

## ORIGINAL ARTICLE

# Abdominal pain in long-term spinal cord injury

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**Objectives:** To describe the prevalence and character of chronic abdominal pain in a group of patients with long-term spinal cord injury (SCI) and to assess predictors of abdominal pain.

**Study design:** Postal survey.

**Setting:** Members of the Danish Paraplegic Association.

**Methods:** We mailed a questionnaire to 284 members of the Danish Paraplegic Association who met the inclusion criteria (member for at least 10 years). The questionnaire contained questions about cause and level of spinal injury, colorectal function and pain/discomfort.

**Results:** Seventy percent returned the questionnaire (133 men and 70 women). Mean age was 47 years. Thirty-four percent reported having chronic abdominal pain or discomfort. Onset of pain was later than 5 years after their SCI in 53%. Low defecation frequency was more common in patients with abdominal pain/discomfort and constipation more often affected their quality of life compared to patients without abdominal pain/discomfort. The most common descriptors were annoying, cramping/tightening, tender, sickening and shooting/jolting. There was no relation to age, time since injury or level of injury, but more women than men reported abdominal pain/discomfort. There was no relation of abdominal pain to other types of pain.

**Conclusion:** Chronic pain located in the abdomen is frequent in patients with long-term SCI. The delayed onset following SCI and the relation to constipation suggest that constipation plays an important role for this type of pain in the spinal cord injured.

*Spinal Cord* (2008) **46**, 198–203; doi:10.1038/sj.sc.3102097; published online 10 July 2007

**Keywords:** spinal cord injury; visceral pain; abdominal pain; neuropathic pain; constipation

## Introduction

Chronic pain has substantial impact on the quality of life (QoL) in patients with spinal cord injury (SCI).<sup>1–5</sup> Persistent pain of visceral origin in SCI has gained only little attention in research and little is known about its prevalence, characteristics and mechanisms.<sup>6</sup>

The prevalence of visceral pain varies from 5 to 38% among studies.<sup>7–14</sup> One of the reasons for this is the lack of a unified definition. In some studies, visceral pain has been defined by location; in others by pain characteristics such as dull and poorly localized, and in others again by its precipitation by bladder and bowel distension. It is also suggested that visceral pain has a long time of onset and that it is much more prevalent at 10 and 15 years after injury than during the early course of the injury.<sup>12,13</sup>

Visceral pain has been described or defined as being dull, poorly localized, bloating and cramping,<sup>15,16</sup> but no study

has examined the characteristics of visceral pain in SCI in more detail. Also, little is known about the possible predictors of visceral pain.

Visceral pain in SCI is likely to have multiple mechanisms, but many are largely unknown. Often, a relation to a visceral pathology cannot be identified,<sup>6</sup> and in these cases it has been suggested to classify the pain as neuropathic rather than visceral and treat it accordingly.<sup>17</sup>

The aim of the present study was to determine the prevalence and character of chronic pain with abdominal localization in a group of SCI patients with long-term SCI. Furthermore, we wanted to estimate possible SCI-related predictors of abdominal pain and assess the correlation between abdominal pain and gastrointestinal function and other types of pain descriptors, especially those indicative of neuropathic pain.

## Methods

In 1996, 424 members of the Danish Paraplegic Association answered a detailed questionnaire describing their colorectal function.<sup>18</sup> In 2006, as a follow-up, those who were still

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Received 29 March 2007; revised 31 May 2007; accepted 3 June 2007; published online 10 July 2007

members ( $n=284$ ) received an almost identical questionnaire describing colorectal function and, in addition, questions on pain. All participants had thus been part of the Danish Paraplegic Association (RYK) for at least 10 years. The questionnaire was composed of 34 questions describing age, gender, level of injury, limits of cutaneous sensibility and motor control, time since injury, constipation including defecation frequency and impact of constipation on QoL, defecation habits including time used for defecation and fecal incontinence. On the basis of patients' description of motor and sensory function in their legs, the severity was classified as complete or incomplete.

A part of the questionnaire evaluated pain, comprising 14 questions. Patients were first asked if they had any chronic pain or discomfort, where chronic was defined as having been present constantly for at least 3 months or at least once a week for at least 3 months. Patients were then asked how much they had been bothered by chronic pain or discomfort 'localized in the abdomen' in the past week (not at all, a little, moderately or much bothered). For those bothered by abdominal pain/discomfort, we assessed the average intensity by means of a numeric rating scale (NRS) from 0 to 10, where 0 indicated 'no pain or discomfort' and 10 'worst imaginable pain or discomfort'. Other questions included temporal aspects, pain descriptors from a Brief Danish Pain Questionnaire (a list of 18 descriptors),<sup>19</sup> accompanying symptoms (no list provided), relations of abdominal pain to spasms, other pains and hypersensitive skin. Furthermore, patients were provided with a list of 10 possible alleviating and aggravating factors and asked for current treatment of abdominal pain.

Following these questions, patients were asked about other types of chronic pains/discomforts. Pain was separated into above level and at or below level of lesion based on self-report. They were asked how they had been bothered by chronic pain or discomfort above injury level and then for each of the following: headache, muscle/joint pain or other. They were then asked how they had been bothered by chronic pain or discomfort at or below injury level, and then for each of the following: pricking/sticking pain (pins and needles), shooting pain, burning or freezing pain, painful spasms, pain evoked by light touching the skin, tightening/cutting pain, pain due to skin or musculoskeletal lesion or disease and other pain. Those who did not respond within 4 weeks received an identical questionnaire encouraging them to respond.

### Statistics

We used Pearson  $\chi^2$  or Fisher's exact tests or independent samples *t*-test to analyze differences between groups. Correlation between nonparametric variables was assessed using Spearman's correlation. *P*-values <0.05 were defined as level of significance.

## Results

Of the 284 patients, 193 returned their questionnaire and had answered the part of the questionnaire concerning pain

(response rate 70.0%). Mean time since injury was 21.8 years (range 10–59 years). Sixty-six patients (34%) reported chronic pain or discomfort in the abdomen. The characteristics of patients with and without abdominal pain or discomfort are listed in Table 1. There were significantly more women in the group with abdominal pain/discomfort (38.6%) than men (29.3%;  $P=0.034$ ; Pearson  $\chi^2$ ). We found no differences in age of the patient, age at injury and time

**Table 1** Clinical characteristics of 66 SCI patients with pain in the abdomen and 127 SCI patients without such pain

	Patients with abdominal pain (%)	Patients without abdominal pain (%)	P-value
Number	66	127	—
<i>Gender</i>			
Men	39 (59%)	94 (74%)	0.034 <sup>a</sup>
Women	27 (41%)	33 (26%)	—
Age, years, mean (s.d.)	47.6 (10.3)	47.1 (11.9)	0.79 <sup>b</sup>
Range	18–72	20–80	—
Time since injury, years, mean (s.d.)	22.4 (10.5)	21.4 (8.4)	0.48 <sup>b</sup>
Range	12–59	10–48	—
Age at injury, years, mean (s.d.)	25.2 (12.0)	25.7 (13.4)	0.79 <sup>b</sup>
<i>Mechanism of SCI</i>			
Traumatic	49 (74%)	101 (80%)	0.29 <sup>a</sup>
Traffic accident	31	61	—
Fall	12	22	—
Diving	2	6	—
Other traumatic	4	12	—
Disease	17 (26%)	24 (19%)	—
Myelomeningocele	6	8	—
Myelitis	3	6	—
Other disease	8	10	—
Unknown	0	2	—
<i>Skeletal level</i>			
Cervical	25 (38%)	41 (32%)	0.21 <sup>a</sup>
Thoracic	35 (53%)	59 (46%)	—
Lumbosacral	5 (8%)	23 (18%)	—
Unknown	1 (2%)	4 (3%)	—
<i>Defecation frequency</i>			
Every or every other day	49 (74%)	108 (85%)	0.037 <sup>a</sup>
Less than every other day	17 (26%)	17 (13%)	—
Unknown	—	2 (2%)	—
<i>Time needed for defecation</i>			
Up to 15 min	23 (35%)	60 (47%)	0.17 <sup>a</sup>
More than 15 min	37 (56%)	62 (49%)	—
Unknown	6 (9%)	5 (4%)	—
<i>Constipation affect quality of life</i>			
Not at all	24 (36%)	85 (67%)	<0.001 <sup>a</sup>
A little	17 (26%)	25 (20%)	—
Some	10 (15%)	9 (7%)	—
A lot	12 (18%)	6 (5%)	—
Unknown	3 (5%)	2 (2%)	—

Abbreviation: SCI, spinal cord injury.

<sup>a</sup>Pearson  $\chi^2$ .

<sup>b</sup>Independent samples *t*-test.

since injury between the groups ( $P > 0.48$ ; independent samples  $t$ -test) or whether the injury was traumatic or due to disease ( $P = 0.08$ ; Pearson  $\chi^2$ ; Table 1). There was also no statistically significant difference between the two groups with regard to level of injury (Table 1); the difference was also not seen when separating patients into lesions above and below the 5th thoracic segment (T5) ( $P = 0.39$ ; Pearson  $\chi^2$ -test). Completeness could be evaluated in 173 patients: 60.1% were classified as complete and 39.9% as incomplete, with no difference among patients with or without abdominal pain ( $P = 0.75$ ; Pearson  $\chi^2$ ).

*Clinical characteristics of abdominal pain/discomfort in SCI*

Of the total 193 patients, 13.9% (26/186) had been bothered a little by abdominal pain the last week, 8.6% (16/186) moderately and 9.1% (17/186) much. Seven answers were missing.

The median intensity of abdominal pain/discomfort was 6 (range 2–10; Figure 1). Twenty patients (30.3%) answered that they were treated for their abdominal pain/discomfort, six reported treatment with paracetamol, five proton pump inhibitors or antacids, two laxatives, two opioids, two gabapentin, and two NSAIDs, two benzodiazepines, one a tricyclic antidepressant and one antibiotics. Two patients did not indicate type.

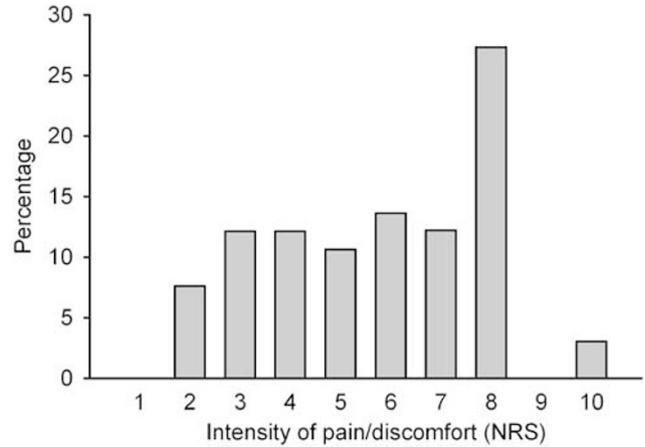
The most common sensory descriptors chosen from the Brief Danish Pain Questionnaire were cramping/tightening, tender, shooting/jolting, stinging and sharp/cutting (Figure 2), while dull/heavy (the Danish words 'dump/tung') was used by only 12.1%.

Thirteen patients (19.7%) had constant abdominal pain/discomfort and 50 (75.8%) had intermittent pain (three missing); the duration and frequency of these are illustrated in Figures 3 and 4. Nineteen patients (28.8%) reported that the onset of abdominal pain/discomfort was within the first 5 years after their injury, 24 (36.4%) that the onset was after 5 year, while 18 (27.3%) could not recall time of onset and 2 (3%) reported pain onset before the SCI (Figure 5).

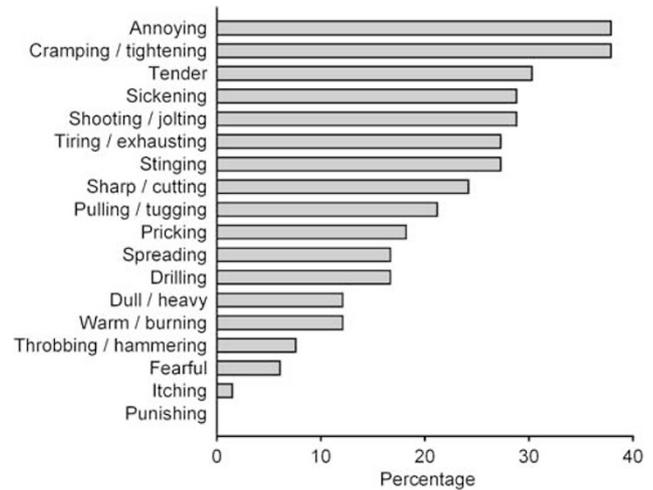
Accompanying symptoms were described by 30 patients with abdominal pain/discomfort (45.5%); 13 mentioned nausea, 11 sweating, 3 spasms, 1 allodynia in the face and 1 feeling unwell. Twenty-six (39.4%) replied that they had more spasms when having abdominal pain/discomfort, 21 (31.8%) had exacerbation of other types of pain and 7 (10.6%) that their skin became more sensitive. Constipation (reported by 60.6%), urinary tract infection, stress, full bladder and food intake were reported as the most common aggravating factors, and defecation (reported by 36.4%), bladder emptying and warm weather were the most common alleviating factors (Figure 6).

*Relation to colorectal function*

Patients with abdominal pain/discomfort more often had a defecation frequency less than every other day than patients without pain ( $P = 0.037$ ; Pearson  $\chi^2$ ), while there was no difference in the number of patients who needed more than 15 min for defecation ( $P = 0.17$ ; Pearson  $\chi^2$ ; Table 1). Constipation was more likely to have an effect on the patient's



**Figure 1** Intensity of pain/discomfort on a numeric rating scale (NRS; 0–10). The figure shows the percentage of the 66 spinal cord injury patients with pain/discomfort in the abdomen, which reported the specific intensity shown on the x axis.

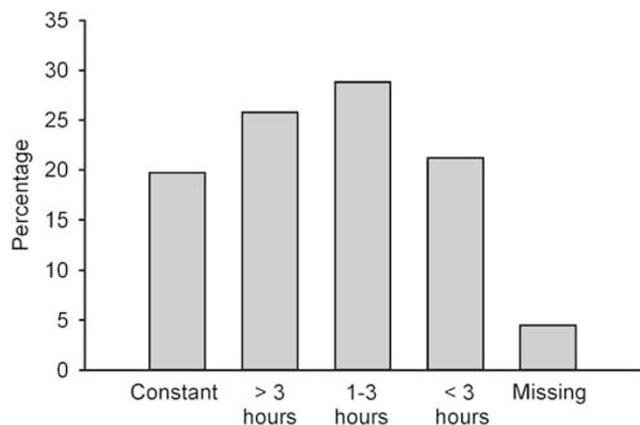


**Figure 2** Descriptors of pain/discomfort in the abdomen reported by 66 spinal cord injury patients. Patients were provided a list of pain descriptors from the Brief Danish Pain Questionnaire (a list of 18 descriptors),<sup>19</sup> and were asked to choose all that applied.

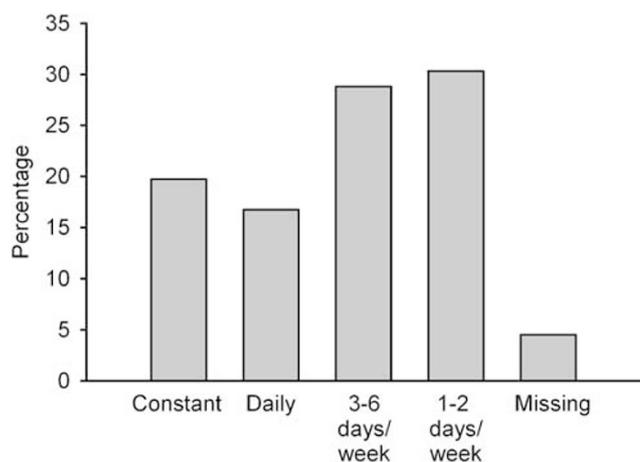
QoL in patients with than without abdominal pain/discomfort ( $P < 0.001$ ; Pearson  $\chi^2$ ; Table 1).

*Relation to other chronic pains*

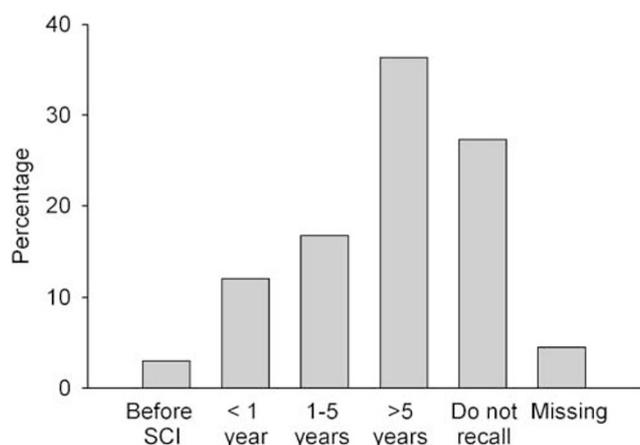
Chronic pain or discomfort, including abdominal pain, was reported by 107 (55%) SCI patients and pain other than pain located in the abdomen was reported by 100 patients (52%). Besides abdominal pain, 74 patients (38%) had other pain above injury level and 95 (49%) patients had other pain at or below injury level. Patients with abdominal pain reported significantly more pain of any type compared to patients without abdominal pain ( $P < 0.0001$ ). For example, 68.2% of patients with abdominal pain reported muscle/joint pain above injury level compared to 19.7% of patients without



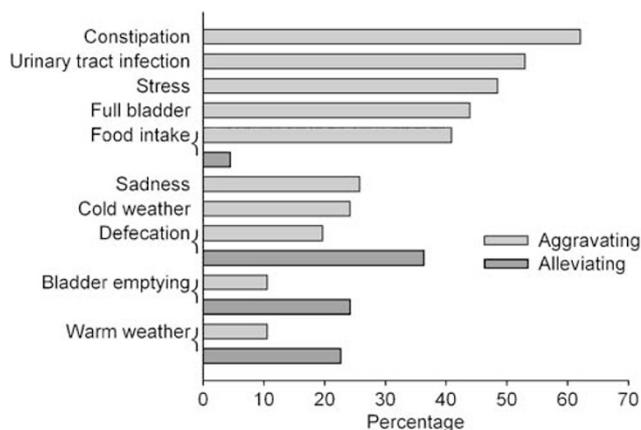
**Figure 3** Percentage of 66 spinal cord injury patients reporting constant or intermittent pain/discomfort in the abdomen and the average duration.



**Figure 4** Frequency by which the 66 spinal cord injury patients experienced pain/discomfort in the abdomen.



**Figure 5** Percentage of 66 spinal cord injury (SCI) patients reporting onset of abdominal pain/discomfort before their SCI, within the first year after their injury, from 1 to 5 years after, more than 5 years after their injury or who could not recall the onset.



**Figure 6** Aggravating and alleviating factors of abdominal pain/discomfort in 66 spinal cord injury patients. Patients were provided a list of possible factors and were asked to choose all that applied.

abdominal pain. This is likely to be a bias (see Discussion). Of those reporting pain at or below injury, 67% reported pricking/sticking pain, 60% shooting pain, 55% burning or freezing pain, 47% painful spasms, 45% pain evoked by light touching the skin, 41% tightening/pressing pain and 28% pain due to skin or musculoskeletal lesion or disease. Of those with pain above injury level, 45% reported headache and 95% pain from muscles or joints. For those patients with abdominal pain, there was no correlation between the degree a patient was bothered by abdominal pain and any of the other pain types ( $P > 0.17$ ; Spearman's correlation).

### Discussion

This questionnaire is to our knowledge the first that attempts to describe abdominal pain/discomfort in detail in a SCI population. Thirty-four percent (66/193) of this SCI population with long-lasting injury reported chronic (lasting for at least 3 months) pain or discomfort in the abdomen; 9.1% (17/186) reported that they had been bothered a lot by abdominal pain the last week and 14.5% (28/193) reported an intensity of 7 or more on a 0–10 NRS. The present figures are limited by a rather small sample size and the lack of controls; nevertheless, the fact that one-third of patients do report abdominal pain/discomfort indicates that it is an important problem.

Onset of pain was reported to be later than 5 years after their SCI by 53% of those who could recall time of onset, which supports previous studies suggesting a late onset of visceral pain.<sup>12,13</sup> Low defecation frequency was more common in patients with abdominal pain/discomfort, and 59% of patients with pain/discomfort in the abdomen reported that constipation affected their QoL compared to 32% of patients without abdominal pain/discomfort, suggesting some relation of abdominal pain to constipation. Pain/discomfort in the abdomen was intermittent in one-fourth, and was associated with nausea and/or sweating by one-third. The most common descriptors were annoying,

cramping/tightening, tender, sickening and shooting/jolting (reported by more than 28%), while dull/heavy was only reported by 12%. This may, however, rely on the Danish translation. Thirty percent reported that they were treated for their abdominal pain. There was no relation to age, time since injury or level of injury, but more women (38.6%) than men (29.3%) reported abdominal pain/discomfort.

Two patients (3%) had onset of abdominal pain before their SCI and with a 10–20% prevalence of irritable bowel syndrome in adults, some would be expected to have abdominal pain before their SCI. However, the vast majority of patients developed abdominal pain after their SCI. We found no predictors of pain except a higher prevalence in women. In the study by Kogos *et al.*,<sup>13</sup> patients with paraplegia tended to have a higher likelihood of experiencing visceral pain at some point after injury than tetraplegic patients, but this was not statistically significant. There were no differences in patients with complete or incomplete SCI, men or women, or association to current age or age at injury.<sup>13</sup> In another study, abdominal pain was found to be associated with higher levels of anxiety but not level of injury.<sup>14</sup>

In our study, there was a relatively high frequency of chronic abdominal pain/discomfort. One of the reasons for this is likely to be the long duration of injury in these patients, which is supported by the reported late onset. We included discomfort because patients with irritable bowel syndrome who rate their predominant symptom as discomfort have similar degrees of psychological distress, impaired QoL and increased health care use as do patients who rate their predominant symptom as pain,<sup>20</sup> but this may add to the relatively high incidence found in this study. Furthermore, to be able to assess descriptors, we did not include descriptors in our definition of the pain/discomfort in interest, and we also did not include poorly localized but assessed all pains that were located *in* the abdomen.

The increased number of patients with low defecation frequency and compromised QoL due to constipation among patients with abdominal pain/discomfort and the reported aggravation by constipation and relief by defecation in a large number of patients suggest that constipation plays an important role in the mechanisms of abdominal pain in at least some of the patients. This is also compatible with the findings that increased frequency and severity of constipation-related symptoms increase with time since SCI (Faaborg *et al.*, unpublished observation). Other mechanisms such as bladder problems or changes in other pelvic visceral structures as well as hormonal influences have not been evaluated in this study, but are likely also to be possible sources of abdominal pain/discomfort.

The study also aimed at looking at possible correlations between abdominal pain and neuropathic pain. The hypothesis was that mechanisms underlying neuropathic pain may also be responsible for abdominal pain. Owing to our design, however, few patients without abdominal pain reported any type of other pain. This suggests that patients may have considered pain other than abdominal pain for non-relevant to this questionnaire, which is in accordance with the relatively low number of patients reporting chronic pain at

or below injury level.<sup>11</sup> For those reporting abdominal pain/discomfort, there was no relation to the report of other types of pain, including burning, pricking or shooting types of pain, which may suggest that there is no correlation to neuropathic pain. Also, the late onset of abdominal pain as opposed to 'somatic' neuropathic pain and choice of pain descriptors suggest different mechanisms. Still, it is not unlikely that peripheral or central neuropathic mechanisms may play a role for the development of abdominal pain in some patients with SCI. Visceral hypersensitivity in combination with altered motility, activation of silent nociceptors, central sensitization, decreased central inhibition and increased descending facilitation have been suggested to play important roles for functional bowel disease and other visceral pains.<sup>15</sup> Further studies are needed to examine the mechanisms of abdominal pain in SCI.

### Conclusion

Chronic pain located in the abdomen is frequent in patients with long-term SCI. The delayed onset following SCI and relation to constipation suggests that constipation plays an important role for this type of pain in the spinal cord injured.

### Acknowledgements

We thank the Danish Paraplegic Association (RYK) for assistance in carrying out the project. The study was supported by grants from Ludvig and Sara Elsass' Foundation, the Danish Medical Research Council, and the Ferdinand Salling Memorial Foundation.

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