Intraoperative awareness — comparison of its incidence in women undergoing general anaesthesia for Caesarean section and for gynaecological procedures

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Abstract

Background. Intraoperative awareness (IA) is diagnosed when patients can recall their surroundings or an event related to the surgery that occurred while they were under general anaesthesia. The female gender and Caesarean section are considered to be contributing factors. The aim of the present study was to analyse the frequency of IA in patients undergoing general anaesthesia either for Caesarean section or gynaecological procedures.

Methods. ASA I and II women were included into the study. Patients were randomly allocated to 4 groups: A, B and C included patients qualified for elective gynaecological surgery, and group D comprised Caesarean section patients. Premedication was not given. Group A received total intravenous anaesthesia with TCI, and groups B, C and D received balanced anaesthesia. The depth of anaesthesia was monitored with an AEP monitor. Blinded structured interviews were conducted 2 hours after anaesthesia and on postoperative days 7 and 30.

Results. 337 patients were enrolled into the study. 45 patients reported diverse sensations connected to the anaesthesia (Group A — 7 patients, B — 9 patients, C — 2 patients, D — 28 patients). There were mainly dream sensations, but IA was present in 3 cases. In all of the cases, IA was recognised during the first interview. One episode of awareness appeared in group B, and the other two appeared in group D. One Caesarean section was complicated by intraoperative haemorrhage. The patient from group B had similar sensations during previous anaesthesia. Two women enrolled in the study reported awareness in the past, which did not occur this time.

Conclusion. Awareness during general anaesthesia occurs occasionally. The frequency of occurrence in a group of patients undergoing general anaesthesia for uncomplicated Caesarean section is not higher than for other procedures. The anaesthesia for Caesarean section, as well as for other procedures, may be accompanied by pleasant dreams.

Key words: anaesthesia, general, intraoperative awareness; surgery, Caesarean section; surgery, gynaecology

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general anaesthesia for gynaecological procedures and for Caesarean sections.

METHODS
The study design was approved by the Bioethics Committee of the Medical University of Lublin. ASA I and II female patients were enrolled in the study and randomly allocated to 4 groups according to the type of general anaesthesia performed. Groups A and B consisted of patients anaesthetised for elective gynaecological procedures, group C consisted of those undergoing anaesthesia for short gynaecological procedures, and group D consisted of Caesarean section patients. Patients were not pharmacologically premedicated.

In group A, patients underwent total intravenous anaesthesia with target controlled infusion (TCI) using cisatracurium (0.1 mg kg\(^{-1}\)) and continuous infusion of remifentanil in incremental doses until reaching the plasma concentration of 8.5 ng mL\(^{-1}\), which was followed by infusion of propofol to provide the desirable plasma concentration of 8 µg mL\(^{-1}\). TCI anaesthesia was maintained with continuous infusion of remifentanil and propofol administered in pre-set doses of 3–6 ng mL\(^{-1}\) and 2–4 µg mL\(^{-1}\), respectively. In the remaining groups, combined general anaesthesia was used: group B — thiopentone (5 mg kg\(^{-1}\)), fentanyl (3–5 µg kg\(^{-1}\)), cisatracurium (0.1 mg kg\(^{-1}\)) and sevoflurane (1–2 vol%); group C — propofol (2 mg kg\(^{-1}\)), fentanyl (3–5 µg kg\(^{-1}\)) and sevoflurane (1–2 vol%); group D — thiopentone (5 mg kg\(^{-1}\)), suxamethonium (1 mg kg\(^{-1}\)), fentanyl (3–5 µg kg\(^{-1}\)) and cisatracurium (0.05 mg kg\(^{-1}\)) administered immediately after the foetus extraction. All of the patients received a mixture of N\(_2\)O and O\(_2\); F\(_{2}\)O\(_2\) was maintained at the level of 0.33.

Basic vital functions and sleep depth were monitored by measuring auditory evoked potentials with the AEP monitor (Danmeter, Denmark); the A-line auditory evoked potential index was kept within the range of 15–25.

Awareness was detected using a questionnaire designed by the authors, which contains 22 questions assessing the recall of patients during anaesthesia regarding pain, dreams, and tactile and auditory sensations (annex). Patients were surveyed three times: 2 h after anaesthesia and on post-anaesthesia days 7 and 30 (by phone). Postoperative surveys were conducted by a person not involved in anaesthesia.

Data were analysed using Statistica 10.0 (StatSoft, Tulsa, USA). Variables concerning characteristics of groups were presented as a mean and standard deviation. Data on intraoperative sensations were presented in the numerical form and as percentages. Because the equal variance assumption was not fulfilled, univariate analysis of variance was applied using the non-parametric Kruskal-Wallis test; when significant differences were found, analysis was continued with multiple comparisons of ranks. Statistical significance was assumed at \(P < 0.05\).

RESULTS
The study included 337 patients. Data regarding the age and body weight of patients, duration of surgery and anaesthesia in individual groups are summarised in Table 1. Group D patients were significantly younger and their body weight was higher compared to patients in the remaining groups. In group D, the duration of surgery and anaesthesia was shorter than in groups A and B.

All anaesthetic procedures were uneventful. Various sensations during anaesthesia were reported by 46 women. In most cases, the sensations were connected with dreams. However, in 3 cases, the descriptions of intraoperative events suggested intraoperative awareness; no significant inter-group differences in their incidence were observed (Table 2).

The feeling of “the presence of a tube in the throat” and “sore throat” at the onset of anaesthesia was reported by one patient in group B, who also experienced unpleasant unidentified dreams. The same patient admitted having similar sensations during an anaesthetic procedure several years earlier.

One patient from group D described pain and pressure experienced during surgery and the feeling of the presence of an endotracheal tube in the throat; moreover, she could not move. She recalled the moment of incision of the abdominal integuments accompanied by pain sensations, and the time when the baby was extracted was associated with pain and severe pressure. She heard the voices of the operating room personnel during the extraction of her baby, yet she could not remember the exact words or define what they were discussing. The memories covered the period of

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>51</td>
<td>95</td>
<td>16</td>
<td>175</td>
</tr>
<tr>
<td>Age (years)</td>
<td>48 ± 10*</td>
<td>44 ± 12*</td>
<td>50 ± 15*</td>
<td>31 ± 6</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>68.6 ± 12.4*</td>
<td>66.8 ± 11.0*</td>
<td>73.4 ± 15.3†</td>
<td>76.7 ± 12.3</td>
</tr>
<tr>
<td>Duration of surgery (min)</td>
<td>42.7 ± 22.8§</td>
<td>43.1 ± 21.8§</td>
<td>29.2 ± 13.6</td>
<td>33 ± 16.6</td>
</tr>
<tr>
<td>Duration of anaesthesia (min)</td>
<td>59.5 ± 23.8*</td>
<td>60.1 ± 22.4*</td>
<td>39.6 ± 13.4</td>
<td>41.6 ± 17.5</td>
</tr>
</tbody>
</table>

*\(P < 0.001\) compared to group D, †\(P = 0.002\) compared to group D, ‡\(P = 0.003\) compared to group D, §\(P = 0.008\) compared to group D

Katarzyna Czarko et al., Awareness in gynaecological and obstetric anaesthesia
surgery shortly after the induction of anaesthesia until the baby was extracted; later, there was no recall.

Another patient reported intraoperative sensations of touch and pressure, which she did not interpret as pain, and the feeling of the presence of an endotracheal tube. She was able to recall conversations in the operating room, e.g., she remembered the words “the professor entered the Caesarean section room”. However, she did not remember the moment of extracting the baby; her memories pertained to the post-delivery period and were associated with an episode of intraoperative haemorrhage.

In all three patients, awareness during general anaesthesia was already confirmed during the first examination 2 hours after surgery. Phone conversations carried out on post-anaesthesia days 7 and 30 did not demonstrate that the events evolved towards post-traumatic stress syndrome.

Two patients described awareness during their previous anaesthetic procedures, which did not reoccur.

**DISCUSSION**

Our results confirm the opinion that intraoperative awareness develops rarely and is more commonly experienced in patients undergoing general anaesthesia for Caesarean section. The specificity of this procedure favours anaesthetic procedures, which did not reoccur.

The types of sensations are evaluated with the 5-degree Michigan awareness classification [7, 8].

Patients with intraoperative recall characterise this episode in different ways, ranging from a lack of satisfaction with anaesthesia to severe mental trauma. The occurrence of recall can be a source of stress, anxiety, nightmares, and insomnia, and recall can lead to post-traumatic stress syndrome [1, 9].

Another noteworthy observation from our study was that, in our subjects, intraoperative recall and other intraoperative sensations were most commonly observed during combined general anaesthesia for Caesarean sections and gynaecological procedures with thiopentone used for induction. In groups receiving propofol, the only sensations were neutral or pleasant dreams. This observation is likely to suggest stronger amnestic effects of propofol compared to thiopentone.

Studies from other centres disclosed that total intravenous anaesthesia is associated with a higher incidence of awareness than combined anaesthesia with halogen volatile anaesthetics [4, 8, 10], which is attributed to the lack of possible monitoring of serum concentrations of intravenous anaesthetics and to population variability of response to propofol. However, our findings suggest that awareness can develop during combined anaesthesia with sevoflurane but not during total intravenous anaesthesia. This observation is likely to be associated with pre-set target concentrations of an anaesthetic instead of its manually adjusted doses used during infusions.

It should be noted that, in one case, intraoperative awareness was also experienced during the previous procedure, which may indicate that some individuals are predisposed to such a phenomenon. Nonetheless, the examples of the other two patients show that awareness in the past does not mean that it will occur during subsequent anaesthetic procedures.

**CONCLUSIONS**

1. Awareness is observed incidentally in patients undergoing general anaesthesia.
2. The incidence of awareness episodes in patients undergoing anaesthesia for uncomplicated Caesarean sec-
tions is comparable to that in patients anaesthetised for gynaecological procedures.

3. Anaesthesia for Caesarean section can be accompanied by pleasant sensations of a dream-like nature, which are similar to those in anaesthesia for other procedures.

4. Awareness during one anaesthetic procedure does not predict occurrence during subsequent procedures.

References:

# ANNEX

## QUESTIONNAIRE FOR ASSESSMENT OF INTRAOPERATIVE AWARENESS

### GENERAL QUESTIONS

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>I don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do you feel?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Have you been troubled by anything?</td>
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<td>Do you feel any pain?</td>
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<tr>
<td>Pain scale</td>
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<tr>
<td>Are you cold?</td>
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<tr>
<td>Do you know that you are in hospital?</td>
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<tr>
<td>Do you know that you are in the recovery room?</td>
<td></td>
<td></td>
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<tr>
<td>Do you know that the surgery has been completed?</td>
<td></td>
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</tr>
</tbody>
</table>

### DETAILED QUESTIONS

1. Do you remember the way to the operating room and initial preparations for surgery?  
2. Do you remember the end of surgery?  
3. Do you remember sleeping during surgery and anaesthesia?  
4. Do you remember when you fell asleep? (enquire further)  
5. Did you dream during anaesthesia?  
6. What dreams did you have? (enquire further)  
7. Did you feel any pain during anaesthesia?  
8. Were you able to breathe?  
9. Do you remember anything from the period of surgery?  
10. What do you remember from the period of surgery? (enquire further)  
11. Did you hear anything during surgery?  
12. What did you hear during surgery? (ask further about noises, conversations, voices, etc.)  
13. Did you feel anything during surgery?  
14. What did you feel during surgery? (ask further about touch, pain, skin incision, pressure, presence of something in the mouth, throat, etc.)  
15. Are you satisfied with anaesthesia?  
16. Would you choose a similar kind of anaesthesia, if needed?