

The relation between pain duration and cortical thickness in patients with cervicogenic headache.

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Background and aims

Cervicogenic headache (CEH) is defined as a secondary headache and is frequent among patients subjected to a cervical trauma (1). Nociceptive and proprioceptive signals, conveyed by cervical afferent nerves, are considered to interfere with the lower trigeminal (2), vestibular and optokinetic system (3) connecting sensorimotor cortical areas including S1. In temporomandibular and other neck pain states increased cortical thickness is found in S1 and prefrontal cortex (4) and left precuneus (5). We aimed to explore potential cerebral changes in patients with chronic CEH compared with healthy controls.

Methods

Clinical features and structural MRI measures from 24 patients (Clinical Trial: NCT02908984) with a probable diagnosis of CEH according to the Antonaci's criteria (2) were compared with 24 gender and age-matched controls (HC). MRI scans were performed in a Siemens 3Tesla MRI and morphological analyses of cortical thickness and cerebral volumes were carried out with FreeSurfer (FS) version 6.0.

Results

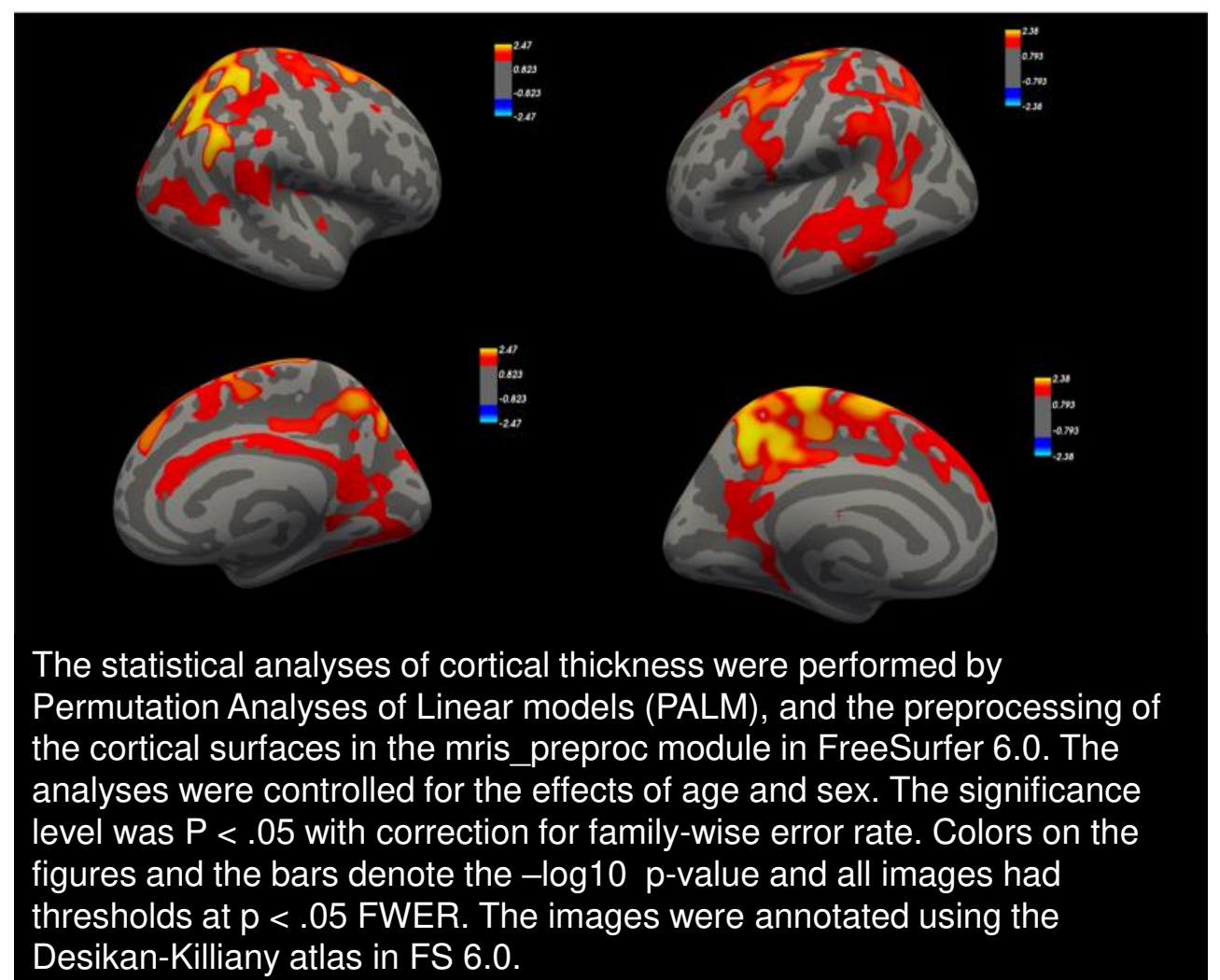
We found no significant differences between CEH patients and HCs in cerebral volumes. However, there was a significant association between duration of the headache condition and cortical thickness of both hemispheres (6), including the areas anterior and posterior to the central sulcus, corresponding to the sensorimotor area (M1/S1), parietal lobe, right cingulate cortex, and left temporal lobe.

Baseline characteristics	CEH patients N: 24 mean (SD)(range)	Healthy controls N: 27 mean (SD)(range)
Unilateral headache left side	16	-
Unilateral headache right side	8	-
Years since onset of headache	15 (9)(2-35)	-
Number of positive Antonaci's criteria	5,4 (0,6)(5-7)	-
Associated migraine (max 1 attach/month) (number (%))	7 (29)	-
Days with headache/month	15,7 (7,3)(7-31)	0,1 (0,4)(0-2)
Days with neck pain/month	20,5 (7,9)(7-31)	0 (0)(0)
Maximum headache intensity	7,0 (1,8)(4-10)	0,1 (0,6)(0-3)
Maximum neck pain intensity	6,1(1,4)(4-8)	0,0 (0,0)(0)

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Conclusions

The areas with increased cortical thickness are involved in pain modulation and sensorimotor regulation and could reflect an adaptive mechanism to increased nociceptive and proprioceptive stimuli, as suggested for other longstanding, intermittent pain conditions (7).



Inclusion criteria	Exclusion criteria
Minimum 2 year of longstanding neck pain and unilateral headache.	No other headache, but tension type headache or migraine max one time per month. No prophylactic medication for migraine.
Minimum one headache attack per week, pain intensity (NRS) of ≥ 4 (scale 0-10) and minimum 30 min duration.	Conditions interfering with the interpretation of the MRI-scans like hypertension, hypercholesterolemia, diabetes mellitus, heart disease, vascular conditions, epilepsy, and drug demanding dysmenorrhea.
Neck Disability Index score > 16 (0-100).	No other pain condition, either local nor generalized.
A likely cervicogenic headache; 5 out of Antonaci's 7 criteria.	Hopkins Symptom Checklist - 25 subscore for depressive symptoms < 2.2
Age 25-60 years	Contraindications to MRI, pregnancy and lactation.
MRI of the neck during the last 2 years without any sign of pathology listed in the exclusion criteria	A malignant/progressive, systemic and neurodegenerative disease, syringomyelia, radiculopathy, as well as ongoing infection in the cervical spine and previous ischemic stroke.
Understanding Norwegian language.	A past or present substance abuse or mental illness and in need for either medical or cognitive treatment.
	Ongoing insurance claim.

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