Analysis of cardiopulmonary stress during endoscopy: Is unsedated transnasal esophagogastroduodenoscopy appropriate for elderly patients?

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BACKGROUND: Transnasal esophagogastroduodenoscopy (EGD) without sedation has been reported to be safe and tolerable. It has recently been used widely in Japan for the detection of upper gastrointestinal disease. Alternatively, transoral examination using a thin endoscope has also been reported to be highly tolerable.

OBJECTIVE: To examine the cardiocirculatory effects of transoral versus transnasal EGD in an attempt to determine the most suitable endoscopic methods for patients ≥75 years of age.

METHODS: Subjects who underwent monitoring of respiratory and circulatory dynamics without sedation during endoscopic screening examinations were enrolled at the New Ooe Hospital (Kyoto, Japan) between April 2008 and March 2009. A total of 165 patients (age ≥75 years) provided written informed consent and were investigated in the present study. Patients were randomly divided into three subgroups: UO group – thin endoscope; SO group – standard endoscope; and UT group – transnasal EGD. Percutaneous arterial blood oxygen saturation, heart rate and blood pressure were evaluated just before EGD and at five time points during EGD. After transnasal EGD, patients who had previously been examined using transoral EGD with a standard endoscope were asked about preferences for their next examination.

RESULTS: There were no statistical differences in the characteristics among the groups. Percutaneous oxygen saturation in the UT group showed a transient drop compared with the SO and UO groups at the beginning of the endoscopic procedure. Heart rate showed no significant differences among the SO, UO and UT groups; Systolic blood pressure in the UO group was lower immediately after insertion compared with the SO and UT groups. The rate pressure product in the UO group was comparable with that in the UT group during endoscopy, and the SO group showed a continuously higher level than the UO and UT groups. More than one-half (54.4%) of patients were ‘will-ing to choose transnasal EGD for next examination’.

CONCLUSIONS: For elderly patients, unsedated transnasal EGD failed to show an advantage over unsedated standard endoscopy. Transoral thin EGD was estimated to be safe and tolerable.

Key Words: Cardiocirculatory effects; Elderly patients; Transnasal esophagogastroduodenoscopy

L’analyse du stress cardiopulmonaire pendant l’endoscopie : l’œsophagastro-duodénoscopie transnasale sans sédation convient-elle aux patients âgés?


OBJECTIF : Examen des effets cardiocirculatoires de l’OGD transorale par rapport à l’OGD transnasale dans une tentative pour déterminer la méthode endoscopique la mieux adaptée aux patients de 75 ans et plus.


RÉSULTATS : Il n’y avait pas de différences statistiques quant aux caractéristiques des groupes. La saturation percutanée du groupe UT a révélé une baisse transitoire par rapport aux groupes SO et UO au début de l’intervention endoscopique. La fréquence cardiaque ne présentait pas de différence significative entre les groupes SO, UO et UT. La tension artérielle systolique du groupe UO était plus basse que celle des groupes SO et UT immédiatement après l’insertion. Le produit de pression du groupe UO était comparable à celui du groupe UT pendant l’endoscopie, et le groupe SO a présenté un taux constant plus élevé que les groupes UO et UT. Plus de la moitié (54,4 %) des patients étaient « prêts à choisir l’OGD transnasale à l’examen suivant ».

CONCLUSIONS : Chez les patients âgés, l’OGD transnasale sans sédation n’était pas plus avantageuse que l’endoscopie standard sans sédation. L’OGD transorale à l’aide d’un endoscope mince était considérée comme sécuritaire et tolérable.
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TABLE 1
Patient characteristics and baseline cardiopulmonary parameters in the study groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>SO (n=55)</th>
<th>UO (n=53)</th>
<th>UT (n=57)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years, mean ± SD</td>
<td>80.1±4.7</td>
<td>80.2±4.3</td>
<td>80.6±3.8</td>
<td>NS</td>
</tr>
<tr>
<td>Sex, male/female, n/n</td>
<td>30/25</td>
<td>25/28</td>
<td>31/26</td>
<td>NS</td>
</tr>
<tr>
<td>Pericardial thin endoscope saturation, %</td>
<td>97.1±2.5</td>
<td>97.5±1.8</td>
<td>97.1±3.2</td>
<td>NS</td>
</tr>
<tr>
<td>Heart rate, beats/min</td>
<td>70.1±13.3</td>
<td>71.8±13.3</td>
<td>73.2±14.0</td>
<td>NS</td>
</tr>
<tr>
<td>Systolic blood pressure, mmHg</td>
<td>139.6±23.0</td>
<td>137.2±21.3.1</td>
<td>135.7±15.4</td>
<td>NS</td>
</tr>
<tr>
<td>Procedure time, min</td>
<td>6.09±0.28</td>
<td>5.12±0.28</td>
<td>6.30±0.40</td>
<td>NS</td>
</tr>
</tbody>
</table>

Data presented as mean ± SD unless otherwise indicated. SO group – transoral standard endoscope (GIF-XQ260; Olympus, Japan); UO group – transoral thin endoscope (GIF-XP260N; Olympus); UT group – transnasal endoscope (GIF-XP260N; Olympus). NS Not statistically significant.

The diameter of the inserted portion of the endoscope was 6.5 mm for the GIF-XP260, 9.0 mm for the GIF-XQ260 and 5.2 mm for GIF-XP260N. All procedures were performed by three senior endoscopists with >15 years of experience each. Only topical anesthesia was used, with no sedative agents. All patients were administered antispasmodic medications 5 min before the examination.

Patients in the UO and SO groups received only local throat anesthesia with 4 mL of 2% viscous lidocaine (Xylocaine, AstraZeneca, Japan) for 5 min. Patients in the UT group received local anesthesia in the form of a nasal spray consisting of 0.5% phenylephrine and 2% Xylocaine, delivered as a fine mist using a mucosal atomization device (Wolf-Tory Medical, USA) attached to a 10 mL syringe, and cetacaine spray for pharyngeal anesthesia.

Monitoring of respiratory/circulatory hemodynamics
Duration of the examination, percutaneous arterial blood oxygen saturation and heart rate were measured at the right first finger, and blood pressure was measured at the upper right arm using a monitoring unit (MUE-200, Olympus). These parameters were evaluated at six time-points (2 min before the examination; at four time points during insertion of the endoscope [esophagus, gastric angle to antrum, pyloric ring to the duodenal bulb and upper gastric body]; and immediately after evulsion of endoscope), then compared among groups. Blood pressure was measured according to a previous report (18). In addition, rate-pressure product (pulse rate × systolic blood pressure/100) reportedly offers a useful marker of cardiac oxygen demand and was, therefore, calculated (19,20).

Questionnaire survey
After transnasal EGD had been performed, the patients, who had all previously been examined by transoral EGD using a conventional endoscope, were asked about their preferences regarding a subsequent upper gastrointestinal examination. Patients were able to select one of three options: would prefer transnasal EGD; no preference for transnasal or transoral EGD; or would prefer transoral EGD.

Statistical analysis
For statistical analysis, Statview statistical software (SAS Institute, USA) was used. Data are expressed as the mean ± SD. The Mann-Whitney U test and Wilcoxon’s rank-sum tests were used; P<0.05 was considered to be statistically significant.

RESULTS

Patient characteristics
All patients enrolled in the study were analyzed. Characteristics of the enrolled patients in each group are summarized in Table 1. No serious complications in cardiopulmonary function occurred. There were no statistically significant differences in mean age, baseline cardiopulmonary parameters, arterial oxygen saturation, heart rate or systolic blood pressure among the groups.

Duration of endoscopic procedure
The mean (± SD) duration of the endoscopic procedure was 6.09±0.28 min in the SO group, 5.12±0.28 min in UO group and 6.30±0.40 min in UT group, with no statistical differences among them (Table 1).

Changes in percutaneous oxygen saturation, heart rate and blood pressure during gastrointestinal endoscopic procedures
Percutaneous oxygen saturation in the UT group (−0.947±0.308%) showed a transient drop compared with SO (0.161±0.246%) and UO (−0.258±0.213%) groups at the beginning of the endoscopic procedure (Figure 1A). Heart rate showed no significant differences among the SO, UO and UT groups (Figure 1B). Changes in systolic blood pressure in the UO group (−0.883±1.578 mmHg) immediately after insertion (esophagus and gastric angle to antrum) were lower compared with the SO (6.475±2.098 mmHg) and UT groups (4.44±2.096 mmHg) (Figure 1C). The rate-pressure product in the
DISCUSSION

In the present study, we investigated cardiocirculatory changes and tolerance during EGD in elderly patients using three different types of endoscopy with oral or transnasal insertion. Among elderly patients, transoral thin EGD demonstrated fewer cardiocirculatory effects than transnasal EGD without sedation. Based on the questionnaire survey, the percentage of elderly patients who preferred transnasal EGD was lower than previously reported. Our results indicate that transnasal EGD is not always the safest or most tolerable procedure for elderly patients partially because of transient decreases in oxygen saturation at the time of endoscope insertion. Moreover, from a cardiocirculatory perspective, transoral thin EGD is as safe as transnasal EGD and is well tolerated by elderly patients without sedation.

In a study investigating transnasal EGD in elderly patients, Yuki et al. (14) reported that unsedated transnasal EGD was safer than conventional transoral EGD in elderly patients. In that study, they defined patients ≥65 years of age as elderly and used conventional transoral EGD as a control, while in our study, we defined patients ≥75 years of age as elderly and used transoral thin EGD as a comparator with transnasal EGD. These differences in patients and methods may explain the difference in results between that study and ours.

Although the prevalence of *Helicobacter pylori* has recently been lower in younger generations in Japan, the mortality rate of gastric cancer in the elderly generation has remained high (21). Because the mortality rate of gastric cancer remains high in elderly patients, screening EGD is essential for these patients in Japan. Although survey data from the United States suggest that >98% of EGDs and colonoscopies are performed with sedation (22,23), approximately 30% of EGDs is commonly performed without sedation in Japan (24). Similarly, >75% of EGDs are performed without sedation in many European countries (25). Thus, tolerable and safe unsedated EGD is needed for screening in elderly patients.

Before discussing calibre size and endoscope insertion method, we should consider physiological parameters in elderly patients. In general, aging is associated with significant cardiopulmonary modifications, both structural and functional. Apart from the decrease in total blood volume and the increase in total peripheral resistance, elderly individuals have altered cardiovascular homeostasis including increases in spontaneous blood pressure variability and decreases in heart rate variability (26). Pulmonary function is also affected by aging. Physiological aging of the respiratory system correlates with dilation of alveoli, enlargement of airspaces, decrease in surface exchange area and loss of supporting tissue for peripheral airways. The strength of respiratory muscle also decreases with aging; consequently, adaptability for exercise or acute disease is also reported to be diminished (27,28). Endoscopy in elderly patients may be less effective given these physiological pulmonary and cardiovascular changes.

Regarding calibre size, Preiss et al. (29) indicated that unsedated transoral thin EGD is well tolerated, feasible and as safe for patients as transnasal EGD without sedation. If the use of transoral thin endoscopes (diameter ≤6 mm) becomes more widely adopted, the need for sedation during EGD may decrease. A multicentre randomized controlled trial in a United States population comparing unsedated endoscopy using transoral thin endoscopes with sedated endoscopy found no significant differences in physician satisfaction, technical ease of the procedure, patient satisfaction or patient willingness to repeat the procedure (30). Other studies have also reported that patients may be able to undergo transoral thin EGD without sedation (15,16).

Using the transnasal insertion route is also considered whenever a thin endoscope is used in the endoscopic examination. Transnasal EGD is known to induce less frequent gagging episodes, nausea, choking sensation and pharyngeal discomfort compared with transoral EGD (7,8). For this reason, unsedated transnasal EGD has been reported to be safer and more tolerable than transoral EGD (31-33) in younger and older generations.

In our study, however, the advantages of transnasal EGD for elderly patients (age ≥75 years) was not confirmed. Even when lower pulmonary function in elderly patients is considered, transnasal EGD may not be suitable due to its effect on pulmonary function (5).

Our results suggest that transoral thin EGD without sedation represents a safe and acceptable approach in elderly patients.

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