Postoperative Nausea and Vomiting (PONV): Usefulness of the Apfel-Score for identification of high risk patients for PONV

C. WEILBACH (*), N. RAHE-MEYER (**), K. RAYMONDOS (**), A. WEISSIG (**), D. SCHEINICHERN (**), S. PIPENBROCK (**)

Abstract: Objective: Postoperative nausea and vomiting (PONV) still represent an important problem in surgery. Treatment and prevention of PONV requires accurate risk stratification. The simplified Apfel-score includes the four factors female gender, no smoking, postoperative use of opioids and previous PONV or motion-sickness in patients’ history. Each of these risk factors is supposed to elevate the PONV-incidence about 20%. The aim of the study was to validate this clinical risk assessment score in patients with high risk for PONV.

Methods: In a prospective study 93 patients with high risk preoperative score for PONV (Apfel Score III and IV) were analyzed. Patients and nurses were interviewed using a standardized questionnaire at the time of discharge from the post-anesthesia care unit (PACU) as well as 6 hours and 24 hours after admission to the PACU. General anaesthesia was applied as total intravenous anaesthesia (TIVA) with mivacurium, propofol and remifentanil (no nitrous oxide / FI O2 0.5)

Results: In the group with Apfel score III PONV occurred in 59.7% of patients and in the Apfel score group IV in 91.3% of all patients. The incidence of PONV corresponds to the predicted values of 60% for Apfel III and 80% for Apfel IV although the use of TIVA should have reduced the incidence of PONV about 26%. This apparent overestimation could be explained by the frequent questioning of patients and nurses for PONV leading to assessment of very minor symptoms.

Conclusion: The Apfel-score is a useful and simple tool for stratification of patients with high risk for PONV.

Key words: Postoperative nausea and vomiting; PONV; Apfel-score.

INTRODUCTION

25-30% of all patients who undergo surgery will experience postoperative nausea and vomiting (PONV) (1,4). Risk factors for PONV have been described and include female gender, no smoking, postoperative use of opioids and previous PONV or motion-sickness in patients’ history” (5, 7). Each factor elevates the risk of PONV about 20%. These factors have been summarized in the simplified PONV-risk score (Table 1), the “Apfel-score” (3, 2).

It has been described recently that treatment with ondasetrone as well as dexamethasone or droperidol may reduce the incidence of PONV by about 26%, propofol by 19% and anaesthesia without nitrous oxide by 12% (1). The reduction of PONV by the use of total intravenous anesthesia (TIVA) with propofol and without nitrous oxide was thus similar to that observed with each of the antiemetic drugs. Patients with high risk score (Apfel III or IV, i.e. 60-80% risk for PONV) require multimodal treatment with more than one antiemetic agent (2). A multimodal approach for prevention and treatment of patients with high risk for PONV requires accurate prediction. In the prospective study presented herein we describe the validation of the PONV risk assessment score by Apfel in patients with high risk for development of PONV.

METHODS

Ninety-three consecutive patients with high risk for PONV (Apfel-score III and IV) (2), undergoing a wide range of elective surgery under general anesthesia were enrolled in this study. Inclusion criteria were age 18-80 yr and ASA-score I-III. Exclusion criteria were vomiting before anesthesia and severe postoperative complication like myocardial infarction. The age ranged from 20-79 yr. The
study protocol was approved by the local ethics committee for human studies (Ärztekammer Niedersachsen / Hannover, Germany).

Using a standardized questionnaire patients and nurses were interviewed by the anesthesiologist at the time of discharge from the post-anesthesia care unit (PACU) and 6 h and 24 h after admission to the PACU by the anesthesiologist. Total intravenous anesthesia (TIVA) was performed in all patients with propofol and remifentanil without nitrous oxide and with FiO₂ of 0.5. Nausea was scored by a 100-point numerical scale from 0-100, where zero represents no nausea and 100 representing nausea "as bad as it can possibly be".

Statistical analysis: Data are given as mean ± SD, differences between groups were analyzed using the Mann-Whitney-U-Test.

RESULTS

The high risk groups Apfel III and IV were equally distributed in the study population. Patient characteristics are shown in table 2. For all parameters analyzed i.e. age, the ASA-Score (ASA I 32.3%, ASA II 63.4%, ASA III 4.3%) duration of surgery as well as time spent in the PACU no significant differences were found between the study groups. The vast majority of patients with high risk for PONV were women consisting of 98.9% of all patients.

PONV occurred in the group Apfel III in 59.7% and in the group Apfel IV in 91.3%, all results are shown in table 3.

DISCUSSION

In this trial the occurrence of nausea and vomiting in 59.7% (Apfel III) and 91.3% (Apfel IV) of all patients. The predicted range was 60% for Apfel III and 80% for Apfel IV. These predictions however are based on anaesthesia method that includes volatile anaesthetics as well as nitrous oxide. In our study total intravenous anaesthesia with propofol, remifentanil without nitrous oxide was applied. This should have reduced the occurrence of PONV by 26% (1). Thus, the real incidence of PONV in our patients appears to be higher than expected. This may be due to the fact that we questioned patients as well as nurses three times within the first 24 hours postoperatively for symptoms of PONV. In the largest study so far (1) the incidence of PONV was measured by interviewing the patients only at 2nd and 24th hour postoperatively. This methodological difference in measurement of PONV may have let to an overestimation of PONV in our patients with assessment of very mild symptoms. It may be considered unethical to leave patients with high risk for PONV without additional treatment, except TIVA. This issue was discussed with the local ethics committee. But, viewing the limited efficacy of each single drug in prevention and treatment of PONV and the need for a simple and effective predictive score for accurate application of a multimodal treatment including antiemetic drugs we decided to start the study. One limitation of this study is that patients with lower risk for PONV were not included making a general calculation of sensitivity and specificity and receiver operating characteristic curves impossible (6). The intention of this study however was to evaluate if patients with very high risk for PONV could be identified prior to operation with a simple clinical score. Viewing that almost all patients with Apfel

Table 1

<table>
<thead>
<tr>
<th>“Risk points”</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk estimation (%)</td>
<td>20 (%)</td>
<td>40 (%)</td>
<td>60 (%)</td>
<td>80 (%)</td>
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</tbody>
</table>

1 point female gender
1 point no smoking
1 point postoperative use of opioids
1 point previous PONV or motion-sickness in patient’s history.

Table 2

<table>
<thead>
<tr>
<th>characteristics</th>
<th>Apfel III (n = 47)</th>
<th>Apfel IV (n = 46)</th>
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<tbody>
<tr>
<td>Age (years)</td>
<td>52.6 ± 15.1</td>
<td>55.6 ± 11.8</td>
</tr>
<tr>
<td>BMI kg/m²</td>
<td>27.5 ± 5.0</td>
<td>26.3 ± 5.6</td>
</tr>
<tr>
<td>Duration OP</td>
<td>60.8 ± 32.9</td>
<td>59.6 ± 33.0</td>
</tr>
<tr>
<td>Duration Anesthesia</td>
<td>88.0 ± 37.4</td>
<td>89.9 ± 34.5</td>
</tr>
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</table>

Table 3

<table>
<thead>
<tr>
<th>PONV</th>
<th>Apfel III</th>
<th>Apfel IV</th>
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</thead>
<tbody>
<tr>
<td>no nausea / no vomiting</td>
<td>40.4%</td>
<td>8.7%</td>
</tr>
<tr>
<td>only nausea</td>
<td>17.0%</td>
<td>8.7%</td>
</tr>
<tr>
<td>only vomiting</td>
<td>4.3%</td>
<td>8.7%</td>
</tr>
<tr>
<td>nausea and vomiting</td>
<td>38.3%</td>
<td>78.3%</td>
</tr>
<tr>
<td>nausea score mean ± standard deviation</td>
<td>27.84 ± 29.25</td>
<td>14.67 ± 19.53</td>
</tr>
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</table>
IV score indeed experienced PONV we believe that the Apfel score is an acceptable clinical tool for this purpose. This high risk population should therefore benefit from a multimodal PONV treatment including perioperative therapy with dexamethasone, droperidol, ondasetrone, haloperidol and total intravenous anesthesia. In addition, therapy of postoperative pain in such patients should be critically reviewed and alternative treatment strategies including regional anaesthetics and omission of opiates reconsidered. Such prophylactic multimodal approach requires correct risk assessment. In conclusion our study confirms that the Apfel risk assessment score for PONV is a simple and reliable test to identify patients at high risk and could thus be used for development of preventive treatment strategies.

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Competing interests

No competing interests to declare

Authors’ contributions

Christian Weilbach designed and analyzed the study, wrote the manuscript and is fully responsible for the scientific content, Niels Rahe-Meyer, Annette Weissig, Kostas Raymondos and Dirk Scheinichen monitoring of patients and data management, Siegfried Piepenbrock: study design and monitoring

References