Pain management of children and adolescents with sickle cell disease presenting to the emergency department

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ABSTRACT

الأهداف: عرض طريقة عملنا أثناء العلاج المبدئي للأطفال والمراهقين المصابين بمرض الخلية المنجلية والذين أتوا إلى قسم الطوارئ جراء إصابتهم بآلام حادة، ومعرفة ما إذا كان هناك تأخير في إعطاء المسكنات للمرضى ومقارنة ذلك بالتوجيهات الدولية.

الطريقة: أُجريت هذه الدراسة الاسترجاعية بقسم الطوارئ في مستشفى الملك عبدالعزيز، مدينة الأحساء، المملكة العربية السعودية وذلك خلال الفترة من يوليو 2006 م إلى يوليو 2007م. وشملت الدراسة الأطفال و المراهقين المصابين بمرض الخلية المنجلية والذين أتوا إلى قسم الطوارئ من جراء إصابتهم بآلام حادة، وكانت أعمارهم تتراوح ما بين 5–18 عاماً. لقد قمنا بمراجعة بيانات المرضى الطبية من أجل تلخيصها، ومن ثم قمنا بتحليلها باستخدام برنامج التحليل الإحصائي (SPSS) والذي كانت نسخته السادسة عشر.

النتائج: اشتملت الدراسة على 43 مريضاً قاموا بتسجيل 270 زيارة إلى قسم الطوارئ. وكان متوسط الوقت الذي استغرقه المرضى حتى تلقي العلاج المسكن للألم 42.2±20.4 دقيقة ويعد هذا الوقت أطول من الوقت المحدد عالمياً وهو 30 دقيقة، وقد تم إخراج 237 زيارة (87.7%) من قسم الطوارئ وذلك بعد فترة زمنية وصل متوسطها إلى 183.9±129.3 دقيقة. لقد كانت أكثر العقاقير المسكنة استخداماً كالتالي: المورفين، والفولتارين، والباراسيتامول، فيما شاع إعطاء العلاج بالطرق التالية: داخل الوريد، والفم، وداخل العضل.

خاتمة: أثبتت الدراسة مدى التأخير في إعطاء العلاج المبدئي المسكن للألم الحاد، ولقد تلقى خمس المرضى تقريباً العلاج المسكن عن طريق العضل، واعتماد هذه الطريقة لمثل هذه الحالات غير مسموح به دولياً.

Objectives: To show and characterize our practice in the initial management of children and adolescents with sickle cell disease (SCD) presenting in acute painful crises, and to identify if there is a delay in patients getting the initial analgesics compared with standard guidelines.

Methods: This retrospective cohort study was conducted at the Emergency Department (ED) of King Abdulaziz Hospital, Al-Ahsa, Kingdom of Saudi Arabia. The study participants were patients who visited the ED with acute painful crises related to SCD between July 2006 and July 2007. Exclusion criteria included age younger than 5 years and those older than 18 years old. A structured medical records review was used to abstract the data. The data was then computed using the Statistical Package for Social Sciences (SPSS, Chicago, IL, USA) for Windows version 16.

Results: There were 270 patient visits made by 43 patients. The time to administration of initial analgesic drugs was 42.2±20.4 minutes. Two hundred thirty-seven (87.7%) visits were discharged from ED after an average length of stay of 183.9±129.3 minutes. The 3 most common initial analgesics used were morphine sulphate, voltaren, and paracetamol. The routes frequently used were intravenous, oral, and intramuscular.

Conclusion: There was a delay in the administration of the initial analgesic and approximately a fifth of patients received their analgesics via an unrecommended intramuscular route.

Saudi Med J 2011; Vol. 32 (2): 152-155

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Received 20th September 2010. Accepted 13th December 2010.

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In a nation wide community-based survey conducted on Saudi children and adolescents, sickle cell disease (SCD) shows a high prevalence of 24 per 10,000. The disease is more common in the Eastern Region with a prevalence of 145 per 10,000.[1] The high number of

SCD cases visiting our Emergency Department (ED) is a reflection of this high prevalence. Sickle cell disease is a group of inherited hemoglobinopathies of which Hemoglobin SS is the most common, accounting for approximately 70% of patients in the UK, and is primarily found in people of African, Mediterranean, Indian, and Middle Eastern descent.[2] In the United States, 1 in every 600 African American has SCD, and 2000 affected infants are born each year.[3] It is particularly a common problem encountered in the Eastern Region of Saudi Arabia. Vaso-occlusive painful episode (VOE) is the clinical hallmark of the disease. The pain is highly variable both within and among patients.[4-6] Almost 60% of patients with SCD have at least one episode of severe pain per year. Vaso-occlusive pain is the result of complex and poorly understood interactions between biological and psychosocial factors. Vaso-occlusion within the bone marrow vasculature leads to bone infarction, which in turn results in the release of inflammatory mediators that activate afferent nerve fibers and cause pain. Acute pain frequently occurs spontaneously but maybe precipitated by infections, cold, dehydration, hypoxemia, or stress.[6-10] The pain is described as throbbing, sharp, or gnawing, and patients can usually recognize, whether it is typical of their disease. If the patient thinks it is atypical, then other causes should be considered. The VOE is unique among pain syndromes in children as it is unpredictable, recurrent, and often persistent. The pain is agonizing and debilitating. It usually lasts for a few days, but sometimes persist for several weeks if untreated. These episodes are principal cause of morbidity, and account for a significant number of ED visits and hospital admissions. Patients with the highest pain rates (pain episodes per year) have an increased risk of early death as compared to those with the lowest rate.[11-13] Despite the fact that pain is an almost universal feature of SCD, children may form one of the most undertreated and understudied population. Pain management guidelines have recently been published. Although there is considerable variability in the way SCD pain is managed, the standard treatment protocol has been rest, rehydration, and analgesia.[14] Health care providers caring for such cases must be well-informed regarding management guidelines of VOE to avoid unnecessary delay, and give the appropriate treatment according to individual patient needs. These guidelines[14,15] stated that all units caring for such patients should have a written protocol, which include rapid triaging and fast assessment of the pain, and rapid safe administration of analgesia. Analgesia should be started within 30 minutes of arrival in ED, and pain should be controlled within 60 minutes of starting analgesia. Oxygen should be given together with adequate hydration. Pain, respiratory rate, and sedation should be assessed every 20 minutes until pain is controlled. Since children with SCD presenting with painful crises in EDs are most undertreated and understudied, therefore, the objectives of this study is to highlight our practice in the initial management of such cases, and to find if there is any delay or improper management compared with the standard guidelines.

Methods. This is a retrospective cohort study, which includes children and adolescents who visited the ED with acute painful episode related to SCD for one year from July 2006 to July 2007. The study was conducted at the ED of King Abdulaziz Hospital, Al-Ahsa in the Eastern Region of Saudi Arabia. The Regional Research Committee approved the study protocol, with a waiver of patient consent and the ethical approval. The study included patients from 5-18 years old who presented to ED with painful crises related to SCD. Children below 5 years were excluded, as we used pain score scale of pain intensity component from 1-10 of adolescent pediatrics pain tool.[16] This tool relies on effective communication, which is difficult to obtain in infants and children below 5 years. We classify those above 18 years old in the adult's group and not the target of our study. Medical record review was used to obtain the following variables: age, gender, time of arrival including triage time, physician time, and drug given time. Additional variables are number of visits, triage level, pain score scale. Other variables included analgesic agents used, dose, route, and time to administration of initial analgesic, disposal time from ED, and outcome whether the patient was discharged, or admitted. The data were then computed using Statistical Package for the Social Sciences for Windows version 16 (SPSS, Chicago, IL, USA).

Results. There were 43 patients who attended the ED during the study period. They made 270 visit with VOE. The mean age was 12.1 years. Male patients had more visits to ED (176 [65.2%]) compared to (94 [34.8%]) females. Most of the visits were triage level 3 (92 [34.1%]) and 4 (158 [58.5%]) visits. Triage level 3 and 4 constitute together 92.6% of all the visits. For triaging patients, we use Canadian Triage Acuity System in our ED for categorizing patients such as: level 1 - patients need to be seen immediately (resuscitation); level 2 - is emergent in which time to medical care is <15 minutes; level 3 - is urgent, in which time to medical care is <30 minutes; level 4 - is less urgent, time to medical care is <60 minutes; level 5 - is not urgent, time to medical care is <120 minutes.[17] The arrival pain score was 5.9±1.7. There were 18 patients (41.8%) with visits between 4-9, 15 patients (34.8%) with 1-3 visits, and 10 patients (23.2%) with more than 10 visits. The recommended standard time to administration of initial analgesic drug in minutes according to international guidelines is 30 minutes

from ED arrival. In our study, we found the time to be 42.2±20.4 minutes, which is more than the standard time of 30 minutes. We compared standard time to administration of initial analgesic in our ED with the international guidelines. Our mean time was 40% (95% confidence interval [CI]: 24.0-64.4) more than the international guidelines. Only 33 visits (12.3%) were admitted to the hospital. Most visits 237 (87.7%) were discharged from ED with an average length of stay of 183.9±129.3 minutes. Initial analgesic agents used, of which morphine sulphate, voltaren, and paracetamol were the commonly used analgesic are shown in **Table 1**. **Table 2** shows the initial analgesic routes in which the most frequently used routes were intravenous. There is a considerable number of visits in which intramuscular and rectal routes were used in **Table 2**, and subcutaneous route was not used for any visits.

Table 1 - Initial analgesics used (N=272).

Initial analgesic	n	(%)
Morphine sulphate	91	(33.7)
Voltaren	84	(31.1)
Paracetamol	55	(19.6)
Ibuprofen	30	(11.1)
Tramadol	5	(1.9)
Pethidine	5	(1.9)
None	2	(0.7)

Table 2 - Initial analgesics route (N=270).

Route	n	(%)
Intravenous	91	(33.7)
Oral	73	(27.0)
Intramuscular	58	(21.5)
Per-rectal	46	(17.0)
None	2	(0.7)

Discussion. In the literature, the guidelines for the management of acute painful episodes include rapid triage, physical assessment, supplemental oxygen, hydration, and analgesia. Analgesia should be given within 30 minutes of patients entering ED and pain should be controlled within 60 minutes of starting analgesia. From our data, we found that the time taken to administer the initial analgesic from arrival of patients to ED was 42.2±20.4 which is 40% (95% CI: 24.0-64.4) more than the international guideline time of 30 minutes, which is a statistically important difference. This delay may be related to the fact that most visits (92.6%) were triaged level 3 and 4, and the average pain score was 5.9, which is considered as moderate pain. Another factor for the delay is the overcrowding of patients in our ED, and lack of proper orientation of the paramedical staff in triaging to give priorities for such cases. A third factor is that our ED is mixed, and most of our staff has adult experience with less experience in handling children. Patients or their relatives should be given cards defining their condition to show them to their caregiver the moment they arrived in ED.[18,19] There were no large controlled trials of analgesic regimens in SCD. A number of smaller trials failed to produce any option regimen. Ideally, the choice of drug should be influenced by an individual's analgesic history, and how far along the analgesic ladder the patient has already progressed. Patients with an uncomplicated VOE often have few physical findings to suggest the severity of their pain during the initial presentation. In addition, there are no laboratory tests that are diagnostic of acute painful episodes.[19] Therefore, we relied on the patient self-report. We assessed the pain intensity using adolescent-pediatric pain tool. From our study, pain score was 5.9±1.7 SD that is considered as moderate pain. This may be due to lack of enough or proper analgesics at home at the start of the painful episode.

Acetaminophen and nonsteroidal anti-inflammatory drugs are generally used as the first line management of mild to moderate sickle cell pain, and in combination with opioids for pain more than 7 score, namely, severe pain. Codeine is the most commonly used oral opioid for the management of mild to moderate VOE in pediatric patient.[19-21] In our ED, the use of codeine is in combination with acetaminophen named as Tylenol III, and is prescribed for patients to use at home. Morphine is the drug of choice when patients require parenteral therapy for severe VOE.[22,23] In our study the commonly used analgesics are NSAIDs as first line constituting all together (42%) (**Table 1**). Morphine is the frequently used opioid and paracetamol (without codeine) is less used (**Table 1**). These findings reflect the fact that most patients presented in moderate to severe pain with such results, and the approach in analgesics regimen in our ED does not differ from the international guidelines.

One of the major advances in the treatment of VOE has been the development of day hospitals and acute care facilities. Such facilities have been shown to reduce both hospital admissions and cost of caring as inpatients.[24] Considering our ED as one of the acute care facility in the area to which our patients present, we found from our study the number of visits that needed admission as inpatients constitute only approximately 12%, while those who were discharged home from ED was 88%. The length of stay of patients in our ED was 183.9±129 minutes, which is within the acceptable time frame of 4 hours allocated to stay in our ED for any patient. Most patients improved within this time frame.

Analgesic medication given for vaso-occlusive painful crises can be administered by several routes, including oral, rectal, intravenous, and subcutaneous for patients who have poor venous access. Intramuscular route is not

recommended in children secondary to pain associated with injection, and unpredictable absorption.[24,25] In significant dehydration the subcutaneous route may result in delayed, or unpredictable absorption. In our study, most of the patients (78%) received their medication via intravenous, oral, or rectal routes, but a considerable number (21.5%) received the medication via intramuscular route (**Table 2**). No one receives medications by subcutaneous route (**Table 2**). This finding does not follow the international recommended route administration. It may be due to the fact that our ED is mixed adult and pediatrics namely, no separate pediatrics settings, and most of our staff are adult trained physicians, who commonly prescribe intramuscular injections for their adult patients, including also children. We need to orient our staff and recommend a policy of not using intramuscular route in treating SCD children.

One of the limitations of this study is the relatively small sample size. Another limitation is the exclusion of children age group below 5 years because of poor communication and as such, the results do not reflect all children presenting to ED with VOE, only the group above 5 years old.

In conclusion, this study revealed a delay in the administration of the initial analgesics to children and adolescents presenting with painful crises related to SCD. Also, a considerable number get their analgesia by intramuscular route, which is not internationally recommended route for children. We need to improve our ED settings, set protocols, educate, and orient our staff when managing such cases.

Acknowledgment. *We are very much thankful to the Emergency Department secretaries for their great help.*

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