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Comparison of propofol with propofol—ketamine combination in pediatric patients undergoing auditory brainstem response testing

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Summary

Objective: The aim of our study was to compare propofol with propofol—ketamine combination for sedation and also to compare related complications in children undergoing auditory brainstem response (ABR) testing.
Methods: Sixty ASA I—II patients aged between 1 and 13 years of age were sedated for ABR testing. Propofol 1.5 mg/kg was used in group P ($n = 30$), and ketamine 0.5 mg/kg + propofol 1.5 mg/kg, i.v., in group PK ($n = 30$). Sedation levels of patients were maintained between scores 3 and 4 according to Ramsey sedation scores; when necessary, half of the starting drug dosage was administered for the maintainence of sedation. Side effects which occurred during or within the first 24 h of the procedure were assessed.
Results: Additional dosage was needed for 21 cases in group P and eight cases in group PK ($p = 0.002$). While oxygen desaturation and apnea were not observed in any of the patients in group PK, there were four patients (11.4%) with oxygen desaturation, and six (17.1%) with apnea in group P ($p < 0.05$).
Conclusions: In pediatric cases where ABR testing was applied, addition of low dose ketamine to propofol avoided the risk of respiratory depression due to propofol and lowered the need for additional dose of propofol. Therefore, the co-administration of propofol and ketamine appears to be a safe and useful technique for ABR testing.

1. Introduction

Number of therapeutic and diagnostic interventions performed outside the operating room has considerably increased during recent years. Issues such as

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sedation, and immobilization have become particularly important in children for a successful intervention and auditory brainstem response (ABR) test is among these interventions. Children and those who are mentally impaired frequently require sedation to attain accurate results when testing ABR. Since children are discharged and allowed to go their homes soon after the intervention, early recovery from anesthesia as well as keeping the possible side effects to a minimum level are usually aimed at.

Propofol is an intravenous sedative—hypnotic agent which helps smooth recovery from aneshesia without dysphoria; antiemetic feature as well as rapid recovery from anesthesia are other advantages. On the other hand, propofol may have some side effects such as respiratory or cardiovascular depression and painful injection. Occasionally, adequate level of analgesia cannot be obtained, therefore, a combination with the opioids is necessary to get the desired level of analgesia [1,2]. However, when opioids are combined with propofol, risk of respiratory depression considerably increases [3,4]. Ketamine is usually preferred for pediatric sedation during procedures performed outside operating room [5—7] because of its analgesic and amnesic effects; preservation of the respiratory reflexes is also an important advantage. On the other hand, side effects such as hallucination and nausea can occur with its use. Ketamine is, therefore, combined with short acting benzodiazepines, to block such side effects. However, this leads to longer recovery time from anesthesia [8].

Recent investigations carried out in adult patients demonstrated that addition of low levels of ketamine to propofol can provide adequate sedation and shorter recovery time without causing respiratory depression [9,10]. Although this combination has been investigated in other diagnostic interventions in children [11,12] it has not been studied previously during ABR testing.

The aim of our study was to compare propofol with propofol—ketamine combination for sedation in children undergoing ABR testing, and also to compare related complications.

2. Methods

Sixty ASA I—II cases were included in the study after the approval of the local ethics comittee. Consent was obtained from the parents or legal guardians of the patients. The ages of the patients ranged between 1 and 13 years. ABR testing was planned in all patients and the patients were kept starved 4—6 h before the intervention. A 22 G intravenous (i.v.) catheter was inserted after the application of EMLA 5% (AstraZeneca) on the dorsal side of hand 45—60 min before the procedure. Propofol 1.5 mg/kg was used in group P ($n = 30$), and propofol 1.5 mg/kg + ketamine 0.5 mg/kg, i.v., in group PK ($n = 30$). Sedation levels of cases were evaluated by Ramsay Sedation Scores [13] (Table 1) and kept constant around 3—4 by administration of half the starting dose of the medications when necessary. Continuous pulse oxymeter moniterization was performed. Blood pressure, respiratory rates, peripheral oxygen saturation (SpO_2) were recorded at the beginning, immediately after the administration and at 3, 5, 10 min, after the administration of the drugs. Oxygen desaturation was regarded as a 10% fall in the SpO2 when compared to the starting level; apnea was regarded as cessation of respiration for a period of 15 s or more.

Table 1 Ramsay sedation score [13]

1. Nervous, agitated and/or restless
2. Cooperative, orientated, quite patient
3. Only obeying the orders
4. Sleeping, responding to hitting the glabella and high voice suddenly
5. Sleeping, responding to hitting the glabella and high voice slowly
6. No response to any of these stimulations

ABR test was applied by DISA Neuromatic 2000 C device after sedation. An active electrode was attached to the vertex, reference electrode to ipsilateral apex and ground electrode to forehead. IDH-39 type earphones were applied, the contralateral ear was masked and 100 ms-long click stimuli were given. Twenty clicks per second were given for every second to make a total of 2000 clicks.

Hemodynamic changes more than 20% of the starting levels, and complications observed during or after the procedure were recorded. Twenty-four hours after the cases were discharged from the hospital, a telephone call was made and information obtained with regard to any possible complications that could have occurred.

Unpaired Student's *t*-test was used for comparison of hemodynamic measurements, duration of interventions; chi-square and Fisher's exact tests were used to compare distribution of sexes and differences between side effects occurred in the groups. A *p*-value less than 0.05 was considered as statistically significant.

3. Results

It was possible to complete the study in all of our cases. There was not a statistically significant dif-