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The effects of visual information leaflets on perioperative anxiety in pediatric patients

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ABSTRACT

Aims: The aim of this study was to investigate the beneficial effects of a visual information leaflet designed in our clinic on perioperative anxiety in pediatric patients scheduled for general anesthesia, as well as on anxiety levels of their caregivers.

Methods: One hundred pediatric patients American Society of Anesthesiologists (ASA) risk classification I–II, aged 4 to 12 years, were randomly divided into two groups. During the preoperative visit, the control group (n=47) received only the standard written information form routinely used in our clinic, whereas the study group (visual group; n=53) received an additional visual information leaflet alongside the standard written form. Anxiety and pain levels of the children were assessed using validated scales before and after surgery. Negative behaviors in children were also evaluated during the postoperative period. In addition, anxiety levels of patient attendants were assessed using appropriate scales.

Results: Preoperative anxiety levels in children and the incidence of negative behaviors in the postoperative period were significantly lower in the visual group. However, in both groups, preoperative anxiety levels and the incidence of delirium increased as the age of the children decreased. Preoperative concerns of patient attendants were significantly reduced in the Visual group, and these concerns were also lower in the postoperative period. Furthermore, baseline anxiety levels, both preoperatively and postoperatively, were lower among attendants who received the visual information leaflet. No statistically significant difference was observed between the groups with respect to postoperative pain scores.

Conclusion: The use of a visual information leaflet describing the anesthesia procedure with pictures, in addition to the standard written information form, appears to reduce anxiety and concerns related to anesthesia in both pediatric patients and their attendants. This approach may also reduce postoperative complications and negative behavioral outcomes in children.

Keywords: Visual information leaflet, pediatric anesthesia, premedication

INTRODUCTION

Anxiety prior to medical treatment is common and often unavoidable in pediatric patients, posing significant challenges for both children and their families.[1] High perioperative anxiety leads to numerous adverse outcomes, including prolonged anesthesia induction time, increased incidence of postoperative delirium, negative postoperative behavioral changes, increased postoperative pain and analgesic consumption, agitation, prolonged hospital stay, delayed wound healing, deterioration of vital signs, and impaired postoperative compliance.[2]

Studies have shown that preoperative parental anxiety has significant negative effects on children in terms of anxiety levels and emotional responses. The anxiety levels of family members are closely associated with children's postoperative recovery.[3,4]

Various approaches to alleviate preoperative anxiety have been widely studied, including preanesthetic medications, distraction techniques, parental presence during anesthesia induction, and preoperative psychological and educational interventions. Among these, non-pharmacological management of anxiety offers important advantages over anxiolytic medications, as it is not associated with adverse effects and emphasizes the importance of psychological assessment and preparation in the preoperative period.[5]

Emotions such as fear and anxiety often arise from a lack of communication and insufficient information. Accordingly,

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various perioperative psychological preparation methods have become increasingly widespread in recent years. Reviews of the literature indicate that different visual interactive methods applied to patients are more effective in reducing preoperative anxiety levels compared with control groups.[6]

In this study, we aimed to investigate the potential benefits of providing a visual information leaflet in addition to the standard written information form on perioperative anxiety levels in pediatric patients scheduled for general anesthesia, as well as in their patient attendants.

METHODS

The study was carried out with the permission of the Kırıkkale University Faculty of Medicine Hospital Scientific Researches Evaluation and Ethics Committee (Date: 19.04.2016, Decision No: 11/02). We obtained an informed consent form from all patients for procedure. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

This study included children aged 4 to 12 years who were scheduled for elective surgery, as well as their patient attendants. Pediatric patients classified as American Society of Anesthesiologists (ASA) physical status I–II and without cognitive, hearing, or speech impairments that could interfere with communication were eligible for inclusion. Patient attendants who had no cognitive, hearing, or speech impairments, no known psychological disorders, were literate, and willing to participate in the study were also included.

Children younger than 4 years or older than 12 years, those classified as ASA III or higher, children undergoing emergency surgery, children with difficult intubation, and those who developed intraoperative surgical and/or anesthesia-related complications (such as respiratory depression, myocardial depression, cardiac arrhythmias, bronchospasm, laryngospasm, anaphylactic reactions, hypotension, or bleeding) were excluded from the study. In addition, illiterate patient attendants, attendants with communication or psychological problems, and those who declined to participate were excluded.

Using a closed-envelope randomization method, pediatric patients and their attendants were randomly assigned to one of two groups during their preoperative evaluation at the anesthesia outpatient clinic:

Control group: Information provided only through the standard written information form (n=47)

Visual group: Information provided through the standard written information form in addition to a visual information leaflet describing the anesthesia procedure with pictures designed in our clinic (n=53) (**Figure**).

The age and sex of the patients and the department in which the surgery was performed (pediatric surgery, dentistry, ophthalmology, otorhinolaryngology, orthopedics, and urology) were recorded. The age, sex, and educational level of the patient attendants were also documented.

The study was conducted in three phases: the anesthesia outpatient clinic, the preoperative bedside, and the postoperative bedside, as described below.

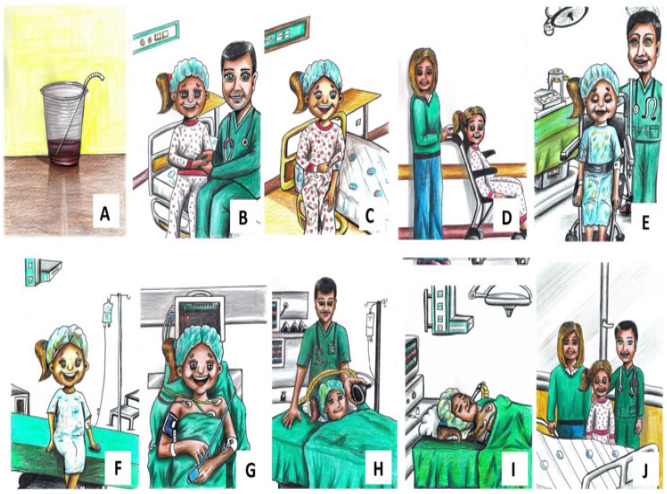

Figure 1. Visual materials used for anesthesia information
(A) A glass of cherry juice and midazolam mix is to drink 30 minutes before the operation. It is explained that this mix is to be drunk before the operation.
(B) Establishing vascular access at the bedside.
(C) Detection of the vascular access. The patient is informed that they may feel a slight pain when establishing vascular access, and that it will be covered by the medical tape.
(D) Transfer from the service to the operating room. The patient is told that he/she will be taken to the preoperative preparation room with his/her parents by wheelchair.
(E) Wearing surgical clothes. In the preparation room, the patient is told that children should put on the clothes that they will wear in the operating room. He/she is told that his/her parents will not be able to accompany him/her after this stage.
(F) Entering the operating room and preoperative preparation-1. The patient is told in an appropriate way that he/she will be taken into the operating room where he/she will lie on the green-colored bed, as seen in this picture, and that the machines around him her will help him/her to sleep.
(G) Entering the operating room and preoperative preparation-2. After the patient is taken to the operating room, he/she is told that some tapes (electrodes) will be applied, and that there will be a blue peg (saturation probe) on his/her thumb, which will not hurt. He/she will be told that he/she will wear a device that will take measurements by applying pressure at intervals to his/her arm, and that the water that he/she did not drink at night will be replaced by fluids through the vascular access. The patient is informed that none of the operations the patient will undergo will hurt.

Anesthesia Outpatient Clinic

Children in the control group and their attendants were informed using the standard written information form routinely used in the clinic. In addition to this standard form, pediatric patients and patient attendants in the visual group were provided with a visual information leaflet illustrating each step of general anesthesia using 10 caricature-style images. This leaflet was designed in our clinic and drawn by a professional technical draftsman. The illustrations depicted situations that patients would encounter in the patient bed, premedication room, and operating room using cartoon-style images. Written permission was obtained from the artist for the use of these illustrations.

Baseline anxiety levels of patient attendants in both groups were assessed using the State–Trait Anxiety Inventory (STAI) (**Table 1**), one of the most widely used self-report measures of anxiety. Developed by Spielberger et al., this inventory assesses how individuals feel under specific conditions and consists of 20 items: 10 items reflecting negative emotions expressed directly and 10 items reflecting positive emotions expressed in reverse. Higher scores indicate higher anxiety levels.[7,8]

In addition, a questionnaire consisting of 11 items, each scored from 1 to 5, was used to assess anxiety regarding anesthesia (AIE). Higher scores indicate increased AIE.[9]

Both the STAI and AIE scales were re-administered to patient attendants in the postoperative period.

Table 1. State Anxiety Inventory (STAI-S) items

Item	Statement	Never (1)	Sometimes (2)	Often (3)	Always (4)
1	I feel calm right now	1	2	3	4
2	I feel secure	1	2	3	4
3	I feel tense	1	2	3	4
4	I feel regretful	1	2	3	4
5	I feel at ease	1	2	3	4
6	I feel unpleasant	1	2	3	4
7	I am worried about possible misfortunes	1	2	3	4
8	I feel rested	1	2	3	4
9	I feel anxious	1	2	3	4
10	I feel relaxed	1	2	3	4
11	I feel self-confident	1	2	3	4
12	I feel upset	1	2	3	4
13	I feel very nervous	1	2	3	4
14	I feel extremely tense	1	2	3	4
15	I feel relaxed	1	2	3	4
16	I feel satisfied	1	2	3	4
17	I feel confused due to excitement	1	2	3	4
18	I feel joyful	1	2	3	4
19	I feel happy	1	2	3	4
20	I feel cheerful	1	2	3	4

Preoperative Patient Bedside

On the morning of surgery, while patient attendants were present, children's anxiety levels were assessed at the bedside using the Modified Yale Preoperative Anxiety Scale (mYPAS) (Table 2) prior to premedication with midazolam (Dormicum®, Deva Holding A.Ş., Turkiye). The mYPAS is an observational tool used to evaluate preoperative anxiety in children aged two years and older. The scale consists of five domains: activity, vocalization, emotional expressivity, state of apparent arousal, and use of parents.[10,11]

Postoperative Patient Bedside

In the recovery room, the pediatric anesthesia emergence delirium (PAED) (Table 3) scale was used to assess early postoperative agitation. This scale incorporates cognitive-based assessments in addition to agitation-related behaviors. A PAED score greater than 10 is considered sensitive and specific for emergence agitation, with higher scores indicating more severe agitation.[12]

Postoperative pain was evaluated using the Facial Expression Scale (FES), also known as the Wong–Baker Pain Scale, at 0, 1, 2, and 6 hours postoperatively, and postoperative analgesic requirements were recorded. This scale uses six facial expressions to rate pain intensity from 0 to 10, ranging from a smiling face indicating no pain to a crying face indicating severe pain.[13]

Patient attendants were contacted by telephone on postoperative days 2 and 14 after hospital discharge and were asked about any behavioral changes in their children, including eating disorders, sleep disturbances, urinary incontinence, and other behavioral alterations that may occur in the early postoperative period. For patients who had not yet been discharged, these questions were asked at the bedside.

Statistical Analysis

At the end of the study, the collected variables were found not to be normally distributed or homogeneously distributed between the groups. Therefore, the Mann–Whitney U test was used to compare variables between the two groups, with a p-value of <0.05 considered statistically significant. The Wilcoxon signed-rank test was used to compare paired measurements within each group (STAI and AIE scores), with a p-value of <.05 considered statistically significant. Correlations between variables were analyzed using Spearman's correlation test, with p-values of <0.05 considered statistically significant.

RESULTS

The study was conducted with a total of 100 patients and their patient attendants. The visual group contained 24 female and 29 male patients, with a median age of seven, while the control group contained 20 female and 27 male patients, with a median age of five. No differences were observed between the groups in the age, sex, type of operation, number of previous operations, number of children in the family and number of child in the family variables. The degree of relation, age and educational status of the patient attendants were found to be similar in both groups (Table 4).

When the test results were examined, the preoperative AIE ($Z=-3.605$, $p<0.001$) and STAI ($Z=-0.839$, $p=0.005$) scores and the postoperative AIE ($Z=-2.149$, $p=0.032$) scores were found to be different, and both the preoperative and postoperative AIE scores in the visual group were observed to be lower. Preoperative STAI scores were also found to be lower in the visual group, while the MYPAS scores were observed to be different in both groups, although the scores in this test were lower in the Visual group regarding numerical values.

Table 2. Modified Yale Preoperative Anxiety Scale (mYPAS)

Score	Description
Activity	
1	Interested in surroundings, curious, playing with toys, active movement within the room
2	Uninterested in surroundings, not playing, fidgety hands, sucking fingers, sitting close to parent
3	Moving toward toys without focus, excited, restless on chair, pushing mask away, clinging to parent
4	Actively trying to escape, pushing with arms and legs, whole-body movement, running around the room, not interested in toys, desperately clinging to parent
Vocalization	
1	Responds normally to adults
2	Responds to adults only with baby talk or head nodding
3	Quiet and does not respond to adults
4	Whimpering, moaning, softly crying
5	Crying and shouting "no"
6	Crying loudly and continuously, screaming audibly even under the mask
State of apparent arousal	
1	Alert, occasionally scanning the environment, watching or noticing the clinician's actions
2	Withdrawn, sitting quietly and motionless, sucking finger, turning face toward parent
3	Vigilant, rapidly scanning surroundings, startled by environmental sounds, frightened eyes, tense
4	Anicked, crying, pushing others away, attempting to leave the area
Emotional expressivity	
1	Clearly happy, smiling, or focused on play
2	Neutral facial expression, no clear emotional emphasis
3	Fearful, anxious, sad, or tearful
4	Distressed, crying, frightened with wide eyes
Use of parent	
1	Playing independently, sitting quietly, no need for parent; engages if parent initiates interaction
2	Interacting with parent, leaning toward parent, quietly talking, resting against parent
3	Quietly watching parent, observing movements, avoids eye contact; either accepts suggestions or clings to parent
4	Keeps parent at a distance or avoids parent; may push parent away or cling desperately and refuse separation

The postoperative complaint levels (Z =-3.613, p<0.001) were found to be different in both groups, and the complaint rate was lower in the visual group (Table 5, 6). In a comparison of

Table 4. Descriptive table of the demographic data of the study groups

Group	Variable	Min	Max	Median	SD
Control	Age	4	12	5	2.68
	Sex	1	2	2	0.50
	Siblings	1	6	2	1.05
	Which child	1	5	2	1.08
	Complaint	0	1	1	0.47
	Patient attendant	1	2	1	0.28
	Patient attendant's age	21	50	34	6.06
	Educational status of the patient attendants	0	4	3	1.10
Visual	Age	4	12	7	2.52
	Sex	1	2	2	0.50
	Siblings	1	6	2	0.96
	Which child	1	6	2	0.96
	Complaint	0	1	0	0.46
	Patient attendants	1	2	1	0.26
	Patient attendant's age	23	50	33	6.23
	Educational status of the patient attendants	0	4	3	1.01

Min: Minimum, Max: Maximum, SD: Standard deviation

the preoperative and postoperative AIE and STAI scores of each group, a statistically significant difference was observed between these values for each group (p<0.001). Based on these findings, preoperative AIE and STAI values were found to be significantly higher in both groups when compared with the postoperative period (Table 7).

Additionally, a correlation test was applied for the demographic data and the test results for each group. In the control group, a positive correlation was observed between the PAED and FS scores; between the preoperative AIE scores and preoperative STAI scores and the postoperative AIE scores; and between the preoperative STAI scores, MYPAS scores and the postoperative STAI scores. A negative correlation was observed between the postoperative AIE scores and the educational status of the patient attendants, and between the age of the child and the MYPAS scores. After a correlation analysis of the visual group's findings, a negative correlation was observed between the age of the child to be operated upon and their PAED and MYPAS scores, while a positive correlation was observed between the preoperative and postoperative AIE scores; and between the preoperative and postoperative STAI scores of the patient attendants included in this group. Moreover, a positive correlation was identified between the MYPAS scores of the children and the pre- and postoperative STAI scores of the patient attendants.

Table 3. Pediatric Anesthesia Emergence Delirium (PAED) Scale

Item	Behavior assessed	0	1	2	3	4
1	The child is aware of surroundings	Always	Most of the time	Sometimes	Rarely	Not at all
2	The child recognizes caregivers	Always	Most of the time	Sometimes	Rarely	Not at all
3	The child is restless or agitated	Not at all	Rarely	Sometimes	Often	Extremely
4	The child is crying	Not at all	Rarely	Sometimes	Often	Extremely
5	The child is inconsolable	Not at all	Rarely	Sometimes	Often	Extremely

Table 5. A descriptive table of the results of the scales applied to children and patient attendants in groups

Group	Variable	Minimum	Maximum	Median	SD
Control	PAED	0	20	9	5.42
	FS0	0	10	4	2.60
	FS6	0	2	0	0.28
	mYPAS1	1	4	2	1.07
	mYPAS2	1	6	2	1.72
	mYPAS3	1	4	2	1.12
	mYPAS4	1	4	3	1.04
	mYPAS5	1	4	2	1.08
	AIE-PRE	14	40	22	5.85
	AIE-POST	11	24	14	2.60
	STAI-PRE	31	74	59	10.29
	STAI-POST	20	51	30	7.61
Visual	PAED	0	18	8	4.79
	FS0	0	10	4	2.19
	FS6	0	2	0	0.26
	mYPAS1	1	4	1	0.82
	mYPAS2	1	6	1	1.16
	mYPAS3	1	4	1	0.91
	mYPAS4	1	4	2	0.91
	mYPAS5	1	4	1	0.82
	AIE-PRE	11	32	18	4.42
	AIE-POST	11	27	13	2.89
	STAI-PRE	21	75	52	10.18
	STAI-POST	20	44	27	6.49

FS: Facial Expression Scale, mYPAS: Yale Preoperative Anxiety Scale, PAED: Pediatric Anesthesia Emergence Delirium, STAI: State-Trait Anxiety Inventory, AIE: Anxiety Regarding Anesthesia, PRE: Preoperative, POST: Postoperative, SD: Standart deviation

Table 6. Comparison of preoperative anxiety and postoperative behavioral outcomes between groups

Variable	Z	p
mYPAS1	-3.079	0.002
mYPAS2	-3.498	<0.001
mYPAS3	-3.242	0.001
mYPAS4	-3.006	0.003
mYPAS5	-3.620	<0.001
AIE-PRE	-3.659	<0.001
AIE-POST	-2.091	0.037
STAI-PRE	-3.145	0.002
Complaint	-3.767	<0.001

AIE: Anxiety Regarding Anesthesia, mYPAS: Yale Preoperative Anxiety Scale; STAI: State-Trait Anxiety Inventory, PRE: Preoperative, POST: Postoperative, Z: Z score

Table 7. Comparison of preoperative and postoperative anxiety levels of patient attendants

Group	Variable	Z	p
Control	AIE-POST–AIE-PRE	-5.975	<0.001
	STAI-POST – STAI-PRE	-5.960	<0.001
Visual	AIE-POST – AIE-PRE	-6.100	<0.001
	STAI-POST – STAI-PRE	-6.323	<0.001

AIE: Anxiety Regarding Anesthesia, STAI: State-Trait Anxiety Inventory, PRE: Preoperative, POST: Postoperative, Z: Z score

DISCUSSION

Previous literature has reported higher stress and anxiety levels in young children who underwent surgical interventions than in older children.[14] Young children worry about feeling pain, the possibility of losing body function or possible changes in appearance. They also develop feelings of abandonment and may feel unloved after surgery, which is performed in an unfamiliar environment, and some children even believe that they have been left in the hospital due to bad behavior.[15,16]

It has been demonstrated that children who experience high levels of preoperative anxiety report significantly higher postoperative pain, have delayed hospital discharge, and more frequently exhibit emergence delirium, sleep disturbances, and other maladaptive behavioral changes that may persist for several weeks after surgery.[17]

At the end of our study, the preoperative anxiety levels of the children in the group to whom the visual information form was given were found to decrease significantly. No correlation was observed between the sex and the preoperative anxiety level. The negative behavior of these children in the postoperative period was found to be significantly decreased.

In our study, the preoperative levels of anxiety and delirium in both groups were found to increase as the age decreased, and there was no statistical difference between the PAED scores of the study groups, although preoperative anxiety levels (all subscales of mYPAS) were observed to be lower in the visual group. Based on these findings, providing information through a visual information leaflet could also be effective in young children, and the preoperative concerns of the patient attendants of these children were found to be significantly reduced in the visual group when compared to the control group, and this concern was determined to be less in the postoperative period in the visual group. Compared to the control group, preoperative baseline anxiety levels were found to be lower in the patient attendants to whom the visual information leaflet was given. In our study, however, preoperative anxiety levels were observed to be higher in the patient attendants with a low level of education in the control group. Concerns about the surgery were found to be high in cases where the baseline anxiety was high in the patient attendants, and this concern was observed to continue in the postoperative period. The anxiety levels of patient attendants were also found to increase if the preoperative anxiety level of the child was high. In addition to this, the preoperative level of anxiety and the baseline anxiety level of the patient attendants who were informed with a visual information leaflet were observed to be also higher in the postoperative period if the levels were high before the surgery. When the results of our study were examined, the anxiety levels of patient attendants who were informed with the visual information form were found to be significantly lower than the patient attendants in the control group. However, compatible with literature, a history of previous operations was seen to have no effect on the anxiety levels of the patient attendants or children in our study.[18,19] In accordance with these findings, we believe that providing information through a visual information form is effective in reducing the level of concern and anxiety related

to surgery in both the patient to be operated upon and his or her patient attendants. Although studies have shown fewer complaints of pain in patients, who were informed preoperatively,[20] No statistically significant difference was identified between the groups in the postoperative pain scores in our study. In the light of this finding, the way patients are informed was determined to have no effect on reducing the pain that may occur in the postoperative period.

In conclusion, a visual information form that was designed and used for the first time in our clinic was determined to reduce preoperative anxiety and postoperative agitation levels in children, while also decreasing the concerns of the patient attendants related to preoperative and postoperative anxiety and postoperative anesthesia.

The brochure used in this study enhanced the preoperative evaluation process for pediatric patients by making it more engaging and reassuring. A notable reduction in parental anxiety was observed, which appeared to positively influence children's emotional responses during the preoperative period. The establishment of a dedicated premedication room further supported this approach by allowing pediatric patients and their parents to remain together in a more comfortable environment. Consistent with these observations, highly positive feedback was received from parents in the postoperative period, underscoring the practical value of this intervention in routine clinical practice. In this context, visual information brochures represent a simple, low-cost, and non-pharmacological adjunct that may support perioperative anxiety management in pediatric anesthesia. Nevertheless, further multicenter studies with larger sample sizes and standardized visual tools are needed to confirm these findings and to better define their clinical applicability.

Summary of Result

In this study, statistically significant differences were observed between the visual and control groups in preoperative and postoperative AIE scores and preoperative State–Trait Anxiety Inventory (STAI) scores. In addition, the incidence of postoperative complications was significantly lower in the visual group.

No statistically significant differences were found between the groups with respect to postoperative STAI, PAED, FES, and mYPAS scores.

Correlation analysis revealed significant associations between mYPAS and FES scores at postoperative minute 0, preoperative AIE and preoperative STAI scores, and mYPAS and postoperative STAI scores.

Furthermore, patient and parental age, history of previous surgery, patient sex, number of siblings, and birth order were not found to have a significant effect on preoperative or postoperative anxiety levels.

Limitations

This study has several limitations and the results should be interpreted within this context. First, the relatively small sample size, single-center design, and heterogeneity of the surgical procedures may limit the generalizability of the findings to different clinical settings and patient populations. Second, although randomization was implemented, the lack of detailed reporting regarding allocation concealment and assessor blinding may have increased the risk of observer bias. Third, all pediatric patients in the study routinely received midazolam premedication. While this approach is considered appropriate from both ethical and literature-based perspectives, it may have influenced postoperative behavioral outcomes and potentially attenuated the isolated effect of the visual information brochure on anxiety and behavioral measures. In addition, the visual information brochure used in this study was developed locally to meet the specific needs of our clinic and was not externally validated, which may limit its applicability across different clinical settings and patient populations.

In addition, the use of subjective anxiety assessment tools and differences in educational level and sociocultural background of patient attendants may have influenced the study outcomes.

CONCLUSION

As a result, using a standard information form together with a leaflet that describe the anesthesia application with pictures can be said to reduce anxiety levels and concerns regarding the anesthesia in both the child patient and his/her patient attendants, and may also reduce the rate of negative behaviors observed in children in the postoperative period.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of the Kırıkkale University Faculty of Medicine Hospital Scientific Researches Evaluation and Ethics Committee (Date: 19.04.2016, Decision No: 11/02).

Informed Consent

Informed consent was obtained from a parent or legal guardian. Where appropriate, age-adjusted assent was also obtained from the child. The inclusion of vulnerable populations in this study adhered to national and international ethical guidelines. Extra care was taken to ensure voluntary participation, understanding, and protection of participant dignity and autonomy.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

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Author Contributions

Concept: ZBG, Design: ZBG, Control: GA, IG, ÜB, Resources: ZBG, EP, Materials: ZBG, Data Collection: ZBG, Analysis: IG, ÜB, Literature Review: ZBG, EP, Writing: ZBG, EP, Critical Review: IG, GA,ÜB.

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