Letter to the Editor

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In reply to Dr R Defrin *et al*

Thank you for the opportunity to respond to the comments by Defrin and colleagues regarding our review and in particular the relationship between pain and physical factors following spinal cord injury (SCI). We agree wholeheartedly that it is difficult to determine a clear correlation between the presence or intensity of pain following SCI and specific physical or psychological factors. Indeed the often conflicting reports that we presented highlight the complexity of this issue and the difficulty in assigning any one variable as a predictor or correlate of pain. We did report studies that concluded that psychosocial factors were more important than physical factors.^{1,2} However, this was done in the context of a review of other studies that have suggested that certain physical factors may also be associated with pain. Therefore we did not intend to communicate that psychosocial factors alone are the sole predictors of pain following SCI. What our review did intend to communicate, however, is that many of these studies are contradictory and therefore there is at present little definitive evidence for a correlation between the presence or severity of pain and any one physical variable associated with the injury.

We acknowledge the findings of Defrin *et al* of a relationship between completeness and increased severity of SCI pain.³ Most studies have examined a relationship between the presence rather than severity of pain, and a number have suggested an association between the presence of pain and incompleteness^{4–6} although another has suggested a relationship with completeness.⁷ Other studies have failed to find any relationship between either the presence^{1,8–10} or severity^{1,2} of pain and completeness. These differences may be due to several factors such as the types of pain included (eg any pain or only neuropathic), the level of injury of those investigated (all levels or lumbosacral only) and the measures used to assess pain severity. However, in the presence of such conflicting information, it is difficult to assert that there is a strong association between the presence or severity of pain and either completeness or incompleteness.

The second issue of concern raised by Defrin and colleagues is the relationship between pain and damage to specific spinal pathways. There appear to be two contentious issues: whether spinothalamic tract damage is a necessary prerequisite for the development of neuropathic SCI pain,^{11,12} and whether neuropathic SCI pain is more likely to occur with loss of spinothalamic inputs when there is relative preservation of dorsal column inputs.^{5,11,13}

There appears to be virtually unanimous support for the importance of spinothalamic tract damage in the development of neuropathic pain.^{11,12,14–18} Studies that have documented sensory deficits consistently indicate that all patients with pain have deficits of temperature and pin prick sensation.^{5,12,16} These studies all support the proposal that spinothalamic tract damage is a necessary prerequisite of neuropathic pain. The only study that disagrees with this assertion is the study by Eide *et al*¹⁹ who found no

significant difference in the mean threshold values for thermal stimuli between painful and non-painful areas. It is not apparent from their study whether any subjects were found with normal thermal sensation and pain and therefore whether the hypothesis can be refuted.

We agree that the bulk of evidence supports the proposal that spinothalamic tract damage is a necessary ingredient in the development of neuropathic SCI pain. However, there is a necessary qualification to this statement. Although this may be the case for below-level neuropathic pain, it may not be the case for all cases of neuropathic pain. Nathan reports cases of patients with hyperaesthesia and hyperpathia following lesions that appear to be confined to the dorsal columns²⁰ and allodynia is common following central cord injuries that do not appear to involve spinothalamic pathways.^{9,21–23} Therefore, it may be that the relationship with spinothalamic tract damage is limited to below-level neuropathic pain and should not be generalised to all types of neuropathic pain.

The second issue is whether the development of pain is dependent on relative preservation of dorsal column pathways. Although this hypothesis has been proposed by Beric *et al*⁵ it does not enjoy such widespread support. As well as the findings by Defrin and her colleagues,¹² the relationship between neuropathic pain and preservation of dorsal column inputs has been questioned by others. Eide and colleagues systematically examined sensory function in a group of people with SCI.²⁴ They found that although there was a significant change in the mean thermal threshold in painful areas, the impairment of both spinothalamic and dorsal column function was not significantly different in painful denervated skin regions when compared with non-painful skin regions in people.¹⁹ Similarly, Bowsher¹⁶ found that although increased pain severity was associated with increased impairment of pin prick and thermal sensations, pain severity was not associated with differences in impairment of large fibre function.

Reports of pain in people with complete deafferentation would also seem to go against this hypothesis. Some have argued that some patients may have preservation of transmission even though they appear to be clinically complete. However, this is questioned by the case series reported by Melzack and Loeser who described continuing neuropathic pain in a series of people with SCI who had verified surgical cord transection.²⁵ It is also questioned by reports of continuing neuropathic pain despite complete spinal local anaesthetic blockade above the level of injury.²⁶

In summary, we agree that the bulk of evidence suggests that spinothalamic tract damage is an important and possibly essential ingredient in the development of neuropathic pain. However, while not disagreeing with the observations of Beric *et al*,⁵ there is no conclusive evidence that relative preservation of dorsal column inputs is a necessary prerequisite for the development of pain.

With regard to the last point regarding the influence of genetic factors in the development of pain we are in complete agreement. There is accumulative evidence in models of both peripheral and central neuropathic pain that genetic factors are important in the development of pain. The extent to which these genetic factors influence both the perception and expression of pain in humans is still to be determined. The fact that a proportion of patients does not have pain despite the documented loss of spinothalamic function may be due to such genetic factors. However, while acknowledging the possible contribution of genetic factors, we do not agree that they account for the remaining variability in the presence or intensity of pain. Returning to the start of this letter, even though we agree that physical factors may be involved in the development of pain, we cannot disregard the evidence from studies that have demonstrated the importance of psychosocial variables.^{1,2} Once again we are not suggesting that they are the most important causal factor associated with the presence or severity of pain or excluding a possible contribution from physical factors. However, there is ample evidence for the importance of psychosocial factors in both the perception and expression of pain and part of the variability in pain behaviour may also be due to these factors.

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