

# Acupuncture for Sickle Cell Pain Management in a Pediatric Emergency Department, Hematology Clinic, and Inpatient Unit

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## ABSTRACT

**Background:** Acupuncture has been shown to mitigate certain painful conditions in children. However, utilization of acupuncture for addressing acute and chronic pain in children with sickle cell disease has not been well-studied. The aim of this article is to report the use of acupuncture to treat acute and chronic sickle cell pain in one patient in a pediatric emergency department (PED), hematology clinic, and inpatient unit of an inner-city children's hospital.

**Case:** A 16-year-old Hispanic male with sickle cell disease was treated with acupuncture for 3 years. A retrospective chart review was performed to collect details on the acupuncture treatments, their effects on this patient's pain and anxiety, feedback from the patient and his family, and frequency of PED visits and admissions for pain.

**Results:** Fifty-eight acupuncture treatments were administered for this patient's sickle cell pain during the period that was reviewed. His pain was reduced by an average of 2.3 points and 2.2 points for inpatient and outpatient treatments, respectively; and he had decreased anxiety. The frequency of PED visits and inpatient admissions for pain both decreased by 80% while this patient was receiving maintenance acupuncture.

**Conclusions:** Acupuncture appeared to decrease pain and anxiety in this patient, and correlated with reduced PED visits and hospitalizations for his sickle cell pain. Acupuncture was feasible in both outpatient and inpatient settings.

**Key Words:** Acupuncture, Pediatrics, Sickle Cell Disease, Sickle Cell Pain Crisis, Pediatric Emergency Department, Hematology Clinic, Inpatient Unit, Anxiety, Pain

## INTRODUCTION

**S**ICKLE CELL DISEASE (SCD) is a genetic blood disorder that afflicts ~100,000 Americans, predominantly patients of African ancestry.<sup>1</sup> The disease is caused by the homozygous inheritance of a single mutation that causes sickling of the red blood cells upon deoxygenation, leading to vasculature occlusion, decreased microcirculation blood flow, and local tissue hypoxemia.<sup>2</sup> An inflammatory cascade

of mediators ensues, involving complex neuronal and biochemical interactions that culminate in pain.<sup>3</sup>

Failure to manage pain effectively early can have lifelong negative impacts on all aspects of children's health—from physical to emotional and psychosocial effects. These consequences may contribute to decreased quality of life (QoL), increased mortality rates, and a higher incidence of early death.<sup>3,4</sup> In addition, unrelieved pain can generate a cycle of fear and avoidance in activities of daily living. Other reported

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sequelae include poor coping strategies, with amplified responses and heightened sensitivity to subsequent pain experiences.<sup>3</sup> Unpredictable, recurrent, and severe pain is the most common reason for patient hospitalizations and pediatric emergency department (PED) visits.<sup>5</sup>

Most patients with SCD manage their painful episodes at home with oral analgesics, such as nonsteroidal anti-inflammatory drug agents, acetaminophen, and opioids. When home therapy fails, patients often present to a PED for pain management.<sup>5</sup> Current standard of treatment in a PED and inpatient care for a vaso-occlusive pain crisis includes intravenous (I.V.) fluids and pharmacologic agents, such as ketorolac, morphine sulfate, and hydromorphone. However side-effects, such as nausea and constipation, are unpleasant. There are also risks of adverse events, such as respiratory depression from oversedation and development of tolerance, dependency, and addiction.<sup>6</sup>

Clinical observations have shown that acupuncture analgesia is very effective for treating chronic pain, helping 50%–85% of patients, compared with 30% for morphine. Acupuncture activates certain brain structures, thereby modulating descending inhibitory pathways and also deactivating limbic areas to produce analgesia. A large body of evidence suggests that acupuncture analgesia has physiologic, anatomical, and neurochemical bases, manifesting in integrative processes at the level of the central nervous system, where afferent impulses from pain regions interphase with acupuncture-point, needle-induced transmitters and modulators.<sup>7</sup>

Three case series have been published on the use of acupuncture to treat patients with sickle cell pain.<sup>1,8,9</sup> In the only one involving pediatric patients, 5 adolescents treated with acupuncture for sickle cell pain reported decreased pain and incidences of crisis, along with improved physical and mental well-being.<sup>9</sup> Given that acupuncture is increasingly being integrated into pediatric health care and is now provided in one-third of the pediatric pain centers in the United States,<sup>10</sup> more studies are needed to determine the efficacy of acupuncture in the setting of SCD.

This article presents a case report of 1 patient with SCD who was treated with acupuncture for sickle cell pain over a 3-year period in both outpatient and inpatient settings. At the current authors' institution, acupuncture is provided to patients and their families by licensed acupuncturists within the Division of Pediatric Hematology/Oncology/Stem Cell Transplant, Center for Comprehensive Wellness, in the Department of Pediatrics, at Columbia University Medical Center, New York–Presbyterian Morgan Stanley Children's Hospital, in New York, NY. In addition, a pediatric emergency medicine physician who is also a certified acupuncturist provided acupuncture in the PED.

## CASE

The patient was a 16-year-old Hispanic male with SCD followed by the medical center's Division of Pediatric

Hematology/Oncology/Stem Cell Transplant for Comprehensive Wellness since birth. His chart was reviewed for all acupuncture treatments provided to address his sickle cell pain in both the outpatient and inpatient settings from November 1, 2012, through April 30, 2015. This patient's pain was assessed by the acupuncturist just prior to treatment with one of two scales: a 0–10 verbal numeric rating scale (VNRS)<sup>11</sup> or a 1–4 Faces Pain Scale adapted from Wong-Baker.<sup>12</sup>

Verbal assent and consent were obtained prior to every acupuncture treatment administration. At each acupuncture session, the patient's pulse and tongue were assessed according to Traditional Chinese Medicine (TCM) standards and a treatment plan was formulated for that session. Acupuncture points were then chosen, based upon the TCM diagnosis, with the intention of relieving the patient's pain and anxiety, and correcting underlying constitutional imbalances contributing to the complaints. All acupuncture treatments were performed using #3 SEIRIN® needles in an even fashion by a licensed acupuncturist or by a pediatric emergency medicine physician–acupuncturist; both of these practitioners had a combined 36 years of clinical experience.

## RESULTS

This patient received a total of fifty-eight acupuncture sessions performed in the PED, outpatient hematology clinic and the inpatient unit during the study period. He had a history of many hospital admissions for vaso-occlusive pain events and other sickle cell related complications, despite being on hydroxyurea therapy and outpatient management with oral opioids (oxycodone, hydromorphone) for episodes of pain exacerbation. Although stem-cell transplantation was discussed, the patient did not have a matched sibling and the family was not interested in an unrelated transplant.

In November 2012, this patient was admitted for chest pain, knee pain, and headache that failed to respond to PED management. Despite days of receiving I.V. ketorolac and patient controlled analgesia with hydromorphone, his pain was poorly controlled. During this particularly difficult hospitalization, the patient and his mother were referred by his pediatric hematology team to receive acupuncture to help manage his sickle cell pain and anxiety. Both the patient and his mother were very interested in a nonpharmacologic adjunctive option.

At the first session, the patient was nervous about trying acupuncture. However, he was able to relax after the first needle was inserted and subsequently fell asleep for the remainder of the treatment. The patient's mother was very pleased with the results of the acupuncture treatment and reported feeling calmer as a result of seeing her son in less discomfort. The patient requested to have acupuncture again the following day. The patient received a total of two

acupuncture treatments during this hospital admission. Although pain assessment was not recorded for these initial treatments, he did report a reduction in his anxiety and requested additional outpatient treatments.

Initially the patient was treated once per week as an outpatient for a total of 7 scheduled treatments. During these sessions, the patient rated his pain on a 1–4 FACES Pain Scale, at 3–4 before and 1–2 after the acupuncture treatment. By treatment #7, the patient reported no pain before or after treatment. He also stated that he was able to walk further and be more active.

During November 2012 to December 2013, the patient's initial TCM diagnosis was *Qi/Ying* level Heat with Damp encumbering the middle *Jiao* leading to Qi and Blood Stagnation in the channels. His tongue was swollen and crimson-to-bright red in color, with a white coat that ranged from moderate to thick. His pulse was either wiry or slippery. Points were typically chosen along the hand and foot *Yang Ming* channels and the foot *Jue Yin* channel to clear Heat, transform Damp, and encourage the free coursing of Qi and Blood in the channels and collaterals to reduce pain—for example: LI 11, LI 4, ST 44, and LR 3. Points on the foot *Yang Ming*, foot *Tai Yin*, and foot *Shao Yin* channels—for example: ST 36, SP 6, and KI 3—were chosen to encourage the production of new Qi and Blood to mitigate the patient's constitutional deficiencies. Extra point *Yintang* and auricular point *Shen Men* were often chosen to calm his mind and reduce his anxiety.

In 2013, the patient received 16 acupuncture treatments: 12 scheduled sessions in the hematology clinic; 3 in the inpatient setting; and 1 in the PED. Pain was assessed during 11 of the 16 treatments, with an average reported reduction of 2.0 on the VNRS. The patient also reported feeling more relaxed with less anxiety, often falling asleep as soon as the needles were inserted. In total, the patient had 2 PED visits and 1 hospital admission for a pain crisis. This is in contrast to 2012, the year preceding the initiation of acupuncture services, when the patient had 10 PED visits and 5 hospital admissions for pain crisis, leading to a total of 30 days spent as an inpatient. The number of PED visits and admissions for pain both decreased by 80% with acupuncture. A review of the medical record did not indicate a change in the patient's maintenance medications nor any issues of noncompliance.

In 2014, patient missed appointments because of family issues. He received 9 outpatient clinic treatments and 17 treatments as an inpatient. He presented to the PED 15 times and was admitted 6 times for pain crises—both being a sixfold increase from 2013. All together, the patient spent 50 days in the hospital, 5 times more than in 2013. As a result, the majority of the acupuncture treatments that the patient received were as an inpatient. For 2014, the patient reported an average reduction in pain of 2.0 and 2.5 for outpatient and inpatient treatments, respectively.

During 2014–2015, the patient's TCM diagnosis changed. He presented primarily with systemic Qi and Blood Deficiency, leading to Qi and Blood Stagnation in the channels, and with Damp encumbering the middle *Jiao*. At this time, the patient's primary tongue presentation was pale and swollen; the color ranged from pink, to red, or to purple and was often dusky. The tongue coating remained primarily thick and white. His pulse continued to be wiry or slippery. As in 2012–2013, points on the foot *Yang Ming*, foot *Tai Yin*, and foot *Shao Yin* channels—for example: ST 36, SP 6, and KI 3—were chosen to encourage the production of new Qi and Blood to mitigate the patient's constitutional deficiencies. Points along the hand and foot *Yang Ming* channels and the foot *Jue Yin* channel were chosen to clear Heat, transform Damp, and encourage the free coursing of Qi and Blood in the channels and collaterals to reduce pain—for example: LI 11, LI 4, ST 44, and LR 3. When the patient was treated during a pain crisis, the TCM treatment methods focused on regulating Qi, quickening the Blood, and transforming Damp, with a decreased emphasis on supplementing Qi and Blood. Heat signs would often return during an acute pain crisis as well.

Throughout the course of his treatment, this patient received individualized acupuncture treatments. Specific point selection was based upon principles of TCM and the practitioners' experience. Treatments were modified, based upon changes in the patient's presenting pattern of disharmony.

All acupuncture treatments were performed using pre-sterilized, disposable #3 SEIRIN needles, 0.20 × 30 mm for body points and 0.20 × 15 mm for auricular points. All points were swabbed with alcohol prior to needle insertion. Needles were inserted bilaterally at a depth of 0.5–1 cun with an even method and retained for 20–30 minutes. Needles were not manipulated after insertion. The range of number of needles inserted was 3–27, with an average of 14.5 needles inserted per treatment.

The patient also requested and received acupuncture in the PED. An example was in March 2015, when he presented twice with “unbearable” recurring chest-wall pain of 8–10 on the VNRS. The pain was “sharp,” and was aggravated by movement and touch. The patient felt very anxious and appeared to be agitated. Despite numerous doses of I.V. hydromorphone, ketorolac, and fluid boluses, the patient's pain remained unchanged. At this time, while awaiting an inpatient bed assignment, he requested acupuncture.

Only auricular acupuncture points focused on reducing anxiety and pain were used during this treatment. The *Shen Men*, Sympathetic, Point Zero, and Cingulate points were accessed for 30 minutes. The patient became calmer and fell asleep during the treatment. He reported feeling more relaxed and less anxious at completion of the session, with a reduction of pain to 7. The overall improvement was enough for him to be discharged home from the PED, and the inpatient admission was cancelled.

## DISCUSSION

There is growing recognition that the optimum therapeutic approach to treating sickle cell pain should entail many modalities. Yet the standard of care remains pharmacologic agents that are not always effective and fraught with side-effects. Acupuncture appears to provide pain relief through many mechanisms,<sup>7,13–15</sup> making acupuncture a potential adjunct therapy for treating sickle cell pain crises by addressing two of the most prominent features of SCD: vaso-occlusion and pain.<sup>15,16</sup> Acupuncture coupled with pharmacologic agents may be a more comprehensive integrative approach to managing both acute and chronic sickle cell pain.

During 2013, while this patient received regularly scheduled acupuncture treatments, there was a concomitant decrease in PED visits and hospital admissions for pain. In contrast, most of the treatments the patient received in 2014 were during acute pain crises as an inpatient, with a concomitant increase in PED visits and hospital admissions. It is possible that maintenance acupuncture may have played a role in keeping this patient's sickle cell pain under control and that a combination of scheduled medications with acupuncture treatments could provide a management strategy to potentially decrease the incidence of acute vaso-occlusive pain crises.

Ballas hypothesized that aggressive treatment at the early stages of acute sickle cell pain crisis may abort and shorten the pain duration, given that reversal of pain is much more difficult once it has emerged fully.<sup>17</sup> Acupuncture is often administered as a last resort after numerous hours of standard pharmaceutical therapy fails to mitigate pain. The current authors wonder if early initiation of acupuncture when acute sickle cell pain first begins could help ease this pain more quickly.

Myrvik et al. found that for pediatric patients with SCD, a mean change in pain score of 0.97 cm for a visual analogue scale and 0.9 cm for the a numeric reporting scale was “associated with ‘a little better’ pain, or minimal clinically significant improvement.”<sup>18</sup> For the current patient, the mean decrease in his pain over the chart review period was 2.1 across all treatment settings. This is well above the minimum that Myrvik et al. proposed, and is similar to the findings in other published case reports.<sup>1,18</sup> In addition, acupuncture appeared to alleviate the patient's anxiety—as evidenced by him falling asleep frequently during treatments. This antianxiolytic effect may be an important aspect in treating children in sickle cell pain crises, but is not often addressed. Decreasing a child's anxiety may go far to calm fears, allowing the patient to cope with the pain, without suffering mental anguish. The feedback received from the current patient's parent suggests that this calming effect was also shared by family members.

One of the limitations of this article is that it is a report of a single patient based on retrospective chart review and

feedback, so information in the chart was not uniform and complete. Another limitation is that two pain scales were utilized at different treatment phases and pain assessment was not recorded at every treatment. These obstacles could be overcome with a prospective study by standardizing outcome measures. A practical consideration is that acupuncture-point selection may need modification in the presence of I.V. tubes and monitoring leads. However, this article is the first to report the use of acupuncture in a longitudinal fashion over 3 years of treating a pediatric patient with sickle cell pain in both outpatient and inpatient settings, demonstrating acupuncture's feasibility and acceptability for this patient and his family.

Other challenges to offering acupuncture services to patients with SCD in hospital settings may be staffing and funding. Future studies would be strengthened by conducting a cost analysis with respect to decreased inpatient days and PED visits, and by assessing QoL life parameters, such as number of school- and workdays *not* missed by patients and caretakers.

## CONCLUSIONS

Acupuncture appeared to decrease pain and anxiety in this patient, as described in this case report, and was feasible to administer in all three hospital settings: the PED, hematology clinic, and inpatient unit. Regular maintenance acupuncture seemed to correspond with decreased PED visits and hospitalization for pain. Further research is needed to study the efficacy of acupuncture for sickle cell pain.

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## AUTHOR DISCLOSURE STATEMENT

No competing financial interests exist.

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