Postoperative cognitive dysfunction (POCD) and age in children

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Background and Goal of Study:

Postoperative cognitive dysfunction (POCD) is defined as a new cognitive impairment arising after a surgical procedure and anaesthesia. Its diagnosis requires both pre and postoperative psychometric testing. Its manifestations are subtle and manifold, depending on the particular cognitive domains that are affected. POCD is characterized by mild changes in personality, emotional instability after anesthesia and surgery, or some loss of cognitive powers.

It has been underinvestigated in children. The cause is still unknown, but there are certainly many factors that can affect the occurrence of POCD.

The aim of this study was to assess whether the age of children may impact upon the incidence of POCD.

Materials and Methods:

Prospective study was conducted at the University Hospital on 64 children (aged 6-13, ASA I-II) undergoing elective adenotonsillectomy. The children were randomized into 2 groups: TIVA and sevoflurane (S). In TIVA group anesthesia was induced with propofol, fentanyl and vecuronium, and maintained with continuous infusion of propofol.

In S group after fentanyl, anesthesia was induced and maintained with sevoflurane in O₂/N₂O (50:50) mixture. BIS monitoring was used and depth of anesthesia accordingly adjusted. Cognitive assessment was conducted with psychomotor evaluation test (PsychE). It is a computer program with two tests: simple reaction time and dual task. Each subject was examined preoperatively, 2 h and 24h after surgery.

Simple reaction time

The subject holds down the keyboard spacebar with the index finger of his/her dominant hand. After a random interval of between 1 s and 10 s, a small 'sun' icon appears at a random position on the screen. On the appearance of this stimulus, the subject is required to lift his/her finger as quickly as possible from the spacebar and use it to press any of the target keys. These are the numeric keys 4–9 on the top row of the keyboard. The test consists of 20 stimuli. For each response, the total reaction time and its components (thinking time and movement time) are recorded separately to an accuracy of 1 ms. Means and standard deviations are calculated and recorded.

Dual task

The primary task requires the subject to use the computer mouse to control the screen cursor, which must follow a smoothly but randomly moving target on the computer screen. The percentage of time on target is recorded. At random intervals, the secondary task stimulus (a small 'sun' icon) is presented and the total reaction time taken for the subject to press the spacebar is measured. Means and standard deviations of the times are calculated.

The key outcome was a relative change in reaction time from the baseline to two hours after the surgery. Mann-Whitney U test with two-tails exact test of statistical significance was done in "R".

Results and Discussion:

Table 1 and 2 showed the differences between two age groups of children in simple and dual task results. There were statistical differences (p<0.05) between children younger and older than 9 years in total reaction time and variability of reactions expressed as standard deviations. There weren't statistical differences (p>0.05) between TIVA and S group in total reaction time in the first postoperative measures. There were statistical differences (p<0.05) between TIVA and S group adjusted for age in standard deviation of total reaction time.

	Age groups				
	Younger to 9		Older than 9		p
	N	Mean±SD	N	Mean±SD	
Total time I	29	1344±296,2	28	953±230,9	< 0.001
Total time II	23	1477±455,8	24	1072±246,3	< 0.001
Total time III	27	1244±275,9	25	954±166,5	< 0.001
SD Total Time I	29	111±76,6	28	63±61,3	0,012
SD Total Time II	23	108±75,1	24	80±59,8	0,160
SD Total Time III	27	83±86,5	25	41±30,1	0,024

Table 1. Simple reaction time according to the age of group

	Age groups				
	Younger to 9		Older than 9		p
	N	Mean±SD	N	Mean±SD	
Total time I	29	819±144,42	27	600±123,58	< 0.001
Total time II	29	48±22,78	27	33±10,24	0.002
Total time III	23	847±153,55	25	645±119,03	< 0.001
SD Total Time I	23	50±22,74	25	36±16,57	0,016
SD Total Time II	28	724±132,86	26	551±113,05	< 0.001
SD Total Time III	28	39±13,87	26	26±12,71	< 0.001

Table 2. Dual reaction according to the age of group

Conclusion(s): It is important to improve the identification and quantification of preoperative risk factors for POCD, as this will assist clinicians and patients in the decision making process (and informed consent) when invasive procedures are planned. Type of anesthesia have impact on variability of reaction, but not on the reaction time and there must be take into account the age of participants.