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SPECIAL TOPIC

Breast

Diagnosis and Management of Neuropathic Breast Pain

Maria Bejar-Chapa, MD*
Seamus P. Caragher, MD, MPhil*
Lisa Gfrerer, MD, PhD†
Ian L. Valerio, MD, MS, MBA*
Amy S. Colwell, MD*
Jonathan M. Winograd, MD*

Summary: Chronic postoperative pain after breast surgery is a significant concern, with studies indicating varying rates depending on the type of surgical procedure. The risk of developing neuropathic pain is notably increased with axillary lymph node dissection due to potential nerve injuries. Additionally, the method of breast reconstruction may influence postsurgical pain rates, with conflicting findings on the impact of reconstruction type. Recent advancements in techniques such as targeted muscle reinnervation, among others, show promise in addressing postoperative pain in these patients. As the prevalence of these procedures rises, future research is likely to focus on assessing and managing pain in this patient population. The development of patient-reported outcome measures specific to breast surgery pain can aid in clinical assessment and treatment planning. This review emphasizes the importance of gaining a deeper understanding of risk factors, nerve anatomy, and treatment options to enhance outcomes and quality of life for individuals undergoing breast surgery. *(Plast Reconstr Surg Glob Open 2024; 12:e6266; doi: 10.1097/GOX.0000000000006266; Published online 23 December 2024.)*

INTRODUCTION

Incidence of Pain After Breast Surgery and Identified Risk Factors

Breast surgery accounts for more than 500,000 surgical procedures each year within the United States alone.[1] Unfortunately, a subset of these patients experience chronic postoperative pain. Several definitions of postbreast surgical pain have emerged in the literature. One frequently encountered definition is postmastectomy pain syndrome, marked by persistent discomfort in the chest, upper arm, and shoulder after mastectomy/lumpectomy, lasting beyond 3 months. It is neuropathic, with hypersensitivity, hyperesthesia, allodynia, skin pulling, and reduced sensitivity to pinpricks, cold, and touch.[2] Different definitions describe similar pain experiences after breast surgeries with differences concerning the duration of pain postsurgery. Persistent postoperative pain is present after 3–6 months,[3] persistent postsurgical pain lasts beyond 3 months,[4] or chronic pain persists beyond 3–6 months.[5]

Several studies have identified these terms to be of limited utility in the clinical setting.[6–9] The mechanisms underlying postbreast surgery pain remain incompletely understood but include neuromas, which are disorganized outgrowths of nerve axons after injury.[10] Thoracic nerve neuromas have been reported, most frequently of the intercostal and intercostobrachial nerves.[3,10–13] In addition, scar tissue formation with subsequent nerve entrapment,[14,15] fibrosis of skin and muscles induced by radiation,[16] and myofascial tightening[17] have also been identified as drivers of postsurgical breast pain derived from the peripheral nervous system. In addition, the central nervous system may contribute to persistent pain. The contribution of the central nervous system to chronic neuropathic pain is a well-described and robust area of research.[18] Changes in brain areas responsible for pain sensation after surgery can generate maladaptive circuit dynamics, perpetuating chronic pain long after the initial surgical insult.[19,20]

Although specific estimates of pain after breast surgery vary, clearly, many patients experience consistent pain. Plastic surgeons are uniquely qualified to engage and treat these patients, given both their extensive experience

*From the *Division of Plastic and Reconstructive Surgery, Massachusetts General Hospital, Harvard Medical School, Boston, Mass.; and †Division of Plastic and Reconstructive Surgery, Weill Cornell Medicine, New York City, N.Y.*

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Drs. Bejar-Chapa and Caragher contributed equally to this work.

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operating on the breast tissue and expertise in the management of nerve reconstruction. This review highlights the large unmet need of patients with pain after breast surgery, beginning with exploring the likely prevalence of this issue by type of breast surgery, as well as the current tools available to treat these patients.

Takeaways

Question: How prevalent is pain after breast surgery and how is it best managed?

Findings: Pain after breast surgery is estimated to affect 20%–40% of patients. Management begins with delineation of nerve pain via questionnaires, physical examination, and nerve blocks. Imaging may be useful. Once identified as neuropathic, interventions may include fat grafting, lysis of scars, or novel nerve management techniques (eg, targeted muscle reinnervation, regenerative peripheral nerve interface, and nerve grafts).

Meaning: Plastic surgeons will encounter many of these patients and have unique skills for intervention via peripheral nerve techniques. Innovations are under development for management and prevention of pain after breast surgery.

Oncologic Breast Surgery

Surgery for breast cancer entails a range of procedures, including lumpectomy, mastectomy, sentinel lymph node biopsy, and axillary lymph node dissection (ALND). The specific intervention depends on the tumor type and stage. The exact incidence of pain after breast cancer surgery is unknown, but several studies provide a basis for estimation. A cohort including 1983 patients who underwent mastectomy without reconstruction found a post-mastectomy pain syndrome rate of 28.2%.[21] In a cohort of more than 23,500 breast cancer patients undergoing mastectomy or breast-conserving therapy (BCT), 48% of patients reported pain at 1 year.[22] A more recent meta-analysis of 297,612 patients undergoing mastectomy or BCT found a pooled pain prevalence of 46%.[4] These studies suggest rates between 30% and 45% within 1 year. Other studies explored pain over longer timeframes. A large prospective study with 3253 women who underwent BCT or mastectomy found a pain prevalence of 47% 2–3 years after surgery[23]; prevalence dropped to 20.4% by 7–9 years.[24] Although further long-term studies are needed, these data suggest that pain after breast surgery is common, gradually improves for roughly half of women, and often persists for years.

Many potential factors associated with pain after breast cancer surgery have been proposed, including operative technique. Studies have compared mastectomy and lumpectomy directly, including a recent case-control study of 407 women that found a slight but significant increase in pain among women treated with BCT compared with mastectomy with or without reconstruction.[25] Another study of 1606 patients identified higher chronic pain rates in patients treated with lumpectomy (46%) than with mastectomy (35.4%).[26] Of note, all of the lumpectomy patients had also undergone radiation, which carries its own risk for pain related to the effects of radiation. Radiation can induce cellular proliferation failure and chronic ischemia, resulting in fibrosis, nerve entrapment, demyelination, and blockage of neural conduction. Neurolysis, often accompanied by an adipose tissue wrap, is indicated when there is progressive motor weakness or when conservative therapy fails.[27–29]

Studies have consistently pointed to ALND as a risk factor for pain after breast surgery. A prospective study of 216 patients and the previously mentioned mastectomy cohort both identified ALND as an independent risk factor for chronic pain after breast surgery.[5,21,30] The large Wang meta-analysis of 297,612 patients confirmed ALND increases pain rates to 43%, compared with 26% with sentinel lymph node biopsy only.[4] The increased rates of pain in ALND are most likely due to the increased risk of injury to sensory nerves within that region, including the lateral cutaneous branch of the second intercostal nerve, the intercostobrachial nerve. A systematic review combining cadaveric and operative studies of intercostobrachial anatomy found that, among more than 1500 axillae, this nerve arises from the T2 spinal nerve in 90% of patients; roughly half of patients have a single cord, whereas another 42% demonstrate a branching pattern.[13] This variability of nerve course may contribute to the increased risk of nerve injury during axillary dissection.

In patients who underwent mastectomy, the method of breast reconstruction influences rates of postsurgical pain. One early study in 1996 of 282 patients treated with mastectomy with and without reconstruction found reconstruction increased pain rates to 49% compared with 31% in mastectomy alone 1 year after surgery. However, the more recent Wang meta-analysis found no significant difference in pain prevalence based on the presence of reconstruction. Within the population of patients undergoing reconstruction, studies have assessed differences in implant-based and autologous tissue techniques. One study found that women with implant reconstruction had a higher rate of pain (53%) than those with tissue-based reconstruction (30%).[31] In contrast, a later study of 205 women undergoing transverse rectus abdominis myocutaneous flaps or implant-based reconstruction found no difference in rates of pain 2 years postsurgery.[32] This finding was further supported by a retrospective cohort of 310 women.[33] Finally, the Wang meta-analysis identified no difference in rates of pain after breast reconstruction with implant or tissue-based approaches.[4] It seems that type of reconstruction is less likely to influence risk of developing chronic pain. However, further study is needed, as we were unable to identify a study looking specifically at pain rates after reconstruction with deep inferior epigastric perforator (DIEP) flaps.

Intrinsic patient variables are also risk factors. Younger patients were consistently identified as more likely to develop postoperative breast pain regardless of intervention type[5,30]; although some studies suggest that there might be a relationship between younger age and increased postsurgical pain due to increased nerve sprouting,[34] clinical observations have yet to determine whether this stems

from a distinct pain perception, physiological alterations, a shift in subjective pain expression, or variances in physical activity levels compared with older patients.[35]

Likewise, elevated weight and metabolic dysfunction have been linked to increased postoperative pain.[36,37] Genetic predispositions to pain have also been identified. For example, women with certain genotypes for potassium channels expressed on nociceptive nerves were at increased risk of pain after breast surgery.[38] Psychological factors, such as catastrophizing, somatization, anxiety, and sleep disturbance, have been linked to higher rates of postsurgical chronic pain.[5,39] Preexisting mental health issues highlight the psychological basis of pain perception. Overall, these studies provide insight into which breast cancer patients are at heightened risk of chronic pain.

Reduction Mammoplasty

Breast reduction surgery (BRS) for macromastia is associated with improvement in quality of life.[40] Despite 115,000 procedures per year in the United States,[41] studies of pain after BRS are rare, possibly because women tend to report high rates of satisfaction.[42,43] A study of 90 patients found that, although 43% reported back pain improvement, 28% described new pain in the breasts at 27 months.[44] Studies examining these patients using the BREAST-Q[45] have shown improved physical well-being subscores[40,46–48]; however, the lack of specific questions related to pain location may mask issues of postoperative pain. Further studies are needed to reveal the prevalence after reduction surgery. Risk factors for pain after BRS seem to parallel results from breast cancer surgery. In the previously mentioned cohort study of 90 women who underwent reduction, younger age was again associated with increased risk of pain.[44] It also showed that sensory abnormalities of the breast before surgery were correlated with increased rates of postoperative pain.

Aesthetic Breast Surgery

Cosmetic surgery is a major share of breast surgery, with more than 225,000 breast augmentations or implant revisions and 87,000 mastopexies in 2020.[41] A systematic review of pain after breast augmentation identified lower rates of postoperative pain at approximately 15%.[49] One retrospective study of 95 breast augmentation patients found that 33.7% of patients experienced postsurgical chronic pain.[50] A larger study assessed 611 patients at 6 weeks and 6 months and found significant increases in quality of life over that time period, but a significant decrease in mean physical well-being, including pain.[51] Specific questions on pain were not provided, limiting interpretation. These studies suggest a significant percentage of augmentation patients experience chronic pain after surgery.

Factors associated with pain after cosmetic breast surgery parallel those in oncology. In 1 study of 265 augmentation patients, younger age was associated with increased risk of chronic pain. The study found lower satisfaction with cosmetic results were associated with higher rates of postoperative pain.[52] A smaller study of 95 augmentation patients identified early postoperative sensory changes as associated with chronic pain.[50] This connection between alterations in sensation and risk of persistent pain was further supported by a study of 116 augmentation patients, assessed 1 and 4 years postoperatively.[53] Breast sensory changes may serve as early indicators of nerve dysfunction and injury, eventually resulting in chronic pain. With the exception of 2 studies,[50,53] all the references cited in this section investigated the potential correlation between implant size and postoperative neuropathic pain, yet none found a statistically significant association.

Gender-affirming "Top" Surgery

Gender affirmation surgery of the chest includes mastectomy and breast augmentation. More than 12,000 such breast surgeries occurred in 2020.[41] Postoperative pain has not yet been studied in large cohorts. A recent study of 84 transmen undergoing mastectomy found a rate of 27.4% of persistent postmastectomy pain with a follow-up of 24 months, though the majority (60.9%) was mild.[54] One study of 308 transwomen identified 5% with chronic pain, though the location was not specified.[55] As rates of these procedures increase,[23] future studies will likely include assessment of patient pain after chest surgery for gender affirmation.

One question raised by this population of breast surgery patients is the effect of concomitant hormonal therapy, a backbone of gender-affirming care in many cases.[56] One cohort study, including 26 transmale and 47 transfemale patients, identified that initiation of estrogens was associated with increased reports of pain, whereas testosterone was associated with decreased pain. Most patients with pain reported musculoskeletal and breast pain, or headaches.[57] The role hormones play on pain development, and perception is a rich and somewhat controversial area of inquiry (reviews[58–60]). Several preclinical models have reached the conclusion that testosterone has antinociceptive effects,[50] via induced endocannabinoid expression[61] and suppression of inflammatory pain modulators.[62] Likewise, estrogen and its metabolites have been shown to influence pain in preclinical models, although the specific influence of these molecules seems heterogenous.[60] These models, however, cannot account for the complex psychosocial dynamics of pain, especially chronic pain. Further clinical study is needed to explore the role of hormone therapy on postoperative pain.

DIAGNOSIS AND MANAGEMENT OF NEUROPATHIC BREAST PAIN

Diagnosis

Diagnosis requires a thorough delineation of the type of pain. Neuropathic pain can be assessed with different questionnaires that rely on the unique symptoms of neuropathic pain, including elevated sensitivity to nonnoxious stimuli and pain to normally tolerable temperatures.[63] Many questionnaires have been developed to aid in the identification of neuropathic pain. They include the DN4,[64,65] the Neuropathic Pain Symptom Inventory,[66] the Leeds Assessment of Neuropathic Signs and Symptoms,[67] and the McGill Pain Questionnaire,[68,69] which the senior author has incorporated into our clinical practice (Fig. 1).

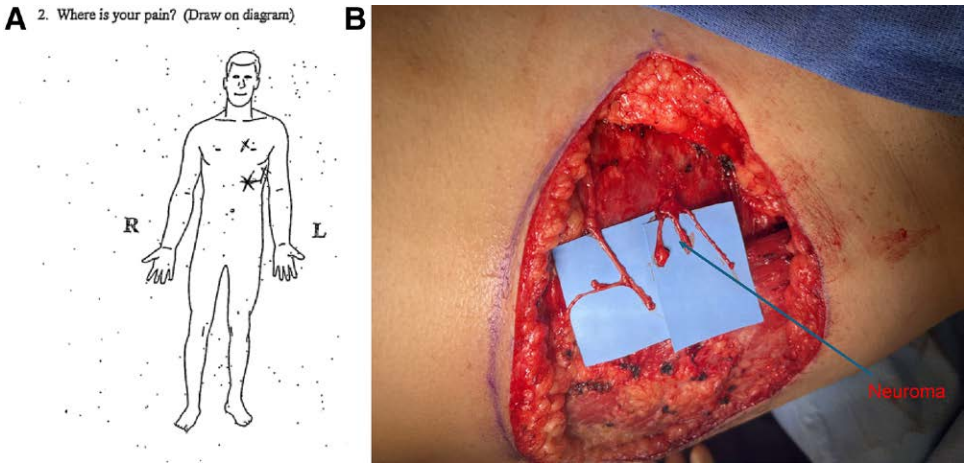

Fig. 1. Clinical presentation of post-breast surgery neuroma. A, A patient's pain diagram showing intercostal neuromas (marked X) after breast surgery, typical for this condition. Additionally, it includes an intraoperative photograph (B) of a large intercostal neuroma (arrow) found during a gender affirmation mastectomy after bilateral breast reduction. Image courtesy of Lisa Gfrerer, MD, PhD.

(**See figure, Supplemental Digital Content 1**, which displays the McGill modified pain questionnaire. Used with permission, **http://links.lww.com/PRSGO/D586**.) In addition, several breast-specific quality of life and patient-reported outcome measures (PROMs) have been developed. The BREAST-Q is the leading PROM for breast surgery,[45,70] including several pain-specific questions. In addition, the European Organization for Research and Treatment of Cancer has developed a range of PROM questionnaires for cancer patients, including both questions on pain and breast cancer–specific symptoms.[71] These questionnaires can be used in the clinic.

Next, a full sensory examination of the chest wall, axilla, and breasts should take place. Sensitivity to palpation or percussion should be noted. For example, a positive Tinel test, in which tapping on the area of concern elicits a tingling or shock-like sensation,[72] indicates axonal injury and in many cases, a sensory neuroma. Also, the presence of pain in the axillary region elicited on raising the arm over the head, should raise suspicion for neuroma of the intercostobrachial nerve.[73] In patients who underwent mastectomy, it is common to find a positive Tinel sign at the point of emergence of one or several of the lateral cutaneous branches of the intercostal nerves, which are routinely injured and may result in a painful neuroma.

If the history and physical examination suggest a sensory nerve injury, nerve blocks can then help to confirm the diagnosis and indicate that surgical intervention may confer substantial benefit. The use of blocks in this patient population is well-described,[6,74] and they are not only diagnostic but also temporarily therapeutic with the potential for longer lasting relief in some patients. The senior author refers patients to pain medicine specialists for blocks with local anesthetics and corticosteroids, which have been shown to increase the efficacy of blocks in clinical scenarios,[75,76] though the efficacy of this technique remains debated.[77,78] If the patient reports relief from symptoms for the duration of the block, then a surgical intervention is considered. Typically, a reduction on the visual analog pain scale of 4 or greater out of 10 is considered a positive response to the nerve block.

Interventional Options

Nonsurgical options for neuropathic pain are vast and outside the scope of this article. They include a range of interventions from medical management, psychotherapy, and cognitive behavioral therapy[79] to injection of Botox.[80] We note with interest that many trials are ongoing related to psychological interventions on postoperative pain, given the possible contribution of the central nervous system to postsurgical breast pain.[81,82] Referral to pain specialists should be considered for all patients with pain after breast surgery. Interdisciplinary management has shown promise across a range of patients experiencing chronic, postsurgical pain.[83] Surgical interventions for refractory cases of chronic pain after breast surgery address the nerve injury directly (Table 1). For intact nerves compressed by scar tissue, neurolysis can be performed. Fat grafting has also been applied to these patients. A trial of 92 patients with chronic pain after lumpectomy and radiation found a significant reduction in pain scores in 57 patients after fat grafting.[87] A randomized control trial of 18 patients with unilateral mastectomy without reconstruction found a 55% reduction in pain with fat grafting.[88] A study of 98 patients found that fat grafting in patients with a previous mastectomy, ALND, and radiation reduced pain and pain medication usage compared with patients without fat grafting.[89] A dual-center study confirmed this result, with reduced pain scores at 1 and 6 months.[90] These studies pointed toward fat grafting as an intervention for pain. However, a double-blind study published in 2022 in which patients underwent scar release with fat grafting or saline injection found no additional beneficial effect for fat grafting.[91] Further research will clarify the efficacy of this technique as well as the possible mechanism, which are currently unknown.

Table 1. Summary of Surgical Interventions for Pain after Breast Surgery

Technique	Indications	Surgical Training	Pros	Cons
Neurolysis	Compression Scar tissue formation	Breast surgery, plastic surgery, or peripheral nerve surgery	Simple surgical technique	Possibility for scar tissue recurrence
TIM[8,82]	Neuroma Nerve transection with only proximal end identified	Breast surgery, plastic surgery, or peripheral nerve surgery	Simplest neuroma management technique Minimal time requirement	High rate of neuroma formation/recurrence in other locations Increased reoperation rate
TMR[84]	Neuroma Nerve transection with only proximal end identified	Plastic surgery, or peripheral nerve surgery	Lower neuroma recurrence rates than TIM in other locations Therapeutic and possibly preventative	Technically demanding Increased surgical time Sacrifice of motor nerve branches in nearby muscles
RPNI[85]	Neuroma Nerve transection with only proximal end identified	Breast surgery, plastic surgery, or peripheral nerve surgery	Lower neuroma recurrence rates than TIM in other locations Technically less challenging than TMR Therapeutic and possibly preventative	Must harvest free muscle grafts, adding morbidity Increased surgical time
Acellular nerve allografts[86]	Nerve transection with long gap injuries	Plastic surgery, or peripheral nerve surgery	Possibility for restoration of sensation to the innervated dermatome Compatible with free flap breast reconstruction	Technically demanding Use of cadaveric nerve grafts increases cost

TIM, transposition into muscle.

If a painful neuroma is present, excision is typically undertaken, followed by additional interventions. Historically, transposition into muscle of the free nerve end was used. Studies have shown positive effects in neuromas after breast surgery using this technique.[3,6,7,74,92] These studies have involved relatively few patients and follow-ups for less than 1 year. In neuromas of the extremity, management with neurectomy and implantation into muscle has been called into question given recurrence rates. Historic studies suggest a recurrence rate of more than 50% after excision and implantation.[93] More recent studies of neuroma management in the hand and extremities have reported recurrence rates of 7.8%,[84] 6.4%,[94] and 23%.[95] New techniques in development for nonintercostal neuroma management have been raised as possible interventions for intercostal neuromas.

One of these techniques, targeted muscle reinnervation (TMR), has gained attention as a method to limit symptomatic neuroma recurrence. In this technique, the neuroma is excised and the distal sensory intercostal nerve end is coapted into a nearby motor nerve branch, often from the serratus muscle, or the mixed sensory and motor intercostal nerve distally (a modified TMR) (Fig. 2). TMR has shown great promise in other areas of neuroma treatment, including amputations and headache surgery.[85,96–98] It has also been applied intraoperatively after mastectomy in a few cases to prevent pain.[86] Our group is currently undertaking a randomized control trial of the modified TMR described above compared with transposition into muscle for postmastectomy patients with intercostal neuroma (Fig. 3).

Regenerative peripheral nerve interfaces (RPNIs) have also demonstrated robust efficacy in reducing symptomatic neuroma recurrence. This technique relies on placing the proximal nerve end into denervated muscle grafts that serve as recipient sites to limit neuroma formation and neuropathic pain. Studies have shown its utility in a range of surgical patients,[99,100] including breast surgery patients affected by postoperative pain.[101,102] An ongoing study exploring this question will further define the utility of RPNI in this population.[103]

In addition, nerve grafting utilizing acellular nerve allografts (ANAs) has also been proposed to treat neuropathic pain, in patients with and without known neuroma.[104] A case report was recently published in which 3 patients with postmastectomy pain were successfully treated with cadaveric ANAs. Nerves causing pain were identified by diagnostic block and methylene blue injection; cadaveric ANAs were grafted from the nerve of interest to sensory nerves in the mastectomy flaps.[105] Interestingly, one of these patients subsequently underwent DIEP successfully with continued relief of pain.

FUTURE DIRECTIONS

Various surgical interventions are available and under development for patients with chronic neuropathic pain after breast surgery. However, prevention may be the most effective approach. Prophylactic nerve treatments during initial surgery to limit neuroma formation have been successful in other areas, particularly the extremities, and are being adapted for breast surgery. A small cohort of 11 patients had TMR of the intercostal sensory nerve branches performed immediately after mastectomy as part of their reconstruction. An average of 1.8 nerves were found damaged in each patient. TMR was utilized without complication, and low pain scores at 8 months postoperatively were found.[86] It may be advantageous to deploy TMR, or other preventative treatments for neuroma such as RPNI, more broadly during initial breast surgery if sensory nerves are injured to decrease the likelihood of neuroma formation and the incidence of neuropathic pain.

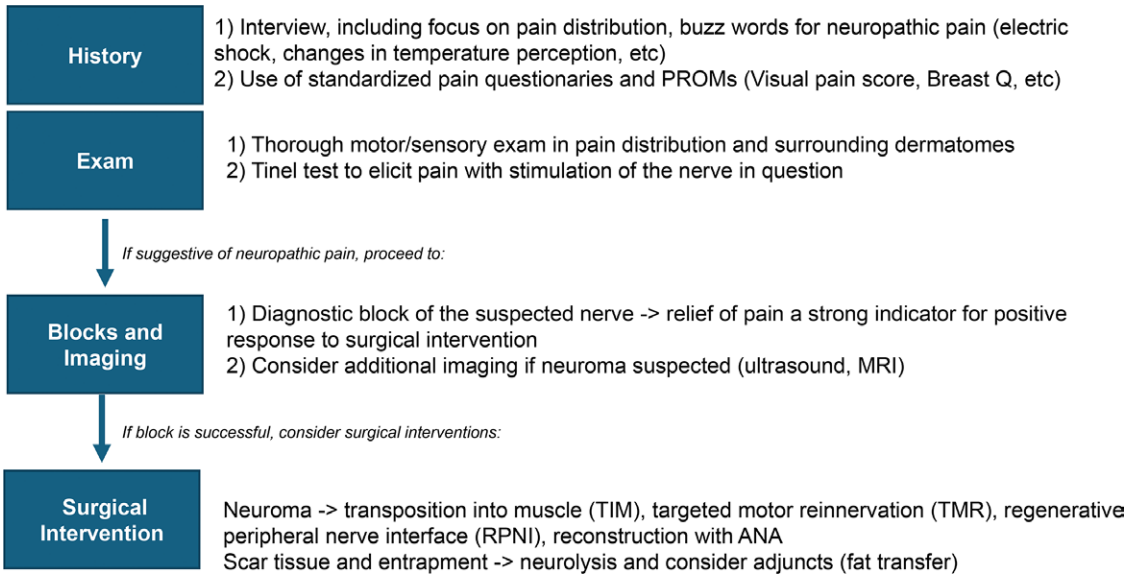

Fig. 2. Diagnostic workflow for patient with postsurgical breast pain. Our evaluation begins with a history and physical examination, complemented by validated questionnaires designed for pain assessment. The physical exam includes detailed sensory testing and Tinel sign assessment. Targeted nerve blocks by pain specialists, are both diagnostic and therapeutic, with pain relief indicating potential benefit from surgical intervention. *Defined as persistent neuropathic pain after breast surgery beyond 3–6 months. MPQ, McGill pain questionnaire; MRI, magnetic resonance imaging; SNRI, serotonin norepinephrine reuptake inhibitors; TCAs: tricyclic antidepressants; TIM, transposition into muscle; VAS, visual analog score.

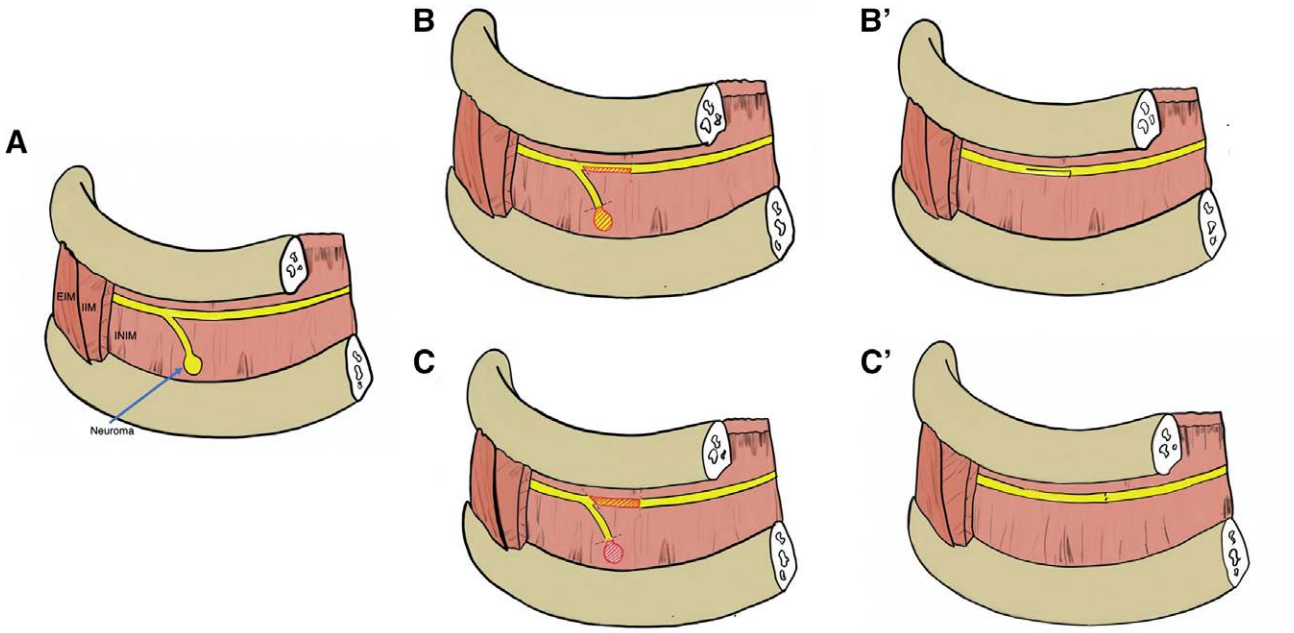

Fig. 3. Schematic representations of TMR for intercostal neuroma. A, An intercostal neuroma formed on the cutaneous branch of the ICN branch running deep to the EIM and IIM, and superficial to the INIM. B and C, After neuroma excision, the main distal nerve branch is stimulated to identify motor fascicles that (B) can be isolated from the rest of the nerve. B′, Isolated motor fascicles are transected and become the neurorrhaphy target for the sensory branch. Epineurium at the branch point where the motor fascicles are divided is closed. C, The distal ICN is monofascicular (distinct motor fascicles cannot be found). C′, The cutaneous branch is copated to the main distal intercostal branch and the epineurium at the branch point where the ICN is divided is closed. EIM, external intercostal muscle; ICN, intercostal nerve; IIM, inner intercostal muscle; INIM, innermost intercostal muscle.

In autologous breast reconstruction, neurotization of free flaps,[106] which similarly allows the intercostal sensory nerve(s) to regrow rather than just form a neuroma, has shown potential to limit postsurgical pain and promote return of sensation.[107] One study comparing neurotized and nonneurotized transverse rectus abdominis

myocutaneous flaps found that nerve reconstruction improved patient-reported quality of life, including a reduction in "bodily pain."[108] In some patients undergoing neurotized flap reconstruction, the removal of fibrosis after radiation therapy coupled with flap coverage could provide additional relief of pain directly related to scarring, which may be complementary to any additional benefit from preventing or alleviating neuropathic pain. A more recent study of necrotized DIEP flaps reported an improvement in quality of life based on the BREAST-Q.[109] Although subscores for pain were not reported, the study highlights the potential for neurotization as a bulwark against neuroma formation and the development of neuropathic pain after breast surgery. Nerve allografts may also be useful in this process, as described above, with the successful use of cadaveric grafts for neurotization of free flaps. By more easily providing the necessary length for an injured nerve to reach an end organ of interest, ANAs greatly expand the pool of patients who may benefit from nerve reconstruction. As such, we expect that continued development, refinement and implementation of nerve reconstruction as a routine part of autologous breast reconstruction will identify best practices for sensation restoration and neuropathic pain prevention.

Advancements in autologous reconstruction are notable, but questions linger about their efficacy in implant-based reconstructions, a common treatment in the United States. Our group and others have shared experiences with neurotization in implant-based reconstruction and gender-affirming top surgery.[110–112] Further research is needed to explore this promising opportunity.

In conclusion, neuropathic pain after breast surgery poses a significant challenge for many patients, compounded by its inherently subjective nature. Pain, deeply rooted in each individual's perception and experiences, defies objective measurement or comparison. However, this challenge has sparked a heightened focus on pain prevention and treatment, which have become crucial objectives for breast and plastic surgeons alike. Moreover, there is a notable expansion in the adoption of techniques such as TMR, RPNI, and nerve reconstruction among this patient demographic. Shedding a light on these treatment options may serve as a catalyst for addressing this problem more effectively and fostering further research endeavors. Such studies could lead to enhanced strategies for mitigating neuropathic pain and preserving or restoring breast sensation.

Jonathan M. Winograd, MD
Division of Plastic and Reconstructive Surgery
Massachusetts General Hospital
15 Parkman Street, WACC Suite 453
Boston, MA 02114
E-mail: jwinograd@mgh.harvard.edu

DISCLOSURES

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