

## **Depression in Burn Reconstruction Patients: Symptom Prevalence and Association with Body Image Dissatisfaction and Physical Function**

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## **ABSTRACT**

**Objective:** This study investigated the prevalence and clinical correlates of symptoms of depression among burn reconstruction patients.

**Methods:** A sample of 224 burn reconstruction patients completed the Beck Depression Inventory (BDI), SF-36 Health Survey, and Satisfaction with Appearance Scale (SWAP).

**Results:** The prevalence of at least mild to moderate symptoms of depression ( $BDI \geq 10$ ) was 46%. Female patients were disproportionately represented in this burn reconstruction population (46%) compared to all survivors from the burn center (29%,  $p < .001$ ) and compared to a national sample of burn survivors (27%;  $p < .001$ ). Compared to males, female patients presented for consultation longer after the burn injury ( $p < .001$ ), tended to have smaller burns ( $p = .06$ ), and were less likely to have facial burns ( $p = .08$ ). Depressive symptoms were largely predicted by body image dissatisfaction ( $\beta = .58$ ;  $p < .001$ ) with some additional variance predicted by physical function ( $\beta = -.13$ ;  $p = .07$ ). The effect of patient and burn injury variables on depressive symptoms was mediated by body image dissatisfaction and physical function.

**Conclusions:** The high prevalence of significant symptoms of depression in burn reconstruction patients and their relationship with body image suggest the importance of routine psychological screening of patients seeking reconstruction services.

## INTRODUCTION

In the United States, there are almost 50,000 hospitalizations per year from burn injuries [1]. Whereas the overall incidence of burn injuries has declined in recent decades [2], the proportion of patients who survive large burn injuries has increased dramatically due to the development of comprehensive burn centers and improvements in treatments [3, 4]. Related to this, the number of reconstructive surgeries performed as the result of a burn injury approximately doubled between 1992 and 2004 when over 35,000 procedures were performed nationally [5].

Reconstructive procedures following a burn injury often begin in the first year following the injury and can continue for many years. The primary reasons for undergoing reconstructive surgery are to improve function, comfort, and appearance [6]. A major burn injury can cause considerable damage to skin integrity and often leads to hypertrophic scarring. Deep burns frequently impair function, and can result in damage to or the loss of functionally and cosmetically important body parts [7]. Among survivors of burn injuries, both body image dissatisfaction and functional impairment have been associated with depression 5 years or longer after the injury [8, 9].

Estimates of the rate of depression among burn survivors vary widely due to the use of different assessment instruments and cutoffs, small sample sizes, and variation in burn severity across samples. Three studies have used validated questionnaires to assess symptoms of depression in adult burn survivors 12 months or more post-discharge. Ward et al. [10] reported that 22% of 139 burn survivors had at least mild symptoms of depression (Beck Depression Inventory [BDI]  $\geq 10$ ) [11] 1 to 8 years post-burn; Weichman et al. [12] reported that 34% of 129 survivors scored 8 or greater on the BDI at 12 months and that 45% scored 8 or above at 2

years post-burn; Pallua et al. [9] reported a rate of 18% with severe depressive symptoms among 92 survivors an average of 5.4 years post-injury using the Center for Epidemiological Studies Depression Scale (CES-D) [13].

Only one study has reported data on psychosocial characteristics of burn reconstruction patients. That study found higher, albeit not significantly so, BDI scores among 16 patients who elected to have surgery compared to 27 who chose not to have surgery [14]. No studies have reported data on the prevalence of symptoms of depression among burn patients seeking reconstructive services or on the relationship between depressive symptoms, body image, and physical function in this population. The objectives of this study were (a) to investigate the prevalence of clinically significant symptoms of depression among burn reconstruction patients, (b) to test the hypothesis that depressive symptoms are predicted by body image dissatisfaction and limitations in physical function, and (c) to test the hypothesis that body image dissatisfaction and physical impairment mediate the relationship between patient and burn injury variables and depression.

## **METHODS**

### **Patients and Study Design**

This study was approved by the Johns Hopkins Institutional Review Board. Patient data for the study was obtained from a de-identified clinical database of adult patients who were evaluated in the Burn Reconstruction Center of the Johns Hopkins Burn Center from March 1994 through July 2005. All adult patients who are evaluated for reconstructive services in the center are routinely referred for psychological evaluation with an affiliated psychologist. The assessment includes a clinical interview and a series of standardized measures to assess personality characteristics, symptoms of depression, body image dissatisfaction, and overall

physical and mental health and function. During the study period, 63% of all new burn reconstruction patients completed psychological assessments, 32% were not evaluated due to scheduling difficulties or the unavailability of the psychologist, and 5% were not evaluated due to patient refusal or the inability to be assessed in English. Supplemental funding for this service is provided by a local grant foundation, so no patients were denied psychological assessments for financial or insurance reasons.

The characteristics of patients who sought services in the burn reconstruction center were compared to all patients who were admitted to and discharged alive from the Johns Hopkins Burn Center from 1995 through 2005 and to a national sample extracted from the American Burn Association National Burn Repository (ABA-NBR) for all adult patients who were discharged alive from 46 burn centers across the United States from 1995 through 2005. A more complete description of the ABA-NBR database is provided elsewhere [15].

## **Measures**

*Beck Depression Inventory:* The BDI [11] is a 21-item measure of depressive symptoms. Each item consists of four statements, scored 0-3, indicating increasing symptom severity. Total scores range from 0-63. Respondents are instructed to describe the way they have been feeling during the past week. The authors recommend cutoff scores of  $\geq 10$  for at least mild symptoms of depression,  $\geq 19$  for at least moderate symptoms of depression, and  $\geq 30$  for severe symptoms of depression [16]. The BDI was administered to all patients included in the present study.

*Satisfaction with Appearance Scale:* The SWAP [17] is a 14-item scale developed to assess non-weight-related body image dissatisfaction among burn patients. Each item is scored on a 7-point Likert scale (0 to 6; *strongly disagree* to *strongly agree*). The SWAP is scored so that higher scores represent greater dissatisfaction. The minimum possible score is 0 and the maximum

possible score is 84. Good internal consistency has been reported for the total SWAP among patients with burn injuries (Cronbach's  $\alpha = .87$ ) [17]. The SWAP, which was published in 1998, was introduced into the center for burn reconstruction assessment battery in February 1998.

*SF-36 Health Survey:* The SF-36 Health Survey [18] is a 36-item multi-purpose health survey, which yields an 8-subscale profile of functional health and well-being, as well as empirically-derived physical and mental health summary measures. The SF-36 is the most widely used and evaluated health outcomes measure and has extensive evidence for its validity and reliability in multiple populations [18, 19]. The Physical Composite Scale (PCS) of the SF-36 Health Survey [18] was used to assess patients' physical function. Higher scores on the PCS indicate better physical function. The SF-36 was introduced into the assessment package in June 1995.

### **Statistical Analysis**

To identify variables that might differentiate patients who seek burn reconstruction services from a general population of patients with serious burn injuries, demographic and burn injury characteristics of the burn reconstruction patients were compared to samples of hospitalized burn patients who were discharged alive from the Johns Hopkins Burn Center and from the ABA-NBR burn centers. Differences between the groups were tested using  $\chi^2$  tests for categorical variables and  $t$  tests for continuous variables. Statistical significance was based on two-sided tests with a  $p < .05$  significance level. Because the proportion of female patients was substantially higher among burn reconstruction patients compared to the general population of patients with burn injuries, similar comparisons were carried out between male and female patients in the burn reconstruction sample. BDI scores were compared between male and female patients, and analysis of covariance was used to compare mean BDI scores adjusted for time

since the burn injury, TBSA, and the presence of a facial burn. These analyses were conducted using SPSS version 13.0 (Chicago, IL).

Path analysis was used to analyze the relationships between demographic and burn injury characteristics, body image dissatisfaction, physical function, and symptoms of depression. The initial model was specified to reflect prior research among burn patients showing that body image dissatisfaction is related to female sex, extent of the burn injury as measured by the percent of total body surface area (TBSA) burned, and the presence of a facial burn [8, 20] and that physical function is associated with current age and TBSA [21]. Thus, the initial model was specified to test the hypotheses (a) that symptoms of depression are predicted by body image dissatisfaction and physical function [8, 9], (b) that physical function mediates a relationship between both age and percent TBSA burned with symptoms of depression, and (c) that body image dissatisfaction mediates the relationship between each of the variables female sex, percent TBSA burned, and the presence of a facial burn with symptoms of depression.

All path model estimations were generated with EQS 6.1 [22] using maximum-likelihood estimation. Model fit was assessed with the chi-square statistic and three model fit indices: the Tucker-Lewis Index (TLI) [23], also known as the non-normed fit index (NNFI) [24], the comparative fit index (CFI) [25], and the root mean square error of approximation (RMSEA) [26]. These indices are used to evaluate the degree to which a variable covariance matrix estimated from the model is an adequate representation of the sample covariance matrix. Rough guidelines suggest that models with TLI/NNFI and CFI between .80 and .90 fit moderately well, with >.90 indicating a well-fitting model [26, 27]. RMSEA values <.05 are considered to be representative of good fitting models, and values between .05 and .08 of moderate fit [27].

## **RESULTS**



## **Patient Characteristics**

A total of 224 patients were included in the study. As shown in Table 1, 46% of the patients from the burn reconstruction center sample were female compared to only 27% of survivors from burn centers nationally ( $p < .001$ ) and 29% of survivors from the Johns Hopkins Burn Center ( $p < .001$ ). The mean age was 33.1 years, and the average time since the burn injury was 7.3 years. The mean percent TBSA burned among burn reconstruction patients (21.8%) was approximately double that of burn survivors from the ABA-NBR database (11.2%,  $p < .001$ ) and from the Johns Hopkins Burn Center (10.5%,  $p < .001$ ). The proportion of burn reconstruction patients with burns to the face was only slightly less than in the sample of burn survivors. The Johns Hopkins Burn Center and ABA-NBR databases, however, do not provide data specifically on burns to the face, but rather lists burns to the entire head. Thus, the figure presented in Table 1 likely overestimates the proportion of patients with facial burns in these groups.

Male and female patients who were evaluated in the reconstruction center differed in important ways (Table 2). Almost 25% of female patients were seeking services for a burn injury that had occurred at least 20 years ago when they were children, compared to only 7% of male patients. Furthermore, the time since the burn injury was over double for female patients compared to male patients (10.5% versus 4.7%,  $p < .001$ ). In addition, male burn reconstruction patients were more likely to have a facial burn ( $p = .08$ ) and tended to have a larger percent TBSA burned (24.1% versus 18.7%,  $p = .06$ ) relative to female patients.

## **Prevalence of Symptoms of Depression**

The percentages of patients classified as having at least mild symptoms of depression ( $\text{BDI} \geq 10$ ) and moderate to severe symptoms of depression ( $\text{BDI} \geq 19$ ) based on published cutoffs are presented in Table 3. Almost half of male and female patients scored 10 or greater on

the BDI, reflecting at least mild symptoms of depression. Prevalence rates and mean BDI scores were similar for male and female patients were similar. Female patients, however, tended to have higher mean BDI scores after adjusting for differences between males and females in the time since the burn injury, the percent TBSA burned, and the proportion with facial injuries ( $p < .09$ ).

### **Path Analysis**

The path analysis included data from only 110 of the 230 patients included in the study. This is chiefly because the SWAP was introduced into the assessment battery midway through the study, and therefore was only completed by approximately half of the patients. Figure 1 presents the hypothesized path model. Age and percent TBSA burned were included in the model as direct predictors of physical function. Female sex, the presence of a facial burn, and percent TBSA burned were specified to predict body image dissatisfaction. Physical function and body image dissatisfaction were hypothesized to mediate the relationship between these variables and symptoms of depression.

Results indicated that the hypothesized model fit the data adequately,  $\chi^2(14, N = 112) = 20.7$ ,  $p = .11$ ; CFI = .93; TLI/NNFI = .90; RMSEA = .07. As shown in Figure 1, body image dissatisfaction and physical function accounted for 36% of the variance in depressive symptoms. Most of the variance in symptoms of depression was associated with body image dissatisfaction ( $p < .001$ ). Physical function also predicted symptoms of depression, but was not statistically significant ( $p = .07$ ), possibly due to poor statistical power related to the relatively small number of patients included in the path analysis. All hypothesized predictors of physical function and body image satisfaction were significant.

After testing the hypothesized model, we explored whether age, female sex, percent TBSA burned or the presence of a facial burn had direct effects on symptoms of depression, but

none of these links were significant. Thus, the model provides evidence that relationships between patient demographic and burn injury characteristics with depression are mediated by body image dissatisfaction and physical function. Standardized regression weights with p values and  $R^2$  values (percent of variance explained in each dependent variable) are presented in Figure 1.

## **DISCUSSION**

The major finding of this study was that at least mild symptoms of depression are present in 46% of patients who sought consultation in a burn reconstruction clinic. This rate is substantially higher than the 18% and 34% reported in two long-term studies of burn patients that used standard cutoffs of the BDI [10] or CES-D [9], respectively and similar to the 45% reported at 2 years post-burn in another study. The latter study, however, used a non-standard BDI cutoff of 8, which likely inflated the symptom rate [12]. The rate of clinically significant symptoms of depression in the burn reconstruction sample is also higher than rates reported in other traumatic injury groups, including 14% to 42% in traumatic brain injury [28], 15% to 30% in spinal cord injury [29, 30], and 29% to 42% after traumatic limb loss [31].

Almost half of the patients in the burn reconstruction sample were female compared to less than 30% in a national sample of patients admitted to burn centers and a sample of patients from the burn center where the reconstruction clinic in this study is located. Female patients tended to present for consultation much longer after the burn injury, tended to have smaller burns, and were less likely to have a facial burn than males. The rate of depressive symptoms and mean BDI scores did not differ significantly between male and female patients. After adjusting for time post-burn, percent TBSA burned, and the presence of a facial burn, however, female patients had somewhat higher adjusted mean BDI scores than male patients with

comparable burn injuries. This suggests that similar injuries may cause more psychological distress in female patients than in male patients, which in turn could account for the disproportional number of female patients who sought reconstructive services. This hypothesis is consistent with findings that issues related to appearance and attractiveness are more important among female burn survivors compared to male burn survivors and that body image esteem is lower among female burn survivors [20].

Indeed, female sex, mediated by body image dissatisfaction, was significantly associated with symptoms of depression in the path model. A substantial proportion of variance in depressive symptoms was explained by body image dissatisfaction with physical function also accounting for a proportion of the variance. This is not surprising given that the principal reasons for seeking reconstructive surgery after a burn injury are to improve appearance, comfort, and function [6].

The findings of this study suggest that it is important to screen for depression among patients who seek burn reconstruction. Screening for depression does not routinely occur in medical settings [32], and there is no literature to suggest that clinics caring for burn survivors are an exception. In the absence of formal screening, however, physicians and other medical professionals do not reliably detect depression in medically ill and injured patients [33]. Identification of burn reconstruction patients with elevated symptoms of depression would provide an opportunity to treat a burdensome health condition. There are no published studies on the treatment of depression after burn injury. Nonetheless, numerous studies have shown that depression in acutely injured and medically ill patients can be successfully treated with both psychopharmacological and behavioral therapies [32, 34-39]. In addition, screening for depression in burn reconstruction clinics could improve ongoing burn care and recovery. There is

evidence that patients with elevated symptoms of depression may be more likely to choose reconstructive surgery after burn injury [14], consistent with evidence from non-burn reconstruction samples [40, 41]. A number of studies have also reported that depression is related to the degree of satisfaction with surgical procedures [42, 43]. Thus, preoperative psychological distress in potential burn reconstruction patients may have important implications for pre-surgical decision-making and post-surgery outcome.

There are also limitations that should be taken into consideration in interpreting the results from this study. The sample was drawn from the clinical population of one burn center, and it is unknown to what degree this sample is representative of other burn reconstruction populations. Approximately two-thirds of patients seen clinically underwent psychological evaluations that were included in this report. The primary reason for which patients were not evaluated was due to scheduling conflict or the unavailability of the psychologist. Fewer than 5% of patients did not undergo an assessment due to sample biasing factors, such as refusal or English language difficulties. Thus, although we do not have data to assess for potential differences between the patients who were assessed and those who were not, it is reasonable to believe that this sample was fairly representative of the patients who sought treatment for burn reconstruction. Typically, studies of burn patients post-discharge have much lower recruitment rates than in this study [44]. In addition, the study was cross-sectional, so it is impossible to verify the proposed direction of the relationship between body image dissatisfaction, physical function and symptoms of depression. Furthermore, it is not known to what extent symptoms of depression predated the burn injury. It is possible, for instance, that pre-existing symptoms of depression could have impacted both body image and physical recovery from burn injury or predicted current symptoms of depression independent of body image and physical function [45]. Finally, we did

not have access to patient reconstruction histories, such as the number of surgeries [if any] at other reconstruction centers prior to scheduling an appointment, and did not know whether or not a patient chose to have surgery after the initial evaluation. Thus, we do not know whether surgery affected depressive symptoms or body image satisfaction or whether depressive symptoms were related to satisfaction with surgical outcomes. Similarly, we do not know how many patients sought treatment for depression or have outcome data related to the course of treated or untreated depression. Questions related to these issues should be addressed in future research.

In summary, this study reported rates of symptoms of depression among burn reconstruction patients. The very high rate of mild to moderate depressive symptoms found in this clinical sample provides a strong rationale for systematic screening for depression among burn reconstruction patients. Screening has been found to be most effective if it is minimally burdensome for patients and medical staff and if there is a provision for referral for evaluation and management of depression [46]. A reasonable method would be to screen initially with one of several short screening tools (1-3 items) that have been validated in primary care settings [47, 48] followed by a more thorough screening tool, such as the BDI or the Patient Health Questionnaire [49] and referral to an affiliated mental health professional for patients with significant symptoms of depression.

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