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Chronic Pain Associated with Upper-Limb Loss

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Abstract

Objective—To describe the prevalence, intensity, and functional impact of the following types of pain associated with upper-limb loss: phantom limb, residual limb, back, neck, and nonamputated-limb pain.

Design—Cross-sectional survey; 104 respondents with upper-limb loss at least 6 months postamputation completed measures of pain intensity, interference, disability, and health-related quality-of-life.

Results—Nearly all (90%) of the respondents reported pain, with 76% reporting more than one pain type. Phantom-limb pain and residual-limb pain were the most prevalent (79% and 71%, respectively), followed by back (52%), neck (43%), and nonamputated-limb pain (33%). Although nonamputated-limb pain was least prevalent, it was reported to cause the highest levels of interference and pain-related disability days. Self-reported quality-of-life was significantly lower for individuals with each type of pain compared with those without any pain. Age, time since amputation, and cause of amputation were not associated with pain.

Conclusions—In addition to pain in the phantom and residual limb, back, neck, and nonamputated-limb pain are also common after upper-limb loss. All of these pain types are associated with significant disability and activity interference for some individuals, suggesting that assessment of multiple pain types in persons with upper-limb amputation may be important.

Keywords

Upper Limb; Limb Loss; Amputation; Pain; Disability; Phantom Limb; Phantom-Limb Pain

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Chronic pain is a common secondary condition affecting many individuals with limb loss. In addition to other challenges posed by amputation, pain can have serious consequences for health and functioning, including reduced likelihood of employment and participation in social activities[1,2] and interference in prosthetic training.[3] Chronic pain associated with amputation has been associated with higher affective distress[4] and disability[5] as well as lower health-related quality-of-life[6] when compared with persons with amputation who do not report pain.

The majority of the amputation literature has focused on lower-limb loss, possibly because of the greater incidence of lower-limb amputation. However, the number of individuals with

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upper-limb loss in the community may be greater than suggested by incidence data, given the younger average age of upper-limb loss and the higher mortality rate of individuals with lower-limb loss.[7] Individuals with upper-limb loss tend to live and work with an amputation for more of their lifespan than those with lower-limb loss. Therefore, the impact of pain on functioning may be especially important for this group and requires further study.

The few studies on pain after upper-limb loss have focused mainly on the characteristics and impact of phantom limb pain (PLP), and to an even lesser degree, residual-limb pain (RLP). Chronic PLP is common after upper-limb loss, occurring in anywhere from 41%[8] to 69%[9] of individuals with upper-limb loss. Chronic RLP is also common in persons with upper-limb loss, ranging from 49%[10] to 66%[11] of community samples. However, pain may occur in sites other than the phantom or residual limb. A handful of studies have examined other types of pain associated with upper-limb loss and have reported significant rates of pain ranging from 33% to 64% in the back,[7,11] nonamputated arm,[7,11] and neck.[7] However, only one study, to our knowledge, included all of these pain locations,[7] and none has examined quality-of-life or the relative levels of pain interference and disability associated with each pain type or site.

The purpose of this study was to examine the prevalence, characteristics, and associations with functioning of a number of pain problems in persons with upper-limb loss, including PLP, RLP, neck pain, back pain, and nonamputated-limb pain. Based on previous research, we hypothesized that PLP and RLP would be the most common types of amputation-related pain. However, we also hypothesized that the other types of pain examined would be common and associated with significant disability for a subset of the sample.

METHODS

Participants

This study was a part of a larger study examining quality-of-life in persons with amputation. Although data from the larger study have been used for several publications,[12–14] data from this upper-limb loss sample have not been reported previously. The potential participants for this study were recruited from several different sources, including the pool of former patients who had undergone an upper-limb amputation at two Seattle and one Spokane area hospitals: Harborview Medical Center, a level 1 trauma center, the Veterans Affairs Puget Sound HealthCare System, and St. Luke's Hospital in Spokane. Other recruitment sources included flyer postings in area prosthetic and orthotic clinics and an advertisement in the *In Motion* magazine published by the Amputee Coalition of America. Inclusion criteria included the following: (1) 6 or more months after upper-limb amputation, (2) at least 18 yrs of age, and (3) ability to read and write English. Questionnaires were mailed to a total of 292 individuals. Of the questionnaires mailed, 43 were returned by the postal service as undeliverable, 8 were returned as the addressee deceased, and 18 were returned but did not meet inclusion criteria (<6 mos after amputation, no upper-limb amputation, or the person was younger than 18 yrs). Thus, a maximum of 223 surveys theoretically could have been completed. Nine potential participants declined to participate. A total of 104 useable surveys were returned, yielding a return rate of 47% (104 of 223). The University of Washington Human Subjects Committee approved the study protocol.

Measures

Demographic and Amputation History Questionnaire—The participants were asked to provide basic demographic information including their gender, age, ethnicity, educational level, and employment status. They also responded to questions regarding their amputation, including the medical reason for their amputation, the date of their original amputation surgery, the date of their most recent revision, the level of their amputation, and their prosthesis use.

Pain Assessment—All participants were asked whether they experienced upper-limb pain before their amputation. They were also asked whether they had experienced persistent, bothersome PLP, RLP, back pain, neck pain, and pain in the nonamputated limb since their amputation, in addition to any nonpainful limb sensations coming from the portion of the limb that had been amputated.

For each type of pain problem reported, participants were asked to indicate its intensity, interference, disability days, and temporal pattern. The questions used to assess these pain domains were taken from the graded chronic pain scale (GCPS).[15] The pain intensity items included present, average, worst, and least pain intensity (for the past 3 mos), assessed using an 11-point numerical rating scale, with 0 = "No pain" and 10 = "Pain as bad could be." Pain interference was assessed with one 0–10 item that asked to what degree pain has interfered with daily activities in the past 3 mos (0 = no interference and 10 = unable to carry out activities). To assess disability days, respondents were asked to report how many days in the past 3 mos they were kept from their usual activities because of each specific pain problem. Participants were also asked to describe the temporal pattern of each pain problem: intermittent, constant, or not present during the past 4 wks.

Pain-related disability associated with each pain site was assessed using the GCPS. This measure of disability is calculated using the items described earlier (pain intensity, pain interference, and disability days). The GCPS score is used to classify individuals with pain into 1 of 5 hierarchical categories: grade 0, no pain problem; grade I, low-pain–related disability and low-pain intensity; grade II, low disability and high pain intensity; grade III, high disability that is moderately limiting; and grade IV, high disability that is severely limiting.

Quality-of-Life—Global health-related quality-of-life domains (HRQoL) was assessed with two measures, the satisfaction with life scale[16] and the Medical Outcomes Study Short-form 12 (SF-12).[17] The satisfaction with life scale is a five-item measure designed to assess overall satisfaction with life by asking respondents to rate their agreement with statements such as "In most ways my life is close to my ideal" on a 7-point Likert scale.[16] The SF-12 is a 12-item measure that provides two scores, the physical component scale and the mental component scale, to capture both the physical and mental/emotional/social aspects of HRQoL. Both the physical component scale and mental component scale have a possible range from 0 to 100, with higher scores indicating better HRQoL.[17]

Procedure—The names of potential participants were randomly selected from the potential participant databases from the participating hospitals. Approximately 25 surveys were mailed every other month over a period of 24 mos. Participants also called or e-mailed the study in response to the flyers or the magazine advertisement. Each potential subject received a packet by mail containing a cover letter, the pain survey, and a stamped return envelope. The cover letter explained the survey in detail, including the risks and benefits of participation, and informed participants that they would be giving informed consent to participate in this study by completing and returning the questionnaire. The cover letter described the survey as assessing both pain and quality-of-life and asked respondents to complete the survey even if they did not have pain. To facilitate recruitment, follow-up calls and postcard mailings were made to those who had not returned a survey. A research assistant contacted participants by phone to obtain or clarify any answers that were incomplete or incomprehensible on the completed survey. We were unable to obtain additional information on nonresponders because of the University of Washington Human

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Subjects Division regulations. Our Human Subjects Division required informed consent for collecting additional information from the medical records and prohibited contact of nonresponders outside of the mailings described earlier.

Data Analysis Plan—The data were analyzed primarily using descriptive statistical analyses. Nonparametric correlational analyses (Pearson's univariate correlation, χ^2) were also used to examine the association between pain and a few selected variables: prosthesis use, age, gender, marital status, years since amputation, cause of amputation, and presence of reported preamputation pain. We used paired-sample *t* tests to compare differences in pain and disability ratings between PLP and RLP. We used independent samples *t* tests to examine the hypothesis that individuals with pain were more likely to have a longer elapsed time since amputation, specifically by comparing time since amputation for those with and without each type of pain.

RESULTS

Description of Participants

The majority of participants in the sample were men (72%) and white (89%). They ranged in age from 18 to 64 yrs (mean = 46.9 yrs, SD = 14.1 yrs). Sixty-three percent were married or living with a partner. The most common level of amputation was above elbow (39%), followed by below elbow (32%). The large majority of participants reported limb loss caused by injury (83%). The median time since amputation was 7.0 yrs (SD = 11.51 yrs), ranging from 0.17 to 60.33 yrs. Additional demographic information is reported in Table 1.

Nonpainful Limb Sensations

Nonpainful limb sensations were reported by the majority of the sample (81%) and were reported as intermittent by 50% of those who had them. There was a significant association between nonpainful limb sensations and PLP in that individuals who reported one were significantly more likely to report the other as well ($\chi^2 = 10.45$, $P < 0.001$). In fact, 86% of participants ($n = 72$ of 84) who reported having these sensations also reported having PLP. The impact of nonpainful limb sensations on participants' functioning was not assessed.

Pain Prevalence and Characteristics

The relative prevalence of the five types of pain we studied in upper-limb loss are reported in Table 2. PLP was the most commonly reported type of pain (79% of the sample), followed by RLP (71%). Fifteen percent of this sample reported experiencing all five of these types of pain, 21% reported four of the pain types, 17% reported three types, 22% reported two types, 14% reported one type of pain, and only 10% reported none of these types of pain. Average pain intensity for all five types of pain was in the moderate range, and pain interference scores were, on average, in the mild to moderate range (based on previous research on the classification of amputation-related pain[12]).

We were interested in determining which types of pain related to amputation tend to be more severe and cause greatest disruption in daily functioning. However, because of the large number of possible combinations of pain problems, it was not possible to directly compare each type of pain with each other with respect to intensity and interference. Instead, we limited analyses to a comparison of the two most common types of pain after limb loss, PLP and RLP. To examine the differences between pain intensity, pain interference, and disability days attributed to PLP *vs.* RLP, we performed paired samples *t* tests with the 65 participants who reported both PLP and RLP. Results showed that individuals with both types of pain tended to report significantly greater pain intensity attributed to PLP (mean PLP = 5.37, SD = 2.66; mean RLP = 4.72, SD = 2.76; $t(64) = 2.45$, $P < 0.05$), but no significant differences between levels of pain interference or disability days attributed to each type of pain.

Levels of pain intensity, interference, and disability for the five pain sites are reported in Table 2. Although PLP, on average, was reported to be the highest in intensity, it was also the lowest in terms of pain interference. Average pain interference and number of disability days were both highest for nonamputated limb pain. Mild disability (category I on the GCPS) was the most common level for all pain types. However, if GCPS categories III and IV are examined jointly (high disability that is moderately to severely limiting), it can be seen that 26% of this sample reported being highly disabled by PLP, 26% by RLP, 18% by back pain, 15% by neck pain, and 13% by nonamputated limb pain. When looking only at the subsets of individuals with each site of pain, nonamputated limb pain had the highest proportion of categories III and IV (38% of those with this pain), followed by RLP (36% of those with RLP), neck and back pain (both with 33%), and PLP (32%).

Pain and Prosthesis Use

Fifty-seven percent ($n = 59$) of the participants reported using a prosthesis, compared with 42% who did not (one person did not answer the question). Type of prosthesis was not assessed. Of those who reported using a prosthesis, 63% reported using their device for >8 hr/day (mean number of hours/day = 11.69, SD = 6.67), and 73% reported 20 days/mo or more of prosthesis use (mean days/mo = 23.27, SD = 9.08). Individuals who reported using a prosthesis were significantly more likely to have PLP ($\chi = 4.23$, $P < 0.05$) but were not significantly more likely to have back, neck, or nonamputated limb pain (χs = 0.01, 0.06, and 3.63, respectively; not significant). Prosthesis use demonstrated a nonsignificant trend to be associated with the presence of RLP ($\chi = 3.55$, $P = 0.06$).

Associations Between Pain and Demographic Characteristics

Regarding the association between pain and age, the results of one-way ANOVAs demonstrated no significant differences in pain intensity across age groups (examined in quartiles: 18–35, 36–45, 46–55, and 56–84) for any of the five types of pain (for PLP, $F(3,78) = 0.29$, $P = 0.83$; for RLP, $F(3,70) = 0.87$, $P = 0.46$; for back, $F(3,50) = 0.59$, $P = 0.62$; for neck, $F(3,41) = 0.41$, $P = 0.74$; for nonamputated limb pain, $F(3.30) = 0.16$, $P = 0.92$). In addition, t tests comparing the ages of those with to those without each type of pain found no significant differences (t values ranged from −0.85 to 0.73, P values ranged from 0.40 to 0.80). We did find a significant effect for gender and the presence of certain types of pain, however; men were significantly more likely to report PLP, RLP, and neck pain (χs = 14.85, 5.55, and 4.26, Ps <0.001, 0.01, and 0.05, respectively) but were no more likely to report back or nonamputated limb pain (χs = 1.96 and 2.34, respectively; Ps = 0.16 and 0.31, respectively). Regarding the associations between gender and pain intensity, t tests comparing the pain intensity of each type of pain for men and women found no significant differences, demonstrating that both sexes reported similar levels of pain intensity (t values ranged from 0.02 to 0.78; P values ranged from 0.44 to 0.99). Regarding marital status, the results of Pearson's χ^2 tests demonstrated that individuals who were married or living with a significant other were no more likely to report having any of the five types of pain compared with those who were divorced or widowed (χ^2 values ranged from 0.03 to 3.11, P values ranged from 0.21 to 0.86); similarly, t tests demonstrated that the married/significant other group did not report significantly greater pain intensity for any type of pain compared with the divorced/widowed group (t values ranged from −0.63 to 0.49; P values ranged from 0.53 to 0.94).

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Associations Between Pain and Amputation Characteristics

Regarding cause of amputation, we used χ^2 tests to examine the presence or absence of each type of pain in limb loss due to injury compared with other causes, and found that individuals with limb loss due to injury were no more likely to report any of the types of pain examined here (χ^2 values ranged from 0.05 to 1.52; P values ranged from 0.22 to 0.97). Regarding pain before amputation, χ^2 tests were again used to examine the association between presence of reported preamputation pain and presence or absence of each type of pain after limb loss. We found that individuals who reported pain before amputation were no more likely to report PLP, RLP, or nonamputated limb pain (χs = 0.61, 1.74, and 1.08, respectively; not significant) but were more likely to report back and neck pain (χs = 5.11 and 8.90, Ps < 0.05 and 0.01, respectively).

We sought to examine the hypothesis that pain at least 6 mos after upper-limb loss may be associated with time since amputation. We conducted t tests to compare time since amputation for those with and without each type of pain, and found no significant differences (for PLP, t (101) = −1.22, P = 0.23; for RLP, t (101) = −0.32, P = 0.75, for back, t (101) = −0.39, P = 0.70; for neck, t (101) = −0.57, P = 0.57; and for nonamputated limb pain, t (94) = 0.01, P = 0.99). Correlations between time since amputation and average pain intensity of all five pain types in the past 3 mos were all weak and nonsignificant (rs ranged from −0.07 to 0.07).

Healthcare Utilization

Regarding satisfaction with pain treatment received from healthcare providers, 26% of those with pain reported they were either completely or very satisfied, 33% were satisfied, 22% were dissatisfied, and 19% were either very or completely unsatisfied.

Quality-of-Life

Scores on the satisfaction with life scale ranged from the lowest possible score of 5 to the highest possible score of 35, with the sample mean falling at 18.12 (SD = 9.19). A slight majority (56% of the sample) had a score below the midpoint of 20, indicating that these respondents reported being more dissatisfied with life than satisfied, although reasons for dissatisfaction were not assessed. The mean score for the physical component scale from the SF-12 was 41.47 (SD = 11.04), with scores ranging from 16 to 60, whereas the mean score on the mental component scale from the SF-12 was 46.89 (SD = 12.29), with scores ranging from 17 to 64. Both SF-12 scores were significantly lower compared with the means for the general U.S. population (mean for the physical scale = 50.12, t (102) = −7.96, P < 0.001; mean for the mental scale = 50.04, t (102) = −2.60, P < 0.05).[17]

To examine the associations between pain and quality-of-life, we computed univariate Pearson's correlations between pain intensity for each of type of pain with the three quality-of-life measures, reported in Table 3. Each of the quality-of-life measures was significantly associated with all or almost all of the types of pain, with the exception that nonamputated-limb pain was not significantly associated with life satisfaction or the mental component of the SF-12. The results of t tests comparing mean scores on the quality-of-life measures for individuals with and without each type of pain are reported in Table 4.

DISCUSSION

The purpose of this study was to provide much-needed information on the prevalence and characteristics of common types of pain after upper-limb loss as well as the relative impact of different pain locations on functioning and quality-of-life. One of the key findings of the study is that most individuals with upper-limb loss experience multiple types of pain. In the current sample, only 10% of respondents reported that they had not experienced any of the five types of pain assessed. More than half (53%) reported three or more types of pain. Although PLP has received the bulk of the attention in research on amputation-related pain, our results suggest that other pain locations or types of pain may also have a significant impact on functioning and should not be overlooked in research and clinical settings. These findings are consistent not only with research on pain in lower-limb amputations[11,13] but also with the broader pain literature, where research has consistently shown that having chronic pain in one region is associated with a higher risk of having chronic pain in another.[18]

The rates of PLP and RLP in this study are higher than some previous studies of pain in upper-limb loss.[8,10,19] For example, Kooijman et al.[10] surveyed 72 individuals with acquired upper-limb loss and found that 51% reported PLP and 49% reported RLP, compared with 79% and 71%, respectively, in the current study. However, another study (*n* = 100) found rates of pain similar to this study, albeit a slightly higher rate of PLP (83% of the upper-limb loss sample) and a slightly lower rate of RLP (66%).[11] In both this and previous studies, injury was the predominant cause of amputation; therefore, our results may be most representative of this group in the population. Our results, combined with previous research, suggest that PLP is the most prevalent type of pain, reported by the majority of individuals with upper-limb loss, and that RLP is slightly less prevalent, but still reported by the majority of individuals in several studies.

Several previous studies have examined pain in other locations, although none examined back, neck, and nonamputated-limb pain in the same study. Regarding back pain, one previous study reported a slightly higher rate of back pain (64%, compared with 52% in this study), whereas another study assessed only upper-back pain and reported a lower rate (40%).[7] A similar range of back pain has been found in lower-limb loss samples (52%–62%),[11,13,20,21] suggesting that both upper- and lower-limb loss may have a much greater rate of back pain compared with estimates for the general U.S. population (from 26%[22] to 28%[23]). The only other study, to our knowledge, to assess neck pain reported a very similar rate, 45% of that sample (*n* = 60), compared with 43% of the current sample.[7] Both studies demonstrate a much greater rate of neck pain compared with the prevalence rate of 14%[22] estimated in the general U.S. population. Pain in the nonamputated limb was reported at a very similar rate in a previous study (36%),[11] compared with this study (33% of our sample).

Across the whole sample, PLP and RLP seem to cause the most interference in functioning and pain-related disability simply because they are the most common types of pain. However, for each type of pain in this study, a notable subset of individuals reported a moderate-to-severe level of pain intensity, interference, and disability. Although nonamputated-limb pain was the least prevalent type of pain, pain interference, disability days, and level of disability (GCPS category) were high among the subset of individuals who reported this type of pain. We can hypothesize that pain in the remaining limb may be especially burdensome because use of the limb is so crucial for daily functioning. In addition, it is probable that having multiple types of pain, as did the majority of the current sample, would be especially burdensome, especially if different types of pain impact different activities. For the subset of 65 individuals with both PLP and RLP, the intensity of PLP was significantly greater than RLP, but no differences in pain interference or disability days were attributed to each.

Regarding prosthesis use, 57% of the sample reported using a prosthesis; within that group, 63% used the prothesis for 8 hr/day or more and 73% used it on 20 days per month or more. These results suggest that the majority of prosthesis users are using it for a number of hours on more days than not, consistent with earlier studies that reported rates of 50% for "daily use,"[24] 47% for prosthesis use ≥5 hr/day,[7] and 37% for ≥8 hr/day.[19] Our rate of prosthesis rejection (42%) is slightly higher than a study of functional outcome in upper-limb loss that reported a rejection rate of 33.75%; reasons for rejection in that study included pain, no functional benefit, weight of the prosthesis, and poor cosmesis.[7] In this study, individuals who used a prosthesis were more likely to report PLP, but we do not know whether using a prosthesis contributes to pain or is used to relieve it. The other pain types were not associated with prosthesis use.

Regarding other triggers of pain, a previous study of nonamputated-limb pain reported causes of pain, such as overuse, exacerbation of preexisting arthritis, and injuries to the remaining arm sustained during the accident[25]; this study further suggested that patients be counseled early in the rehabilitation process about the risk of overuse injuries.[25] Our results suggest a need for further research regarding the causes of neck, back, and nonamputated-limb pain, especially if functional interventions could prevent or manage much of this type of pain. However, it should be noted that we surveyed these pain locations without specifying that the pain must be related to the amputation; therefore, these types of pain could be caused by other or multiple factors.

We found few associations between amputation characteristics and pain, consistent with at least one previous study.[10] Time since amputation was not related to pain, suggesting that for those individuals with pain, it is not likely to fade away with time. Preamputation pain in the limb to be amputated was significantly associated with the presence of both back and neck pain, but not other pain types, in contrast to a number of studies that have supported an association between preamputation pain and PLP.[26,27] The role of preamputation pain has been closely studied, based on the theory that significant pain before amputation creates a somatosensory pain memory that sets the stage for greater pain after amputation.[28,29] Previous studies associating preamputation pain with PLP have included mostly individuals with lower-limb amputation, who may tend to live with preamputation pain for longer because of the predominance of chronic vascular issues. In contrast, injury is the most common cause of upper-limb loss and may be associated a much shorter duration of preamputation pain. It is also possible that we may have failed to detect this association because of the problems inherent in retrospective recall of preamputation pain, which has been shown to be inaccurate only 6 mos after amputation.[8,27] Overall, our results suggest some associations between preamputation and postamputation pain, and we stress that regardless of our mixed results, preemptive pain control is important for the sake of patient comfort and well being.

Regarding HRQoL, both physical and mental quality-of-life were significantly lower compared with the general U.S. population means, and a slight majority of the sample (56%) reported being more dissatisfied with life than satisfied. All five of the pain types were significantly correlated with at least one of the quality-of-life measures. Although the negative impact of PLP on quality-of-life has been explored in several studies,[6,14,30] this study demonstrates that other types and regions of pain may impact HRQoL as well.

One factor that may impact HRQoL is satisfaction with pain management. Although a slight majority (54%) reported being satisfied with their pain treatment, a significant minority (37%) of the sample expressed dissatisfaction with the pain treatment they had received. However, reasons for dissatisfaction were not assessed. Previous research has found that individuals with lower-limb loss and pain try many forms of treatment but do not report high levels of helpfulness from these treatments, taken as a whole.[31] Research into more effective treatment of amputation-related pain is highly important, and novel approaches for treating phantom pain, such as mirror therapy,[32] are currently being explored.

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Several additional limitations of this study should be addressed. Our response rate of 47% was lower than several other survey studies of limb loss[7,10,11] for unknown reasons. Regarding generalizability of pain prevalence, it is possible that those with pain may have been more motivated to complete the survey than individuals without major pain complaints; however, to minimize this issue, all survey recipients were instructed to complete the survey whether they had pain or not. We had a high rate of white respondents (89% of the sample), which may in part reflect the ethnic make-up of the geographic region in which the research was conducted and was similar to a larger (n = 914) survey study of limb loss (86% of the sample was white).[11]

This study found that most (90%) of the individuals with upper-limb loss in this sample experienced at least one type of amputation-related chronic pain, and the majority reported multiple types of pain years after the amputation surgery. In addition to PLP and RLP, back pain, neck pain, and nonamputated-limb pain were reported by significant subsets of individuals, and, for some, were reported to cause as much or more disability and interference with daily activities as PLP and RLP. Rates of back and neck pain in limb loss seem to be higher than general population rates. Important directions for future research should include examining the causes of all types of amputation-related pain and methods of alleviation.

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TABLE 1

Sample characteristics (*N* = 104)

Age range, yrs	18–64
Mean age, yrs	46.88 (SD = 14.15)
Gender, %	72 M, 28 F
Marital status, %	
Married/living w/SO	63
Separated/divorced	13
Widow	3
Never married	20
Ethnicity, %	
White	89
Hispanic	4
Native American	4
African American	1
Other	2
Education level, %	
<12 years	14
12 years	19
Voc/tech school	10
Some college	31
College graduate	15
Postgraduate	9
Employment status, %[a]	
Employed full or part time	45
School full or part time	7
Retired	18
Homemaker	8
Unemployed due to pain	6
Unemployed due to disability	23
Unemployed other	13
Reason for amputation, %[a]	
Injury	83
Infection	8
Vascular	4
Gangrene	8
Diabetes	0
Congenital	1
Other	16
Level of amputation, %	
Shoulder	3
Above elbow	39

Elbow	3
Below elbow	32
Wrist	5
Partial hand	14
Other	3

[a]Multiple answers allowed and thus percentages add up to >100%.

TABLE 2

Prevalence and characteristics of pain

Measures	Phantom	Residual	Back	Neck	Nonamputated Limb
Prevalence, *n* (%)	82 (78.8)	74 (71.2)	54 (51.9)	45 (43.3)	34 (32.7)
Frequency in the past 4 wks, n (%)					
None	33 (31.7)	39 (37.5)	52 (50.0)	61 (58.7)	72 (69.2)
Intermittent	44 (42.3)	43 (41.3)	35 (33.7)	28 (26.9)	26 (25.0)
Constant	27 (26.0)	22 (21.2)	17 (16.3)	15 (14.4)	6 (5.8)
Pain intensity, mean (SD)[a]	5.0 (2.8)	4.7 (2.8)	4.4 (2.4)	4.6 (2.6)	4.1 (2.6)
Pain intensity category, *n* (%)					
Mild	38 (36.6)	37 (35.6)	35 (33.7)	23 (22.1)	23 (22.2)
Moderate	20 (19.2)	18 (17.3)	7 (6.7)	11 (10.6)	5 (4.8)
Severe	24 (23.1)	18 (18.3)	12 (11.5)	11 (10.6)	6 (5.8)
Pain interference, mean (SD)[a]	3.2 (3.3)	3.4 (3.6)	3.4 (3.3)	3.3 (3.5)	4.2 (3.3)
Disability days/month, mean (SD)	10.2 (21.0)	12.1 (24.6)	12.3 (26.4)	9.5 (20.9)	18.4 (32.1)
Disability category[b], *n* (%)					
0, no pain problem in past 3 mos	23 (22.1)	33 (31.7)	51 (49.0)	59 (56.7)	71 (68.3)
I, low disability, low pain intensity	31 (29.8)	30 (28.8)	25 (24.0)	22 (21.2)	18 (17.3)
II, low disability, high pain intensity	23 (22.1)	14 (13.5)	10 (9.6)	8 (7.7)	2 (1.9)
III, high disability, moderately limiting	11 (10.6)	13 (12.5)	9 (8.7)	5 (4.8)	5 (4.8)
IV, high disability, severely limiting	16 (15.4)	14 (13.5)	9 (8.7)	10 (9.6)	8 (7.7)

[a]Of those reporting each pain type.

[b]Classified using the graded chronic pain scale which assesses pain in the last 3 mos.

TABLE 3

Pearson correlations between pain intensity for five types of amputation-related pain with quality-of-life measures (among those reporting each type of pain)

Type of Pain	Satisfaction With Life Scale	SF-12 PCS	SF-12 MCS
Phantom	−0.25*	−0.32***	−0.26**
Residual limb	−0.35***	−0.34***	−0.37***
Back	−0.26**	−0.36***	−0.33***
Neck	−0.33***	−0.35***	−0.31**
Nonamputated limb	−0.14	−0.39***	−0.14

*$P < 0.05$;

**$P < 0.01$;

***$P < 0.001$.

SF-12 PCS, physical component scale of the medical outcomes study short-form 12 (SF-12); SF-12 MCS, mental component scale of the medical outcomes study short-form 12 (SF-12).

TABLE 4

Quality-of-life scores for individuals with and without each type of pain

Type of Pain	Satisfaction with Life Scale	SF-12 PCS	SF-12 MCS
Phantom			
Yes: Mean (SD)	17.29 (9.93)	39.88 (11.13)	46.17 (11.83)
No: Mean (SD)	21.55 (10.78)	46.80 (10.32)	48.60 (14.18)
t Value	$-1.82^{\dagger}$	-2.51^{*}	-0.78
Resiual limb			
Yes: Mean (SD)	16.86 (9.17)	38.91 (10.97)	45.17 (11.88)
No: Mean (SD)	21.56 (9.46)	47.77 (9.53)	50.69 (12.80)
t Value	-2.24^{*}	-3.63^{***}	$-1.98^{\dagger}$
Back			
Yes: Mean (SD)	15.53 (8.83)	38.27 (10.86)	44.00 (12.05)
No: Mean (SD)	20.94 (9.36)	44.47 (10.92)	49.43 (12.12)
t Value	-2.91^{**}	-2.77^{**}	-2.19^{*}
Neck			
Yes: Mean (SD)	15.37 (9.25)	36.95 (10.62)	44.83 (12.93)
No: Mean (SD)	20.27 (9.11)	44.67 (10.68)	48.09 (11.77)
t Value	-2.59^{*}	-3.50^{***}	-1.28
Nonamputated limb			
Yes: Mean (SD)	16.33 (8.68)	35.50 (10.15)	44.50 (11.18)
No: Mean (SD)	18.72 (9.97)	43.81 (10.56)	47.95 (12.90)
t Value	-1.15	-3.62^{***}	-1.27

$0.05 < {}^{\dagger} < 0.10$,

$^{*}P < 0.05$;

$^{**}P < 0.01$;

$^{***}P < 0.001$.

SF-12 PCS, physical component scale of the medical outcomes study short-form 12 (SF-12); SF-12 MCS, mental component scale of the medical outcomes study short-form 12 (SF-12).