Neuroimage signature in Post-Stroke Pain: A Systematic Review

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Background and Aims

Central post-stroke pain (CPSP), previously known as Dejerine & Roussy Syndrome, is a debilitating neurological condition, often refractory to treatment, that negatively affects patients' quality of life and hinders their rehabilitation. The pain associated with this condition is neuropathic in nature, affecting up to 12% of stroke survivors ,with its mechanism still not fully understood.

Our primary objective is to determine what areas of the brain, according to neuroimaging techniques, are most likely to trigger CPSP. Our secondary objectives are to determine whether there are secondary brain areas that when damaged can lead to CPSP and what type of pain is most prevalent in central-post stroke pain.

Materials and Methods

The team followed the methodological guidelines of Preferred Reporting Items for Systematic Reviews (PRISMA).
Our search yielded a total of 289 articles. Two researchers screened the initial articles based on pre-determined criteria. Data from all selected articles was extracted and categorized into a section related to brain imaging.
Risk of bias was assessed using the QUADAS-2 tool.

The protocol of this review is registered in PROSPERO, with the following registration number: CRD42023467331.

Results

- This systematic review identified fourteen studies that addressed CPSP and brain imaging;
- Our overall findings suggest that there is a direct correlation between CPSP and stroke along the terminal portion of the spinothalamic pathway and/or the thalamus, causing disturbances such as thermal sensation or sensory loss;
- Our presented evidence implies that there is a high prevalence of CPSP patients in lesions of the lateral portion on the thalamus;
- We have selected some studies with functional connectivity analysis, which reinforce the previously observed importance of the spinothalamic pathway in CPSP;
- There might be a functional connection to various structured such as the cingulate cortex, the operculum and the insula;
- Given that not all articles report specific stroke locations, or only thalamic strokes are considered, we have selected the studies that establish specific lesions that are associated with CPSP and present them in Table 1.

Percentage	Brain Regions
49%	Thalamus
8%	Basal ganglia
8%	Parietal cortex
7%	Medulla
7%	Pons
3%	Internal capsule

Table 1. Brain imaging studies (n=3). Most common brain lesions that lead up to CPSP.

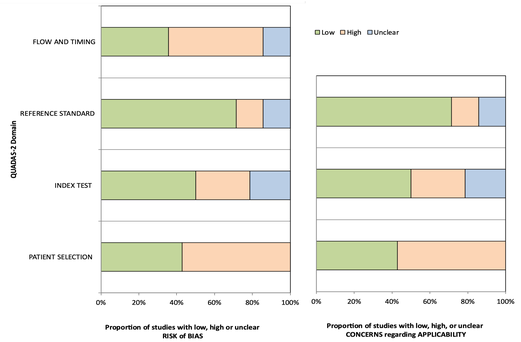

Chart 1. Risk of Bias Quality Assessment using the QUADAS-2 tool.

Bias Risk Assessment

As seen in Chart 1:

- More than half the studies rank "High" on patient selection bias;
- "Flow and Timing" are a concern for about half the selected studies.

Conclusion and Future Prospects

Despite the suggestive evidence, there are studies that appear to diverge from this consensus. This may be justified by the studies' limitations. One plausible reason for these results is that these studies did not have a control group and rank high on potential patient selection bias.

There is a limited number of articles on this topic with a high degree of heterogeneity, which prevents us from establishing definitive conclusions.

Publication bias established itself as an important limitation, as almost half the studies ranked "High" on patient selection bias;

Although this domain has been vastly enlarged with MRI and fMRI imaging, it is still in its infancy as there is a lack of multicenter, large scale double-blind research that can build a solid foundation for future reference, given this topic's relevance in public health improvement;

Future innovative neuroimaging studies could prove itself as a steppingstone in understanding CPSP's underlying mechanisms and developing treatment.

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References