Reducing Anxiety Levels in Preschool Children Undergoing Cryotherapy for Cutaneous Viral Warts

Use of a Portable Video Player

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Objective: To determine if watching a children’s program on a portable video player reduces anxiety levels in preschool children before cryotherapy for cutaneous viral warts.

Design: Nonblinded before-after trial.

Setting: General dermatology clinic.

Participants: Consecutive patients aged 2 to 6 years who underwent cryotherapy for cutaneous viral warts.

Intervention: Patients were shown a children’s program on a portable video player before cryotherapy.

Main Outcome Measure: Mean score difference on the modified Yale Preoperative Anxiety Scale between children treated during the 10 weeks before vs the 10 weeks after the intervention was implemented.

Results: Ninety-nine cryotherapy sessions performed among 35 children were evaluated. Fifteen children underwent cryotherapy during the preintervention phase only, and 13 children underwent cryotherapy during the intervention phase only. The mean modified Yale Preoperative Anxiety Scale scores were 58.4 during the preintervention phase and 37.7 during the intervention phase (P=0.005). The percentages of children with a high anxiety score (≥30) were 100% (15 of 15) during the preintervention phase and 38% (5 of 13) during the intervention phase (P<.001). Another 7 children underwent cryotherapy during both the intervention and intervention phases. Their mean modified Yale Preoperative Anxiety Scale scores were 53.7 during the intervention phase and 42.0 during the intervention phase (P=.03). The percentages of children with a high anxiety score were 86% (6 of 7) during the intervention phase and 43% (3 of 7) during the intervention phase (P=.25). In both groups, the time spent coaxing and treating children decreased after the intervention, but the differences were not statistically significant.

Conclusion: The use of a portable video player significantly reduced preprocedural anxiety levels in preschool children undergoing cryotherapy for cutaneous viral warts.


Viral Warts are benign epidermal neoplasms caused by infection with the human papillomavirus and are common in childhood.1,2 Viral warts can spread readily by cutaneous contact or autoinoculation and may result in significant physical and psychosocial distress.3 Cryotherapy using liquid nitrogen is the most widely used treatment of warts.4 Successive treatments at weekly or fortnightly intervals are usually needed to achieve complete clearance of viral warts.

With a temperature of −196°C, liquid nitrogen causes discomfort or pain when it is applied to skin lesions. In young children, cryotherapy often results in much distress; therefore, time and resources are spent coaxing or restraining children during treatment. Psychologically, parents and health care professionals are also adversely affected when children scream during treatment. The children will be reluctant to return for successive treatments, and a vicious cycle ensues.

Although pharmacological agents, such as benzodiazepines, are often used for preoperative sedation, nonpharmacological approaches are preferable in children, especially when the procedures are minor. This study evaluated the use of a portable video player in relieving preprocedural anxiety among preschool children before cryotherapy, which is the most commonly performed procedure in many general dermatology clinics.
The study was conducted as part of Singapore’s Clinical Practice Improvement Programme and was approved by the Institute of Healthcare Quality, Singapore, and by the institution in which it was conducted. The study time line was divided into the preintervention and intervention phases, each of 10 weeks’ duration.

### PREINTERVENTION PHASE

Baseline demographic data were collected from consecutive patients aged 2 to 6 years who underwent cryotherapy for cutaneous viral warts in a general dermatology clinic at National Skin Centre, Singapore, during 10 weeks between May 10 and July 22, 2011. The primary end point was assessed using the modified Yale Preoperative Anxiety Scale (m-YPAS), which comprises 22 items representing specific features of anxious behavior in children. These features are defined within 5 domains, namely, Activity, Vocalization, Emotional Expressivity, State of Arousal, and Use of Parents. Each domain has a maximum score of 20, which translates into a maximum total score of 100. A higher score indicates a greater level of anxiety, and a score of 30 or higher was defined as having high anxiety.

Cryotherapy was performed in a designated room by an experienced dermatology-trained nurse, who treated all the patients. Each patient was given a standard set of explanations for the treatment, and neither the child nor the parent was informed that the patient would be assessed (so as not to influence the child’s anxiety). Assessment and scoring using the m-YPAS were performed during 2 minutes before the initiation of cryotherapy by a particular investigator (F.G.C.T.) in all the cases. Two freeze-thaw cycles were performed routinely for each wart: liquid nitrogen was administered using a spray canister until the whole wart turned white, and the second round of freezing was performed when the whiteness dissipated.

Secondary end points in the assessment included the time taken for treatment (from entering to leaving the treatment room), the requirement for restraint, and the time spent coaxing the patient, and the requirement for restraint. In addition, caregivers were asked to give written feedback about their experience after the treatment.

### INTERVENTION PHASE

In addition to the processes described for the preintervention phase, patients were shown a children’s program on a portable video player after the explanations for cryotherapy were given. The program Barney was shown to children aged 2 to 4 years, while the cartoon movie Kung Fu Panda was shown to those aged 5 and 6 years. Assessment and scoring using the m-YPAS were performed 1 minute after the children had watched the video programs. Cryotherapy was subsequently initiated, and the video programs were played until the treatment ended.

Consecutive patients during the next 10 weeks, between July 25 and October 6, 2011, were assessed in this intervention phase. Data for the secondary end points and caregiver feedback were similarly collected, as in the preintervention phase.

### RESULTS

In total, 99 cryotherapy sessions (46 before and 53 after the intervention was implemented) were evaluated. In total, 35 children underwent weekly to fortnightly treatments during the 20-week study period. Fifteen children underwent cryotherapy during the preintervention phase only, and 13 children underwent cryotherapy during the intervention phase only. Another 7 children underwent cryotherapy during the preintervention and intervention phases. The demographic profiles of 35 children are summarized in Table 1.

### CHILDREN WHO UNDERWENT CRYOTHERAPY DURING THE PREINTERVENTION PHASE OR INTERVENTION PHASE ONLY

The mean m-YPAS score among 15 children during the preintervention phase was 58.4, while that among 13 children during the intervention phase was significantly lower at 37.7 (P = .005) (Table 2). The percentage of children with a high anxiety score (≥30) during the preintervention phase was 100% (15 of 15), while that during the intervention phase was significantly lower at 38% (5 of 13) (P < .001).

Comparing the preintervention and intervention phases, the mean time taken for treatment decreased from 15.3 to 12.4 minutes, whereas the mean time spent coaxing the patient decreased from 1.9 to 1.1 minutes. The percentage of children who required restraint decreased from 33% (5 of 15) to 23% (3 of 13). None of these improvements in secondary end points were statistically significant (Table 2).

### CHILDREN WHO UNDERWENT CRYOTHERAPY IN THE PREINTERVENTION AND INTERVENTION PHASES

Among 7 children who underwent cryotherapy during the preintervention and intervention phases, the mean m-YPAS score decreased significantly from 53.7 in the preintervention phase to 42.0 in the intervention phase (P = .03).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Preintervention Phase Only (n = 7)</th>
<th>Intervention Phase Only (n = 13)</th>
<th>Both Phases (n = 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean, y</td>
<td>5.3</td>
<td>4.5</td>
<td>4.7</td>
</tr>
<tr>
<td>Sex, No. (%)</td>
<td>Male 6 (40)</td>
<td>7 (54)</td>
<td>5 (71)</td>
</tr>
<tr>
<td></td>
<td>Female 9 (60)</td>
<td>6 (46)</td>
<td>2 (29)</td>
</tr>
<tr>
<td>Race/ethnicity, No. (%)</td>
<td>Chinese 8 (53)</td>
<td>6 (46)</td>
<td>3 (43)</td>
</tr>
<tr>
<td></td>
<td>Indian 2 (13)</td>
<td>1 (8)</td>
<td>3 (43)</td>
</tr>
<tr>
<td></td>
<td>White 5 (33)</td>
<td>5 (38)</td>
<td>1 (14)</td>
</tr>
<tr>
<td></td>
<td>Filipino 0</td>
<td>1 (8)</td>
<td>0</td>
</tr>
</tbody>
</table>

### STATISTICAL ANALYSIS

Because cryotherapy requires successive visits, some children underwent cryotherapy in the preintervention and intervention phases. We compared the outcomes for these patients across the 2 phases using paired-samples statistical tests. Conversely, we compared the results between children who underwent cryotherapy during the preintervention phase only and those who underwent cryotherapy during the intervention phase only using independent-samples statistical tests. All the analyses were performed using commercially available software (SPSS, version 19.0; SPSS, Inc). Statistical significance was set at P < .05.
The percentage of children with a high anxiety score was reduced from 86% (6 of 7) to 43% (3 of 7), although this difference was not statistically significant ($P=.25$).

In the analysis of the secondary end points, the mean time taken for treatment decreased from 16.7 to 14.0 minutes after the intervention was implemented ($P=.10$), while the mean time spent coaxing the patient decreased from 1.7 to 1.1 minutes ($P=.34$), although these differences were not statistically significant.

Two children each required restraint in the preintervention and intervention phases, one of whom was the same child in both phases.

**QUALITATIVE ASSESSMENT**

Based on their feedback, the caregivers were satisfied with the treatment procedure overall, with greater satisfaction after the intervention was implemented. It was observed that most children were fully engrossed in the video program and took no notice of the treatment. Using the intervention, the nurse could concentrate and perform the procedure better and was much less likely to have stopped the treatment prematurely because of the child's protesting. The children consequently seemed less apprehensive and more willing to return for treatments. With the intervention, the physicians were more confident in prescribing cryotherapy for young children, without having to resort to less effective topical therapies.

**COMMENT**

This study showed that preprocedural anxiety levels in children were significantly reduced with the use of a portable video player. Concurrently, fewer children had high anxiety with the intervention; however, this difference was not statistically significant among children who underwent cryotherapy during the preintervention and intervention phases (probably because of the few children in the sample). For the secondary end points, consistent trends were observed toward reduced time spent coaxing and treating children. Qualitatively, the intervention was favorably received by caregivers and by health care professionals.

Children inherently experience high anxiety when faced with the prospect of an impending painful or uncomfortable procedure. Such apprehension is amplified in younger children because they possess fewer coping skills.6,7 Anxiety in a young child is expressed with maladaptive behaviors, such as uncooperativeness, agitation, and loud crying, and these result in increased stress for caregivers and difficulty in treatment administration. Distress experienced during medical procedures in childhood has also been linked to long-term consequences of fear and avoidance of medical care in adulthood.8 Therefore, management of children's anxiety should be an integral component of preprocedural preparations.

Various nonpharmacological interventions have been described to reduce pediatric anxiety in the preoperative setting for different procedures, such as changing burn dressings and needle-related pain.9,10 Behavioral interventions that have been reported to alleviate preoperative anxiety in children include the use of a children's book, a handheld video game, toys, and clowns.11-14 Hypnotic relaxation during voiding cystourethrography, an invasive investigation, was found to reduce distress in chil-
dren and shorten the duration of the procedure. A systematic review concluded that music therapy was effective in reducing anxiety and pain among children undergoing medical and dental procedures. The basic mechanism underlying nonpharmacological therapy stems from the neuromatrix theory of pain, which proposes that the brain's neural network integrates multiple sensory inputs to generate the pain output. It is known that ascending pain signals from peripheral tissue injury can be altered by descending signals from the brain, namely, thoughts and emotions. Such a phenomenon can be seen in the augmentation of pain with anxiety and the attenuation of pain with joy and excitement.

The portable video player was selected because it can easily be comfortably positioned for the young patient. It was not meant to be used as a visual shield to prevent the child from seeing the cryotherapy. It was intended to work by distracting the child from fear. In addition, by elevating mood and providing a pleasant cognitive stimulus, the painful sensory input from cryotherapy was probably reduced via the central nervous system (spinal cord and brain). Although we used the programs Barney and Kung Fu Panda, any age-appropriate video program for children should be effective. A book or static pictures may not be as effective as moving images in distracting the child.

The portable video player was safe, easy to use, and cost-effective. With the increasing popularity and availability of new handheld devices, implementation of the intervention will become easier. We have since expanded the use of the portable video player to other procedures for young children, including skin prick tests, needling and cryotherapy for molluscum, paring of calllosities, and needle-related procedures. The tool has also been used for older children who were fearful. The intervention is potentially useful for other minor procedures in nondermatological clinics.

Our study had some limitations. First, no randomization was performed of children to the preintervention or intervention phases. Second, blinding of the investigator scoring the m-YPAS as to whether a child was receiving the intervention was infeasible and represents a potential bias.

The use of a portable video player significantly reduced preprocedural anxiety levels in preschool children undergoing cryotherapy for cutaneous viral warts. Trends were observed toward reduced time spent coaxing and treating children.

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Author Contributions: Dr Tey had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Tey, K. L. Tan, and Lim. Acquisition of data: Tey and F. G. C. Tan. Analysis and interpretation of data: Tey, E. S. T. Tan, and A. S. L. Tan. Drafting of the manuscript: Tey, E. S. T. Tan, F. G. C. Tan, K. L. Tan, and A. S. L. Tan. Critical revision of the manuscript for important intellectual content: Tey and A. S. L. Tan. Statistical analysis: A. S. L. Tan. Administrative, technical, and material support: Tey, E. S. T. Tan, F. G. C. Tan, and K. L. Tan. Study supervision: Tey and K. L. Tan.

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REFERENCES