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การศึกษาภาวะวิตกกังวลก่อนการผ่าตัดในผู้ป่วยเด็กที่เข้ารับการผ่าตัดถ่างขยายท่อปัสสาวะส่วนล่าง ในโรงพยาบาลจุฬาลงกรณ์

พิชานันท์ พูลสวัสดิ์*, รื่นเริง ลีลานุกรม**
*แผนกวิสัญญีวิทยา โรงพยาบาลจุฬาลงกรณ์ สภากาชาดไทย กรุงเทพฯ 10330 ประเทศไทย
**ภาควิชาวิสัญญีวิทยา คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย กรุงเทพฯ 10330 ประเทศไทย

Preoperative Anxiety in Children Undergoing Urethral Dilatation Procedure in King Chulalongkorn Memorial Hospital

Pichanun Pulsawat*, Ruenreong Leelanukrom**
*Department of Anesthesiology, King Chulalongkorn Memorial Hospital, Bangkok, 10330, Thailand
**Department of Anesthesiology, Faculty of Medicine, Chulalongkorn University, Bangkok, 10330, Thailand

บทนำ: ภาวะวิตกกังวลก่อนการผ่าตัด พบได้บ่อยในผู้ป่วยเด็กที่เข้ารับการระงับความรู้สึกต่อเนื่องหลายครั้ง ทำให้เกิดผลในหลายด้าน

วัตถุประสงค์: ศึกษาผลของภาวะวิตกกังวลก่อนการผ่าตัดในอดีตและถึงปัจจัยอื่น ต่อการเกิดภาวะวิตกกังวลก่อนการผ่าตัดในปัจจุบัน รวมถึงความสัมพันธ์ระหว่างความวิตกกังวลก่อนการผ่าตัด และการให้ความร่วมมือขณะเริ่มระงับความรู้สึก ในผู้ป่วยเด็กที่เข้ารับการผ่าตัดถ่างขยายท่อปัสสาวะส่วนล่าง

วิธีการศึกษา: การศึกษาเชิงพรรณนาแบบจุดช่วงเวลาในผู้ป่วยเด็กอายุ 1-7 ปี ที่เข้ารับการผ่าตัดถ่างขยายท่อปัสสาวะส่วนล่างที่โรงพยาบาลจุฬาลงกรณ์ ผู้วิจัยจะประเมินระดับความวิตกกังวลก่อนการผ่าตัด (Modified Yale Preoperative Anxiety Scale; m-YPAS) รวมทั้งประวัติภาวะวิตกกังวลก่อนการผ่าตัดในอดีต โดยวิสัญญีแพทย์จะเป็นผู้ประเมินความร่วมมือทางพฤติกรรมของผู้ป่วยขณะเริ่มให้การระงับความรู้สึกด้วยวิธีสูดดม (Induction Compliance Checklist; ICC)

ผลการศึกษา: การศึกษาในผู้ป่วยเด็กชายทั้งหมด 100 คน พบว่า ความวิตกกังวลก่อนการผ่าตัดในอดีต และอายุของผู้ป่วยเด็ก มีผลต่อการเกิดภาวะวิตกกังวลของผู้ป่วยเด็กก่อนการผ่าตัดในปัจจุบัน ($p<0.05$) แต่ไม่พบว่า การมีภาวะวิตกกังวลก่อนการผ่าตัดในอดีตและถึงปัจจัยอื่น ต่อการเกิดภาวะวิตกกังวลก่อนการผ่าตัดในปัจจุบัน รวมถึงความสัมพันธ์ระหว่างความวิตกกังวลก่อนการผ่าตัด และการให้ความร่วมมือขณะเริ่มระงับความรู้สึก ในผู้ป่วยเด็กที่เข้ารับการผ่าตัดถ่างขยายท่อปัสสาวะส่วนล่าง

Background: Preoperative anxiety is common problem in pediatric patients undergoing multiple anesthesia which is associated with both psychologically and physiologically adverse outcomes.

Objectives of Study: To study the correlations of previous anesthetic anxiety and factors related to previous anesthesia to the present preoperative anxiety in children undergoing urethral dilation procedure. In addition, the effect of preoperative anxiety to behavioral compliance during inhalational induction of anesthesia was analyzed.

Material and Method: A cross-sectional descriptive study was conducted in children aged 1-7 years presenting for elective urethral dilatation procedure in King Chulalongkorn Memorial Hospital. Previous anesthetic anxiety, previous anesthetic induction technique and the present preoperative anxiety (Modified Yale Preoperative Anxiety Scale; m-YPAS) were evaluated at preoperative holding area. Behavioral compliance was evaluated during inhalational induction of anesthesia (Induction Compliance Checklist; ICC). The correlations of previous anesthetic anxiety including factors related to previous anesthesia to present preoperative anxiety were analyzed. The association between preoperative anxiety and compliance during anesthetic induction was also assessed.

Correspondence to: Pichanun Pulsawat M.D., E-mail: pichanun_p@hotmail.com
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กังวลก่อนการผ่าตัดสัมพันธ์กับความร่วมมือทางพฤติกรรมของผู้ป่วยเด็กขณะเริ่มให้การระงับความรู้สึกด้วยวิธีสูดดม
สรุป: ความวิตกกังวลก่อนการผ่าตัดในอดีต และอายุของผู้ป่วยเด็ก มีผลต่อการเกิดภาวะวิตกกังวลก่อนการผ่าตัด วิสัญญีแพทย์จึงควรหามาตรการในการดูแลผู้ป่วยกลุ่มเสี่ยงดังกล่าว

คำสำคัญ: วิสัญญีวิทยาสำหรับเด็ก, ภาวะวิตกกังวลก่อนการผ่าตัด, ความร่วมมือทางพฤติกรรมขณะเริ่มดมยาสลบ, ผ่าตัดถ่างขยายท่อปัสสาวะส่วนล่าง

Results: A hundred boys were enrolled in this study. The history of previous anesthetic anxiety and age of child were significantly related to the present preoperative anxiety ($p<0.05$). However, there was no association between preoperative anxiety and behavioral compliance during inhalational induction.
Conclusion: Previous anesthetic anxiety, number of anesthetic experiences and age of child were associated with the present preoperative anxiety. Measures for reducing anxiety to the child at risk should be provided.

Keywords: pediatric anesthesia; preoperative anxiety; behavioral compliance; urethral dilatation

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Introduction

Preoperative anxiety is characterized by subjective feelings of tension, apprehension, nervousness, and worries[1]. In children, preoperative anxiety is associated with both psychologically and physiologically adverse outcomes in the postoperative period and consequently, may result in postoperative negative behavioral changes and development in the future[2, 3]. In our experiences, children undergoing urethral dilatation procedure were a unique group of children who received multiple anesthesia. Each anesthesia could be the unpleasant experience and influences the future anesthesia. These unpleasant anesthetic experiences were represented by previous anesthetic anxiety and the influences were shown by preoperative anxiety and behavioral compliance during induction of anesthesia. However, there were no studies of these effects in this special group of children.

The primary objective of the present study was to study the correlation of previous anesthetic anxiety to the preoperative anxiety in preschool to school-aged children undergoing repeated urethral dilatation procedure. The secondary objectives were to identify the predicting factors of preoperative anxiety and also the effect of preoperative anxiety to the behavioral compliance during inhalational induction of anesthesia. Ultimately, we can have the measures to decrease the preoperative anxiety and improve our anesthetic management in these children.

Materials and Methods

After IRB approval and informed parental consent was obtained, a cross-sectional descriptive study was conducted. The study population was the ASA physical status I or II boys, age 1-7 years, with normal neurocognitive development who was scheduled for elective urethral dilatation under general anesthesia in King Chulalongkorn Memorial Hospital.

In the preoperative holding area, preoperative anxiety was evaluated by the investigators who did not involve in anesthesia of the child. Previous anesthetic anxiety was judged by yes/no question answered by the parents whether the child had anxiety or poor anesthetic experience in each previous anesthesia. The tool to assessed preoperative anxiety was the Modified Yale Preoperative Anxiety Scale (m-YPAS) (Appendix1) which was an observational measure consisted of 27 items in 5 categories of behavior indicating anxiety in children (activity, emotional expressivity, state of arousal, vocalization and use of parents)[4]. The score ranges from 0 to 100. The child with the score of more than 40 was interpreted as preoperative anxiety[5]. In addition, the previous anesthetic induction techniques (inhalational or intravenous technique) were obtained from anesthetic records in patients' charts.

All children received no premedication. One parent accompanied the child to the operating room and presented during induction of anesthesia (parental

presence during induction of anesthesia; PPIA). After the pulse oximeter was applied, the anesthesia was induced with nitrous oxide and sevoflurane in oxygen via anesthetic face mask. Behavioral compliance during induction of children was scored by the attending anesthesiologist using the Induction Compliance Checklist (ICC). (Appendix 2) This ICC was an observational scale used for evaluation of the compliance during induction of anesthesia which contained 10 negative behavioral groupings. The ICC score of 0 represented perfect induction whereas the score of at least 4 represented poor behavioral compliance[6]. Other characteristics of children such as age, BMI and number of previous anesthesia were also recorded.

Statistical Analysis

The SPSS program version 17.0 was used for statistical analysis. Continuous variables were presented as mean and standard variation (SD) whilst categorical variables were presented as percentage. Chi-square test was applied for correlation analysis between categorical data. The differences of continuous data, such as percentage of poor anesthetic experiences and percentage of previous inhaled induction technique between anxious and non-anxious groups were evaluated by unpaired t-test. Statistical significance was accepted at the p-value less than 0.05.

The previous anesthetic anxiety, demographic data, total number of anesthetic experiences and factors related to previous anesthesia such as previous anesthetic induction techniques (inhalational vs. intravenous) were studied to demonstrate the influence to preoperative anxiety. The association of preoperative anxiety to behavioral compliance during inhalational induction was also analyzed.

Results

A hundred boys undergoing general anesthesia for elective urethral dilatation procedure were enrolled in the study. The basic characteristics of the study population were presented in table 1. Ninety-eight percent of children had the experiences on anesthesia, ranged 0-17 times (median 5 times). The m-YPAS score in the preoperative holding area ranged from 23.33 to 81.67, with mean ± SD of 40.78 ± 14.43. Fifty percent of children developed preoperative anxiety defined as m-YPAS of more than 40. The mean ± SD of ICC score assessed during inhalational induction was 3.67 ± 3.93 and 43% of children had poor behavioral compliance during anesthetic induction (ICC score ≥ 4).

Table 1 Characteristics of Study Population (N=100)

Characteristics	Mean ± SD	Minimum	Maximum
Age (year)	4.30 ± 1.60	1.00	7.00
BMI (kg/m^2)	16.09 ± 3.26	10.74	23.44
Poor anesthetic experiences (% of total anesthetic experiences)	34.36 ± 37.79	0	100
History of inhaled induction (% of total anesthetic experiences)	80.66 ± 24.57	0	100
m-YPAS score (0-100)	40.78 ± 14.43	23.33	76.67
ICC score (0-10)	3.67 ± 3.93	0.00	10.00

Table 2 illustrates that the previous anesthetic anxiety was significantly related to the preoperative anxiety (p=0.032). The age of children at time of anesthetic induction was also significantly related to the incidence of preoperative anxiety (p=0.002) which the younger children tended to develop preoperative anxiety less than the older children. Nevertheless, there was no correlation between the technique of previous anesthetic induction (inhaled or intravenous induction) and the present preoperative anxiety (p=0.051). Moreover, there was no significant association between the number of previous anesthetic experience and the incidence of preoperative anxiety (chi-square=22.643 and p=0.092, table is not shown).

Table 2 The comparisons of factors related to previous anesthesia including demographic data between anxious children and non-anxious children (N=100)

	Preoperative anxiety state of children*		T	p-value
	Non-anxious (N=50)	Anxious (N=50)		
Previous anesthetic anxiety (% of total anesthetic experiences)	26.67 ± 36.57	42.45 ± 37.61	2.181	0.032
Age (year)	3.82 ± 1.41	4.78 ± 1.66	3.120	0.002
BMI (kg/m^2)	15.55 ± 3.06	16.64 ± 3.37	1.690	0.094
History of inhalational induction (% of total anesthetic experiences)	85.44 ± 23.09	75.89 ± 25.29	1.972	0.051
History of intravenous induction (% of total anesthetic experiences)	14.56 ± 23.09	24.11 ± 25.29	1.972	0.051

* As measured by the modified Yale Preoperative Anxiety Scale (m-YPAS) which score of more than 40 is defined as anxious state of child[4].

However, the present study did not find the significant relationship between the preoperative anxiety and the development of poor behavioral compliance during inhaled induction (p=0.313) as demonstrated in table 3.

Table 3 The association between the preoperative anxiety and behavioral compliance during inhaled induction (N=100)

	Behavioral compliance during anesthetic induction*		Chi-square	*p*-value
	Good compliance (N=57)	Poor compliance (N=43)		
Non-anxious child (m-YPAS ≤ 40)	31 (54.39%)	19 (44.19%)	1.020	0.313
Anxious child (m-YPAS > 40)	26 (45.61%)	24 (55.81%)		

*As measured by the Induction Compliance Checklist (ICC) which score of at least 4 is defined as poor behavioral compliance[6].

Discussion

There was a significant relationship between previous anesthetic anxiety and the present preoperative anxiety. Although the total number of anesthetic experiences and the previous anesthesia induction techniques were not associated with the incidence of preoperative anxiety in children, the age of children at time of anesthetic induction significantly related to the present preoperative anxiety. However, there was no correlation between preoperative anxiety and difficult anesthetic induction.

The results of this report validate several works describing the previous unpleasant experience of anesthesia and hospitalization associated with the present preoperative anxiety[1,4]. Kain et al. demonstrated that increased anxiety in preoperative holding area and at separation from parents was significantly related to the poor quality of previous medical experience[1]. Preoperative identification of children at risk would permit administration of behavioral (parental presence during induction of anesthesia; PPIA) and pharmacologic interventions (sedative premedication)[7] in an attempt to improve anxious level of children prior to anesthetic procedure. However, these interventions often incur undesirable effect, for instance delayed discharge from post-anesthesia care unit and hospital[8], increased preoperative and post-anesthesia care unit nursing staff requirements, delayed surgical schedules, and increased health care costs[6]. Consequently, application of these interventions to the children who would derive benefit while avoiding the use to children who would not benefit might improve healthcare cost-effectiveness and decrease undesirable effects of unnecessary interventions.

For many minor procedures, the psychological impact of anesthetic induction may be greater than the

physical insult from procedure itself. Induction of anesthesia is one of the most stressful events in peri-operative period[6] that often affects anesthetic management[9]. Up to 65% of all children undergoing anesthesia and surgery develop intense anxiety and fear during preoperative period[1, 10]. Surprisingly, the results revealed that incidence of preoperative anxiety in our children who underwent repeated anesthesia was not higher than the incidence in general pediatric population. However, the authors' findings were correlated well with prior study describing that repeated anesthetic experiences increased likelihood of developing preoperative anxiety[1]. Consequently, the children who had undergone frequent anesthesia were at greater risk of preoperative anxiety than general pediatric patients in the same age group.

The authors did not find the statistically significant relationship between the higher incidence of poor induction compliance in children and the state of anxiety upon arrival to the preoperative area, even though, the prior studies showed that anxious child tended to develop difficult induction of anesthesia[1, 6, 11]. There are many possible explanations for our results with regard to related factors of poor behavioral compliance during anesthetic induction. Firstly, it is possible that preoperative anxiety was associated with incidence of poor induction of anesthesia, but only to a minor degree, and not sufficient to alter the ICC category. If preoperative anxiety increased the ICC score by only one or two points, then anxious child might have had "higher" ICC score than otherwise expected, but still be within the same ICC category. Secondly, anesthesiologist's experience in inhalation induction technique vastly impacted the behavioral compliance during anesthetic induction in children. This might be one of our study limitations, because the level of anesthesiologists' experience could not be controlled in this investigation. Finally, children's temperament and socioeconomic status of parents which might have an influence on occurrence of stormy anesthetic induction were not recorded and analyzed in the present study.

The modified-Yale Preoperative Anxiety Scale (m-YPAS) has been proved to be an excellent tool for assessing children's anxiety during perioperative period[11]. Zee et al.[11]has shown its good to excellent observer reliability and good concurrent and construct validity, although the m-YPAS was validated against a currently recognized "gold standard" (Spielberger's State-Trait Anxiety Inventory in Children; STAIC) for evaluating child's anxiety only for preoperative period, not for anesthetic induction[4]. As noted in the previous work[5], subjects with m-YPAS scores of more than 40 were considered as anxious.

The Induction Compliance Checklist (ICC) is observational scale used to assess behavioral compliance during inhaled induction which confirmed its good reliability and excellent inter-rater reliability[12]. The investigators decided to use the ICC scores at least 4 as a definition of poor induction according to the study of Anna et al.[6]which suggested to use the ICC scores at least 4 instead of 6 as used in other studies for identifying poor behavioral compliance during inhaled induction because of its validity and efficiency.

As generally seen in our institution, this group of children always came to operating rooms with some signs of stress, for example, crying and refusing inhaled induction by closing their mouths with their hands. For this reason, investigators decided to explore the relationship of induction techniques (inhaled or intravenous technique) to the preoperative anxiety. Nevertheless, there were no associations between inhaled or intravenous induction techniques and preoperative anxiety.

Several methodological issues are related to the design of the present study. First, this is an observational investigation hence no comparison between groups of samples was analyzed. Second, failure to obtain anesthesiologists' experience of inhaled induction in children and the absence of parental anxiety assessment including socioeconomic status of child's family might affect both preoperative anxiety and compliance during inhaled induction. Finally, our results may not be generalized to anesthetic inductions conducted without parental presence in the operating

room. However, this research aimed to describe factors which could rapidly identify children who might be at risk of developing anxiety in preoperative area to improve anesthetic management in order to decrease preoperative anxiety and poor behavioral compliance during anesthetic induction. Assessment of parental anxiety and child's temperament is time consuming[2] and might require multidisciplinary approach (psychologist, psychiatrist, anesthesiologist, nurse anesthetist) that is not practical for outpatient setting.

Conclusions

The previous anesthetic anxiety and age of child were associated with the present preoperative anxiety. Future studies could be directed to further evaluate other contributing factors including parental anxiety, children's temperament, and socioeconomic status of patient's family which might be predictors of preoperative anxiety. Moreover, measures for reducing anxiety are recommended to provide especially in high risk children.

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Appendix 1

Modified Yale Preoperative Anxiety Scale (m-YPAS)[4]

Activity

1. Looking around, curious, playing with toys, reading (or other age-appropriate behavior); moves around holding area/treatment room to get toys or to go to parents; may move toward operating room equipment
2. Not exploring or playing, may look down, fidget with hands, or suck thumb (blanket); may sit close to parent while waiting, or play has a definite manic quality
3. Moving from toy to parent in unfocused manner, non-activity-derived movements; frenetic/frenzied movement or play; squirming, moving on table; may push mask away or cling to parent
4. Actively trying to get away, pushes with feet and arms, may move whole body; in waiting room, running around unfocused, not looking at toys, will not separate from parent, desperate clinging

Vocalizations

1. Reading (nonvocalizing appropriate to activity), asking questions, making comments, babbling, laughing, readily answers questions but may be generally quiet; child too young to talk in social situations or too engrossed in play in respond
2. Responding to adults but whispers, “baby talk”, only head nodding
3. Quiet, no sounds or responses to adults
4. Whimpering, moaning, groaning, silently crying
5. Crying or may be screaming “no”
6. Crying, screaming loudly, sustained (audible through mask)

Emotional expressivity

1. **Manifestly happy,** smiling, or concentrating on play
2. Neutral, no visible expression on face
3. Worried (sad) to frightened, sad, worried, or tearful eyes
4. Distressed, crying, extreme upset, may have wide eyes

State of apparent arousal

1. Alert, looks around occasionally, notices or watches what anesthesiologist does (could be relaxed)
2. Withdrawn, sitting still and quiet, may be sucking on thumb or have face turned into adult
3. Vigilant, looking quickly all around, may startle to sounds, eyes wide, body tense
4. Panicked whimpering, may be crying or pushing others away, turns away

Use of parents

1. Busy playing, sitting idle, or engaged in age-appropriate behavior and dosen’t need parent; may interact with parent if parent initiates the interaction
2. Reaches out to parent (approaches parent and speaks to otherwise silent parent), seeks and accepts comfort, may lean against parent
3. Looks to parent quietly, apparently watches actions, doesn’t seek contact or comfort, accepts it if offered or clings to parent
4. Keeps parent at distance or may actively withdrawn from parent, may push parent away or desperately clinging to parent and not let parent go

Appendix 2

Induction Compliance Checklist (ICC)[6]

- Crying, tears in eyes,
- Turns head away from mask,
- Verbal refusal, says “no,”
- Verbalization indicating fear of worry, ‘where’s mommy?” or “will it hurt?”
- Pushed mask away with hands, pushes nurse or anesthesiologist with hands/feet
- Covers mouth/nose with hands/arms or buries face,
- Hysterical crying, may scream,
- Kicks/ flails legs/ arms, arches back, and/or general struggling,
- Requires physical restraint,
- Complete passivity, either rigid or limp

Interpretation

ICC = 0: Perfect induction

ICC = 1-3: Moderate induction

ICC ≥ 4: Poor induction