

Neuropathy Central Impingement Related CLIFF Peer Review

1. *Strength of evidence presented in CLIFF in modeling the characteristics and mission impact of this medical condition within the spaceflight environment?*

Score: 2

Grading Scale:

4 - *Confident*

3 - *Somewhat confident*

2 – *Neutral*

1 – *Somewhat unconfident*

0 – *Not confident*

2. How confident are you that these data accurately represent the spaceflight environment?	Tables 1, 2 Composite Incidence and Level of Confidence	Table 3, 4 BC/WC Loss of Crew and probability	Table 4 - Clinical Phase 1, 2 durations Table 5 – CP 2 Loss of Crew	Table 4 – RTDC % Table 6 – RTDC Loss of Crew	Table 4 – Loss of Crew Life % Table 7 – Loss of Crew Life, Loss of Crew	Table 8 – TI
Score	2	3	2	2	3	3

Comments and limitations:

1. General comments. This CLIFF is entitled “Neuropathy Central Impingement Related” and covers cervical radiculopathy and lumbar radiculopathy. Cervical radiculopathy is typically caused by an impingement or displacement of a cervical nerve root by a herniated or prolapsed disc or by bony irregularities associated with osteophytes or spondylosis. Lumbar radiculopathy is typically caused by an impingement or displacement of a lumbar nerve root by a herniated or prolapsed disc or by bony irregularities in the lumbar spine. Thoracic radiculopathy is rarely seen in comparison with the other spinal regions. Peripheral nerve impingement conditions such as carpal tunnel syndrome or sciatica are not included. There are no reported cases of this condition during spaceflight although differentiating central impingement syndromes from other causes of back pain may be problematic. The best case is considered to be neuropathy due to nerve impingement that resolves spontaneously (i.e. pinched nerve) or with symptomatic treatment (this excludes peripheral impingement syndromes). The worst case is persistent neuropathy due to impingement that requires nerve-modulating agents, steroids, or surgical intervention. (This excludes peripheral impingement syndromes)

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2. Incidence. Since there is no spaceflight data, the incidence values are based on analog military populations. Two studies by the same author, individually investigated cervical and lumbar radiculopathies. Since the two references reported on the same data source, they could be summed to calculate a composite incidence. The best case/worst case probabilities used terrestrial data demonstrating the probability that surgical intervention would be needed. Since there was a range of estimates in these studies, the best case/worst case probabilities were set at 54-74%/26-46%. The clinical phase durations, RTDC and Loss of crew life probabilities are supported by terrestrial evidence, and I am in agreement with their calculation. Loss of crew life probabilities were considered to be zero given the medical condition definition. The probability density curve that was derived appears to be a reasonable representation of the data presented.

3. Clinical phase data. I am in agreement with the clinical phase 1 duration entered in this CLIFF. This data was compiled by a team of expert clinicians, and I was involved in the discussions leading to the calculation of the clinical phase duration. CP2 was supported by terrestrial evidence.

4. Task impairment. The analysis was performed and reviewed by a separate team of expert clinicians. I am aware of the methods that were used but did not directly participate in the discussions.

5. Dependence on mission phase or duration of mission. This medical condition is not dependent on mission phase.

6. Limitations

- Since analog military studies were used, the average age of the population is less than the astronaut population. This could affect the incidence calculation as central impingement increases with age.
- Unloading of the spine in microgravity may reduce the incidence of central impingement. Thus, the incidence may be overestimated.
- Astronauts are well screened prior to spaceflight, so it is unlikely that cases of central impingement would arise *de novo* during a mission. Thus, the studies used may result in an overestimate of the incidence.

Reviewed by:

David C. Hilmers