Incorporation of Pain in Dreams of Hospitalized Burn Victims

Isabelle Raymond, MSc[a,1]; Tore A. Nielsen, PhD[b2] ; Gilles Lavigne, DMD, MSc,[b,3]; and Manon Choinière, PhD[a,1]

[a]Burn Center, Hôtel-Dieu du Centre hospitalier de l'Université de Montréal; [b]Centre d'étude du sommeil Hôpital Sacré-Cœur de Montréal, Québec, Canada; [1]Department of Anesthesiology, Faculty of Medicine, Université de Montréal; [2]Department of Psychiatry, Faculty of Medicine, Université de Montréal; [3]Faculties of Dental Medicine and Medicine, Université de Montréal

Summary: It has been shown that realistic, localized painful sensations can be experienced in dreams either through direct incorporation or from past memories of pain. Nevertheless, the frequency of pain dreams in healthy subjects is low. This prospective study was designed to evaluate the occurrence and frequency of pain in the dreams of patients suffering from burn pain. Twenty-eight nonventilated burn victims were interviewed for 5 consecutive mornings during the first week of hospitalization. A structured-interview protocol was used to collect information on dream content, quality of sleep, and pain intensity and location. Patients were also administered the Impact of Event Scale to assess posttraumatic symptoms. Thirty-nine percent of patients reported 19 pain dreams on a total of 63 dreams (30%). Patients with pain dreams showed evidence of worse sleep, more nightmares, higher intake of anxiolytic medication, and higher scores on the Impact of Event Scale than did patients reporting dreams with no pain content. Moreover, patients with pain dreams also had a tendency to report more intense pain during therapeutic procedures. Although more than half of our sample did not report pain dreams, these results suggest that pain dreams do occur at a greater frequency in suffering populations than in normal volunteers. More importantly, dreaming about pain may be an added stress for burn patients and may contribute to both poor sleep and higher pain intensity, which could evolve into a cycle of pain-anxiety-sleeplessness.

Key words: Dreaming, acute pain, burns, posttraumatic stress

INTRODUCTION

THE RELATIONSHIP BETWEEN SLEEP AND PAIN HAS RECEIVED CONSIDERABLE ATTENTION IN THE LAST FEW YEARS. Although a causal relationship has yet to be determined, there is strong support for an intimate relationship between pain and quality of sleep.[1-5] Active processing of pain continues throughout the sleep/wake cycle, and the arousal threshold to pain increases as sleep deepens.[6-11] Although attenuated reactions to nociceptive stimulation (eg, cortical arousals) can be observed during sleep, healthy subjects usually have little or no memory of such stimulations upon awakening in the morning.[4,10]

However, memories of pain have been reported in dream content following painful stimulation during rapid-eye-movement (REM) sleep[12,13] and also in home dreams of the general population.[14] In both settings, it has been found that realistic localized pain sensations could be experienced in dreams, either through direct incorporation[12,13] or from past memories of pain.[14]

The occurrence of pain in dreams may be rare; large studies of dream content make no mention of pain sensations.[15-19] However, subjects in these studies were not sensitized to report their dreamed pain experiences. More recent studies suggest a higher prevalence of pain in dreams. For example, 30% of dreams following experimental pain stimulation in REM sleep made reference to painful experience.[12] Also, as many as 50% of a sample of 189 normal participants reported having experienced pain in their dream at least once when asked about such sensations.[14] Nevertheless, the frequency of pain dreams is low, as they occur in approximately 1 out of 170 home dreams reported by healthy participants.[14] It has been suggested that the low frequency of pain dreams could reflect the low frequency of pain in waking life.[12] If this is true, one would expect to observe a greater frequency of pain dreams in suffering populations. Although some anecdotal accounts support this notion,[20] to our knowledge no study has specifically investigated the occurrence of painful sensations in the dreams of suffering populations.

The goal of this study was to evaluate the occurrence and frequency of pain in the dreams of patients suffering from particularly intense pain: burn victims. Often hospitalized for weeks, burn patients are confronted on a daily basis with intense pain. They suffer not only the pain of their wounds, but also the pain due to numerous therapeutic procedures (eg, debridement, dressing changes, physiotherapy) performed throughout the course of treatment (see Choinière for complete review).[21,22]

METHODS

Subjects

Adult patients under 50 years of age were selected for participation when admitted to the hospital within 72 hours of their burn injuries and when hospitalization of at least 7 days was expected. Participants had to be conscious, alert, and capable of answering questionnaires in French. Patients suffering from active neurologic or psychiatric disorders, as well as those requiring assisted mechanical ventilation, were excluded. They were recruited among successive admissions to the Burn Centers of the Hotel-Dieu du Centre hospitalier de l'Université de Montréal (CHUM) and the Centre hospitalier affilié universitaire de Québec (CHA) Pavillon St-Sacrement. The Ethics Committee of both institutions approved the protocol. Forty-one patients fitting the selection criteria were approached. Of these, 34 consented to participate; 6 patients were subsequently excluded due to intubation (N = 1), amputation (N = 1), delirium related to alcohol withdrawal (N = 2), preexisting diagnosis of chronic insomnia (N = 1), and voluntary withdrawal from the study (N = 1), leaving a total sample of 28 participants. Patients were not paid for their participation.

Procedure

Patients were approached within 72 hours of their injuries by the first investigator (IR) or a trained research assistant to explain the procedures of the study. Once the consent forms were signed, patients were given

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Nothing to disclose

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Address correspondence to: Isabelle Raymond, MSc, Burn Center, Hôtel-Dieu du Centre Hospitalier de l'Université de Montréal, 3840 St-Urbain, Montréal (Quebec) Canada; H2W 1T8; Tel: 514.890.8000 ext. 14053; Fax: 514.412.7175; E-mail: isabelle.raymond@umontreal.ca

instructions on how to improve their dream recall in the morning (ie, keep eyes closed, move as little as possible, remain focused on the last recalled image, slowly recall the dream). During the 5 following days, data were collected every morning between 5:00 AM and 7:30 AM just after the patient woke up.

Structured interviews were conducted to collect information on dream content, quality of sleep during the preceding night, and pain intensity and location. These morning interviews began with patients recalling dream content, followed by a rating of the intensity and location of pain in their dreams. Patients were then asked to evaluate the intensity of visual, tactile, and auditory sensations (results not reported), the general emotion, and whether they considered the dream to be a nightmare. The interviews ended with sleep quality and pain assessment (results reported in Raymond et al[5]). Interviews lasted 10 to 15 minutes and were tape-recorded. On day 5 of the study, patients were administered the Impact of Event Scale (IES)[23] in order to assess posttraumatic symptoms.

Dream Content

Patients recalled the content from their last dream, and then rated the intensity and location of pain in the dream. The intensity of pain in the dream was determined by patients with a 0-to-10 numeric scale, where 0 represented "no pain at all" and 10 "unbearable pain." Numeric rating scales are sensitive, reliable, simple to apply,[24,25] and routinely employed in the burn unit. The location of pain in the dream, also determined by patients, was assessed with anatomic maps similar to those used by medical staff to identify location, size, and depth of burns.[26] The general emotion of the dream was assessed using a 10-centimeter visual analogue scale (VAS),[27] where the leftmost extreme corresponded to "very negative" and the rightmost extreme to "very positive."

Dream reports were later transcribed, reviewed, and scored for incorporation of the trauma by one of the investigators who had knowledge of individual accidents. Dream reports were also scored for the number of words referring to elements of hospitalization (hospital setting, procedures, and staff). Word counts were done individually by two trained research assistants, following the method described by Antrobus.[28] In order to control for individual differences in report length, incorporation proportions were calculated by dividing the number of words referring to the incident by the total number of words in the report; the ratings were subsequently averaged within subjects to produce single scores for each subject.

Pain Assessment

During the day, the treating nurse assessed pain levels at rest every 4 hours using the same 0-to-10 pain scale as described above.[24,25] In addition, the first investigator or the research assistant met with the patient within 30 minutes following a dressing change or other painful therapeutic procedures to assess the average pain level. Location of pain at night and upon awakening were determined by patients with the same anatomic maps as described above.[26]

Sleep Quality

Sleep quality was assessed with four subjective measures. Patients rated their sleep using a VAS[27] consisting of a 10-centimeter horizontal line where the leftmost extreme corresponded to "slept very poorly" and the rightmost to "slept very well." Patients also estimated the total number of hours slept, the number of awakenings during the night, and the presence or absence of nightmares.

Posttraumatic Stress Symptoms

Severity of posttraumatic stress was assessed using the French Canadian version[29] of the Impact of Events Scale (IES).[23] The IES is a validated instrument[30] that is widely used to assess psychologic consequences and severity of symptoms of avoidance and intrusion associated with posttraumatic stress. This 15-item questionnaire has been administered to several different types of traumatized and bereaved populations. According to Yule and Williams,[31] average scores for trauma victims are 38, 21, and 17 for total scale, intrusion, and avoidance subscales, respectively. Although the IES is a self-assessment tool, all patients completed the questionnaire with the first investigator or the research assistant because certain patients could not write due to the location of their injuries.

Medication and Other Medical Information

Opioid medication in both burn centers was administered to all patients according to a standardized protocol in which morphine was used to control pain at rest and at times of therapeutic procedures. The analgesic medication data were transformed into morphine-equivalent doses using an oral-to-parenteral ratio of 2:1 (see Raymond et al[5]).[32] Anxiolytic medication consisted of either lorazepam or oxazepam and was administered as needed during the day, at bedtime, and during the night. The anxiolytic medication data were transformed into lorazepam-equivalent doses using a ratio of oxazepam to lorazepam of 15 to 1.[33] A research nurse reviewed all patients' medical charts to record information on analgesic and anxiolytic medications administered during the study (type, dose, route). Information about burn type and severity (expressed in percent of total body surface area (TBSA) burned was also extracted from the medical charts.

Statistical Analyses

Patients' characteristics, pain intensities, dream content and medication data were analyzed with descriptive statistics. Scores obtained as continuous variables are presented as means ± SD. Descriptive statistics were also used to compare the four body maps representing the location of pain in the dream, during the night, upon awakening, and the location of burn injuries. Student *t*-tests were used to compare patients who reported one or more pain dream (PD) and those who reported dreams with no pain content (NPD). Statistical significance of group difference was fixed at $P<.05$, and Bonferroni's corrections were applied within each of the following group of variables: (1) dream characteristics, (2) pain intensity measures, (3) sleep quality variables, (4) posttraumatic stress measures, and (5) medication data.

RESULTS

Patient Characteristics

Twenty-eight patients (24 men; 4 women) aged between 17 and 50 years, (34.8 ± 10.0) completed the study. Burns were caused by thermal injuries except for three that were due to electrical shocks (N = 2) or chemical agents (N = 1). The size (extent) of the burn wounds varied from 3.5% to 64% of the TBSA, with an average of 15.5% ± 13.5%. Apart from 1 patient who reported low back pain, patients did not report any comorbid medical disorders. Sleep-quality ratings and pain-intensity scores are summarized in Table 1.

Dream Characteristics

Eighty-two percent of patients (N=23) reported at least one dream during the study period; 14% (N=4) reported having had a white dream (no content recalled). Only 1 patient reported never having a dream during the course of the study. Out of the 140 morning interviews, a total of 63 dreams was reported (45%). Thirty-nine percent of patients reported at least one nightmare during the study period, and 39% also reported at least one PD. Dream-report length averaged 94.3 ± 98.3 words (range 6-476).

Nineteen PD were identified by patients' ratings of pain intensity (ie, numeric scale) in the dream, 2 of which consisted only of the recall of painful sensations. Of these, 4 contained specific words related to pain,

Table 1—Mean sleep-quality ratings and pain-intensity scores

	Mean	SD
Sleep Quality		
Sleep Quality (10-cm scale)	5.4	2.6
Hours of Sleep	6.0	2.1
Number of Awakenings	4.3	4.7
Pain Intensity (0-10 scale)		
During the Night	3.9	2.6
Upon Awakening	2.8	1.7
At Rest	2.5	1.3
During Therapeutic Procedures	4.2	2.0

Scores are averaged across the 5 days of the study (N=28)

and 13 included no pain-related words even though patients reported experiencing pain in the dream. These dreams that did not include pain-related words, however, often had scenarios where pain would be expected (eg, Patient #5: "I raised my feet and when I let them down, I banged them on the side. . . We got into a fight and I don't know how but I hit myself." Patient #17: "They were taking off all my wounds, the bandages and all that"). Length of PD (average: 86 ± 78) was comparable to that of NPD (average: 98 ± 106). Table 2 provides examples of dreams in which burn patients reported physical pain. Fifty-six percent of the dreaming patients (N=12) incorporated the burn trauma into their dreams, with an average proportion of trauma-related words corresponding to 3.9% ± 5.6. Fifty-nine percent of dreamers (N=13) incorporated some feature of their hospitalization. The average proportion of hospital-related words was 6.3% ± 8.7.

Location of Pain

In almost all cases, the location of pain in dreams corresponded to the burn injuries, and to the location of pain reported during the night and upon awakening. However, not all injured or painful (during the night or upon awakening) areas were represented in the PD. Only six PD (32%) accurately represented all injured or painful areas. Moreover, in six PD (32%), the location of dreamed pain was related neither to location of the burn injuries (N=2) or to pain during the night (N=6), nor to pain upon awakening (N=5).

Posttraumatic Stress

Twenty-two patients (79%) completed the IES. Mean total score was 21 ± 18.6, mean avoidance score was 10.2 ± 10, and mean intrusion score was 10.4 ± 10. Five patients (23%) exceeded the clinical criterion for posttraumatic stress.

Medication

All patients received an average of 71.4 mg ± 40.7 mg of morphine on a 24-hour period for controlling pain at rest (both at night and during the day) and during therapeutic procedures across the 5 days of the study. Approximately two thirds of the patients received benzodiazepines (0.5 mg – 2.0 mg of lorazepam or 15 mg – 30 mg of oxazepam) at some point during the study (5% only during the day, 32% only at bedtime or during the night, 63% at both times). Patients taking benzodiazepines received an average of 0.7 mg ± 0.6 mg of lorazepam in a 24-hour period (0.3 mg ± 0.5 mg during the day; 0.4 mg ± 0.4 mg during the night).

Group Comparisons

Student *t*-tests were performed to compare patients who reported PD (N = 9) and NPD (N = 14). Results obtained for the dream characteristics, pain-intensity measures, and medication scores revealed no significant group differences (see Table 3), although large variances were observed for several of these variables. A slight tendency emerged for the PD patients to report more intense pain during therapeutic procedures (eg, dressing changes) than did the NPD patients, but the difference failed to reach statistical significance. The PD patients showed evidence of worse sleep than NPD patients, in that they reported significantly more awakenings and more nightmares during the night. The PD patients also received more benzodiazepines during the day, and had higher scores on the IES than did NPD patients.

DISCUSSION

The purpose of this study was to evaluate the occurrence and frequency of physical pain sensations in dreams of hospitalized burn patients. One third of our 28 patients experienced at least one PD within the 5 days of the study. Pain dreams comprised 30% of all reported dreams, which is a considerably higher rate than what has been observed for normal volunteers,[14] but which is similar to rates following experimental painful stimulation of REM sleep episodes in the laboratory.[12] Moreover, the present results are similar to those of a recent study where 24% of burned patients reported dreams containing "painful situations" after hospital discharge.[34]

Although it might be argued that some of the PD in our sample were due to methodologic artifact (ie, our biasing of patients to report pain in their dreams by repeatedly asking them about it), this possibility seems unlikely for at least three reasons. First, during the interviews, patients were also asked about the intensity of their pain during the night and upon awakening; therefore, pain in dreams was not the focal point of the interview. Moreover, patients were also asked to rate their pain several times during the day following therapeutic procedures and at rest. Therefore, being asked about their pain was part of their daily routine of care. Second, during the morning interviews, patients were often reporting similarities between dream content and elements of their trauma, suggesting that they were reporting images salient to them. Third, a close reading of the verbatim reports indicates that pain sensations in many dreams were not mere fabrications. Some patients gave vivid descriptions of pain in a dream scene (eg, patient #18: "I had the impression that there was fire burning inside of me… I see myself becoming fire red from place to place." Patient #25: "There, I would bump my arms and parts and it hurt very much.").

On the other hand, more than half our sample did not report physical PD, despite acutely painful injuries. These results are similar to those of previous studies[12,13] reporting that most pain-stimulated rapid-eye-movement (REM) periods do not result in PD. It appears that even the acute pain from burn injuries can be suppressed during dreaming in some individuals. How can we account for this differential presence of pain in the dreams of burn victims? The present results do not offer any clear explanation, although some possibilities may be offered. First, the differential presence of pain in dreams could be due to the variability in the processing of ascending pain transmissions across different sleep states.[4,6-11] Although all dreams were collected in the morning, when REM sleep predominates,[35] it is possible that some dreams were experienced in Stage 2 sleep.[36] Another possibility, consistent with results from Zadra et al[13,14] is that PD may be constructed with the memory of pain that was experienced during the preceding day or earlier. This hypothesis is supported by the present results, where the location of dreamed pain did not always correspond to the true location of the burn injuries, or to painful areas reported during the night and upon awakening. In this case, the presence or absence of PD would more likely be a function of differences in the patient's prior experiences of pain and in his or her capacity to reconstruct them in imaginal form. Nonetheless, no conclusions can be drawn by the present results to explain the occurrence of pain in dreams. Future studies are needed to evaluate these proposed hypotheses.

The administration of analgesic medication, anxiolytic medication, or both medications may have influenced patients' sleep and dreaming, as both are known to reduce REM sleep.[37-39] Our previous analyses[5] demonstrated a positive relationship between higher doses of analgesic medication and improved sleep quality, although no specific effects on sleep stages could be noted due to the nature of the measures. Morphine

Table 2 —Edited transcripts of 9 dreams in which patients reported physical pain, translated from French to English (backward translation).

Patient #5; 41-year-old male; 4%TBSA, day 2.
Again, it was a dream with bowling balls except that this time, it seems like the balls were grenades. They had the form of black balls and the grenades ended with kind of little leaves, they weren't flowers, it seems like there were leaves that would come out of each little grenade. Someone came in the room and there were lots of little balls that were coming, I don't know from where, from the top of the ceiling of the hallway here, the main hallway and I was in my room. At one point, I saw that the grenades had fallen on the floor and although I was in my room, I was scared that the things (grenades) would fall on my feet and so I raised my feet and when I let them down, I banged them on the side of the bed where the table is. I even had time to see the feet in…they were up and I let them go in one movement and I was very angry because I didn't want it to happen (hit my feet). I don't know what the consequences were exactly but I was really scared for myself and it seemed like it could hurt other people.
Day 4. It was at work, at the factory. We were making parts, and like everyday, there were two breaks of 15 minutes. During one of the breaks, there were 4 or 5 delivery guys that arrived and there were more around the delivery trucks. They asked if they could unload and put the parts in the shop. Since it was during break, no one wanted to answer them, and so they said, well, we'll manage. Before I went on my break, I did the rounds to make sure the machines are working well. At one point, there are four guys, the older ones, were bringing the part in boxes and were putting them under the machines. There was no room to put them there and also, this machine is very hot sometimes and so it was dangerous. The others were mocking me and they kept putting the boxes while they laughed in my face. The other delivery guys were doing the same thing and so I told the one who looked more angry not to put them there and he said that he would put them there. We got into a fight and I don't know how but I hit myself. I was upset and revolted.

Patient #9; 50-year-old male; 41.5%TBSA; day 1.
I was with some people on a beach, on the side of a river. There was a boat, and many people on the boat. The boat was passing by, it was springtime. The boat passed close by and I jumped to try to get on board but I got stuck on the side of the boat. Nobody saw me and the boat turned and I fell in the water. The water had hypothermia conditions and then I remember swimming and someone saw me and everyone ran to throw something to help. I was able to get to the ladder and onto the dock. I was able to get my head out of the water and then I woke up covered in sweat.

Patient #17; 33-year-old male;35%TBSA, day 5.
I had a bad dream that woke me up in a startle, it made me raise my legs and crack all the skin. It was a dream of the previous day, when they took off all of my wounds. The dream, they were taking off all my wounds, the bandages and all that, and when they came to get me to go to the bath, to go downstairs, to soak the wounds in the bath, I had a lot of anxiety and all that…to see the results, it was scary when they put me in the bath. It was like everything was OK for them, it was all good, when they put me in the bath, I woke up startled. I don't know if I woke up there but let's say that the message got to there. It was mostly the anxiety of going through that stage like on Monday morning (rounds), after Monday, I think that things will be OK.

Patient #18; 46-year-old male; 64% TBSA; day 1.
I dreamed a lot about pain. In my dream, I was always in pain and I was wondering when it would stop. I had the impression that there was fire burning inside of me, but it did finish by diminishing a bit. I saw my wounds in the accident and it was scary, I see my evening of treatments again and I see myself becoming fire red from place to place. It becomes unbearable from a 4-5 to a 10. I was in pain and I was trying to change position but I didn't know how to. I asked the nurse if she could give me something, but she couldn't do anything. I just had to endure and wait until it passes.

Patient #24; 47-year-old male; 14% TBSA; day 2; No reference to pain.
I had trouble getting up but I was able to stand up. I succeeded into getting out for a walk and smoke a cigarette until they caught me and brought me back to the hospital. They scolded me because I couldn't do that, and it would worsen my case. They told me I'd better listen otherwise they would not treat me any longer.

Patient #25; 20-year-old male; 16.5% TBSA; day 2.
I was in this room, more or less except that behind the wall that is in front of me, there was a huge gray boiler. We had to wash it and I was alone and I really didn't feel like doing it. I dreamt about this twice. When I tried to go see the boiler, I had to worm my way through little places. There, I would bump my arms and parts and it hurt very much. It was mostly the arms, more the left arm. That's why I didn't go. At one point, there was kind of a game from an amusement park and we had to shoot pictures but it didn't give any points or anything, it was funny. I did not know anybody in the pictures.
Day 3. We were in a group and it seems like I knew everybody, but not by name. We all knew each other without knowing our names and we were partying. Everything was funny. I kicked something and my foot slipped and it hurt excessively.
Day 4. It was in this room. It was like a wall like this, with a multitude of little holes, around four feet by three feet. From there, the heat was coming out, and it was leaking and I had to tighten it for it to stop leaking. It hurt a lot and I was dehydrated and I wasn't aloud to drink. It was like a punishment in my dream.

TBSA, total body surface area burned.

may indeed have influenced dream content; however, its use was constant as all patients received analgesics on a continuous basis. The majority of patients also received benzodiazepines during the study; therefore, any of the effects on sleep would also be relatively constant across patients. In addition, no significant differences were found between patients with PD and those with NPD for nighttime benzodiazepine doses, although differences were found between the two groups for daytime doses. However, daytime doses usually consisted of oxazepam, which does not seem to affect dreaming.[40] Moreover, it has been found that benzodiazepine use does not affect dream recall frequency.[41] Therefore, the effects of these doses on dreaming may have been minimal; although not much is known on the effects of benzodiazepines on dream content, it has been reported that dream descriptions following intake of such drugs are more positively toned than are dreams of drug-free patients.[41]

Patients with PD showed evidence of worse sleep, as they reported significantly more awakenings and nightmares than did patients without PD. Although no direct relationship can be established between sleep quality and dreamed pain, these results suggest the possibility that poor sleep contributes to the frequency of PD. Our previous analyses[5] indicated that poor sleep was followed by higher levels of pain on the following day. This effect may generalize to dreamed pain as well; however, the opposite could also be true. Our previous study also revealed that nighttime pain intensity was a determinant of poor sleep quality. Therefore it is entirely feasible that PD disrupted patients' sleep, leading to the pattern of disrupted sleep. Future research studying the temporal relationship between dreamed pain, awake pain, and sleep quality is needed to assess the nature of these possible relationships.

The results of this study also suggest a possible continuity between awake and dreamed pain intensity. Although there were no significant differences between the two groups regarding pain variables, the intensity of pain during procedures was found to be marginally higher in patients with PD. Whether this relationship is direct or indirect cannot be verified with the current data, even though both are plausible. For instance, patients with PD had higher IES scores and used more anxiolytic medication. Consequently, if patients with PD are more anxious, both the intensity of their pain and the quality of their sleep may be worsened. It has been suggested that acute pain results in anxiety and sleeplessness, leading to a circular relationship between anxiety, sleep, and pain.[42] Therefore, dreaming about pain may be an added stress for burn patients and may contribute to both poor sleep and higher pain intensity; the latter may evolve into a cycle of pain-anxiety-sleeplessness.

In summary, the present study demonstrates that dreams with references to physical pain occur at a greater frequency in an acute pain population than in normal volunteers, although not all suffering patients reported such dreams. Although the disparity in the presence of pain in dreams of burn victims cannot be explained by the present results, certain possibilities have been offered. Finally, it has been suggested that dreaming about pain, either as a cause or a consequence, may be related to intense pain, poor sleep quality and anxiety.

Table 3—Comparisons between patients reporting one or more pain dreams and patients reporting dreams with no pain content

	PD (N = 9)	NPD (N = 14)	*T* *	*P*
Burn Size (% of TBSA)	24 ± 19.8 range:4-64	12.3 ± 7 range:3.5-28	1.71	0.12
Dream Characteristics				
Average Length of Dream Report	105.8 ± 104.1	65.1 ± 56.2	1.19	0.25
Emotion in Dream Report (10-cm scale)	5 ±1.3	5.7 ± 1.7	0.99	0.33
Proportion of Trauma Elements	3.7 ± 4.8	4 ± 6.4	0.11	0.91
Proportion of Hospital Elements	8.7 ± 10.3	4.6 ± 7.3	1.09	0.29
Pain Intensity (0-10 Scale)				
During the Night	4.9 ± 3	3.5 ± 2.2	1.31	0.20
Upon Awakening	3.7 ± 1.8	2.6 ± 1.9	1.43	0.17
At Rest	2.7 ± 1.3	2.3 ± 1.1	0.75	0.42
During Therapeutic Procedures	5.4 ± 1.8	3.8 ± 2	1.96	0.06
Sleep Quality				
Sleep Quality (10-cm scale)	4.8 ± 1.6	5.8 ±1.3	1.68	0.12
Hours of Sleep	5.8 ± 0.6	6.4 ± 1.1	1.41	0.17
Number of Awakenings	6.5 ± 2.9	2.9 ± 1.2	3.57	0.01
Total Number of Nightmares	1.3 ± 0.5	0.2 ± 0.6	4.76	0.00
Posttraumatic Stress				
Impact of Event Scale Total Score	34.3 ± 15.7	16.2 ± 19	2.10	0.05
Medication (mg)				
Morphine: total	83.4 ± 59.6	55.3 ± 23.8	1.54	0.14
Lorazepam: total	0.9 ± 0.5	0.3 ± 0.4	2.97	0.01
Lorazepam: daytime	0.3 ± 0.3	0.05 ± 0.09	2.46	0.04
Lorazepam: nighttime	0.5 ± 0.4	0.3 ± 0.4	1.69	0.1

*Considering the large variance observed on certain variables, Mann-Whitney tests were also conducted and offered similar results.
Data are presented as means ± SD. PD, pain dreams; NPD, no pain content in dreams

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REFERENCES

1. Moldofsky H Sleep and musculoskeletal pain. In: Voeroy H, Merskey H, eds. Progress in fibromyalgia and myofascial pain. Amsterdam:Elsevier Science; 1993:137-47
2. Affleck G, Urrows S, Tennen H, Higgins P, Abeles M. Sequential daily relations of sleep, pain intensity, and attention to pain among women with fibromyalgia. Pain 1996;68:363-8
3. Drewes AM, Nielsen KD, Arendt-Nielsen L, Birket-Smith L, Hansen LM. Pain and sleep. The effects of cutaneous and deep pain on the electroencephalogram during sleep: an experimental study. Sleep 1997;20:632-40
4. Lavigne GJ, Zucconi M, Castronovo C, Manzini C. Sleep arousal response to experimental thermal stimulation during sleep in human subjects free of pain and sleep problems. Pain 2000; 4:283-90
5. Raymond I, Nielsen TA, Lavigne GJ, Manzini C, Choinière M. Quality of sleep and its daily relationship to pain intensity in hospitalized adult burn patients. Pain 2001;92:381-8
6. Carli G, Kawamura H, Pompeiano O. Transmission of somatic sensory volleys through ascending spinal hindlimb pathways during sleep and wakefulness. Pflügers Arch 1967; 298:163-9
7. Soja PJ, Oka JI, Fragoso MC. Synaptic transmission through cat lumbar ascending sensory pathways is suppressed during active sleep. J Neurophysiol 1993; 70:1708-12
8. Soja PJ, Pang W, Taepavarapruk N, McErlane SA. Spontaneous spike activity of spinoreticular tract neurons during sleep and wakefulness. Sleep 2001;24:18-25
9. Cairns BE, McErlane SA, Fragoso MC, Jia WG, Soja PJ. Spontaneous discharge and peripherally evoked orofacial responses of trigemino-thalamic tract neurons during wakefulness and sleep. J Neurosci 1996;16:8149-59
10. Sandrini G, Milanov I, Rossi B, et al. Effects of sleep on spinal nociceptive reflexes in humans. Sleep 2001;24:13-7
11. Manzini C, Brousseau M, Kato T, Mayer P, Lavigne G. Effects of experimental muscle pain on sleep in normal subjects. Psychosom Med 2002;In Press
12. Nielsen TA, McGregor DL., Zadra AL., Ilnicki D, Ouellet L. Pain in dreams. Sleep 1993;16:490-8
13. Zadra AL, Nielsen TA, Lavigne GJ, Germain A. Pain in stimulated and unstimulated laboratory dreams. Sleep Res 1996;25:149
14. Zadra AL, Nielsen TA, Germain A, Lavigne GJ, Donderi DC. The nature and prevalence of pain in dreams. Pain Res Manage 1998;3:155-61
15. Calkins MW. Statistics of dreams. Am J Physiol 1893;5:311-43
16. Hall C, Van de Castle RI. The content analysis of dreams. New York: Appleton-Century-Crofts; 1966
17. Snyder F. The phenomenology of dreaming. In: Madow H, Snow LH, eds. The psychodynamic implications of the physiological studies on dreams. Springfield, Il: Thomas; 1970:124-51
18. McCarley RW, Hobson JA. The form of dreams and the biology of sleep. In: Wolman BB, ed. Handbook of dreams: research theory and applications. New York:Van Nostrand Reinhold; 1979:76-130
19. McCarley RW, Hoffman E. REM sleep dreams and the activation-synthesis hypothesis. Am J Psychiatry 1981;138:904-12
20. Garfield P. The healing power of dreams. New York: Simon & Schuster; 1991
21. Choinière M. Pain of Burns. In: Wall PD, Melzack R, eds. Textbook of pain. London: Churchill Livingstone; 1994:523-37
22. Choinière M. Burn pain management: a unique challenge. Pain –clinical updates. International Association of the Study of Pain 2001;IX:1-4
23. Horowitz M, Wilner N, Alvarez W. Impact of Event Scale: a measure of subjective stress. Psychosom Med 1979;41:209-18

24. Jensen MP, Karoly P, Braver S. The measurement of clinical pain intensity: a comparison of six methods. Pain 1986;27:117-26
25. Jensen MP Karoly P. Self-report scales and procedures for assessing pain in adults. In: Turk DC, Melzack R, eds. Handbook of pain assessment. 2nd ed. New York: Guilford Press; 2001:15-34
26. Lund C, Browder NC. The estimation of burns. Surg Gynecol Obstet 1944;79:352-8
27. McCormack HM, de L Horne DJ, Sheather S. Clinical applications of visual analogue scales: a critical review. Psychol Med 1988;18:1007-19
28. Waterman D, Schnee A, Lynn, Silverman S, Offer V. Methodological issues affecting the collection of dreams. J Sleep Res 1993;2:8-12
29. Brunet A. Épidémiologie des événements traumatiques et effets des expositions multiples chez des chauffeurs de bus urbains. Université de Montréal, Faculté des Arts et Sciences, département de psychologie, 1996
30. Zilberg NJ, Weiss DS, Horowitz MJ. Impact of Event Scale: a cross-validation study and some empirical evidence supporting a conceptual model of stress response syndromes. J Consult Clin Psychol 1982;50:407-14
31. Yule W, Williams RM. Post-traumatic stress reactions in children. J Trauma Stress 1990;3:279-95
32. American Pain Society. Principles of analgesic use in the treatment of acute and cancer pain. Glenview IL:American Pain Society; 1999
33. Teboul E, Chouinard G. A guide to benzodiazepine selection. Part 1: pharmacological aspects. Can J Psychiatry 1990;35:700-10
34. Boeve SA, Aaron LA, Martin-Herz SP, et al. Sleep disturbances after burn injury. J Burn Care Rehabil 2002;23:32-8
35. Carskadon MA., Dement WC. Normal human sleep: an overview. In: Kryger M, Roth T, Dement WC, eds. Principles and practice of sleep medicine 3rd ed. Philadelphia: WB Saunders Co; 2000:15-25
36. Nielsen TA. A review of mentation in REM and NREM sleep: "covert" REM sleep as a possible reconciliation of two opposing models. Behav Brain Sci 2000;23:851-66
37. Kay DC, Eisenstein RB, Jasinski DR. Morphine effects on human REM state, waking state and NREM sleep. Psychopharmacologia 1969;14:404-16
38. Moote CA, Knill RL, Skinner MI, Rose EA. Morphine disrupts nocturnal sleep in a dose-dependent fashion. Anesth Anal 1989;69:S200
39. Mendelson WB. Hypnotics: basic mechanisms and pharmacology. In: Kryger M, Roth T, Dement WC, eds. Principles and practice of sleep medicine. 3rd ed. Philadelphia: WB Saunders Co; 2000:407-13
40. Gotestam KG, Oppoyen F, Berntzen D. Treatment of insomnia with two benzodiazepines: a double-blind crossover study. Eur J Clin Pharmacol 1991;41:137-40
41. Schredl M, Schafer G, Weber B, Heuser I. Dreaming and insomnia: dream recall and dream content of patients with insomnia. J Sleep Res 1998;7:191-8
42. Phillips GD, Cousins MJ. Neurological mechanisms of pain and the relationship of pain, anxiety, and sleep. In: Cousins MJ, Phillips GD, eds. Acute pain management. New York: Churchill Livingstone; 1986:21-48