

## ORIGINAL ARTICLE

# Effects of a conscious sedation dressing on pain and anxiety in pediatric burn patients

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## Abstract

**Aim:** This study examined the effects of a conscious sedation dressing on pain and anxiety in pediatric patients with burns.

**Methods:** This was a quasi-experimental study, using a nonequivalent control group. Using convenience sampling, the participants were assigned to two groups, an experimental group ( $n = 10$ ), which comprised children who received a conscious sedation dressing, and a control group ( $n = 13$ ), which comprised children who received general dressing care. To minimize the risk of contamination between the two groups, the sampling was sequentially performed.

**Results:** The children in the experimental group showed significantly lower levels of pain ( $U = 3.29$ ,  $d = 1.00$ ,  $P = .003$ ) and physiological responses, as evidenced by lower systolic blood pressures, diastolic blood pressures, pulse rates, and respiratory rates than the control group (systolic blood pressures:  $t = 5.05$ ,  $d = 1.22$ ,  $P < .001$ ; diastolic blood pressures:  $t = 2.12$ ,  $d = 0.93$ ,  $P = .046$ ; pulse rates:  $t = 2.28$ ,  $d = 1.00$ ,  $P = .033$ ; and respiratory rates:  $t = 2.47$ ,  $d = 1.09$ ,  $P = .022$ ).

**Conclusion:** The application of a conscious sedation dressing may alleviate pain and anxiety for pediatric burn patients.

## KEYWORDS

anxiety, child nursing, pain, wound care

## 1 | INTRODUCTION

Pediatric burn injuries are a global health concern. They can have long-lasting physical and psychological consequences (De Young, Kenardy, Cobham, & Kimble, 2012). According to the Korean National Health Insurance Service (2015), the number of burn patients in Korea increased from 454,068 in 2009 to 505,278 in 2014. The incidence of burns in children under 9 years of age reached 85,336, accounting for 16.9% of all burn patients. This is equivalent to 1,881 child burns per 100,000 people in the population, which is about twice the rate of any other age group. In the USA, over 300 children visit hospitals each day due to burn injuries, and two of them die (Center for Disease Control and Prevention, 2016).

Compared to adults, children are at a higher risk for burn injuries because they are more curious, less able to control themselves, and often show poor judgment. This risk has also increased during the past few decades due to various factors, including an increase in the use of electrical machinery and, in some societies, a reduction in the level of supervision of children (Ha et al., 2017). Together, these factors have contributed to an increase in the incidence of burns in the Korean pediatric population (Korean National Health Insurance Service, 2015).

Burn injuries are among the most painful forms of trauma that a person can sustain (Browne, Andrews, Schug, & Wood, 2011). Burn pain is inherently difficult to manage because of the multi-faceted and variable experiences of each individual during the healing process and repeated treatment procedures (Gandhi, Thomson, Lord, & Enoch,

2010). Poor management of burn pain may lead to anticipatory anxiety before procedures and a decreased pain tolerance threshold (Gandhi et al., 2010). This may lead to avoidance that impairs optimal care and increases the risk of post-traumatic stress disorders (Gandhi et al., 2010).

After the initial pain caused by a burn injury, additional pain is experienced while children wait for the burn to heal. Since proper burn care requires debridement, wound cleansing, and changing “general dressing” (GD) (Jenkins & Young, 2010), even with the use of analgesics, pediatric burn patients may experience an ordeal that they perceive as unendurable (Gandhi et al., 2010).

Preschool children (i.e., 3–6 years old) have a limited cognitive capacity and lack self-control (Lee et al., 2013). Children at this developmental age may experience conflict, anxiety, and fear related to negative events, such as bodily harm or pain, that exceed their physical tolerance and mental abilities (Ha et al., 2017). Thus, for them, negative events such as painful procedures may lead to anxiety (Lee et al., 2013). Based on previous research, it has been reported that anxiety is associated with undesirable treatment outcomes, including changes in vital signs, reduced comfort, and increased stress levels (Lee et al., 2013; Pal, Ganesh, Karthik, Nanda, & Pal, 2014; Stoddard et al., 2002). Younger children in this age group tend to be more anxious and have more negative reactions to the procedure than children in other age groups (Ahmed, Farrell, Parrish, & Karla, 2011). However, because of the common misunderstanding that young children are less likely to be affected by trauma, this population has received little attention clinically and via research (De Young et al., 2012). Therefore, the pain and anxiety that they experienced was relatively underestimated.

Helping children to cope with pain and anxiety is one of the most vital responsibilities assumed by nurses (Ghabeli, Moheb, & Hosseini-Nasab, 2014), and to this end, nurses could provide information and intervention that may help minimize pain and anxiety (Ha et al., 2017). In recent years, conscious sedation (CS), which involves inducing sleep while maintaining consciousness but without any memory of what happened during the treatment, has been induced using intravenous and inhaled sedatives. With respect to the three stages of sedation comprising minimal, moderate, and deep sedation, CS results in minimal sedation and has been used in many types of pain-inducing procedures, including applications and changings of burn dressings. In this stage, the children respond normally to questions and independently maintain their airway and cardiovascular function (Kee, Kimble, Cuttle, & Stockton, 2013; Koo & Baek, 2009; Song, 2013). Thus, while anesthesia, which can be used for sedation during dressing changes, may lead to some problems such as respiratory depression, airway obstruction, and apnea, it could be an effective method for children if they

carefully follow instructions (Cote, Wilson, American Academy of Pediatrics, & American Academy of Pediatric Dentistry, 2016). Therefore, sedation may play a role in reducing pain and anxiety in a safe and effective pediatric healthcare environment (Song, 2013).

According to Kolcaba's (2003) Theory of Comfort, patients have healthcare needs such as comfort, which are both physical and mental, and through comfort, recovery can be achieved (Figure 1). This theory stresses patient-centered practice and the most common theme of comfort is the relief of pain, reduction of anxiety, and enhancement of comfort. Therefore, based on this theory, the main focus of this study was to enhance comfort by reducing the pain and anxiety, through the application of conscious sedation dressing (CSD).

For these reasons, we examined the effects of CSD, which is GD modified by the addition of a sedative for the reduction of pain and anxiety among children admitted to a hospital with burns. We hypothesized that it might help to mitigate the problems by allowing dressings to be applied comfortably, which would contribute to recovery from the injuries. The aim was to increase understanding of the effectiveness of CSD as an alternative intervention aimed at reducing dressing-related pain and anxiety among pediatric burn patients.

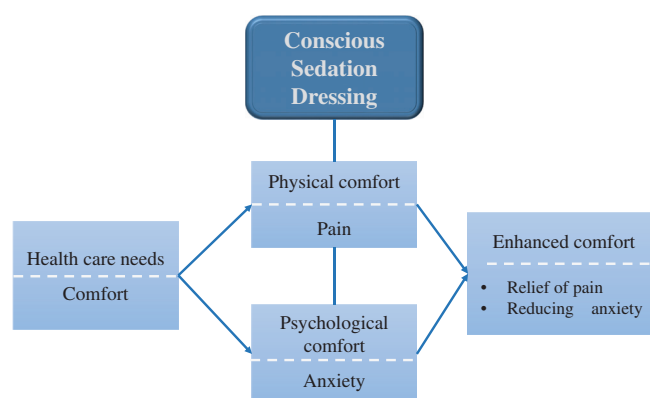


FIGURE 1 Theoretical framework

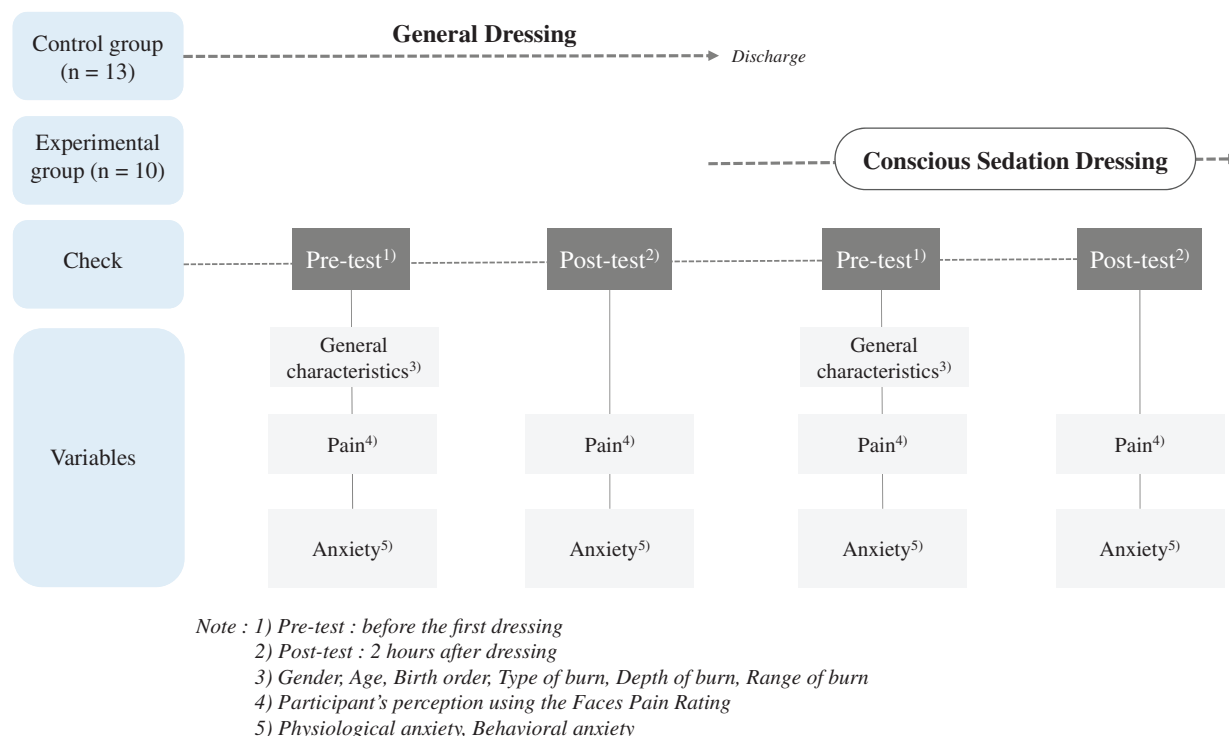
## 1.1 | Purpose

The aim of this study was to evaluate the effects of a CSD, which is regarded as an alternative to a GD, on pediatric burn patients' (a) pain and (b) anxiety levels.

## 2 | METHODS

### 2.1 | Design

A quasi-experimental design with a nonequivalent control group was used (Figure 2).



**FIGURE 2** Study design

## 2.2 | Setting and subjects

This study was carried out at H University Hospital in Seoul, South Korea, which is established as a burn clinic. The hospital in this study is a specialized burn hospital established in 1970 and services approximately 2,400 newly admitted burn patients per year. Following ethics approval and provision of parental consent, children were recruited prior to receiving their first dressing change through informed consent in the burn unit. Burn size and depth were assessed clinically using pediatric burn assessment rules and burn depth characteristics (Victoria State Trauma System, 2018) by a doctor with over 10 years of burn treatment.

The inclusion criteria were as follows: (a) age between 3 and 6 years; (b) an acute burn injury that covered greater than 10% of the total body surface area; (c) no previous experiences with burn dressings. We recruited preschool children because this developmental stage is the most vulnerable to pain and anxiety (Ha et al., 2017). In addition, according to the standards of the American Burn Association (2016), cases of pediatric patients with burns covering over 10% of their total body surface area are considered severe and require hospitalization.

Children were excluded if they: (a) had a burn occupying more than 20% of their total body surface; (b) had a third-degree burn; (c) had other health problems, such as developmental delay or a non-anxiety psychological disorder, in addition to a burn injury, or had been previously

hospitalized. Burns covering greater than 20% of the total body surface area are classified as a very severe condition and require transfer to the intensive care unit. Third-degree burn patients cannot feel pain due to damaged nerves. Other health problems might have influenced the outcome variables, including pain and anxiety.

The participants were assigned to the following two groups: (a) the experimental group, which comprised children who received a CSD; and (b) the control group, which comprised children who received GD care. The assignment to the experimental group or the control group was determined by the caregiver (usually the mother) after the strengths and weaknesses of and differences between GD and CSD were explained using approximately two pages of written material (size A4 paper).

The dressings, such as GD and CSD, were applied in the dressing room by trained healthcare professionals—nurse practitioners from the burn clinic with over 10 years of experience. The dressings of the patients in the two groups were performed by the same dressing team, to eliminate confounding factors that could influence the outcome variables. In addition, to minimize the risk of contamination between the two groups, we sequentially sampled them. Following the completion of the testing for the control group, the experimental group intervention commenced. Although data collection in the two groups did not simultaneously take place, no events that occurred during the data collection process for either group posed a threat to the study's validity.

Using G\*Power 3.1.7 (Faul, Erdfelder, Lang, & Buchner, 2007), it was determined that 13 participants were required in each group to achieve a medium effect size of .50 with a two-sample *t* test at a 95% confidence interval and a significance level of .05. Taking into consideration a dropout rate of approximately 20%, we included 15 participants in each group. During the course of the study, five children in the experimental group withdrew (three refused to participate further and two were transferred to another unit). Two children in the control group withdrew (refusal to participate). Ultimately, there was a total of 23 participants in the study, with 10 in the experimental group and 13 in the control group. (Figure 3).

## 2.3 | Measurement

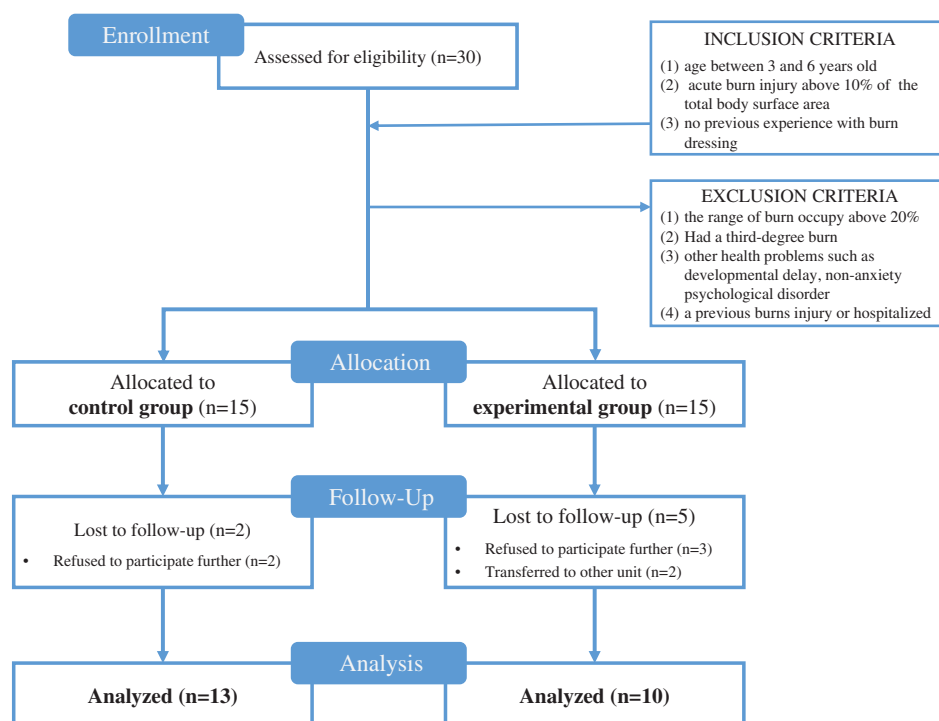
### 2.3.1 | Pain

The children's pain was assessed using the FACES Pain Rating Scale developed by Wong and Baker (1988). This instrument consists of a six-face scale for children, ranging from a child's happy face to a grimace. The child points to the face that best indicates the degree of pain that he or she is experiencing. Higher scores indicate greater pain. Pain assessment was conducted when the child expressed willingness to cooperate. In this study, Cronbach's alpha was .72. Several studies have shown that face scales are preferred by young children, in part because of their ease of application (Champion, Goodenough, & Wu, 2002).

### 2.3.2 | Anxiety

Physiological responses, including oxygen saturation levels (SpO<sub>2</sub>), respiratory rates (RR), pulse rates (PR), and blood pressure (BP) levels, were measured based on findings from previous research demonstrating that SpO<sub>2</sub>, BP, and PR may be influenced by anxiety levels (Chang, Kim, Ko, Bae, & An, 2009; Pal et al., 2014). Children's PR and BP were measured using an automated sphygmomanometer (Model: BP-8800C, Colin company, Komaki-city, Japan) and SpO<sub>2</sub> was measured using an oximeter (Model: Care Vision HP-110, Medical supply Co., Ltd., Wonju-si, Korea), which was checked periodically by the in-hospital machine inspection team to ensure compliance with the applicable medical safety standards. For each of the SpO<sub>2</sub>, RR, and PR measurements, we calculated the mean value of three recordings, which were obtained at 5 s intervals. In addition, to ensure accurate measurement of BP, the width of the cuff was 12.7 to 16.9 mm (Ha et al., 2017). The cuff was inflated sufficiently to enable accurate measurement. Two consecutive measurements were taken by skilled nurses. Inter-observer reliability was determined using a correlation coefficient, which was .96 in this study. Physiological responses were checked prior to going to the dressing room and 2 h after the dressing was applied, the time at which pain and anxiety are reported to peak, vital signs are stabilized, and the level of consciousness is clear (Weinberg et al., 2000).

Behavioral anxiety was assessed using the modified Yale Preoperative Anxiety Scale (m-YPAS). The m-YPAS is an observational behavioral checklist developed by Kain et al.



**FIGURE 3** Flow diagram

(1997) for the measurement of the five dimensions of anxiety in young children. The m-YPAS has been revised and translated for use with Korean children to accurately match the current study and consists of four categories (activity, emotional expressivity, state of arousal, and vocalization). It contains 17 items (Oh, 2001). A score on a two-point scale is assigned to each category according to the child's behavior; a score of one is assigned if the child exhibits a behavior related to a given item, while zero is assigned if the child does not exhibit any such behavior. Possible scores range from zero to 17, with higher scores indicating greater anxiety. Previous studies have reported reliability values measured by Cronbach's alpha of .73 (Kain et al., 1997) and .79 (Oh, 2001). In the current study, a Cronbach's alpha of .85 was obtained. In addition, the inter-rater reliability was high with a correlation coefficient of .97.

The content validity of all the measurement tools used in this study was reviewed by a panel of external experts. The

panel consisted of five child-health nursing professors, who tested the suitability of the questionnaire and confirmed that it was suitable for the assessment of pain and anxiety of pediatric burn patients. Each expert evaluated the appropriateness of each item using a four-point Likert scale (1 = not valid at all, 2 = not valid, 3 = valid, and 4 = highly valid). The content validity index of the tools (pain, anxiety) used in the current study was above 0.95, indicating that the measurement tools were valid.

## 2.4 | The dressing intervention

The children in both groups received the usual burn care, which included management of infection, prevention of skin contraction, and maintenance of fluid and electrolyte balance.

The burn dressings for both GD and CSD were the same (Figure 4). When they arrived at the dressing room, they

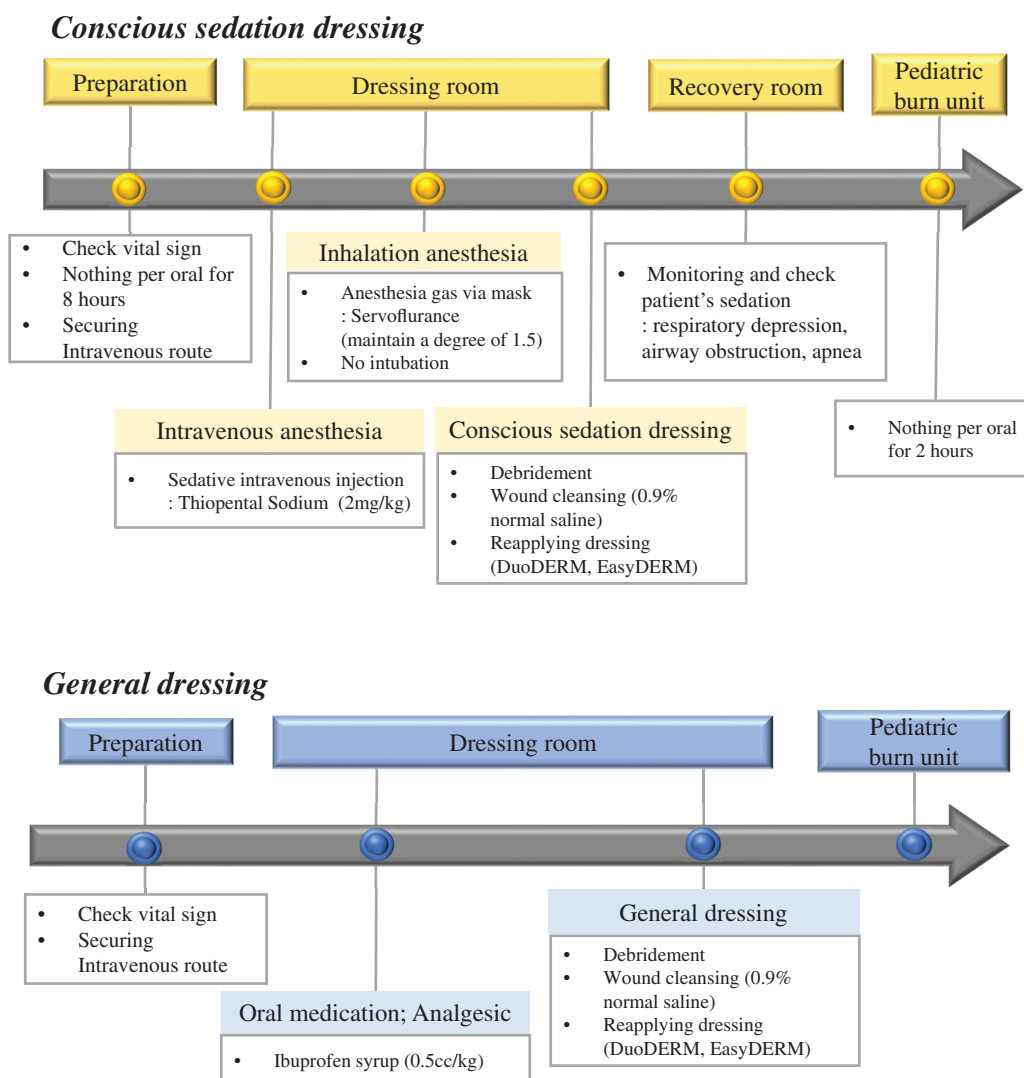


FIGURE 4 Intervention process

received an intravenous injection. In addition, the patient's condition was checked, including vital signs. After confirming the preparation, the dressing was performed by a professional dressing team, which included a nurse practitioner. All burns were debrided at the initial dressing change (blisters were de-roofed and dead skin wiped away with gauze) and 0.9% normal saline was used to clean the burn at every dressing change. Dressings were applied on the basis of the consultant's assessment and consisted of DuoDERM Extra Thin Dressing (ConvaTec Inc., Greensboro, NC, USA) or EasyDERM Thin (CGbio, Sungnam, Korea).

For the control group, who received GD, children were orally administered ibuprofen syrup (Brufen, 0.5 mL/kg) to alleviate pain.

For the experimental group, before initiating the CSD intervention, information regarding CS was provided to the caregiver, including not only the benefits, but also cautions and alternative methods of CSD for burns. An explanation of the reason for the "nothing per oral" restriction was added, stating that its purpose was to maintain airway reflexes and minimize the danger of aspiration into the lungs.

The intervention was performed as follows. CS was administered according to the guidelines set by the American Academy of Pediatrics and the American Academy of Pediatric Dentistry (Cote et al., 2016) and American College of Emergency Physicians (Godwin et al., 2014). CS was performed in the early morning, with the patients receiving nothing by mouth for 8 h (0 a.m.-8 a.m.) prior to the start of the intervention.

Before the first dressing change, participants initially received an intravenous injection of a sedative (thiopental sodium 2 mg/kg), which induced sleep. After arriving at the dressing room, inhalation anesthesia (sevoflurane, to maintain a minimum alveolar concentration of 1.5) was delivered by an anesthesiologist with the support of an anesthesiology nurse for monitored anesthesia care (MAC, Model: Tec 7, Datex-Ohmeda company, Madison, WI, USA).

The frequency of dressing change in both groups depended on the patient's condition, but was typically once per day. During the procedure, the patient's condition, such as vital signs, SpO<sub>2</sub> level, was checked every 5 min. Although it depended on the extent of the burn injury, the average duration was 40 min for CSD and 10 min for GD. After the CSD, the patients were transferred to a recovery room until their vital signs stabilized and their consciousness level became clear. During that time possible drug complications, including respiratory depression, airway obstruction, and apnea were monitored. After returning to the pediatric ward, the patients fasted for an additional 2 h.

The children in the control group received GD and dressing procedures that were similar to the experimental group, with the exception of using the recovery room.

All the participants received information regarding the standard procedures related to burn dressings from the nurses and support staff during the admission process.

## 2.5 | Data collection

Data were collected before the first dressing change from July 1 to November 8, 2015. Pediatric patients aged 3–6 years, who had scheduled burn dressing applications, were potential participants. The effects were tested at the following time points: prior to the application of the burn dressing (pre-test) and 2 h after the burn dressing that was not affected by sedative was placed (post-test). The variables were measured in both groups by the same research assistant.

## 2.6 | Ethical considerations

Ethics approval of the study was granted by the Institutional Review Board (IRB No: 2015-037) of H University Hospital, with which the first author is affiliated. Voluntary participation, anonymity, and confidentiality were ensured throughout the study. The children and their parents were informed that they had the right to withdraw from the study at any time. The IRB confirmed that there were no elements of this study that were a violation of human rights and that all the materials and processes conformed to proper ethical research procedures. A small gift (about 5 dollars) was given to each participant as a token of appreciation.

## 2.7 | Data analysis

Statistical analyses were performed using Statistical Package for Social Sciences, version 21.0 (IBM, Chicago, IL, USA). Chi-squared and *t* tests were performed to assess the homogeneity of the two groups. To compare the two groups' outcome variables, *t* tests were used when the data met parametric assumptions and the Mann–Whitney *U* test was used otherwise. All the analyses were conducted with significance level of  $\alpha = .05$ .

# 3 | RESULTS

## 3.1 | Homogeneity of demographic characteristics and pre-burn dressing pain and anxiety levels

Table 1 presents the baseline demographic characteristics and pre-burn dressing pain and anxiety levels of the children

**TABLE 1** Homogeneity of demographic characteristics and pre-burn dressing pain and anxiety levels ( $N = 23$ )

Characteristics	Classification	Con. ( <i>n</i> = 13)	Exp. ( <i>n</i> = 10)	$\chi^2/t$ ( <i>P</i> )	Effect size
		n (%) / Mean $\pm$ SD	n (%) /M $\pm$ SD		
General characteristics					
Sex	Male	7 (53.8)	7 (70.0)	0.62 (.431)	0.16
	Female	6 (46.2)	3 (30.0)		
Age		5.08 $\pm$ 1.55	4.70 $\pm$ 1.57	0.58 (.571)	0.24
Birth order	First	8 (61.5)	6 (60.0)	0.01 (.940)	0.02
	Second	5 (38.5)	4 (40.0)		
Type of burn	Scalding burn	12 (92.3)	6 (60.0)	3.47 (.063)	0.39
	Contact burn	1 (7.7)	4 (40.0)		
Depth of burn	Shallow 2°	4 (30.8)	0 (0.0)	3.73 (.054)	0.40
	Deep 2°	9 (69.2)	10 (100.0)		
Range of burn	≤5%	9 (69.2)	6 (60.0)	0.21 (.645)	0.10
	≥6%	4 (30.8)	4 (40.0)		
Pre-score					
Pain		2.62 $\pm$ 1.71	2.60 $\pm$ 1.00	0.03 (.980)	0.01
Physiological responses	Systolic BP	114.54 $\pm$ 9.07	120.00 $\pm$ 6.33	1.62 (.120)	0.70
	Diastolic BP	60.31 $\pm$ 7.72	65.00 $\pm$ 11.66	1.16 (.259)	0.47
	PR	96.31 $\pm$ 9.60	104.40 $\pm$ 12.57	1.80 (.087)	0.72
	RR	21.92 $\pm$ 1.04	22.60 $\pm$ 0.84	1.68 (.108)	0.72
	SpO <sub>2</sub>	98.23 $\pm$ 0.93	98.20 $\pm$ 1.23	0.07 (.946)	0.03
Behavioral anxiety		4.85 $\pm$ 0.99	4.80 $\pm$ 0.92	0.11 (.910)	0.05

Abbreviations: BP, blood pressure; Con., control group; Exp., experimental group; PR, pulse rate; RR, respiratory rate; SpO<sub>2</sub>, O<sub>2</sub> saturation levels.

$t$  test effect size = Cohen's  $d$ , Chi-square test effect size =  $\phi$ .

in the two groups. No significant differences were found for any of the children's or parents' demographic characteristics such as children's sex, age, birth order, type of burn, depth of burn, and range of burn.

There were no significant differences between the experimental and control groups with regard to the children's perceived pre-dressing pain and anxiety levels, including physiological responses and behavioral anxiety. In addition, the effect size for these variables ranged from 0.01 to 0.72 (Cohen's  $d$ ) and from 0.02 to 0.40 ( $\phi$ ). Despite the medium effect size for sex, type and depth of burn, systolic and diastolic BP, PR, RR, the  $P$  value of  $t$  test and Chi-square were not significant. Therefore, the two groups were considered homogenous. The differences between the groups does not affect the results and subsequent conclusions.

### 3.2 | Effect of a CSD

The mean differences of pain and anxiety scores in the two groups are presented in Table 2.

#### 3.2.1 | Changes in children's pain

Children in the experimental group experienced significantly lower post-test pain than those in the control group. These results indicate that the CSD reduced pain, which may reduce the negative psychological impact on pediatric patients with a large effect size.

#### 3.2.2 | Anxiety levels

The children in the experimental group had significantly lower post-test physiological response measures than those in the control group with large effect size (systolic BP, diastolic BP, PR, and RR). However, there was no significant difference between the experimental and control groups in SpO<sub>2</sub>. In addition, there was no significant difference in the behavioral anxiety scores between the two group. These results suggest that the children in the experimental group experienced significantly smaller physiological responses than those in the control group.

**TABLE 2** Effects of conscious sedation dressing on Children's pain and anxiety ( $N = 23$ )

Variable classification	Control group (n = 13)			Experimental group (n = 10)						
	Mean (SD)			Mean (SD)						
	Pre	Post	Difference <sup>a</sup>	Pre	Post	Difference <sup>a</sup>	t or U	d	Power	P
Pain	2.62(1.71)	3.85(1.90)	1.23(1.54)	2.60(0.97)	2.00(0.94)	−0.60(0.97)	3.29 <sup>b</sup>	1.00	.77	.003
Physiological anxiety										
Systolic BP	114.54(9.07)	123.92(7.24)	9.38(3.97)	120.00(6.33)	117.70(4.62)	−2.30(7.04)	5.05	1.22	.84	<.001
Diastolic BP	60.31(7.72)	65.62(9.78)	5.31(8.25)	65.00(11.66)	63.50(7.93)	−1.50(6.70)	2.12	0.93	.74	.046
PR	96.31(9.60)	100.69(8.46)	4.38(5.04)	104.60(12.57)	103.40(15.31)	−1.20(6.75)	2.28	1.00	.77	.033
RR	21.92(1.04)	22.31(1.18)	0.38(0.65)	22.60(0.84)	22.40(0.84)	−0.20(0.42)	2.47	1.09	.80	.022
SpO <sub>2</sub>	98.23(0.93)	96.77(0.18)	−0.77(0.95)	98.20(1.23)	98.30(1.57)	0.10(0.88)	0.46	0.20	.32	.653
Behavioral anxiety	4.85(0.99)	5.62(2.14)	0.77(2.05)	4.80(1.23)	4.80(1.23)	0.00(1.23)	1.10 <sup>b</sup>	0.32	.39	.285

Abbreviations: BP, blood pressure;  $d$ , effect size;  $M \pm SD$ , mean  $\pm$  standard deviation; PR, pulse rate; RR, respiratory rate; SpO<sub>2</sub>, O<sub>2</sub> saturation levels.

<sup>a</sup>Difference = Post-score – Pre-score.

<sup>b</sup> $U$ , Mann–Whitney  $U$  test.

## 4 | DISCUSSION

During the past three or four decades, there have been great advances in pediatric burn treatment, but the treatment processes, such as dressing changes, are extremely painful and thus continue to provoke anxiety (Stoddard et al., 2002). Even with administration of pain relief drugs prior to the procedure, pain related to dressing changes have been shown to be the most severe when compared to other types of pain related to burns (Gravante et al., 2009; Oh, 2001; Richardson & Mustard, 2009). Because the dressing of burn wounds commonly involves wound cleansing, blister debridement, and the application of antibacterial drugs, these procedures can be a physically and emotionally devastating experience (Gravante et al., 2009; Kee et al., 2013). Many of these children experience substantial pain and anxiety during dressing change procedures, and this remains a major challenge when treating acute pediatric burn injuries (Kee et al., 2013).

Monitoring of pain is complicated by the nature of the burn injury and reaction to distress after a burn (Gandhi et al., 2010). Pain has negative effects on physiological and psychological conditions; therefore, an adequate level of pain control is an essential factor in improving outcomes. However, pain in children with burns has typically been underestimated (Stoddard et al., 2002). Although dressing changes are the most painful form of acute pain for burn patients (Browne et al., 2011), they have not been considered important. Gandhi et al. (2010) pointed out that the anticipatory distress associated with dressing changes following a burn injury has scarcely been reported in the literature.

The key to successful nursing care in children with burns is to provide comfort even when they have difficulties. For the continuous and accurate assessment of pain, it is necessary

to observe the responses to the accompanying procedures such as dressing change with attention. Therefore, the dressing-related pain in burn injuries needs to be considered at the forefront of the nursing care plan for pediatric patients.

One of the primary tasks on the burn unit is the relief of pain and anxiety, which can exacerbate each other (Stoddard et al., 2002). In other studies, anxiety has been shown to have a strong positive correlation with pain; children with more anxiety are shown to experience more pain (Fortier, Del Rosario, Rosenbaum, & Kain, 2010; Zhuo, 2016). Thus, decreasing children's anxiety is an important intervention that could aid the management of pain related to burn dressings, which are inevitable procedures in the treatment of burns.

In our study, the experimental group's pain and physiological responses were significantly lower than those of the control group. The effect size for pain was about 1.00, and the effect size for physical symptoms of anxiety was 0.93. These results suggest that a CSD can be an effective tool for the reduction of distress and the associated physiological response, as well as the level of pain experienced by pediatric burn patients.

Although the behavioral anxiety level was increased in the control group, it was not changed in the experimental group, and the difference between the two groups was not significant. This may be a result of the small sample size. Further study is needed to examine this effect.

Until now, potential pain and anxiety-reducing intervention strategies have rarely been examined (Fincher, Shaw, & Ramelet, 2012). The present study demonstrated that children in the experimental group experienced lower post-dressing pain than those in the control group. CSD lowers children's sensitivities to pain and allows them to feel more comfortable than when receiving a GD. However, considering that anxiety or fear often enhances the feeling of pain (Zhuo, 2016), the effect may be greater. Chieng, Chan,

Klainin-Yobas, and He (2013) also reported that children who had a higher level of perioperative anxiety experienced more postoperative pain. Therefore, the interaction among all these factors should be considered.

To the best of our knowledge, no other studies of the effects of CSD on burn patients have been performed. CS has been used for dental treatment in adults, where it produced a higher level of satisfaction (Shin, Lee, & Min, 2009). In a study of 335 children (average age = 40.9 months) receiving dental treatment, a positive reaction after recovery was reported when CS was used (Koo & Baek, 2009).

Preschool children with burns are a vulnerable population who can no longer be neglected (De Young et al., 2012). If a child is in a state of pain or distress, a CSD may be considered. In addition, management of pain and anxiety should be prioritized and comprise of a multidisciplinary approach involving many specialized health professionals and, importantly, the child's parents/care givers (Gandhi et al., 2010).

This study aimed at reducing children's pain and anxiety related to treatment procedures. Pain and anxiety related to procedures should be reduced not only for humanitarian reasons, but also to achieve speedy recovery. The findings in this study provide the information that should help medical health personnel in a hospital's burn clinic to plan the necessary procedures for pediatric burn patients.

In the current study, we adopted Kolcaba's (2003) Theory of Comfort as the basis of the theoretical framework. According to this theory, comfort is the final goal of nursing care and through this, recovery can be achieved. With the application of CSD to promote pain relief and the reduction of anxiety, comfort can be increased.

Although the sample size in this study was insufficient due to the drop of three pediatric patients in the experimental group, the power of the main comparisons ranged from 0.74 to 0.84. Thus, the results suggest CSD may contribute to the enhancement of comfort. For nurses, as health professionals, comfort for pediatric patients should be considered important.

The strength of this study is that the results can help health professionals to recognize the potential effects of CSD as an effective method to alleviate the pain and anxiety of pediatric burn patients during dressing change. CSD could be valuable for providing comfort to pediatric patients with burns in the clinical setting.

#### 4.1 | Limitations

Despite the encouraging results, the limitations of this study need to be acknowledged. First, the sample size of this study was three less than required. Therefore, it lacks sufficient data to draw definite conclusions. To increase the generalizability of findings, further research that includes preschool children from different trauma populations is needed.

Second, the physiological responses used as an anxiety measurement tool in this study may be affected by pain and show a greater effect. In the future, further studies should be undertaken to investigate this issue in greater depth.

However, since this is the first study to assess the effects of CSD in nursing pediatric burn patients in Korea, we believe that the results of this study provide interesting evidence that could encourage further research. If a prospective study with a larger sample size is conducted, we might be able to draw more reliable conclusions regarding the effects of CSD in pediatric burn patients.

## 5 | CONCLUSIONS

With its focus on the use of CS, this study evaluated children's pain and anxiety associated with burn dressings. The findings suggest that children who receive a CSD may perceive the dressing to be less threatening than those who receive a GD. This study provides some empirical evidence that CSD may be more effective than GD in minimizing children's dressing-related pain and anxiety levels. Based on these findings, the authors suggest that some form of preparation is needed to reduce the pain and anxiety related to burn dressings. Therefore, our findings may be tentatively applied to burn clinics in the hospital setting.

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## CONFLICT OF INTEREST

None of the authors has any actual or potential of interest including any financial, personal, or other relationships with other people or organizations that could inappropriately influence or be perceived to influence this work.

## AUTHOR CONTRIBUTIONS

J. O.Y. S.-J. K. Responsible for the study conception and design, made critical revisions to the study, and led the drafting of this manuscript. J.O.Y S.-J. K. Performed the data analysis and participated in the drafting of this manuscript. H.C. Conducted data collection and participated in a revision of this manuscript. H.C. K.E.L. Performed the data analysis and provided critique of the intellectual content. J.O.Y. Planned the educational method and provided critique for the educational strategy. K.E.L Substantially revised and edited the manuscript.

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## REFERENCES

- Ahmed, M. I., Farrell, M. A., Parrish, K. & Karla, A. (2011). Preoperative anxiety in children risk factors and non-pharmacological management. *Middle East Journal of Anesthesiology*, 21(2), 153–164.
- American Burn Association. (2016). *Burn incidence and treatment in the United States: 2016*. Retrieved from [http://www.ameriburn.org/resources\\_factsheet.php](http://www.ameriburn.org/resources_factsheet.php)
- Browne, A. L., Andrews, R., Schug, S. A. & Wood, F. (2011). Persistent pain outcomes and patient satisfaction with pain management after burn injury. *Clinical Journal of Pain*, 27(2), 137–145. <https://doi.org/10.1097/AJP.0b013e3181f7f9bb>.
- Center for Disease Control and Prevention. (2016). *Protect the ones you love: Child injuries are preventable, burn prevention*. Retrieved from <http://www.cdc.gov/safechild/burns/>
- Champion, G. D., Goodenough, B., & Wu, E. (2002). *Children's self-report of pain intensity using six different scale types*. Paper presented at the Seventh International Symposium on Pediatric Pain, June 2000, London, England
- Chang, S. B., Kim, H. S., Ko, Y. H., Bae, C. B. & An, S. E. (2009). Effects of abdominal breathing on anxiety, blood pressure, peripheral skin temperature and saturation oxygen of pregnant women in preterm labor. *Korean Journal of Women's Health and Nursing*, 15(1), 32–42. <https://doi.org/10.4069/kjwhn.2009.15.1.32>.
- Chieng, Y. J. S., Chan, W. C. S., Klainin-Yobas, P. & He, H. (2013). Perioperative anxiety and postoperative pain in children and adolescents undergoing elective surgical procedures: A quantitative systematic review. *Journal of Advanced Nursing*, 70(2), 243–255. <https://doi.org/10.1111/jan.12205>.
- Cote, C. J., Wilson, S., American Academy of Pediatrics & American Academy of Pediatric Dentistry. (2016). Guidelines for monitoring and management of pediatric patients before, during, and after sedation for diagnostic and therapeutic procedures: Update 2016. *Pediatrics*, 138(1), e20161212.
- De Young, A. C., Kenardy, J. A., Cobham, V. E. & Kimble, R. (2012). Prevalence, comorbidity and course of trauma reactions in young burn-injured children. *Journal of Child Psychology and Psychiatry*, 53(1), 56–63. <https://doi.org/10.1111/j.1469-7610.2011.02431.x>.
- Faul, F., Erdfelder, E., Lang, A. G. & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavioral Research Methods*, 39(2), 175–191.
- Fincher, W., Shaw, J. & Ramelet, A. S. (2012). The effectiveness of a standardized preoperative preparation in reducing child and parent anxiety: A single-blind randomized controlled trial. *Journal of Clinical Nursing*, 21(7–8), 946–955. <https://doi.org/10.1111/j.1365-2702.2011.03973.x>.
- Fortier, M. A., Del Rosario, A. M., Rosenbaum, A. & Kain, Z. N. (2010). Beyond pain: Predictors of postoperative maladaptive behavior change in children. *Pediatric Anesthesiology*, 20(5), 445–453. <https://doi.org/10.1111/j.1460-9592.2010.03281.x>.
- Gandhi, M., Thomson, C., Lord, D. & Enoch, S. (2010). Management of pain in children with burns. *International Journal of Pediatrics*, 2010, 825657. <https://doi.org/10.1155/2010/825657>.
- Ghabeli, F., Moheb, N. & Hosseini-Nasab, S. D. (2014). Effect of toys and preoperative visit on reducing children's anxiety and their parents before surgery and satisfaction with the treatment process. *Journal of Caring Sciences*, 3(1), 21–28. <https://doi.org/10.5681/jcs.2014.003>.
- Godwin, S. A., Burton, J. H., Gerardo, C. J., Hatten, B. W., Mace, S. E., Silvers, S. M., ... Fesmire, F. M. (2014). Clinical policy: Procedural sedation and analgesia in the emergency department. *Annals of Emergency Medicine*, 63(2), 247–258. <https://doi.org/10.1016/j.annemergmed.2013.10.015>.
- Gravante, G., Caruso, R., Sorge, R., Fabio, N., Pietro, G. & Valerio, C. (2009). Nanocrystalline silver: A systematic review of randomized trials conducted on burned patients and an evidence based assessment of potential advantages over older silver formulations. *Annals of Plastic Surgery*, 63(2), 201–205. <https://doi.org/10.1097/SAP.0b013e3181893825>.
- Ha, Y. S., Lee, J. H., Kim, H. S., Kim, S. H., Kim, S. J., ... Chae, M. Y. (2017). *Child and adolescents nursing I*. Seoul, South Korea: Shinkwang Publication.
- Jenkins, A. T. A. & Young, A. (2010). Smart dressing for the prevention of infection in pediatric burns patients. *Expert Reviews in Antibiotics and Infection Therapy*, 8(10), 1063–1065. <https://doi.org/10.1586/eri.10.98>.
- Kain, Z. N., Mayes, L. C., Cicchetti, D. V., Bagnall, A. L., Finley, J. D. & Hofstadter, M. B. (1997). The Yale preoperative anxiety scale: How does it compare with a “gold standard”. *Anesthesia and Analgesia*, 85(4), 783–788.
- Kee, E. M., Kimble, R. M., Cuttle, L. & Stockton, K. (2013). Comparison of three different dressings for partial thickness burns in children: Study protocol for a randomized controlled trial. *Trials*, 14, 403. <https://doi.org/10.1186/1745-6215-14-403>.
- Kolcaba, K. (2003). *Comfort theory and practice: A vision for holistic health care and research*. New York, NY: Springer.
- Koo, J. E. & Baek, K. W. (2009). Post sedation events in pediatric patients sedated for dental treatment. *Journal of the Korean Academy of Pediatric Dentistry*, 36(2), 209–216.
- Korean National Health Insurance Service. (2015). *My child's burn, initial first aid is important*. Seoul, South Korea: National Health Insurance.
- Lee, J. H., Jung, H. K., Lee, G. G., Kim, H. Y., Park, S. H. & Woo, S. C. (2013). Effect of behavioral intervention using smartphone application for preoperative anxiety in pediatric patients. *Korean Journal of Anesthesiology*, 65(6), 508–518. <https://doi.org/10.4097/kjae.2013.65.6.508>.
- Oh, J. J. (2001). *The effect of the parental presence on the reduction of preoperative anxiety of young child in operating room*. (Unpublished doctoral dissertation). Chonnam National University, Gwangju, South Korea.
- Pal, G. K., Ganesh, V., Karthik, S., Nanda, N. & Pal, P. (2014). The effects of short-term relaxation therapy on indices of heart rate variability and blood pressure in young adults. *American Journal of Health Promotion*, 29(1), 23–28.
- Richardson, P. & Mustard, L. (2009). The management of pain in the burns unit. *Burns*, 35(7), 921–936. <https://doi.org/10.1016/j.burns.2009.03.003>.
- Shin, Y. S., Lee, J. R. & Min, K. J. (2009). A study on influence of sleep dental treatment on satisfaction degree and revisit to dental clinics. *Journal of the Korean Academy of Dental Hygiene Education*, 9(3), 415–425.

- Song, J. H. (2013). Procedural sedation and analgesia in children. *Journal of the Korean Medical Association*, 56(4), 271–278. <https://doi.org/10.5124/jkma.2013.56.4.271>.
- Stoddard, F. J., Sheridan, R. L., Saxe, G. N., King, B. S., King, B. H., Chedekel, D. S., ... Martyn, J. A. J. (2002). Treatment of pain in acutely burned children. *Journal of Burn Care Rehabilitation*, 23(2), 135–156. <https://doi.org/10.1097/00004630-200203000-00012>.
- Victoria State Trauma System. (2018). *Paediatric burns sub guideline*. Retrieved from <http://trauma.reach.vic.gov.au/guidelines/paediatric-trauma/paediatric-burns-sub-guideline#overview>
- Weinberg, K., Birdsall, S., Vail, D., Marano, M. A., Petrone, S. J. & Mansour, H. E. (2000). Pain and anxiety with burn dressing change: Patient self-report. *Journal of Burn Care Rehabilitation*, 2(2), 157–161. <https://doi.org/10.1097/00004630-200021020-00013>.
- Wong, D. & Baker, C. (1988). Pain in children: Comparison of assessment. *Pediatric Nursing*, 14(1), 9–17.
- Zhuo, M. (2016). Neural mechanisms underlying anxiety-chronic pain interactions. *Trends in Neurosciences*, 39(3), 136–145. <https://doi.org/10.1016/j.tins.2016.01.006>.

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