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# Sensory Perceptions of Patients With Cancer Undergoing Surgical Insertion of a Totally Implantable Venous Access Device: A Qualitative, Exploratory Study

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**M**any patients with cancer require prolonged treatment with IV chemotherapeutic drugs. Repeated access to peripheral veins becomes increasingly difficult over the course of treatment and can become a challenge to doctors, nurses, and patients (Borst, de Kruif, van Dam, & de Graaf, 1992). Patent and safe venous access is essential for IV treatments because venous integrity may be compromised by cytostatic agents that are toxic to peripheral veins (Chen et al., 2007; Dede, Akmangit, Yildirim, Sanverdi, & Sayin, 2008; Wolosker et al., 2004).

A totally implantable venous access device (TIVAD) can offer a safe alternative for long-term administration of chemotherapy, blood transfusion, blood sampling, hydration, pain therapy, and other supportive care. Experience has shown that the catheters are safe and reliable (Wolosker et al., 2004). A TIVAD consists of a silicone septum mounted above a chamber that is inserted subcutaneously on the anterior chest wall. The chamber is connected to a catheter whose distal extremity is positioned at the junction of the superior vena cava and the right atrium (Caers et al., 2005; Kreis et al., 2007; Rodgers, Liddle, Nixon, Innes, & Greening, 1998; Schutz et al., 2004; Wolosker et al., 2004). Surgical insertion usually is performed in an operating room as a day-case surgical procedure and under local anesthesia by a team specialized in venous access insertion (Maurer, Beck, Hamm, & Gebauer, 2009; Rodgers et al., 1998).

Preoperative education is a common feature in preparing patients for many surgical procedures. Patients can be informed through an information pamphlet, audiovisual presentations, training, or a combination thereof (Hodgkinson, Evans, & O'Neill, 2000). The aim of preparing patients is to help them to be ready mentally for the invasive procedure. Self-regulation theory indicates that

**Purpose/Objectives:** To investigate sensory perceptions of patients who underwent insertion of a totally implantable venous access device (TIVAD) under local anesthesia.

**Research Approach:** Qualitative, exploratory study.

**Setting:** Tertiary care center in Belgium.

**Participants:** 20 adult patients with cancer or hematologic disease undergoing a first-time TIVAD insertion.

**Methodologic Approach:** Immediately after insertion, patients were asked to describe their sensory perceptions during each of four phases. Descriptions were documented in a sensory information grid (SIG) that was composed of a row and column matrix of entries for the four phases of the procedure and the five sensory modalities. Verbatim descriptions of patients were assigned labels using a descriptive coding process.

**Main Research Variables:** Sensory perceptions in the modalities of hearing, sight, touch, smell, and taste.

**Findings:** Patients experienced many sensory perceptions that mainly occurred during preparation of the patients and surgical equipment (phase 2) and during the actual TIVAD insertion (phase 3). Patients perceived fewer olfactory sensations. No taste perceptions were mentioned.

**Conclusions:** Patients reported numerous sensory perceptions during TIVAD insertion. The SIG method proved suitable for assessing and documenting patients' sensory perceptions.

**Interpretation:** The reported descriptions can be used (a) to develop a structured questionnaire to quantitatively assess sensory perceptions and (b) to prepare patients for what to expect with regard to sensory information experienced before, during, and after TIVAD insertion. This method for exploring and documenting sensory perceptions might be applicable to other diagnostic or therapeutic interventions.

preparatory information enables patients to construct mental representations of the procedure (Nerenz & Leventhal, 1983). During the procedure, patients use the mental schemas to predict what they might experience.

Congruence between the expected and actual experiences will result in less distress and greater ability for self-care (Rhodes, McDaniel, Hanson, Markway, & Johnson, 1994).

Some argue that preparatory information should include procedural, sensory, and temporal information (Rhodes et al., 1994). Procedural information explains what will occur during the procedure, sensory information describes the sensations that typically are experienced, and temporal information depicts the length of time generally required for the procedure (McDaniel & Rhodes, 1998). Research in different populations such as surgical patients scheduled for an elective total hip replacement, patients in intensive care, and women with breast cancer receiving chemotherapy has demonstrated that the combination of procedural, sensory, and temporal information is more effective in reducing anxiety and psychosocial impact than one single type of information (Gammon & Mulholland, 1996; McDaniel & Rhodes, 1998; Shi et al., 2003).

To fully and accurately prepare patients for TIVAD implantation, healthcare workers need to know the different procedural phases that occur and the sensory perceptions that patients may experience. Although imparting expected sensory information appears to be important in preparing patients, the literature describing participants' sensory perceptions is lacking. Therefore, preparatory sensory information often is indirectly based on healthcare professionals' presumed perceptions of the patients' sensations, rather than on actual sensations described by patients (Rhodes et al., 1994). As a result, the current study aimed to assess the sensory perceptions of patients under local anesthesia who underwent surgical TIVAD insertion.

## Methods

### Design

To assess sensory perceptions, the authors developed a three-stage approach. In the first stage, the surgical procedure was divided into different phases. In the second stage, a general exploratory approach was used to conduct a semistructured interview, during which respondents were asked to report what they had experienced with their five senses in each of the phases of the procedure. In the third stage, a descriptive coding process was performed with the assistance of a sensory information grid (SIG). The three-stage approach was named the SIG method. The institutional review board of the University Hospitals Leuven approved the study protocol. The study was performed in accordance with ethical standards, as described in the 2002 Declaration of Helsinki.

### Study Population

Inclusion criteria were patients who could read and speak Dutch and were aged 18 years or older, diagnosed

with an oncologic or hematologic disease, and undergoing a first-time TIVAD insertion under local anesthesia without any form of sedation. Patients with a cognitive or verbal dysfunction or patients who needed to start IV chemotherapy directly after TIVAD insertion were excluded.

### Data Collection

The first step in the SIG method is the division of the surgical procedure into different stages. Based on nonparticipatory observations by a researcher independent from the clinical team, four successive phases were identified. Phase 1 was defined as the period when patients were sitting in the waiting room. Phase 2 began in the operating room with the preparation of the patient and surgical equipment and ended when the patient was covered with sterile drapes. Phase 3 encompassed the period from the TIVAD insertion to the removal of the patient's sterile drapes. Finally, phase 4 consisted of the period encompassing the aftercare given to patients before leaving the operating room. During aftercare, the pads positioned on the patients' thorax for electrocardiogram (ECG) monitoring and those attached to their limb for the cauterizer were removed. Nurses assisted the patients as they dressed and left the operating room.

Immediately after TIVAD insertion, patients were approached to participate. If they provided written informed consent, a single semistructured, open-ended interview was conducted to explore patients' sensory perceptions during the different procedural phases. The semistructured interviews took place at the surgical daycare unit of the University Hospitals Leuven. To ensure quietness and privacy, the investigators performed the interviews in patients' rooms or in a different room. At the beginning of each interview, patients were asked some questions about their demographic and clinical characteristics. Patients then were invited to describe in their own words the sensory perceptions they experienced during each phase in the modalities of audition, vision, pressure, olfaction, and gustation. In the current study, the five modalities are referred to as hearing, sight, touch, smell, and taste, respectively. Interviews were digitally recorded.

### Data Analysis

After conducting the interviews, the researchers listened to the conversations several times and documented the patients' descriptions of sensory perceptions in a SIG specifically designed for the current study. The four rows of the grid referred to the four phases that comprised the entire procedure, and the five columns of the grid referred to the five sensory modalities. The researchers subsequently performed a descriptive analysis that involved breaking down the data into smaller units and adding labels according to the content they represented (Gibbs, 2002). After

performing a number of interviews, the labels were reviewed by a panel of experts, comprised of an associate professor in nursing science, three nurse specialists in venous access, and a surgical oncologist specializing in TIVAD insertion. The preliminary data guided the next interviews, illustrating the iterative process of analysis occurring concurrently with data collection (Dicicco-Bloom & Crabtree, 2006). Interviews were performed until theoretic saturation was achieved.

To enhance methodologic rigor of this qualitative study, the researchers used a diary to document the decision trail, the evolution of the interviewing technique, and reflections on the collected data. Keeping a reflexive journal can form part of an audit trail concerning theoretic, methodologic, and analytic decisions made during the course of the study (Koch, 1994). Trustworthiness also was enhanced through peer review of the interviewing technique and descriptive analysis. Finally, peer debriefing was performed through a critical linguistic analysis, ensuring that labels explicitly represented patients' descriptions. By attributing labels, the researchers attempted to describe patients' perceptions objectively.

## Results

Twenty-two patients were asked to participate. One patient refused and one patient eventually was excluded because the interview was interrupted several times. Therefore, 20 patients (91%) were included in this study. The demographic and clinical data of the included patients are shown in Table 1. The sensory perceptions for the four procedural phases are summarized in Table 2.

### Phase 1

Participants experienced quietness and silence in the waiting room, which they found comforting. Depending on the number of patients sitting in the waiting room, respondents heard conversations of surrounding people and sometimes crying children.

Participants saw a queue of other patients waiting for a procedure. Some mentioned seeing bustling staff walking up and down the hallway. Most patients reported that they did not perceive smells during the first phase. However, one patient noticed a stale smell, but she could not specifically describe it. Another patient smelled ether, describing it as a typical scent experienced when entering hospitals. None of the patients perceived any sensations concerning their touch or a taste while waiting for the operation.

### Phase 2

Some patients reported hearing staff engaged in conversations. Although all patients were monitored

with an ECG, few remembered hearing their heartbeat. Patients stated they did not pay much attention to surrounding sounds because they were focused on the upcoming surgical procedure. Most patients mentioned hearing only some background noise. When patients were asked to describe what they saw during the second phase, they mentioned an operating table with a large lamp placed above, medical and surgical staff, and a large amount of medical equipment. When patients were lying down on the operating table as they were being prepared for the procedure, they saw pads positioned on their chest for ECG monitoring. Two patients reported seeing the electrosurgical pad attached on their limb. Patients who had undergone an operation in the past reported seeing a recognizable space and interior. However, patients who had never entered the operating room before reported being surprised to see a small but bright space. The room exuded a more private ambience than expected. Because sterile drapes were placed over the patients' face, their direct field of view was very

**Table 1. Participant Demographic and Clinical Variables**

Patient	Age (Years)	Gender	Type of Care	Clinical Diagnosis
A	28	Male	Inpatient	Testicular cancer
B	42	Female	Inpatient	Gastric cancer
C	42	Male	Outpatient	Bowel cancer
D	51	Female	Outpatient	Ovarian cancer
E	52	Female	Inpatient	Ovarian cancer
F	56	Female	Outpatient	Non-Hodgkin lymphoma
G	56	Male	Inpatient	Lung cancer
H	57	Female	Inpatient	Ovarian cancer
I	59	Male	Inpatient	Lung cancer
J	60	Male	Outpatient	Laryngeal cancer
K	63	Female	Inpatient	Ovarian cancer
L	65	Male	Outpatient	Laryngeal cancer
M	67	Female	Inpatient	Mantle cell lymphoma
N	67	Male	Inpatient	Liver cancer
O	69	Female	Outpatient	Breast cancer
P	69	Male	Inpatient	Bowel cancer
Q	70	Female	Inpatient	Bowel cancer
R	70	Female	Outpatient	Breast cancer
S	73	Female	Inpatient	Bowel cancer
T	73	Male	Inpatient	Laryngeal cancer

**Table 2. Sensory Information Grid**

Phase	Hearing	Sight	Touch	Smell	Taste
1	<ul style="list-style-type: none"> <li>• Silence</li> <li>• No annoying background noise</li> <li>• Conversations between patients</li> <li>• Crying children</li> </ul>	<ul style="list-style-type: none"> <li>• Queue of waiting patients</li> <li>• Fussing or bustling staff</li> </ul>	<ul style="list-style-type: none"> <li>• No perceived sensations</li> </ul>	<ul style="list-style-type: none"> <li>• No perceived smell</li> <li>• Stale smell</li> <li>• Smell of ether</li> </ul>	<ul style="list-style-type: none"> <li>• No perceived taste</li> </ul>
2	<ul style="list-style-type: none"> <li>• Silence</li> <li>• Conversations between staff</li> <li>• Heartbeat on electrocardiogram monitor</li> <li>• Background noise</li> </ul>	<ul style="list-style-type: none"> <li>• Operating table with a lamp above</li> <li>• Medical and nursing staff</li> <li>• Electrocardiogram monitor and electrosurgical pad</li> <li>• Medical equipment</li> <li>• Recognizable space and interior</li> <li>• Small, bright space</li> </ul>	<ul style="list-style-type: none"> <li>• Lying on back for awhile</li> <li>• Cold</li> <li>• Stinging, tingling, and cold feeling</li> </ul>	<ul style="list-style-type: none"> <li>• Various odors</li> <li>• No smell</li> <li>• Smell of ether</li> <li>• Sweet smell</li> <li>• Strange smell</li> </ul>	<ul style="list-style-type: none"> <li>• No perceived taste</li> </ul>
3	<ul style="list-style-type: none"> <li>• Squeaking sound</li> <li>• Grating sound</li> <li>• Surgeon giving instructions and orders</li> <li>• No annoying background noise</li> <li>• Sound of medical equipment and instruments</li> </ul>	<ul style="list-style-type: none"> <li>• Almost nothing</li> <li>• Not seeing enough of the procedure</li> <li>• Surroundings</li> <li>• Arch (radioscopy)</li> </ul>	<ul style="list-style-type: none"> <li>• Pain during the procedure (no pain, very painful, tolerable pain, uncomfortable feeling, dentist-like feeling, or unpleasant feeling in the neck)</li> <li>• Pressure of medical instruments on chest</li> <li>• Pain during drape removal</li> <li>• Someone pushing and pulling one's body</li> </ul>	<ul style="list-style-type: none"> <li>• No smell</li> <li>• Odd, burning smell</li> </ul>	<ul style="list-style-type: none"> <li>• No perceived taste</li> </ul>
4	<ul style="list-style-type: none"> <li>• Background sounds</li> <li>• No prominent sounds</li> </ul>	<ul style="list-style-type: none"> <li>• Dressing materials</li> <li>• Surgical equipment</li> <li>• Staff cleaning up the operating room</li> </ul>	<ul style="list-style-type: none"> <li>• Local numbness</li> <li>• Local stiffness</li> </ul>	<ul style="list-style-type: none"> <li>• No perceived smell</li> </ul>	<ul style="list-style-type: none"> <li>• No perceived taste</li> </ul>

limited. Some respondents reported wanting to see more during this phase.

During phase 2, patients felt uncomfortable laying supine on the operating table for a while. Some patients reported feeling cold and chilled because of the relatively low temperature in the operating room. When the local anesthetic was injected, some patients reported a stinging, tingling, and cold feeling around the shoulder and neck. Some patients reported a peculiar, odd smell that they could not specify. One patient noticed that the covering drapes had a sweet smell. Another patient mentioned that she smelled ether during the course of the second phase.

### Phase 3

During TIVAD insertion, patients heard a squeaking and grating sound that was produced by the cauterizer used for hemostasis. Patients reported hearing the surgeon giving instructions and orders to the assisting personnel. Patients mentioned that the use of medical equipment and surgical instruments also produced inconspicuous background noise that they could not specifically describe.

Patients reported that they could not see much of their surroundings because of the sterile drapes cover-

ing their faces. Patients only mentioned seeing blue drapes and portions of the environment. Some patients reported seeing a radioscopy arch placed above the upper part of their body. This arch was the only visible item seen by patients in whom radioscopy control was used to correctly position the catheter tip. Although all patients received an injection of an anesthetic, each patient reported variable sensations of pain, ranging from not painful at all to very painful. Most patients described the pain as being tolerable.

Patients said they felt uncomfortable during the intervention because of the supine position they had to maintain. Patients were asked to lay on their back with their head turned to the opposite direction of the insertion site. This position felt very unnatural and uncomfortable to patients. Some patients compared their sensations during this phase with the feeling they had when visiting a dentist: being unable to observe the procedure. They felt as if someone was pulling and pushing their body.

A few patients were annoyed to feel the weight of instruments (used by the surgeon) laying on their chest. When the sterile drapes were removed at the end of phase 3, patients experienced pain. Because the



disposable drapes were attached to the patients' skin at their neck, they mentioned a painful and unpleasant feeling. Some patients even reported that the removal of the drapes was the most painful episode of the entire procedure.

Patients reported smelling burned tissue. Most could not explain where this odd odor originated, except for a few who knew the smell was produced by the cauterizer used during the procedure.

#### Phase 4

Patients perceived background sounds of staff cleaning medical equipment and instruments. Patients were able to see the dressing materials that covered the incision. Most of the patients wanted to look at the incision site. Therefore, they were disappointed to see only the dressings covering the incision. When patients were getting ready to leave the operating room, some of them saw the instruments that were used during the procedure, which impressed them. Other patients only mentioned seeing people cleaning the instruments.

When the TIVAD insertion was completed, patients felt local numbness at the incision site. The feeling often was combined with stiffness localized to the skin and muscles surrounding the incision. None of the respondents perceived a smell during phase 4.

## Discussion

Self-regulation theory (Nerenz & Leventhal, 1983) argues that preparatory sensory information has a positive effect on coping by decreasing the discrepancy between expectations and actual experiences, as well as by increasing patients' understanding of perceived sensations during invasive procedures (Gammon & Mulholland, 1996). The theory emphasizes that patients' perceptions are crucial in designing informational materials (Rhodes et al., 1994). Therefore, the current study explored patients' sensory perceptions in the five modalities—hearing, sight, touch, smell, and taste—during four successive phases of surgical TIVAD insertion.

The current study demonstrated that patients experience many sensory perceptions during TIVAD insertion. Most reported sensations dealt with touch, sight, and hearing. Patients experienced few sensations of smell and reported no perceptions of taste. Most sensory perceptions were experienced during phase 2, which involved the preparation of the patient and surgical equipment up to the covering of the patient with sterile drapes, and during phase 3, which included the insertion phase up to the removal of the drapes.

The environment made a profound impression on the patients. Patients were surprised to see a brightly lit and private room when they entered the operating room, and the amount of medical equipment impressed them.

Conversations between the medical and nursing staff during the course of the TIVAD insertion were among the most noticeable sounds heard. Patients reported that the conversations did not come across as irritating or annoying; they found hearing personnel talk about the procedure to be assuring. Perceptions regarding sight were considerably limited because of the restricted range of vision caused by the positioning of the drapes. Some patients were disappointed when they realized that they could not observe the surgeon during the procedure. Those patients would have liked to have been able to look at themselves in a mirror during the insertion. Strikingly, patients compared the sensations they experienced during TIVAD insertion with the feelings one would experience during a visit to a dentist.

Although patients perceived many sensory perceptions, they also described emotional experiences. Patients reported being anxious, nervous, distressed, or impatient about the upcoming procedure. Two patients spontaneously requested anxiolytic premedication to reduce their nervousness. Nonetheless, some patients felt calm or reported feeling unconcerned. When TIVAD insertion was finished, patients were relieved.

To the best of the authors' knowledge, the current study is the first that specifically assessed sensory perceptions of patients under local anesthesia during surgical TIVAD insertion. A few studies incidentally reported some general experiences of patients during TIVAD insertion (Borst et al., 1992; Goossens, Vrebos, Stas, De Wever, & Frederickx, 2005; Kreis et al., 2007), although this was not their main study aim. Goossens et al. (2005) investigated the general experiences of 98 patients on living with a TIVAD. Some patients perceived the TIVAD implantation as a long and painful procedure, and one patient indicated that if a future TIVAD insertion was necessary, she would prefer general anesthesia to avoid pain (Goossens et al., 2005).

Borst et al. (1992) evaluated the satisfaction and experiences of 40 adult patients with a TIVAD. They found that many patients had unfavorable experiences with TIVAD insertion. Although preoperative counseling was provided, many patients found the operation to be more painful or long lasting than they had anticipated. The finding stresses the importance of providing patients with preparatory sensory information because a gap existed between expected and perceived sensations.

Kreis et al. (2007) studied port-specific aspects in 232 women with gynecologic or breast cancer. Seventy-two percent of the patients reported that the operation was not painful at all or was slightly painful. In the current study, patients reported variable sensations of pain, ranging from no pain to tolerable pain or even significant pain. However, none of the current study's patients expressed a wish to receive general anesthesia if they need another surgical TIVAD insertion in the future.

## Methodologic Issues

Rhodes et al. (1994) developed the Sensory Information Questionnaire (SIQ) to document sensory experiences of patients during the administration of chemotherapy. Their approach consisted of eight open-ended and closed questions relating to the five senses and was designed to be administered by either telephone or personal interview. Although a pilot study had indicated that the SIQ had acceptable clarity and sequencing of questions, the SIQ did not seem to make a clear distinction between sensory perceptions and emotions. In addition, the SIQ was never used in other studies to assess its validity. Because of those limitations, the current authors developed a new method. The self-developed methodology appeared to be useful for evaluating and documenting patients' perceptions. However, the SIG method should be applied to other samples, settings, and procedures to further explore its validity.

In the current study, patients with different types of oncologic disorders were included. The researchers deliberately did not focus on a homogeneous patient population because they wanted to explore the experiences of a wide range of patients. Although a diverse group of patients was included, the sample is not necessarily representative of all patients who undergo a TIVAD implantation. However, the aim of this qualitative study was to gather exploratory data on patients' experiences for the first time, rather than to provide generalizable results that were obtained in a representative sample of patients and settings. Patients were eligible for the study when they underwent a TIVAD insertion for the first time. Admittedly, the researchers did not ask patients about previous experiences with other invasive procedures performed under local anesthesia. Therefore, future research should investigate patients' sensory experiences in a representative sample by using quantitative research methods. The current findings could be used to develop a standardized questionnaire that could be applied in such a study.

When patients were asked to describe perceived sensations in their own words, several reported psychologi-

cal sensations and emotions, particularly with respect to the sense of touch. Patients had difficulty distinguishing *what* they felt from *how* they felt; this coinvolvement could be a result of semantics or misinterpretation by the patients. For example, the Dutch verb *voelen* (English: *to feel*) refers both to the sensory perception of touch and to emotional feelings. In addition, the question, "What did you feel during . . . ?" often was interpreted by patients in terms of emotional experiences. This question needed to be revised to make it less ambiguous for respondents.

## Conclusions

Patients experienced a range of sensory perceptions during the current study's procedure. Use of the SIG method proved to be suitable to assess and document patients' perceptions during invasive procedures. Descriptions reported by the current study's patients could be used to develop a standardized instrument for quantitatively investigating the sensory perceptions of patients or for drafting preparatory sensory information for patients. Such interventions may help patients to cope with the distress of a TIVAD insertion by providing procedural, temporal, and sensory information.

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