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Effects of dexmedetomidine nasal drops-assisted audio-visual animation psychological intervention on anxiety and coordination before general anesthesia in children with congenital heart disease

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Abstract: *The purpose of this article is to observe the effect of dexmedetomidine nasal-assisted audio-visual animation psychological intervention on preoperative anxiety and coordination of children with congenital heart disease surgery under general anesthesia. Seventy children who underwent elective congenital heart disease surgery in our hospital from January to December 2020 were selected as the research objects, and they were divided into the control group and the study group by random number table method, 35 cases/group. Both groups were given 2μg/kg dexmedetomidine slowly instilled in the nose 30 minutes before induction of anesthesia. At the same time, the control group received routine nursing care, and the study group combined audio-visual and animated psychological intervention. The sleeping conditions of the two groups of children after 30 minutes of nasal drip were recorded. The two groups of children were compared with the modified Yale preoperative anxiety scale (mYPAS) scores at 1 day before surgery, on the day of surgery, and during induction of anesthesia, and the induction compliance checklist during induction of anesthesia (induction compliance checklist, ICC) score. Thirty minutes after nasal drip, compared with the control group, the number of children falling asleep in the study group was significantly increased, and the difference was statistically significant (P <0.05); 1 day before the operation, the mYRAS score and mYRAS score of the two groups of children were more than 40 points. Compared with the control group, the mYRAS score and the number of cases with mYRAS score ≥40 in the study group were significantly reduced on the day of surgery and during induction of anesthesia (P > 0.05). The difference was statistically significant. Significance (P < 0.05); during induction of anesthesia, compared with the control group, the number of ICC scores and ICC scores ≥ 4 in the study group were significantly lower than those in the control group (P < 0.05). The use of 2μg/kg dexmedetomidine nasal drops to assist the psychological intervention of audio-visual animation 30 minutes before surgery can significantly improve the cooperation of children and improve preoperative anxiety. It is worth promoting to improve nursing satisfaction.*

Keywords: *dexmedetomidine; audio-visual animation; psychological intervention; anxiety; degree of cooperation*

1. Introduction

Congenital heart disease is a group of clinically common congenital malformations, accounting for about 28% of all congenital malformations. It refers to abnormal cardiac anatomical structure caused by abnormal development or developmental disorders of the heart and great vessels during embryonic development[1]. At present, surgical intervention under general anesthesia is the main way to treat congenital heart disease. However, due to the young age of children, they are easy to have fear of the unfamiliar environment of the operating room and anesthesia operation, and they are separated from their parents before surgery, which is easy to cause a series of negative emotions such as crying, excitement and irritability of children[2]. Anxiety can not only reduce the cooperation of children with anesthesia and surgery, but also cause hemodynamic fluctuations and increase the risk of anesthesia and surgery. It may also lead to restlessness during the recovery period of children, and even increase the incidence of postoperative delirium and adverse behavior change events, and prolong the length of hospital stay[3,4]. Therefore, it is necessary to pay attention to the preoperative nursing of children with congenital heart disease, improve their negative emotions through relevant intervention measures, and improve the

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treatment compliance and treatment effect.

Dexmedetomidine, a novel selective α2 adrenergic receptor agonist, has sedative, analgesic and anxiolytic effects without causing any respiratory complications[5,6]. Intranasal administration of dexmedetomidine is painless and stimulative, with high compliance of children, and can be used for preoperative administration in children[7]. Previous studies have shown that intranasal dexmedetomidine 2ug/kg can be used in children aged 3-8 years and can achieve satisfactory sedative effects[8].

Preschool children are easily immersed in the virtual world of audio-visual animation, thus ignoring stimulation factors such as changes in the surrounding environment, language and touch[9]. Age-appropriate video animations or games are often used as effective tools to relieve anxiety and distract attention in children's medical and surgical procedures[10]. Moreover, the acquisition cost of audio-visual animation is low, the operation is simple, and it has high feasibility. Therefore, the purpose of this study is to explore whether preoperative dexmedetomidine nasal drip assisted audio-visual animation for psychological intervention can relieve anxiety of children, improve children's cooperation and nursing satisfaction.

2. Methods

A total of 70 children scheduled for congenital heart disease surgery in our hospital from January to December 2022 were selected as the research objects. They were divided into control group and experimental group by random number table method, with 35 cases in each group. Inclusion criteria:

①Age 3-6 years old;

②American Society of Anesthesiologists (ASA) grade ii-iii. Exclusion criteria: ① Patients with contraindications to dexmedetomidine; ② History of nervous system disease, developmental delay or mental retardation; ③ preoperative use of other sedative and analgesic drugs; ④ Body mass index > 20kg/m^2. There was no significant difference in age, gender, body mass index, ASA physical status, operation method, operation time, cardiopulmonary bypass time, and anesthesia time between the two groups (P > 0.05;Table 1). All the children's families were informed and signed the informed consent form.

Table 1: Comparison of general conditions between the two groups

Variables	Experimental group(n=35)	Control group(n=35)	t/χ2-Vaule	P-Vaule
Age (years), mean (SD)	4.57(1.05)	4.69(1.18)	-0.425	0.672
Gender, (%) male female	 18(51.4) 17(48.6)	 15(42.9) 20(57.1)	0.516	0.472
BMI (Kg/m2), mean (SD)	17.18(1.57)	17.05(1.75)	0.315	0.754
Surgical procedures, (%) Repair of atrial septal defect Repair of ventricular septal defect	 18(51.4) 17(48.6)	 19(54.3) 16(45.7)	0.057	0.811
Operation time (minutes), Mean (SD)	217.00(21.34)	222.57(13.32)	-1.310	0.195
CPB time (min), mean (SD)	93.40(18.26)	99.63(13.81)	-1.610	0.112
Anesthesia time (minutes), Mean (SD)	251.89(21.61)	253.26(14.05)	-0.315	0.754
ASA, (%) II III	 29(82.9) 6(17.1)	 27(77.1) 8(22.9)	0.357	0.550

Note: Data are presented as means (SD) or numbers (%). Abbreviations: SD, standard deviation.

Before surgery, solid food was forbidden for 8 hours and water was forbidden for 2 hours. Thirty minutes before anesthesia induction, the children were taken to the waiting area of the operating room,

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and were allowed to adapt to the environment with the help of their parents. The children in the experimental group selected one of the animation videos and began to watch it with the assistance of their parents. At the same time, the anesthesiological doctor gave 2μg/kg dexmedetomidine by a 1ml syringe and the control group was given the same dose of normal saline by slow nasal drops. Thirty minutes later, children in both groups were connected to the operating room by flat car. Electrocardiogram, blood pressure, pulse, oxygen saturation and end-tidal carbon dioxide partial pressure were monitored to record vital signs. Anesthesia was induced by tidal volume 8% sevoflurane and oxygen was inhaled 5L/min. After sleeping, the intravenous channel was opened and atropine 0.02mg/kg, midazolam 0.1mg/kg, propofol 2mg/kg, sufentanil 1μg/kg and vecuronium 0.1mg/kg were given intravenously. Three minutes later, the trachea was intubated, arterial puncture was performed to measure pressure, and right internal jugular vein puncture was performed. Anesthesia was maintained with propofol 4mg/kg/h, sufentanil 1μg/kg/h and vecuronium 0.1 mg/kg intermittently. At the end of operation, the micropump was stopped and the patient was sent to the cardiac surgical care unit with a tube.

3. Presentation of observations

The two groups were compared and analyzed in terms of falling asleep after 30 minutes of nasal drops, preoperative anxiety and cooperation of the two groups. The scores of the modified Yale Perioperative Anxiety Scale (MSPAS) at 1 day before surgery, on the day of surgery and during anesthesia induction, and the score of the cooperative Degree during anesthesia induction were collected. mYPAS was used to assess the basic anxiety and separation anxiety of children. The mYPAS scale contains 22 behavioral assessment items in 5 aspects, the highest score is 100 points, and mYPAS ≥ 40 points are considered to be anxiety[11]. The ICC scoring scale is used to describe children's compliance during anesthesia induction. It contains 10 negative behavior scoring items, and the result is the sum of each item score, with higher scores indicating worse induction compliance. According to ICC score, the induction cooperation of children can be divided into three grades: 0 points for perfect cooperation, 1-3 points for general cooperation, and 4-10 points for induction without cooperation[12].

4. Statistics

SPSS26.0 statistical software was used to analyze the data. A difference of 0.05 was considered statistically significant. Measurement data with normal distribution were represented as mean ± SD and compared between groups using the independent sample t test. Percentage (%) was used to describe the count data, and x 2 test was used for comparison between groups.

5. Results

The sleep status of children in the two groups was compared 30 minutes after nasal drip.After 30 minutes of nasal drip, 14 children fell asleep in the experimental group, and no children fell asleep in the control group, and the difference was statistically significant (x 2=17.500, P < 0.001).

Table 2: Comparison of mYRAS score and the number of cases with mYRAS score ≥40 between the two groups

Groups	n	mYRAS score [score, mean (SD)]			mYRAS score ≥40 (%)		
		Pre-1d	On the day	Anesthesia	Pre-1d	On the day	Anesthesia
Experimental group	35	29.31(3.44)	30.26(4.84)	31.09(4.79)	2 (5.7)	4 (11.4)	4 (11.4)
Control group	35	29.89(3.15)	41.00(4.80)	49.71(10.48)	2 (5.7)	23 (65.7)	27 (77.1)
t/χ2-Vaule	-	-0.725	-9.435	-9.565	0.000	21.766	30.629
P-Vaule	-	0.471	<0.001	<0.001	1.000	<0.001	<0.001

Note: Data are presented as means (SD) or numbers (%). Abbreviations: SD, standard deviation.

The preoperative anxiety and cooperation degree of the two groups were compared.There was no significant difference in mYRAS score and the number of cases with mYRAS score ≥40 points between the two groups one day before surgery (P > 0.05). The mYRAS score and the number of cases with mYRAS score ≥40 in the experimental group were significantly lower than those in the control group on the day of operation and anesthesia induction (P < 0.05). During anesthesia induction, the ICC score and the number of cases with ICC score ≥4 in the experimental group were significantly lower than those in the control group (P < 0.05; Tables 2 and 3).

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Table 3: Comparison of ICC scores and the number of cases with ICC scores ≥4 between the two groups

Groups	n	ICC scores	ICC score ≥4 (%)
Experimental group	35	1.37(1.22)	4(11.4)
Control group	35	4.34(1.21)	25(71.4)
t/χ2-Vaule	-	-10.247	25.963
P-Vaule	-	<0.001	<0.001

Note: Data are presented as means (SD) or numbers (%). Abbreviations: SD, standard deviation.

The incidence of postoperative adverse events was compared between the two groups.There was no significant difference in the incidence of adverse reactions such as respiratory depression, nausea, and vomiting between the two groups (P > 0.05; Table 4).

Table 4: Comparison of the incidence of postoperative adverse events between the two groups

Adverse events	Experimental group(n=35)	Experimental group(n=35)	χ2-Vaule	P-Vaule
Nausea, (%)	2(2.9)	1(5.7)	0.000	0.555
Vomiting, (%)	0	0	-	-
Respiratory depression, (%)	0	0	-	-

Note: Data are presented as numbers (%)

6. Discussion

Children with congenital heart disease have impaired cardiac anatomy and function, and are often associated with damage to other organs and systems, resulting in reduced tolerance to anesthesia and surgery[13]. If children have preoperative anxiety, it will affect their operation cooperation and further increase the risk of anesthesia and surgery. Intranasal dexmedetomidine is noninvasive and comfortable, has anxiolytic effects, provides a state of sedation that can be roused without causing respiratory depression, and can be safely and effectively used before anesthesia induction in children[7,14]. Audio-visual animation intervention is simple, feasible, economical and safe, which can distract children's attention, immersing them in the virtual animation world, and ignore the changes of the surrounding unfamiliar environment and the stimulation of language and touch, so as to relieve the preoperative anxiety of children[15].

School-age children undergoing cardiac surgery were enrolled in this study. Dexmedetomidine (2μg/kg) was administered by nasal drip 30 minutes before anesthesia induction and assisted by audio-visual animation for psychological intervention. In the experimental group, 14 children fell asleep after nasal drops, and the rest of the children could reach a quiet state and could cooperate with calling, while no children fell asleep in the control group. The results showed that the mYRAS score and the number of cases with mYRAS score ≥40 in the experimental group were significantly lower than those in the control group on the day of operation and anesthesia induction. During anesthesia induction, the ICC score and the number of cases with ICC score ≥4 in the experimental group were significantly lower than those in the control group. This suggests that dexmedetomidine combined with audio-visual animation intervention can significantly reduce preoperative anxiety of children and improve their cooperation.

In conclusion, the use of 2μg/kg dexmedetomidine nasal drip 30 minutes before surgery combined with video and audio animation intervention can significantly improve the cooperation of children, improve preoperative anxiety, with high nursing satisfaction and good safety, which is worthy of clinical promotion.

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