Side effects after Anesthesia for Cerebral MRI in 175 children

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Purpose
The aim of this study was to examine type, incidence, and duration of side effects in pediatric anesthesia for Cerebral MRI scannings being performed in 175 children.

Methods
The MRI was performed with passive shielded high field magnets: Philips Gyroscan S 15-HQ/1.5 Tesla, and Philips Gyroscan S 15-ACS/1.5 Tesla (mean duration: 45±17 min; range 23-155 min).

Premedication (midazolam, atropine) and induction (thiopental sodium) followed standardized routines. Maintenance was performed with isoflurane (n=61; 53.5%), sevoflurane (n=32; 28%), desflurane (n=12; 10.5%), halothane (n=8; 7%). The inhalational agents were applied via an oxygen/air mixture (FiO2=0.4; flow 5l/min) using an open mask system in the supine position. As contrast agent 0.1mmol/kg BW gadolinium was administered (n=45; 40%). Pulse oximetry, capnometry, electrocardiography, noninvasive monitoring of blood pressure and inspiratory oxygen concentration monitoring were performed as demanded. Anesthesia was ceased one minute before the end of MRI. After return of adequate sensoric responses as well as cardiorespiratory and neuromuscular function the children were brought to the recovery room. Questionnaires on post-procedure side effects within the first 72 hours were distributed to 175 parents as a survey instrument. For statistics, contingency analysis was used.

Results
Responses have been received from 114 (= 65.1%; mean age: 3.8±2.9 years; range: 2 months-13 years) of 175 parents who have received questionnaires.

In 55 children (48.2%) different side effects (n=110) were reported within the first 72 hours after MRI (see Table 1): Agitation (n=24); nausea (n=14); singultus/hiccough (n=13); vomiting (n=12); conjunctival injections (n=9); rhinitis (n=8); tiredness (n=7); rash (n=6); vertigo (n=5); diarrhea (n=5); cephalgia (n=2); fever (n=1); laryngitis (n=1); bronchial asthma (n=1).

Single pathological MRI-results were found supratentorially (n=41; 36%), infratentorially (n=17; 14.9%), extracerebrally such as sinusitis or mastoiditis (n=14; 12.3%). Combined MRI-results were found supratentorially/infratentorially (n=7; 6.1%), and supratentorially/extracerebrally (n=2; 1.8%).

<table>
<thead>
<tr>
<th>Time Post</th>
<th>Single Side Effects</th>
<th>Two Side Effects</th>
<th>More than Two Side Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 hr. post</td>
<td>29 (25.4%)</td>
<td>13 (11.4%)</td>
<td>3 (2.6%)</td>
</tr>
<tr>
<td>24 hrs. post</td>
<td>20 (17.3%)</td>
<td>2 (1.8%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>72 hrs. post</td>
<td>10 (8.8%)</td>
<td>5 (4.4%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

| Total | 45 (39.4%) | 22 (19.3%) | 15 (13.2%) |

Table 1: Quantity and time course of children (n=114) with side effects (n=110; percentage of total children) after anesthesia for Cerebral MRI

A significant association was detected between the appearance of side effects and: 1) extracerebral pathological findings and the use of isoflurane (p<0.0001), 2) without administration of gadolinium and extracerebral pathological findings (p<0.0001), 3) children older than 5 years of age and extracerebral pathological findings (p<0.038). There was a lack of association of side effects with the length of anesthesia time or the anesthesia technique.

Discussion
Anesthesia for MRI examinations requires no use of narcotics. Even then side effects seem to be related to anesthetic agents [2].

Our results suggest that the appearance of side effects is correlated to the combination of sinusitis or mastoiditis at the time of MRI scanning and 1) the use of isoflurane, 2) no application of gadolinium, and 3) children older than 5 years of age. As isoflurane was associated with a greater incidence of side effects in children with sinusitis or mastoiditis, we suggest sevoflurane would be the preferable agent. More than one side effect is possible, and their appearance is not predictable. Side effects occur as long as 72 hours following anesthesia. Further evaluation of the influence of anesthetic agents, the contrast agent, the children’s age, preexisting diseases or the magnetic field and the appearance of side effects is necessary.

Our findings show the necessity to give parents of pediatric outpatients adequate information on the incidence and variability of side effects after minimally invasive, diagnostic procedures like MRI performed with anesthesia.

References