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Long-term adjustment in burn victims: a matched-control study

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ABSTRACT

Background. To date, there is little information about how severely burned patients compare to unburned healthy individuals in terms of psychological profile and quality of life. As part of a larger study on the sensory consequences of burns, we assessed psychological functioning and quality of life in burned patients and unburned healthy control subjects. We also examined whether burn patients experiencing pain and/or paresthetic sensations (i.e. symptomatic patients) present a profile that is different from those who are asymptomatic.

Methods. Forty-nine burned patients (% total body surface area = 34·59 % ± 13·40; 82 % males/18 % females) were evaluated 63·59 ± 28·1 months post-burn. They were matched with 49 unburned healthy volunteers on age, sex, and education level. All subjects were administered the Symptom Checklist 90-Revised (SCL-90-R) to assess psychological functioning and the 36-item Short-Form Health Survey (SF-36) to assess quality of life.

Results. Approximately 25 % of the burn patients presented clinically-significant psychological disturbances compared to 12 % in the control group. Burn patients enjoyed a quality of life comparable to that of the control subjects, although they perceived some deterioration in their general health. More symptomatic than asymptomatic patients suffered from clinically-relevant somatization and obsessive–compulsive disturbances.

Conclusions. Severely burned patients adjust relatively well, although some develop clinically-significant psychological disturbances such as somatization and phobic anxiety. Burn patients experiencing abnormal sensations in their healed wounds (i.e. symptomatic patients) do not suffer from maladjustment to a greater extent than their asymptomatic counterparts, although more symptomatic patients experience somatization and obsessive–compulsive behaviours.

INTRODUCTION

Many burn patients experience pain as well as paresthetic sensations (e.g. itching, tingling) in their healed wounds that can persist for several years (e.g. Choinière *et al*. 1991; Choinière, 1994; Malenfant *et al*. 1996). Little is known, however, about the characteristics of these abnormal sensory problems or the mechanisms underlying them. To address this problem, we recently conducted a psychophysics study to examine the long-term sensory consequences of burn injuries in 121 burn patients paired-matched to 121 unburned healthy control volunteers. We took the opportunity of this large-scale matched-control study to assess, as secondary outcomes, psychological functioning and quality of life. The purpose of the present paper is to share the results of these secondary outcomes based on a subgroup of patients with severe burns.

The first year following a burn injury is thought to be a vulnerable period during which many patients suffer from anxiety, depression, delirium and psychosis (see Patterson *et al*. 1993, for review). Numerous studies have also examined adjustment in burn patients on a more

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long-term basis, 1 year or more after the injury (see for review Patterson *et al.* 1993). Most studies find that patients suffer from long-term psychological complications, with a prevalence rate ranging between approximately 10% and 65% (e.g. Andreasen & Norris, 1972; White, 1982; Browne *et al.* 1985; Williams & Griffiths, 1991). Anxiety and depression are the most frequent long-term symptoms reported by burn patients (Andreasen & Norris, 1971; Andreasen *et al.* 1972; White, 1982; Tuker, 1987; Patterson *et al.* 1993). These disturbances appear to be unrelated to the severity of the burn, the time elapsed between the injury and the evaluation, and the deformity sustained (Andreasen *et al.* 1971; Browne *et al.* 1985). Other studies indicate that psychological maladjustment is associated with pre-morbid psychopathology, duration of hospitalization and socio-economic variables (White, 1982; Browne *et al.* 1985; Malt & Ugland, 1989). Although not specifically related to burn injuries, an interesting series of studies derived from the Trauma Recovery Project indicate that many patients who sustained a major trauma experience long-term psychological disturbances and disruptions in their quality of life (Holbrook *et al.* 1998; 1999; 2001*a*, *b*).

Of interest, a recent study by Sheridan *et al.* (2000) evaluated quality of life on average 14·7 years post-burn in 68 children who survived massive burns ($\geqslant$ 70% total body surface). They found that most patients enjoyed a quality of life comparable to age-matched national population norms, although some experienced long-term physical disabilities. Another study found that burn patients experienced decreased quality of life compared to a normal population 1 year after the injury (Jonsson *et al.* 1997). The present study resembles the latter ones in that we assessed quality of life in adult burn victims using the same standardized questionnaire, namely the Medical Outcomes Study 36-item Short-Form Health Survey (SF-36) (Ware, 1993). In addition to evaluating quality of life, we assessed psychological functioning via the Symptom Checklist 90-Revised (SCL-90-R) (Derogatis, 1977).

An important originality of the present study rests on the experimental design used. Indeed, we used a matched-control design such that each patient was matched on several variables with an unburned healthy control subject. Such a design allows us to know how burn patients compare to unburned healthy individuals in terms of psychological profile and quality of life. The study also examined whether there are any differences in the psychological profile and in perceptions of quality of life between burn patients experiencing sensory abnormalities in their healed wounds and those who do not experience these problems. Because psychological disturbances are frequent among chronic pain patients (Gamsa & Vikis-Freibergs, 1991; Ashburn & Staats, 1999; Gallagher & Verma, 1999), one question of interest is whether burn patients experiencing chronic sensory abnormalities suffer from psychological disturbances and diminished quality of life to a greater extent than their asymptomatic counterparts. This problem has never been addressed in the literature devoted to burn patients. We therefore interviewed burn patients to assess the presence or absence of sensory abnormalities in their healed wounds and compared the scores obtained on the SCL-90-R and the SF-36 between symptomatic and asymptomatic patients.

METHOD

Subjects

Patients meeting the inclusion criteria required to conduct the psychophysics study (Malenfant *et al.* 1998) were invited to complete questionnaires (prior to psychophysics testing). The participants were recruited via a computerized list of patients who had been admitted to the Burn Center of the Hôtel-Dieu du Centre Hospitalier de l'Université de Montréal between June 1985 and December 1993. They were selected for the study if they were aged between 18 and 70 years, had sustained second or third degree burns in at least one upper limb and had been discharged from the Burn Center more than 18 months before. One hundred and twenty-one burn patients completed the questionnaires and participated in the psychophysics study. They were paired-matched with 121 unburned healthy volunteers on age ($\pm$3 years), sex, and educational level ($\pm$3 years). The control subjects were recruited from the staff at the Hotel-Dieu du Centre Hospitalier de l'Université de Montréal or the entourage of the patients. Of the 121 patients (and 121 control subjects), we included for the present study only the data of 49 patients who sustained a burn covering at

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least 20% of their body (expressed in total body surface area (TBSA)) and of their respective paired-matched unburned healthy control subjects. We attempted to exclude patients who had a diagnosis of psychiatric illness clearly documented in their file. Only white patients were included as this was a requirement to conduct the original psychophysics study.

Procedure

The experimental protocol was approved by the institutional Ethics and Scientific Committee. Burn patients and control subjects were contacted by telephone by one of the investigators (A.M.) or an assigned research nurse. They were invited to the Burn Center to participate in a study involving the administration of questionnaires and psychophysic sensory tests. On the test day, after obtaining the subjects' informed written consent, a research nurse conducted a structured interview using a modified version of a questionnaire developed by Choinière *et al.* (1991). The first part of the questionnaire consisted of descriptive items on the patients' demographic and medical variables. The second part inquired about the presence, location, and characteristics of abnormal sensations (i.e. pain and/or paresthesia) at the sites of burn injuries. This information was used to classify the sites as being symptomatic (presence of abnormal sensations) or asymptomatic (absence of abnormal sensations).

Measures

All participants were administered the SCL-90-R to assess psychological functioning followed by the SF-36 to assess quality of life. The SCL-90-R questionnaire consists of a 90-item self-report inventory which requires subjects to rate their degree of distress on the following nine dimensions: somatization (i.e. distress arising from bodily dysfunction such as abnormal sensations, dizziness, and spells); obsessive–compulsive (i.e. unwanted thoughts, impulses and actions); interpersonal sensitivity (i.e. feelings of personal inadequacy and inferiority, particularly compared to others); depression; anxiety; hostility; phobic anxiety (i.e. persistent and irrational fear to a specific person, place, object, or situation); paranoid ideation; and psychoticism (withdrawal, isolation, schizoid lifestyle and symptoms of schizophrenia). The SCL-90-R also evaluates a global index of psychological distress (Global Severity Index (GSI)) and provides criteria for defining a clinically-significant psychiatric disorder. This questionnaire has been shown to be both reliable and valid (Derogatis, 1977; Derogatis & Cleary, 1977). The SF-36 is a self-report questionnaire which measures on a multi-item scale eight health concepts known to be most affected by illness, disease and treatment: physical functioning (i.e. activities such as sports, carrying groceries, climbing stairs and walking); role–physical (limitations due to health problems in usual daily activities such as work, housework, or school); bodily pain; general health; vitality; social functioning; role–emotional (i.e. limitations due to emotional problems in usual daily activities); and mental health. The validity and reliability of the SF-36 has been extensively demonstrated (e.g. McHorney *et al.* 1993; Jenkinson *et al.* 1994; Ware, 1996). Because the subjects recruited for the present study were French-Canadian, we administered the validated French version of the SCL-90-R (Fortin *et al.* 1989) and SF-36 (Dauphinee *et al.* 1997). Upon completion of the study, each patients' medical file was reviewed in order to obtain information about the type and size of the burns (expressed in % total body surface area (TBSA)) and the time elapsed between the burn injury and testing.

Statistical analyses

The raw scores obtained from the participants on the SCL-90-R were transformed into T-scores using Norm B for female or male non-patients (Derogatis, 1977). We compared, using chi-square tests, the percentage of burn patients and control subjects who fit the criteria for a clinically-significant psychological disturbance (i.e. T-score $\geqslant 63$ on two or more dimensions or on the GSI (Derogatis, 1977)). We also compared, using chi-square tests, the percentage of burn patients and control subjects as well as of symptomatic and asymptomatic burn patients who obtained a T-score of at least 63 on the various dimensions of the SCL-90-R. Data obtained on each scale of the SF-36 were analysed by two-way multivariate analyses of variance with Group (Burn *v.* Control) and Diagnosis (Symptomatic *v.* Asymptomatic) as between-subjects variables. Multiple linear regression analyses were also conducted in order

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to analyse relationships between the SCL-90-R and SF-36 scores, demographic variables (i.e. age, sex), burn extent (i.e. TBSA) and time since injury.

RESULTS

Patients' characteristics

The 49 burn patients (82 % male) who participated in the present study were aged between 21 and 69 years (mean = 42·9 ± 10·6). The extent of burn injuries (TBSA) averaged 34·59 % ± 13·4 % (range = 20–75 %) and all patients underwent one or more skin grafting procedures during the course of hospitalization. The most common burn aetiology was thermal (78 %). On average, the patients were enrolled in the study 63·59 months (± 28·1 months) after the injury. For more details, see Table 1.

SCL-90-R-psychological functioning

The average T-scores obtained by the burn patients on all scales of the SCL-90-R were < 63, the score considered to delimit the presence of a clinically-significant psychological disturbance (burn patients = 50·94 ± 1·54–55·73 ± 1·58 and control subjects = 47·53 ± 1·35–52·16 ± 1·17). The latter is operationally defined in the SCL-90-R by either a T-score that is ⩾ 63 on at least two dimensions or a T-score that is ⩾ 63 on the GSI (Derogatis, 1977). Fig. 1 shows the proportion of burn patients and control subjects who fit the criteria for a clinically-significant psychological disturbance. It reveals that approximately one-quarter of our sample presented a clinically-significant psychological disturbance. Indeed, 29 % of the burn patients obtained a T-score of ⩾ 63 on at least two dimensions, and 22 % obtained a T-score of ⩾ 63 on the GSI. With regard to the control subjects, 12 % of them scored ⩾ 63 on at least two dimensions and on the GSI. The proportion of burn patients presenting a clinically-relevant psychological disturbance was significantly higher than that of control subjects when applying the criterion to two or more dimensions ($\chi^2 = 4{\cdot}0$, $P < 0{\cdot}05$), but not to the GSI. Multiple linear regression analyses indicated that there was no significant correlation between scores on the various dimensions of psychological functioning, demographic variables (i.e. age, sex), burn size (i.e. TBSA) and time since injury (Ps > 0·05). Fig. 2 shows the percentage of burn patients and control subjects who obtained a score of ⩾ 63 on each dimension of the SCL-90-R. Significantly more burn patients than control subjects suffered from somatization ($\chi^2 = 9{\cdot}52$, $P < 0{\cdot}005$) and phobic anxiety ($\chi^2 = 4{\cdot}0$, $P < 0{\cdot}05$).

Table 1. *Characteristics of the patients* ($N = 49$)

Variables	
Demographic	
Sex (% male/female)	82/18
Mean age ± S.D.	42·9 ± 10·6
Range (years)	(21–69)
Medical	
Extent of burns (TBSA) ± S.D.	34·59 % ± 13·4
Total range (%)	(20–75)
Mean time since injury ± S.D. (months)	63·59 ± 28·1
Range (months)	(24–122)
Burn aetiology, *N* (%)	
Thermal	38 (78)
Electrical	6 (12)
Chemical	1 (2)
Combination	4 (8)

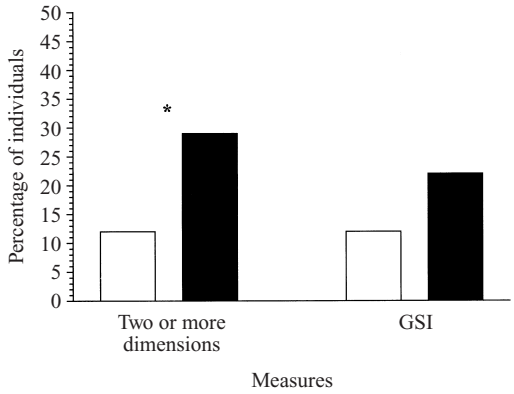


FIG. 1. Percentage of burn patients (■) and control subjects (□) who obtained a T-score of at least 63 on two or more dimensions or on the GSI (i.e. Global Severity Index) of the SCL-90-R, thus fitting the criteria for a clinically-significant psychological disturbance (26). Significantly different from the control group: *$P < 0{\cdot}05$.

SF-36-quality of life

Fig. 3 shows the scores obtained by the burn patients and control subjects on the various health concepts measured by the SF-36. Burn patients had scores that were comparable to those of the control subjects on all of the scales of the SF-36 (Ps > 0·05), although there was a near-significant difference for General Health ($F(1,94) = 3{\cdot}53$, $P = 0{\cdot}06$). Age was negatively correlated with Physical Functioning ($R^2 = 0{\cdot}21$,

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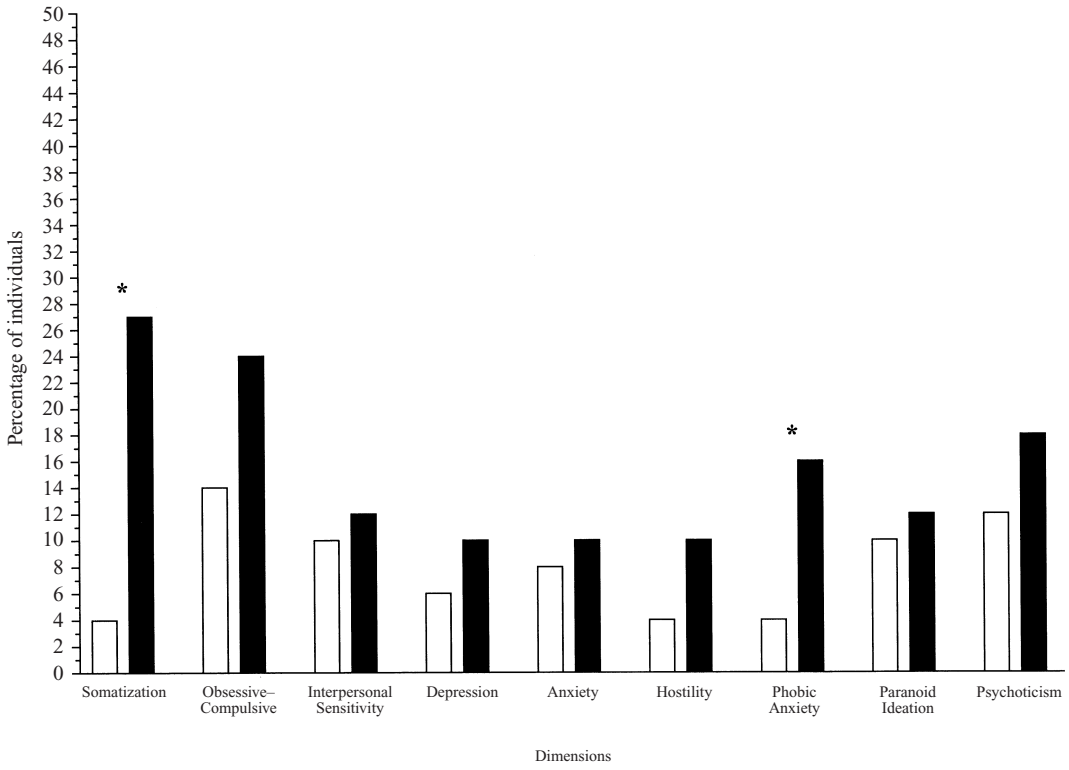


FIG. 2. Percentage of burn patients (■) and control subjects (□) who obtained a T-score of at least 63 on the various dimensions of the SCL-90-R. Significantly different from the control group: $*P < 0{\cdot}05$.

$P < 0{\cdot}001$), suggesting that older patients tended to be slightly more limited in performing physical activities. There was no correlation between these same two variables for the control subjects ($R^2 = 0{\cdot}009$, $P = 0{\cdot}526$). Also, there was no correlation between scores on the various scales of the SF-36 and sex, TBSA, and time since injury (Ps $> 0{\cdot}05$).

Comparison of symptomatic and asymptomatic patients on the SCL-90-R and SF-36

Twenty-nine (59%) patients experienced pain and/or paresthetic sensations in their healed wounds (i.e. symptomatic patients) whereas 20 (41%) were asymptomatic. Among the 29 symptomatic patients we evaluated, 72% experienced paresthetic sensations such as itching, tingling, and numbness and 28% complained of pain. In terms of frequency, 48% reported that the symptoms were present 'continuously' (more than 1 day a week) whereas 52% reported that these occurred 'intermittently' (less than one day a week or as a function of the temperature). Nearly three-quarters (72%) of the patients reported that the abnormal sensations interfered with their daily life (e.g. sleep, work).

Thirty-four per cent of the symptomatic patients obtained a T-score of $\geqslant 63$ on at least two dimensions, and 24% obtained a T-score of $\geqslant 63$ on the GSI. With respect to the asymptomatic patients, 20% obtained a T-score of $\geqslant 63$ both on at least two dimensions and on the GSI. There were no significant differences between the two groups of patients on each of these measures (Ps $> 0{\cdot}05$). As well, the proportion of symptomatic *versus* asymptomatic burn patients who obtained a score of at least 63 did not differ significantly on any of the dimensions of psychological functioning (Ps $> 0{\cdot}05$), except on the somatization and obsessive–compulsive dimension ($P < 0{\cdot}05$). Indeed, as shown in Fig. 4, significantly more symptomatic than asymptomatic burn patients suffered from clinically-relevant somatization and obsessive–

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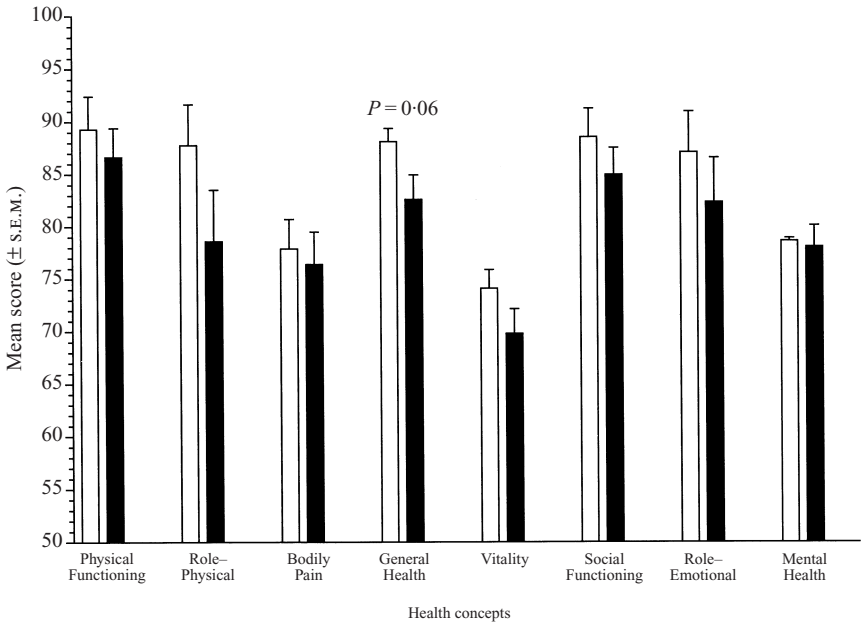


FIG. 3. Mean scores (±S.E.M.) obtained by the burn patients (■) and control subjects (□) on the various scales of the SF-36 questionnaire measuring quality of life.

compulsion. With regards to the SF-36 questionnaire, there were no significant differences in the scores obtained between patients experiencing abnormal sensations (i.e. symptomatic patients) and asymptomatic patients on any of the scales (Ps $> 0{\cdot}05$).

DISCUSSION

A belief held widely by health care professional is that severely burned individuals will be permanently afflicted by functional deficiencies, including psychological distress (Patterson *et al.* 1993). This belief is thought to stem from the fact that burn injuries give rise to severe psychological distress during the hospitalization period when health care professionals interact most with the patients (Patterson *et al.* 1993; Gilboa, 2001). The present findings suggest that burn-induced long-term psychological problems may not be as prevalent as expected. Indeed, we found that the prevalence of a clinically-significant psychological disturbance among unburned healthy individuals was 12%. In contrast, approximately 25% of patients who sustained severe burn injuries (on average 35% TBSA) requiring hospitalization experience long-term psychological disturbances. The disturbances reported include somatization (i.e. distress regarding bodily dysfunction) and phobic anxiety. These problems were unrelated to the age or sex of the patient, the extent of the injury, or the time elapsed since the injury.

The finding that more burn patients reported somatization than control subjects is likely attributable to a large extent to the presence of pain and/or paresthesia in the healed wounds which a majority of patients in this study complained about (i.e. 59%). In support of this idea, it was found that patients experiencing pain and/or paresthesia in their healed wounds (i.e. symptomatic patients) reported somatization to a greater extent than asymptomatic patients. As well, the finding that more burn patients suffer from phobic anxiety than unburned healthy individuals is consistent with the fact that many burn patients develop post-traumatic stress disorder (PTSD) and a hallmark feature of this disorder is phobic anxiety (Yu & Dimsdale, 1999). Unfortunately, we do not know the rate of PTSD in our sample of burn patients. As well, based on the statements proposed in the phobic anxiety dimension of the SCL-90-R, we do not know whether the phobias experienced

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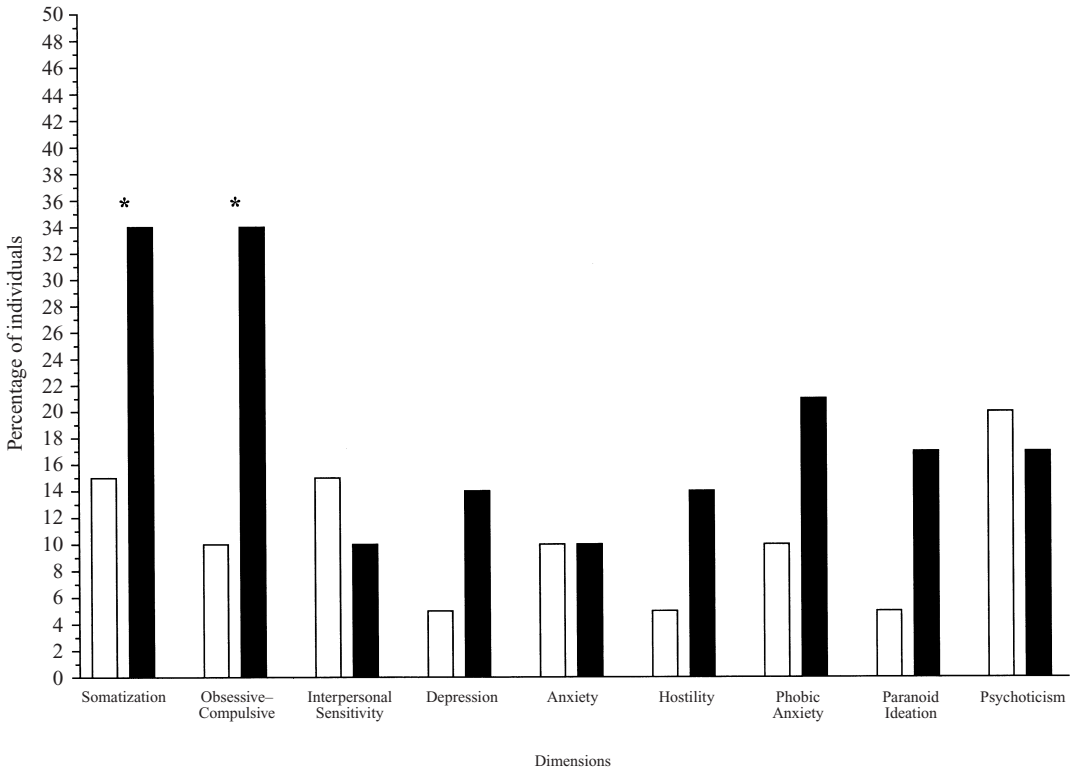


FIG. 4. Percentage of symptomatic (■) and asymptomatic (□) burn patients who obtained a T-score of at least 63 on the various dimensions of the SCL-90-R. Significant difference between symptomatic and asymptomatic burn patients: $*P < 0{\cdot}05$.

by the burn patients are related to a specific situation, place, and/or object (e.g. injury). Future studies should explore more closely the long-term development of phobic anxiety in burn patients.

The results also suggest that severely burned patients enjoy a quality of life comparable to that of unburned healthy individuals, although they perceive some deterioration in their general health. This finding is consistent with that of a recent study on long-term quality of life in survivors of massive pediatric burns (Sheridan *et al*. 2000). We also found that older burn patients reported feeling more limited in performing physical activities due to their health problems. Interestingly, this association was not present among the control subjects suggesting that the greater physical limitations experienced by the older burn patients were perhaps unlikely related to age but rather to their injury.

As mentioned above, more burn patients with abnormal sensations. (i.e. symptomatic patients) experienced somatization than their asymptomatic counterparts. As well, we found that more symptomatic than asymptomatic burn patients presented clinically-relevant obsessive–compulsive disturbances. The latter finding is difficult to explain. Perhaps the abnormal sensations felt in the healed wounds serve as a reminder of the accident, leading to obsessive–compulsive behaviours aimed at reducing anxiety elicited by danger-arousing stimuli. Despite these disturbances, symptomatic patients enjoyed a quality of life comparable to asymptomatic patients.

It is interesting to compare the present findings with those of previous studies. Most studies found that burn patients experience long-term psychological disturbances, with a prevalence rate varying between approximately 10% and 65% 1 year or more after the injury (e.g. Andreasen & Norris, 1972; White, 1982; Browne *et al*. 1985; Williams & Griffiths, 1991). It is unclear from most of these studies, however, whether the prevalence rates reflect those of

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patients who suffer from psychological disturbances that are considered mild or more severe. It is possible that the prevalence rate in some studies is higher than the one we found because the criterion for defining a psychological disturbance allowed the inclusion of mild forms. The prevalence rate in our study reflects severe clinically-significant psychological problems. As well, many studies which report a high prevalence rate of psychological problems include patients which suffered from a psychopathology prior to the burn accident (White, 1982; Ward *et al*. 1987; Malt & Ugland, 1989). In our study, we attempted to exclude patients who presented a psychopathology prior to the injury and thus this attempt may explain the lower prevalence rate observed. It is important to note, however, that the 'diagnosis' of a pre-morbid psychopathology in the present study was based on the work-up provided by the burn unit physician who questioned the patient and his or her entourage (e.g. family, friends). Thus, we cannot exclude the possibility that some of the patients we evaluated had psychiatric antecedents or that some patients were psychologically more vulnerable than others.

It is unclear what factors might explain why some burn patients develop psychological problems while others do not. We found, as other did (Andreasen *et al*. 1971; Browne *et al*. 1985), that these problems are unrelated to the age or sex of the patient, the extent of the injury, or the time elapsed since the injury. These problems could be related to several other variables, which we unfortunately did not assess in our study but could be addressed in future ones. Such problems might be related to poor recovery of motor function in a burned limb, forced career change due to the burn injury, traumatic circumstances surrounding the burn accident (e.g. loss of a loved one), low socio-economic status (Browne *et al*. 1985), or poor social support (e.g. Bowden *et al*. 1980; Davidson *et al*. 1981; Browne *et al*. 1985; Sheridan *et al*. 2000).

The present study is limited by the fact that it was originally designed to examine the long-term sensory consequences of burn injuries (Malenfant *et al*. 1998). Nevertheless, the strengths of the original design (i.e. matched-control design, relatively large sample size) are preserved here. In addition, the present results are based on standardized questionnaires, relatively long-term end-points, and categories of patients (symptomatic or not). Thus, our results are valuable, novel and complement usefully those presented in the literature. It could also be argued that the study is limited by the fact that the range of the time elapsed since injury was large. Although this is the case, it is interesting to note that there were no correlations between SCL-90-R and SF-36 scores and time since injury. Finally, because the majority of the patients (78%) sustained thermal injuries whereas very few sustained electrical (12%), chemical (2%) or a combination of burn aetiologies (8%), it was not possible to analyse whether psychological distress varied as a function of burn aetiology.

In summary, approximately 25% of the patients we evaluated who sustained burns averaging 35% TBSA suffered from clinically-significant psychological problems (i.e. somatization and phobic anxiety) on average 5 years post-burn as opposed to 12% of unburned healthy individuals. Despite these disturbances, burn patients enjoyed a quality of life comparable to unburned healthy individuals, although they tended to perceive some deterioration in their general health. Of interest, patients experiencing abnormal sensations in their healed wounds (i.e. symptomatic patients) reported psychological problems (i.e. somatization and obsession–compulsion) to a greater extent than asymptomatic patients. This finding adds a piece to the puzzle concerning the complex interplay between physical trauma and long-term adjustment (Holbrook *et al*. 1998, 1999, 2001*a*, *b*). Individuals involved in the care of burn patients can use this information when conducting assessments.

Although these results are encouraging in that one might expect greater maladjustment in burn patients, it is important to remember that some patients (approximately 25%) do develop long-term psychological problems that are clinically-significant. Health care professionals should focus on providing adequate and improved psychological care to these afflicted patients, especially given the recent finding that many patients are dissatisfied with this type of service (Van Loey *et al*. 2001).

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REFERENCES

Andreasen, N. J. C. & Norris, A. S. (1972). Long-term adjustment and adaptation mechanisms in severely burned adults. *Journal of Nervous and Mental Disease* **154**, 352–362.

Andreasen, N. J. C., Norris, A. S. & Hartford, C. E. (1971). Incidence of long-term psychiatric complications in severely burned adults. *Annals of Surgery* **174**, 785–793.

Andreasen, N. J. C., Noyes, R. Jr. & Hartford, C. E. (1972). Factors influencing adjustment of burn patients during hospitalization. *Psychosomatic Medicine* **34**, 517–525.

Ashburn, M. A. & Staats, P. S. (1999). Management of chronic pain. *Lancet* **353**, 1865–1869.

Bowden, M. L., Feller, I., Tholen, D., Davidson, T. N. & James, M. H. (1980). Self-esteem of severely burned patients. *Archives of Physical Medicine and Rehabilitation* **61**, 449–452.

Browne, G., Byrne, C., Brown, B., Pennock, M., Streiner, D., Roberts, R., Eyles, P., Truscott, D. & Dabbs, R. (1985). Psychosocial adjustment of burn survivors. *Burns* **12**, 28–35.

Choinière, M. (1994). Pain of burns. In *Textbook of Pain, 3rd edn* (ed. P. D. Wall and R. Melzack), pp. 523–535. Churchill Livingston: London.

Choinière, M., Melzack, R. & Papillon, J. (1991). Pain and paresthesia in patients with healed burns: an exploratory study. *Journal of Pain and Symptom Management* **6**, 437–444.

Dauphinee, S. W., Gauthier, L., Gandek, B., Magnan, L. & Pierre, U. (1997). Readying a US measure of health status, the SF-36, for use in Canada. *Clinical and Investigative Medicine* **20**, 224–238.

Davidson, T. N., Bowden, M. L., Tholen, D., James, M. H. & Feller, I. (1981). Social support and post-burn adjustment. *Archives of Physical Medicine and Rehabilitation* **62**, 274–278.

Derogatis, L. R. (1977). *SCL-90-R Administration Scoring and Procedures Manual*. Clinical Psychometrics Research: Baltimore, MD.

Derogatis, L. R. & Cleary, P. A. (1977). Factorial invariance across gender for the primary symptom dimensions of the SCL-90. *British Journal of Social and Clinical Psychology* **16**, 347–356.

Fortin, M.-F., Coutu-Wakulczyk, G. & Engelsmann, F. (1989). Contribution to the validation of the SCL-90-R in French-speaking women. *Health Care for Women International* **10**, 27–41.

Gallagher, R. M. & Verma, S. (1999). Managing pain and comorbid depression: a public health challenge. *Seminars and Clinical Neuropsychiatry* **4**, 203–220.

Gamsa, A. & Vikis-Freibergs, V. (1991). Psychological events are both risk factors in, and consequences of, chronic pain. *Pain* **44**, 271–277.

Gilboa, D. (2001). Long-term psychosocial adjustment after burn injury. *Burns* **27**, 335–341.

Holbrook, T. L., Anderson, J. P., Sieber, W. J., Browner, D. & Hoyt, D. B. (1998). Outcome after major trauma: discharge and 6-month follow-up results from the Trauma Recovery Project. *Journal of Trauma* **45**, 315–323.

Holbrook, T. L., Anderson, J. P., Sieber, W. J., Browner, D. & Hoyt, D. B. (1999). Outcome after major trauma: 12-month and 18-month follow-up results from the Trauma Recovery Project. *Journal of Trauma* **46**, 765–771.

Holbrook, T. L., Hoyt, D. B. & Anderson, J. P. (2001*a*). The impact of major in-hospital complications on functional outcome and quality of life after trauma. *Journal of Trauma* **50**, 91–95.

Holbrook, T. L., Hoyt, D. B. & Anderson, J. P. (2001*b*). The importance of gender on outcome after major trauma: functional and psychologic outcomes in women versus men. *Journal of Trauma* **50**, 270–273.

Jenkinson, C., Wright, L. & Coulter, A. (1994). Criterion validity and reliability of the SF-36 in a population sample. *Quality of Life Research* **3**, 7–12.

Jonsson, C. E., Schuldt, K., Linder, J., Bjornhagen, V. & Ekholm, J. (1997). Rehabilitative, psychiatric, functional and aesthetic problems in patients treated for burn injuries: a preliminary follow-up study. *Acta Chirurgica Plastica* **39**, 3–8.

McHorney, C. A., Ware, J. E. Jr. & Raczek, A. E. (1993). The MOS 36-item Short-Form Health Survey (SF-36): II, Psychometric and clinical tests of validity in measuring physical and mental health constructs. *Medical Care* **31**, 247–263.

Malenfant, A., Forget, R., Papillon, J., Amsel, R., Frigon, J. Y. & Choinière, M. (1996). Prevalence and characteristics of chronic sensory problems in burn patients. *Pain* **67**, 493–500.

Malenfant, A., Forget, R., Amsel, R., Papillon, J., Frigon, J. Y. & Choinière, M. (1998). Tactile, thermal and pain sensibility in burned patients with and without chronic pain and paresthesia problems. *Pain* **77**, 241–251.

Malt, U. F. & Ugland, O. M. (1989). A long-term psychosocial follow-up study of burned adults. *Acta Psychiatrica Scandinavica* **355**, 94–102.

Patterson, D. R., Everett, J. J., Bombardier, C. H., Questad, K. A., Lee, V. K. & Marvin, J. A. (1993). Psychological effects of severe burn injuries. *Psychological Bulletin* **113**, 362–378.

Sheridan, R. L., Hinson, M. I., Liang, M. H., Nackel, A. F., Schoenfeld, D. A., Ryan, C. M., Mulligan, J. L. & Tompkins, R. G. (2000). Long-term outcome of children surviving massive burns. *Journal of the American Medical Association* **283**, 69–73.

Tucker, P. (1987). Psychosocial problems among adult burn victims. *Burns* **13**, 7–14.

Van Loey, N. E., Faber, A. W. & Taal, L. A. (2001). Do burn patients need burn specific multidisciplinary outpatient aftercare: research results. *Burns* **27**, 103–110.

Ward, H. W., Moss, R. L., Darko, D. F., Berry, C. C., Anderson, J., Kolman, P., Green, A., Nielsen, J., Klauber, M. & Wachtel, T. L. (1987). Prevalence of postburn depression following burn injury. *Journal of Burn Care and Rehabilitation* **8**, 294–298.

Ware, J. E. Jr. (1993). *SF-36 Health Survey Manual and Interpretation Guide*. Nimrod Press: Boston, MA.

Ware, J. E. (1996). The SF-36 health survey. In *Quality of Life and Pharmacoeconomics* (ed. B. Spilker), pp. 337–345. Lippincott-Raven: Philadelphia.

White, A. C. (1982). Psychiatric study of patients with severe burn injuries. *British Medical Journal* **284**, 465–467.

Williams, E. E. & Griffiths, T. A. (1991). Psychological consequences of burn injury. *Burns* **17**, 478–480.

Yu, B.-H. & Dimsdale, J. E. (1999). Posttraumatic stress disorder in patients with burn injuries. *Journal of Burn Care and Rehabilitation* **20**, 426–433.

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