Electrophysiological diaschisis following transient and permanent focal cerebral ischemia in rats

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Purpose:
We evaluated how ischemia in companion with or without reperfusion affects the somatosensory evoked potential (SSEP) in the ipsilateral and the contralateral hemispheres in 3 different models of transient (30 or 90 min occlusion) and permanent focal cerebral ischemia in rats.

Materials and Methods:
Twenty-two male Sprague–Dawley (SD) rats (250–300 g body weight) were allocated to three groups. After 30 min (Group I, n=8) or 90 min (Group II, n=8) transient middle cerebral artery (MCA) occlusion, or permanent thermodiathermy of the distal MCA (Group III, n=6), SSEP was recorded prior to and 7 days after reperfusion. The amplitude between the first positive (P1) and the first negative (N1) peaks and the P1 latency were analyzed. Data were analyzed using one-way analysis of variance (ANOVA) with Scheffe post hoc or paired t-test with p<0.05.

Results:
Infarct volume in the contralateral hemisphere in the transient, 30min (Group I), transient, 90min (Group II) and permanent model (Group III) is 8.7%, 27.5% and 15.3%, respectively, and comparison in either group is also significantly different. At 7 days post-injury, the amplitude recorded from the ischemic fore- and hindpaw cortical fields in Group I, II and III were significant decreases to the data recorded prior to MCA occlusion. The suppressed amplitude in each group is also significantly different from each other (p<0.001). Interestingly, the amplitude recorded from the contralateral hemisphere is also suppressed (p<0.05). Suppression in the contralateral hemisphere is different between the transient (30 and 90 min) and permanent models (p<0.001).

Conclusion:
The suppression in the contralateral hemisphere is also known as diaschisis. Given that permanent MCAO causes damage in the cortex leaving striatum intact while transient models affect both cortex and striatum, our results suggest that diaschisis likely results from cortical lesion, rather than striatal injury.

Reference