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ORIGINAL RESEARCH

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Observation on the effect of nursing intervention based on non-violent communication concept combined with child life medical aid game on school-age children treated with concealed penis surgery

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Abstract

Background: This study investigates the clinical effects of an intervention combining the principles of non-violent communication (NVC) and a medical-assisted game on school-age children undergoing concealed penis surgery. **Methods**: A total of 100 school children who underwent concealed penile surgery were divided into a control group (receiving usual care) and a study group (receiving an NVC-based medical-assisted game intervention). The groups were compared in terms of treatment compliance, children's medical fear score, wound pain 24 hours post-operation, complications, postoperative recovery and parental satisfaction with nursing care. **Results**: The treatment compliance rate in the study group was significantly higher than in the control group ($p = 0.040 < 0.05$). The Children's Medical Fear Scale (CMFS) scores in the study group were notably lower than those in the control group. The Face, Legs, Activity, Cry and Consolability (FLACC) pain score at 24 hours post-operation was significantly lower in the study group compared to the control group ($p < 0.001$). The differences were statistically significant. Moreover, no significant differences were observed in operation time and intraoperative blood loss between both groups. However, the study group had a significantly shorter off-bed activity time and hospital stay compared to the control group. Furthermore, the study group exhibited a lower incidence rate of complications (such as hematoma and preputial edema) than the control group. Parental satisfaction with nursing care was significantly higher in the study group ($p = 0.037 < 0.05$). **Conclusions**: The intervention combining non-violent communication and medical aid games demonstrates significant clinical benefits for school-age children undergoing concealed penis surgery. It improves treatment compliance, reduces medical fear and postoperative pain, shortens recovery times, lowers complication rates and enhances parental satisfaction with nursing care.

Keywords

Concealed penis surgery; Non-violent communication concept; Medical aid games; Medical fear; Nursing effect

1. Introduction

Concealed penis is broadly defined as a condition where the penis is poorly exposed on the body surface, being concealed underneath due to abnormal development of the penile skin fascia. This congenital malformation has an incidence rate of approximately 0.67%, according to incomplete statistics [1]. Because a hidden penis is a relatively rare condition, many mild cases may go unrecorded or be overlooked by healthcare providers, leading to incomplete statistical data. It predominantly affects school-age children, often leading to complications such as inflammation of the glans penis and difficulty in everting and cleaning the prepuce. If left untreated, this malformation can severely impact penile development, resulting in both physical and psychological issues for children and causing psychological distress for their families [2]. Surgery is the primary treatment for concealed penis in children. However, due to the dense distribution of sensory nerves in the penis, the area is highly sensitive to noxious stimuli, causing significant pain from surgical trauma and postoperative erection. The young age of patients and their insufficient understanding of the surgical procedure often lead to perioperative anxiety, fear and other adverse emotions, which significantly reduce treatment compliance and affect therapeutic outcomes [3]. In addition, parents, who often lack disease-related knowledge, may experience anxiety due

to emotional fluctuations and environmental changes, further complicating the surgical process and leading to dissatisfaction with the treatment [4]. Nonviolent communication (NVC) is a communication method that fosters emotional connection, mutual respect and harmonious relationships [5]. Studies have shown that the application of the NVC model in nurse-patient communication effectively reduces adverse emotions caused by language violence and enhances patient satisfaction and engagement [6]. Child life medical aid play is an intervention specifically designed for children to alleviate their anxiety and fear in the medical environment, improving their adaptability and understanding through play and educational activities [7]. Integrating NVC concepts into child life medical aid games provides children with a supportive and understanding environment, helping them express their emotions and needs positively while promoting psychosocial development and medical adaptation. This study aims to apply a nursing model that combines NVC with child life medical aid games to improve medical fear in school-age children undergoing concealed penis surgery.

2. Research materials and methods

2.1 Clinical data

To determine the required sample size for a two-sample mean comparison within a grouped design, we employed the following formula: $n = 2 \times [(\mu_\alpha + \mu_\beta)^2 \times \sigma^2]/\delta^2$. We set the significance level (α) at 0.05 and the probability of a Type II error (β) at 0.1, aiming for a power of 0.9 ($1 - \beta$). From the tables, the critical values were determined as $\mu_{0.05} = 1.96$ and $\mu_{0.1} = 1.282$. The difference in means (δ) anticipated from preliminary clinical data involving 11 cases is 4.5, with a corresponding standard deviation (σ) of 6.5. These values, when substituted into the sample size formula, yield an initial estimate of 43.9 cases per group. To accommodate a possible 15% attrition rate and maintain balanced numbers in the treatment and control groups, we adjusted the estimated sample size to 50 cases per group.

Qualifications for selection: From existing case records, clinical data of 100 school-age children who underwent concealed penis surgery at our hospital from October 2022 to October 2024 were retrospectively collected. This study was reviewed by the hospital ethics committee and informed consent was obtained from the children's families.

Inclusion criteria: (1) Aged 3–7 years old, meeting the diagnostic criteria for concealed penis, penis concealed in the subcutaneous tissue, appearance and length shorter than normal children of the same age; (2) Normal sex hormone levels; (3) Surgical treatment is performed at our hospital. Inclusion criteria for families: (1) Parents or legal guardians of the children; (2) Ability to cooperate with questionnaire and scale assessments, having normal cognition.

Exclusion criteria for children: (1) Presence of malformations outside the reproductive system; (2) History of mental illness or neurosis; (3) Presence of specific conditions such as micropenis or urethral malformations and other reproductive system malformations; (4) History of penile trauma; (5) Severe cardiovascular disease; (6) Acute and chronic infection.

As shown in the table, 100 preschool children treated with concealed penis surgery were equally divided into two groups with 50 cases in each group. The average age of children in the control group was 5.39 ± 1.16 years, and their body mass index was 20.14 ± 1.52; the average age of children in the study group was 5.35 ± 1.34 years, and body mass index was 20.32 ± 1.48. There was no significant difference in the average age and body mass index between the two groups ($t = 0.152, 0.603$, $p = 0.879, 0.548$), ensuring comparability.

2.2 Study methods

As a retrospective study, the nursing methods have been recorded in the existing case records.

The children in the control group received standard nursing care for concealed penis surgery. Before the operation, perioperative precautions and key cooperation points were explained to the children and their families. The children were given an enema the night before surgery, and instructed to fast for 6 hours before the operation and to refrain from drinking water for 4 hours before surgery. During the operation, cooperation with the surgeon was ensured. After surgery, the child was placed in a supine position without a pillow for 6 hours. A urinary catheter was inserted for 5–7 days, and the incision was dressed in Vaseline gauze, followed by compression bandaging using an elastic bandage. The postoperative complications were managed and controlled. Besides, guidance for dressing changes, postural nursing, dietary planning and precautionary measures were provided.

Children in the study group received an intervention based on non-violent communication combined with a medical aid game model (NVCGAM). A specialized NVCGAM team comprising doctors, nurses, psychological counselors and game designers was formed. Training and educational activities were conducted to familiarize team members with the principles and techniques of non-violent communication and medical aid games. Before enrollment, a preliminary assessment was conducted to understand the children's medical fears and personality traits. Non-violent communication with the children and their parents was then established, addressing their feelings and needs while providing relevant information and support. Personalized medical games were designed based on each child's age, interest and comprehension. Game content was tailored accordingly. The first step was environmental preparation. Concisely, the nursing staff prepared an environment with medical auxiliary game areas, decorated with cartoon characters and other child-friendly elements, ensuring all game tools were regularly disinfected. The games, designed to ease preoperative anxiety, involved both nurses and parents. Initial activities fostered a positive doctor-patient relationship through engaging communication. Medical care role-play clothing was prepared for the children, and "rescue risk-taking activities" were conducted to familiarize children with medical tasks. Using role-play and child-friendly language, children were guided through preoperative examination and preparation. Medical supplies were utilized, and children were encouraged to act as medical staff by performing intravenous infusions and anesthesia procedures on the dolls. This hands-on experience helped

children understand the surgical process and alleviate their preoperative fear. Throughout the process, children were encouraged to actively participate, relaxation techniques were demonstrated through video introductions. These included attention redirection via breathing exercises, listening to music and communication strategies. An animated cartoon video was used to illustrate the surgical process and key cooperation points, allowing children to better understand the procedure. After surgery, children were invited to express their feelings, receiving emotional support and guidance on patient pacification through ongoing communication and assistance. Finally, children who actively and bravely completed the procedure were rewarded with cartoon cards and small red flowers, enhancing their sense of achievement.

2.3 Outcome measures

As a retrospective study, the outcomes of the outcome indicators have already been recorded in the existing case records.

2.3.1 Compliance

(1) Complete compliance: The child fully cooperates and completes all prescribed postoperative medical therapeutic operations; (2) Partial compliance: The child completes the necessary postoperative medical therapeutic operations while engaged in distractions such as watching animation, playing games or requiring pacification from family members to complete tasks; (3) Non-compliance: The child refuses to perform required postoperative medical therapeutic operations necessitating the use of mandatory auxiliary methods such as continuous restraint to complete tasks or use the above methods without obtaining satisfactory results [8].

2.3.2 The child medical fear scale (CMFS) score

The CMFS [9] consists of four subscales: fear of medical operation, fear of medical environment, interpersonal fear and self-fear. The full scale has a total of 17 items. Each item uses a 5-level scoring method: 0—no fear at all, 1—some fear, 2—fear, 3—very fear, 4—extreme fear. The internal consistency coefficient of this scale is 0.95. The timing of evaluation: the day before surgery and the day after surgery.

2.3.3 Wound pain score on the first day after surgery

For children under 7 years, the Children's Pain Behavior Checklist (Face, Legs, Activity, Cry and Consolability, FLACC) is used [10], which includes five aspects: facial expression, legs, activity, cry and consolability, each score 0 to 2 points. Scoring criteria: 0 represents relaxation and comfort, 1–3 represents slight discomfort, 4–6 points represent moderate pain and 7–10 represents severe pain, discomfort or both.

2.3.4 Postoperative recovery

This measure includes the duration of the operation, intraoperative blood loss, off-bed activity time and discharge. Additionally, the incidence of complications such as hematoma, incision infection, flap necrosis and preputial edema, along with family satisfaction regarding the nursing care, are recorded.

2.4 Statistical analysis

All data were double-checked and analyzed with SPSS 22.0 (IBM Corp., Armonk, NY, USA). Continuous variables were presented as mean $\pm$ standard deviation and compared using independent samples t-test. Count variables were presented as percentages and compared using the χ^2 test. A p-value < 0.05 was considered statistically significant.

3. Results

3.1 Comparison of treatment compliance

Two children in the study group exhibited non-compliance, resulting in a compliance rate of 96.00%, which was significantly higher than the 84.00% observed in the control group. This difference was statistically significant ($p < 0.05$, Table 1).

3.2 Comparison of CMFS scores for medical fear

Before the intervention, the CMFS scores of the two groups were similar, showing no statistically significant differences (t = 0.426, 0.011, 0.635, 0.300, p = 0.671, 0.991, 0.527, 0.765). Compared with the same group before the intervention, the four scores of the control group and the study group were reduced to different extents, and the scores of medical operation fear, medical environment fear, interpersonal fear and self-fear of the study group after intervention were significantly lower than that of the control group, and the differences were statistically significant ($p < 0.05$, Table 2).

3.3 Comparison of FLACC scores for postoperative pain

At 24 hours post-operation, the FLACC scores were 6.93 $\pm$ 0.97 in the control group and 5.46 $\pm$ 0.97 in the study group. The FLACC score 24 hours after operation in the study group was significantly lower than that in the control group, and the difference had statistical significance (t = 7.584, $p < 0.001$).

3.4 Surgery and postoperative recovery

There were no statistically significant differences between the two groups in terms of operation time and intraoperative blood loss ($p > 0.05$). However, the study group demonstrated significantly shorter times to ambulation and reduced lengths of hospital stay compared to the control group, with these differences being statistically significant ($p < 0.05$, Table 3).

3.5 Incidence of complications

Among 50 cases in the control group, preputial edema occurred in 5 cases at most, followed by hematoma in 4 cases, with a total complication rate of 26.00%. In the study group, both preputial edema and hematoma occurred in 2 cases each, with incision infection in 1 case, with a total complication rate of 10.00%. The incidence of total complications in the study group was significantly lower than that in the control group ($p < 0.05$, Table 4).

TABLE 1. Comparison of treatment compliance.

Group	Complete compliance (Case)	Partial compliance (Case)	Non-compliance (Case)	Compliance rate (%)
Control group (n = 50)	24	18	8	84
Study group (n = 50)	35	13	2	96
χ^2				6.457
p				0.040

TABLE 2. Comparison of CMFS scores for medical fear.

Group	Time	Medical operation fear	Medical environment fear	Interpersonal fear	Self-fear
Control group (n = 50)					
	Before intervention	11.98 ± 2.00	7.80 ± 1.23	8.21 ± 1.09	7.16 ± 0.89
	After intervention	7.66 ± 1.58	6.11 ± 0.61	5.47 ± 0.82	5.58 ± 0.62
Study group (n = 50)					
	Before intervention	11.80 ± 2.18	7.79 ± 1.34	8.06 ± 1.26	7.11 ± 0.83
	After intervention	5.83 ± 0.69	4.70 ± 0.48	4.58 ± 0.72	4.44 ± 0.68
t		7.496	12.888	5.782	8.816
p		<0.001	<0.001	<0.001	<0.001

TABLE 3. Comparison of surgery and postoperative recovery.

Group	Procedure time (min)	Intraoperative bleeding (mL)	Ambulation time (d)	Length of hospital stay (d)
Control group	42.47 ± 4.78	23.45 ± 5.77	1.72 ± 0.40	6.82 ± 1.01
Study group	41.38 ± 3.18	23.72 ± 6.34	1.33 ± 0.35	5.63 ± 1.37
t	1.332	0.217	5.211	4.955
p	0.186	0.828	<0.001	<0.001

TABLE 4. Comparison of incidence of complications.

Group	Hematoma (Case)	Incision infection (Case)	Flap necrosis (Case)	Preputial edema (Case)	Total complication rate (%)
Control group (n = 50)	4	3	1	5	26
Study group (n = 50)	2	1	0	2	10
χ^2					4.336
p					0.037

3.6 Satisfaction comparison

The satisfaction rate of family members with nursing care in the study group was 94.00%, significantly higher than the 82.00% observed in the control group. This difference was statistically significant ($p < 0.05$, Table 5).

4. Discussion

Medical fear, also known as iatrophobia or white coat phobia [11], is particularly prevalent in school-age children. This demographic is susceptible due to their immature cognitive and emotional development, resistance to unfamiliar environments and anxiety about the unknown. Additionally, children may fear pain or discomfort, misunderstand medical procedures, or have had negative prior experiences with healthcare or hospitals [12, 13]. In clinical practice, healthcare providers often focus primarily on addressing the physical condition of children, overlooking the negative psychological effects of medical fear. These impacts can delay medical treatment and complicate the treatment process, leading to worse health outcomes. Persistent fear can also contribute to heightened anxiety and depression in children, and as they grow older, it may lead to social isolation and further psychological difficulties, significantly diminishing their quality of life [14, 15]. Previous research indicates that medical fear is a pervasive psychological challenge throughout the entire hospitalization process, becoming a major psychological disorder in the treatment of young children. Early intervention is crucial for improving treatment compliance and overall treatment outcomes [16]. Studies have shown that the perioperative period is the critical phase during which children experience intense negative emotions such as tension, anxiety and fear. Distress, non-cooperation or excessive crying in children can increase the risk of developing sleep disorders, anxiety, timidity and depression [17, 18]. Furthermore, poor communication with the child can exacerbate these negative emotions [19]. A study of 800 surgical patients demonstrated that effective and empathetic communication can help stabilize the patient's mental state and mitigate adverse psychological effects during surgery [20].

TABLE 5. Comparison of satisfaction.

Group	Satisfied (Case)	Basically satisfied (Case)	Dissatisfied (Case)	Satisfaction rate (%)
Control group (n = 50)	17	24	9	82
Study group (n = 50)	28	19	3	94
χ^2				6.270
p				0.043

Child life medical aid games serve as an effective intervention by using playful, child-friendly language to explain medical procedures. These games, which are based on evidence and developmental principles, help children form positive relationships with caregivers, reshape their understanding of illness, improve their healthcare experience and enhance treatment cooperation [21]. Previous studies have underscored the significant role of medical aid games in improving the psychological well-being of school-age children, particularly those with severe conditions like pneumonia [22]. This study aimed to evaluate the clinical effectiveness of a nursing model that combines NVC with child life medical aid games in improving the emotional and psychological outcomes of school-age children undergoing concealed penis surgery.

The results demonstrated that treatment compliance was higher in the study group, which utilized a combination of non-violent communication and Child life medical aid play models, compared to the standard care model used in the control group. This improvement may be attributed to the preoperative development of NVC and medical aid games, which facilitated the establishment of friendly relationships between children and medical staff, thereby increasing treatment confidence. Additionally, early education regarding surgical procedures and the importance of following medical advice likely contributed to the higher compliance in the study group. The Child Medical Fear Scale (CMFS) categorizes the fear experienced by hospitalized children into four key aspects: fear of entering an unfamiliar environment, fear of interpersonal relationships, fear of self and fear of medical procedures [23]. In our study, 50 children with concealed penis admitted to our department were evaluated. The results indicated that children exhibited the highest levels of fear in the following order: interpersonal fear, fear of medical procedures, fear of the medical environment and fear of self. Among the 17 specific items assessed, including understanding the illness, preoperative preparation, invasive procedures (*e.g.*, blood drawing and infusion) and wound dressing changes, the highest levels of fear were reported. Post-intervention, the scores for fear of medical procedures, fear of the medical environment, interpersonal fear, and self-fear were significantly lower in the study group compared to the control group. These findings further confirmed that the NVC and child life medical aid game model effectively alleviates perioperative medical fear in children. This model took into account the children's preferences and personality traits, tailoring the environment and game props to suit their needs. Moreover, it helped children adapt to unfamiliar environments, reduce tension, divert attention and decrease resistance to surgery through role-playing and other interactive activities.

Previous studies have established a close relationship between fear of hospital treatment and postoperative pain, as well as between mood and pain perception. Fearful patients tend to have a higher pain sensitivity, and fear of surgery can intensify pain, while postoperative pain can, in turn, aggravate surgical anxiety [24, 25]. In our study, the FLACC score of the study group was significantly lower than that of the control group 1 day post-surgery, likely linked to the reduced medical fear in the children of the study group. Furthermore, the study group exhibited better postoperative recovery, as evidenced by significantly shorter times to ambulation and a reduced hospital stay. The incidence of postoperative complications was also significantly lower in the study group compared with the control group, confirming the higher safety of the nursing model in the study group. Finally, family satisfaction with nursing care was higher in the study group, illustrating that the nursing model employed was more readily accepted and appreciated by the children's families.

This study has several limitations. First, the integration of NVC with Child Life medical aid play is still in its early stages in China, necessitating further refinement of the process. Additionally, the sample size was limited and the observation period was relatively short. To more comprehensively assess the effectiveness of the nursing model, future studies should increase the sample size, extend the observation period and explore the model's in-depth clinical nursing value.

5. Conclusions

In summary, the nursing model that combines Non-violent communication with Child life medical aid play significantly improved the clinical outcomes for school-age children undergoing concealed penis surgery. This approach not only enhanced treatment compliance and family satisfaction but also reduced medical fear and postoperative pain. Additionally, it promotes faster recovery and reduces complications. Demonstrating high safety and efficacy, this model represents a promising intervention for pediatric care.

AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

AUTHOR CONTRIBUTIONS

XYH, HSH—designed the study and carried them out; prepared the manuscript for publication and reviewed the draft of the manuscript. XYH, XXL, LQ, SLZ, KPW—supervised the

data collection; analyzed the data; interpreted the data. All authors have read and approved the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Ethics Committee of the Second Affiliated Hospital of Wenzhou Medical University and Yuying Children's Hospital (Approval no. 2024-K-362-02). Written informed consent was obtained from a legally authorized representative for anonymized patient information to be published in this article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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