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The contribution of rib fractures to chronic pain and disability

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Abstract

BACKGROUND: The contribution of rib fractures to chronic pain and disability is not well described.

METHODS: Two hundred three patients with rib fractures were followed for 6 months. Chronic pain was assessed using the McGill Pain Questionnaire Pain Rating Index and Present Pain Intensity (PPI) scales. Disability was defined as a decrease in work or functional status.

RESULTS: The prevalence of chronic pain was 22% and disability was 53%. Acute PPI predicted chronic pain. Associated injuries, bilateral rib fractures, injury severity score, and number of rib fractures were not predictive of chronic pain. No acute injury characteristics were predictive of disability. Among 89 patients with isolated rib fractures, the prevalence of chronic pain was 28% and of disability was 40%. No injury characteristics predicted chronic pain. Bilateral rib fractures and acute PPI predicted disability.

CONCLUSION: The contribution of rib fractures to chronic pain and disability is significant but unpredictable with conventional injury descriptors.

Chronic pain and disability are significant contributors to diminished quality of life following injury.[1–4] It is estimated that about a third of the population of the United States and Canada suffer from chronic pain.[5,6] Although cause-specific data are lacking, it is estimated that up to one quarter of the 1 billion disabled individuals worldwide have injury-related disabilities.[7] Economic costs specific to injury-related chronic pain and disability in the United States and Canada are also lacking, but estimates range at least in the tens of billions of dollars per year.[8] Rib fractures are commonly recognized as a significant source of acute pain following injury, but little is known about their specific contribution to chronic pain and disability. Last year we reported that the traditional view that most rib fracture pain resolves within 6 to 8 weeks of injury is incorrect.[9] In this companion report we document the extent of chronic pain and disability in the same cohort of rib fracture patients.

Methods

All injured patients evaluated in the Oregon Health & Science University emergency department or inpatient units from July 2005 to January 2008 were screened for the

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diagnosis of rib fracture(s). Patients with rib fractures confirmed by radiologist interpretation of plain films or computed tomography scan were contacted for enrollment within 14 days of injury. Exclusion criteria included patients ≤15 years, non-English speaking patients, patients determined by the investigators as unlikely to be able to report pain levels or complete the survey instruments at 60 days (eg, patients with severe head injury or dementia/delirium), and patients not expected to survive to 60 days postinjury. Patients or their legally authorized representatives provided informed consent to participate. The Oregon Health & Science University Institutional Review Board approved and monitored the conduct of this study.

At study entry, the age, sex, race/ethnicity, preinjury work status (employed, unemployed, retired), preinjury functional status (physical labor, nonphysical labor, disabled), and preinjury level of activity (vigorous, moderately active, ambulatory, sedentary/requires care) were determined. Pre-existing comorbidities were recorded and the Charlson Comorbidity Index was calculated.[10] Associated injuries and their corresponding Organ Injury Scale (OIS) were recorded and the injury severity score (ISS) was calculated. The number of rib fractures, bilaterality of rib fractures, the chest wall region where the majority of the rib fractures were located (anterior, lateral, posterior), the presence of flail chest, need for mechanical ventilation, the use of epidural pain control, and lidocaine patches were also recorded.

The McGill Pain Questionnaire (MPQ) was administered to patients who were able to communicate within 7 to 14 days postinjury. The MPQ is a validated instrument designed to provide quantitative measurements of subjective pain that can be treated statistically.[11] Twenty questions of pain descriptors are administered to the patient from which the Pain Rating Index (PRI) is calculated. Values ranging from 0 to 50 are possible. The Present Pain Intensity (PPI) is based on a scale of 0 to 5 and is calculated from a single question of 6 pain descriptors.

At 60, 120, and 180 days postinjury (±5 days), subjects were seen in person or contacted by phone to complete another MPQ and the RAND-36 Health Survey. The RAND-36 Health Survey is an extensively validated 36-item questionnaire consisting of 36 questions that evaluates 8 components of health including 4 physical components (physical function, role physical, bodily pain, and general health perception) and 4 mental components (mental health, role emotional, social function, and vitality).[12] Each component is scored on a scale of 0 to 100 where a higher score indicates a more favorable level of health or function. Subjects were asked whether they had returned to employment. Postinjury level of activity and functional status were also determined.

Chronic chest wall pain was defined as an MPQ-PRI ≥8 at 180 days postinjury (see our previous report for the rationale of choosing this cutoff level).[9] Disability was defined as a decrease in 1 or more levels of work or functional status at 180 days.

Patient demographics, preinjury work and functional status, injury characteristics and initial MPQ-PPI were evaluated with univariate analysis (chi-square test or *t* test) to determine associations with chronic chest wall pain or disability. Variables with a *P* value of ≤.2 were selected for inclusion in a multivariate analysis to determine independent associations with prolonged pain or disability. Among variables with significant covariance, only 1 variable was chosen to include in the model. Odds ratios (OR) and 95% confidence intervals (CI) were calculated and a *P* value of <.05 was chosen to indicate statistical significance. Subset analysis for patients with isolated rib fractures (no associated injuries with an OIS ≥3) was repeated as described above.

Results

Two hundred three patients (145 men and 58 women) with a mean ISS of 20 (range 1 to 59) had a mean of 5.4 rib fractures (range 1 to 29). Forty-four patients (22%) had bilateral fractures, 15 (7%) had flail chest, and 92 (45%) had one or more associated injuries with an OIS ≥2. The region of the chest wall with the most rib fractures was posterior in 50%, lateral in 26%, and anterior in 24% of patients.

Race/ethnicity included White, non-Hispanic (191, 94%), American Indian (7, 3%), Hispanic (3, 1%), and Black, non-Hispanic (1, <1%). One hundred fifty-two subjects (75%) were employed, 27 (13%) were unemployed, and 23 (11%) were retired at the time of injury. One hundred four (51%) subjects reported a vigorous activity level, 66 (33%) a moderate activity level, 24 (12%) an ambulatory activity level, 8 (4%) a sedentary or "requires care" activity level. Functional status reported included physical labor (122, 60%), nonphysical labor (67, 33%), and disabled (13, 6%). The Charlson Comorbidity Index was 0 in 79%, 1 in 8%, 2 in 7%, 3 in 3%, and ≥4 in 2% of patients (range 0 to 7).

One hundred ninety-three (95%) patients were admitted as inpatients >24 hours. Mean length of stay was 8.3 days (range 0 to 56). Mean intensive care unit length of stay was 3.8 days (range 0 to 33). Fifty (25%) patients required mechanical ventilation. Epidural analgesia was used in 18 (9%) patients. Lidocaine patches were used in 29 (14%) patients. No patient received paravertebral or intercostal nerve blocks and none had surgical rib fracture fixation. Chest wall MPQ-PPI and MPQ-PRI on enrollment (9 ± 2 days postinjury) were median 3 (range 0 to 5) and mean 28 ± 16 (range 0 to 70), respectively. Eighty-six percent of patients were discharged to home and 14% were discharged to a skilled nursing facility or other acute care facility. There were 5 deaths all following discharge. Four patients died because of complications relating to their injuries and comorbidities and 1 patient died because of injuries suffered in a subsequent motor vehicle crash.

One hundred sixty-one patients (79%) were followed for 6 months. The prevalence of chronic pain was 22% (35/159