

Assessment of Pain Caused by Invasive Procedures in Cancer Patients

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Key Words

Procedures, pain, cancer, pain management

Abstract

Invasive procedures are commonly required in the diagnosis and management of cancer in adults. However, little is known regarding the prevalence and severity of procedure-related pain in this patient population. This prospective study was conducted to determine the frequency and types of invasive procedures performed in a large comprehensive cancer center, the intensity of pain associated with these procedures, the types of periprocedural analgesics administered, and how these patients would like their procedural pain to be managed in the future. During a 6-week period, 102 cancer patients were interviewed immediately after undergoing an invasive procedure. They were asked to rate the pain they experienced before, during, and after their procedure using a verbal descriptor scale (VDS) ranging from 0 to 10. They also were asked if they would want more, less, or the same amount of pain medication if they were to undergo the same procedure again. The most frequently performed procedures were bone marrow aspirates and biopsies (68%), lumbar punctures (14%), and placements of central venous catheters (10%). The average pain rating during these procedures was 4.2 (standard deviation [SD], 3.0). However, 26% of patients experienced severe pain (VDS score ≥ 7) during the procedures. Twenty-four percent of patients surveyed received conscious sedation for their procedure. There was no statistical relationship between patients' pain ratings and their satisfaction with the pain control they received during the procedures. This study represents the largest descriptive study of procedural pain in adult cancer patients. As more than 50% of these patients experienced moderate to severe pain during procedures, further studies are needed to improve the control

of procedure-related pain in patients with cancer. (*JNCCN* 2003;3:435-439)

The pediatric oncology literature contains studies that address pain associated with invasive procedures^{1,2} and guidelines to reduce the incidence of periprocedure pain.³⁻⁶ This is particularly important in children because psychological consequences can result depending on the child's stage of development and ability to cope with a painful experience. However, even in adults, painful procedures can cause substantial fear and anxiety that can significantly affect quality of life or adherence with therapy. Moreover, modern analgesic techniques and conscious sedation should be able to provide adequate analgesia for the vast majority of patients undergoing diagnostic or therapeutic procedures.^{7,8}

Research on the incidence, severity, and impact of procedural pain in adults is extremely limited. All reported studies have examined the use of conscious sedation, with either a benzodiazepine alone^{9,10} or with an opioid,^{11,12} in patients undergoing bone marrow aspiration and biopsy (BMAB). The prospective study reported in this manuscript was conducted to determine the frequency and types of invasive procedures performed in a large comprehensive cancer center, the intensity of pain associated with these procedures, the types of periprocedural analgesics administered, and how these patients would like procedural pain managed in the future.

Patients and Methods

Patient Population

Inpatients and outpatients who had a scheduled invasive procedure at the Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins were identified each day

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Received February 25, 2003; accepted for publication April 10, 2003.

None of the authors have received any financial support for this study.

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(Monday through Friday) during a 6-week period in January and February 2002. Patients were identified from a daily list of outpatients scheduled for procedures and by communicating each morning with the charge nurses on each of the medical oncology inpatient units. Eligible patients included both women and men who were at least 18 years old, had a Karnofsky performance status of greater than 60, provided informed consent, and did not receive general anesthesia for the procedures. This study was approved by the Internal Review Board of the Johns Hopkins Medical Institutions.

Data Collection

Patients were interviewed less than one hour after the procedure was completed. They were asked to quantify their pain before, during, and after the procedure using an 11-point numeric scale, in which 0 is no pain and 10 is the worst pain imaginable. Patients also were asked "If you had to undergo the same procedure again, which of the following statements would you agree with: 1) I would not want anything to be done differently; 2) I would need more pain medicine before the start of the procedure next time; or 3) I would need less pain medication next time. Basic demographic information and the type of analgesic provided to each patient for the procedure were documented. These included local anesthetics or conscious sedation, defined as the use of a benzodiazepine or a combination of an opioid analgesic with a benzodiazepine in addition to the local anesthetic.

Results

One hundred and two eligible patients were identified during this period of 30 working days at the Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins. Table 1 shows the characteristics of the study sample. The majority of patients undergoing procedures were hospitalized. There was a slight predominance of men in the study. Table 2 lists the

Table 1 Patient Characteristics

Inpatients	73
Outpatients	29
Women	41
Men	61
Average age (range)	52 (21-81)

Table 2 Cancer Diagnoses of the Study Patients

Diagnosis	Patients, <i>n</i>
Acute myelogenous leukemia	24
Non-Hodgkin's lymphoma	22
Myelodysplastic syndrome	12
Multiple myeloma	12
Chronic myelogenous leukemia	10
Acute lymphoblastic leukemia	7
Chronic lymphocytic leukemia	2
Breast cancer	2
Prostate cancer	2
Hodgkin's disease	1
Mycosis fungoides	1
Esophageal cancer	1
Gastric cancer	1
Melanoma	1
Non-small cell carcinoma	1
Primary CNS lymphoma	1
Aplastic anemia	1
Leukemia, not otherwise specified	1

cancer diagnoses of the study patients. Most patients undergoing invasive procedures during the study period had a hematologic malignancy, with acute leukemia being the most frequent diagnosis, followed by non-Hodgkin's lymphoma. Table 3 presents a summary of the invasive procedures that were surveyed. The most frequently performed invasive procedures at the cancer center were BMAB (68%), followed

Table 3 Types of Invasive Procedures Documented in the Study

Type of Invasive Procedure	Patients Undergoing Procedure, <i>n</i>
Bone marrow aspirate or biopsy	69
Lumbar puncture	14
Central line catheters	10
Thoracentesis	3
G-Tube placement	1
Cystoscopy	1
Liver biopsy	1
Lymph node biopsy	1
Nephrostomy tube insertion	1
Angiogram	1

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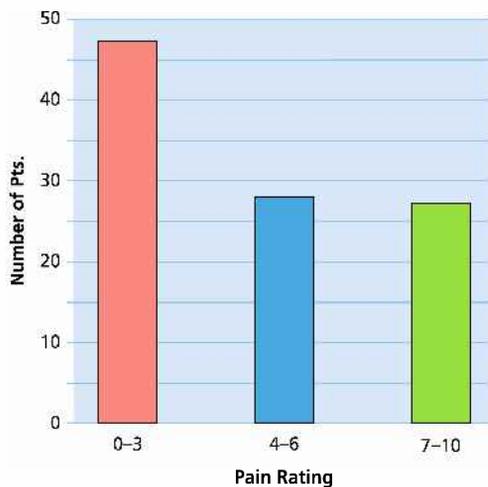


Figure 1 Average pain rating during invasive procedures.

by lumbar punctures (14%) and placement of central venous catheters (10%).

Figure 1 provides a breakdown of the pain ratings associated with all procedures. The average pain rating during the procedures was 4.2 (SD, 3.0). Twenty-seven percent of patients experienced moderate pain (VDS 4–6), and 26% had severe pain (VDS 7–10). The average baseline pain rating before the procedure was less than 1 and after the procedures the average pain rating was also less than 1. Table 4 shows the procedures associated with higher pain scores. Note that over half of the patients undergoing bone marrow aspirates and biopsies experienced moderate to severe pain during the procedure.

Seventy-seven percent of patients reported that if they had to undergo the procedure again, they would not want anything to be done differently in terms of pain control. Twenty-three percent of patients said they would need more pain medication, whereas none of the patients surveyed said they would want less pain medication for their procedure. Table 5 details the most commonly performed procedures and the per-

Table 4 Procedures Associated with Moderate to Severe Pain

Procedure	Patients with a Pain Rating ≥ 4 , n
Bone marrow aspirate/biopsy	44 (64%)
Lumbar puncture	6 (43%)
Central line placement	2 (20%)
Cystoscopy	1 (100%)
Thoracentesis	1 (30%)
Lymph node biopsy	1 (100%)

Table 5 The Most Commonly Performed Procedures and Patient Satisfaction

Procedure	Average Pain Rating (SD)	% Patients Satisfied with Pain Control During the Procedure
Bone marrow aspirate/biopsy	5.1 (2.74)	71%
Lumbar puncture	3.0 (2.62)	100%
Central line placement	2.0 (2.28)	67%

centage of patients within each group who were satisfied with their periprocedural pain control.

Table 6 gives a breakdown by pain rating of the percentage of patients who were satisfied with their pain control. Patients were grouped together based on pain rating, not procedure. From this result, it appears that about 20% of patients having mild to moderate procedural pain would like more pain medication, and this number jumps to about 40% when patients experience pain ratings of 7 or higher.

Approximately one quarter of the procedures was performed using conscious sedation. Table 7 compares the type of analgesia administered during the procedure with the percentage of patients who were satisfied with their periprocedural pain control. The average pain rating during the procedures was similar for patients who received local anesthetic alone or conscious sedation in addition to the local anesthetic. On average, both groups experienced a moderate amount of pain during the procedures, but both types of pain control were associated with a high level of patient satisfaction.

Discussion

This study represents the largest examination to date of the prevalence and severity of procedural pain in adults with cancer. It also provides a cross-sectional view of invasive procedures performed at a comprehensive cancer center. However, it is not a complete

Table 6 Comparison of Patient Satisfaction within Each Pain Rating

Pain Rating During the Invasive Procedure	Patients with This Pain Rating, n	Patients Satisfied with Pain Control, n (%)
0-3	47	38 (81)
4-6	28	22 (78)
7-10	27	16 (59)

Table 7 Type of Analgesia and Patient Satisfaction

Type of Analgesia	Patients, n	Average Pain Score (SD)	Patients Satisfied With Pain Control, n (%)
Local anesthetic	78	4.1 (2.8)	61 (78.2)
Conscious sedation	24	4.5 (3.4)	19 (79.2)

survey, because some commonly performed procedures, such as paracentesis and chest tube placement, were not documented during the brief study period.

The findings in this study show that over 50% of patients undergoing diagnostic and therapeutic procedures experienced moderate to severe pain from the invasive procedure. As excellent analgesic strategies are currently available, this study documents a genuine need to improve pain control in adult oncology patients undergoing these procedures. It also emphasizes the need for a routine monitoring plan to quantify the pain associated with procedures so that appropriate steps can be taken if analgesia for a particular procedure or from a specific health care provider is inadequate. These should be included as a routine component of a cancer center's quality assurance program.

The results of this study also have implications for the informed consent process in oncology patients undergoing invasive procedures. Because it is required that health care providers accurately inform patients of the risks associated with a particular procedure, data on the likelihood of significant pain from studies such as this one should be incorporated into the informed consent documents and discussion. As pain control improves, these documents and discussions should be modified to reflect these improvements.

This study was not designed to analyze reasons for the significant amount of procedural pain that was observed. However, this initial research should stimulate further investigation designed to determine factors that contribute to and interfere with adequate pain management during invasive procedures. These future studies will need to account for many variables, including the wide range of procedures, patients on whom they are performed, and provider proficiencies and attitudes with regard to pain control.

Although this study documents that moderate to severe pain is common in adults with cancer undergoing invasive procedures, most of the patients sur-

veyed were satisfied with the management of their procedural pain. This paradox has been reported previously in patients with nonmalignant pain^{13,14} and cancer pain.¹⁵ Ward et al¹⁴ theorized that, instead of pain severity, an important factor contributing to patient satisfaction may be "the pattern of pain relief," in which patients "experience a commonly expected peak and trough pattern of pain relief." Although this explanation may be relevant for patients with chronic pain or postoperative pain, other factors may be more important in procedural pain. These may include patient expectations of how painful a procedure will be or attitudes regarding opioid use. Many patients may be willing to tolerate severe pain for a brief time rather than take "potentially addicting" drugs. Other patients may not understand that much of the discomfort that they experienced might have been prevented. Further studies are needed to better understand why the majority of patients in this study reported they were satisfied with their pain control even though they experienced moderate or severe pain.

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