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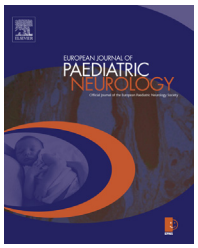

Case study

Alterations in the trapezius muscle in young patients with migraine – A pilot case series with MRI

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ABSTRACT

Background/purpose: Migraine is frequent in young adults and adolescents and often associated with neck muscle tension and pain. Common pathophysiological pathways, such as reciprocal cervico-trigeminal activation, are assumed. Tense areas within the neck muscles can be clinically observed many patients with migraine. The aim of this pilot case study was to visualize these tense areas via magnet resonance imaging (MRI).

Methods: Three young patients with migraine were examined by an experienced investigator. In all three patients tense areas in the trapezius muscles were palpated. These areas were marked by nitroglycerin capsules on the adjacent skin surface.

Results: The MRI showed focal signal alterations at the marked locations within the trapezius muscles.

Conclusion: Visualization of palpable tense areas by MRI may be usefully applied in the future to help elucidate the underlying pathophysiological processes of migraine.

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1. Introduction

The association of migraine and muscular pain is well known but not yet fully understood. This type of muscular pain typically originates in the occipital area and extends to the nuchal region and lower neck. Cervical and neck pain and tenderness are more often observed in patients with migraine than in controls (e.g.[1,2]). The underlying pathophysiological concept is summarized as the trigeminocervical complex (TCC).[3] This concept postulates that sensory, nociceptive afferences from the upper cervical radices as well as from the meninges converge in the caudal trigeminal nucleus within the brainstem.

Clinically, physical examination of a patient with migraine may be positive for neck muscle tension and muscle pain. This phenomenon can be further classified in a widely used construct called "myofascial trigger point" in which the trapezius muscle (upper part) represents a prominently involved anatomical structure.

Primary headache migraine plays a significant role in adolescent health care. Migraine has a minimum prevalence of 10% in adolescents[4] with significant impact on their everyday functioning and quality of life. In our population-based study conducted in Munich (details see Ref. [4]), adolescents were asked to fill out a questionnaire concerning headache as well as other health conditions and possible relevant life style factors. In a subsequent assessment, the study participants were asked to answer questions about muscle pain in the neck and/or shoulders and to mark affected muscle areas on a provided sketch showing a person's head and neck area.[5] Adolescents with muscle pain in the neck or shoulder had a more than two fold higher prevalence of migraine than adolescents without neck or shoulder pain, independent of other life style factors such as alcohol or caffeine intake, or physical activity.

The aim of this pilot case-study was to assess whether clinically identified tense areas of the trapezii muscles in young adults with migraine have a structural correlate in concomitant muscle imaging using structural magnetic resonance (MR) imaging.

2. Methods

This pilot case study was approved by the ethics committee of the Ludwig-Maximilians-University Munich. Criteria for inclusion were migraine classified according to the ICHD-3 beta with a history of at least five attacks,[6] and an age between 20 and 30 years.

Exclusion criteria were a neurological disorder other than migraine as well as contraindications for magnetic resonance imaging such as cardiac pacemakers or claustrophobia. Neurological diseases other than migraine were excluded by taking a full medical history and conducting a neurological examination.

Students from two universities in Munich were asked to participate in this pilot study. The first three students who signed up to participate and who met the inclusion criteria formed the study cohort of this pilot trial. Participants did not receive an honorarium or any other form of compensation. All participants provided written informed consent for participating in the study including the clinical examination and MR imaging.

We performed a thorough local physical examination to assess tense areas within the neck musculature. The trapezii muscles were chosen based on the reviewed literature[7,8] and our clinical experience in adolescents, which show this muscle to be most commonly affected in patients with migraine. In addition, the trapezius muscle can be readily examined and marked, e.g. by a nitroglycerin capsule taped to the skin directly adjacent to the clinically detected tense muscle area. The marker can be reliably visualized in MR imaging.

The existence of a tense muscle area was rated as positive by following the definition of so-called active myofascial trigger points, aMTrP: (1) a tender spot within a palpable taut band of muscle fibers within the trapezius muscle was palpable, (2) the palpation of this structure led to referred cranial pain in a typical location for the individual subject (referred pain, recognized pattern) and (3) pressure on/palpation between "pincer grip" of this structure resulted in a spontaneous defensive movement of the patient (jump sign).

The tense areas within the trapezius muscles were palpated by an experienced neurologist. Each tense area was confirmed by an experienced physiotherapist. A nitroglycerin capsule was attached to the skin adjacent to the tense muscular area.

Directly after this physical examination (maximum time delay 65 min), high-resolution MR imaging of the posterior cervico-cranial muscles was performed on a 3 T MR scanner (Magnetom Verio, Siemens Healthcare, Erlangen, Germany) with a spine array as well as surface coils. High resolution T2-weighted and T1-weighted sequences as well as short tau inversion recovery (STIR) sequences were acquired in a coronal and axial slice orientation. For sequence acquisition parameters, please refer to Table 1.

Table 1 – Sequence acquisition parameters for magnet resonance imaging.

	TR [ms]	TE [ms]	TI [ms]	Slice thickness [mm]	Field of view [mm^2]	Matrix
3D T2-weighted sequence	3460	55	0	0.9	172 × 172	320 × 320
Coronal T2-weighted sequence	3000	54	0	3	172 × 172	320 × 320
Coronal T1-weighted sequence	1060	9.6	0	3	162 × 162	320 × 256
Coronal STIR sequence	3300	31	220	3	150 × 150	256 × 192
Axial T2-weighted sequence	2810	69	0	2	180 × 180	384 × 384

TR: Time to Repeat, TE: Time to Echo; TI: Time to Inversion; STIR: short tau inversion recovery.