Relieving the Pain of Sentinel Lymph Node Biopsy Tracer Injection

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Sentinel lymph node biopsy (SLNB) has been reliably accurate as a minimally invasive surgical alternative for identifying lymphatic breast metastasis. During mapping, the injection of a radioactive tracer or isosulfan blue dye to differentiate the SLN is acutely painful. The use of the eutectic mixture of lidocaine and prilocaine (EMLA) cream to reduce tracer injection pain has been reported anecdotally. A retrospective study compared injection discomfort of 20 women who had undergone SLNB without EMLA and 20 women who had undergone SLNB with the EMLA protocol. Results indicated a significant difference in mean pain rating. Standards of care should include the use of EMLA prior to intradermal SLN tracer injection unless contraindicated.

At a Glance

- Intradermal injections of radioisotopes are extremely painful.
- The eutectic mixture of local anesthetics is effective at reducing injection pain prior to sentinel node biopsy.
- Nurses should advocate for interventions that minimize discomfort during diagnostic procedures.

Fetzer conducted a meta-analysis on the use of EMLA to reduce the pain of IV insertion and reported that 85% of the population would obtain pain relief from EMLA. However, research reporting the use of EMLA for SLNB tracer injection pain could not be identified.

Background

Breast cancer is the most common malignancy in women, with an estimated one million cases identified each year (McPherson, Steel, & Dixon, 2000). The American Cancer Society (2008) estimated that more than 40,000 women will die of breast cancer in 2008. Therapy for breast cancer has dramatically increased survival, decreased morbidity, and improved quality of life for survivors. One of the most stressful aspects of a breast cancer diagnosis is the evaluation for metastasis. Sentinel lymph node biopsy (SLNB) has replaced traditional axillary node dissection in the staging of breast cancer. The advantages of SLNB over axillary dissection are numerous, including decreased scarring, numbness, lymphedema, and pain (Schwartz, 2004).

In preparation for the SLNB, lymphatic pathways are mapped using lymphoscintigraphy. During this radiologic procedure, the patient is awake and alert. A radioactive tracer is injected, usually intradermally, into the breast tissue near the tumor. Anecdotal reports from radiology nurses, who monitored patients during injection, provide description of patients’ behaviors consistent with complaints that the injection procedure is extremely painful. Current standards for SLNB lymphoscintigraphy do not include pain management interventions for the tracer injection (Motonura et al., 2007).

The eutectic mixture of local anesthetics (EMLA) cream has been used effectively in a variety of painful dermal procedures for the past 25 years. In addition to dermal surgical procedures, such as removal of genital warts, debridement of leg ulcers, and laser treatment of port wine stains, EMLA has been used widely in reducing injection pain (Fetzer, 2002). Nurses routinely apply EMLA cream prior to lumbar puncture to reduce pain experienced by children (Prevent needless pain, 2007). Bloch et al. (2004) compared EMLA with a placebo cream to ameliorate injection pain during injection of depot antipsychotic medications. Using a double blind, placebo-controlled, crossover procedure, EMLA significantly reduced injection pain.
Isosulfan blue dye (Lymphazurin®, Tyco Healthcare Group) and a sulfur colloid radioisotope (technetium 99m) are injected, usually intradermally, into the breast tissue near the tumor. The dye and the radioisotope migrate through the lymphatics to the first or sentinel node draining the tumor. The radioisotope can be detected or traced by a lymphoscintigram and the dye provides visual identification of the node. The use of dye and isotope in identifying sentinel nodes has been shown to be superior to either technique used alone (Allweis, Badriyyah, Bar Ad, Cohen, & Freund, 2003; Schwartz, 2004).

The isosulfan blue dye is injected just before the surgical biopsy and therefore can be performed after local or general anesthesia has been administered. However, injection of the radioisotope requires participation by a nuclear medicine practitioner to determine dosage, location, and timing of injection. Technetium 99m (Tc 99m) is injected from 2–24 hours prior to a surgical procedure (Schwartz, 2004). The patient is awake during the tracer injection and monitored by the radiology or breast health nurse.

Technetium 99 (Tc 99), an isotope of the artificially produced element technetium, is produced commercially as the byproduct of nuclear reactors. It is a dense material, weighing more than 10 times as much as an equivalent volume of water. For medical purposes, an isotope of Tc 99, Tc 99m, can be bound with a biologically active marker such as sulfur. Tc 99m has a half-life of six hours and emits low-energy gamma rays detected by a Geiger counter. Technetium 99 is the most widely used isotope in radiology, employed in more than half of all procedures (Washington State Department of Health, 2002). During SLNB, the volume of Tc 99m injected intradermally usually is 0.3 ml using a 25 cc gauge needle.

**Eutectic Mixture of Local Anesthetics**

EMLA consists of two topical anesthetics, 25 mg/ml (2.5%) of lidocaine and 25 mg/ml (2.5%) of prilocaine, in an oil-in-water emulsified cream. The white cream is dispensed from a 5 g or 30 g aluminum tube with 1–2 g covering 10 cm^2 in a thick layer (AstraZeneca, n.d.). Both of the amide-type anesthetics inhibit the ionic flux required for the initiation and conduction of pain impulses. The quality of the anesthesia is dependent on the application time and dose applied to the area.

A search of the literature revealed no published research on the efficacy of EMLA to reduce SLNB tracer injection pain. Published research protocols involving SLNB efficacy and outcomes do not include procedural details and fail to note injection pain and patient discomfort (Mantomura et al., 2007; Zack, 2001). Of the numerous SLNB studies reviewed, only Giuliano (2003) reported EMLA application as part of the research procedure. A single article was located reporting that “shallow intradermal injections are more painful than intraparenchymal ones” (Krynyckyi et al., 2004, p. 128) during the lymphoscintigraphic procedure and suggested that EMLA was effective. Despite the lack of evidence, a benchmarking query of National Consortium of Breast Cancer Centers found that some facilities applied EMLA prior to lymphoscintigraphy, albeit with mixed results. Therefore, the purpose of this retrospective study was to determine if an EMLA protocol significantly reduced the pain of SLNB tracer injection.

**Method**

After receiving approval from the institutional review board, the medical records of 20 patients who underwent SLNB tracer injection with the EMLA cream protocol were selected randomly and reviewed. The patient’s verbal assessment of pain, using a 0 to 10 numerical scale, as documented in the nurses’ notes, was retrieved and recorded. A comparison group who underwent SLNB tracer injection prior to the EMLA protocol was obtained using the departmental patient logbook. Twenty patients who underwent SLNB tracer injection prior to the implementation of the protocol were selected randomly from the logbook. Because pain had not been documented in the medical record of these patients, the breast health nurse contacted the patients via telephone. Each patient was asked to remember the SLNB injection and rate her pain using a verbal numerical analog scale rating from 0, no pain, to 10, pain as bad as it could be. Every one of the patients contacted by telephone remembered their experience and were able to rate their pain. The lapsed time since their SLNB injection experience ranged from one month to two years.

**Sentinel Lymph Node Biopsy Protocol**

A SLNB tracer injection protocol was developed based on information obtained from the Web site of the Calgary Health Region Hospital system, Calgary, Canada. Upon outpatient admission to the breast center, the nurse verifies that the patient is not allergic to the anesthetic components of EMLA, prilocaine, and lidocaine. Using a preprinted order set, the physician indicates on a diagram of the breast the area that will be injected with Tc 99m. One hour prior to the injection, the nurse applies a thick layer of EMLA cream in a 3 in wide oval over the area marked by the physician on the diagram. The EMLA is covered with a large, transparent occlusive dressing (see Figure 1). In the nuclear medicine suite, the EMLA is removed immediately prior to the injection. After the injection procedure and prior to discharge from the radiology suite, injection pain is assessed using a verbal numerical analog scale rating from 0, no pain, to 10, pain as bad as it could be.

![Figure 1. A Thick Layer of Eutectic Mixture of Local Anesthetics Cream Secured by a Transparent Occlusive Dressing](image-url)
Results

Prior to implementation of the EMLA protocol, the mean pain score reported by patients was 8.8 (SD = 1.3) compared to the mean pain score reported by patients after implementation of the EMLA protocol of 3.4 (SD = 2.7). The difference in pain scores between the two groups was statistically significant (t = 7.34, p < 0.000). Patients who did not receive EMLA reported more than twice the amount of pain than patients who receive EMLA. One of the limitations of this study is that patients were required to remember an experience and then rate their pain. None of the women contacted by phone hesitated to report that their pain experience was still a vivid memory.

Discussion

Clearly, the EMLA protocol provided an effective intervention to reduce SLNB tracer injection pain. Although the limitations of this study include small sample size and retrospective data collection, all of the women contacted were explicit on the memory of their pain experience. The findings in this small sample provide compelling evidence that standards of care for women undergoing SLNB should include a protocol for tracer injection pain management. Other pain management strategies, such as the use of vapocoolants when patients are allergic to EMLA anesthetics, require further study to determine their suitability for SLNB tracer injection. Research also is needed to determine the optimal anesthetic cream for SLNB tracer injection pain. A systematic review of randomized controlled trials found that topical tetracaine cream, liposome-encapsulated lidocaine cream, and liposome-encapsulated tetracaine cream, when compared with EMLA, had similar outcomes during skin puncture (Eidelman, Weiss, Lau & Carr, 2005).

Assessment of a patient’s response to therapy remains a fundamental nursing responsibility. When pain manifests as a significant response, nurses must act to implement effective pain management strategies. This pilot study is the first report using an analgesic cream, EMLA, to reduce tracer injection pain during lymphoscintigraphy for breast cancer. Further research to identify alternative interventions to ameliorate procedural pain is needed. However, this is a simple, low-risk approach to minimize procedural pain from SLNB.

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References


