

## LETTER TO THE EDITOR

### Reply to Putz *et al.*

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The authors<sup>1</sup> raise two important issues when dealing with the assessment of the autonomic nervous system: the definition of the completeness of sympathetic lesion and its relationship with the American Spinal Injury Association (ASIA) neurological examination.

Very few studies have focused on the completeness or incompleteness of the autonomic lesion in spinal cord injury (SCI) individuals. The sympathetic skin response (SSR) is, by far, the most used technique for this purpose: the presence of SSR below the lesion in response to a stimulus above the lesion is indicative of an incomplete sympathetic lesion.<sup>2–6</sup> Apart from the SSR, a few studies have directly addressed this issue. In paraplegics, the lack of vasoconstriction in the calf during the hand cold pressor test, indicates a lack of supraspinal control of sympathetic outflow to the leg vasculature,<sup>7</sup> whereas a positive pressor response to mental arithmetic and hand cutaneous cold along with the lack of postural hypotension confirm a functionally competent sympathetic outflow.<sup>8</sup> In tetraplegics, the absence of vasoconstriction of the skin of the hand after a sudden loud noise, pin-pricks on the face and neck or ice applied to the same region is indicative of the completeness of the lesion.<sup>9</sup>

Although international standards to document remaining autonomic function after SCI have been recently published, it doesn't recommend a set of definitions for a complete or an incomplete autonomic lesion.<sup>10</sup> In line with the ASIA standards,<sup>11</sup> we used the term 'complete sympathetic lesion' when there is an absence of normal function at the lowest sympathetic thoracolumbar segments (that is, lack of supraspinal control).<sup>12</sup> We understand this is a difficult matter to apprehend, and we'll try to clarify our point of view by using analogy with the SSR.

Using the above definition, the absence of SSR at the feet of SCI patients (that is, below the lesion) after electrical stimulation above the lesion corresponds to a complete sympathetic lesion. When aggregating data on complete AIS A SCI patients from several studies on SSR using this methodology,<sup>2–4,6</sup> we can find that 94% of the tetraplegic and 92% of the paraplegic patients above T10 present with a complete sympathetic lesion (absent SSR at the feet). These findings clearly support our data. Definitely, there is a good relationship between completeness of somatic and autonomic lesions.<sup>12</sup>

Also, we propose the term 'sympathetic zone of partial preservation' be used when some sympathetic func-

tion is found below the lesion in presence of a complete sympathetic injury. In tetraplegic patients, it corresponds to the presence of SSR at the hands even though SSR at the feet are absent. This is found in 19% of tetraplegic AIS A patients.<sup>2–4,6</sup> In our study, 34% of all SCI AIS A patients presented such sympathetic zone of partial preservation. Obviously, the greater sensitivity of the skin axon-reflex vasodilatation (SkARV) test, which explores each dermatome, can explain the small discrepancy observed. We feel that the sensory zone of partial preservation should be reappraised in the same way, as it gives important information on the completeness of the somatic lesion.<sup>12</sup>

One limitation of the SkARV test is that it can only be used on the thoracic dermatomes from T3 to T12, whereas no reliable SkARV can be evoked on the upper legs corresponding to the lowest L1–L2 sympathetic segments. When a normal SkARV extended below the lesion down to T12, the sympathetic level of lesion could not be defined.

Finally, 81 consecutive patients were enrolled in our study, irrespective of the origin and of the duration of SCI, even though the majority of them were traumatic, and all were out of spinal shock. We agree it would be most interesting to use the SkARV in the early phase of the SCI and to repeat the test during the recovery period in association with the ASIA neurological examination. We propose that the SSR should be recorded at the same time to compare the results of both autonomic tests.

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