Risk Management for Gastrointestinal Endoscopy in Elderly Patients: Questionnaire for Patients Undergoing Gastrointestinal Endoscopy

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Summary  More elderly patients now undergo gastrointestinal endoscopy following recent advances in endoscopic techniques. In this study, we conducted a high-risk survey of endoscopies in Japan, using a questionnaire administered prior to upper gastrointestinal tract endoscopy (UGITE), and identified anticholinergic agents and glucagon preparations as high-risk premedication. We also evaluated the cardiovascular effects of anticholinergic agents and glucagon through measurements of plasma levels of human atrial natriuretic peptide (hANP) and human brain natriuretic peptide (hBNP). The subjects were 1480 patients who underwent UGITE. Nurses administered a pre-endoscopy questionnaire, questioning subjects regarding heart disease, hypertension, glaucoma, and urinary difficulties as risk factors for anticholinergic agents, and Diabetes mellitus as a risk factor for glucagon preparations. Evaluation of subjects divided into under 65 and over 65 age groups revealed that in subjects aged 65 and over, risk factors for anticholinergic agents were significantly more high than those for glucagon. Analysis of the cardiovascular effects of anticholinergic agents and glucagon, in the elderly patients showed that hANP levels were significantly higher following administration of anticholinergic agents, but the change was not significant for glucagon premedication. Taking a detailed history before UGITE with the aid of a questionnaire at the same time as informed consent is obtained, is extremely useful in terms of risk management and selection of the appropriate premedication.

Key Words: risk management, gastrointestinal endoscopy, questionnaire, hANP, hBNP

Introduction

Gastrointestinal endoscopic investigation and treatment have contributed greatly to improved quality of life for Japanese patients in recent years, through innovations in endoscopic techniques, marked improvement in endoscopes and accessories, and enhancements to the medical insurance system. Gastrointestinal endoscopy is used in wide variety of situations, from everyday investigation to highly complex diagnostic and therapeutic applications. A certain level of complications appears to be unavoidable; both adverse drug reactions to antispasmodic premedication, including allergic reactions and anaphylactic shock, and intraoperative haemorrhage or perforation [1–4]. Reports from Japan of endoscopic complications appear regularly in the literature; in a survey of the age distribution of deaths due to endoscopic premedication and endoscopy itself, Kaneko et al. found a rapid increase in deaths from both causes over the age of 60 years [5].
Accompanying the aging of the general population in Japan, the proportion of elderly patients undergoing gastrointestinal endoscopy is also increasing, making less invasive and safer investigations desirable from the risk management point of view. Okamura et al. reported increased use of antithrombotic therapy in elderly patients, and examples of inadequate history-taking resulting in hemorrhagic complications due to an inadequate washout period for the antithrombotic therapy, or no washout at all [6]. The choice of anticholinergic agents and glucagon, administered as antispasmodic premedication prior to gastrointestinal endoscopy, needs to be carefully considered in the elderly because of the high incidence of conditions such as prostatic hypertrophy, glaucoma and heart disease, for which anticholinergic agents are contraindicated.

With these considerations in mind, we developed a questionnaire for assessing patient background factors prior to gastrointestinal endoscopy, and investigated the proportions of patients with risk factors for anticholinergic agents and glucagon, and how these correlated with age. We also evaluated the cardiovascular effects of anticholinergic agents and glucagon used as premedication in gastrointestinal endoscopy.

Subjects and Methods

Patients who underwent upper gastrointestinal tract endoscopy (UGITE) at the Osaka Medical College Hospital Endoscopy Center between June and December 2001 were included in the retrospective study. The World Health Organization (WHO) definition of elderly patients, i.e., those aged 65 years or older, was used for this study.

A doctor or nurse administered the oral pre-endoscopy questionnaire, which is shown in Figure 1. The questions were developed to detect background factors, including underlying conditions and medication, in each subject to help in risk management and reducing endoscopy complications. The <65 (younger) and ≥65 age groups (elderly) were compared for five characteristics or clinical conditions deemed high-risk for complications: 1) first-time endoscopy;

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The following questions are designed to facilitate the examination procedure. Please circle the responses that apply to you.

1. Do you feel well in yourself today? ___________________________________________ Yes No
2. Have you had a gastrointestinal investigation before (including endoscopy)? ________ Yes No
   If yes, when was the last time? (including at another hospital) ___________ Don’t remember Date: ______
3. If Yes, did you feel unwell in any way during or after the examination?_________ No Sweating Nausea Dizziness Heart palpitations Urination problems Other
4. Have you ever had a bad reaction to an anaesthetic used in dental treatment? ________ Yes No
5. Have you ever had a bad reaction to an injection for reduce gastrointestinal activity? ________ Yes No
6. Have you ever had a reaction to a medication or suffered from any allergies?_________ Yes No
   If Yes, please specify the type of medication: ________________________________
7. Which medicine do you take? _____________________________________________ Warfarin Ticlopidine Low-dose Asprin Other [ ] No
   If so, did you stop for the medicine? _________________________________________ Yes No
   If Yes, how many days ago did you stop it? _____________________________ _______ days ago
8. Do you have any heart disease? ____________________________________________ No Arrhythmia Angina Myocardial infarction Other [ ]
9. Do you take medicine for heart disease? _____________________________________ Yes No
10. Do you have hypertension? ________________________________ Yes No
11. Do you have Glaucoma? _______________________________________________ Yes No
12. Do you have enlarged prostate? __________________________________________ Yes No
13. Do you have Diabetes? ________________________________________________ Yes No
14. Do you want to be informed if the result of test is cancer?______________________ Yes No
   <For female> Is there a possibility that you may be pregnant?_________ Yes No Unknown
   <For colonoscopy> When did you last open your defecation? ________________ _______ days ago
   Have you opened your defecation today? ____________________________ Yes No

Osaka Medical College Gastrointestinal Endoscopy Center

Fig. 1. Detail of pre-endoscopy questionnaire developed at Osaka Medical College Gastrointestinal Endoscopy Center.
2) lignocaine allergy; 3) antithrombotic therapy (e.g., warfarin, ticlopidine, aspirin); 4) heart disease (arrhythmia, ischemic heart disease), hypertension, glaucoma, prostatic hypertrophy; and 5) Diabetes mellitus.

We injected anticholinergic agents (15 mg of prifinium bromide) or glucagon (1 mg of Glucagon G Novo) muscularly according to Table 1 (Comparison of contraindications and precautions for use associated with anticholinergic agents and glucagon used as premedications for gastrointestinal endoscopy) and then evaluated the cardiovascular effects of anticholinergic agents and glucagon through measurements of plasma levels of human atrial natriuretic peptide (hANP) and human brain natriuretic peptide (hBNP), which are indices of cardiovascular load [7, 8]. hANP and hBNP were measured before and after UGITE using chemiluminescent enzyme immunoassay (CLEIA) in the above period, between June and December 2001. The levels of hANP and hBNP at baseline and after endoscopy were compared in the <65 and ≥65 age groups, and the elderly group (≥65 years) was further stratified according to the presence of cardiovascular disease.

Analysis

All data were expressed as mean ± SD. Analyses were conducted using Fisher’s exact method (chi-square test) or Student’s t test, with p<0.05 considered statistically significant.

Results

Baseline patient characteristics

The baseline patient characteristics are shown in Table 2.

Analysis of risk groups

Subjects undergoing their first endoscopy. First-time endoscopy cases accounted for 26.6% of all subjects and the proportion of first endoscopy procedures was significantly lower in the elderly subjects (p = 0.0042, Table 3).

Subjects with lignocaine allergy. Subjects allergic to lignocaine accounted for 2.8% (25/883) of subjects aged <65 years and 1.0% (6/597) of those ≥65 years, making lignocaine allergy significantly less common in elderly subjects (p = 0.016, Table 3).

Table 1. Comparison of contraindications and precautions for use associated with anticholinergic agents and glucagon used as premedications for gastrointestinal endoscopy

<table>
<thead>
<tr>
<th>Glucagon</th>
<th>Anticholinergic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contraindications</td>
<td></td>
</tr>
<tr>
<td>Patients with suspected pheochromocytoma</td>
<td>Patients with haemorrhagic colitis</td>
</tr>
<tr>
<td>Patients with a history of hypersensitivity to this drug</td>
<td>Patients with glaucoma</td>
</tr>
<tr>
<td></td>
<td>Patients with impaired micturition due to prostatic hypertrophy</td>
</tr>
<tr>
<td>Precautions with use</td>
<td></td>
</tr>
<tr>
<td>Patients with an insulinoma</td>
<td>Patients with prostatic hypertrophy</td>
</tr>
<tr>
<td>Elderly patients with known heart disease</td>
<td>Patients with congestive heart failure</td>
</tr>
<tr>
<td>Diabetic patients</td>
<td>Patients with cardiac arrhythmias</td>
</tr>
<tr>
<td>Patients with hepatic disease associated with impaired glucose release, such as cirrhosis</td>
<td>Patients with ulcerative colitis</td>
</tr>
<tr>
<td></td>
<td>Patients with hyperthyroidism</td>
</tr>
<tr>
<td></td>
<td>Patients in high temperature environments</td>
</tr>
</tbody>
</table>

Table 2. Baseline patient characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of subjects</td>
<td>1480</td>
</tr>
<tr>
<td>Age (yrs, mean ± SD)</td>
<td>59.2 ± 14.3</td>
</tr>
<tr>
<td>Elderly (over 65 yrs)</td>
<td>40.3% (597)</td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>805/675</td>
</tr>
<tr>
<td>First time for endoscopy</td>
<td>26.6% (402)</td>
</tr>
<tr>
<td>Lignocaine allergy</td>
<td>2.1% (31)</td>
</tr>
<tr>
<td>Antithrombotic therapy</td>
<td>16.6% (245)</td>
</tr>
<tr>
<td>Concurrent conditions</td>
<td></td>
</tr>
<tr>
<td>Heart disease (arrhythmias, ischemic heart disease)</td>
<td>28.0% (414)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>23.4% (347)</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>3.6% (54)</td>
</tr>
<tr>
<td>Urinary difficulties</td>
<td>8.6% (128)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>8.1% (119)</td>
</tr>
</tbody>
</table>

The study included 1480 patients, of which over half were aged <65 years.
Subjects on antithrombotic therapy. Subjects on antithrombotic therapy accounted for 11.1% (98/883) of subjects <65 years, and 24.6% (147/597) of those ≥65 years, with significantly more elderly subjects on antithrombotic therapy (p<0.0001, Table 3).

Subjects with risk factors for use of anticholinergic agents. The proportions of subjects with conditions where anticholinergic agents should be avoided (heart disease, hypertension, Glaucoma and/or prostatic hypertrophy) are shown in Table 3. The proportion of subjects ≥65 years in whom anticholinergic agents were contraindicated was therefore 66.2% (395/597), significantly higher than that of 33.0% (291/883) for the <65 age group (p<0.0001, Table 3).

Subjects with risk factors for glucagon. The proportions of diabetic subjects, for whom glucagon was contraindicated, was 5.8% (51/883) of subjects <65 years, and 11.4% (68/597) of those ≥65 years, with diabetes significantly more common in elderly subjects (p<0.0001, Table 3).

Subjects with risk factors for anticholinergic agents and/or glucagon. Almost half the study population had no contraindications for anticholinergic agents or glucagon (Table 4). More patients had contraindications for anticholinergic agents than glucagon, and less than 5% of the study group had contraindications for both anticholinergic agents and glucagon (Table 4).

Stratifying the risk groups according to age shows that patients in the ≥65 years old group were less likely than younger patients to have no contraindications (Table 5). This difference is largely driven by a higher proportion of patients with risk factors for anticholinergic agents in the elderly group, as there was no significant difference between the groups in the proportion of patients with risk factors for glucagon.

Cardiovascular effects of endoscopic premedication

In the younger group, there were no significant changes from baseline in hANP (Fig. 2) or hBNP (Fig. 3) levels measured after endoscopy. However, in the elderly group,

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Table 3. Analysis of risk factors for endoscopy-related complications or premedication contraindications according to age

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>&lt;65 years old (n = 883)</th>
<th>≥65 years old (n = 597)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>First time endoscopy</td>
<td>29.9% (264)</td>
<td>23.1% (138)</td>
<td>0.0042</td>
</tr>
<tr>
<td>Lignocaine allergy</td>
<td>2.8% (25)</td>
<td>1.0% (6)</td>
<td>0.0160</td>
</tr>
<tr>
<td>Antithrombotic therapy</td>
<td>11.1% (98)</td>
<td>24.6% (147)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Heart disease</td>
<td>19.8% (175)</td>
<td>40.0% (239)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hypertension</td>
<td>15.1% (133)</td>
<td>35.8% (214)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Glaucoma</td>
<td>2.5% (22)</td>
<td>5.4% (32)</td>
<td>0.0046</td>
</tr>
<tr>
<td>Prostatic hypertrophy</td>
<td>4.8% (42)</td>
<td>14.4% (86)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Diabetes</td>
<td>5.8% (51)</td>
<td>11.4% (68)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

All data were expressed as mean. Analyses were conducted using Fisher’s exact method (chi-square test).

Table 4. Incidences of risk factors for anticholinergic agents and glucagon in patients undergoing gastrointestinal endoscopy

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Risk (n = 1480)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No risk</td>
<td>49.9% (738)</td>
</tr>
<tr>
<td>Anticholinergic</td>
<td>41.6% (616)</td>
</tr>
<tr>
<td>Glucagon</td>
<td>3.8%* (56)</td>
</tr>
<tr>
<td>Anticholinergic &amp; Glucagon</td>
<td>4.7%** (70)</td>
</tr>
</tbody>
</table>

All data were expressed as mean. Analyses were conducted using Fisher’s exact method (chi-square test).
*Anticholinergic Group vs Glucagon group (p<0.001)
**Anticholinergic Group vs Anticholinergic & Glucagon group (p<0.001)
regardless of whether cardiovascular disease was present or not, hANP level post-endoscopy was significantly greater than at baseline ($p < 0.01$), indicating an increased atrial load associated with endoscopy (Fig. 2). In contrast, the increase from baseline in hBNP level, indicating an increased ventricular load, was only statistically significant ($p < 0.05$) in elderly patients with cardiovascular disease (Fig. 3).

Analysis of the cardiovascular effects of anticholinergic agents and glucagon, administered as antispasmodic premedication prior to endoscopy, in the elderly patients showed that hANP levels were significantly higher following administration of anticholinergic agents, but the change was not significant for glucagon premedication ($p < 0.05$) (Fig. 4). No statistically significant changes from baseline were observed for hBNP levels after either anticholinergic or glucagon premedication in elderly patients (Fig. 5).

**Discussion**

The Japanese population is ageing rapidly. The Ministry of Internal Affairs and Communications estimates that in 2008 there will be 27,790,000 Japanese aged over 65 years, 21.8% of the total population [9], and every year the number and proportion of elderly sets a new record. Declining physiological function accompanies the aging process, arteriosclerosis and various degenerative changes. At the same time, the prevalence of other comorbid diseases increases, so special consideration is required to ensure the safety of elderly patients when performing gastrointestinal...
endoscopy.

We developed this questionnaire from the viewpoint of risk management associated with endoscopy. Questions relating to known risk factors were included to identify five groups considered high-risk during UGITE: 1) subjects undergoing their first endoscopy, who are thought to be at increased risk for complications; 2) subjects allergic to lignocaine who are more likely to develop anaphylactic shock, allergic reactions, or toxicity \(^{[10]}\); 3) subjects taking antithrombotic therapy (e.g., warfarin, ticlopidine, aspirin), prone to hemorrhage during investigations or treatment \(^{[11]}\); 4) subjects with heart disease (arrhythmia, ischemic heart disease), hypertension, glaucoma, or prostatic hypertrophy, for whom anticholinergic agents are contraindicated according to the Japanese Guidelines for Endoscopy in Elderly Patients \(^{[12]}\); and 5) subjects with Diabetes mellitus, for whom glucagon is contraindicated.

The patient’s cardiorespiratory load is a major risk associated with gastrointestinal endoscopy \(^{[13]}\). In this study, no significant changes in hANP and hBNP, markers of cardiac load, were seen before and after endoscopy in younger subjects. In elderly subjects, however, hANP levels increased significantly following the procedure, regardless of whether cardiovascular disease was present or not, indicating an increased atrial load associated with endoscopy. A significant rise in hBNP level was observed following the procedure in elderly subjects with cardiovascular disease, indicating an increased ventricular load in addition to the abovementioned atrial load.

If tissue biopsies are required during an endoscopic procedure, it is important to consider whether the patient is taking anticoagulant medication. In recent years, the use of antithrombotic agents has increased markedly, particularly in elderly patients, and the duration of the washout period for these medications prior to an endoscopy has become a major problem \(^{[14]}\). In this study, we were able to prevent gastrointestinal hemorrhage associated with endoscopy by confirming patients’ current medications using the pre-procedural questionnaire.

Caution is also required to prevent problems associated with endoscopic premedication. Reported complications include anaphylaxis and allergic reactions caused by lignocaine used for pharyngeal anesthesia \(^{[10]}\), sudden hemodynamic changes caused by anticholinergic agents administered to inhibit gastrointestinal motility \(^{[15]}\), and secondary hypoglycemia caused by glucagon in diabetic patients \(^{[16]}\). Apart from these complications, a number of conditions have been identified as contraindications, or requiring caution with use, for anticholinergic agents and glucagon (Table 1).

Due to their parasympathetic blocking activity, anticholinergic agents are contraindicated in patients with glaucoma, prostatic hypertrophy, and cardiac conditions.
such as arrhythmias. When anticholinergic agents are contraindicated, glucagon is used as an alternative premedication. However, glucagon should be used with caution in diabetic patients due to its hyperglycemic effect [16]. Like anticholinergic agents, glucagon acts directly on the smooth muscle of the gastrointestinal tract to inhibit peristaltic activity [17–19], and should be administered with caution to patients with cardiac disease. Compared with anticholinergic agents, however, the effects of glucagon on hemodynamic parameters such as blood pressure and heart rate are minimal [20]. In this study, we measured hANP and hBNP levels to compare the cardiovascular effects of anticholinergic agents and glucagon, both used as antispasmodic premedication for gastrointestinal endoscopy. We found the rise in hANP levels, indicating increased atrial load, was significant in elderly patients given anticholinergic agents, but not in those given glucagon. Accordingly, the premedication best suited to the individual patient’s medical condition should be selected in accordance with the information provided by the questionnaire, and informed consent obtained before performing gastrointestinal endoscopy [21].

Saito et al. applied a preprocedural questionnaire similar to ours, defining the contraindications for anticholinergic agents as “hypertension, arrhythmia, ischemic heart disease, glaucoma and prostatic hypertrophy”, with glucagon contraindicated in patients with “diabetes mellitus” [22]. Of 416 subjects who underwent investigations of the gastrointestinal tract (365 endoscopies, 51 barium contrast radiography), anticholinergic agents were contraindicated in 35% of all subjects, and more than half (53%) of elderly subjects aged 65 years and older [22]. In the current large-scale study, we analyzed background factors using a questionnaire in 1480 subjects undergoing UGITE. The proportion of subjects in whom anticholinergic agents were contraindicated was significantly higher than in subjects aged under 65 years. In particular, more than half of elderly subjects aged 65 years and older [22]. In the current large-scale study, we analyzed background factors using a questionnaire in 1480 subjects undergoing UGITE. The proportion of subjects in whom anticholinergic agents were contraindicated was significantly higher than in subjects aged under 65 years. In particular, more than half of elderly subjects aged 65 years and older than in those under 65 years. In particular, more than half of elderly subjects had contraindications for anticholinergic agents, significantly higher than in subjects aged under 65 years. There was no significant difference between age groups in the proportion of subjects in whom glucagon was contraindicated.

From the point of view of risk management and prevention of complications associated with gastrointestinal endoscopy, our results show that taking a thorough history before the procedure will reveal important patient background factors, including underlying medical conditions and medications, thus facilitating selection of the appropriate premedication for that patient. In particular, in many elderly patients glucagon should be selected as the premedication for safer endoscopies because of its narrower range of complications and precautions for use in this population.

We analyzed risk groups for endoscopy using a question-

References


