3]

Blood pressure, heart rate and SpO_2 were measured intraoperatively every 15 min. VAS was used postoperatively every 4 hours during first 24 hours. Satisfaction of the patient, conscious level, and complications, e.g. nausea, vomiting, itching and urine retention, were recorded in both groups.

Statistical analysis: Results are presented as mean ± standard deviation (SD). Statistical analysis was performed with SPSS software version 16. The unpaired students t test was used to compare the results of both groups. Complications were represented by percentage. P value <0.05 was considered significant.

RESULTS:

Demographic data are shown in Table 1. In Group A, there were 27 male and 3 female patients, with mean age of 40.50 ± 9.0 years. In Group B, there were 25 male and 5 female patients, with a mean age of 39.30 ± 9.9 years. Concerning the age, body weight and operation duration, there were no statistically significant difference between the two groups.

Regarding heart rate and blood pressure during intraoprative period as shown in Table 2, a significant trend (P <0.05) was found between both groups. The hemodynamic parameters were increased in Group B in comparison to Group A. No significant changes in oxygen saturation during intraoperative period were observed between both groups or within the groups.

Pain score (visual analog scale) of the study of the two groups was presented in Table 3. Postoperatively, there were no statistically significant differences between both groups at (0) hour but there were statistically significant differences between both groups regarding pain score after 4, 8, 12, 16, 20 and 24 hours. The VAS score was increased in Group B in comparison to Group A postoperatively.

Table 1: Demographic data (mean ± SD)

Variable	Group A n = 30	Group B n = 30	P value
Age (years)	40.50 ± 9.0	39.30 ± 9.9	0.628
*Sex (Male/female)	27/3	25/5	
Weight (Kg)	90.80 ± 7.7	92.53 ± 10.0	0.909
Duration of surgery (min)	97.33 ± 18.28	95.73 ± 12.4	0.693

Table 2: Intraoperative hemodynamics (mean ± SD)

Parameter	Time (min)	Group A	Group B	P value
Heart rate (beat/min)	0	88.13 ± 9.5	95.87 ± 3.8	0.01
	30	90.87 ± 8.5	109.17 ± 6.7	0.0
	60	90.30 ± 7.5	112.07 ± 7.9	0.0
	90	92.77 ± 6.4	110.07 ± 8.5	0.0
	120	90.80 ± 7.5	108.57 ± 7.1	0.0
MBP (mmHg)	0	87.13 ± 9.6	65.53 ± 6.5	0.0
	30	90.23 ± 9.1	76.73 ± 6.9	0.0
	60	91.70 ± 6.9	84.50 ± 8.3	0.01
	90	75.70 ± 16.9	95.27 ± 7.9	0.0
	120	71.47 ± 15.9	97.70 ± 7.3	0.0
SpO_2 (%)	0	94.10 ± 1.7	94,23 ± 1.6	0.758
	30	98.17 ± 0.67	98.23 ± 0.8	0.753
	60	98.03 ± 1.15	97.73 ± 1.4	0.367
	90	96.6 ± 2.1	96.40 ± 2.2	0.722
	120	98.00 ± 1.08	97.97 ± 1.2	0.912

Table 3: Pain score (VAS) represented by mean ± SD

Time	Group A	Group B	P value
0 hour	2.60 ± .814	2.30 ± .466	0.85
4 hour	2.43 ± .504	3.13 ± .900	0.08
8 hour	2.80 ± .407	4.20 ± .847	0.00
12 hour	3.73 ± .740	4.97 ± .999	0.00
16 hour	3.20 ± .761	5.60 ± 1.192	0.00
20 hour	2.97 ± .615	6.63 ± .809	0.00
24 hour	3.03 ± .615	6.77 ± .971	0.00

Table 4: Side effects recorded represented by n (%)

Variables	Group A	Group B
Nausea	3 (10)	9 (30)
Vomiting	0 (0)	3 (10)
Pruritus	0 (0)	3 (10)
Drowsiness	1 (3.3)	6 (20)
Urine retention	0 (0)	3 (10)

Concerning the side effects recorded intraoperatively and postoperatively in Group A and B. Only 10% and 3.3% of patients in Group A suffered from nausea and drowsiness respectively. In Group B, 30%,10%, 10% , 20 % and 10% of patients suffered from nausea, vomiting, Pruritus , drowsiness and urine retention respectively.

DISCUSSION

Severe postoperative pain, particularly within the first 24 h after operation, is frequently observed after major maxillary surgery. Adequate management of pain intraoperatively and after surgery is important not only to improve the patient's well being, but also to facilitate recovery.[5]

In the present study, continuous maxillary nerve block performed before GA improved intraoperative and postoperative analgesia after surgery for unilateral maxillary medium sized pathology removal in comparison to PCA group. Maxillary nerve blocks can be easily performed by the lateral extraoral approach or by the intraoral approach. The lateral extraoral approach was preferred because some of our patients had difficulty in opening the mouth, and also because we planned to place a catheter for postoperative analgesia and away from pathological lesion. The combining regional anesthesia and GA was done to provide intraoperative and postoperative analgesia and prevent hemodynamic response to pain. Pterygopalatine fossa is extremely vascular due to pterygoid plexus of veins and there is a possibility of intravascular injection or hematoma formation, so proper caution must be exercised to prevent hematoma formation, infection, kinking, or obstruction of the catheter. It was important to keep the catheter as close to the target nerve as possible to ensure a proper anesthetic effect.[3]

The hemodynamic parameters were increased in Group B in comparison to Group A. In the Group A with maxillary nerve block the hemodynamic responses during operation were comparable to hemodynamics recorded by Tuchinda et al, in 2010 during craniotomy operation with scalp nerve block.[6]

Concerning postoperative analgesia in the current study, there was statistically significant decrease in pain score of Group A in relation to Group B. This result does not match with the result reported by Cho and his colleagues,[7] that there was no statistically significant difference between group with continuous nerve block and group with PCA. This discrepancy may be related to the type of the operation and the method of regional anesthesia. In the present study the operation was unilateral maxillary medium sized pathology removal and maxillary nerve block was the method of analgesia while in Cho and his colleagues study the operation was arthroscopic and cuff repair and the method of local anesthesia was subacromial infusion.

Intravenous PCA produces satisfactory analgesia intraoperatively and postoperatively but less than continuous nerve block. The results of the present study were similar to results obtained by Wu et al,[8] that epidural analgesia overall provided significantly

superior analgesia compared with intravenous PCA with opioids for all regions of surgery examined (thoracic, pelvic, abdominal, cesarean delivery, lower extremity, and multiple locations).

In the Group A the incidence of nausea, vomiting, pruritus and drowsiness were 10%, 0%, 0% and 3.3% respectively which were considered low, and were similar to that observed by Borgeat et al,[9] in which they used interscalene PCA with local anesthetics and PCA for shoulder surgery. In Group B the incidence of nausea, vomiting, pruritus and drowsiness were 30%, 10%, 10% and 20% respectively, the previous results were relatively similar to that observed by Borgeat et al. study.

In spite of satisfactory analgesia in Group A and B, there were no signs of local anesthesia toxicity or respiratory depression respectively. Continuous peripheral nerve block has been proposed to offer similar benefits to single injection techniques extending well into the patient settings. Richman et al[10] performed a meta-analysis of randomised controlled trials and found that, when compared with opioid (parenteral and oral), perineural analgesia with local anesthetic provided significantly better analgesia for postoperative pain. Improvements in analgesia were noted through postoperative day. Continuous peripheral nerve block provided superior postoperative analgesia compared with opioids. Perineural analgesia also resulted in fewer minor complications, including nausea, vomiting, peruritis and sedation, and improved patient satisfaction.

Single injection peripheral nerve blocks have been demonstrated to provide superior pain control and decreased side effects compared with the use of opioids.[11] Conclusion of research was done by Singelyn [12] that PCA with morphine, and continuous "3-in-1" block, provided comparable pain relief. Because it induces the fewest technical problems and side effects, continuous "3-in-1" block is the preferred technique

Bupivacaine is a liposoluble local anesthetic whose half life is 189 ± 84 min. It combines with the intra-articular receptor, preventing repolarization and reducing postoperative pain.[13]

Intravenous PCA with an opioid is a widespread therapy for postoperative pain relief. The main advantage of PCA is titration of the analgesic drug according to the patient's individual requirements, thereby maximizing pain relief and minimizing the risk of opioid overdose with subsequent respiratory depression. Although intravenous PCA has been shown to provide excellent pain relief and patient satisfaction, but necessity of intravenous access and a PCA-pump that restricts the patients' mobility.

Morphine and ketorolac tromethamine move to the central nervous system through blood and interact with the receptor in the system to reduce postoperative pain.[14] Adding an nonsteroidal anti-inflammatory drug to an opioid regimen reduces opioid requirements, which could lead to a decrease in opioid-related side effects, so in the present study ketorolac was added to morphine to fill the PCA bag.[15] Furthermore, the use of a comprehensive, preemptive multimodal analgesic regimen has been shown to lower opioid requirements, minimize opioid-related side effects and complications, and reduce hospital length-of-stay.[16]

CONCLUSION

Perioperative pain relief, in cases of unilateral maxillary surgery for medium sized pathology removal, is better by maxillary nerve block than with intravenous patient controlled analgesia, and it offers better hemodynamic stability, better pain control and fewer side effects.

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