



Original Article

A Prospective Study on Bone Marrow Aspiration/Biopsy under General Anesthesia

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ABSTRACT

Invasive diagnostic and minor surgical procedures on patients outside the traditional operating room setting have increased in the last decade. Multiple procedures like bone marrow aspiration /biopsy cause pain, stress, depression etc for the patients and their families. Various methods have been recommended for pain reduction during invasive procedures. The aim of this study is to report the complications following general anesthesia. In this prospective observational study, 45 patients were enrolled. All patients received propofol 2.5 mg /kg and fentanyl 1 µg/kg. After adequate anesthesia, procedures were performed by the clinical pathologist. All anesthesia complications were classified into two groups: Intraoperative and Postoperative complications. In this study, 34 males and 11 females underwent general anesthetic procedure. Intraoperative period complications occurred in 7 patients (15.56%), and Postoperative period complications occurred in 9 patients (20%) cases. The most common complications were local bleeding, decrease O2 saturation and bradycardia. To conclude General anesthesia by propofol and fentanyl may be a good choice for short-term painful procedures in patients undergoing bone marrow aspiration/biopsy.

Keywords: General Anesthesia; Bone marrow aspiration, bone marrow biopsy.

INTRODUCTION

The bone marrow biopsy and aspiration is an essential diagnostic approach to the diagnosis of hematological disorders [1]. Invasive diagnostic and minor surgical procedures on pediatric patients outside the traditional operating room setting have increased in the last decade. These procedures cause lots of pain for children and adults and bring lots of stress for the patients and their families, particularly when these procedures

are repeated many times during the diagnosis or treatment period [2]. These procedures can also lead to depression and other Psychiatric disorders [3]. General anesthesia or combination of analgesia and sedative drugs during painful procedures is recommended by The World Health Organization and the American Academy of Pediatrics (AAP) [4,5,6]. Currently, various methods have been recommended for pain reduction during invasive procedures in this group of patients. These

methods include: effective education for parents and patient attenders in elderly patients, preparation of the patient for the procedure, cognitive behavioral therapy, sedation and general anesthesia^[7]. General anesthesia is recommended for all invasive procedures in pediatric and elderly patients. In this study, we reported the complications following general anesthesia for bone marrow aspiration /biopsy in children below 14 years of age and elderly patients whose age is above 65 years.

MATERIALS AND METHODS

This is a prospective observational study which was held in a teaching hospital for a period of one year. Forty five patients who required bone marrow aspiration were enrolled in our study. Inclusion criteria was defined as all patients between 6 months to 14 years old ages who needed interventions such as Bone marrow aspiration (BMA), Bone marrow biopsy (BMB) and elderly patients whose age is above 65 years. Excluding criteria were patients age between 14 years to 64 years, history of recent head injury; neurological abnormality, cardiopulmonary disease, drug allergies, and the parents who were not willing to give informed consent.

All patients received propofol 2.5 mg /kg and fentanyl 1 µg/kg by a trained anesthesiologist. After adequate anesthesia was gained, procedures were performed by a clinical pathologist. All anesthesia complications were classified into two main groups: intraoperative complications are those occurred from the time of starting anesthesia to completion of surgical procedure and transferring the patients to the recovery room. Postoperative complications refer to those complications which occur while the patient is still in the recovery room.

Complications which were recorded include: abnormal age-specific bradycardia (≤ 20 x baseline), decrease in arterial oxygen saturation ($\leq 90\%$), laryngospasm, vomiting, , hypothermia (< 35 C°), hyperthermia (> 37.8 C°), and local bleeding. All of these complications were

recorded by an expert nurse who did not participate in the anesthesia process or bone marrow aspiration/biopsy procedures. All Patients remained in the operating room until they gained their consciousness. All patients had cardiopulmonary monitoring, pulse oximetry, blood pressure and temperature monitoring during all procedures. All patients were discharged when they gained their consciousness completely and all vital signs went back to their normal values.

RESULTS

Forty five patients consisting of 34 males and 11 females, underwent general anesthetic procedures for bone marrow aspiration/biopsy. Forty five patients underwent only bone marrow aspiration and 36 underwent both bone marrow aspiration and bone marrow biopsy. The patient's characteristics are presented in (table I).

Intraoperative period complications occurred in 7 patients (15.56 %). The most common intraoperative period complications were, bradycardia, laryngospasm and decrease in arterial oxygen saturation which occurred in 3, 1 and 3 cases, respectively (6.67%, 2.23%, and 6.67 %). Shown in (table 2)

Postoperative period complications occurred in 9 (20%) cases. The most common complications in the postoperative period were local bleeding, vomiting, and decrease in arterial oxygen saturation which happened in 3, 2 and 2 cases, respectively (6.67%, 4.45%, and 4.45%) shown in (table 3)

Table: 1. Showing the type of procedures in all the patients.

sex	Number of patients	percentage
Male	34	75.56%
Female	11	24.44%
Procedures		
Bone marrow aspiration	45	100%
Bone marrow aspiration and biopsy	36	80%

Table 2: showing intraoperative complications.

Complication	Number of patients	Percentage
Bradycardia	3	6.67%
Laryngospasm	1	2.23%
Decrease in arterial oxygen saturation	3	6.67%
vomiting	0	0
Hyperthermia	0	0
Hypothermia	0	0
Local bleeding	0	0
Total	7	15.56%

Table 3: showing postoperative complications

Complication	Number of patients	Percentage
Bradycardia	0	0
Laryngospasm	0	0
Decrease in arterial oxygen saturation	2	4.45%
vomiting	2	4.45%
Hyperthermia	1	2.23%
Hypothermia	1	2.23%
Local bleeding	3	6.67%
Total	9	20%

DISCUSSION

It was developed in the beginning of the nineteenth century, allowing doctors to diagnose marrow disorders in patients [8,9]. The procedure evolved in the following years with focus on easier and repeatable collection of bone marrow, leading to full standardization of the procedure in the 1970s [10 to 12].

Usually, a bone marrow biopsy and aspiration is performed in a hospital or an outpatient clinic by a trained physician or clinical pathologist. Typical biopsy sites are the posterior and anterior superior iliac crest, but the sternum can also be used for aspiration. Before the biopsy, a local anesthetic is injected into the subcutaneous tissue to numb the area and reduce pain. The patient may also receive systemic analgesia and/or antianxiety medications [13]. In this present study, we enrolled the patients who are below 14 years and above 65 years age, who underwent for bone marrow aspiration and biopsy under general anaesthesia.

The posterior superior iliac crest is a preferred site for the bone marrow aspiration /biopsy due to safety, comfort, and convenience. The anterior

superior iliac crest is less preferred due to increased occurrence of pain and difficulty in sampling [14]. The sternal aspiration benefits are weighted against the risks associated with accidentally entering of the underlying mediastinum or causing a fatal episode of cardiac tamponade [15,]. Cases of hemorrhage have been reported, however, with very rare frequency [16]. In our study all the 45 patients, the bone marrow aspiration and biopsy was done from posterior superior iliac crest.

Various methods have been offered to reduce pain during invasive procedures in patients undergoing bone marrow aspiration/biopsy. As this procedure bring pain and anxiety for patient and their family. Implication of an effective pain reducing method seems necessary [17]. General anesthesia is currently recommended as the preferred method to reduce pain in patients undergoing lumbar puncture, bone marrow aspiration and bone marrow biopsy [4,5].

According to several studies, patients receiving intravenous sedation(IVS) tend to be more often willing to undergo a future bone marrow aspiration/biopsy, compared to patients receiving only local anesthesia (LA) [18]. Apart from the favorable effects, IVS administration has serious drawbacks, like prolongation of the hospital stay, requirement of additional staff and equipment, and furthermore, it contributes to an increase in incidence of adverse effects. Before administration, the beneficial effects of IVS need to be balanced against the adverse effects for each given patient. When given the choice between (LA) only and LA/IVS, patients choosing LA were more satisfied with their choice. However, patients that received IVS alongside LA had a lower pain score compared to patients receiving LA only [19].

Meneses et al. in their study stated that vomiting, agitation, headache being the most common complications in the postoperative period [20]. However our present study showed that 6.67% patients had local bleeding from site and 4.45% patients had vomiting during postoperative period, intraoperatively bradycardia and decrease in

arterial oxygen saturation are the most common complications.

CONCLUSION

To conclude, patients undergoing bone marrow aspiration/biopsy is a severely painful process, and, as the unbearable pain score is closely related to the difficulty of this procedure and the experience of the performing clinical pathologist. General anesthesia by propofol and fentanyl is a good choice for short-term painful procedures like bone marrow aspiration/biopsy particularly in children and elderly patient.

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