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ORIGINAL ARTICLE/ARTICLE ORIGINAL

Long-term EEG in children

L'EEG prolongé de l'enfant



A. Montavont^{a,b,*}, A. Kaminska^{c,d,e}, C. Soufflet^{c,d,e}, D. Taussig^f

^a Service épilepsie, sommeil et explorations fonctionnelles neuropédiatriques, hôpital Femme–Mère–Enfant, 59, boulevard Pinel, 69677 Lyon, France

^b Service de neurologie fonctionnelle et d'épileptologie, hôpital Neurologique P.-Wertheimer, 59, boulevard Pinel, 69677 Lyon, France

^c Laboratoire de neurophysiologie clinique, hôpital Necker–Enfants-Malades, AP–HP, 149, rue de Sèvres, 75015 Paris, France

^d Inserm, U1129, 75015 Paris, France

^e Université Paris-Descartes, CEA, Neurospin, 91191 Gif-sur-Yvette cedex, France

^f Service de neurochirurgie pédiatrique, Fondation Rothschild, 25-29, rue Manin, 75019 Paris, France

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Summary Long-term video-EEG corresponds to a recording ranging from 1 to 24 h or even longer. It is indicated in the following situations: diagnosis of epileptic syndromes or unclassified epilepsy, pre-surgical evaluation for drug-resistant epilepsy, follow-up of epilepsy or in cases of paroxysmal symptoms whose etiology remains uncertain. There are some specificities related to paediatric care: a dedicated pediatric unit; continuous monitoring covering at least a full 24-hour period, especially in the context of pre-surgical evaluation; the requirement of presence by the parents, technician or nurse; and stronger attachment of electrodes (cup electrodes), the number of which is adapted to the age of the child. The chosen duration of the monitoring also depends on the frequency of seizures or paroxysmal events. The polygraphy must be adapted to the type and topography of movements. It is essential to have at least an electrocardiography (ECG) channel, respiratory sensor and electromyography (EMG) on both deltoids. There is no age limit for performing long-term video-EEG even in newborns and infants; nevertheless because of scalp fragility, strict surveillance of the baby's skin condition is required. In the specific context

Abbreviations: EMG, Electromyography; IPS, Intermittent photic stimulation; CSWS, Continuous spike-waves during slow-wave sleep syndrome; ECG, Electrocardiography; TSC, Tuberous sclerosis complex; PMG, Polymicrogyria.

* Corresponding author. Service épilepsie, sommeil et explorations fonctionnelles neuropédiatriques, hôpital Femme–Mère–Enfant, 59, boulevard Pinel, 69677 Lyon, France. Tel.: +33 6 50 58 71 33.

E-mail address: alexandra.montavont@chu-lyon.fr (A. Montavont).

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of pre-surgical evaluation, long-term video-EEG must record all types of seizures observed in the child. This monitoring is essential in order to develop hypotheses regarding the seizure onset zone, based on electroclinical correlations, which should be adapted to the child's age and the psychomotor development.

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Résumé La vidéo-EEG avec polygraphie de longue durée correspond à un enregistrement allant d'une heure à 24 heures ou plus. Il est indiqué dans les situations suivantes : diagnostic syndromique d'une épilepsie débutante ou non classée, bilan pré-chirurgical d'une épilepsie pharmacorésistante, suivi de la maladie épileptique ou en cas de manifestations paroxysmiques dont l'origine épileptique n'est pas certaine. Il existe certaines particularités liées à l'enfant : milieu hospitalier spécialisé pédiatrique, enregistrement continu couvrant le nyctémère, notamment dans le cadre du bilan pré-chirurgical, présence indispensable des parents et d'un technicien ou d'une IDE, installation plus solide des électrodes (électrodes cupules) dont le nombre sera adapté à l'âge, et durée d'enregistrement à adapter en fonction de l'âge de l'enfant et de la fréquence des crises ou des manifestations paroxysmiques. La polygraphie doit être adaptée au type et à la topographie des mouvements. Il est indispensable de bénéficier au minimum de l'ECG, la respiration et l'EMG des deux deltoïdes. Il n'y a pas de limite d'âge pour la réalisation d'une vidéo-EEG prolongée mais chez le nouveau-né et le nourrisson, la fragilité plus grande du cuir chevelu implique une surveillance stricte de l'état cutané. Dans le cadre particulier du bilan pré-chirurgical, la vidéo-EEG de longue durée aura pour objectif d'enregistrer tous les types de crises présentés par l'enfant. Cet enregistrement est incontournable afin d'émettre une ou plusieurs hypothèses basées sur les corrélations électro-cliniques sur la zone de départ des crises qui devront être adaptées à l'âge de l'enfant et à son degré de développement psychomoteur.

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Summary of guidelines

Long-term video-EEG recording (LTVER) in children follows the same recommendations as adults regarding definition, duration and rules for writing the EEG report (see guidelines on "Long-term EEG in adults"). Technical conditions, environment and indications are adapted to pediatrics.

LTVER can be performed when standard duration video-EEG recording is insufficient to determine the syndromic diagnosis for early epileptic symptoms or non-classified epilepsy in children.

Duration of the recording depends on the frequency of seizures: it can last a few hours, ideally up to 24–48 h for epilepsy of neonatal onset, West syndrome, myoclonic epilepsy in infancy or myoclonic astatic epilepsy.

A complete night-time sleep recording is especially useful when frontal lobe epilepsy or Lennox-Gastaut syndrome is suspected, or in the context of pre-surgical exploration.

LTVER can also be indicated in patient follow-up (evaluating treatment efficacy, reassessing the diagnosis in case of changes of seizure semiology or interictal EEG abnormalities), but also in the presence of paroxysmal events when the epileptic origin is uncertain, in epileptic or non-epileptic children.

Seizures or events should be frequent enough to have sufficient likelihood of capture during a 24-hour video-EEG. Video recordings longer than 24–48 h remain rare, except in pre-surgical evaluation.

Long-term video-EEG recording requires a sturdier electrode set-up, and hospitalization in a specialized unit. We

recommend using cup electrodes maintained by gauze pads soaked in water-soluble conductive paste. The electrodes are kept in place by a lightweight net bandage covered first by a non-adhesive bandage and finally by a second adhesive bandage to ensure proper fixation.

The polygraphy must be adapted to the type and topography of movements; EMG channels can be increased, the minimum being ECG, respiration and EMG of both deltoids.

There is no age limit for performing long-term video-EEG recording but in newborns or infants the scalp is more fragile and requires close monitoring of skin condition.

The 24-hour presence of one of the parents or a legal guardian is necessary (if feasible the presence of a technician during working hours is also preferable); they keep the child occupied, make sure that electrodes and the head cap stay in place, and maintain the child in the camera field of view, especially during seizures.

Parents note behavioral events and/or seizures; interaction with the child during a seizure and clinical examination are preferable in order to better assess the nature of the seizures.

Full-length guidelines

Long-term video-EEG in children

Long-term video-EEG (from 1 h to 24 h or more) has been developed in the context of epilepsy surgery (see specific annex), but may also be indicated when standard video-EEG

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