THE RAPID SEQUENCE INDUCTION: A MULTICENTER SURVEY OF PRACTICES IN FRANCE

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Abstract

Background: Rapid sequence inductions are generally indicated for patients at increased risk of regurgitation. However, this approach has been questioned and is applied heterogeneously in several European countries. The objective of this investigation was to determine how RSI is interpreted and practiced in France.

Method: A questionnaire was given to anesthetists and anesthesia residents at hospitals in Toulouse, Bordeaux, Orléans, Nantes, Fort-de-France and Perpignan. Information was collected about: indications for RSI, preoxygenation, aspiration prophylaxis such as antacid use, application of cricoid pressure, patient positioning, types of medications used, complications, modifications in protocol for patients with coronary artery disease and finally the use of sugammadex if available.

Results: 255 anesthetists (86 residents and 169 attending physician) completed the questionnaire (rate of response 86%). Some practices are almost universally followed such as RSI for emergency intubation and in obstetrical patients, pre-oxygenation and the use of succinylcholine. However others are inconsistently applied such as the use of antacids (never given by 49%) or the application of cricoid pressure (used in cases of difficult intubation by only 30%).

Conclusion: This study shows a heterogeneous practice of RSI among anesthetists based on their experience, but also on patient factors. Professional societies should urgently create recommendations for RSI.

Keywords: rapid sequence induction, crash induction, intubation, survey practice, sugammadex, aspiration of gastric contents.

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Introduction

Between 1990 and 2007, 17% of legal claims were related to respiratory complications, and 3% of the total claims were specifically due to aspiration, as reported found in the ASA Closed Claims Database\(^1\). In France, aspiration of gastric contents is responsible for 20% of mortality totally or partially due to anesthesia with an incidence ranging between 1 and 5/10 000\(^2\). The majority of these events are considered preventable by using a rapid sequence induction (RSI)\(^3\)-\(^5\). However RSI has been used only in 38% of patients who died of Mendelson’s syndrome in France\(^6\). The classic RSI protocol consists of a pre-oxygenation, induction with a fast-acting hypnotic, cricoid pressure, injection of fast acting muscle relaxant, and finally orotracheal intubation - all within one minute - by direct laryngoscopy without prior positive pressure ventilation. However the exact indications for RSI, the choice of the medications, their dose as well as the sequence of all steps are up to the individual practitioner. Although it is recognized that the risk of aspiration is increased in case of emergency intubations and in patients with gastro-esophageal reflux\(^6,7\), the lack of accurate definitions for patients considered to have a “full stomach” can lead to diverse practices. While this was confirmed by several surveys in different European countries\(^8\)-\(^11\), RSI in France has only been investigated in obstetrics\(^12\),\(^13\).

This study was therefore performed in order to evaluate how RSI is practiced among anesthetists working in France.

Materials and Methods

The questionnaire consisted of 65 questions exclusively on RSI (time required to fill out the survey: about 10 minutes). The questions focused on the practice setting, indications for RSI, antacid prophylaxis, pre-oxygenation, medications used, cricoid pressure, intubation, complications, changes in protocol for patients with coronary artery disease and the availability of sugammadex. The questions concerned only anesthesia in the OR including obstetrics and excluded the emergency department and prehospital care. A working group constructed the questionnaire after a review of the literature\(^8\),\(^10\),\(^12\). This group tested and edited the questions.

The questionnaire was distributed between June and December 2010 by mail or hand delivered to anesthetists in Toulouse, Bordeaux, Orleans, Nantes, Fort-de-France, and Perpignan. A reminder was sent three weeks after the initial mailing to all non-responders.

Statistical Analysis

Data were entered in Excel \(^®\) and statistics were performed using the Statview \(^®\) software, using the Chi squared test for categorical variables and Student-t test for continuous variables. A \(p < 0.05\) was considered significant.

Table 1

<table>
<thead>
<tr>
<th>Total (n=255)</th>
<th>Residents (n=86)</th>
<th>Staff Anesthetists (n=169)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work in obstetrics</td>
<td>111 (44%)</td>
<td>60 (70%)</td>
<td>51 (30%)</td>
</tr>
<tr>
<td>Number of persons required for RSI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always one person</td>
<td>7 (3%)</td>
<td>1 (1%)</td>
<td>6 (3%)</td>
</tr>
<tr>
<td>Always two persons or more</td>
<td>201 (79%)</td>
<td>77 (90%)</td>
<td>124 (73%)</td>
</tr>
<tr>
<td>One persons (if two not available)</td>
<td>46 (18%)</td>
<td>8 (9%)</td>
<td>38 (22%)</td>
</tr>
</tbody>
</table>
Results

Two hundred fifty-five practitioners responded to the questionnaire (169 staff anesthetists and 86 anesthesia residents). The response rate was 86% (90% for residents and 81% for staff anesthetists). The majority practice in a University Hospital and half work in obstetrics (Table 1). Up to 22% of staff anesthetists reported to perform a RSI by themselves, significantly more frequently than the resident (Table 1). The use of a RSI depended on whether a caesarean section was urgent or scheduled and the level of experience of the practitioner (Table 2). Up to 17% of anesthesia residents practicing obstetrics do not necessarily perform an RSI for a scheduled cesarean section versus only 5% of staff. For emergency abdominal surgeries, 32% of staff anesthetists and 21% of residents do not perform a RSI if the patient has been fasting > 6 hours while almost all use it if the patient has been NPO for less than 6 hours. In trauma cases where the patient has been NPO for < 6 hours RSI is not always practiced regardless of the experience of the respondent (Table 2). In patients with gastro-esophageal reflux, RSI is not routinely used in the majority of cases. Verifying the availability of functional suction and the use of pre-oxygenation are uniformly practiced, but a timer is not routinely used and neither are use of antacids and changing the positioning of the patient (Table 3). Propofol is used more often than thiopental for RSI (Table 4) and etomidate is used occasionally (slightly more often than ketamine). Thirteen % of participants reported injecting midazolam during a RSI. Succinylcholine remains the most widely used muscle relaxant followed by rocuronium (Table 5). The injection of muscle relaxant before the loss of consciousness is done by approximately 20% of surveyed practitioners (Table 5) and the use of opioids during RSI is frequent (Table 6).

Twelve percent of staff anesthetists are not applying cricoid pressure (vs. 1% of the residents, \( p = 0.006 \), Table 7). Half of the participants indicated that they have experienced a complication such as an aspiration or a difficult intubation (Table 8). The RSI protocol is often modified in patients with coronary artery disease, or in case of availability of sugammadex (Table 9).

Discussion

In our study, we investigated the use of RSI in 6 different medical centers in France. Although RSI is generally indicated for certain situations (i.e. caesarean section, emergency abdominal or trauma surgery, for a patient who is not NPO > 6 hours), our results show that physicians do not always follow those standard RSI procedures. Our results are consistent with previously reported surveys results from other European countries\(^9,10\). In patients with gastro-esophageal reflux, our survey showed a high variability in the use of RSI among physicians. Sakai et al. observed 11 regurgitations and 3 cases of vomiting when they investigated the incidence of aspiration, suggesting an important role of single reflux\(^3\). Kluger et al. showed that 5% of patients who aspirated had a history of reflux\(^7\).

At least two physicians are usually needed for a rapid sequence induction to be properly performed, however 21% of practitioners admitted to actually or potentially performing a RSI with only one person. As such, our results show that up to 12% of staff anesthetists (vs. 1% of residents, \( p = 0.006 \)) do not always apply cricoid pressure. This is in contrast to previously published British studies who report unanimous use of cricoid pressure\(^7,8\). When cricoid pressure is applied, it is usually applied in the unconscious patient and with one hand and those results are in keeping with the results found in the UK\(^8\).

Thirty-eight percent of physicians apply cricoid pressure even in cases of anticipated difficult intubation and these findings are comparable to those found in the survey of practice in the United Kingdom\(^8\). These findings raise major questions because cricoid pressure is alleged to potentially further increase difficulty of visualizing structures during intubation\(^14\). In addition, RSI and its application are controversial since no studies have yet proven their effectiveness in preventing gastric aspiration\(^15,16\). Moreover, to this date, succinylcholine is the only muscle relaxant that meets the standards for RSI in terms of speed and reversibility and there are still questions about its safety due to its ability to cause serious side effects. With the arrival of the sugammadex, rocuronium could be considered as a potential alternative to succinylcholine\(^17\) and it has
to be acknowledged that most studies on RSI have been performed before the arrival of sugammadex. Nonetheless, rocuronium is a potential alternative to succinylcholine in case of hyperkalemia or allergy. The rapid reversal of rocuronium by sugammadex in unpredicted difficult intubation patients could lead to an increase in the use of rocuronium for RSI and younger anesthesia practitioners (residents) would indeed use rocuronium more than staff.

An agent with short period of action is selected in most cases. In this survey, propofol was shown to be the most used hypnotic for RSI in France unlike other European countries. Staff anesthetists prefer thiopental and resident prefer less cardio-depressant drugs (such as etomidate or ketamine) probably due to their experience with theses medications in the ICU and pre-hospital care although the questionnaire focused on RSI in the operating room. Of particular concerns is the practice to slowly titrate hypnotics until unconsciousness, which is clearly contrary to the concept of ‘rapid’ sequence.

The use of an opioid during an RSI still remains a controversy. On one hand, opioids can limit the hemodynamic response to tracheal intubation (a benefit for many patients with coronary or hypertension). On the other hand, opioids are recognized as a risk factor for aspiration and even the single dose of morphine can lead to transient lower esophageal sphincter relaxations. According to our survey, nearly half of staff anesthetists and more than one third of anesthesia residents use opioids before intubation, mainly before the use of any hypnotic agent. When opioids are used before intubation, it may be preferable to choose agent with rapid onset. However, the most commonly used opioid in our study was sufentanil, far ahead of remifentanil or alfentanil. Similarly, in the survey conducted in the UK, 76% of physicians opted for agents with slower onset, such as fentanyl.

Interestingly, one third of the anesthesia residents and one half of anesthesia staffs have experienced aspiration of gastric contents during RSI, resulting in hypoxia and even death. This suggests that aspiration, while not common, is not a rare as commonly depicted. Similarly one third of the participants (staff and residents) had already experienced a failed intubation during a RSI and 7% of those had witnessed a patient death as a result.

This study has some limitations. First it was distributed to a limited number of centers (and only in public institutions) potentially limiting the generalizability of our findings. While the choice to survey only public hospitals was made to have practitioners with varied activity who could answer all questions, it may have introduced a bias.

In summary, our multicenter survey shows a heterogeneous practice of RSI among different practitioners. Professional societies should urgently create recommendations for rapid sequence induction.
References
