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ORAL COMMUNICATION

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Effects of amitriptyline and intra-oral device appliance on clinical and laser-evoked potentials features in chronic tension-type headache

Abstract In the present study, we examined clinical and laser-evoked potentials (LEP) features in two groups of chronic tension-type headache (CTTH) patients treated with two different approaches: intra-oral appliance of prosthesis, aiming to reduce muscular tenderness, and 10 mg daily amitriptyline. Eighteen patients suffering from CTTH (IHS, 2004) participated in the study. We performed a basal evaluation of clinical features and LEPs in all patients (T0) *vs*. 12 age- and sex-matched controls; successively, patients were randomly assigned to a two-month treatment by amitriptyline or intra-oral device appliance. The later LEPs, especially the P2 component, were significantly increased in amplitude in the CTTH group. Both the intra-oral prosthesis and amitriptyline significantly reduced headache frequency. Total Tenderness Score was significantly reduced in the group treated by the prosthesis. The amplitude of P2 response elicited by stimulation of pericranial zones showed a reduction after amitriptyline treatment. The results of this study may confirm that pericranial tenderness is primarily a phenomenon initiating a self-perpetuating circuit, favoured by central sensitisation at the level of the cortical nociceptive areas devoted to the attentive and emotive compounds of pain. Both the interventions at the peripheral and central levels may interrupt this reverberating circuit, improving the outcome of headache.

Key words Tension-type headache • Laser-evoked potentials oral prosthesis

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Introduction

Although tension-type headache (TTH) is the most common type of primary headache, there is little knowledge of its pathophysiology. In a recent study we examined features of laser-evoked potentials (LEPs) [1], as well as cutaneous heat-pain thresholds to laser stimulation, in relation to the tenderness of pericranial muscles in chronic TTH (CTTH), during a pain-free phase [2]. The amplitude of the N2Aa–P2 complex elicited by stimulation of the pericranial zone was greater in TTH patients than in controls; the amplitude increase was significantly associated with the Total Tenderness Score (TTS). Our findings suggested that pericranial tenderness may be a primary phenomenon that precedes headache, and it should be mediated by greater pain-specific hyper-vigilance at the cortical level. Multichannel recording of LEPs allows a topographic analysis to be performed and allows examination of all the LEPs' components; the earlier ones originating from the suprasylvian region (parietal operculum, SII), mainly devoted to the discriminative component of pain, and the later from the anterior cingulate cortex [3], subtending the attentive and emotive features of pain.

The first aim of the present study was to extend previous analysis of LEPs in CTTH, performing a multichannel

topographic analysis during the pain-free phase in comparison to a group of normal subjects, also correlating the LEP findings with the TTS, the main clinical features and the levels of anxiety and depression scored by the Zung (1965, 1976) scales [4, 5].

The second aim of the study was to examine the effect of a specific intervention at the peripheral level consisting of an intra-oral appliance device, *vs*. the central-acting treatment by amitriptyline, on the LEPs, the TTS and the main clinical features of two groups of CTTH patients.

Methods

Eighteen outpatients attending the Headache Centre of the Neurology Clinic of Bari University, who fulfilled the criteria of CTTH associated with pericranial muscles tenderness, according to International Headache Society (IHS) (code 2.3.1) [6], participated in the study. Twelve gender- and age-matched controls were selected, each without any history of headache or other cranio-facial pain according to IHS criteria. All patients who participated were instructed to come to the recording session free from pain and free of medication intake for at least the last 12 h.

All subjects underwent a recording session with 23 scalp electrodes, placed according to the 10–20 International System. The stimulus was a laser pulse generated by CO_2 laser; the dorsum of the hand and the cutaneous zones corresponding to pericranial muscles were stimulated. We performed a basal evaluation of LEPs, clinical features and TTS in all patients (T0); after this one patient was randomly allocated to the amitriptyline group for one who entered the intra-oral device group. It was an open-label randomised study. Patients assigned to the drug therapy took 10 mg amitriptyline daily in the evening. In the other group, a specially designed prosthesis, aiming to reduce pericranial tenderness, was applied, which was prepared at the Johannesburg Headache Clinic on the basis of previous experience of myofascial pain and headache (Fig. 1). The clinical and LEP evaluations were performed in basal conditions (T0) and after two months treatment (T1).

Results

Clinical features

The mean TTS was significantly higher in patients than controls (F=33.5, p<0.0001). The SAS and the SDS scores were also significantly different between the two groups (SAS: F=9.51, p<0.005; SDS: F=24.21, p<0.0001).

LEPs

The temporal N1 amplitude was not significantly different between patients and controls, for any of the sites of stimulation; the amplitude of the vertex N2A was significantly different when all the stimulation points, except for the temporal site, were considered; the vertex P2 amplitude significantly differentiated patients from controls when all the pericranial points were stimulated.

Effects of treatment

Clinical features

Both the oral appliance and amitriptyline significantly reduced the frequency of headache: the two-way ANOVA,

Fig. 1 An example of an oral prosthesis. The final shape and thickness were of course different for each patient

with the treatment and the condition as factors, showed a significant effect of the treatment (F=56.5, p<0.0001), which was not dissimilar between the two groups (treatment x condition: F=0.4, p=0.53). The TTS was significantly different between the two groups, for reduced values in the group treated by the prosthesis (ANOVA with treatment as factor F=17.11, p=0.0001).

LEPs

The amitriptyline provoked a reduction of the vertex P2 at the neck point, masseter and temporal sites. The oral device did not reduce the amplitude of LEPs at any stimulated point.

Conclusions

Taken together, the results of this study may confirm that pericranial tenderness seems to be a primary phenomenon in CTTH. It was correlated with a great activation of the cortical nociceptive areas subtending the emotions and the attention against pericranial painful stimuli. According to the Bendtsen hypothesis [7], pericranial tenderness may initiate a self-perpetuating circuit in which the prolonged nociceptive inputs from pericranial myofascial tissues cause central sensitisation at the level of the spinal dorsal horn/trigeminal nucleus, with supraspinal sensitisation and great activation of cortical nociceptive areas, which contribute to increase the pericranial muscle activity and the painful afferent stimuli. Though our therapeutic design was not exhaustive for the lack of placebo control, it may be suggested that intervention at both the peripheral and central levels may interrupt this reverberating circuit, improving the outcome of headache.

References

1. Bromm B, Treede RD (1984) Nerve fibre discharges, cerebral potentials and sensations induced by CO_2 laser stimulation. Hum Neurobiol 3:33–40
2. de Tommaso M, Libro G, Guido M, Sciruicchio V, Losito L, Puca F (2003) Heat pain thresholds and cerebral event-related potentials following painful CO_2 laser stimulation in chronic tension-type headache. Pain 104:111–119
3. Garcia-Larrea L, Frot M, Valeriani M (2003) Brain generators of laser-evoked potentials: from dipoles to functional significance. Neurophysiol Clin 33:279–292
4. Zung WWK (1965) A self-rating depression scale. Arch Gen Psychiatry 12: 63–70
5. Zung WWK (1976) SAS, Self-Rating Anxiety Scale. In: Guy W (ed) ECDEU Assessment Manual for Psychopharmacology, revised edn. Rockville, pp 337–340
6. Headache Classification Subcommittee of the International Headache Society (2004) The International Classification of Headache Disorders, 2nd Edn. Cephalalgia 24[Suppl 1]:1–159
7. Bendtsen L (2000) Central sensitization in tension-type headache – possible pathophysiological mechanisms. Cephalalgia 20:486–508