

Post-breast surgery pain syndrome: establishing a consensus for the definition of post-mastectomy pain syndrome to provide a standardized clinical and research approach — a review of the literature and discussion

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See the related commentary by Brackstone on p. 294.

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Background: Post-mastectomy pain syndrome (PMPS) is a frequent complication of breast surgery. There is currently no standard definition for this chronic pain syndrome. The purpose of this review was to establish a consensus for defining PMPS by identifying the various elements included in the definitions and how they vary across the literature, determining how these definitions affect the methodological components therein, and proposing a definition that appropriately encompasses all of the appropriate elements.

Methods: We searched PubMed to retrieve all studies and case reports on PMPS, and we analyzed definitions of PMPS, inclusion/exclusion criteria, and methods of measuring PMPS.

Results: Twenty-three studies were included in this review. We identified 7 independent domains for defining PMPS: surgical breast procedure, neuropathic nature, pain of at least moderate intensity, protracted duration, frequent symptoms, appropriate location of the symptoms and exacerbation with movement. These domains were used with varying frequency. Inclusion/exclusion criteria and methods for assessing PMPS also varied markedly.

Conclusion: To prevent future discrepancies in both the clinical and research settings, we propose a new and complete definition based on the results of our review: PMPS is pain that occurs after any breast surgery; is of at least moderate severity; possesses neuropathic qualities; is located in the ipsilateral breast/chest wall, axilla, and/or arm; lasts at least 6 months; occurs at least 50% of the time; and may be exacerbated by movements of the shoulder girdle.

Contexte : Le syndrome douloureux post-mastectomie (SDPM) est une complication fréquente de la chirurgie mammaire. Actuellement, il n'existe aucune définition unique de cette douleur chronique. Le but de la présente revue était donc d'élaborer une définition consensuelle du SDPM en dégagant les différents éléments défini-toires, en observant leur variation dans les différentes sources, en déterminant comment ces variations influent sur la méthodologie utilisée, puis en proposant une définition qui met correctement en relation tous les éléments pertinents.

Méthodes : Nous avons cherché dans PubMed toutes les études et études de cas sur le SDPM. Nous avons ensuite analysé les définitions du syndrome, ses critères d'inclusion et d'exclusion et ses méthodes d'évaluation.

Résultats : La présente revue repose sur 23 études. Nous avons mis en évidence 7 éléments indépendants servant à définir le SDPM : l'intervention de chirurgie mammaire, la nature neuropathique de la douleur, la présence d'une douleur au minimum d'intensité modérée, la persistance des symptômes, leur fréquence élevée, leur localisation ainsi que leur exacerbation due au mouvement. La prise en compte de ces éléments dans les différentes définitions était variable; des variations importantes ont aussi été observées dans les critères d'inclusion et d'exclusion ainsi que dans les méthodes d'évaluation.

Conclusion : Pour prévenir les différences conceptuelles, autant dans les milieux cliniques que dans les milieux de recherche, nous proposons une définition originale et complète fondée sur les résultats de notre revue. Le SDPM est une douleur qui apparaît à la suite d'une chirurgie mammaire, peu importe sa nature; est au minimum d'intensité modérée; est de nature neuropathique; est localisée dans le sein, la paroi thoracique, l'aisselle ou le bras ipsilatéraux; persiste au moins depuis 6 mois; est présente au moins 50 % du temps; et peut être exacerbée par les mouvements de la ceinture scapulaire.

Pain plays an important role in human survival, aiding in prompt withdrawal from sources of damage and preventing further exposure to painful elements. Pain after injury further serves to promote the protection of vulnerable area(s) of the body. Thus, pain typically exists in a transitory state, which remits once painful stimuli are removed and tissue damage is healed. However, in some cases, pain can become chronic, lasting well beyond its useful period and becoming pathological. Chronic pain can be extremely burdensome, reducing the quality of life and overall functional ability of the patient. In many cases, typical analgesic methods do not provide effective relief and/or present with their own consequences in the form of side effects. Unfortunately, chronic pain syndromes are common, occurring in up to 64% of North Americans and 55% of people worldwide.^{1,2} For these reasons, it has been a prominent topic of study in many areas of medicine.

Breast cancer is very common, second only to lung cancer in both developed and developing countries.³ The mastectomy procedure is the foremost curative treatment of breast cancer.⁴ As with any surgical procedure, acute and/or delayed complications can occur.⁴

One such complication is chronic pain, which may last months to years after surgery. Persistent pain following mastectomy was reported as early as 1978.⁵ Since then, this phenomenon has been named post-mastectomy pain syndrome (PMPS). This syndrome has emerged as a ubiquitous complication of breast surgery, with a reported frequency of 4%–100%.⁶ There is currently no standard definition of what constitutes PMPS. The International Association for the Study of Pain (IASP) defines PMPS as persistent pain soon after mastectomy/lumpectomy affecting the anterior thorax, axilla, and/or medial upper arm.⁷ The IASP has been often misquoted as defining a duration of more than 3 months for PMPS, when in reality no explicit duration is stated. In general, the IASP claims that 3 months is a convenient point from which pain may be considered chronic; however, they go on to state that 6 months is often preferred for research purposes.⁷ Indeed, 3 months may not be the most appropriate time point. Despite its name, the term PMPS may also be used when discussing patients who underwent breast-conserving surgery.

The ambiguity surrounding the definition of PMPS has resulted in a well-studied topic that has not been well defined, wherein several definitions have been used in the literature. For instance, a study by Vilholm and colleagues⁸ defined PMPS as pain of a neuropathic nature with intensity greater than 4 on a 10-point numeric scale, located at the surgical site or ipsilateral arm, and lasting longer than 6 months following surgery. However, Couceiro and colleagues⁹ defined PMPS as any type of pain located in the anterior surface of the chest axilla, shoulder or upper half of the arm, and persisting for longer than 3 months. In this example, we are effectively

dealing with 2 different conditions. The variety of definitions used for PMPS has likely translated into a difference in methodology, namely inclusion/exclusion criteria and outcome measures. Ultimately, the epidemiology and potential etiology and treatments surrounding PMPS are not applicable to one another.

The purpose of this study was to review the literature to identify all operational definitions currently being used for PMPS; identify corollaries among the domains of each definition; identify variation in the methodological properties for diagnosing, measuring and assessing PMPS; and, if need be, propose a standard definition taking into account the results of the literature review and make recommendations for methodology. In doing so, we intend to make future study of PMPS analogous, both in terms of research and clinical diagnosis.

METHODS

Search strategy

We searched all records in the PubMed database from creation (1946) to June 5, 2015, using both medical subject heading (MESH) terms and text words “(post mastectomy OR postmastectomy) pain syndrome.”

Inclusion and exclusion criteria

The review included all study designs, including randomized trials, nonrandomized studies and case reports/series. For inclusion in this review, studies needed to include the term “post-mastectomy pain syndrome” in the abstract, methods and/or results of the article. Non-English language articles were excluded from the study.

Data extraction

Following the search, we reviewed the full text of articles and extracted the following data: definition(s) of PMPS, inclusion/exclusion criteria used germane to PMPS, case descriptions (if applicable), measurement methods for pain and any other symptoms germane to PMPS, and duration of the study.

RESULTS

Search

Our search of the literature retrieved 67 articles. After excluding articles that did not specifically address PMPS and articles published in languages other than English, we selected 23 studies specifically exploring PMPS for full-text review. Of these studies, 4 were case reports. All reviewed articles were published between 1988 and 2015 and are analyzed hereafter.

Definition of PMPS

We identified a total of 7 domains among all definitions of PMPS: surgical breast procedure, neuropathic nature, pain of at least moderate intensity, protracted duration, frequent symptoms, appropriate location of the symptoms and exacerbation with movement. The contents of PMPS definitions in each of the reviewed articles is summarized in Table 1, Table 2, Table 3, Table 4, Table 5, Table 6 and Table 7.

Corollaries of these domains across the literature are summarized in Table 8. None of the articles' definitions included all 7 domains, and 17% of the articles' definitions included 6 of the 7 domains. One of the articles did not explicitly define PMPS.³³

Surgical breast procedure: all breast surgery versus mastectomy alone

Thirty per cent of articles restricted the definition of PMPS to only mastectomy procedures, whereas the remaining two-thirds used a broader definition, including lumpectomy (13%), quadrantectomy (9%), any breast cancer surgery (22%), and any breast surgery (17%).

Neuropathic nature

Eighty-three per cent of studies included neuropathic nature to define the quality of the pain, and of those studies, 79% elaborated on specific qualities that render the pain neuropathic (i.e., altered sensation, such as dys-

thesia, hypo/hyperesthesia and allodynia; or particular qualities of dysesthesia, such as pins and needles, shock-like, burning, dull, aching, and stabbing/lancinating pain in the painful area).

Pain of at least moderate intensity

Pain intensity was included in the definition of PMPS in 22% of the reviewed studies and was based on either numerical or analogue scales (e.g., 10-point scale), or descriptive terms (e.g., moderate or severe pain).

Protracted duration

Sixty-five per cent of included studies identified a protracted duration of symptoms as a requisite for PMPS. Of these, 67% of studies required symptom duration to be 3 months or longer for consideration of a PMPS.

Frequent symptoms

Continuity of symptoms was defined as either "continuous" or "intermittent" or in terms of hours per day or days per week. Nine per cent of studies required pain for 12 hours per day, 9% required pain for 4 days a week, and 13% of studies included either continuous and/or intermittent pain.

Appropriate location of the symptoms

Appropriate location of symptoms (i.e., surgical site, axilla, arm, shoulder, and/or chest wall) was the most consistent domain of the PMPS definition across the literature; it was included in 87% of studies.

Table 1. Operational definitions of post-mastectomy pain syndrome, surgical procedure domain

Study	Measure(s) fulfilling definition	Quantification(s)/ qualification(s) fulfilling definition
Shahbazi et al ¹⁴	Mastectomy	—
Ebid and El-Sodany ¹⁵	Mastectomy, lumpectomy	—
Kojima et al ¹⁶	Breast cancer surgery	—
Maione et al ¹⁷	Mastectomy, lumpectomy	—
Dessy et al ¹⁸	Mastectomy	—
Meijuan et al ¹⁹	Mastectomy, quadrantectomy	—
Bauml et al ²⁰	Mastectomy	—
Alves Nogueira Fabro et al ²¹	Breast cancer surgery	—
Cavigioli et al ²²	Mastectomy, quadrantectomy	—
Vilholm et al ⁸	Breast cancer surgery	—
Vilholm et al ²³	Breast cancer surgery	—
Eisenberg et al ²⁴	Breast surgery	—
Macdonald et al ²⁵	Breast surgery	—
Blunt and Schmiedel ²⁶	Mastectomy, lumpectomy	—
Reuben et al ⁶	Breast surgery	—
Miguel et al ²⁷	Breast cancer surgery	—
Smith et al ²⁸	Mastectomy	—
Stevens et al ²⁹	Breast surgery	—
Dini et al ³⁰	Mastectomy	—
Watson and Evans ³¹	Mastectomy	—
Watson et al ³²	Mastectomy	—

Exacerbation with movement

Thirteen per cent of studies included exacerbation of pain with movement when defining PMPS.

Methodological factors

Inclusion and exclusion criteria

For 7 (30%) of the articles, PMPS was not an initial inclusion criterion (i.e., studies assessed the prevalence of PMPS), and thus other than a history of breast surgery, a PMPS definition did not factor into the study.

Of the other 12 non-case report studies, 6 (50%) listed PMPS as a criterion for inclusion, while 4 (33%) articles specifically outlined neuropathic pain or neuropathic symp-

toms in their criteria. Five (42%) of these studies outlined specific locations (i.e., chest/breast, arm/shoulder and/or axilla) for which symptoms were needed. Half of the studies also required symptoms to persist for more than 3 months. Intensity of pain was a criterion in 2 (17%) of the 12 studies, and at least moderate severity was required in both.

Assessing PMPS

The visual analogue scale (VAS) was the most common method of assessing pain used to identify PMPS; this method was used in 7 (30%) of the 23 studies. A verbal intensity scale (VIS) accompanied the VAS in 2 (9%) of these studies. A numeric pain scale out of 10 was an

Table 2. Operational definitions of post-mastectomy pain syndrome, protracted duration domain

Study	Measure(s) fulfilling definition	Quantification(s)/qualification(s) fulfilling definition
Shahbazi et al ¹⁴	Post Mastectomy Pain Syndrome questionnaire (designed by cancer research centre, Shohada Hospital, Tajrish, Tehran, Iran)	> 3 mo
Kojima et al ¹⁶	Not included in methodology	
Maione et al ¹⁷	Unclear	> 3 mo
Couceiro et al ¹⁹	Not included in methodology	
Dessy et al ¹⁸	Follow-up time points	3 mo
Meijuan et al ¹⁹	Unclear	> 3 mo
Alves Nogueira Fabro et al ²¹	Physiotherapeutic assessments	6 mo
Cavigioli et al ²²	Follow-up time points	> 3 mo (12–15 mo follow-up)
Vilholm et al ²³	Unclear	> 3 mo
Macdonald et al ²⁵	Follow-up time points	7–12 yr
Blunt an Schmiedel ²⁶	Follow-up time points	“Long lasting” (4–11 mo follow-up)
Smith et al ²⁸	Follow-up time points	> 3 mo (6 yr follow-up)
Dini et al ³⁰	Follow-up time points	> 3 mo (5 mo follow-up)
Watson and Evans ³¹	Follow-up time points	> 3 mo (10–30 mo follow-up)
Watson et al ³²	Follow-up time points	> 3 mo (7 mo–20 yr follow-up)

Table 3. Operational definitions of post-mastectomy pain syndrome, pain of moderate intensity or greater domain

Study	Measure(s) fulfilling definition	Quantification(s)/qualification(s) fulfilling definition
Vilholm et al ²³	Numerical rating scale (0–10)	≥ 4 out of 10
Vilholmet al ¹⁹	Numerical rating scale (0–10)	≥ 3 out of 10
Dini et al ³⁰	VAS	At least moderate (middle third of scale), severe (final third of scale)
	VIS	At least moderate (middle third of scale), severe (final third of scale)
Watson and Evans ³¹	VAS	At least moderate (middle third of scale), severe (final third of scale)
	VIS	At least moderate (middle third of scale), severe (final third of scale)

VAS = visual analogue scale; VIS = verbal intensity scale.

alternative pain assessment tool in 4 (17%) studies. Questionnaires, including the McGill Pain Questionnaire (MPQ) and short-form MPQ (used in 26% of studies) and the UCSF Pain Service Questionnaire (used in 13% of studies) were also used to identify PMPS. Physical examination was used to identify sensory changes in 5 (22%) studies. Four studies also incorporated analgesia requirement into the assessment. In addition to pain assessment, quality of life questionnaires, namely the Short Form 36, were included in some methodologies. Finally, 4 studies used patients' report for assessment of PMPS symptoms.

DISCUSSION

Post-mastectomy pain syndrome is a chronic pain syndrome that incorporates a number of different clinical pictures, depending on the particular nerve or nerves that are

damaged.³⁴ Variation exists across the literature as to how PMPS is defined, wherein inclusion of any number of these domains and the details therein is heterogeneous. Though pain has been an obvious corollary across studies, there are notable differences in how the nature, intensity, frequency, location and triggers of that pain is described with respect to the definition of PMPS.

In this review, all studies using the term “post-mastectomy pain syndrome” were assessed to identify the operational definitions being used and their respective influence on inclusion and exclusion criteria as well as assessment of pain symptoms. Seven independent domains were identified for defining PMPS within the included studies. Thus, we cannot be confident of the true prevalence of PMPS or optimal management based on the research to date, since different results have been reported based on different inclusion criteria and assessment of PMPS.

Table 4. Operational definitions of post-mastectomy pain syndrome, frequent symptoms domain

Study	Measure(s) fulfilling definition	Quantification(s)/qualification(s) fulfilling definition
Shahbazi et al ¹⁴	Unclear	Unclear
Meijuan et al ¹⁹	Short Form MPQ	Continuous or intermittent
Cavigioli et al ²²	Not included in methodology	
Vilholm et al ²³	Unclear	≥ 4 d/wk
Vilholm et al ⁸	Author-developed questionnaire	≥ 4 d/wk
Macdonald et al ²⁵	Questionnaires (MPQ and UCSF Pain Service Questionnaire)	Continuous or intermittent
Blunt and Schmiedel ²⁶	Non-questionnaire, patient-reported	Continuous
Watson and Evans ³¹	Pain diary	≥ 12 h/d
Watson et al ³²	Pain diary	≥ 12 h/d

MPQ = McGill Pain Questionnaire.

Table 5. Operational definitions of post-mastectomy pain syndrome, neuropathic pain domain

Study	Measure(s) fulfilling definition	Quantification(s)/qualification(s) fulfilling definition
Shahbazi et al ¹⁴	Post mastectomy pain syndrome questionnaire (designed by cancer research centre, Shohada Hospital, Tajrish, Tehran, Iran)	Neuropathic descriptors
Ebid and El-Sodany ¹⁵	Unclear	Unclear
Maione et al ¹⁷	Unclear	Unclear
Dessy et al ¹⁸	Non-questionnaire, patient-reported	Neuropathic descriptors
Meijuan et al ¹⁹	Short Form MPQ	Neuropathic descriptors
Bauml et al ²⁰	Non-questionnaire, patient-reported	Neuropathic descriptors
Alves Nogueira Fabro et al ²¹	Physiotherapeutic assessments	Neuropathic descriptors, phantom breast pain descriptors, neuroma descriptors
Cavigioli et al ²²	Not included in methodology	
Vilholmet al ²³	Peripheral nerve lesion	Neurological examination, quantitative sensory test
Eisenberg et al ²⁴	Short Form MPQ	Neuropathic descriptors
Macdonald et al ²⁵	MPQ, UCSF Pain Service Questionnaire	Neuropathic descriptors
Blunt and Schmiedel ²⁶	Nonquestionnaire, patient-reported	Neuropathic descriptors
Reubenet al ⁶	Nonquestionnaire, patient-reported	Neuropathic descriptors

MPQ = McGill Pain Questionnaire.

As such, the parameters surrounding inclusion and exclusion of patients with PMPS and the assessment of PMPS was heterogeneous across studies. In order to identify PMPS, the reviewed studies used a variety of methods for assessing the respective operational definitions, including questionnaires, scales, sensory examination and non-questionnaire, patient-reported symptoms. The latter 2 methods have inherent biases and inconsistencies in the setting of research. Of the questionnaires that were used, the MPQ, was a frequent basis for PMPS assessment. The MPQ is effective in identifying neuropathic pain based on identifying words as well as pain intensity, frequency and location. Thus, the MPQ covers 4 of the essential 6 oper-

ational definitions for PMPS, the other 2 being accurately and easily retrieved from patient history or medical record. The VAS and VIS were also commonly used in select studies to quantify pain intensity. Another notable questionnaire is the Post-Mastectomy Pain Syndrome Questionnaire recently developed by Shahbazi and colleagues;¹⁴ however, we were unable to obtain a copy.

Incorporation of the key operational definitions identified in our review offers a comprehensive characterization of PMPS while accommodating for the spectrum of potential clinical findings. In reviewing the literature, we were able to identify important domains that address the syndrome from many facets.

Table 6. Operational definitions of post-mastectomy pain syndrome, appropriate location of symptoms domain

Study	Measure(s) fulfilling definition	Quantification(s)/qualification(s) fulfilling definition
Shahbazi et al ¹⁴	Post mastectomy pain syndrome questionnaire (designed by cancer research centre, Shohada Hospital, Tajrish, Tehran, Iran)	Symptoms in axilla, arm, shoulder and/or chest wall on affected side
Ebid and El-Sodany ¹⁵	Unclear	Unclear
Maione et al ¹⁷	Unclear	Unclear
Couceiro et al ⁹	Not included in methodology	Not included in methodology
Meijuan et al ¹⁹	Short Form MPQ	Symptoms in thorax, axilla, and/or upper half of the arm on affected side
Baumli et al ²⁰	Nonquestionnaire, patient-reported	Symptoms in chest wall on affected side
Alves Nogueira Fabro et al ²¹	Physiotherapeutic assessments	Symptoms in inner arm and/or axilla on affected side, or surgical scar area
Cavigioli et al ²²	Not included in methodology	Not included in methodology
Vilholm et al ²³	Unclear	Symptoms in breast, axilla and/or arm
Vilholm et al ⁸	Author-developed questionnaire	Symptoms in area of surgery and/or ipsilateral arm
Eisenberg et al ²⁴	Sensory examination	Symptoms in axilla, medial upper arm, and/or anterior chest wall on affected side
Macdonald et al ²⁵	Body chart, questionnaires (MPQ and UCSF Pain Service Questionnaire)	Symptoms in axilla, arm, and/or chest wall on affected side
Blunt and Schmiedel ²⁶	Nonquestionnaire, patient-reported	Symptoms in axilla, medial upper arm, and/or lateral chest wall on affected side
Reuben et al ⁶	Nonquestionnaire, patient-reported	Pain in chest, arm, and/or axilla
Miguel et al ²⁷	Medical records	Pain in in axilla, arm, shoulder and/or chest wall on affected side
Smith et al ²⁸	Body chart, questionnaires (MPQ and UCSF Pain Service Questionnaire)	Symptoms in axilla, arm, shoulder and/or chest wall on affected side
Stevens et al ²⁹	Body chart, questionnaires (MPQ and UCSF Pain Service Questionnaire)	Symptoms in axilla, medial upper arm, and/or anterior chest wall on affected side
Dini et al ³⁰	Not included in methodology	
Watson and Evans ³¹	Sensory examination	Symptoms in anterior chest wall, axilla, and/or medial upper arm on affected side
Watson et al ³²	Sensory examination	Symptoms in anterior chest wall, axilla, and/or medial upper arm on affected side

MPQ = McGill Pain Questionnaire.

Table 7. Operational definitions of post-mastectomy pain syndrome, exacerbated by movement domain

Study	Measure(s) fulfilling definition	Quantification(s)/qualification(s) fulfilling definition
Dessy et al ¹⁸	Nonquestionnaire, patient-reported	Unclear
Macdonald et al ²⁵	Questionnaires (MPQ and UCSF Pain Service Questionnaire)	Unclear
Stevens et al ²⁹	Cancer Pain Questionnaire (adapted from UCSF Pain Service Questionnaire)	Unclear

MPQ = McGill Pain Questionnaire.

Breast surgery

Despite the nomenclature, the mechanism for causing pathological postoperative pain in PMPS is likely not limited to mastectomy procedures. Any other surgical procedure involving breast parenchyma or underlying muscle is prone to the same outcome.⁹

Given the broader purview of surgical procedures to which PMPS applies, we propose that post-breast surgery pain syndrome (PBSPS) is a more clinically appropriate term. The term is used henceforth in this discussion.

Neuropathic nature

A neuropathic quality of pain within the PBSPS definition is crucial for identifying the pathological pain process that makes it a true chronic pain syndrome. Persistent postoperative pain beyond physiologic healing has been attributed to nerve damage or traction incurred during the procedure, in particular to the intercostobrachial, medial pectoral, lateral pectoral, thoracodorsal or long thoracic nerve.³⁴ Neuropathy can be measured subjectively through clinical assessment or questionnaires to determine the presence of any neuropathic qualities (e.g., dysesthesia, burning), or it can be measured objectively using quantitative sensory testing (QST). A reliable account of neuropathic pain is required for a diagnosis of PBSPS.

Pain of at least moderate intensity

In order to identify a clinical pain problem, there should be evidence that the symptoms are of clinical importance. It has been reported that pain intensity significantly correlates with quality of life.¹⁰ Pain of at least moderate intensity (i.e., within the middle third of a pain scale) is classically considered for sensitivity in a pain trial.¹¹

Protracted duration

The duration of pain should be beyond the expected time for normal healing after breast surgery. The 2 most commonly used markers for duration to be considered chronic pain versus acute pain are 3 and 6 months.¹² The IASP has stated that 3 months is considered a normal healing time, but that 6 months is preferred for research purposes.⁶ By extending the definition of PBSPS to encompass a 6-month duration of symptoms postoperatively, one can be certain that each case is truly a pathological pain syndrome rather than normal postoperative healing.

Frequent symptoms

In line with pain intensity, in a clinically important chronic pain syndrome the pain should occur frequently. The definition of PBSPS should be based on symptoms

Table 8. Distribution of domains defining post-mastectomy pain syndrome across articles

Author	Surgical breast procedure	Neuropathic nature	Pain of at least moderate intensity	Protracted duration	Frequent symptoms	Appropriate location of the symptoms	Exacerbation with movement
Shahbazi et al ¹⁴	√	√		√	√	√	
Ebid and El-Sodany ¹⁵	√	√				√	
Kojima et al ¹⁶	√			√			
Maione et al ¹⁷	√	√		√		√	
Couceiro et al ⁹				√		√	
Dessy et al ¹⁸	√	√		√			√
Meijuan et al ¹⁹	√	√		√	√	√	
Bauml et al ²⁰	√	√				√	
Alves Nogueira Fabro et al ²¹	√	√		√		√	
Cavigioli et al ²²	√	√		√	√	√	
Vilholm et al ⁸	√		√		√	√	
Vilholm et al ²³	√	√	√	√	√	√	
Eisenberg et al ²⁴	√	√				√	
Macdonald et al ²⁵	√	√		√		√	√
Blunt and Schmiedel ²⁶	√	√		√	√	√	
Reuben et al ⁶	√	√				√	
Miguel et al ²⁷	√	√				√	
Smith et al ²⁸	√	√		√		√	
Stevens et al ²⁹	√	√				√	√
Dini et al ³⁰	√	√	√	√		√	
Watson and Evans ³¹	√	√	√	√	√	√	
Watson et al ³²	√	√	√	√	√	√	
Rogers et al ³³							

that are present for a clinically important amount of time: at least 4 days per week for more than 12 hours per day.

Appropriate location of symptoms

Symptoms local to the surgical site and surrounding structures indicate a procedure-related cause, reducing the likelihood of other processes or events (perioperative or otherwise) being the source of PBSPS symptoms. The breast, chest wall, axilla, or arm of the affected side represent the site of direct trauma to these structures. Presence of symptoms in at least 1 of these sites is thus essential to diagnosing PBSPS.

Exacerbation with movement

What triggers or intensifies pain is important when classifying it clinically. Though pain exacerbation with shoulder movement is not necessarily a requisite when defining or diagnosing PBSPS, it is likely to be closely associated with the syndrome owing to proximity to the surgical site.

CONCLUSION

The purpose of this review was to identify the domains for defining PBSPS, their variation across the current literature and subsequent methodological discrepancies. We found substantial variation therein, bringing to light a need for a standard definition of PBSPS. All 7 of the identified domains have been shown to be important for appropriately and comprehensively defining PBSPS. We conclude that a complete definition of PBSPS is pain that occurs after any breast surgery; is of at least moderate severity; possesses neuropathic qualities; is located in the ipsilateral breast/chest wall, axilla, and/or arm; lasts at least 6 months; occurs at least 50% of the time; and may be exacerbated by movements of the shoulder girdle. It is our hope that a consensus can be drawn regarding the inclusion of patients and appropriate assessment of PBSPS in subsequent research and to help guide surgeons and physicians when they encounter these cases.

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