CLINICAL REPORTS

There was no difference between the abdominal to thoracic pneumobelt displacement ratio during the calibration procedure and jet ventilation.

Uncertainty as to delivered volume and adequacy of ventilation is a major disadvantage of any "open" ventilation system. The pneumobelts provided an indirect yet reasonably accurate estimate of delivered volume during jet ventilation. Satisfactory ventilation was achieved by maintaining estimated delivered volume between 2.0–3.5 ml·kg⁻¹ at rates of 40–60 cycles/min.

Risk of barotrauma is a potential disadvantage of jet ventilator ventilation. Pneumothorax secondary to ball-valve obstruction and subsequent overinflation during jet ventilation have been reported. In this study, the pneumobelt system was helpful in detecting hyperinflation caused by airway obstruction and therefore may be useful in preventing barotrauma. Low jet driving pressures are less likely to produce mucosal tears and subsequent emphysema. By confirming the patient is receiving an adequate tidal volume, the use of pneumobelts prevents inadvertent application of excessively high jet driving pressures.


REFERENCES


Postural Stability after Oral Premedication with Diazepam

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The tendency of a patient to sway in a standing position after administration of a drug may be an index of patient safety. Because this index has not been used in studies of premedication regimens, we determined the postural stability of patients before and 90 min after oral administration of diazepam by use of a computer-assisted force plate. The applied method has been shown to be useful in the investigation of other drugs.¹⁻⁵

METHODS

Twenty-one patients, 10 women and 11 men, scheduled for elective surgical procedures were tested. None took any medications or had any drugs the week before the study. All patients were ASA class 1, ages ranging from 20 to 57 years. Informed consent was obtained from the patients after written and oral information. The study was approved by the staff of the involved departments.

The quantitative Romberg's test, the indication of body sway, was used in this study. The Romberg's position is defined as a standing position with arms hanging aside and the feet parallel with 1 cm interspace. The fluctuations

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TABLE 1. Influence of Diazepam 0.2 mg/kg (D) Orally on Postural Stability

<table>
<thead>
<tr>
<th></th>
<th>Sway* Before D</th>
<th>Sway* After D</th>
</tr>
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<tbody>
<tr>
<td>Eyes open</td>
<td>46 (37–76)†</td>
<td>63 (36–117)</td>
</tr>
<tr>
<td>Eyes closed</td>
<td>49 (36–83)</td>
<td>60 (37–109)</td>
</tr>
</tbody>
</table>

* Sway is indicated in cm × 0.01.
† Mean plus range.

of the center of pressure imposed by the person’s feet on the ground were quantified. The ground reaction forces were measured by a 52.5 cm × 30 cm horizontal force plate placed in the floor of the laboratory. The forces were registered by strain gauges placed in each corner of the force plate. The measurements were recorded by a LYREC-TR-86® analog multichannel tape recorder. Further calculations were performed with a Digital PDP 11/10® computer. The signals of the strain gauges were added into a sagittal and a transversal vector. The mean position of the center of pressure in the two directions were calculated for 60 s of the test. The areas between the mean positions and the instantaneous positions of the center of pressure were integrated and divided by the sampling time. In this way the average values of the transversal sway (Sx) and the sagittal sway (Sy) were found. The expression was compressed into \( \sqrt{(Sx)^2 + (Sy)^2} \) = the common sway vector, which was used as the indication of sway and the figure used for the statistic evaluation.

The patient was placed in the standing Romberg’s position on the force plate. After adaptation to the situation for 20 s, the person was asked to close his or her eyes, and sway impulses were registered for 3 min. Measurements registered from the 15th to the 75th second were used for the calculations.

One test was performed with open eyes, followed by a test with closed eyes after an interval of 3 min of sitting rest. A set of tests was performed the day before premedication and 90 min after the oral administration of diazepam 0.2 mg/kg. The latter time was chosen because induction of anesthesia frequently is 90 min after administration of premedication drugs. A blood sample for plasma diazepam was taken immediately before the second set of tests. Plasma diazepam was determined according to the methods of Rutherford, Arnold, and Rey et al.

The sway figures were evaluated by Pratt’s nonparametric test for paired data. The least-squares method was used for determining the correlation between log concentration of plasma diazepam and the difference between the two sets of tests.

Patients who fell were excluded from the statistical analysis.

RESULTS

The average postural sway increased \( (P < 0.01) \) after premedication with diazepam, especially with the eyes open. Whether diazepam had been given or not, the tendency of swaying was not aggravated when the patients closed their eyes \( (P > 0.10) \) (table 1). One of the 21 patients (95% confidence limits 0.12–23.82%) fell during the test after premedication and is therefore not included in the calculations of postdiazepam sway.

Plasma diazepam was in the range of 0.60–2.14, median value 0.95 μg/ml. A correlation between log concentration of plasma diazepam and the alteration of postural stability was not found \( (r^2 = 0.02) \).

DISCUSSION

In a study by Eriksen et al. on postanesthetic postural stability following thiopental or propanidid anesthesia, outpatients were tested before and 3 hs after anesthesia. In the propanidid group no differences were found between preoperative and postoperative test results, while the patients anesthetized with thiopental had a decreased postural stability by 23% in the sagittal direction, but no change was found in the transversal sway. These patients were not permitted to be left alone for the rest of the day after leaving the hospital. In our study the decrease in postural stability following diazepam probably can be considered expressive of reduced safety to the ambulatory patient. However, the margin of safety cannot be determined because only one patient fell. The increase in sway in our study can be compared with the results of a study on alcohol and postural imbalance. The increase of sway after diazepam 27% and 44% is equivalent to the sway during a blood alcohol concentration of 0.60–0.90 mg/ml.

Our study demonstrates that the patients’ visual perception of the surroundings adds no safety in the standing position after premedication. One of the patients fell during the test with closed eyes after premedication. The previous tests did not reveal especially bad figures for his postural stability (table 1). We believe the fall might have resulted from orthostatic hypotension following a total of 7 min in the standing and sitting position. The necessary bed rest impeded further investigation of this case. Our data and the fall of one patient lead us to conclude that bed rest is mandatory after premedication with diazepam in the doses given to our patients.

Our study cannot be taken as a pharmacodynamic analysis, because from each patient only one blood level was sampled rather than a series necessary for such analysis. A wide scatter of plasma diazepam concentrations was found, despite a uniform diazepam dosage on a body weight basis. This may result from a variable bioavailability and a multicompartment distribution described by Kaplan et al. The multicompartment distribution may
be the explanation of our finding of no correlation between the log plasma concentration and the differences in postural stability. The lack of correlation in the group of patients does not preclude a possible correlation in the individual person. This possibility may be supported by the observation that the patient who fell was one of the two persons having the highest plasma diazepam concentration (2.14 μg/ml). Korttila et al. 10 found that diazepam 0.3 mg·kg⁻¹ iv produced almost a 100% increase in the postural sway in the lateral direction when the patient was standing with eyes open 1 h after the injection.

In conclusion, objective measurement of postural stability after oral diazepam premedication demonstrates a decreased stability with a tendency for falling. On the basis of these results, we believe patients should not be allowed to ambulate after premedication.

REFERENCES


