Hypotension After Local Anesthetic Infiltration Into The Oral Submucosa During Oral And Maxillofacial Surgery
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Citation

Abstract
We have noted hypotensive episodes in close association with submucosal infiltration of adrenaline contained in lidocaine. We investigated the effects of adrenaline contained in lidocaine on hemodynamics during oral and maxillofacial surgery under general anesthesia. Sixteen patients with an American Society of Anesthesiologists physical status of I scheduled to undergo sagittal splitting ramus osteotomy were included in this study. The patients comprised 6 men and 10 women with a mean age of 22.3 years and mean weight of 58.5 kg. We measured the patients’ systolic arterial pressure (SAP), mean arterial pressure (MAP), diastolic arterial pressure (DAP), and pulse rate (PR). The patients exhibited a mean 30% decrease in SAP, mean 29% decrease in MAP, mean 33% decrease in DAP, and mean 13% increase in PR. All data were normalized to the values immediately before infiltration and expressed as a relative percentage. The average time from injection to minimum pressure was 88 seconds, and the mean duration of the trough was about 60 seconds. This study suggests that there is an approximately 90-second lag time in hemodynamic changes after local anesthetic injection into the oral submucosa. Local anesthetic infiltration with adrenaline contained in lidocaine elicits temporary but severe hypotension.

INTRODUCTION
Adrenaline contained in lidocaine is widely used in neurosurgery, otorhinolaryngological procedures, dental treatment, and oral and maxillofacial surgery to decrease surgical bleeding [1-3], lessen mucosal congestion, and maintain a clear field of view [4, 5]. In neurosurgery and otorhinolaryngological procedures, local infiltration with adrenaline-containing lidocaine solution elicits temporary but severe hypotension [2, 3, 5]. However, hemodynamic changes has not been known after local anesthetic injection into the oral submucosa for dentists. We here report hypotensive episodes in close association with submucosal infiltration of local anesthetics with adrenaline during general anesthesia.

METHODS
This observational study was approved by the Committee on Clinical Investigation for Human Research (IRB) at Iwate Medical University. Written informed consent was obtained from all patients.

We studied 16 patients with an American Society of Anesthesiologists physical status of I who were scheduled to undergo sagittal splitting ramus osteotomy. The patients comprised 6 men and 10 women with a mean age of 22 years and mean weight of 58.5 kg (Table 1). And we could measure 32 cases since the surgeon infiltrated the tissue around both the right and left side of the ascending ramus at almost 60 min after infiltrated the tissue...
Hypotension was observed within about 1 min, and never been continuous in all case. Therefore, when we observe the severe hypotension after local anesthetic infiltration into oral submucosa, we may avoid to administer intravenously atropine sulfate or an adrenergic agonist, ephedrine hydrochloride et al., in haste.

In neurosurgery and otolaryngological procedures, local infiltration with adrenaline-containing lidocaine solution elicited temporary but severe hypotension.

DISCUSSION

In this study, we found out two important clinical issues. Hypotensive episodes may be in close association with submucosal infiltration of local anesthetics with adrenaline during general anesthesia. The hypotension is temporary but severe.

First, hypotensive episodes may be in close association with submucosal infiltration of local anesthetics with adrenaline during general anesthesia. The hypotension occasionally occur after infiltration local anesthetic with adrenaline into oral submucosa has not well known for dentists. Hemodynamic changes including hypotension were caused by the absorption of adrenaline contained in lidocaine solution [5, 6]. The hemodynamic effects of adrenaline are dose-dependent, and different doses of adrenaline may activate different types of sympathetic receptors. An infusion rate of 1 to 2 μg/min, although rarely used, should predominantly activate β2-receptors with resultant vascular and bronchial smooth muscle relaxation. A rate of 2 to 10 μg/min should predominantly activate β1-receptors to increase the heart rate, contractility, and conduction and decrease the refractory period. Doses of >10 μg/min cause marked β-stimulation with generalized vasoconstriction [5, 7]. The major mechanism of the occurrence of hypotension is presumed to be activation of β2-receptors [3, 5, 7]. A decrease in MAP with an increase in heart rate was observed at 1.0, 1.5, and 2.0 minutes when 1% lidocaine with 40, 80, and 160 μg of adrenaline was administered; additionally, the average increase to the highest heart rate was approximately 10 bpm after the beginning of local infiltration [5]. The cause of this increase of HR mainly involves a baroreceptor reflex that decreases the blood pressure and gently stimulates β2-receptors [5, 8, 9].

Second, the hypotension is temporary but severe. In this study, there was a 30% decrease in SAP, 29% decrease in MAP, 33% decrease in DAP and the mean duration of the trough was about 60 seconds. The temporary but severe hypotension was observed within almost 1 min, and have never been continuous in all case. Therefore, when we observe the severe hypotension after local anesthetic infiltration into oral submucosa, we may avoid to administer intravenously atropine sulfate or an adrenergic agonist, ephedrine hydrochloride et al., in haste.

In neurosurgery and otolaryngological procedures, local infiltration with adrenaline-containing lidocaine solution elicited temporary but severe hypotension. When 1% lidocaine with 40, 80, and 160 μg of adrenaline was administered to the scalp in neurosurgery, the MAP
temporally decreased by >30%, the average time from the
start of local infiltration to the lowest MAP was 102
seconds, and the hemodynamic changes in blood pressure
and PR tended to become relatively stable by 5 minutes [5].
Neither the MAP nor the PR changed significantly when 1%
lidocaine without adrenaline was administered [5]. In
functional endoscopic sinus surgery, a low dosage of
adrenaline may produce significant hemodynamic effects,
particularly obvious hypotension combined with a slight
increase in heart rate [5, 7].

Limitation in this study, we did not measure the
hemodynamic changes when lidocaine without adrenaline
was infiltrated into the oral submucosa. Though we did not
demonstrate directly that hypotensive episodes in association
with submucosal infiltration of local anesthetics with
adrenaline, we emphasize that local infiltration with
adrenaline-containing lidocaine solution elicits temporary
but severe hypotension within almost 90s after infiltrated
into oral submucosa.

In conclusion, hypotensive episodes may be in close
association with submucosal infiltration of local anesthetics
with adrenaline during general anesthesia and the
hypotension was temporary but severe. Clinicians must
consider the possibility of marked hemodynamic changes
when adrenaline contained in lidocaine solution is infiltrated
into the oral submucosa. We carefully observe without any
treatment because the changes only last approximately 1
minute or so.

Table 1
Demographic data : Data are presented as mean ± standard
deviation unless otherwise indicated.

| Patient, n | 10 |
| (Case, both right and left side, n) | (32) |
| Age, years | 22 ± 4 |
| Weight, kg | 58.5 ± 8.8 |
| Sex, male/female | 6:10 |
| Lidocaine dose, mg/kg | Right, 1.5 ± 0.4, left, 1.5 ± 0.4 |
| Adrenaline dose, mg/kg | Right, 1.5 ± 0.4, left, 1.5 ± 0.4 |
| Type of surgery | Sagittal splitting ramus osteotomy |

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