Making Patients Safe and Comfortable: Application of Midazolam during Removal of Impacted Third Molars

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Aims. To assess the safety, acceptability of local anesthesia combined with midazolam.

Methods. 100 patients who required removal of four impacted third molars aged 18–36 years old were randomly divided into two groups. Group I (test group): 50 patients were to have the teeth removed under local anaesthetic (2% lignocaine and 1/100 000 adrenaline) and i.m midazolam 0.1 mg/kg. Group II (control group): the other 50 were to have the teeth removed under the routine local anaesthetic alone. Vital signs including blood pressure, heart rate, arterial oxygen saturation and breath frequency were recorded every 2 min. anxiety scores (assessed by visual analogue scale) and patient opinions were recorded after operation too.

Results. All impacted third molars were removed successfully. No mortality and serious morbidity events occurred in all patients. There is significantly different between these two groups in MAP and HR (P < 0.05). The hemodynamics was kept steadily in test group, but fluctuated greatly in control group. There is no significantly different between these two groups in SaO2 and breath frequency. Anxiety scores were markedly lower in test group than control group (P < 0.05). 80% of the patients in test group would accepted the same operation if it were necessary, but 12% of the patients in control group would accepted it.

Discussion and conclusions. Appropriate midazolam makes patients in stage I of anaesthesia. In this stage patients are relaxed and cooperative, with a decreased awareness of their surroundings, and may exhibit a diminished response to stimulation. The effect of local anesthesia combined with midazolam was significantly better than the routine local anaesthesia alone. It makes patients safe and comfortable during removal of impacted third molars.

Evaluation of Intravenous Sedation with or without Artificial Ventilation following Free Tissue Transfer Reconstructive Surgery for Oral Cancer

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Aim. To evaluate the intravenous sedation with or without artificial ventilation following free tissue transfer reconstructive surgery for oral cancer.

Methods. Twenty patients who underwent various reconstructive surgery with free tissue transfer after resection of oral cancer between April 2000 and March 2004 were selected in our hospitals. All patients belonged to Class 1 or 2 of ASA classification. We obtained the informed consent from all patients in advance and verbal consent on postoperative sedation with propofol. These patients underwent tracheostomy, tumor resection, and reconstructive surgery with free tissue transfer accompanied with vascular anastomosis.

All cases were randomly assigned to Group A (n = 10) (sedation with propofol on artificial ventilation) or Group B (n = 10) (sedation with propofol without artificial ventilation). The rate of propofol administration was adjusted to maintain the Observer’s Assessment of Alertness/sedation scale (OAA/S) between 2 and 3. Pentazocine (7.5–15 mg) was injected intravenously for pain management, as required. Postoperative mean blood pressure (MAP), cardiac rate (HR), mean infusion rate of propofol, and blood gases analysis were examined, retrospectively. An unpaired-t-test was used.
for statistical analysis of these data, with a level of significance less than 5% defined as significantly different.

Result. The total requirement (the mean infusion rate) of propofol in the sedation of group A and group B were $2148 \pm 221 (4.1 \pm 0.33)$ and $1539 \pm 153 \text{mg}(3.2 \pm 0.1 \text{mg/kg/h})$, respectively. During the sedation period, MAP and HR were higher in group A than group B.

Discussion and conclusion. The total requirement (the mean infusion rate) of propofol was more in the sedation on artificial ventilation than without it. Intravenous sedation without artificial ventilation may be favorable for postoperative management.

Clinical Study of Midazolam on Maxillofacial Postoperative Patient with Nasotracheal Intubation

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Objective. To observe the sedation effect of midazolam on maxillofacial postoperative patient with nasotracheal intubation.

Methods. 40 cases were equally divided into two groups with 20 in each group: sufentanil group (group S) and sufentanil-midazolam group (group S-M). The continuous dose was 2 mL/h. When the patients feel uncomfortable, patient controlled intravenous analgesia (PCIA) was used. To observe the changes of circulation and respiration, the changes of visual analogue scale (VAS) and Ramsay score, the patients’ bucking times within 24 h and the PCIA times, patients’ total satisfactory degree and the complications during postoperative analgesia.

Results. There were significant decrease in VAS of two groups after postoperative analgesia 1, 4, 12, 24, 48 hours ($P < 0.01$). Ramsay score in group S-M were significant increased after postoperative 1, 4, 12 hours ($P < 0.01$), and were statistically higher when compared with the group S after postoperative, 4 hours ($P < 0.05$). In group S-M, PCIA times ($5.4 \pm 2.4$) were significantly lower than the group S($14.5 \pm 4.6$) ($P < 0.01$) and the patients’ bucking times within 24 h($3.2 \pm 1.1$) were also significantly lower than the group S($6.6 \pm 1.4$) ($P < 0.01$). The patients’ total satisfactory degree in group S-M (90%) were statistically higher when compared with the group S (65%) ($P < 0.05$).

Conclusion. Sufentanil is an effective method for maxillofacial postoperative analgesia. When combined with midazolam, they could get higher Ramsay score and decrease the PCIA times and the patients’ bucking times within 24 h, so the patients could have better tolerance for the nasotracheal intubation without the incidence of nausea or vomiting.

Requirement of Oral Midazolam for Sedation in Pediatric Patients Undergoing Minor Oral and Maxillofacial Surgery; Retrospective Analysis in Relevance to Age

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Aim. Oral midazolam have been employed for children in dental settings. An optimal dose for midazolam in relation to age, however, has not been established.

Methods. Pediatric patients aged 10 or less who received minor oral surgery under oral sedation with midazolam supplemented with nitrous oxide inhalation or propofol were retrospectively analyzed. Patients those who had delayed emergence more than 1 hour, those who had vomiting, and those who needed airway maintenance were classified as overdose (0); the rest were classified as satisfactory (S). Thus, for both groups, correlations between age and midazolam dose (mg/kg) were analyzed by Pearson’s correlation coefficient, whereas relationships were fitted by simple regression.

Results. Thirty-three cases were analyzed. In the S group (25 cases), the dose of midazolam significantly decreased as the age goes up ($R = 0.48$), whereas that in the 0 group (8 cases) was significantly higher than S group and decreased with age along with more correlation coefficient ($R = 0.77$). No difference was found between the two groups in age and weight.

Discussion and Conclusions. These findings suggest that both requirement of midazolam and threshold to overdose decreases with age, thus we should be careful for overdose of midazolam especially children at school age undergoing oral sedation.

Clinical Analysis of Intravenous Sedation in Dentistry of Disabled Patients at National Welfare Foundation for Disabled Children

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Aim. Intravenous sedation (IVS) is one of the effective methods for some non-cooperative disabled patients. We use IVS for such patients that can sit on a dental chair but cannot accept dental treatment. They seem to have fear and try to eliminate dental manipulation, although they can accept facemask for inhalation sedation or venipuncture. Almost such patients turn to cooperate using intravenous midazolam and/or propofol administration. Some patients however do not show sedative states or others happen to have airway obstruction. The aim of this study was to analyze safety and effectiveness of IVS for disabled patients in our clinic for the previous 3 years.

Method. We investigated 555 cases from July 2003 through June 2006. Following parameters were analyzed: age, gender, body weight, disabilities, habitual drugs, dental procedures, duration of treatment and sedation, recovery time, amount of injected drugs, sedative effect and complications.

Results. The patients were ranged from 7 to 81 years old and 352 males and 203 females. Many patients had disabilities: 167 autistic, 92 cerebral palsy, and 42 patients with Down’s syndrome. Seventy cases were phobic without mentally retarded. About 8 (435 patients) had mental retardation and 89 patients had epilepsy. Forty-eight (8.6 percent) cases had difficulties for dental treatment even using IVS. Although there no serious complication, 37 cases (6.7 percent) showed low oxygen saturation (Spo2 under 85 percent) during sedation.

Discussion and conclusion. Intravenous sedation is an effective method for those who cannot accept routine dental treatment, if the indications are well discussed.

The ineffective patients became drowsy by midazolam or propofol but remained resistant to dental treatment. Addition of those agents for such patients sometimes caused respiratory depression. Other additional drugs were discussed.

Assessment of Perioperative Cardiac Complications in 1422 Patients in Oral Surgery

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Aim. Cardiac complications are a primarily source of increased cost and morbidity in surgically treated dental patients. This study investigated potential risk factors related to perioperative cardiac complications that may occur during oral surgery.

Methods. Data from 1422 patients (n = 1376) who had undergone oral surgery at the Meikai University School of Dentistry between 1999 and 2003 were retrospectively reviewed. Chi-square analysis and Student t test were used to evaluate perioperative variables identified as potential risk factors for perioperative cardiac complications.

Results. Major perioperative cardiac complications occurred in 7 patients (0.49%). ST-segment depression or elevation was documented in 4 patients, acute myocardial infarction (AMI) was documented in 2 patients and ventricular tachycardia (VT) was documented in 1 patient. Most patients showed improvement in health by appropriate treatments. However, one of the AMI patients died at 14 days after surgery. We identified nine risk factors of cardiac complications: history of hypertension; history of diabetes mellitus; history of angina pectoris; history of myocardial infarction; preoperative abnormal ECG; preoperative abnormal echocardiogram; classification of ASA; classification of Ishiguro; and age (p < 0.05).

Conclusions. This study shows the age, history of HT, DM, AP, MI, preoperative abnormal ECG and abnormal echocardiogram, classification of ASA and Ishiguro to be significant factors associated with cardiac complications.

Differences in Blood Pressure during Induction of Anesthesia by Type and Timing of Discontinuation of Antihypertensive Drugs before Surgery

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Aim. In patients receiving antihypertensive medications, administration of drugs to induce anesthesia and elicitation of undesirable reflexes during intubation often cause hypotension. Antihypertensive treatment is frequently continued until the day of surgery using general anesthesia, some antihypertensives have long durations of action, and little is known concerning the relationship be-
tween timing of interruption of antihypertensive treatment and changes in blood pressure during surgery.

Methods. The subjects were 129 patients receiving antihypertensives who underwent surgery with general anesthesia between January 2003 and December 2005. The relationship between preoperative blood pressure and changes in blood pressure during the period between induction of anesthesia and the end of surgery was assessed by type of and timing of suspension of antihypertensive drugs.

Results. In patients undergoing monotherapy with calcium blockers, blood pressures in the hospital ward, at the time of arrival in the operating room, and immediately before induction of anesthesia were constant, though decreases in blood pressure were observed after loss of consciousness regardless of the type of antihypertensive drug. Patients with higher systolic blood pressure in the hospital ward did not exhibit higher minimal systolic blood pressures during surgery. Patients with higher preoperative blood pressures tended to exhibit larger decrements in blood pressure during surgery. Many patients receiving angiotensin II receptor antagonists required vasopressors during surgery.

Discussion and Conclusion. We have experienced a relatively large number of cases of abrupt hypotension during induction of anesthesia that have required administration of vasopressors. Our findings indicate that the timing of suspension of antihypertensive treatment prior to surgery must be carefully considered.

Influence of Pre-Medication on the BIS Value and Level of Memory before Induction

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Aim. We examined the influence of pre-medication on BIS value and on the level of memory.

Methods. 25 healthy oral surgery patients scheduled to undergo general anesthesia were studied. Objects were separated to two groups. The one was the 9 patients who were administrated hydroxyzine 50 mg and atropine sulfate 0.5 mg before 15 minutes (H-group), and another one was the 16 patients who administrated midazolam 3 mg and atropine sulfate 0.5 mg in muscle 15 minutes (M-group) before entering the operating theater. We installed some monitors for general anesthesia including BIS monitor to the patient in the operating theater. We recorded the BIS value after measurements were steady. We asked patients whether they had their memory after pre-medication, using the following assessment form (1: Remember all of things 2: Remember almost, 3: Hardly have the memory, 4: Don't have all the memories) at the next day.

Results. BIS value were 95.0 ± 5.5 (Mean ± SD) in H-group and 85.6 ± 9.7 in M-group. There was a significant difference between two groups. 8 persons had all/almost memory after pre-medication in H-group. 14 persons don't have all the memories or hardly have the memory, and no persons had all the memories in M-group.

Discussion and conclusions. It was suggested that measurements of BIS value will be effective to guess the level of the memory following pre-medication in the operating theater.

Propofol and Midazolam Increase Salivary Flow at Induction of General Anesthesia - Compared With Slow Induction with Sevoflurane

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Aim. An increase in salivary flow at induction of general anesthesia may cause airway trouble. Accordingly we investigated salivary flow after induction of general anesthesia by propofol, midazolam or sevoflurane.

Methods. Subjects underwent oral surgery with general anesthesia. We divided the subjects into three groups; propofol, midazolam and sevoflurane groups (n=10 each). Respectively, the groups were given 2 mg·kg⁻¹, 0.15 ~ 0.2 mg·kg⁻¹, and 5% to induce general anesthesia. Salivary flow was measured with placing four dental cotton rolls in the floor of the mouth and oral vestibules for one min at baseline (BL), immediately after intubation (AI) and ten-min after intubation (10m). Cotton rolls were weighed immediately after removal on an electronic balance. Data values were analyzed using ANOVA and student's t-test (P < 0.05 significant).

Results. The gender, age, height and weight of the subjects in the three groups were not significantly different. At BL, salivary flow in the propofol, midazolam and sevoflurane groups were 0.355 ± 0.144 (mean ± SD) g·min⁻¹, 0.289 ± 0.191 and 0.355 ± 0.08 l, respectively. At AI, salivary flow was increased significantly in the propofol (1.464 ± 1.291) and midazolam (1.561 ± 0.896) groups versus BL.

Conclusions. Induction of general anesthesia by propofol or midazolam increased salivary flow level, but
sevoflurane did not. It is necessary to prevent salivation in rapid induction of general anesthesia.

Prolonged Injection Time and Pre-administration of Vecuronium Decrease the Incidence of Fentanyl-Induced Cough

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Aim. Fentanyl is used as an analgesic agent during induction of general anaesthesia widely, however it often induce cough reflex transiently.

We therefore evaluated whether the incidence of cough following IV fentanyl increase with dependent on quantity or not, and whether pre-administration drug such as lidocaine, atropine, vecuronium, or ephedrine suppress the cough or not.

Methods. Study 1: Three-hundred-eighteen ASA physical status I–II patient scheduled for oral surgery under general anesthesia were randomly assigned to 3 groups. In Group I (n = 106) patients were received fentanyl 1 microg/kg, whereas for patients in Groups II (n = 106) and III (n = 106), they received fentanyl 3 and 5 microg/kg, respectively. Study 2: One-hundred-fifty ASA physical status I–II patient scheduled for oral surgery under general anesthesia were randomly assigned to 6 groups. In Group A (n = 25) patients were received saline before IV bolus administration of fentanyl 5 microg/kg, whereas for patients in Group B (n = 25), C (n = 25), D (n = 25) and E (n = 25), they were received lidocaine 0.5 mg/kg, atropine 0.01 mg/kg, vecuronium 0.015 mg/kg, or ephedrine 0.1 mg/kg, respectively. Patient in Group F (n = 106) received fentanyl 5 microg/kg for 30 s slowly. We recorded the incidence of cough reflex for 60 s following fentanyl injection.

Results. Study 1: The incidence of cough was 6.6% in Group I, 29.2% in Group II, and 44.3% in Group III. Study 2: The incidence of cough was significantly lower in Group D and F compared with Group A.

Discussion and conclusions. The incidence of cough following IV bolus of fentanyl increases by the dependent on quantity. Pre-administration of vecuronium and prolonged injection time of fentanyl decrease the incidence of the cough. However, pre-administration of lidocaine, atropine or ephedrine were not effective in preventing fentanyl-induced cough.

Aminophylline Reverses Isoflurane-Induced Unconsciousness in Humans: A Sequential Low-Dose Administration and Serum Theophylline Concentration

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Aim. Aminophylline has been successfully used as benzodiazepine, barbiturate, ketamine as well as opioid antagonist in surgical patients. The aim of this study was to evaluate the low-dose aminophylline, an adenosine receptor antagonist, on the CNS activities as assessed by the bispectral index (BIS) when it was sequentially injected in isoflurane-anesthetized humans.

Methods. After institutional approval and informed consent from 6 healthy volunteers, isoflurane (0.5%) was administered using a tightly fitted facemask for 50 min. Inspired and end-expired gases were continuously monitored. The CNS activities were assessed using BIS and behavioral responses. Thirty mm after the start of isoflurane, aminophylline (1 mg/kg) was sequentially injected 5 times at 3 mm intervals. The following variables were also monitored: ECG, blood pressure, heart rate, respiratory rate, tidal volume, O2, CO2 oxygen saturation, and serum theophylline concentrations. RM-ANOVA followed by SNK test for multiple comparisons were used for statistical analysis (P < 0.05).

Results and Discussion. During 30 mm inhalation of isoflurane, the BIS decreased significantly to 52 ± 14 (Mean ± SD). The first low dose of aminophylline (1 mg/kg) effectively counteracted the isoflurane effects and rapidly restored the BIS values to the awake baseline levels (>80) despite continued isoflurane inhalation. The peak serum theophylline concentrations remained low even after 5 sequential doses. After completion of 70-mm study, all subjects were fully awake, alert and were able to resume physical and intellectual activities. The present results show in volunteers that rapid reversal of isoflurane anesthesia can be safely achieved with low doses of aminophylline, and if necessary, subsequent sequential administration can be applied with no side effects. This titration technique will clinically facilitate aminophylline antagonism in isoflurane anesthetized patients.

Intravenous ATP Potentiates and Aminophylline Reverses the Sedative/Hypnotic Effect of Sevoflurane

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Aim. Sevoflurane did not. It is necessary to prevent salivation in rapid induction of general anesthesia.
Endogenous adenosine neuromodulatory actions, which modulate synaptic neurotransmission may play an important role in the mechanisms of several anesthetic/analgesic drugs. We investigated whether IV ATP (ATP rapidly breaks down to adenosine) could potentiate the sedative/hypnotic effects of sevoflurane (SEVO), and whether ammophylline (adenosine receptor antagonist) would affect the SEVO hypnotic action.

**Method.** After institutional approval, fifteen volunteers participated in the study in two trials, in a randomized and crossover design: (Trial 1) Administration of SEVO alone at target end-tidal (ET) concentration of 0.4% for 50 min, and (Trial 2) Co-administration of SEVO and ATP (100 g/kg/min) for 50 min. CNS activities were monitored using BIS, and the behavioral responses to verbal command were tested every five min. Forty min after the start of SEVO alone, or combined with ATP, the deeply sedated subjects were slowly injected with ammophylline (IV 5 mg/kg). The following variables were also monitored: blood pressure, heart rate, oxygen saturation, respiratory rate, tidal volume, O₂, CO₂ sevoflurane and plasma theophylline concentrations. RM-ANOVA followed by SNK test for multiple comparison were used for statistical analysis (P < 0.05).

**Results and Discussion.** SEVO produced consistent sedation associated with significant reduction in BIS values. Co-administration of ATP and SEVO further decreased the BIS significantly as compared to SEVO alone, suggesting that ATP potentiated the sedative effect of SEVO. IV ammophylline effectively reversed the sedative effect despite continuing SEVO administration. Within minutes, all subjects were responsive to verbal commands, and the BIS values were quickly restored to awake level in both groups. These results clearly demonstrate that the sedative/hypnotic effects of SEVO may be mediated, at least in part, via central purinergic mechanisms.

**Influence of Hypotensive Anesthesia on Autonomic Function: Analysis of Intraoperative Autonomic Nerve Activity using Wavelet’s Procedure**

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**Aim.** In the oral surgical field, hypotensive anesthesia is indicated for patients undergoing relatively invasive surgery, and to reduce blood transfusion. We performed hypotensive anesthesia with sodium nitroprusside (SNP) under sevoflurane anesthesia, and investigated intraoperative autonomic activity.
Methods. The subjects were 7 patients who underwent sagittal mandibular osteotomy (ASA I). After rapid induction with thiopental sodium and vecuronium bromide, nasotracheal intubation was performed. During surgery, anesthesia was maintained with oxygen, nitrous oxide, and sevoflurane, and hypotension was maintained by administering SNP at 0.5 to 0.8 microgram/kg/hr using an infusion pump, with systolic blood pressure (SBP) values ranging from 80 to 90 mmHg. Autonomic nerve activity was analyzed based on changes in heart rate (HR) and blood pressure using Flaklet’s software (Dam-Nippon Pharmaceutical Co., Ltd.). As indices of sympathetic activity, we employed SBP-LF and HR-LF/HF. Using HR-HF as an index of parasympathetic activity, Wilcoxon’s rank sum test was employed. \( P < 0.005 \) was regarded as significant.

Results. HR increased under hypotensive anesthesia with SNP, although there were no significant differences. Concerning autonomic nerve activity during surgery, both sympathetic activity (SBP-LF, HR-LF/HF) and parasympathetic activity (HR-HF) reduced. However, there were no significant differences.

Conclusions. These results suggest that inhalation anesthetics reduce autonomic nerve activity during surgery, and that SNP does not influence the sympathetic nervous system.

Perioperative Management by NCPAP in Obstructive Sleep Apnea Patients
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Obstructive sleep apnea results from a malfunction of the upper airway and causes, in some patients, severe hypoxemia during sleep. Patients with obstructive sleep apnea syndrome (OSAS) represent heightened surgical risk, as the use of the anesthetics, sedatives and analgesic drugs in the perioperative period selectively impairs muscle activity in the upper airway. It has been recommended that such drugs be avoided or used with extreme caution in OSAS patients undergoing surgery. We report the employment of nasal continuous positive airway pressure (NCPAP) during the perioperative period in the respiratory management of a patient with OSAS undergoing mammory surgery. Using this approach, we were able to administer anesthetic and analgesic drugs without major complications, which suggests that the use of NCPAP may not only prevent respiratory obstruction and other complications associated with OSAS, but also allow us to use anesthetic and analgesic drugs.

Perioperative Management for Long-Lasting Maxillofacial Surgery
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Objective. To investigate perioperative management for long-lasting maxillofacial surgery.

Methods. We retrospectively reviewed the records of the patients who received long-lasting maxillofacial surgery (over 10 hours) at Jichi Medical University Hospital from January 2003 to June 2006.

Results. Data were collected from 40 patients (23 male, 17 female, mean age 59.9 yr (22 to 81)). All the surgical procedures were removals of malignant tumors with or without the reconstruction. Four patients were ASA III, and others were ASA I or II. Intravenous induction with propofol and fentanyl was performed in 38 patients, and inhalation induction was used in 2 patients. As initial airway management, orotracheal or nasotracheal intubation was chosen in 32 and 4 patients, respectively. Twenty-eight of those patients received tracheostomy during the surgery. In 4 patients, laryngeal mask airway was used initially, and the tracheostomy was followed. Anesthesia was maintained with sevoflurane plus fentanyl in 38 patients, and inhalation induction was used in 2 patients. As initial airway management, orotracheal or nasotracheal intubation was chosen in 32 and 4 patients, respectively. Twenty-eight of those patients received tracheostomy during the surgery. In 4 patients, laryngeal mask airway was used initially, and the tracheostomy was followed. Anesthesia was maintained with sevoflurane plus fentanyl in 38 patients and propofol plus fentanyl in 4 patients. Sixteen patients received blood transfusion during the surgery. All the patients were transferred to the intensive care unit for postoperative management. There were no severe complications during the course of anesthesia and postoperative care.

Conclusions. Important aspects of perioperative management for long-lasting maxillofacial surgery include airway management and fluid replacement.

Use of Apparatus Dead Space Improves Arterial Blood Oxygenation and Airway Humidity in Patients undergoing Prolonged Surgery. The Role of Rebreathing
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Mechanical ventilation during anesthesia has been conventionally set at 10 ml/kg (tidal volume; Vt) and 10 breath/min (respiratory frequency; f), which often result in profound hypocapnia. This hypocapnia may be treated with rebreathing by adding apparatus dead space (DS). However, safety and effectiveness have not been established. We evaluated the arterial blood gas (PaO₂ and PaCO₂) hemodynamics and the airway climate (temperature and humidity) following the application DS (Normocap-F comprising a flexible tube incorporating a bacterial filter with a total volume of 150 ml DS) attached to the breathing circuit.

**Method.** Adult patients undergoing long lasting general anesthesia (>4 h) were randomly divided into 3 groups: 5Y (5 L/min with Y-circuit, n = 21), 2Y (2 L/min with Y-circuit, n = 7) and 2F (2 L/min with F-circuit, n = 7). In both 5Y and 2Y groups, a Y shaped 2-limb circuit (Y-circuit), and in the 2F group, a coaxial (F-circuit) was used. The fresh gas flow (FGF) was kept constant at 5, 2, and 2 L/min, respectively. During the first 2 hours, conventional ventilation (Vt: 10 ml/kg, f: 10 breath/min) without dead space (−DS), and during the next 2 hours dead space (+DS) was added. In 6 patients (5Y group) heat and moisture exchanger (HME: Giebeck Humid-Vent Filter Compact A) was used for evaluating the airway climate.

**Results.** Addition of DS significantly improved arterial blood gas oxygenation PaO₂ concomitant with increased PaCO₂ in all groups. Humidification of the airway gases improved significantly with +DS, achieving almost comparable values to the use of HME, but it increased significantly only in the group of 2F without −DS.

**Conclusion.** The use of Normocap-F appears to be safe and effective, not only in treating hypoxia but also improving arterial blood oxygenation and airway humidity and presumably preventing bacterial infection.

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**Which Anesthesia is Suitable for Ambulatory Anesthesia: Propofol with Nitrous Oxide versus Sevoflurane with Nitrous Oxide**

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**Aim.** Anesthesia techniques for day case dental treatment should provide a rapid recovery without side effects. We therefore compared the recovery characteristics of two anesthetic techniques: propofol with nitrous oxide and sevoflurane with nitrous oxide.

**Methods.** One hundred and four handicapped patients undergoing dental treatments under ambulatory general anesthesia in our hospital over the past three years were investigated retrospectively. Propofol with nitrous oxide (group P: n = 75) were induced with a bolus injection of 2–2.5 mg/kg of propofol, and maintained with a propofol infusion of 8–12 mg/kg/h with 50–70% nitrous oxide. Sevoflurane with nitrous oxide (group S: n = 29) were induced with sevoflurane 3–5 vol.%, and maintained with sevoflurane 2–3 vol.% with 50–70% nitrous oxide. Tracheal intubation in both group were facilitated by vecuronium 0.1 mg/kg. Time of anesthesia, recovery time (from the end of treatments to eyes open in response to a verbal command), discharge time (from the end of treatments to the discharge), and the incidence of side effects were compared between groups.

**Result.** Patients’ demographics, anesthesia time, recovery time were not statistically different between groups. In group P, discharge times were significantly shorter than in group S (P < 0.0001). The incidence of nausea and/or vomiting was statistically significantly less in group P (4%) than group S (21%) (p < 0.03).

**Discussion and conclusion.** Although recovery from anesthesia was similar between two methods, propofol with nitrous oxide provided faster discharge time. In addition, the side effects such as nausea and vomiting were not almost observed in propofol with nitrous oxide. We conclude that propofol with nitrous oxide is advantageous than sevoflurane with nitrous oxide for ambulatory general anesthesia.

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**Dental Ambulatory Anesthesia in Infantile Cerebral Palsy Patients**

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**Aim.** Choice and rationale of anaesthetic approach to individuals with infantile cerebral palsy.

**Methods.** 46 ambulatory dental patients with ASA II–III, was randomly allocated in 2 groups. Group A (n = 22) received halothane and N2O/O2 = 2/1. Group B (n = 24) received propofol with N2O/O2 = 2/1. Both groups received standard infiltration anesthesia with Ultracaine-DS and spontaneous breathing by laryngeal mask.
Clinical studies (BP, heart rate, SpO2, frequency of breath and tidal volume) were analyzed: before and after induction, the most traumatic stage, after anaesthesia and surgical intervention. Recovery period was evaluated by Bidway test and statistically analysed.

Results. The more prolong induction in group A ($p < 0.05$) was accompanied by mild hypotension-less 10% of basic level ($p < 0.05$), decreased tidal volume ($p < 0.05$) and tachypnea. Restlessness and airway irritation were observed during induction. The recovery period was significantly longer in group A ($p < 0.05$), particular with somnolence, dizziness and diplopia. Spontaneous ventilation was effective in both groups (SpO2 – 97–99%).

Conclusion. The propofol based anaesthesia with N2O/O2 in combination with articain based infiltration provided shorter induction and recovery time and was more appropriate for individuals with infantile cerebral palsy on different anaesthesia stages.

Day Case General Anesthesia for Pediatric Patients undergoing Dental Treatment
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Aim. Day case general anesthesia has been applied for several kinds of patients including disabled or non-cooperative children undergoing dental treatment in Tokyo Dental College Chiba hospital. We are here reporting the present condition of day case general anesthesia for pediatric patients.

Methods. General anesthesia cases performed in the outpatient clinic, Department of Dental anesthesiology at Tokyo Dental College Chiba Hospital from 2002 to 2005 were analyzed. Of those, general anesthesia for non-cooperative children was focused in respect to age, anaesthesia technique, anesthesia time, operation time and treated teeth.

Results. General anesthesia cases were 560 in the four years. Of those, 256 were for pediatric patients and 196 were given in day case settings. Cases were divided into the following categories, dental treatments: 154 cases (disabled patients: 83 cases; medically compromised patients: 7 cases; non-cooperative patients: 64 cases) and minor oral surgery: 42 cases. Average data were, 7.0 years for age, 134 min for anesthesia time, 96 min or operation time and 7.9 for treated teeth. General anesthesia included nitrous oxide – oxygen – sevoflurane (134 cases), oxygen – sevoflurane (33 cases), nitrous oxide – oxygen – propofol (55 cases) and oxygen – propofol (16 cases). There were no severe complications.

Discussion and Conclusions. Although behavior modification is a common approach for disabled or non-cooperative children undergoing dental treatment, we sometimes experience pediatric patients having many teeth caries because of difficulties in their treatment. In these situations, day case general anesthesia may be a good candidate. Complex dental treatment such as root canal treatment followed by crown restoration can be attained by repetitive general anesthesia.

Study on Recovery from Air-Oxygen-Propofol Ambulatory Anesthesia: Randomized Comparative Study of GOS Anesthesia
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Purpose. The nitrous oxide-oxygen-sevoflurane anesthesia (GOS) is widely utilized in ambulatory general anesthesia. However, even with GOS, recovery takes time for some patients. We hypothesized that if ambulatory general anesthesia were performed using local anesthesia and air-oxygen-propofol anesthesia (AOP), the advantages of propofol could be effectively realized. Therefore, between GOS and AOP, such factors as time from the end of surgery to recovery, time from the end of anesthesia to discharge, and incidence of PONV were compared.

Methods. No premedication was administered. Anesthesia was induced using propofol and sevoflurane. Tracheal intubation was carried out after administering vecuronium. Anesthesia was maintained as follows. AOP group: Inhalation of nitrous oxide and oxygen. Propofol was administered to maintain BIS at 40 to 60. GOS group: Inhalation of nitrous oxide and oxygen. Sevoflurane was administered to maintain BIS at 40 to 60. We measured time from the end of anesthetic administration to BIS 80 (BIS80 time), to extubation (extubation time), and to discharge (discharge time). We also measured incidence of PONV.

Results. In a total of 72 patients, no significant intergroup difference existed in anesthesia time, operation time, or infusion volume. The vecuronium dose for the AOP group was significantly higher than that for the GOS group. The average BIS80 time and average extubation time for the GOS group were significantly shorter. No significant intergroup difference existed in the average length of discharge time. Incidence of PONV was also no significant intergroup difference.
Conclusion. In ambulatory general anesthesia lasting about three hours, there are no marked differences in incidence of PONV and time to discharge between GOS and AOP.

**The Useful of Non-Intubated TIVA on Day Stay Anesthesia in Dentistry**

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Introduction. We studied the usefulness of outpatient non-intubated total intravenous anesthesia (TIVA) for dental procedures provided by dental anesthesiologists in Japan.

Methods. Subjects consisted of 400 outpatients given dental treatment under non-intubated TIVA during March 2005 from April 2004 at the Kobe Dental Center. The medical histories of the patients included mentally disability, uncooperativeness, gagging reflex and phobia.

Non-intubated TIVA. For non-intubated TIVA, the most frequently used sedative drug is benzodiazepine, opioid, and general anesthetic agent. Airway maintenance is facilitated by placing an oropharyngeal partition and nasopharyngeal airways. The head can be taped to the dental chair headrest in a manner that raises the chin and nose. During dental procedures, the dentist and dental assistant take extra precautions to help keep the oropharynx clear and maintain a patient airway. We investigated intra and postoperative complications from medical records.

Results. In all cases, we could perform dental treatment on schedule. There were 17 cases that required a laryngeal mask with respiratory tract difficulty. The complication during dental procedures was none. All patients were able to go home after the dental treatment within several hours. As for postoperative complication, fever (more than 37.5 degrees) was recognized in 4 cases, and vomiting in only 7 cases.

Discussion. With endotracheal intubation, the airway is protected and the practitioner is able to positive pressure ventilate the patient while the dentist continues working intraorally. However, intubation increases the risk of injury to airway structures and laryngeal mask obstruct to facilitate dental procedures. Intra and postoperative complication was few in non-intubated TIVA.

Conclusion. Non-intubated TIVA was thought to be useful anesthesia method for a dental treatment on day stay anesthesia.

**Imaging Study in the Effect of Intravenous Anesthetics on Cerebral Function with Functional Magnetic Resonance Imaging in Healthy Volunteers**

Hui Zhang and Lixian Xu, Fourth Military Medical University, China

Objective. Using the BOLD-IMRI technology, to examine the changes of BOLD signal in distinct cerebral regions produced by propofol and investigate specific brain regions that are important for anesthesia.

Methods. Anesthetics were used for stimulation, stimulus procedure included awake, sedation, unconsciousness, analgesia process. Scan lasted 50 Dy for propofol. Anesthetics were injected from the tenth Dy. Propofol was delivered at rate of 1.5 mg/kg using a constant speed infusion pump. Functional magnetic resonance images were acquired during the entire experimental session. A dynamic single-shot EPI sequence was used to perform functional MR imaging on a 1. ST Philips gyroscan MR system. Regional activation was measured in the sagittal imaging planes and then analyzed by functool software in BOLD function package of workstation.

Results. propofol anesthesia: The decreased in signal intensity were observed in hypothalamus (r = 0.75, 20.2%), frontal lobe (r = 0.71, 37.5%), temporal lobe (r = 0.72, 33.8%). The changes of signal intensity were at equal pace, the decreased of signal intensity from higher to lower was frontal lobe > temporal lobe > hypothalamus, but there was not a significant deviation. Significant decrease was visible in thalamus (r = 0.60, 3.9%), compared to regions in frontal lobe, temporal lobe, hypothalamus, there was remarkable difference at the changes of signal intensity in thalamus.

Conclusions. Propofol anesthesia firstly affected hypothalamus, frontal lobe, temporal lobe, then affected thalamus region, these regions may be the key targets for propofol action.

**Imaging Study in the Effect of Intravenous Anesthetics on Neurotransmitter Metabolism with 1 H-Magnetic Resonance Spectrography in Healthy Volunteers**

Hui Zhang, Fourth Military Medical University, China

Objective. To investigate the changes of neurotransmitter metabolism in different cerebral regions produced by propofol in volunteers using the proton magnetic
Methods. Each of volunteers underwent three MRS scan, one scan assessed awake baseline the levels of neurotransmitter metabolism. The other two scan separately assessed sedative level and unconscious level of neurotransmitter metabolism (sedation TCI 1.5 μg/ml, unconsciousness TCI 3.0 μg/ml). Volume of interest included sensory cortex, motor cortex, thalamus, hippocampus and basal ganglia. The metabolites in the spectra included: NAA, Glu, GABA, Cho and Cr.

Results. Propofol anesthesia: Glu in sensory cortex, motor cortex and thalamus were significant decreased in sedation (P < 0.05). Cho in thalamus were significantly decreased in sedation (P < 0.05). Compared with awake group, NAA content of thalamus and hippocampus was significantly decreased in unconsciousness (P < 0.05); the decrease of Glu was obvious in thalamus, hippocampus and basal ganglia during propofol anesthesia (P < 0.05); GABA in sensory cortex motor cortex, thalamus, hippocampus and basal ganglia increased significantly in unconsciousness; But Cho content in the five regions decreased significantly; Cr content in the five areas did not change significantly.

Conclusions. Intravenous anesthetics action closely relates to neurotransmitters metabolism in sensory cortex, motor cortex, thalamus, hippocampus and basal ganglia, among the total, it is one of important mechanisms that anesthetics depress the effect of Glu system and enhance the effect of GABA system, but it needs further research about regulated interrelationship of neurotransmitters in distinct regions.

A Convertible Gas Delivery Circle CO2 Absorption Anesthesia System

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We present a readily convertible anesthetic gas delivery system with a fresh gas flow diverter device (FGF diverter) in a circle CO2 absorption system. The fresh gas inlet site could be located at (A) pre-inspiratory valve between the CO2 absorber canister and the inspiratory valve (Conventional system, old high-flow mode), or at (B) post-inspiratory valve site between the inspiratory valve and the patient (F-economy type I, new low-flow mode). Their structural and functional characteristics are described and compared the inspired/delivered gas concentration ratio (I/D ratio) with the coaxial breathing circuit (F2 and Flex 2) in the circle CO2 absorption system.

Method. We compared the effects of two different fresh gas inlet sites (A and B) on the sevoflurane I/D ratios, while continuously monitoring the cardio-respiratory variables, during high-flow (6 L/min) and low-flow (1 and 2 L/min) with various anesthesia machines. Surgical patients undergoing general anesthesia were randomly assigned to Drager Fabius GS (n = 6), Ohmeda Excel 210 (n = 18), ACOMA D-3F (n = 25). Anesthesia was first induced and maintained with 6 L/min at 3% sevoflurane in O2 and fentanyl supplementation, and thereafter reduced to low-flow.

Results. With the conventional inflow site, old-mode (A), lowering the inflow rate from 6 L/min to 1 L/min significantly decreased the I/D ratio (p < 0.05) in all Drager 0.81 (−19%), Ohmeda 0.83 (−17%) and ACOMA 0.78 (−22%), respectively. After conversion to the new mode (B), the F-economy type I, the I/D ratio was quickly improved to clinically acceptable levels in all Drager 0.85 (−15%), Ohmeda 0.85 (−15%) and ACOMA 0.81 (−19%) machines, respectively.

Conclusion. This simple and versatile system functions safely and reliably with improved I/D ratio during low-flow anesthesia. It may also provide a means for minimizing the chemical interaction between the dry gas and CO2 absorbent, thus, reducing the hazard of heat and toxic metabolites.

An Integrated Anesthetic Gas Delivery System for Low-Flow Anesthesia

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Aim. We present an integrated (hybrid) anesthetic gas delivery system (Fconomy typeII), a combination of the Mapleson type rebreathing circuit with that of the circle CO2 absorption system. The system comprises a volume adjustable rebreathing tube with a bacterial filter (F-tube) which connects at a distal (patient) end of a coaxial circuit whose inlet and outlet further connect at the proximal end to the anesthesia machine’s CO2 canister.

Methods. The system was assessed in 37 cases. Patients were randomly assigned to 4 groups of different rebreathing volumes (RV): Group 1 (150 mL RV (n = 10)), Group 2 (300 mL RV (n = 6)), Group 3 (450 mL...
RV (n = 7)) and Group 4 (600 mL RV (n = 10)). Sevo-
flurane anesthesia was induced and maintained with
constant low-flow of 1 L/min during the entire pro-
dure without vaporizer adjustment. In each group, the
I/D ratio and the anesthetic consumption were mea-
sured and calculated for 3% sevoflurane anesthesia
and the cardio-respiratory variables were continuously
monitored.

Results. Increased RV significantly improved I/D ra-
tios in all groups studied (0.83 +/- 0.03, 0.99 +/-
0.06, 0.99 +/- 0.07, 0.98 +/- 0.16, respectively)
(RV150, 300, 450, 600 mL).

Conclusion. The results demonstrate that the Fcon-
omy type II system can be safely and effectively used
to greatly reduce the anesthetic gas consumption dur-
ing low-flow anesthesia. The system is simple, flexible
and can be readily used with low-flow as well as high-
flows, and with spontaneous or controlled ventila-
tion. There is no need of either vaporizer or flow ad-
justments, yet the I/D ratios achieved are significantly im-
proved during low-flow anesthesia (1 L/min), resulting
in over twice as much of actual anesthetic gas savings.
A further advantage includes an easy optimization of
the inspired anesthetic gas concentration and an easy
control of CO2 rebreathing by simply adjusting the RV
volume of the breathing circuit. The system appears to
provide warm and humid breathing gases.

Changes in Inspired/Delivered Anesthetic Gas
Concentration Ratio and Anesthetic
Consumption During Low-Flow
Sevoflurane Anesthesia
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Kasahara1, Ken-ichi Fukuda1, Tatsuya Ichinohe3 and
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Aim. Although it seems reasonable to assume that low-
flow anesthesia would result in low anesthetic gas con-
sumption and savings, it is difficult to estimate the ex-
tent of such savings, as it has not been quantified and
reported. This is because in clinical practice, the anes-
thetist is constantly adjusting either the fresh gas flow
(FGF) inflow rate and/or the vaporizer's gas concentra-
tion when practicing low-flow anesthesia due to the in-
spired/delivered (I/D) ratio discrepancy. We studied (a)
the discrepancy degree of the I/D ratio, and (b) mea-
sured the actual amount of anesthetic consumption in
milliliters when no adjustments are made, and when
adjustments are made to achieve an adequate level of
anesthesia and determined the actual sevoflurane con-
sumption during low-flow anesthesia (1 L/min).

Method. Patients undergoing major oral surgical pro-
cedures were randomly assigned to Group A (N = 19)
with a constant vaporizer setting, and Group B (n = 1
5) with a vaporizer adjustment. Anesthesia was initially
induced with high-flow (6 L/min at 1% sevoflurane in
O2) for the first 10 mm, and the flow was reduced to
1 L/min and maintained constant for the rest of the
procedure. Sevoflurane (1%) was supplemented with
propofol to ensure proper anesthesia. The I/D ratio
was determined by using infrared gas analyzer (Datex),
and the anesthetic consumption was assessed by liquid
measurement (in mL/h).

Results. In Group A, the results showed a 0.55 +/-
0.04 I/D ratio (unacceptable level of anesthesia if pro-
pofo is not used), with the sevoflurane consumption of
10.74 mL/hr. In Group B, the vaporizer was constantly
adjusted to achieve a 1.00 +/- 0.01 I/D ratio, and re-
sulted in 18.24 mL sevoflurane consumption (calculat-
ed as 3%), which is almost twice as much of the non-
adjusted group.

Conclusion. With the conventional low-flow anesthe-
sia, the I/D ratio significantly decreased and the re-
quired adjustments do not lead to lower anesthetic
consumption and gas savings.

Clinical Study on Airway Examination Factors
that Affect Laryngeal View Grade in
Prognathism and Retrognathism Patients
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Aim. The failure of airway management has been
known as the most important causes of anesthetic-re-
lated mortality. The purpose of this study was to ob-
serve the degree of the difficulty of airway manage-
ment in mandibular prognathism and retrognathism
using some anatomic criteria for defining and grading
difficulty of airway and difficulty of endotracheal intu-
bation with direct laryngoscopy.

Methods. The observations and measurements are
done to the 103 patients with mandibular prognathism,
18 patients with mandibular retrognathism who were
scheduled for corrective esthetic surgery. The case
study is done to the 67 patients with normal mandible
for control group. In all patients, mouth opening dis-
tance (MOD), mandibular depth (MD), mandibular
length (ML), mouth opening angle (MOA), neck
extension angle (EXT), neck flexion angle (FLX),
thyromental distance (TMD), inter-notch distance (IND), thyromental area (TMA), Mallampati grades, and Cormack and Lehane grades are measured. T-test and Chi-square test are done.

**Results.** Cormack and Lehane grade was 85.4% (grade I), 13.6% (grade II), and 1% (grade III) in the mandibular prognathism cases, 50% (grade I), 16.7% (grade II), and 33.3% (grade III) in the retrognathism cases, 62.7% (grade I), 28.4% (grade II), and 9.0% (grade III) in the control group respectively. In the mandibular prognathism cases, the measurements of MD, MOA, TMD and TMA are greater than those of other groups (P < 0.05). In the mandibular retrognathism cases, the measurements of ML, are shorter than those of other groups (P < 0.05).

**Conclusions.** In the patients of mandibular prognathism, the intubation with laryngoscope will be easier than that of retrognathism. And TMD, IND and TMA were new significant anatomic criteria for airway evaluation.

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**Anesthetic Management for Children with Syndromes Accompanying Congenital Anomalies undergoing Oral and Maxillofacial Surgery**

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**Aim.** The aim of this study is to describe specific considerations for the anesthetic management of children with syndromes accompanying congenital anomalies undergoing oral and maxillofacial surgery.

**Methods.** The patient profile and anesthetic course of 5 cases were reviewed; 3 cases of Pierre Robin syndrome (mean 1.7 y) and a case of Treacher Collins syndrome (1.5 y) undergoing palatoplasty, and a case of Klippel-Feil/Turner syndrome combination (12 y) undergoing distraction of maxilla.

**Results.** Patients with Treacher Collins syndrome and Klippel-Feil/Turner syndrome progressed to difficult intubation cases, whereas the anesthetic courses in those with Pierre Robin syndrome were uneventful. Anesthesia was induced by sevoflurane and nitrous oxide in oxygen in all cases. Direct laryngoscopy revealed Cormack and Lehan grade IV in the Treacher Collins and Klippel-Feil/Turner cases. Several intubating attempts have been unsuccessful, due to typical micrognathia (Treacher Collins) and to restricted neck flexion and restricted mouth opening (Klippel-Feil/Turner), before the operations were rescheduled. The Treacher Collins case was intubated through a laryngeal mask airway (LMA) using a fiberscope, and the Kippel-Feil/Turner case was intubated using fiberoptic laryngoscopy under midazolam sedation.

**Discussion and Conclusions.** These findings suggest that the employment of awake fiberoptic laryngoscopy or LMA-guided intubation will be helpful in children with a difficult airway in relation to syndromes accompanying congenital anomalies.

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**Outpatient Anesthesia with Propofol and Laryngeal Mask Airway for Dental Procedures in the Handicapped - An Analysis of 100 Cases**

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**Aim.** To establish safe outpatient anesthesia for dental treatment in the handicapped, we analyzed 100 cases in our clinic of propofol anesthesia with flexible laryngeal mask airway (FLMA).

**Methods.** Points discussed here are gender, age, co-existing problems, medication, dental treatments, treatment time, general assessment before anesthesia, premedication, induction techniques, dosage of midazolam, dosage of propofol, airway stability with FLMA, infusion volume, body temperature (preanesthetic, intraoperative and postoperative in 42 cases), duration of anesthesia, time to discharge, and the state of the patient after discharge.

**Results.** 1) airway management by FLMA was secure in 89 cases, 2) mean time to discharge was 70 ± 16 mm, 3) no adverse events happened after discharge except for I case of postoperative nausea and vomiting, 4) body temperature in the patients looking nervous was higher than the rest.

**Conclusions.** 1) airway management by FLMA is non-invasive and reliable, if gastric contents are removed, 2) propofol is suitable for outpatient anesthesia because there are few post-anesthetic problems, 3) anesthesia with FLMA and propofol is suitable for outpatient anesthesia for the handicapped patients not suited to admission, 4) anesthesia of nervous patients with high body temperatures can be possible.

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**The Flexible Laryngeal Mask Airway as a Nasal Airway in Dento-Oral Surgery**

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Aim. The flexible laryngeal mask airway (FLMA) has been used for dento-oral surgery, while the FLMA as a nasal airway has been scarcely reported. We present clinical usage of the FLMA as a nasal airway for minor oral surgery.

Method. The FLMA is inserted using the standard technique, and a Foley catheter is introduced through the nostril, and brought out through the mouth using Magill’s forceps. The catheter is inserted in distal end of the LMA airway tube with an inflated balloon to be connected. The catheter is withdrawn from the nose while guiding the FLMA tube. The FLMA airway tube emerges from the nose.

Results. We inserted the nasal FLMA successfully in all 18 patients undergoing extraction of wisdom teeth. No patients had epistaxis in perioperative period. Four patients with injuries to uvula palatine were found postoperatively. Minor air leaks or an obstructed airway was encountered in 5 patients during operation. The problems were solved by correcting the dislocation of the FLMA.

Discussion and Conclusions. Uvula palatine injury was prevented by pulling out the tube carefully. Air-leaks and airway obstructions were caused by FLMA dislocated from the proper position. We suggest that malposition of FLMA results from light anesthesia, inappropriate size of FLMA, and mouth-opening movement. We conclude that FLMA as a nasal airway can be used effectively for minor oral surgery.

Clinical Experience of General Anesthesia using Laryngeal Mask Airway for Ambulatory Dental Treatment on Patients with Intellectual Disability

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Aim. When patients with intellectual disability (ID) cannot accept or tolerate dental treatments, intravenous sedation (IS) or general anesthesia (GA) is considered. IS has advantages for outpatients due to quick recovery, but treatment is limited. However GA with endotracheal intubation (ET) brings smooth dental treatment, it is involved with screening examinations, longer time for recovery, and an admission occasionally. Laryngeal mask airway (LMA) has been developed to prevent complications related to ET. Therefore, GA with LMA is expected to meet requirements for ambulatory dental treatment. And LMA Flexible, which has spiral wire and enable to be bent, is expected for head, neck and dental cases. And our experiences of LMA were reviewed.

Methods. We reviewed our experiences of LMA on 18 dental treatments in 10 patients with ID (27.9 years old, 6 male and 4 female) in last ten months.

Results. Midazolam was used initially, followed by continuous infusion of propofol. Average infusion rate of propofol was 8.9 mg/kg/hr, and average of treatment time was 92.5 mm, and average recovery time from stopping propofol until leaving hospital was 99.1 min. All planned treatment could be done, although it is observed a case of laryngeal spasm, 4 cases of secretions in LMA and 2 cases of bucking.

Discussion and Conclusions. LMA is considered useful for ambulatory dental treatment on patients with ID; however, close attention must be paid to prevent airway problems.

Laryngeal Mask Use in Outpatient Dental Surgery

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Aim. To compare airway potency with laryngeal mask (LM) and intranasal airway (IA) during outpatient dental surgery.

Methods. A group of 47 patients with ASA II–III, 17–36 y.o., was randomly allocated in 2 groups. The patients in Group A (n = 24) with LM and in group B (n = 23) with IA suffered from stomatophobia and low pain threshold. There was induction with propofol 2.0–2.5 mg/kg; maintenance N2O/O2 = 2/1 with propofol infusion 3.1 ± 0.8 mg/kg/h. Both groups received articain (4%) infiltration with epinephrine 1:200000.

Results. LM was successfully placed after first attempt in 98% cases. Face malformation did not facilitate LM insertion but was the first choice. LM tolerability was satisfactory and did not demand anaesthesia depth. There were no ventilatory or gas exchange complications. Spontaneous ventilation was 18 ± 0.1 breath per mm, SpO2 98–100%.

Discussion. LM was successfully placed after first attempt in 98% cases. Face malformation did not facilitate LM insertion but was the first choice. LM tolerability was satisfactory and did not demand anaesthesia depth. There were no ventilatory or gas exchange complications. Spontaneous ventilation was 18 ± 0.1 breath per mm, SpO2 98–100%.

The group B was more demanding and time consuming, because IA placing and fixing. Spontaneous ventilation was adequate SpO2 98–100% but with mild tachypnea 23 ± 0.3 breath per min. Occasiona-
ly backwards jaw migration blocked airway potency and caused episodes of desaturation. IA did not provide prophylactic of aspiration.

**Conclusion.** LM demands less time for proper placement, less traumatic, prevent possible translocations of the soft tissues, provide better airway potency and ventilatory control.

## Application of Nasal Flexible Laryngeal Mask Airway in Anesthesia for Oral Surgery
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**Aim.** The laryngeal mask airway has been used increasingly in clinics, but is seldom applied in anesthesia for oral surgery, as the mask occupies the middle of the mouth and tends to obstruct the surgical field. Here, we report the successful placement and usage of a nasal flexible laryngeal mask airway in an oral surgical procedure.

**Methods.** Fifteen patients undergoing dental procedures under general anesthesia, were studied. We made a clinical application of a modified method for inserting a nasal flexible laryngeal mask airway, which was previously reported by Agro.

**Results.** There was no significant bleeding from the intubated nostril in any of the patients. None of the patients complained of sore throat, coughing, hoarseness or any discomfort in the nose.

**Conclusions.** Although we anticipate that further refinements of the technique may be possible and the safety of this method of nasal FLMA needs to be assessed in a greater number of patients, in this preliminary study we provide a proof-of-principle demonstration of the efficacy of nasal LMA ventilation as a method of airway management for oral surgery.

## A New Method of Transnasal Airway Management in Oral Surgery with the Combined Use of Cobra and Tracheal Tube
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**Aim.** Previously, an insufflation technique was used during general anesthesia in the absence of tracheal intubation.

Cobra is a new non-intubation type airway device that can be used for airway control in addition to devices such as laryngeal mask airway (LMA), combitube, and laryngeal tube.

We devised a new method of transnasal airway management with the combined use of cobra and tracheal tube.

We evaluated the usefulness and safety of this new method.

**Method.** This procedure was performed on a patient who was scheduled to undergo oral surgery under general anesthesia by nasotracheal intubation at Fukuoka Dental College Hospital.

After the induction of anesthesia, the cobra which cut a tube short was inserted transorally, and the cuff was inflated.

The tracheal tube was inserted transnasally through the cobra, and the cuff was inflated.

After confirming adequate airway control, the cobra was removed.

A nasotracheal tube was inserted into the trachea, and the scheduled surgery was then performed.

**Results.** Cobra and the combination of tracheal tube could be ventilated.

**Discussion and conclusions.** Further, this method would be useful in dentistry (dental treatment) and oral surgery.

## A Survey of Nasotracheal Intubation and Complications in Dental Anesthesia of Japan
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Nasotracheal intubation is frequently indicated in oral and maxillofacial surgery and dental treatment under general anesthesia. However, the actual practicing condition under which nasotracheal intubation is performed has not been investigated. In order to study the actual activity under which nasotracheal intubation is performed in Japan, a questionnaire was circulated among dental colleges and the university hospitals (DH), medical hospitals (MB) and dental offices (DO) in 2003. There were a total of 11,763 replies about general anesthesia cases from 24 of 29 dental colleges/university hospitals. There were 47,098 replies from...
six medical colleges hospitals and 17 medical hospitals. There were 2,118 replies from 15 dental offices.

In 2003, general anesthesia with nasotracheal intubation comprised 64.7% of the total general anesthesia cases, with 7,616 cases in the DH.

On the other hand, nasotracheal intubation was performed in 1,699 cases in MB, but it was only 3.6% of the total general anesthesia cases. At DO, they were 845 cases and 39.9% of the total general anesthesia case (Fig. 1).

The incidence of complications (except nasal bleeding) accompanied by nasotracheal intubation (injury on the pharyngeal wall, fracture of turbinate, after intubation granuloma etc.) was 0.22% (17/7,616) in DH. In MB, it was 0.47% (8/1,699). At the dental clinic, it was 0.36% (3/845) (Table 3). The rate of complications (except nasal bleeding) was analyzed statistically by one factor ANOVA. There was no statistically significant difference between DH, MH, and DO.

### Dental Treatment under Non-Intubated Total Intravenous Anesthesia: Determination of Optimal Airway Control Procedures

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**Purpose.** We use total intravenous anesthesia with a non-intubated airway (non-intubated TIVA) during dental treatment of handicapped patients with significant non-cooperative behavior. We addressed these problems and designed optimal airway control procedures.

**Methods.** The following procedures were used during dental treatment of a total of 100 patients. Data for patients for whom BIS score, the value obtained with the BIS™ monitor to assess depth of anesthesia, was <40 were used to evaluate blood gas levels and presence/absence of complications during and after dental treatment.

1. Ensuring proper posture to improve airway patency.
2. Insertion of a nasal airway to prevent obstruction of the pharynx and soft palate.
3. Cervical auscultation to obtain vital information such as respiratory rate, respiratory condition, presence/absence of excessive airway secretion, water content of pharyngeal pack, and heart rate.
4. Oxygenation with an oxygen-rich gas with placement of the tip of the aspiration catheter immediately proximal to the tracheal cavity to ensure patent airway even in case of proximal airway obstruction.
5. Monitoring of ECG, blood pressure, pulse, SpO2, blood gases, and depth of anesthesia using BIS monitor.
6. Additional measures to secure a patent airway such as jaw lifting, if required.

**Results and Discussion.** Although additional measures such as jaw lifting were required for some patients, appropriate blood gas levels (mean PaCO2 40.1 mmHg) and respiratory rate (mean 14/min) were maintained during treatment. The mean BIS value was 38. No patients experienced complications during or after treatment.

The above-mentioned procedures for maintaining airway patency were considered effective in securing safe dental treatment of patients under non-intubated TIVA.

### Extubation using Dexmedetomidine and Airway Exchange Catheter Following Malignant Oral Tumor Surgery in Difficult Airway Patients

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**Aim.** Following malignant oral tumor surgery, anatomical changes in the upper airway and inflammatory swelling and edema can cause airway constriction. This risk is particularly high in difficult airway patients. Therefore, in order to safely extubate without a tracheostomy, a management method using dexmedetomidine hydrochloride (DEX) and a Cook airway exchange catheter (C-AEC-14.0-83) (AEC) was investigated in this study.

**Methods.** Of four patients, one was a man and three were women. The mean age of the patients was 65 years. Since the start of anesthesia, DEX was continuously administered. In the ICU, sedation was maintained. After macroscopically confirming that there was no problem with the upper airway 3–5 days later, in consideration of airway obstruction following extubation, the tracheal tube was removed while the AEC was still in the airway. After approximately three hours of observation, DEX was discontinued and the AEC was removed.

**Results.** According to Cormack classification system, there were two grade 3 cases and two grade 4 cases. In the ICU, sedation was favorable in all cases (Ramsey score: 3–4), and additional sedation was not required. The duration of time from ICU entry to extubation ranged from 45 to 160 hours, with a mean of 93 hours.
None of the patients had any problem with the upper airway after inserting the ABC for extubation or before removing the AEC.

Discussion and conclusions. Endotracheal AEC placement with DBX administration did not cause respiratory suppression, was safe, and did not require a tracheostomy for extubation. Therefore, extubation combining AEC and DEX is considered practical when avoiding tracheostomy.

Huntington's Disease: Dental Care Under Sedation and General Anaesthesia

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Aim. To carry out a literature review of dental care for people with Huntington's disease. To describe the dental management of people with Huntington's disease using intravenous sedation and general anaesthesia.

Methods. Case study of 3 patients. One patient was treated in a teaching hospital under general anaesthesia. The other two patients were treated in a hospital for people with neuro-disability under conscious sedation with midazolam.

Results. The treatment implications presented by Huntington's disease are described.

Discussion and Conclusions. Both conscious sedation with midazolam and general anaesthesia are suitable for managing people with Huntington's disease. It is important that guidelines regarding the setting and the drugs used are followed.

The Effects of Differential Respiratory Rate on Gas Analysis and Blood Pressure in Anesthetized Patients

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Aim. The 2005 AHA guidelines emphasis that hyperventilation during cardiopulmonary resuscitation (CPR) can be harmful because it compromise cardiac output. We studied the effects of differential respiratory rate on gas analysis and systolic blood pressure (BP) in anesthetized adults.

Methods. The 40 patients were divided into two groups, patients with a respiratory rate of 8/min and 12/min respectively. After nasotracheal intubation, the lungs were ventilated with 40% O2, and 2.0% sevoflurane setting at T/E ratio of 1/1.5, tidal volume of 10 mL/kg, and a rate of either 8 or 12 cycle per min.

Results. PaCO2 were significantly different between both groups.

Discussions and conclusions. During CPR cardiac output is approximate 30% of normal, so less ventilation is needed for gas exchanges at the lung. In conclusion, lower minute ventilation may maintain effective oxygenation and ventilation during CPR although our condition was optimal under general anesthesia.

Post Auricular Muscle Response (PAMR) in Conscious Sedation

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Aim. We often experience differences in the sensitivity to N2O or sedatives among patients. We attempted to measure sedation levels more objectively by analyzing the relationship between sedation levels and changes in PAMR which was measured electrophysiologically.

Methods. Following IRB approval, 20 patients were studied. Ten patients employed to N2O in oxygen inhalation and the other to IV. sedation with midazolam. The concentration of N2O was elevated in 10% increments at intervals of 5 minutes till to 30%. For sedation of IV. midazolam, 2 mg were first administered and additional 1 mg was given at 5 minutes intervals until the optimum level of sedation achieved. PAMR was measured at every gas concentration and stage of midazolam. And serum midazolam concentration were examined.

Results. PAMR which appeared in a negative wave (N) at 12–14 msec obtained and followed a positive one (P) at 16–18 msec were obtained with ease. The sum of absolute values of N and P waves reduced in amplitude according to depth of sedation. In N the amplitude reduced to 33.3% of the control on average at 30% N. With midazolam, at the optimum level of sedation achieved, the amplitude came to 19.7% of the control value on average.

Conclusions. PAMR was found to be useful in assessing the depth of in conscious individuals. It seems particularly useful as an objective monitor when using IV. drug injection, because sensitivity to IV. sedatives varies greatly among individuals.
Specific Stress Response of Cardiovascular System of Infants with Various Types of Personal Alertness During Dental Treatment

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Aim. The detection of specific hemodynamic changes among infants of 7–10 years old with various types of personal alertness before dental procedures.

Methods. Study of 60 infants 7–10 years old. Depending on index of alertness (IA) [Method of Temple, Dorki, Amen] all patients were divided into 4 groups: the active group included 12 infants with IA < 5%, the hyperactive group (5 < IA < 20%) 18 infants, the alert (20 < IA < 50%) and autistic (IA > 50%) groups 15 patients each. Cardiovascular performance estimation was based on blood pressure (Korotkov’s method) and heart rate alterations. All tested parameters were compared to the control groups of healthy infants in no stress conditions.

Results. The decrease of blood pressure and heart rate by 40% against the control group was demonstrated by patients with IA > 50% during dental procedures. The active (IA < 5%) and alert (20 < IA < 50%) groups were characterized by a 25% increase of pressure and heart rate comparing to the control values, hyperactive patients by a 30% increase accordingly.

Discussion and conclusions. Research demonstrated the dependence of cardiovascular response to dental treatment on personal alertness of patients. Autistic infants showed vagotonic reaction. Cardiovascular performance of the other studied patients was regarded as normal. It is recommended for infants considering personal alertness of the patient evaluated by index of alertness before any dental procedure.

A Comparison of Recording Quality between BIS and Entropy Indices during Oral and Maxillofacial Surgery under Sevoflurane Anesthesia

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Aims. The BIS-XP platform improved the utility of the monitor during electrocautery usage. The recently introduced brain monitor is the Entropy module that generates both a state entropy (SE) and a response entropy (RE) values. We evaluated the difference related to the susceptibility of the EEG signal to interference by the electrocautery between two monitors. A secondary objective was to compare the fluctuation of the displayed values within BIS, SE and RE.

Methods. Fifteen consenting patients scheduled for major oral and maxillofacial surgery were enrolled. Both BIS-XP and Entropy sensors were simultaneously applied. BIS, SE and RE indices were continuously recorded by computer. Anesthesia was induced with propofol, fentanyl and vecuronium. Following tracheal intubation, anesthesia was maintained with sevoflurane. The displays on both monitors were recorded by video camera continuously. The incidence of electrocautery interference with BIS or Entropy reading was determined by visual inspection of the recorded tapes as that the displayed variables were absent each time during operation. The percentage of time determined to be blank was calculated. The fluctuation of each value was determined by the average differences between each value and the value 5 seconds before. Data was expressed as mean ± SD. Statistical analysis was performed using the unpaired t-test. P < 0.05 was considered significant.

Results. Significantly fewer patients had blanking with the Entropy (0.04%) compared to BIS (0.42%). There were significant differences in fluctuation of the indices (BIS 1.1 ± 1.8, SE 2.3 ± 2.7, RE 4.0 ± 4.4).

Discussion and conclusions. The present study demonstrates that Entropy indices were less interfered with by the electrocautery unit. On the other hand, there were fewer fluctuations on the displayed values of BIS, suggesting that BIS is superior to SE and RE to reflect stable hypnotic states.

Oral Surgery without Local Anaesthesia Magic or Medical Hypnosis?

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Aim. Oral surgery is normally accompanied by local anaesthesia. During an experimental clinical study it was proved that somatosensory evoked potentials can be reduced or completely flattened through hypnosis. The objective of this case study is to demonstrate that modern medical hypnosis can be used during surgical treatment to eliminate pain completely.

Methods. A 68 year old woman was referred to the university dental clinic with acute pain for surgical treatment. Prior she was treated by a dentist and suffered from an allergic shock caused by multiple allergies against drugs inclusive local anaesthetics and sedatives. She needed a removal of the remaining roots
and a cystectomy in the mandible. In the first session her hypnotic susceptibility was estimated. During the surgical treatment an orally hypnotic induction was given as pain management divided in: relaxation, deepening procedure, suggestion application, posthypnotic suggestions and termination. The treatment was recorded on video and the pain evaluation was postoperatively carried out with the help of the Visual Analog Scale (VSA).

Results. The patient showed multiple phenomenon’s of hypnosis, e.g. the levitation of the arm, immobility and a partial amnesia. She reached a deep state of trance that caused numbness in the surgical field. The surgical treatment, including the cystectomy was without any complications. The patient felt no pain during treatment or after waking up (VSA 0,5). In addition posthypnotic suggestions were carried out by the patient. No swellings or pain occurred after the operation.

Discussion and conclusions. This case demonstrates that hypnotic techniques are successful in the elimination of pain during dental or surgical treatment. In certain cases it can be the method of choice. However, there are large individual differences in response to hypnosis. In summary it can be said that medical hypnosis should be an inherent part of modern pain management.

The Adequate Period of Recovery from Anemia Caused by Phlebotomy

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Aim. Simultaneous two-jaw surgery for the correction of jaw deformities has become a common practice in oral and maxillofacial surgery, thus creating an occasional need for blood transfusion in this elective surgery. Preoperative autologous blood donation (ABD) decreases the need for homologous blood transfusion. After ABD, a small number of patients suffer from anemia. There is no information concerning the period that is necessary for the recovery from this condition. We draw a parallel between a 2-week and a 3-week recovery period from anemia.

Methods. Patients who required preoperative ABD before elective orthognathic surgery were classified into two groups (Group 2W: ABD was performed 2 weeks prior to the operation, Group 3W: ABD was performed 3 weeks prior to the operation). Blood examination was performed before phlebotomy (S1) and just prior to the operation (S2). The ratio between the hemoglobin (Hb) levels at S2 and at S1 (HbS2/HbS1) was also calculated to obtain the degree of recovery from anemia. Data were statistically analyzed (Student’s t-test, \( \chi^2 \) test, \( P < 0.05 \)).

Results. In this study, 118 patients were enrolled (Group 2W, \( n = 49 \); Group 3W, \( n = 69 \)). No statistically significant differences were found between the groups with regard to patient demographics. The Hb levels at S1 and S2 were not significantly different between the groups. However, the value of HbS2/HbS1 was significantly lower in Group 2W than in Group 3W.

Conclusion. These results suggest that a recovery period of 3 weeks is more suitable than that of 2 weeks to avoid persistence of anemia and to preserve 400 ml of autologous blood for orthognathic surgery.

Pain Sensitivity and Choice of Pain Control in Out-Patients with Diabetes Mellitus

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Aim. To justify the choice of pain control in out-patients with diabetes mellitus Type 1 (DM1) and Type 2 (DM2).

Methods. 12 patients aged 22–58 took part in the study. We used local anesthesia with 4% solution of articaine with epinephrine 1:200000 and midazolam (7,5 mg per os) 20 min before intervention. The glucose level in the blood was determined by the One Touch Basic express method. Pain sensitivity was estimated by the pain threshold (PT) of a gum. The study was carried out twice before the intervention (1–7 days and several minutes), after premedication and after treatment.

Results. Before treatment PT was lower in DM1 patients than in DM2 ones. PT of DM1 did not change but PT of DM2 increased under the influence preoperational stress. Under the influence of premedication PT of DM1 increased but PT of DM2 reduced. After the treatment PT of DM1 restored but PT of DM2 were still low. The glucose level in DM1 did not change and in DM2 was decreasing.

Discussion and conclusions. Patients with DM need different types of anesthesia. It is reasonable to use lower doses of midazolam for DM2.
The Effect of the Postural Change of a Dental Chair on Blood Pressure and Pulse Rate in Relation to Age

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In the elder person, the attention has been aroused to become a cause of fluctuation and syncope, because autoregulation mechanism of blood pressure dulls by aging which become orthostatic hypotension with the light action in daily life.

Dental treatment is often done in the attitude of patient horizontal positioning, and frequently changed the position between sitting and horizontal. It is anticipated that the load has been applied on circulatory system in the elder person. In this study, we examined the effect of postural change of a dental chair on blood pressure and pulse rate in subjects in relation to age.

Methods. Blood pressure and pulse rate in the postural change on a dental chair were carried out for the volunteer (39 persons) by using connected continuous sphygmomanometer equipment Finapress. It made two groups, subjects older than age 65 years and that under than age 30 years.

In addition aged group was divided into two groups in the existence of anti-hypertensive drug internal use, the aged group compared it and was examined. After blood pressure was stabilized on a dental chair, the postural change was converted from horizontal position to standing position, from sitting position to standing position.

Results and Discussion. In the aged group, there was significant and transient decrease of blood pressure in the postural change from horizontal positioning to sitting position. From sitting position to standing position, there was the significant extension in transient decrease of blood pressure in recovery time of blood pressure, in the aged group.

From the results of this study, in the elder person it was indicated that there was the possibility which blood pressure change which is generated by postural change under dental treatment generates vertigo and fluctuation by orthostatic hypotension by deviating from the physiological range.

General Condition and Problems of Systematic Management in Dysphagic Child

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Aim. The purpose of this study is to investigate the general condition and problems of systematic management in dysphagic child in order to apply the safety management for swallowing training.

Methods. 120 dysphagic patients, who received swallowing training from 1997 to 2005, were the subjects. Data on their dietary status and general condition was collected from their medical records in Asahi University Hospital.

Results. The number of dysphagic patients was a few for first five years from 1997, but there was increase tendency to 2005. Age distribution was 40 patients in 0–4 years old, 35 in 5–9, 30 in 10–19, and spreading among lowered age was characteristic. The classification of disability was most 56 cerebral palsy, 11 chromosomal aberration, 8 purulent meningitis, the other with 45 patients. All almost had a complication with 109 mental retardation, with 94 body movement disability, with 71 epilepsy. 8 patients were tracheotomy. On the administration of drugs, 27 had three kinds of drugs, 11 had four kinds of them. On the dietary status, 88 patients were on full oral feeding, 13 on the combination of tube and oral feedings, 19 on full tube feeding. There were 59 patients with aspiration of all 70 patients by videofluorography. 4 patients died by serious epilepsy and pneumonia during the training course.

Discussion and conclusions. These results were shown in the increase of more serious and lowered aged dysphagic patients. In addition, it was characteristic of that general condition was unstable with mental retardation and administration of multiple drugs. In conclusion, it is important to realize the presence of risk factors after checking general condition.

The Comparison on Oral Health Status between Disabled and Common Primary School Children at Taipei County, Taiwan

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Background & Objectives. Current data have shown that the oral health conditions of schoolchildren in Taiwan are improving. Although many dental caries preventive programs for schoolchildren were implemented, most children with disabilities were not able to be covered on account of their physical condition. The purpose of this study was to compare the oral health
status among the disabled and common schoolchildren at Taipei County, Taiwan.

Methods. A case control study design among 23 public schools with special education classes were randomly selected from 67 elementary schools. The study group was from a stratified cluster sampling with probability proportional to size method. After matched with sex, age and grade, the control group with about the same amount was selected. Oral health examination according to the WHO's Oral Health Surveys, Basic Method 4th ed. were performed by calibrated dentists in May and June, 2004. All data were processed with t-test, ANOVA and Levene's test by SAS 8.12.

Results. 789 disabled and 877 common schoolchildren, with mean age of 9.8 and 10.0 respectively, completed the oral health examination. The caries prevalence rate of disabled was higher than that of common children, but not significant difference. Both DMFT and dft index together with their components of disabled revealed statistically significant higher than those of common children (p < 0.05).

Conclusion. It showed that the oral health status of disabled children was worse than that of the common children. More concern and special designed oral health preventive and care programs are in urgent need.

Sensitization of Dura Sensitive Spinal Trigeminal Nucleus Neurons in Chronic Morphine Treated Rats
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Aim. Overuse of medication to treat migraine headaches can produce chronic daily headaches, termed medication overuse headache (MOH). The neuronal mechanisms underlying MOH remain unknown. We hypothesize that chronic intake of medication to treat migraine headache causes an upregulation of pronociceptive systems involved in headache pain.

Methods. Osmotic mini-pumps with saline or morphine were implanted in SD rats for 7 days. Dura sensitive (DS) neurons from the spinal nucleus caudalis (Vc) and upper cervical dorsal horn were sampled using extracellular single unit recording in anesthetized rats. The dural sensitivity, receptive field (RF) properties and neuronal activities of DS neurons were compared in chronic morphine and saline treated animals. Furthermore, inhibition of neurons by diffuse noxious inhibitory controls (DNIC) was produced by placing the tail in hot and cold water.

Results. Dural electrical and mechanical activation thresholds were lower in chronic morphine treated animals when compared to saline controls. The cutaneous receptive field sizes were significantly larger in chronic morphine treated animals. The evoked activities by mechanical and thermal stimulation to RF of lateral face were also greater in morphine treated animals. The DNIC stimulus produced significant inhibition of heat-evoked activity (both Ad and C fiber) in saline, but not chronic morphine treated animals.

Conclusion. These results demonstrate that chronic morphine administration may provide a clinically relevant model for studying the mechanisms of medication overuse headache.

The Change of GABAA Receptor of Trigeminal Neuralgia in a Rat Model
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Aim. To assess the relationship between GABAA receptor in medulla and trigeminal neuralgia of rats by using of real-time polymerase chain reaction (PCR).

Methods. Twenty SD rats were divided into four groups randomly, five rats for each group. Group A and group C were surgical groups, Group B and group D were sham surgical groups. In the surgical group, right unilateral chronic constriction injury (CCI) of rat was produced by placing loose chromic gut ligature around the infraorbital nerve (ION). In the sham surgical group, the ION was only exposed using the same procedure but not ligated. Mechanical response threshold was observed before operation and 3, 6, 9, 12, 15 days after operation. Medullas of rats in group A and B were taken to measure the quantity of GABAAa1 receptor, GABAAa2 receptor, GABAAa3 receptor by real-time PCR nine days after operation, and medullas of rats in group C and D were also done fifteen days after operation.

Results. Compared with the sham surgical group, an allodynia to mechanical stimulation on the territory of ligated ION was found from the 9th to 15th day after operation in surgical group (P < 0.05). There was no difference in GABAAa1 receptor, GABAAa2 receptor, GABAAa3 receptor between group A and group C, also there was no difference in GABAAa1 receptor, GABAAa2 receptor, GABAAa3 receptor between group B and group D.
Conclusion. CCI-ION can result in trigeminal neuralgia on rat. Trigeminal neuralgia of rat may not be associated with GABA<sub>Aa1</sub> receptor, GABA<sub>Aa2</sub> receptor and GABA<sub>Aa3</sub> receptor.

Co-Expression of Neuropeptides and ATF3 in Injured Trigeminal Ganglion

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Aim. NPY, VIP, and Galanin are neuropeptides expressed in central and peripheral nervous system, and these expressions are up-regulated after nerve injury. The microarray analysis of trigeminal ganglion of inferior alveolar nerve (IAN) injury model rats which developed allodynia, also presented transcriptional activation of these neuropeptides. The aim of this study is to obtain some knowledge about the relationships between these neuropeptides and allodynia.

Methods. Following complete transection of the IAN, sections of trigeminal ganglion were investigated by double-labeling techniques for both in situ hybridization histochemistry to neuropeptides and immunohistochemistry to ATF3.

Results. The IAN transection induced remarkable up-regulation of both ATF3, a marker of injured neuron, and neuropeptides in trigeminal ganglion. The expression pattern of each gene is compared. Then, the percentages of positive neurons, size distribution, and the results of double staining indicated that the expression patterns of these genes are not identical.

Conclusions. NPY, VIP, and Galanin are induced by nerve injury, but the expressions are heterogeneous. These results suggest different transcriptional control of these neuropeptides and/or complex heterogeneous property of each neuron in trigeminal ganglion. Additionally, the expressions of them were not confined to ATF3-positive neurons. The injury-dependent expression of neuropeptides in the uninjured neurons may be related to alldynia in area innervated by the uninjured neurons.

Formalin Stimulation of Rat Infraorbital Nerve CCI Model

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Aim. We performed a formalin test in a CCI model of the trigeminal nerve-innervated region, involving chronic constriction injury of the rat infraorbital nerve (CCI IoN model), using formalin as a chemical stimulant, and investigated changes in the level of pain behavior.

Methods. Male SD rats were used. An OP group with ligation, an SO group with sham operation, and an NO group without surgery were established. The von Frey test was performed followed by the formalin test on day 1 in all groups. On day 2, ligation and sham operation were performed in the NP and SO groups, respectively. On day 7, the von Frey test was performed, followed by the formalin test in all groups, as on day 1. In the evaluation of development of neuropathic pain, when the measured value in the 2nd von Frey test was lower than that in the 1st test, the animal was considered to have neuropathic pain.

Results. All 3 groups showed biphasic pain behavior on the 1st measurement, showing no significant difference among the 3 groups. On the 2nd measurement, the NO and SO groups showed biphasic pain behavior as in the 1st measurement, but the pain behavior decreased in both the 1st and 2nd phases in the OP group, showing a significant difference from those in the NO and SO groups.

Discussion. Based on these findings, formalin administration did not increase pain behavior in the CCI IoN model, suggesting that formalin may not induce chemical hyperalgesia in this model.

Effect of Lafutidine on Inflammatory Pain

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We investigated the effect of lafutidine on inflammatory pain. This was done by studying how capsaicin receptors (TRPV1) affected lafutidine by pretreating animals with a capsaicin antagonist, capsazepine. We prepared an inflammatory pain model, the complete Freund’s adjuvant (CFA) model, and investigated the development of inflammatory pain using behavioral assessments. Lafutidine was administered to the hind paw of experimental rats at 10 and 150 mg/kg, and the effect was investigated using behavioral assessments. We found that although heat hyperalgesia and mechano-allodynia induced by inflammation were slightly promoted at 10 mg/kg, hypoalgesia and hypoesthesia were noted at 150 mg/kg. The latter findings were not seen at 10 mg/kg. Pretreatment with capsazepine inhibited these effects. We concluded that lafutidine exhibited different actions on inflammatory pain depending on the dose, and that the effects were
exhibited through capsaicin-sensitive sensory nerves. Based on these findings, we concluded that TRPV1 is closely involved in the pain mechanism, and that lafutidine may be effective for painful disorders.

**Intravenous ATP Infusion for Chronic Orofacial Pain: An Open-Label Study**

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**Aim.** We conducted an open-label trial of intravenous infusion of adenosine triphosphate (ATP) in patients with chronic intractable orofacial pain to elucidate whether ATP could alleviate such pain, and which type of orofacial pain would likely respond to ATP.

**Methods.** After approval our local ethical committee and informed consent, 18 patients (4 males) aged 21 to 80 years old with chronic intractable orofacial pain, which had lasted for 6 month or more and had been refractory to conventional therapies, were enrolled in the study. Six patients had non-neuropathic pain including idiopathic burning pain of the tongue (n = 3) and temporomandibular pain (n = 3), and 12 had neuropathic pain following herpes zoster (n = 2), pulpectomy with or without subsequent tooth extraction (n = 8), and inferior alveolar nerve damage due to wisdom tooth extraction (n = 2). ATP was intravenously infused at a rate of 100 microg/kg/min for 120 min. The intensity of spontaneous pain was assessed using a 100 mm visual analog scale (VAS) immediately before (0 min), and then every 15 min until 180 min after starting ATP infusion. The intensity of tactile allodynia was assessed with VAS at 0 and 180 min.

**Result.** In all patients, ATP infusion could be safely completed without severe adverse effects. Patients were classified as a responder if the VAS for spontaneous pain decreased by more than 50%, and could be clearly divided into two groups: 9 responders and 9 non-responders. Nine of 12 patients with neuropathic pain, but none of 6 patients with non-neuropathic pain, responded to the ATP infusion. In particular, all of 8 patients with neuropathic pain following pulpectomy responded to ATP.

**Discussion and conclusion.** The results suggest that intravenous ATP infusion exerts significant and long-lasting analgesic and anti-allodynic effects in a selected group of patients with neuropathic orofacial pain.

**Intravenous ATP Infusion for Neuropathic Pain Following Pulpectomy and Tooth Extraction: A Double-Blind Placebo-Controlled Cross-Over Study**

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**Aim.** We conducted a double-blind, placebo-controlled, cross-over study in 12 patients with chronic neuropathic pain following dental pulp extirpation (pulpectomy) and subsequent tooth extraction.

**Methods.** After approval of our local ethical committee and informed consent, ATP at a rate of 100 microg/kg/min and normal saline as a placebo were infused over 180 min in a randomized order on separate days in 12 patients (11 females) aged 39 to 70 years with such neuropathic pain lasting for 8 months or more and refractory to conventional pain therapies. The intensity of spontaneous pain was assessed using a 100 mm visual analog scale (VAS) immediately before the start of ATP infusion (baseline: 0 min), and then every 15 min until 240 min. VAS for tactile allodynia was evaluated at 0 and 240 min.

**Results.** In one patient, ATP infusion was discontinued because of chest pain/discomfort. All of the 11 patients consistently responded to ATP infusion. With ATP infusion, VAS for spontaneous pain decreased slowly but progressively and markedly by 87 +/- 10% (mean +/- SD) from 75 (median) mm (range: 48–87 mm) at 0 min to 7 mm (0–19 mm) at 240 min (P < 0.0001), while VAS did not decrease with placebo infusion (P > 0.05). VAS for tactile allodynia also decreased markedly by 87 +/- 11% from 91 mm (68–97 mm) to 10 mm (0–28 mm) with ATP (P < 0.0001), but not with placebo (P > 0.05). Our results clearly demonstrated that intravenous ATP infusion exerts gradual-onset but pronounced and long-lasting analgesic and anti-allodynic effects in patients with neuropathic orofacial pain after pulpectomy and subsequent tooth extraction.

**Discussion and conclusion.** ATP thus may be a potential and promising candidate for a treatment modality of neuropathic pain in a selected group of patients.

**Could Radiofrequency Abrasion Make Orofacial Neuropathic Pain?**

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There were some animal models for the trigeminal neuropathic pain. Nonetheless, knowledge on the relative importance of key mechanisms behind orofacial neuropathic pain will most likely increase as other models are added, which mimic, e.g. disease, toxic damage or inflammation. We used radiofrequency abrasion method to generate a partial injury to the infraorbital branch of the trigeminal nerve in rats. We abraded the infraorbital nerve for separated time and temperature relatively. Following injury, rats were evaluated for four weeks. The rats developed a hypersensitivity to mechanical stimulation in the territory innervated by the infraorbital nerve. In some rats, excessive facial grooming/scratching were observed. In rats abraded for 30 seconds at 60 degree there was a significant decrease of withdrawal threshold lasting all experimental period. In separated experiments, ten animals which were abraded for 30 seconds at 60 degree and ten sham-operated rats were allowed to survival for 14 days. At this time we injected 5% formalin at the vibrissal pad and then evaluated the grooming behavior for an hour. In both phase 1 and phase 2, grooming time were increased in injured group. We conclude that radiofrequency abrasion method could create orofacial neuropathic pain effectively, but there is in want of further study.

A New Evaluation Method for Peripheral Nerve Damage on the Chin Following Dental Treatments or Disease: An Application of the Heat Flux Technique
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Aims. The heat flux technique is one of the methods for thermal sense threshold. The aim of this study was to examine peripheral nerve damage on the chin following dental treatments or disease using the heat flux technique.
Methods. Eleven patients with nerve damage on the chin were examined. Five patients underwent dental implantation, 4 patients underwent third molar tooth extractions and 2 patients suffered from osteomyelitis. The average period of suffering was 23 months (range from 2 to 63 months). The warm sense threshold (WHF) and cold sense threshold (CHF) on the chin in these patients were measured by the heat flux technique. Touch sensation was also measured with the Semmes-Weinstein monofilament test (SW test). The control measurements were conducted on the healthy opposite site.
Results. WHF, CHF and touch sensation in the damaged site were significantly higher than those in the healthy opposite side. The recovering periods of touch sensation were shorter than that of thermal sensation.
Discussion and conclusion. These results suggest that the thermal and touch sensations on the chin were disturbed in the patients with peripheral nerve damage following dental treatments or osteomyelitis. The recovering period in the touch sensation was different from that in the thermal sensation. The heat flux technique indicates one of the useful methods for the examination of neurosensory damage on the chin.

A Retrospective Study of Orofacial Neuroparalysis and Pain in Kanagawa Dental College
Masanao Matsumoto, Satoshi Beppu, Masato Kawashima and Kazu-ichi Yoshida, Kanagawa Dental College, Japan
The purpose of this study is to introduce our treatments concerning orofacial neuroparalysis and chronic pain in the pain clinic of Kanagawa Dental College Hospital. Clinical studies were retrospectively performed on 15 patients with orofacial neuroparalysis and chronic pain (trigeminal neuralgia) seen in the pain clinic at Kanagawa Dental College Hospital between Feb. 2000 and Feb. 2005. They were 7 males and 8 females, between 24 and 75 years old, with a mean age of 52.2 ± 17.1 years. The treatments for patients included stellate ganglion blockade (SGB), electric acupuncture (EAP), pharmacotherapy, and use of a low-output laser. Our treatment results were as follows: completely effective (complete cure), 13.3% (2 patients); effective (showed effect of analgesia or improved paralysis), 46.7% (7 patients); still on treatment, 20.0% (3 patients); not effective or treatment discontinuation (moved to other facilities), 20.0% (3 patients). The improvement rate was 60.0%

Comparison of Ketoprofen and Tramadol/Acetaminophen Effectiveness in Patients with Dental Pain
Elena V. Zoryan and Solomon A. Rabinovich, MSUMD, Russia
Aim. We studied the analgesic effectiveness of the non-steroid antiinflammatory drug Ketoprofen and combined centrally acting analgetic Tramadol/Acetaminophen (Zaldiar).

Methods. 29 patients aged 17–60 years received Ketoprofen and 16 patients aged 21–64 years used Tramadol/Acetaminophen to treat the acute pain syndrome after surgery or endodontic interventions. The effectiveness of the drugs was estimated by means of a special pain scale. The daily dose of Ketoprofen was 100 mg 3 times daily, Tramadol/Acetaminophen - 2–5 tablets.

Results. The clinical investigation showed that Ketoprofen demonstrated more successful analgesia for inflammatory pain and edema. Tramadol/Acetaminophen was more effective for traumatic pain. The patients did not record any adverse effects during this treatment. There were no adequate effects of Ketoprofen in three cases of severe traumatic pain. Tramadol/Acetaminophen showed no adequate analgesia in one case of inflammatory pain.

Discussion and conclusion. This study suggests that both kinds of treatment provide safe pain relief but routine use of Ketoprofen is not always successful in removing traumatic dental pain. Tramadol/Acetaminophen is more useful for relieving the dental pain associated with severe tissue injuries. Thus the choice of analgetics and their doses must be individual for each patient according to the cause of pain syndrome.

Mesophotophoresis of the Neurotropic Drug “Milgamma” in Complex Treatment of Patients with Chronic Generalized Periodontitis

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Aim. To develop and justify a new physicompharmaceutical method which is mesophotophoresis in complex treatment of periodontal patients.

Methods. 48 patients with chronic generalized periodontitis (23 with a moderate form and 25 with a severe form) were examined and treated. First the neurotropic drug “Milgamma” (2–3 injections (the dose of each was 0.5–1.7 ml) per one affected area) was introduced intrasosseously into the periodontal tissues within the territory of the trigeminal nerve innervation with left-right interchange of nerve innervation territories. Then each area was exposed to the beams of a 5–6 mW power semiconductor laser with pulse sequence having frequency of 1.5–4.0 kHz and exposure of 2–3 mm for one area and after that we applied the same drug (in its gel form) to the whole alveolar ridge (5–8 procedures in the whole).

Results. The remission lasted 12 months in 97.5% of cases of moderate periodontitis and 93.7% of cases of severe periodontitis.

Discussion and Conclusions. A persistent antiinflammatory and normalizing local microcirculation effect is obvious.

Unaccountable Masticatory Pain may have a Component of Sympathetically Maintained Pain

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Aim. There are patients who have conditions of chronic, unaccountable masticatory pain. The pain are severe, persisted, and intractable, whereas they are often relieved significantly by stellate ganglion block (SGB), albeit transiently. The etiology of masticatory pain is complex and considered various factors. The aim of this study are to investigate whether the unaccountable masticatory pain have a component of sympathetically maintained pain or not by pharmacological test.

Methods. Consent was obtained from 22 patients (female/male = 14/8, 21–67 years) with masticatory pain for more than 6 months. The pain of any patient was intractable to many therapies including splint, non-steroidal anti-inflammatory drugs, amitriptyline, trigger point injection, and/or muscle exercises. There were no therapies that produced complete pain free, whereas all of patients were alleviated by SGB. All of subjects were infused phentolamine (0.1 mg/kg), lidocaine (1 mg/kg), and saline in pharmacological test. The change in the spontaneous pain intensity was assessed using a visual analogue scale. Wilcoxon signed-ranks test was used for statistical significance (p < 0.05).

Results. No patient reported subjective improvement of pain during or immediately following saline infusion. Phentolamine infusion showed significant decrease in the spontaneous pain intensity. 12 (55%) of the 22 patients reported decreased pain (pre: 64–93, post: 7–48) at 5 mm following phentolamine infusion. Five (23%) of the 22 patients reported decreased pain (pre: 60–95, post: 15–60) at 3 min following lidocaine infusion.
Conclusion. Results of these procedures suggest that masticatory pain may have a component of sympathetically maintained pain. Furthermore, we propose that stellate ganglion block play an important role for management of unaccountable masticatory pain.

The Usefulness of Stellate Ganglion Block and Acupuncture for the Treatment of Trigeminal Paresthesia

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Aims. Despite various attempts to treat trigeminal paresthesia, an effective therapy has not yet been established. We investigated the usefulness of stellate ganglion block (SGB) and acupuncture for trigeminal paresthesia.

Methods. Seventeen patients (5 male, 12 female) with the trigeminal paresthesia were evaluated retrospectively. Mean patient age was 41.8 years old (21-64 years).

Results. The most frequent cause of trigeminal paresthesia was dental procedure such as tooth extraction, surgical orthodontics and dental implantation. The mental nerve was damaged in 14 patients, the lingual nerve in 2 patients and both the mental and infraorbital nerves in one. Seven patients were treated within 1 month after nerve damage, while 6 patients consulted our pain clinic more than 1 year after symptom onset. Fifteen patients received SGB and/or acupuncture and paresthesia was somewhat improved. After therapies the extent of paresthesia decreased to less than 20% of the initial level in 6 patients. Patients with a short interval between onset of nerve damage and the first SGB and/or acupuncture demonstrated a better prognosis.

Discussion and conclusions. SGB and acupuncture are effective therapies for trigeminal paresthesia.

The Effects of Acupuncture on the Autonomic Nervous System in Humans

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Aims. Acupuncture has been widely used in clinical practice for the management of chronic pain. However, it is well known that there is a close relationship between chronic pain and the autonomic nervous system. We evaluated the effects of acupuncture stimulation on autonomic nervous activity using blood pressure and heart rate variability.

Methods. Ten healthy adult volunteers (mean age: 29.5 years old) were enrolled in the study. Heart rate (HR) and blood pressure (BP) were measured using electrocardiograph and tonometry. Control values were recorded after a 30-minute rest in a supine position. Then acupuncture was applied at Hegu (LI14) and Shousanli (LI10) on the right arm for 30 min. HR and BP were recorded continuously during acupuncture. We analyzed the low frequency power of systolic blood pressure variability (SBP-LF) and the high frequency power of HR variability (HR-HF) by power spectral analysis. SBP-LF and HR-HF are good markers for sympathetic and parasympathetic nervous activity respectively.

Results. Immediately after acupuncture, SBP-LF and HR decreased significantly. However, these changes disappear within 5 min. Mean arterial pressure (MAP) and diastolic blood pressure (DBP) decreased slightly due to acupuncture. There were no changes in HR-HF.

Discussion and conclusions. Reduction in HR, MAP and DBP resulted from suppressed sympathetic activity and these responses were transient. Acupuncture at Hegu point and Shousanli points may affect the autonomic nervous system.

The Level of Recognition of the Primary Headache in Dentists

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Aim. Headache is one of the chief complaints of patients who consult a doctor in the hospital, and those patients consult various department physicians. However many physicians included dentists does not have an interest in primary headaches. We think the possibility that the patient with the primary headache consults a dentist is high. We investigate the level of recognition of the primary headache in dentists.

Method. We conducted a questionnaire survey concerning the level of recognition of the primary headache and other orofacial pain by dentists at random.

Results. Only 78.4% of dentists knew about migraines, tension-type headache was 34.6%, cluster headache was 7.2%.
However none of the dentists could diagnose the primary headache precisely. When the patient with orofacial pain that isn’t caused by teeth consults a dental clinic, many dentists seem to diagnose it as a psychogenic pain disorder.

Discussion and conclusion. Few dentists understood the primary headache in detail. Dentists should know about the primary headache in detail.

The Suppression of Anxiety would Lead to the Reduction of Pain on the Dental Anxiety Patients

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Backgrounds. To evaluate the correlation between emotion and pain.

Subjects and Methods. 236 Dental anxiety patients were enrolled. The anxiety was evaluated on Spielberger State and Trait Anxiety Inventory (STAT) and depression was evaluated using the Zung Self-rating Depression Scale (SDS). Venipuncture was undergone for the intravenous sedation. The needling pain was measured immediately by using the Visual Analogue Scales (VAS).

Study 1. The subjects’ anxiety and depression was evaluated and were classified by the degree of trait anxiety (T-Anx), state anxiety (S-Anx) and SDS in three groups. We compared these with the VAS. Study 2. An explanation was given before dental procedure and the subjects’ anxiety was evaluated on STAI (STAI 1). We then divided the subjects into three groups as follows: 1) No treatment group (NT: N = 23) 2) Mecobalamamin group (CO: N = 20) 3) Tandospirone group (TA: N = 20). The anxiety in each group was examined again (STAI2). The second evaluation was followed immediately by venipuncture.

Results. Study 1. The VAS tend to increased in the order to degree of S-Anx significantly, but not T-Anx, SDS. Study 2. Nor did the T-Anx in groups NT, CO, and TA show any significant change in STAT 1 and STAT 2. In contrast, the S-Anx showed significant increase in groups NT and CO, but little change in TA. The comparison of the VAS of needling pain showed that TA was significantly low.

Conclusions. These results suggested that the suppression of patients’ anxiety would lead to the reduction of pain as well.

Consideration on the Relationship between Psychological Factor and Postoperative Pain in Patients undergoing Orthognatic Surgery

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Aim. Preoperative surgical patients often suffer from preoperative anxiety. Especially, patients undergoing orthognatic surgery can be effected by particular psychological states, not only anxiety but also depression, because of the difficulties that are involved in breathing, eating, and talking, etc. after the operation. We surmise that anxiety and depression are important factors which increase postoperative pain. This study was aimed to examine perioperative changes in the psychological factors of patients receiving anesthesia for orthognatic surgery, and to examine the relationship between the psychological factors and postoperative pain.

Methods. The Patient’s psychological factor was evaluated using the Japanese version of the State-Trait Anxiety Inventory (STAI), Hospital Anxiety and Depression scale (HADs) at two points: the day before the operation and 7 to 10 days after the operation. 100 consenting patients with jaw deformities classified as ASA physical status I and undergoing orthognatic surgery participated in this study.

Results. The median scores of the state anxiety (STAT) and anxiety (HADs) significantly decreased postoperatively. But the median score of the trait anxiety (STAI) and depression (HADs) did not change significantly. Patient who had a high anxiety score before the operation complained of relatively strong pain for a long time.

Conclusion. We conclude that patients receiving anesthesia and operations have higher anxiety, and so our study indicated the importance of psychological care for patients undergoing orthognatic surgery during the perioperative period.

A Solution for Mucosa Pain Associated with Clasp-Retention RPD in Mandibular Bilateral Long Free-End Edentulous Spans with Extracoronal Precision Attachment: A Clinical Report

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Stubborn mucosa pain associated with clasp-retention RPD was sometimes encountered in mandibular bilateral long free-end edentulous spans. A case was reported to replace clasp-retention RPD for attachment-
Effects of Anticonvulsants and Antidepressants on Trigeminal Nerve Injury after Implant Surgery

Seongtaek Kim, Hyungjoon Aim, Jonghoon Choi and Chong-youl Kim, Yonsei Univ Dental College, Korea

Injury of trigeminal nerve is one of most common complications after implant surgery. Usually the altered sensation and neuropathic pain caused by the nerve injury are temporary, but sometimes it results in permanent neurosensory disorder. Surgical procedure has been the most common treatment for this condition, however it also has some complications and the rate of success is generally not so high. It has been reported that anticonvulsants and antidepressants are effective to the treatment of neuropathic pain after nerve injury.

To evaluate the effects of anticonvulsants and antidepressants on trigeminal nerve injury, a total of 85 trigeminal nerve injury patients who visited TMJ & Orofacial pain clinic from March 2004 to March 2005, were enrolled in this study. Prospectively pain characteristics, pain and discomfort level (VAS) and pain relieving factors were investigated.

In results, the average rate of reduction of pain and discomfort level was 24.8% in the patients who have taken anticonvulsants and antidepressants at least for 12 weeks. Also there was 17.1% of reduction of pain and discomfort in the patients who have experienced the altered sensation and neuropathic pain over a year. In terms of reduction of pain and discomfort, the sooner taking the medications, the better prognosis was observed and there was no statistically significant difference in sex and age. The most effective pain relieving factor was rest, sleep and use of moist heat.

In conclusion, anticonvulsants and antidepressants could be used as an alternative treatment for relieving the altered sensation and neuropathic pain after implant surgery.

Aftercare of Patients with Painful Syndroms

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Aim. Aftercare of patients with acute and chronic painful syndromes and functional disorders after dental interventions.

Methods. Traditional and advanced Chinese, Japanese, Korean medicine; authorings (classical acupuncture; Su Jok Therapy), homeopathy.

Results. For 20 years more than 10,000 patients with painful syndromes, complications and diseases of the temporomandibular joint (TMJ), mucous membrane, musculoskeletal system and the connective tissue of the maxillofacial area, painful syndromes of unidentified etiology (with previous diagnostics) have got treatment and consultations.

We have developed and put into clinical practice new scientific-practice fields linked with aftercare of patients with such nosologies as neuropathy of facial and trigeminal nerves; odontogenic osteomyelitis; locked jaw; in case of the excess of filling material behind the apex; after traumatic extractions; periosteotomy, cystectomy, odontogenic antritis, one-time oral cavity sanation with removal of tooth pulp and extraction of teeth, in case of alveolitis, alveoneuritis, painful syndrome of TMJ dysfunction.

Conclusions. Necessity to apply reflexotherapy in all stages of treatment to increase aftercare opportunities for a human, cut drug taking, facilitate an aftercare period, prevent complications, cut their number.

Psychological Aspects of Patients with Trigeminal Neuropathy

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Trigeminal neuropathy (TN) into the maxillofacial area is characterized with constant exhausting pains breaching a patient’s somatic and psychological condition.

Aim. To study the dynamics of psychological aspects in patients with TN and aftercare by means of reflexotherapy (RT).

Methods. The psychometric tests: Spielberger State-Trait Anxiety Inventory, Beck Depression Inventory, MMPI, visual-analog pain scale (VAS), Lusher test, traditional, advanced RT methods and authorings.

Results. We studied the psychological status of 36 patients (8 male and 28 female - average age 43) with TN and 15 patients in a control group (matched for age). Significantly low sense, activity, mood levels and
significantly higher stress, pain (VAS), depression, state and trait anxiety levels were found in the TN patients compared with those in the control group correlating with long disease. After RT the condition of patients with TN significantly improved. Results of psychological tests in TN group were close to those in the control group.

**Conclusions.** Analysis of psychological tests is helpful for dentists to deepen the idea of the structure of subjective sensations in facial pain. After RT the patients felt much better.

**AC Iontophoresis for Orofacial Pain and Abnormal Sensations**

Takao Shibaji, Masato Kawashima, Shigenari Mashu, Akira Maeda, Shigebaru Jinno, Tomoyuki Miyamoto, Chikako Ooe, Naoki Suzuki, Masahiro Umino and Masahiko Shimada

**Aim.** Iontophoresis with the direct current (DC) has been used in the treatment of PHN and other neuropathic pain. But the treatment with DC cannot be made to last more than a few tens of minutes because of the electric polarization. Also, it sometimes causes redness or burning of the skin. We used alternating current (AC) iontophoresis in the treatment of the orofacial pain in order to avoid these inferiorities of DC iontophoresis.

**Methods.** Thirty one patients suffered from facial or neck pain or abnormal sensation have been treated with AC iontophoresis. The electrode was made of cotton and aluminum foil. The cotton was soaked in 4% lidocaine hydrochloride. The 50 Hz of AC pulse was supplied by LASPER® (Sankyo Electric Co., Japan) for 40 through 60 minutes. The voltage was determined as high as the patient felt no pain.

**Results.** Most patients reported the pain or abnormal sensation was reduced at the moment a session of the AC iontophoresis finished. The effect lasted more than a few hours in more than half cases. The intensity of the severest pain was reduced in some patients even a few days after the therapy. A few patients reported no change in the pain after AC iontophoresis.


**Sevoflurane Enhances Ethanol-Induced Cardiac Preconditioning through Mitochondrial KATP Channels and Protein Kinase C Activation in Guinea Pig Hearts**

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**Introduction.** We investigated whether sevoflurane enhances low dose ethanol-induced preconditioning, and the potential role of mitochondrial channels and protein kinase C (PKC).

**Methods.** Isolated perfused hearts from guinea pigs were subjected to 30 mm global ischemia and 120 mm reperfusion (IIR) in all groups. Controls (CTL) were neither ethanol- nor sevoflurane-treated. Ethanol-treated group (EtOH) received 2.5% ethanol in their drinking water for 6 weeks. Anesthetic preconditioning was elicited by administration of 10 mm of sevoflurane (1 MAC; 2%) with 10 mm washout before ischemia in hearts from ethanol-treated (EtOH + SEVO) or non-ethanol-treated (SEVO) animals. To investigate the involvement of mitochondrial channels and PKC, each inhibitor, 5-hydroxydecanoate (5-HD, 200) and chelerythrine (CHE, 10) respectively, were administered for 20 mm, starting 10 mm before sevoflurane (EtOH + SEVO + 5-HD, EtOH + SEVO + CHE) or vehicle (CTL + 5-HD, CTL + CHE) administration.

**Results.** After I/R, SEVO, EtOH, and EtOH + SEVO had higher LVDP, and lower LVEDP compared to CTL. Administration of sevoflurane to EtOH led to further reduction of infarct size to 17 ± 1% in EtOH + SEVO.

**Conclusion.** Sevoflurane enhances cardiac preconditioning induced by low dose ethanol consumption through mitochondrial KATP channels and PKC activation.

**Effects of Different Sevoflurane Exposure on Myocardial Infarction and Arrhythmia during Ischemia and Reperfusion in Rabbits**

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**Aims.** This study was designed to investigate the incidence of ventricular arrhythmias observed during ischemia and reperfusion in an in vivo rabbit model.
A second goal of this investigation was to assess whether sevoflurane can influence ischemia and reperfusion induced arrhythmias and reduce the intensity of myocardial necrosis (infarct size) following ischemia and reperfusion.

**Methods.** Rabbits received regional ischemia by 30 min of the LAD occlusion followed by 3 hrs of reperfusion under ketamine/xylazine (k/x) anesthesia. Before this, rabbits were randomized into one of five groups. In the control group and sevoflurane group, rabbits were subjected to 30 min of LAD occlusion and 3 hrs of reperfusion (C,S). The ischemia-preconditioned (IP) rabbits underwent 5 min LAD occlusion followed by 10 min of reperfusion (C-IP, S-IP). In the C-SP group, 30 min of sevoflurane exposure at a 1.5% end-tidal concentration was followed by 15 min of washout (C-SP). The area at risk was delineated by Evans blue, and infarct size was determined by triphenyl tetrazolium chloride staining at the end of the experiment by re-ligation of LAD.

**Results and Conclusion.** The area at risk showed no significant differences among the five groups. The mean infarct size was significantly smaller in the S, C-IP, S-IP, and C-SP groups. Sevoflurane significantly attenuated the incidence and severity of ventricular arrhythmias during ischemia and reperfusion as well as infarct size.

**Effects of Ketamine on Glutamate-Induced Ca\(^{2+}\) Increase in Presynaptic Nerve Terminals of Rat Hippocampal Neurons**

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**Aim.** In the last decade, investigators have presented the binding sites for general anesthetics in the postsynaptic receptor-channel complexes, using gene technology and electrophysiology. Presynaptic effects of these agents are, however, not well documented. Anesthetics may affect transmitter release, disturbing the physiological process in the nerve terminal. Ca\(^{2+}\) plays an important role in processing the chemicals to the synaptic cleft. It was, however, hard to estimate the Ca\(^{2+}\) concentration in the nerve terminal due to difficulty to obtain a suitable preparation.

**Methods.** Wister rats of 10–14 days were decapitated under pentobarbital anesthesia and brain slice of 400 μM were made. Hippocampal CA 1 area was touched with a fire-polished glass microelectrode, which vibrated horizontally for 2 min, and neurons were dissociated with intact presynaptic nerve terminals (boutons) attached. Using a confocal laser scanning microscope, boutons were visualized with Fluo3-43 dye. The intracellular Ca\(^{2+}\) concentrations ([Ca\(^{2+}\)]) in the bouton and in the neuron were measured with fluo3-AM.

**Results.** Glutamate increased the [Ca\(^{2+}\)] dose-dependently both in the boutons and in the neurons, depending on the extracellular Ca\(^{2+}\). L-type calcium channel blockers and CNQX suppressed the glutamate-induced ([Ca\(^{2+}\)]) increase dose-dependently. Ketamine, less than 300 μM, had no effect on the peak increase. Sustained increase in ([Ca\(^{2+}\)]) in the neurons was markedly depressed by ketamine, whereas that in the boutons was not.

**Discussion and Conclusion.** The results suggest that glutamate increase the ([Ca\(^{2+}\)]) in the presynaptic terminals in a different manner from in the neuronal soma.

**Intraventricular Administration of Orexin A Causes Arousal Patterns on the EEG in Anesthetized Rats**

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**Aim.** It is unclear how the orexins, a family of neuropeptides that play important roles in maintaining arousal, affect depth of anesthesia. We therefore investigated the effects of intraventricular administration of orexin A on the electroencephalogram (EEG), and cerebral blood flow (CBF) in rats under sevoflurane anesthesia.

**Methods.** Following confirmation of the presence of burst suppression patterns on the EEG, rats anesthetized with 3% sevoflurane received intraventricular administration of orexin A at a dose of 1 nmol (5 μL) and were then observed for changes in EEG and CBF before to after administration.

**Results.** Administration of orexin A induced disappearance of burst suppression patterns in some rats and an increase in number of bursts in others.

**Discussion and Conclusion.** Orexin neurons are believed to activate brainstem regions involved in sleep/arousal regulation. The induction of arousal patterns on the EEG by intraventricular administration of orexin A observed in rats under sevoflurane anesthesia suggests that orexin A may modulate the anesthetic effects of sevoflurane.
The Influence of Moderate Hypothermia on Acute Stage of Cerebral Circulation following Transient Global Cerebral Ischemia

Anzu Yamashita, Teruhito Kunimatsu and Kazu-ichi Yoshida, Kanagawa Dental College, Japan

Aim. The aim of this study is to evaluate the participation of hypothermia-induced neuroprotective actions from the mechanisms of cerebral circulation in the acute stage following cerebral ischemia (CI) in vivo.

Method. Male Sprague Dawley rats were used. The cerebral blood flow (CBF) determined by laser-Doppler flowmetry. Ten-minutes of CI was induced by Smiths model. Fourteen rats divided into two groups for maintaining pre- and intra-ischemic brain temperatures 32 or 37°C (normal), respectively.

Result. The CBF was immediately increased to 224% following reperfusion in normothermic group. On the other hand, the CBF in hypothermic group was increased to 260%. Then, CBF gradually decreased in both groups; however, CBF remained high level near 150% until 60 mm in the normothermic group. In the hypothermic group, CBF gradually decreased to basal level not later than 25 mm, and preserved this level until 60 mm (as called reactive hyperemia). There were no significant differences in % of mean arterial blood pressure change between normo- and hypothermic groups. The period of reactive hyperemia followed by an ischemia were significantly reduced by pretreatment with these pharmacological agents, such as the L-NAME, MK-801, and NS-398, respectively.

Conclusion. We indicate that the mechanism underlying hypothermia-induced post-ischemic cerebral circulation is closely related inhibitory effect with morbidly accelerated for NO synthesis via activation of NixADA receptor.

Cerebral Circulation during Drug-Induced Convulsions

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Aim. Cerebral circulation was evaluated during drug-induced convulsions by comparing changes over time in cerebral blood flow (r-CBF) and brain tissue partial oxygen pressure (PtO2) in rabbits exhibiting convulsions induced by lidocaine, a local anesthetic, and the convulsants pentylenetetrazole (PTZ) and picrotoxin (PIC).

Methods. Rabbits were intubated and mechanically ventilated under general anesthesia. Those in the lidocaine, PTZ, and PIC groups received continuous infusion of the allocated drug through an ear vein until convulsions developed. Femoral arterial pressure was recorded continuously, and electrodes were placed on the skull to monitor EEG, by which development of convulsions was detected. An electrode for determination of PtO2 and brain temperature was inserted into the brain through a small bur hole placed over the parietal region. r-CBF in the cerebellum, cerebral hemispheres, medulla, thalamus, and corpus callosum was evaluated using a fluorescence-labeled microsphere technique.

Results. r-CBF was increased during convulsions induced by PTZ and PIC, while no significant changes in r-CBF were observed in any brain area examined during lidocaine-induced convulsions. Rabbits receiving lidocaine exhibited a transient increase in PtO2 immediately before the occurrence of convulsions.

Discussion and Conclusions. It has been believed that regional cerebral blood flow is significantly increased during the convulsions induced by intravenous administration of lidocaine. In the present study, blood flow in various regions of the brain was increased during PTZ- and PIC-induced convulsions, while neither significant increase in regional cerebral blood flow nor decrease in PtO2 was noted during lidocaine-induced convulsions. These findings indicate that lidocaine does not affect cerebral hemodynamics even at doses at which convulsions are induced.

Effects on Dexmedetomidine Hydrochloride on Cerebral Hemodynamics

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Introduction. Although there have been many studies of the effects of dexmedetomidine hydrochloride (Dex) on the cardiovascular system, few have determined cerebral hemodynamics during Dex treatment. We evaluate changes in mean arterial pressure (MAP), intracranial pressure (ICP), regional cerebral blood flow (r-CBF), and the electroencephalogram (EEG) during Dex treatment.

Method. Male Japanese white rabbits were anesthetized with oxygen, nitrous oxide, and sevoflurane and then intubated with an endotracheal tube connected to a ventilator. Catheters were placed in the right and left ear veins for administration of pancuronium and Dex, respectively. MAP was monitored continuously with a transducer placed in the right femoral artery. r-
CBF was monitored continuously using laser Doppler flowmetry by positioning a probe on the parietal dura matter. ICP was monitored continuously with a catheter placed in the cisterna magna. EEG was recorded using electrodes placed on the parietal bone. Anesthesia was maintained with nitrous oxide (50%), oxygen (50%), and pancuronium. After all parameters to be evaluated were stable, each animal received Dex at doses of 10 μg/kg/hr and 30 μg/kg/hr for 30 minutes for each dose, with a 30-minute period for stabilization between the two doses.

Results. Dexamethasone (Dex) 10 μg/kg/hr decreased MAP slightly at 15 min after initiation of administration, without significant changes in r-CBF or ICP. MAP began to decrease immediately after administration of Dex 30 μg/kg/hr, and significantly decreased during treatment, while r-CBF slightly and insignificantly decreased as systemic blood pressure decreased, and change in ICP was slight and insignificant.

Conclusion. These findings suggest that treatment with Dex at doses of 10 and 30 μg/kg/hr does not interfere with autoregulation of cerebral blood flow in the presence of decrease in systemic blood pressure, and does not affect intracranial hemodynamics.

Evaluation of the Antioxidant Property of 1% Propofol Inj. “Maruishi” using Electron Spin Resonance (ESR) Spectroscopy

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Aim. 1% Propofol inj. “MARUISHI” was well known as the antioxidant anesthetic. Recently, it has been reported that 1% Propofol inj. “MARUISHI” has reduced oxidative stress induced by reactive oxygen species (ROS) via its antioxidant property. Thus, we investigated the antioxidant property of 1% Propofol inj. “MARUISHI” using in vitro or in vivo ESR technique directly.

Methods. The effects of 1% Propofol inj. “MARUISHI” on ROS generating system in vitro ESR spin trapping technique with 5,5-dimethyl-1-pyrroline-N-oxide (DMPO) were investigated. We measured the alteration of oxidative stress in the rat brain using in vivo ESR with blood brain barrier permeable nitroxyl spin probe as 3-methoxyphenyl-2,2,5,5-tetramethyl-pyrrolidine-1-yl-oxyl (MC-PROXYL). We used control rat as Wistar Kyoto Rat (WKY) and stroke-prone spontaneously hypertensive rat (SHRSP), which was occurred high oxidative stress in the brain.

Results. 1% Propofol inj. “MARUISHI” reduced the DMPO-OH spin adduct, indicating hydroxyl radical (HO•) generation by Fenton reaction. There was no significant difference at the decay rate of MC-PROXYL between WKY and SHRSP after treatment with 1% Propofol inj. “MARUISHI”

Discussion and Conclusions. From these results, 1% Propofol inj. “MARUISHI” could have the antioxidant property in vitro or in vivo, suggesting that it can reduce oxidative stress induce by HO• in the brain.

The Influence of Simultaneous Administration of Clonidine and Atropine on Intraocular Pressure, Heart Rate and Blood Pressure during General Anesthesia in the Rat

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Aim. Clonidine, an α-adrenergic agonist, has often been used for sedation and analgesia prior to surgery. Atropine, a muscarinic antagonist, is used for improving some side effects of clonidine action during surgery, such as low blood pressure and bradycardia. It is known that clonidine and atropine affect intraocular pressure (IOP). Actions of these drugs on IOP still remain unclear, whereas low blood pressure and bradycardia can be monitored and controlled during surgery. The present study examined the influence of clonidine and atropine on IOP during anesthesia in the rat.

Methods. Male Wistar rats (250–300 g, n = 50) were used. Under urethane anesthesia (25%, i.p.), a catheter was inserted into the jugular vein for administering drugs and into the femoral artery for measuring the mean blood pressure (MBP). For measuring the IOP, an injection needle (27-gauge) was penetrated into the anterior chamber of the eyeball. The heart rate (HR) was recorded from an electrocardiogram. Statistical analysis was carried out using ANOVA. A difference was accepted as significant when P < 0.05.

Results. Administration of clonidine hydrochloride (5 μg/kg, n = 15) significantly decreased the IOP to 81% of the control (100%, before drugs). The MBP and the HR were also significantly reduced to 81% and to 85% of the control, respectively. Atropine sulphate (0.06 mg/Kg, n = 4) significantly increased the HR to 130% of the control, while significant changes in the IOP and the MBP were not observed. Simultaneous
administration of clonidine and atropine (n = 7) produced significant decreases of both the IOP (to 86% of the control) and the MBP (to 80% of the control), whereas no significant change in the HR was observed.

Discussion and conclusions. The present study suggests that atropine does not alter IOP under normal conditions and improves bradycardia produced by clonidine without changes in the MBP and the IOP.

Experimental Study of Effect on Cleft Lip and/or Palate and Thymic Anomalies Administered with Reverse Agents (Atropine and Neostigmine) in A/J Strain Mice -2nd Report

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Purpose. Reversed atropine sulfate and neostigmine antagonist nondepolarizing muscle relaxant has been widely used during general anesthesia. The purpose of this study was to investigate the teratogenicity of atropine sulfate and neostigmine in A/J strain mice with spontaneously occurring cleft lip and/or palate (CL/P) and thymic anomalies.

Method. Three groups injected with atropine sulfate 0.02 mg/kg and neostigmine 0.04 mg/kg into a tail vein were administrated during the organogenesis period at seventh (group 1), eighth (group 2), ninth (group 3) day of gestation. The pregnant female mice were killed on the 18th days of gestation by cervical dislocation. After laparotomy, the fetuses were removed from the uterus.

Results. In the group 2 administrated with atropine sulfate 0.02 mg/kg and neostigmine 0.04 mg/kg at eighth day of gestation, there were 125 implantations observed among 17 mothers yielding 113 (90.4%) live fetuses. Among these were 7 (6.1%) with cleft palate (CP), 3 (2.6%) with cleft lip and palate (CLP), 4 (3.5%) with thymic anomalies only, and 2 (1.8%) with CLP and thymic anomalies in combination.

Conclusions. This results of the present study do not support the view that the administration of a liquid compound of atropine sulfate and neostigmine induces abnormalities in the fetus.

Visualization of the Effect of Epinephrine on Localization of Co-Administered Lidocaine in Oral Mucosa of the Rabbit - A Radiolsotopic Study-

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Aim. Epinephrine contained in a local anesthetic solution has many benefits such as retarding intravascular absorption of local anesthetics based on its vasoconstricting action. We visualized the localization of lidocaine based on the vasoconstricting action of epinephrine in oral mucosa of the rabbit using 14C labeled lidocaine.

Methods. We used five male Japanese white rabbits. After induction of general anesthesia with isoflurane, tracheotomy and venipuncture was performed. Anesthesia was maintained with intermittent administration of intravenous thiopental. Two percent 14C labeled lidocaine solution with or without 1:80,000 epinephrine was injected into oral mucosa close to the apex of the lower incisor tooth. Three minutes after the injection, the animal was killed and frozen using liquid nitrogen. The animal’s head was invested with carboxyl methyl cellulose paste and sliced samples were made using a cryomicrotome. Bio-Imaging Analyzer System (BAS) was used to visualize the accumulation of 14C in the sample. To identify the localization of 14C labeled lidocaine in the oral tissue, we scanned the same sliced sample and superimposed the two obtained images.

Results and Conclusion. Injected 14C labeled lidocaine was clearly visualized by BAS. We could realize the localization of a local anesthetic solution by a superimposing technique. Localization of lidocaine with epinephrine around the root apex was more apparent than that without epinephrine. It is suggested that this technique is useful to visualize the localization of lidocaine in the tissue.

The Effects of Prolonged General Anesthesia on Spatial Learning and Memory in Adult and Aged Senescence-Accelerated Mouse (SAM)

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Aim. Prolonged general anesthesia effect spatial learning and memory in adult and aged SAM were investigated. 8-arm radial maze is helpful in a retention of spatial learning memory.

Methods. Two groups of male SAM were used: 16 weeks old (Adult group: n = 5), 40 weeks old (Aged group n = 5). Spatial learning and memory were measured by performance in 8-arm radial maze. Water was available...
ad libitum. Performance in 8-arm radial maze were performed one time/day. SAM in two groups were used performance 8-arm radial maze finished within 10 minutes in five days continuously. General anesthesia was maintained during 12 hours with 2% sevoflurane and 98% oxygen. Spatial learning and memory were measured by performance in 8-arm radial maze in seven days continuously.

Results. Spatial memory of the adult group recovered after about five days in before general anesthesia conditions. But the spatial memory of aged group recovered in about three days.

Discussion and Conclusions. The present study showed that spatial memory was slow to recover after 12 hours of general anesthesia in adult SAM compared with aged SAM. This result indicates that prolonged general anesthesia may affect spatial memory in adult SAM. But further studies on hypoxia, dehydration, and so forth need to be conducted to reveal more.

Morphologic Study of the Human Inferior Alveolar Nerve Damage
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Aim. With regard to the incidence of inferior alveolar nerve (IAN) damage after receiving an IAN block or following oral and maxillofacial surgical procedures, sexual dimorphism had been reported. We morphometrically analyzed the IAN and considered that morphometric findings may be one of the reasons why IAN damage indicated sexual dimorphism.

Methods. The materials were obtained from 22 cadavers (11 females and 11 males) aged 59–84 yr (average age: 74.1 yr). Human IANs were resected at the mandibular foramen. We counted the myelinated axons and measured the transverse area, perimeter and circularity ratio of the myelinated axons.

Results. We estimated the average total number of myelinated axons in the female IAN to be 25,230, with an average transverse area of 34.1 $\mu$m$^2$ an average perimeter of 21.8 $\mu$m and an average circularity ratio of 0.86, with the same measurements in the male IAN being 20,278, 31.7 $\mu$m 20.7 $\mu$m and 0.87, respectively.

Discussion and Conclusions. Our data showed no significant difference between the female and male specimens in any measured item (p < 0.05). We assumed that the IAN morphometric findings did not affect sexual dimorphism in the case of IAN damage.

Application of Computer Knowledge Control in Postgraduate Dental Education
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Aim. Development of computer controlling and training programs in postgraduate dental education.

Methods. Computer training and controlling programs for dentists on every basic section of anesthesia and first aid.

Results. Controlling and training programs on methods of local anesthesia, tools for local anesthesia (including computer syringes and pharmacological preparations used in local anesthesia), complications of local anesthesia, prevention and treatment of urgent cases in dental patients have been developed. We use computer programs in block-modular dental training for all specialties (therapeutic, prosthetic, pediatric dentistry and oral surgery) in all postgraduate programs. Over 5000 tests and more than 80 problem-solving examples and business games have been prepared.

Discussion and conclusions. Computer controlling and training programs help to learn modern methods of local anesthesia and first aid more quickly and make prompt and right decisions in standard and non-standard situations.

Shared View System Using a PC Camera for an Instruction of Tracheal Intubation
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Aim. Instruction of tracheal intubation has been difficult because a trainer and a trainee are hardly able to share the laryngeal view at orotracheal or nasotracheal intubation. Although several tools for the instruction of intubation such as video laryngoscope, a fiberscope combined with a CCD camera, has been already used, the obtained image that the trainer observes may be different from direct view by the trainee. The aim of this study was to investigate the availability of a PC camera to share the laryngeal view between a trainer and a trainee at tracheal intubation.

Methods. Seven freshman dental anesthesiologists participated in this study. These trainees put a PC camera on their head. The direction of the PC camera was adjusted for the obtained image by the PC camera to conform to the trainee’s field of view. The trainee performed nasotracheal intubation to the ASA I–II patients undergoing oral and maxillofacial surgery. Their
Mallampati findings were classified in I–II. The obtained image by the PC camera was shown on a notebook PC and recorded at the same time.

Results. The present system was able to show the field of view on a notebook PC similar with the real field of the trainee’s view. In addition, it was also useful for feedback after intubation by image recordings.

Conclusions. Trainer and trainee can share the laryngeal view by using this system and effective instruction of tracheal intubation was possible. It is suggested that a shared view system using a PC camera is an effective method for the instruction of tracheal intubation.

A Novel Training Model for Dental Infiltration Anesthetic Injections

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Aim. To provide simulation training for students on infiltration anesthetic injection techniques, a new dental training model, the M2004IA, comprising two parts was developed: M2004IA-HP, upper jaw for injection of the hard palate and M2004IA-LMBG lower jaw for injection of molar buccal gingiva. Student impressions for the use of this novel model, M2004IA, were evaluated.

Methods. In a pretrial evaluation of the properties of the M2004IA, injection pressure was measured. Injection pressure for injection speed of 0.5 m/90 sec with local anesthetic, 2% lidocaine hydrochloride, using an electric- type syringe, The Wand™ with 30 G×1/2’ disposable needles was measured. Using the same injection method, injections were carried out by fifth-year dental students, with the students being blinded to the injection pressure results during the training. In addition, we sent questionnaires to students (n = 78) to determine their impressions in their injection training.

Results. The injection pressure for the M2004IA at the end of the 0.5 mL injection over approximately 90 seconds was 241.3 (mean) mmHg for the M2004IA-HP and 357.1 mmHg in the M2004IA-LMBG. In questionnaire results of dental students (response rate = 100%), 71.8% reported the models to be “very easy to handle” and 61.0% reported it to be “very useful” in their training.

Discussion and conclusions. The newly developed M2004IA enables simulation training under realistic infiltration anesthetic injection conditions and was well received by the dental students based on its usefulness.

A Novel Training Model for Inferior Alveolar Nerve Block Injection

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Aim. To provide simulation training for dental students on inferior alveolar nerve block injection techniques, an original dental training model, the M98IANV was developed. In clinical training sessions at the Dental Anesthesia course (5th year dental school), interactive training involving dental local anesthetic injection is conducted. In 1994, training sessions were introduced which demonstrated the initial simulation model. The educational effectiveness with respect to application of this simulation model in terms of inferior alveolar nerve block injection was investigated.

Methods. The anesthetic success rate prior to the simulation model introduction was compared to those following introduction of it in the interactive training session. The effectiveness of inferior alveolar nerve block (direct method) in the interactive training session was conducted. Only in the simulation training group, students practiced the techniques of direct block method before their interactive training session.

Results. The anesthetic success rate prior to the simulation model introduction (1993) was 87%. However, the success rate following introduction of the simulation model (1994) was 94%; further, the increase was significant when compared with results from the previous year. No significant increases in effectiveness occurred from 1994, during which continued educational effectiveness was demonstrated.

Discussion and conclusions. The introduction of our simulation model for inferior alveolar nerve block injection; the M98IANV in dental clinical training sessions improved the educational effectiveness for injection techniques.

Effect of BLS-AED Practice for All Staff in Ohu University Dental Hospital

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Aim. The importance of emergency medicine in dentistry is increasing because the reports of accidental shock and cardiopulmonary arrest during dental treatment are increasing. Now, not only MD but also DDS should learn about BLS (basic life support) and ACLS (advanced cardiovascular life support) as a gold stan-
standard of emergency medicine. Then, we established a committee, and a BLS-AED course was held for all staff of our hospital, and we obtained some findings from the questionnaire.

**Methods.** Our BLS-AED course was held for one hour in the evening by three instructors for 6–9 participants over 29 days. Instructors consisted of 29 experts in our hospital who had taken the formal BLS/ACLS course of the AHA (American Heart Association) or JAAM (Japanese Association for Acute Medicine). Before and after the course, some questionnaires were given to all 239 participants.

**Results.** Before BLS-AED course, most participants answered “When I encounter a collapsed patient, I want to help but I can’t help”. However, after BLS-AED course, most participants answered “I can help” and the acknowledgment of the technical term (BLS, ACLS, AED, PEA, AHA) increased significantly.

**Discussion and conclusions.** Most participants learnt about BLS-AED and came to be able to have confidence to the patient’s sudden change. It means the entire hospital becomes safe. It is necessary to hold the course regularly to maintain this good condition. If the course is held regularly, the instructor should make it interesting.

### Participation Rate to Formal BLS/ACLS Course of Society in Ohu University Dental Hospital

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**Aim.** The importance of emergency medicine in dentistry is increasing, because the reports of accidental shock and cardiopulmonary arrest during dental treatment are increasing. Now, not only MID but also DDS should learn about BLS (basic life support) and ACLS (advanced cardiovascular life support) as a gold standard of emergency medicine. In recent years, we have participated in the formal BLS/ACLS course of AHA (American Heart Association) or JAAM (Japanese Association for Acute Medicine) that has been held in surroundings, and we obtained some findings.

**Methods.** We have positively participated in the formal BLS/ACLS course of AHA (American Heart Association) or JAAM (Japanese Association for Acute Medicine) that has been held in surrounding general hospital and medical college. Fifty staff attended the five courses from 2003 to now.

**Results.** Fifty staff who attended the formal courses consisted of 36 dentists, 9 nurses, and 5 dental hygienists. The 36 dentists who attended the formal courses consisted of 15 oral surgeons, 9 dental anesthesiologists, 9 general dentists, and 3 pediatric dentists. Seventeen of the staff of fifty who attended the formal courses are contributing to those courses as an instructor.

**Discussion and conclusions.** It is very good to learn the emergency medicine in other facilities. Relationships among the doctors, nurses, and emergency medical technicians of other facilities has deepened. And, the knowledge of BLS/ACLS has deepened with various information from them.
Resuscitation Training Course for the Staff Dentists in Tsurumi University

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In Tsurumi University, we established a study group on cardiopulmonary resuscitation and started the resuscitation training course for the staff dentists of our university hospital in July, 2005.

A questionnaire survey was performed to the dentists in order to evaluate the training course.

The resuscitation training course was given once a month on Saturday afternoon for 5 hours 30 minutes. A total of 99 had finished the course in the 8 months.

Each course included basic life support of an infant, a child and an adult using Automated External Defibrillator (AED) according to the guidelines of American Heart Association 2000. What was called “watch then practice” method was applied for the program using DVDs and clinical situations.

After the lecture, the participant was asked to answer the questionnaire containing past experience of the resuscitation and estimation of the training course.

The answers were obtained from the all dentists attending the course. Twenty-five (25%) dentists encountered emergency cases and 13 cases among them were related to dental treatment. Chest compression was done by 3 dentists, artificial ventilation by 3, and removal of foreign body in the airway was done by 5 dentists.

As for the courses, preferable evaluation was given by 93 dentist (94%) and 75 (76%) hoped repetitive and periodical courses.

It is not uncommon for the dentist to encounter emergencies where basic life support is needed. The lecture and training course is essential for the situation, and our course program was accepted by the participant dentists.

Dentists’ Contribution to The Development of Surgical Anesthesia

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Aim. To study the role of dentists in the development of surgical anesthesia.

Methods. Archive papers, scientific articles, congresses materials, private correspondence with medical historians, museums, and experts in the field of anesthesia.

Results. The role of such dentists as J. Riggs, W. Morton, N. Keep, E. Pope, B. Richardson, A. Witzel, Z. Howe, J. Carmichael, Ch. Nash, E. Raymond, H. Carlson, E. Meller, P. Taubkin, G. Fischer, J. Bercher in the development of anesthesiology, surgery and stomatology has been determined and defined.

Discussions and results. Unfortunately, diseases and pain have been always pursuing people. Since ancient times the mankind has dreamed to get rid of pain. In the Pushkin times surgical operations and treatment of teeth were performed without anesthesia in modern sense. Absence of anesthesia became an obstacle in the development of surgery. Surgeons, not dentists, were the pioneers of modern anesthesiology. It is they who discovered narcosis. They also made a significant input in the development of local anesthesia. Certainly, such surgeons as S. Hanaoka, C. Long, W. Halstead, R. Hall, C. Schleich, P. Reclus, H. Braun, A. Vishnevskiy etc. also contributed to the development of local and general anesthesia.