Initial Neuropathic Pain Symptoms Predict Musculoskeletal Pain Severity Six Weeks After Motor Vehicle Collision

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PROJECT CRASH

INTRODUCTION

- Neuropathic pain symptoms identify individuals more likely to transition from acute to persistent pain in post-operative settings (e.g. [1,2]). Persistent musculoskeletal pain (MSP) after motor vehicle collision (MVC) is common and results in substantial societal costs.[6] However, to our knowledge the ability of neuropathic pain symptoms in the hours after MVC to predict MSP persistence/severity has not been assessed.
- In this study we evaluated the hypothesis that neuropathic pain symptoms in the emergency department (ED) in the hours after MVC would predict MSP severity at six weeks.

MATERIALS AND METHODS

- This prospective observational study recruited patients presenting to one of eight EDs in the immediate aftermath of MVC (Figure 1). Consenting participants completed ED evaluation including an assessment of overall pain severity (0-10 NRS, mild pain = NRS 1-3, moderate pain 4-7, severe pain 8-10) and an assessment of neuropathic pain symptoms (assessed using Douleur Neuropathique en 4 (DN4) Questions,[7] severity of each symptom evaluated using a 0-10 NRS). Assessments were repeated at 6 week follow-up. Univariate and bivariate analyses were performed using descriptive statistics and chi square analyses, respectively. Multivariate analyses were preformed using linear regression.

RESULTS

- 115/129 (89%) participants completed the 6-week follow-up assessment. Most participants (n = 115) had some education past high school, came directly to the ED after their MVC, and reported moderate or severe vehicle damage (Table 1).
- In the ED, 109/115 (95%) patients reported acute pain and 87% patients reported moderate or severe pain (Table 2).
- Neuropathic pain symptoms were commonly reported in the ED. 76/109 (70%) of the patients with pain in the ED reported experiencing one or more neuropathic pain symptoms
- ED neuropathic pain score and ED pain severity were only moderately correlated (r=0.35, p=0.01).
- At 6 weeks, 78/115 (68%) patients reported persistent MVC-related MSP. 51% patients reported moderate or severe pain.

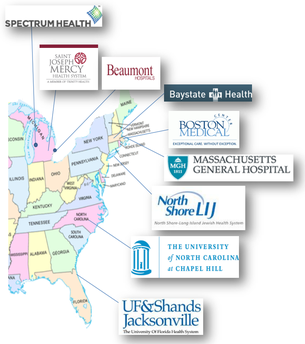

Figure 1. Project CRASH study network.

Table 2. Relationship between initial neuropathic pain symptoms and overall pain severity measured in the ED and at 6 weeks.

	ED					6 Weeks				
NRS Categories	None (6, 5%)	Mild (20, 18%)	Moderate (44, 39%)	Severe (43, 38%)	p	None (37, 32%)	Mild (19, 17%)	Moderate (28, 25%)	Severe (29, 26%)	p
Painful Cold	–	0 (0)	3 (7)	7 (17)	**0.08**	1 (3)	2 (11)	0 (0)	7 (25)	**<0.01**
Pins and Needles	–	0 (0)	11 (25)	13 (31)	**0.02**	3 (9)	3 (16)	8 (30)	12 (43)	**0.02**
Numbness	–	5 (25)	10 (23)	19 (45)	0.06	4 (13)	8 (42)	9 (33)	12 (43)	**0.04**
Burning	–	7 (35)	14 (32)	21 (49)	0.24	15 (47)	6 (32)	8 (30)	15 (52)	0.27
Tingling	–	4 (20)	18 (41)	24 (56)	**0.03**	11 (34)	8 (42)	12 (44)	17 (59)	0.30
Itching	–	0 (0)	2 (5)	1 (2)	0.58	0 (0)	0 (0)	2 (7)	1 (4)	0.31
Electric Shocks	–	2 (10)	5 (11)	6 (14)	0.87	3 (9)	3 (16)	4 (15)	4 (14)	0.90

Bold indicates p<0.05.
Numbers expressed as n(%). Percent of patients with each individual neuropathic pain symptom (measured in the ED) calculated out of the number of patients with that NRS pain category, measured either in ED or at six weeks as designated in table. Patient that had no pain in the ED were not asked about neuropathic pain symptoms.

Table 1. Characteristics of the sample (n=115)

Characteristic*	Total
Age, mean (SD)	36 (14)
Sex (n, %)	
Male	50 (44)
Female	65 (56)
Education (n, %)	
11 years or less	11 (9)
High school	23 (20)
Post-high school	6 (5)
Some college	38 (33)
College graduate	26 (23)
Postgraduate	11 (10)
Came directly to ED from scene	89 (77)
Came to ED by ambulance (n=89)	74 (83)
Time before presentation, mean (SD)	2.5 (4.5)
Vehicle damage severity (n=113)	
Minor	17 (15)
Moderate	31 (27)
Severe	65 (58)

*Denominators vary due to missing values, n=115 unless otherwise specified.

Table 3. Relationship between neuropathic pain score and 6-week pain intensity adjusting for possible confounders using linear regression.

		6-Week Pain Intensity		
		Adj. Model R^2	B_{Std}	p
Model 1	Intercept	0.04	-	**<0.01**
	Neuropathic Pain Sore		**0.23**	**0.02**
Model 2	Intercept	0.07	-	**<0.01**
	Age		0.10	0.27
	Sex		0.16	0.08
	Neuropathic Pain Score		**0.25**	**0.01**
Model 3	Intercept	0.23	-	0.31
	Age		0.14	0.11
	Sex		0.11	0.20
	ED Pain Score		**0.44**	**<0.01**
	Neuropathic Pain Score		0.10	0.26
Model 4*	Pins and Needles	0.23	**0.167**	**0.07**
	Painful Cold		0.14	0.13
	Itching		0.07	0.39
	Tingling		0.05	0.60
	Numbness		0.03	0.70
	Electric Shocks		0.03	0.71
	Burning		-0.01	0.90

*Model 4 adjusted for age, sex, and ED pain intensity.

RESULTS CONTINUED...

- 61/78 (78%) of individuals with persistent MSP at 6 weeks reported coincident neuropathic pain symptoms.
- Six week neuropathic pain score and 6 week MSP severity were strongly correlated (r=0.66, p=0.05).
- Neuropathic pain symptoms in the hours after MVC that best predicted 6 week MSP severity were painful cold and pins and needles (Table 2).
- Neuropathic pain score reported in the ED predicted overall pain intensity at six weeks (model adjusting for age and sex, Table 3).
- When ED pain intensity was also added to this model, neuropathic pain score was not an independent predictor of pain intensity at six weeks in this sample (Table 3).
- Individual ED neuropathic pain symptoms that most strongly predicted six week pain severity in a model adjusting for patient age and sex were painful cold and pins and needles. In a model adjusting for patient age, sex, and ED pain intensity, pins and needles continued to demonstrate predictive value.

CONCLUSION

- Neuropathic pain symptoms are common in the immediate aftermath of MVC and are associated with persistent pain. The presence of specific neuropathic symptoms (eg, pins and needles) at the time of initial evaluation may be useful in predicting which patients are at increased risk for developing persistent pain.

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Research reported in this publication was supported by the National Institute of Arthritis and Musculoskeletal and Skin Diseases of the National Institutes of Health under Award Number R01AR056328 and by NIH T35 Grant 5T35DK007386-32. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.