ORIGINAL REPORT

FUNCTIONAL OUTCOMES AND HEALTH-RELATED QUALITY OF LIFE IN FRACTURE VICTIMS 27 MONTHS AFTER THE SICHUAN EARTHQUAKE

Xia Zhang, PhD1,2,3, Xiao-rong Hu, MD1,2, Jan D. Reinhardt, PhD3,5,6, Huai-jun Zhu, MD4, James E. Gosney, MD3, Shou-guo Liu, MD1,2 and Jianan Li, MD1,3

From the 1The First Affiliated Hospital of Nanjing Medical University, Nanjing, 2Caring For Children Foundation, Hong-kong, China, 3World Health Organization Liaison Sub-Committee on Rehabilitation Disaster Relief of the International Society of Physical and Rehabilitation Medicine, Assenede, Belgium, 4Division of Clinical Pharmacy, Department of Pharmacy, the Affiliated Nanjing Drum Tower Hospital of Nanjing University Medical School, Nanjing, China, 5Swiss Paraplegic Research, Nottwil and 6Department of Health Sciences and Health Policy, University of Lucerne, Switzerland

Objective: To evaluate functional outcomes, health-related quality of life and life satisfaction in fracture victims 27 months after the 2008 Sichuan earthquake.

Methods: A total of 390 earthquake survivors from 3 earthquake areas who sustained fractures were divided into early intervention, late intervention and control groups. Functional outcomes assessed included activities of daily living using the Modified Barthel Index and pain level with a visual analogue scale. Health-related quality of life was evaluated with the Medical Outcomes Study Short-Form 36 and life satisfaction using the Life Satisfaction Questionnaire.

Results: Activities of daily living and life satisfaction in the intervention groups were significantly improved compared with the control group. Health-related quality of life was higher in early intervention subjects compared with controls. Group differences in pain level were not significant. In addition, the early and late intervention groups did not differ significantly in any of the measured outcomes. Good performance of activities of daily living and widowed marital status predicted high health-related quality of life, while pain level was associated with worsened outcomes. Rehabilitation therapy, remunerative employment and female gender were predictors of improved life satisfaction.

Conclusion: Clinical effectiveness of physical rehabilitation intervention was demonstrated in fracture earthquake victims.

Key words: earthquake; rehabilitation; activities of daily living; life satisfaction; pain; fracture.

J Rehabil Med 2012; 44; 206–209

INTRODUCTION

Following the Sichuan earthquake, the focus of medical care had shifted from rescue and stabilization to functional recovery and health-related quality of life (HRQOL) by 27 months. Fractures were the most common earthquake-related injuries (1, 2). Among 2,287 earthquake victims in County MZ, 84.3% (1,920) were diagnosed with a fracture (2). Patients with fractures who underwent rehabilitative therapies had better functional outcomes and reduced complications, and thus decreased mortality rates and improved quality of life (QoL) (1–4).

The ultimate goal of the rehabilitation process following fractures is functional recovery and restoration or improvement of the person’s QoL. Increased age, male gender, and worsened physical and mental condition have been identified as predictors of decreased HRQOL in earthquake victims (5–7).

However, studies evaluating functional recovery and HRQOL in fracture victims receiving rehabilitation therapy following a natural disaster have not yet been performed. Quasi-experimental studies, retrospective analyses of hospital cohorts, observational studies, and surveys are appropriate designs to investigate the clinical impact of physical rehabilitation on disaster-induced disability (8), as prospective, randomized controlled trials of rehabilitation interventions following disaster are not feasible.

Institutional-based rehabilitation was performed in counties MZ and AX, beginning at 4 and 16 months after the Sichuan earthquake, respectively, while only routine care was provided in county SF. Rehabilitation therapy was provided in counties MZ and AX by rehabilitation professionals and local health departments, and funded by international non-governmental organizations (NGOs).

This study evaluates functional outcomes, HRQOL, and life satisfaction in fracture victims 27 months after the Sichuan earthquake. Major determinants of HRQOL and life satisfaction are analysed.

METHODS

Design
This is a cross-sectional quasi-experimental design study performed with two intervention groups and a control group.

Participants
A total of 390 fracture victims from 3 heavily destroyed areas who sustained injuries in the 2008 Sichuan earthquake were identified and
enrolled. Eligibility criteria were: (i) 18 years and older; (ii) had received institutional-based rehabilitation therapy in MZ and AX counties (intervention groups) or had not received rehabilitation therapy in SF county (control group); and, (iii) agreed to participate in demographic and medical questionnaires, medical examinations, and clinical assessments.

Participants were divided into two research groups and a control group, as follows:
- early intervention group: 226 earthquake victims rehabilitated in county MZ in September 2008;
- late intervention group: 80 earthquake survivors rehabilitated in county AX 1 year later in September 2009;
- control group: 84 earthquake survivors who had not received rehabilitation therapy in SF county.

Table I provides subject demographics for each group. This study was approved by the ethics committee of Nanjing Medical University and written informed consent was obtained from all participants.

Data measurement

The research group comprised 40 rehabilitation professionals, including physiatrists, therapists (physical and occupational) and rehabilitation nurses assessed victims with fractures and worked with local healthcare providers in support of community follow-up. All the team members were from well-developed rehabilitation areas in China, who had a degree in rehabilitation medicine and at least 2 years’ clinical experience. Data were collected from September 2010 to February 2011 via a survey administered at a central community site, physical examinations, and home visits. ADL performance was assessed with the Modified Barthel Index (MBI) (10); pain level (in the past month) was evaluated with the visual analogue scale (VAS) (11); HRQOL was evaluated with the Medical Outcomes Study Short-Form-36 (SF-36) (12), and; life satisfaction was assessed with the Life Satisfaction Questionnaire (LiSat-9) (13).

RESULTS

ADL and life satisfaction were significantly improved in the intervention groups compared with the control group. SF-36 scores were higher in early intervention subjects than in controls. Pain level did not differ significantly across groups. Early and late intervention groups did not differ significantly in any of the measured outcomes (Table II).

Improved ADL (MBI) and widowed marital status were positive predictors of HRQOL (SF-36), while higher pain levels were associated with worsened functional outcomes. Those subjects who had received rehabilitation therapy, or were in paid employment, or female subjects showed higher life satisfaction (Table III).

Table II. Functional outcomes in subgroups

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Early intervention group Mean (SD)</th>
<th>Late intervention group Mean (SD)</th>
<th>Controls Mean (SD)</th>
<th>Between-group, p</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBI</td>
<td>92.24 (9.46)</td>
<td>92.24 (9.56)</td>
<td>87.39 (9.45)</td>
<td>0.0000 vs Late intervention group</td>
</tr>
<tr>
<td>VAS</td>
<td>3.82 (1.85)</td>
<td>4.02 (1.87)</td>
<td>4.19 (1.85)</td>
<td>1.0000 vs Late intervention group</td>
</tr>
<tr>
<td>SF-36</td>
<td>477.12 (107.76)</td>
<td>474.90 (108.96)</td>
<td>433.40 (107.64)</td>
<td>1.0000 vs Late intervention group</td>
</tr>
<tr>
<td>LiSat-9</td>
<td>49.41 (8.66)</td>
<td>49.34 (8.76)</td>
<td>44.74 (8.65)</td>
<td>1.0000 vs Late intervention group</td>
</tr>
</tbody>
</table>

*p-values are based on post-estimation Wald Tests with Bonferroni correction. All models are adjusted for age, gender, education, marital status, income, and employment status.

MBI: Modified Barthel Index; VAS: visual analogue scale; SF-36: Medical Outcomes Study Short-Form 36; LiSat-9: Life Satisfaction Questionnaire.
suggests a “response shift” coping mechanism whereby victims challenging life could explain this finding. This explanation of the rural population, which is accustomed to a difficult, nants) following the Sichuan earthquake. The high resilience reported better HRQOL (when adjusted for potential determi-

tigations that showed that chronic pain significantly affected physical, emotional, cognitive, communicative and social func-
tion of fracture patients (5, 21, 22). Variation of HRQOL among disaster survivors has also been found to be associated with changes in pain levels (23). Effective pain control is thus essential for improved long-term HRQOL of earthquake survivors.

In contrast with other studies (24, 25), widowed individuals reported better HRQOL (when adjusted for potential determinants) following the Sichuan earthquake. The high resilience of the rural population, which is accustomed to a difficult, challenging life could explain this finding. This explanation suggests a “response shift” coping mechanism whereby victims quickly accepted and adjusted their life expectations following the earthquake (26).

Rehabilitation therapy was shown to be a significant predictor of improved life satisfaction, which correlates with another study of Sichuan SCI victims who reported that the most important goal of rehabilitation was “recovery of independence in everyday functioning” (17). ADL in rehabilitated patients in this study were significantly improved compared with those who did not receive therapy, perhaps contributing to the positive association between rehabilitation and life satisfaction.

Relatively decreased life satisfaction in male victims may be related to differential gender roles. Chinese men may have been more negatively affected by loss of financial assets, employment, and earning ability compared with women, who are traditionally defined by their role as a non-earning caretaker within the home (27). Consequently, more women returned to their pre-injury, familial roles compared with men, who were more disenfranchised from their familiar roles.

Related, paid employment strongly predicted improved life satisfaction in this investigation. This finding is indirectly supported by a recent study following the Parnitha earthquake in Greece, which showed that loss of employment of a family member or financial problems contributed significantly to decreased life satisfaction (28).

The major limitation of the present study was that it did not focus on the detailed classification of fracture, i.e. the type and severity of fractures, and type of intervention (surgical or conservative). However, some studies also showed that HRQOL was not associated with the category of fractures or with the severity of injury (2, 29).

In conclusion, this study is the first to demonstrate the effectiveness of rehabilitation intervention on functional outcomes, HRQOL, and life satisfaction in earthquake fracture victims. Major determinants of QoL and life satisfaction were analysed. Longer-term follow-up is planned to further assess these findings, which remain to be confirmed in future earthquakes.

DISCUSSION

Medical rehabilitation should begin immediately after emergency trauma stabilization and continue after the patient has been discharged to the community as necessary, in order to achieve maximum restoration of function (14, 15). Previous studies have demonstrated that early rehabilitation programming can effectively reduce fracture complications and improve functional outcomes of the injured limb (2–4). Rehabilitation was shown to be effective in improving ADL and life satisfaction in both the early and late intervention groups in this study of Sichuan earthquake fracture victims. HRQOL was significantly higher in the early intervention group than in the control group, but did not differ significantly between the groups. This finding confirms the results of other studies, which showed a positive benefit of rehabilitation on HRQOL (2, 8, 16). ADL performance was one of the strongest positive predictors of HRQOL, which is not surprising since achieving independence in ADL is of vital important to disaster victims (17). Rehabilitative therapy thereby contributes to HRQOL as functional independence is a primary objective of rehabilitation.

Pain level also influences rehabilitation outcomes following complex orthopaedic trauma (18). At 27 months post-injury all subjects had chronic pain, which is one of the main complications of fractures (19, 20) and is correlated with HRQOL (21). Pain level was found to be the strongest negative predictor of HRQOL in this study, which is consistent with previous investigations that showed that chronic pain significantly affected physical, emotional, cognitive, communicative and social function of fracture patients (5, 21, 22). Variation of HRQOL among disaster survivors has also been found to be associated with changes in pain levels (23). Effective pain control is thus essential for improved long-term HRQOL of earthquake survivors.

We would like to express our gratitude to all the earthquake victims and rehabilitation volunteers who participated in this study. We would also like to thank the Hongkong Caring for Children Foundation for funding support. Deep appreciation is also extended to the Chinese Association of Rehabilitation Medicine, the Nanjing Medical University, the Mianzhu County People’s Hospital, the Sichuan Province and Mianzhu County Governments, the Hongkong Rehabilitation Society, and Handicap International for their continuous support of this research. We are also grateful to Dr Hongxing Wang for his editorial assistance.

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