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Role of Anesthesia in Performing Invasive Procedures for Children with Malignancy

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Abstract

Background: Pediatric oncology patients frequently need several painful procedures during their diagnostic and therapeutic process. During the past decades, most centers abroad have developed safe and effective protocols for procedural sedation and analgesia in children. This report describes procedural sedation and analgesia as performed in pediatric oncology unit and tries to report success of sedation and incidence of complication. **Materials and Methods**: Between 1998 and 2004, all invasive procedures for oncologic children presented in Aliasghar and Dastgheyb hospitals in Shiraz, were performed with deep sedation or general anesthesia and the failure(s) and side effects were evaluated.

Results: totally 1381 deep sedations or general anesthesia were carried out and 1792 invasive procedures were performed For 166 children (103 boys and 63 girls) with suspected or proved oncologic disease with age range of 1.5 to 15 years Lumbar puncture (LP) and intratechal injection were performed in 73% of patients mean while bone marrow aspiration and biopsy were performed in 26% and 1% of patients; respectively. The main side effects were nausea and vomiting in about 7% of patients. No failure of the invasive procedures especially LP happened.

Conclusion: Use of general anesthesia and/or deep sedation on pediatric patients with oncologic disease is safe and can be recommended in these patients.

Keywords: Children, Oncology, Invasive procedures, General anesthesia, Deep Sedation

Introduction

Thomas Cooley (1) recognized Thalassemia as Pediatric patients who seldom need medication for relief of pain. They tolerate discomfort well (1). There is widespread ignorance about the pain and its relief in childhood. Too many children suffer the pain as a result of medical attitudes over the pain relief, which leads to inadequate and ineffective therapy. Pediatric oncology patients frequently need the invasive procedure such as bone marrow aspiration and biopsy, lumbar puncture and intratechal chemotherapy injection. One of the most complications of these invasive procedures is pain, especially in children and teenagers that causes delay and stops diagnostic and therapeutic procedures due to patients' and their parent's non-cooperation. During these painful procedures, children always suffer the fear and anxiety and these bad images remain in their minds during the oncology therapy. [1, 2].

By using the general anesthesia, today it is proved that we can reduce the pain degree and

***Table 1**: Different levels of consciousness based on American academy of pediatrics*

Consciousness level	Definition
Conscious sedation	Controlled medical situation with minimal conscious ness that retains protective reflexes. Maintains airway and adequate ventilation without intervention. The patient normally responds to verbal or physical commands.
Deep sedation	Controlled medical situation with unconscious ness that the patient cannot be easily aroused but responds purposefully to noxious stimulation. May require assistance to maintain the airway and adequate ventilation. Cardiovascular function is usually maintained.
General anesthesia	Controlled medical situation with unconscious and lack of protective reflexes such as, inability to maintain the airway and inability to normally respond normally the verbal or physical commands.

complications of the invasive procedure, and we can both completely fix patients and also reduce their anxiety and their accompanists'.

Controlling the fear and anxiety ensued from an invasive procedure is difficult and it may be worse because of parents' anxiety, for the sake of being separated from their children and because of the pain itself and waiting for suffering pain. Although, diverting patient's attention, using movies and music have had clear and proved advantages, but they can not play an important role to decrease the pain degree, so it is needed to apply effective and more important methods [4]. Access to situation without anxiety and prolonged immobilization of child through a painful and terrible procedure is very difficult in conscious children.

Whereby use of various anesthesia methods in many hospitals and cancerous children centers is purposed [5, 6].Sedation and anesthesia methods that are used in the invasive procedures are between conscious and unconscious limits. This spectrum has 3 levels: conscious sedation, deep sedation and general anesthesia. These phases have internal continuous relation and patient may easily go from sedation and painless level to general anesthesia in this subject. The American academy of pediatrics has defined and classified these concepts. [5](Table1).

Many of the invasive procedures that need sedation could be done in deep sedation level for children.

In addition to protection of children safety and their psychological security, Sedation in cancerous children can reduce the invasive procedure's pain and eliminates negative psychological response to treatment by using anesthesia and anti-anxiety medicines, and causes amnesia for them to eliminate any unpleasant remembrance. And also controls their movement and makes a practically desirable stillness, and returns patient to a situation that makes it possible for physician to discharge patient from hospital [4, 5].

Today, various supplementary sedation or anesthesia procedures are used in the USA and many European pediatric wards to do the invasive procedures over cancerous children. Although there are differences between the USA and Europe in this subject, but surely, usage of mere local anesthesia won't be sufficient during an invasive procedure [6].

In our country, using the sedation and

***Table 2**: Different drugs used in anesthesia for bone marrow aspiration and biopsy*

	A Method	B Method	C Method	D Method
1- Premedication	Alfentanil	Alfentanil+ remifentanil	Alfentanil	Alfentanil+ remifentanil
2-Anesthetic induction	Pentothal	Pentothal	Propofol	Propofol
3- Maintenance of anesthesia	Oxygen- if the operation time lasted. Pentothal was reinjected.	Oxygen + remifentanil	Oxygen ± Propofol	Oxygen± remifentanil

anesthesia methods, conscious sedation to general anesthesia, was not common and this report announces the physicians who use these methods in doing approximately 1400 invasive procedures over cancerous children.

Materials and Methods

Using the anesthetic methods in doing invasive diagnostic and therapeutic procedures was programmed in late 1997 and has done since early 1998 up to late 1999 in Aliasghar hospital and since early 2000 up to late 2001 in Dastgheyb hospital (these two centers are subdivisions of Shiraz Medical University).

Samples were all cancerous children out of admitted and out-patient wards of aforementioned hospitals that had thoroughly under-gone the invasive procedures. After informing parents about procedures, methods and getting informed consent and giving written instructions about cares before and after anesthesia, children were kept NPO from 4 hours before operation. After their entrance to operating room and intravenous cannulation, anesthesia was done by an anesthetist, using anesthetic machine (without intubations) and using oxygen and mask, and then the invasive procedure was done by a hematologist when the consciousness of patient arrived to desired level. The medicines that were used in different phases are presented in tables 2 and3.Venous antiemetic medication, metoclopramide or Granisetron, injected for all patients.

All cases were controlled by means of cardiac monitor, and oxygen saturation was measured by pulse -oximetry. Patients' blood pressure was measured before and after anesthesia and hereafter every 5 -10 minutes during it.

To control the security and quality of done actions, time of anesthetic induction, duration of anesthesia, and time of recovery, administrated dose of agents and their complications such as laryngospasm, hypoxia, emergency reactions and nausea after anesthesia were precisely recorded. In addition we, recorded demographic patients' information, details of disease type and accomplished works, failure of the invasive procedures, need to their repetition, inaptitude of taken samples and bloody CSF during the lumbar puncture. Information of patient was recorded in related questionnaire and then it was analyzed by SPSS software.

Results

Within 8-year period, 1381 general anesthesia or deep sedations were done, for 166 children (103 boys and 63 girls) suspected or suffered to cancer in age range of 1/5 – 15 years and 1792 invasive procedure such as lumbar puncture and intratechal injection, bone marrow aspiration and biopsy were done. In some patients, several invasive procedures were done simultaneously with the general anesthesia. The kinds of illness and invasive procedures are separately given in Tables 4 and 5.

The most common complications after anesthesia were nausea and vomiting in which 7% of patients needed second dose of anti emetic agent.

There was no failing case in the lumbar puncture and intratechal injection and there was no need to repeat the invasive procedure because of poor result. In 7 cases, time of operation was increased because of patient's condition such as excessive obesity or spinal column problems

Discussion

Today, there are various methods available for decreasing the pain and simultaneously happened unpleasant side effects during curative and diagnostic interventions in children with malignant disease. Today, it is clear that the degree of understood pain in children is the same as adults' and it is not morally acceptable to let children suffer the pain [7].

It was also seen that the anxiety and last experience of the pain have profound and considerable effects on patientswho had undergone the invasive procedure [8, 12].

***Table 3**: Different drugs Used in anesthesia for lumbar puncture and intratechal injection*

1- Premedication	Oxygen ± remifentanil
2-Anesthetic induction	Pentothal or Propofol
3- Maintenance of anesthesia	Oxygen

***Table 4**: Kinds of illness*

No.	Kind of illness	No patient	No anesthesia
1	Acute lymphoblastic leukemia	129	1185
2	Acute myeloid leukemia	9	61
3	Non Hodgkin's lymphoma	13	98
4	Hodgkin's lymphoma	3	3
5	Mixed leukemia	2	13
6	Pancytopenia	3	4
7	Histiocytosis x	2	2
8	Neuroblastoma	1	1
9	Retinoblastoma	1	1
10	Idiopathic thrombocytopenic purpura	1	7
11	Rhabdomyosarcoma	1	4
12	Splenomegaly	1	2
	Sum	166	1381

There are different guidelines to decrease the pain such as training children to adopt it and some complicated methods that tries to modify a somatic pain or anxiety experience and the methods that cause anesthesia in children [13].

The severity of the pain that cancerous children suffer due to an invasive procedure is more than the pain of illness, itself. [13]. Children that suffer the acute lymphoblastic leukemia will undergo the lumbar puncture, nearly 10 times and bone marrow aspiration around 4 times during 2-3 years of treatment course. [6]. Nowadays in many of world clinics, usage of painless methods such as general anesthesia or deep sedation in cancer wards are applied, although 1/4 of North American institutions do the invasive procedures on conscious patients and lack of equipment and complications of these anesthesia methods are their important reasons to abandon these methods.

Whereas today, researchers prove that frequent use of general anesthesia or deep sedation is very harmless [14-16].

In this study 1381 general anesthesia or deep sedations were done for 166 patients and no especial complication was seen. Furthermore there was no failing case about the lumbar puncture and intratechal injection.

On the basis of published reports in children with the acute lymphocytic leukemia, if the first LP becomes bloody (or traumatic LP = existence of more than 10 RBCs in each CC) relapse of tumor in central nervous system would be more contingent [17]. In Gajjar et al. study, during treatment, chance of failure in cases with the traumatic LP was twice more than whom without it [18, 19]. Moreover it must be considered that if the LP became bloody it can hide existence of blast cell in the CNS. The best way to prevent the traumatic LP is using the anesthesia and doing it by experienced professors [20, 21].

With this preconception, using the anesthesia and sedation methods both could decrease the children pain and increase the chance of success in procedures, and it was effective on prognosis. Although experience of the person performing is very important to do the invasive procedure report. In this report all of the invasive procedures were precisely done by hematologists such that bloody LP never occurred.

Using the sedation and anesthesia methods has also this privilege that let us accomplish important operations such as testis biopsy, lymph node biopsy, and operations as circumcision, hernia and so on simultaneously.

Although, using these anesthesia methods raises patient's medical expense, but it decreases the repetition or failure of operation and patients would be more satisfied.

Conclusion

Applying the anesthesia methods for the invasive procedures on cancerous children would be safe and harmless if it is performed by experienced persons and has an important role to lower the pain

of patient and causes increase in survival of patients by decreasing the failure of cases. So we suggest making these methods pervasive in other clinics, especially hematology –oncology wards.

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