CE 1.5 Contact Hours

# Intranasal Fentanyl as a Pain Management Modality During Dressing Changes in the Outpatient Setting

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**Objective:** The purpose of this study was to compare the effectiveness of intranasal (IN) fentanyl versus an oral opioid for managing pain during a pediatric burn dressing change in the outpatient setting.

**Methods:** Previously healthy children with burn injuries who underwent dressing changes in the outpatient setting were prospectively enrolled in a comparative trial. The patients were matched based on demographics, burn size, and location. The patients were divided into two treatment groups: One group received IN fentanyl immediately before their dressing change, whereas the other group received an oral opioid 30 minutes before their burn clinic visit. Revised Face, Legs, Activity, Cry, Consolability (rFLACC) pain scores were calculated to assess effectiveness.

**Results:** Sixty-four patients were included ($n$ = 32 per group). rFLACC scores for children who received IN fentanyl decreased from 5.06 ± 2.5 during treatment to 0.50 ± 0.14 after treatment ($p < .0001$). Similarly, rFLACC scores for children who received an oral opioid decreased from 6.47 ± 2.3 during treatment to 1.19 ± 1.9 after treatment ($p < .0001$). There was no significant difference in the average rFLACC pain scores of the two groups ($p > .05$).

**Conclusion:** IN fentanyl and oral opioid are equally effective for managing pain associated with burn dressing changes in the outpatient setting. However, IN fentanyl showed a more rapid onset of action and provided a more reliable form of pain control.

**KEY WORDS:** intranasal fentanyl, oral opioid, outpatient clinic, pediatric burn

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## INTRODUCTION

Pain control with a timely, age- and dose-appropriate analgesic is essential for successful dressing changes with pediatric burn injuries in the outpatient setting. Proper pain management must consider the time and effort required for the dressing change as well as address the emotional state of the child and/or parents. Repeated evaluation of the child's analgesia during the dressing change is equally important to ensure optimal pain relief (Gandhi, Thompson, Lord, & Encoch, 2010). Two main factors in managing pediatric pain depend on the child's ability to articulate the level of pain experienced as well as the understanding of the caregiver or medical provider regarding how painful burn dressing changes can be (Mudd, 2011).

Care providers in the outpatient setting are challenged to manage the cleansing of wounds, complex dressing changes, soft casting, suture removal, sliver nitrate application, and deflating blisters with a limited number of medications available for use. The literature validates the conservative use of an oral opioid in the outpatient setting, although many emergency departments are now replacing oral opioids with intranasal (IN) fentanyl because of fast onset and easy administration (Bailey & Trottier, 2016; Saunders, Adelgais, & Nelson, 2010).

Oral opioids administered before treatment have both benefits and drawbacks. They often provide successful analgesia but can have slow onset, long half-life, extensive first-pass metabolism, and poor bioavailability (20%–40%; Smith, 2012). Common side effects of

oral opioid medications include constipation, nausea/vomiting, sedation, and dizziness (Barletta, Asgeirsson, & Senagore, 2011).

Fentanyl has several properties that make it ideal for use before the outpatient dressing changes of pediatric burn injuries. It has a rapid onset (reaches therapeutic level within 2–6 minutes), is a synthetic opioid with rapid clearance (30–60 minutes), and has a duration of analgesia lasting less than 1 hour (Christrup, Foster, Popper, Troen, & Upton, 2008; Foster, Upton, Christup, & Popper, 2008). Utilizing fentanyl via IN route allows the medication to enter the cerebrospinal fluid via the olfactory mucosa, resulting in an almost immediate effect on the central nervous system (Hansen, Mathiesen, Trautner, & Dahl, 2012; Panagiotou & Mystakidou, 2010). Fentanyl's analgesic properties have been shown to be equal to those of oxycodone (Gandhi et al., 2010) and comparable with intravenous (IV) morphine (Borland, Jacobs, King, & O'Brien, 2007). Fentanyl lacks histamine release and produces fewer respiratory and cardiovascular side effects compared with other opioids (Fenster, Dayan, Babineau, Aponte-Patel, & Tsze, 2016). The most serious side effect of fentanyl is respiratory depression, which is dose related (Grape, Schug, Lauer, & Schug, 2010). Finally, IN fentanyl is cost-effective. One 100-mcg vial of fentanyl costs approximately $0.60, and the total cost for supplies typically runs $5–$7 (Wolfe & Braude, 2010).

Our objective in this study was to compare the efficacy of IN fentanyl with an oral opioid. We hypothesized that the administration of IN fentanyl immediately before outpatient burn dressing changes would achieve a higher level of pain control compared with medicating with an oral opioid.

## METHODS

This study is an institution-approved, prospective, comparative trial conducted in the outpatient clinic of a regional pediatric trauma and burn center. The study spanned calendar year 2014 and included children between the ages of 6 months and 7 years. Children similar in age and injury were grouped by their premedication status. One group was premedicated with an oral opioid by their caregiver 30–45 minutes before their outpatient burn clinic visit. The dosage for the medication was calculated by the physician who wrote the prescription. Those patients who received IN fentanyl were dosed at 1.5 mcg/kg per dose with a maximum dose of 100 mcg. The dose was administered 15 minutes before the dressing change. Data collected included patient demographics, burn size, burn location, type of dressing change or procedure performed, and revised Face, Legs, Activity, Cry, Consolability (rFLACC) scores at the midpoint of the dressing change and after the dressing change was completed.

The rFLACC tool has been adequately validated for use in pediatric patients to assess both postprocedural and burn pain (Babl, Crellin, Cheng, Sullivan, & O'Sullivan, 2017; Shen et al., 2017). The rFLACC pain scoring tool is divided into five categories; each category scores 0–2. The total scores range from 0 = *no pain* to 10 = *most pain*.

IN fentanyl was administered via an atomizer to the group of children who did not receive an oral opioid before their outpatient burn dressing change. The atomizer is easy to use, provides rapid absorption in the nasal mucosa, and decreases the amount of medication lost due to swallowing or spitting up (Mudd, 2011). A burn nurse closely monitored each child during administration, throughout the dressing change, and during a brief recovery period. The rFLACC pain scoring tool was utilized by the burn nurses to assess the severity of the patient's pain. This tool allowed the provider to document a pain score based on the behavior of the child regardless of age and verbal skill level. The dressing change included cleansing, dressing changes, soft casting, suture removal, silver nitrate application, and deflating blisters (Table 1).

Providers were also given the opportunity to comment on the usefulness, efficacy, and safety of IN fentanyl using a five-question Likert scale with a 1–5 scoring model. This was completed by nine burn team members who were involved in the outpatient dressing change. The team consisted of a burn surgeon, burn nurses, occupational therapists, physical therapists, a child life specialist, a burn psychologist, and a clinical social worker.

**Table 1: Procedures Performed**

| | Cleaned | Redressed | Casted | Sutures Removed | Silver Nitrate | Blisters Deflated |
|---|---|---|---|---|---|---|
| IN fentanyl | 33 | 33 | 3 | 0 | 2 | 3 |
| Oral opioid | 33 | 33 | 18 | 1 | 0 | 0 |

### Analysis

Statistical analysis was performed using SAS/STAT Software, Version 9.4 (Cary, North Carolina). The data were not normally distributed and thus required the use of nonparametric methods. A repeated measure of analysis test was conducted to determine if the decrease seen in the pain level was statistically different between the two medications.

## RESULTS

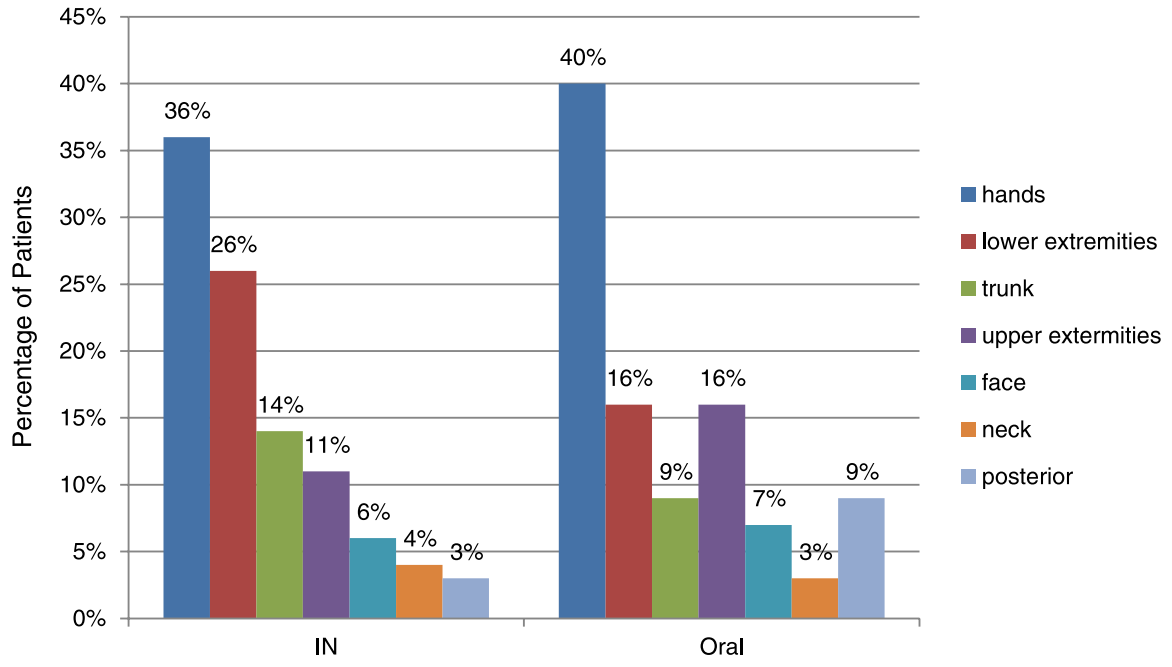
This study is a single-center, prospective, comparative trial conducted in the outpatient clinic with 64 children enrolled. Thirty-two children who received IN fentanyl were compared with 32 children who received oral opioids before their outpatient burn clinic dressing change. The mean age of the IN fentanyl group was 23 months (*SD* = 14.3 months) with 19 (58%) boys and 14 (42%) girls. These patients had an average total body surface area of 4.5% with 70 burned areas. Most of the injuries were to the hands (36%), lower extremities (26%), and trunk (14%; Table 2). The patients who received an oral opioid had a mean age of 27 months (*SD* = 20.5 months) with 13 (40%) boys and 21 (60%) girls. The patients in this group had an average total body surface area of 3.1 % with 68 burned areas. Most burn injuries were to the hands (40%), upper extremities (16%), and lower extremities (16%; Table 2).

Children who received IN fentanyl reported an average rFLACC pain score of 5.06 ± 2.5 at the midpoint of treatment and 0.50 ± 0.14 after treatment ($p < .0001$; Table 3). In comparison, the children who received an oral opioid reported an average rFLACC score of 6.47 ± 2.3 at the midpoint of treatment and 1.19 ± 1.9 after treatment ($p < .0001$; Table 4). Both opioids showed a decrease in rFLACC score; however, one method of pain control did not prove to be superior to the other ($p = .2231$; Table 5).

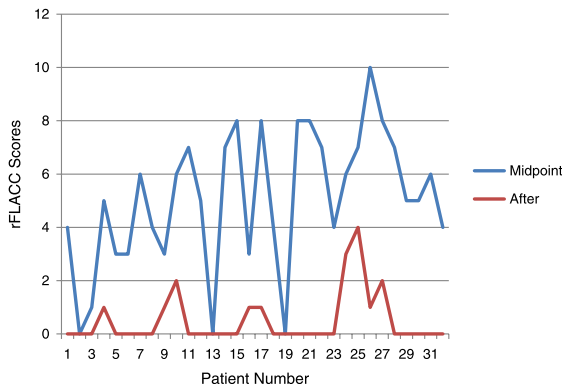
Adverse events occurred in 2 of the 32 patients (6%) who received IN fentanyl. Both patients experienced decreased $SpO_2$ saturations after IN fentanyl administration to 86% and 89%. The patient whose saturation reached 86% was placed on supplemental oxygen for the balance of the dressing change, whereas the other patient received verbal stimuli by both staff and family. Both patients quickly returned to baseline with $SaO_2$ in the mid-90s. Each patient had received 1.5 mcg/kg of IN fentanyl, was opioid naive, and was back to baseline within 20 minutes of administration.

The results of the five-question Likert scale indicated that care providers believed in the efficacy and safety of IN fentanyl during a dressing change. On average, the effectiveness of IN fentanyl was ranked at 4.25 of 5 (range = 3–5). Care providers found it especially useful when the child did not receive an oral opioid before their dressing change, and the injury required

**Table 2: Burn Demographics by Percentage**



## Table 3: rFLACC Scores for IN Fentanyl



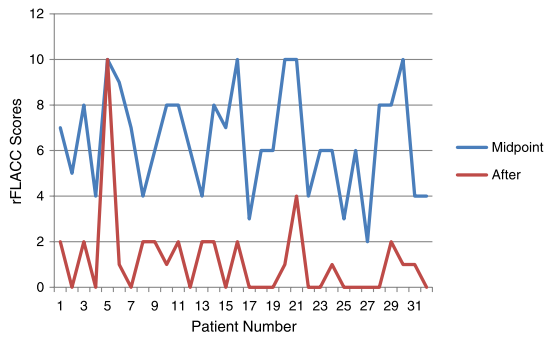

significant intervention such as deflation of blisters and deep cleaning. Each child's parent/guardian was comfortable with their child receiving IN fentanyl during a dressing change (4.25/5, range = 3–5). Team members reported confidence in the safety of the patient who received IN fentanyl (4.38/5, range = 4–5).

## DISCUSSION

Burn injuries are painful, and patients require analgesia before a dressing change. The administration of an oral opioid before the child's dressing change is time intensive, has unpredictable absorption rates, and creates unnecessary delays (Borland et al., 2007; Wolfe & Braude, 2010). Alternatively, IV opioids require IV cannulation, which is often impractical. IV cannulation is difficult to achieve and requires another painful procedure (Murphy et al., 2014; Saunders et al., 2010). Because of the efficacy and noninvasive mode of administration, IN fentanyl is a valuable option. The effectiveness and safety of IN fentanyl are well documented in the literature (Fenster et al., 2016; Furyk, Grabowski, & Black, 2009; Mudd, 2011).

Provider comfort and satisfaction also affect the medical decision making in the administration of opioids

## Table 4: rFLACC Scores for Oral Opioid




## Table 5: rFLACC Scores

| | rFLACC During | rFLACC After | |
|---|---|---|---|
| IN fentanyl | 5.06 (*SD* = 2.5) | 0.5 (*SD* = 0.14) | $p < .0001$ |
| Oral opioid | 6.46 (*SD* = 2.3) | 1.1 (*SD* = 1.9) | $p < .0001$ |

(Mathew, Kim, & Zempsky, 2016). Although conducting a survey on satisfaction is subjective, the medical providers expressed a high level of satisfaction with IN fentanyl for burn dressing changes. Therefore, the administration of IN fentanyl has become our standard of care for patients who will benefit from the form of pain control.

### Limitations

The study has several limitations. One was the small sample size. Future studies should include a larger sample size to test the effects of this medication at a variety of doses and how to incorporate additional medications such as anxiolytics. Another limitation is determining the appropriate pain score as this is a subjective piece of information and an accurate recording may be skewed by bias and/or assumption of the medical providers. Finally, although the dose of IN fentanyl was consistently provided at 1.5 mcg/kg, the dose of oral opioid administered was solely dependent on the child's caregiver.

## CONCLUSION

IN fentanyl and an oral opioid are equally effective for managing the pain associated with a pediatric burn dressing change in the outpatient setting. However, IN fentanyl showed a more rapid onset of action and proved to be a reliable form of pain control. IN fentanyl was also associated with high provider satisfaction scores during dressing changes. This medication should be considered when caregivers or medical providers need to safely treat pain in the outpatient setting.

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