

# Pain and Anxiety Levels of Patients Undergoing Tissue Expansion After Mastectomies: A Case Series Study

Cancer Control  
2017, Vol. 24(4) 1–5  
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sagepub.com/journalsPermissions.nav  
DOI: 10.1177/1073274817729893  
journals.sagepub.com/home/ccx



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## Abstract

The tissue expansion process is done after mastectomies to increase the submuscular space in preparation for the placement of permanent breast implant. The process is often believed to be painful by patients who are often intimidated by the prospect of mechanically stretching out their skin and muscle. This study aims to quantify the pain experienced by patients and determine the different pain management techniques used. We used a case series approach, in which patients who were undergoing serial tissue expansion process were asked to rate their pain and anxiety on a scale from 1 to 10, using a questionnaire and the visual analog scale. Pain was rated during and after the expansion procedure, and patients were also surveyed to find the most commonly used and most effective pain management technique. Patients typically reported very little pain during and after the procedure, with an average of 0.4 to 2.5 pain experienced out of 10. The pain did not last, on average, longer than 1 day. Furthermore, the most widely used and most helpful pain medication was ibuprofen. During the tissue expansion procedure, the mean anxiety level was 0.64 (1.3). The findings show that tissue expansion process is a relatively low pain procedure and is not a contraindication for undergoing breast reconstruction. Ibuprofen, a mild treatment with few side effects, was efficacious in pain relief though most patients required no pain relief.

## Keywords

tissue expansion, breast reconstruction, ibuprofen, pain management

Received January 20, 2017. Accepted for publication August 10, 2017.

## Introduction

Breast cancer, the most prevalent cancer, affects over 230 000 women in the United States, on a yearly basis.<sup>1</sup> With increased rates of women undergoing mastectomies, breast reconstruction with tissue expansion has become a common surgical procedure.<sup>2</sup> This technique, pioneered by Radovan and Argenta, involves the use of temporary, textured, or smooth tissue expanders placed submuscularly, to gradually expand the overlying skin and muscle.<sup>3,4</sup> Weekly or biweekly injections into the integrated-valve expander are given with normal saline over a time period of several weeks to months until a size slightly larger than target size is achieved or until the patient is satisfied with her size.<sup>5</sup> This allows for the

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eventual placement of a permanent implant into a soft reconstructed breast.<sup>6</sup>

Patients reported great satisfaction with the results of the tissue expansion.<sup>7</sup> However, some patients undergoing mastectomies may still have reservations about the tissue expansion process due to the perceived high levels of pain. During this process, it has been reported that patients can experience soreness, tightness, pain, and muscle spasms but not much is known about the true pain levels.<sup>8</sup>

Currently, there is no gold standard for pain management during the tissue expansion process, with a wide variety of analgesic techniques available and commonly used.<sup>9</sup> Some methods, like massaging and breathing exercises during injections, can help minimize the pain.<sup>10</sup> Other treatment modalities used include narcotic analgesia, nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, local anesthesia, regional anesthesia, muscle relaxants, and topical anesthetics like EMLA.<sup>11,12</sup> Several of these techniques may be potentially addictive (ie, opioid-based regimens) and/or given through an inconvenient intravenous route. Therefore, milder methods of pain management should be explored to mitigate any potential negative effects on patients.

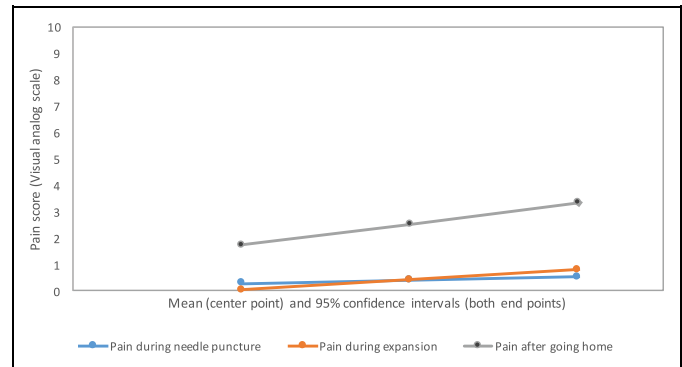
In this study, we aim to elucidate the pain levels experienced by patients during and after the tissue expansion. We also wish to ascertain the pain management techniques most used and most helpful for patients during the expansion process.

## Methods

We performed a case series analysis and the study was approved by the institutional review board (no. Pro00018026) at the University of South Florida. All consecutive adult patients who underwent tissue expansion after a mastectomy performed by a single plastic surgeon between September and November 2016 were eligible for inclusion. All surgeries and tissue expansions were completed at H. Lee Moffitt Cancer Center using the anatomical shape, integrated port, textured tissue expander. All patients began the tissue expansion process 4 weeks after their reconstruction surgery. The tissue expanders were placed during the reconstruction surgery. The 4-week gap allows for moderate time to heal postsurgery and ensures that the assessed pain levels are solely due to the tissue expansion process. The tissue expansion process was completed prior to radiation therapy.

All tissue expanders were placed in a total submuscular plane. The technique used included an incision along the lateral border of the pectoralis major muscle to create a submuscular pocket under the pectoralis major muscle without the use of an acellular dermal matrix. The serratus anterior fascia was elevated to allow for additional lateral coverage. The 3-0 Vicryl was used to approximate the lateral border of the pectoralis major muscle.

Data were collected on the number of tissue expansion sessions, volume of the tissue expander filled at each session, total fill of the tissue expanders in cubic centimeter, anxiety level prior to the procedure, pain experienced during the needle



**Figure 1.** The mean pain levels at different time points during the tissue expansion process.

injection, the pain during the expansion and after going home, number of hours after the injections that the pain started, number of days the pain lasted for, interventions for pain management, and the intervention most helpful during pain management. The anxiety level was assessed using a questionnaire and pain levels during and after the procedure were assessed using the visual analog scale. The volumes of the tissue expanders were measured based on the amount of saline that was injected in graduated syringes.

## Statistical Analysis

All outcomes were summarized using descriptive statistics where continuous data were reported as mean/median along with standard deviations (SDs) and binary data as proportions. The unit of analysis for all outcomes was tissue expansion procedures instead of patients. All analyses were performed using SPSS v22 statistical analysis software.

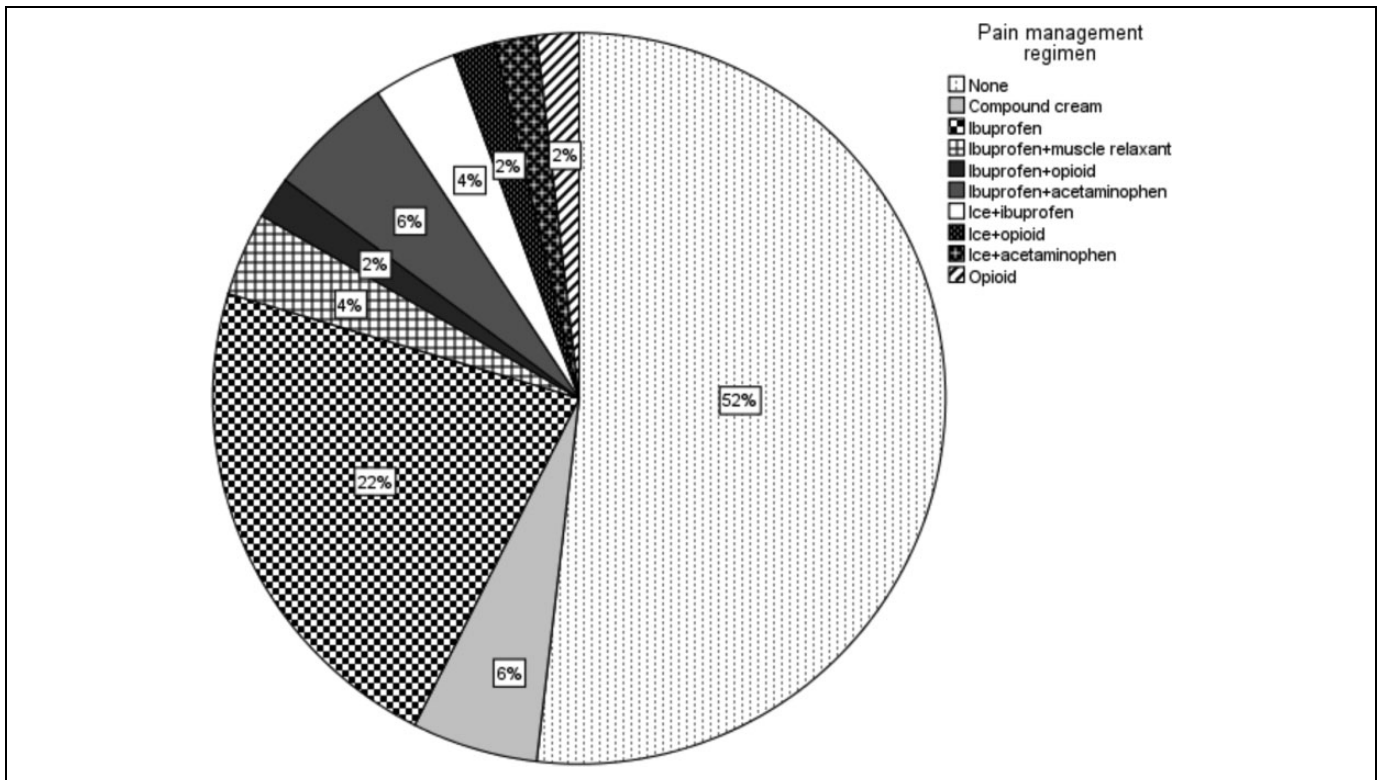
## Results

A total of 24 patients who met the inclusion criteria underwent a total of 68 tissue expansion procedures. The mean number of tissue expansion per patient was 4.4 (3), that is  $n = 67$  procedures, to reach their target size. The mean amount of saline injected (in cubic centimeter) into the tissue expander was 81 (25),  $n = 63$  procedures, to reach a total of 432 (229) cubic centimeter,  $n = 63$  procedures, by the end of the entire process.

During the tissue expansion procedure ( $n = 64$  procedures), the mean anxiety level was 0.64 (1.3). As shown in Figure 1, the mean level of pain due to the needle puncture was 0.4 (0.5),  $n = 63$  procedures. The mean pain level during the expansion was a 0.4 (1.5),  $n = 62$  procedures, while the mean pain level after going home was 2.5 (3),  $n = 55$  procedures. The pain generally started, on average, 4.2 (10.6) hours,  $n = 55$  procedures, hours after the procedure and lasted for a mean of 22.8 (38.4) hours,  $n = 54$  procedures.

## Pain Management Interventions

As shown in Figure 2, 52% of the time ( $n = 54$  procedures), patients did not require any intervention for pain management.



**Figure 2.** Different pain management options used by patients during the tissue expansion process.

The most common intervention for pain management was ibuprofen alone (22%), followed by ibuprofen in combination with acetaminophen (5.6%), muscle relaxant (3.7%), or ice (3.7%); 5.6% of cases used compound cream. Use of opioid either alone or in combination with ice, acetaminophen, or ibuprofen was restricted to 1.9% of cases. As shown in Figure 3, 50% of the time, patients did not require any medications for pain management. Ibuprofen alone was found to be helpful after 27.8% of the procedures. Ibuprofen in combination with ice was reported to be helpful after 5.6% of the procedures followed by ibuprofen in combination with muscle relaxant (3.7%) or acetaminophen (1.9%). Compound cream alone and opioids alone were reported to be most helpful for pain relief in 5.6% of the procedures.

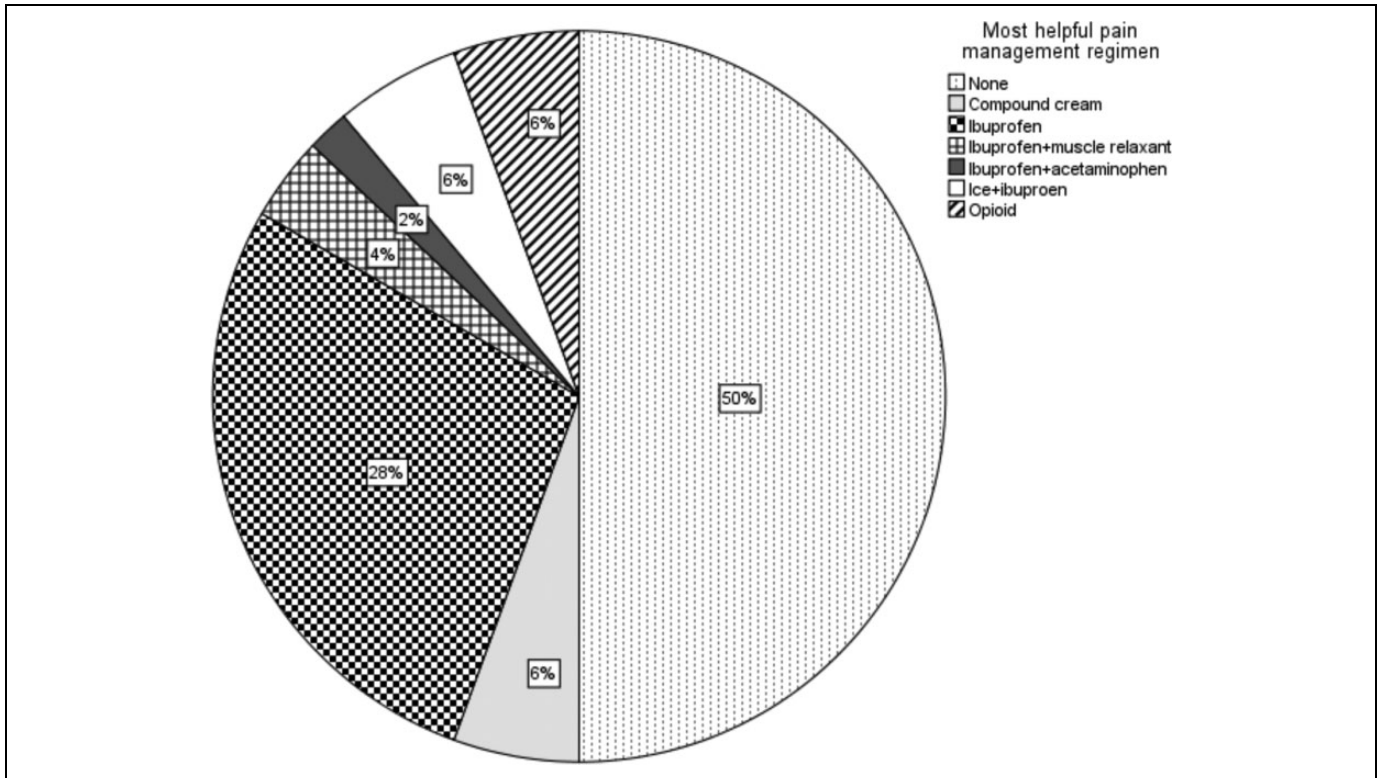
## Discussion

It's a common belief of patients that the tissue expansion is a daunting and painful procedure. However, findings from this case series analysis show that, overall, patients were comfortable with the tissue expansion process and experienced relatively low anxiety and pain during and after the procedure. Patients experienced little to no pain (an average of 0.4-2.5 of 10 pain levels) after each expansion, and the pain did not last, on average, longer than 1 day. Majority of patients did not require any pain reduction. Of the different pain management modalities used, ibuprofen was the most common option and was reported to be the most helpful in alleviating pain by patients.

To the best of our knowledge, this is the first study to report pain levels during the tissue expansion process for breast reconstruction. Ibuprofen and other NSAIDs have been used successfully to relieve different types of breast pain.<sup>13-16</sup> It has been used to reduce pain in other situations by inhibiting cyclooxygenase and the local inflammatory process.<sup>11</sup> In addition to pain relief, ibuprofen is easily accessible over-the-counter and doesn't cause addictive or adverse side effects like that of opioids.<sup>15</sup> However, if used in excess, ibuprofen can cause renal impairment and peptic ulcer.<sup>17,18</sup> If used appropriately, ibuprofen is both effective and safe to use. Other studies have reported that acetaminophen is as effective as NSAIDs.<sup>11</sup>

Ice has been found in other instances to help alleviate pain by decreasing nerve conduction, reducing muscle spasms, and preventing edema.<sup>19</sup> Muscle relaxants have been used to reduce perioperative pain from breast augmentations.<sup>20</sup> In other situations, topical anesthetics like compound creams and EMLA have also been found to have some efficacy in pain management.<sup>12</sup> Ice, ibuprofen, and EMLA are relatively inexpensive and may be purchased over-the-counter, which is a clear advantage for patients.

One limitation to this study was the small sample size, which restricted us from comparing the efficacy different pain management medications used during tissue expansion. We also didn't characterize the quality of pain that patients experienced. The findings from this study need to be assessed through a prospective study with a larger sample size to confirm or refute these results and preferably with a comparison group.



**Figure 3.** The most helpful pain management modalities for patients during the tissue expansion process.

The postmastectomy stage is a very difficult and vulnerable time for many female patients. Since these patients already encounter many psychological, emotional, sexual, physical, and spiritual issues during their breast reconstruction process, it is critical that we alleviate their concerns about pain associated with this procedure.<sup>11,21</sup> Many patients come into the process with a preconceived notion that tissue expansion is a very painful process. Our study demonstrated that tissue expansion after mastectomy is a safe and mostly painless process and that any discomfort that the patient may experience can be easily treated with over-the-counter options like ibuprofen.

#### Authors' Note

No significant relationships exist between the authors and the companies/organizations whose products or services may be referenced in this article.

#### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

#### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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