



Case report

Isolated nostril myoclonus: A novel ictal presentation in structural generalised epilepsy

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ABSTRACT

Introduction: Perioral myoclonus (POM) is a rare seizure manifestation which may present in either idiopathic or structural epilepsies. There has been little description of the rarer ictal manifestations in POM in generalised epilepsy. It is important during Electroencephalography (EEG) testing to carefully monitor clinical change during inter-ictal bursts, as this condition, demonstrated in this case, can exhibit extremely subtle seizure semiology which can allude typical clinical examination.

Case: Presented is a four-year-old boy with a complex medical history, referred following episodes up to six times per day consisting of perioral myoclonus at a rate of ~ 3 p/s alongside behavioural arrest lasting up to thirty seconds. Electroencephalography (EEG) recording captured nine seizures within a twenty-five-minute period, where only one seizure was of his stereotyped semiology. Additional seizures commonly adopted a novel semiology of isolated nostril (“flaring”) myoclonus, on some occasions with concomitant head bobbing. Surface EMG and high resolution zoomed video revealed time-locked myoclonus to the generalised spike and wave discharges seen in on EEG.

Significance: The findings demonstrate a novel epileptic seizure manifestation of nostril myoclonus, in which detailed electroencephalographic and video correlation was essential to minimise risk of underestimating seizure frequency in this rare and complex epilepsy disorder.

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1. Background

Perioral myoclonus (POM) is a rare seizure semiology which is most typically associated with an idiopathic generalised epilepsy where individuals are developmentally normal (Bilgic et al., 2001). The seizure semiology of POM typically involves short, isolated, repetitive and localised rhythmic jerks of the lower facial region, which most commonly includes the lips and jaw, often extending superiorly to the eyelids. However, POM in structural or metabolic (“symptomatic”) epilepsies are very rare and may be of generalised or focal origin (Mayer et al., 2006). Such cases are not well publicised within the literature and therefore the spectrum of ictal and interictal electroencephalographic (EEG) findings are not well differentiated, which may lead to less sensi-

tive diagnoses or underestimation of seizure burden in these patient cohorts.

Some rare generalised epilepsies may therefore, as presented below, manifest with very subtle features such as extremely localised myoclonus of the nostrils as an ictal semiology. It is proposed that isolated nostril myoclonus is a generalised seizure phenomenon in POM, even where clinical semiology appears focal, which we presume forms the basis of a structurally derived generalised epilepsy. Described is a case of a young male who was referred for suspected POM, but during polygraphic EEG recording was found to have several episodes of clinically subtle nostril “flaring” myoclonus, previously unwitnessed by the parents or referring clinician. With rising complexities of patient co-morbidity, it is essential that novel manifestations of disease are disseminated to minimise late or missed diagnoses. This is the first known case to document isolated nostril myoclonus as an epileptic seizure phenomenon, which the EEG allowed more accurate identification of seizure burden in this child.

Abbreviations: EEG, electroencephalography; MRI, Magnetic Resonance Imaging; EMG, electromyography.

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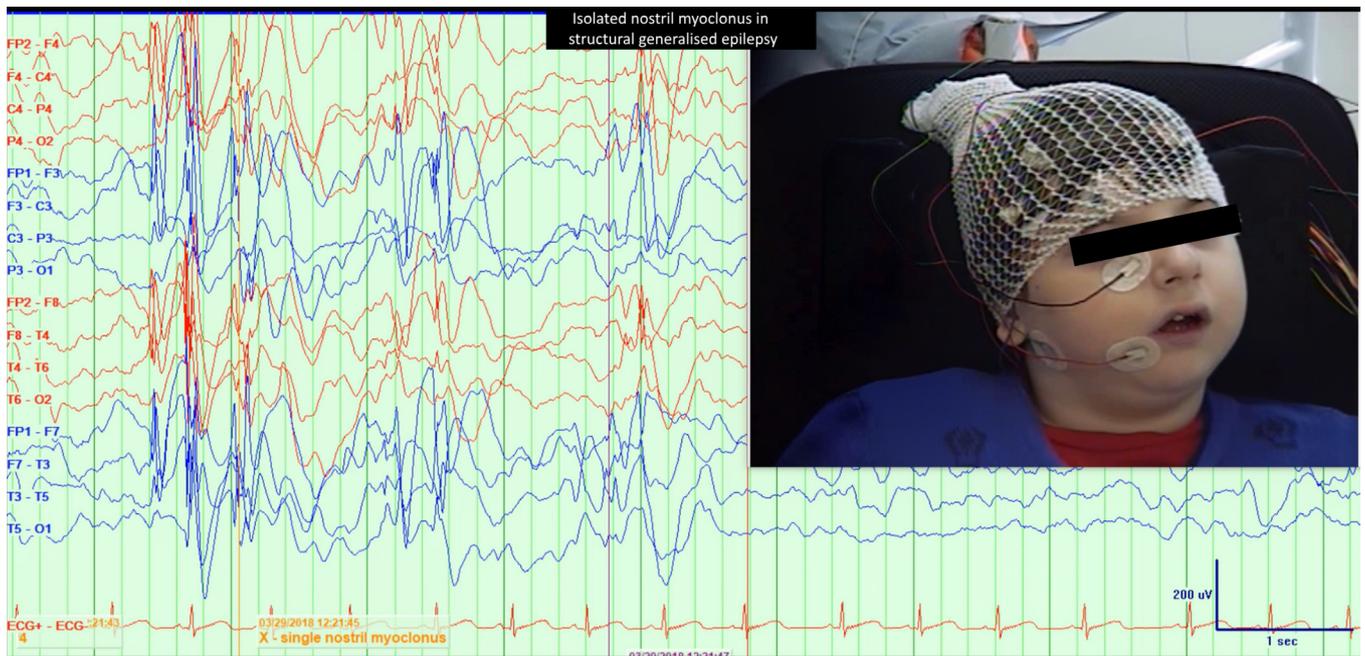
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2. Case presentation

Presented is a four-year-old boy with a complex medical history which included prematurity of 28/40 weeks, global developmental delay, myelopathy of uncertain aetiology, exotropic strabismus and a retracted chin. The patient was referred for EEG testing following an approximate six-month history of episodes consisting of myoclonus affecting the neck, mandible, peri-oral region and nose, which were often associated with behavioural arrest and laboured breathing effort. These events were most frequent in pre- and post-

EEG revealed a burst of high amplitude 3.5 Hz spike and wave discharges lasting 20 s, slowing to 2.7 Hz over this period. The discharges were bisynchronous and symmetrical, however evolved to show doublet spikes over the frontal regions with a right more than left emphasis during the seizure. Clinically, the patient was observed to have the semiology of POM, consisting of myoclonus affecting his upper lip, jaw, nostrils and lower facial regions with a slight right hemifacial bias, time-locked to the EMG discharges. The patient remained unresponsive throughout the seizure but became distressed post-ictally before returning to sleep.



Video 1. Demonstrated within this video supplement are EEG with video of eight representative seizures captured during the standard routine EEG. Seizures '2' and '3' demonstrate that typical video resolution and capture size do not demonstrate any overt clinical changes during these electrographic changes. Seizure '4' demonstrates zoomed video (with EMG electrodes now attached) of singular nostril myoclonus associated with transient doublet or triplet bursts of generalised spike-wave discharges. Seizures '5', '6' and '7' also demonstrate this with the benefit of zoomed video and time-locked nostril flares with each complex, though with different electrophysiological discharge patterns. Seizure '8' demonstrates a 7–8 s burst of generalised spike-wave activity maximal over the anterior regions with frequent nostril flaring, occasional truncal myoclonus and increased respiratory effort (*demonstrated in a referential and bipolar montage*). Seizure '9' demonstrates a very similar prolonged burst of generalised spike-wave activity but with little other semiological features other than nostril myoclonus which was captured with zoomed video and atypically placed EMG electrodes.

dormitum states, being witnessed around six times per day. Magnetic Resonance Imaging revealed diffuse delayed myelination for age.

A standard EEG was recorded including spontaneous sleep, with additional surface Electromyogram (EMG) electrodes applied over the nasalis/levator labii superioris muscles (placed over the lateral nasal bone), depressor anguli oris/platysma muscles (placed under the infero-lateral aspect of the oral commissure) and over the masseter muscle (placed over the angle of the mandible), which are illustrated as Aux. 6, Aux. 5 and Aux. 7 respectively in Video 1. The background resting record showed diffuse excessive slowing for age, with a background dominated of medium amplitude theta/delta frequencies and with absence of a posterior basic rhythm on eye closure. Interspersed were frequent sharp waves, sharp and slow waves, spikes, and poly-spike and waves discharges which were noted with a generalised topography but at times with alternating lateralisation over the temporal regions. The patient was not found to be photosensitive to any flash frequencies (1–50 flashes p/s). Spontaneous sleep was recorded which soon revealed a representative seizure during the drowsy state. The

Following this single representative seizure, an additional eight seizures were seen during the pre-dormitum period which were very subtle clinically and not previously noted by the patients parents. These seizures were more heterogenous in their electrographic patterns but typically consisted of between 1 and 8 s of generalised spike or doublet spike-wave discharges maximal over the anterior regions (Fig. 1). Most interestingly, detailed examination with surface EMG and high-resolution video revealed the subtle clinical correlate to these previously assumed interictal discharges. The semiology in most instances took the form of isolated myoclonus (“flaring”) of the nostrils, which was time-locked to the electrical spike discharges (Fig. 1). Furthermore, on two or three occasions isolated high amplitude spike or doublet spike-wave discharges revealed single flares of the nostrils (Fig. 2). On a small number of occasions, the patient was noted to have additional peri-oral clinical manifestations but with a far smaller myotomic distribution than the clinically overt events. Examples of these seizures can be seen in Video 1.

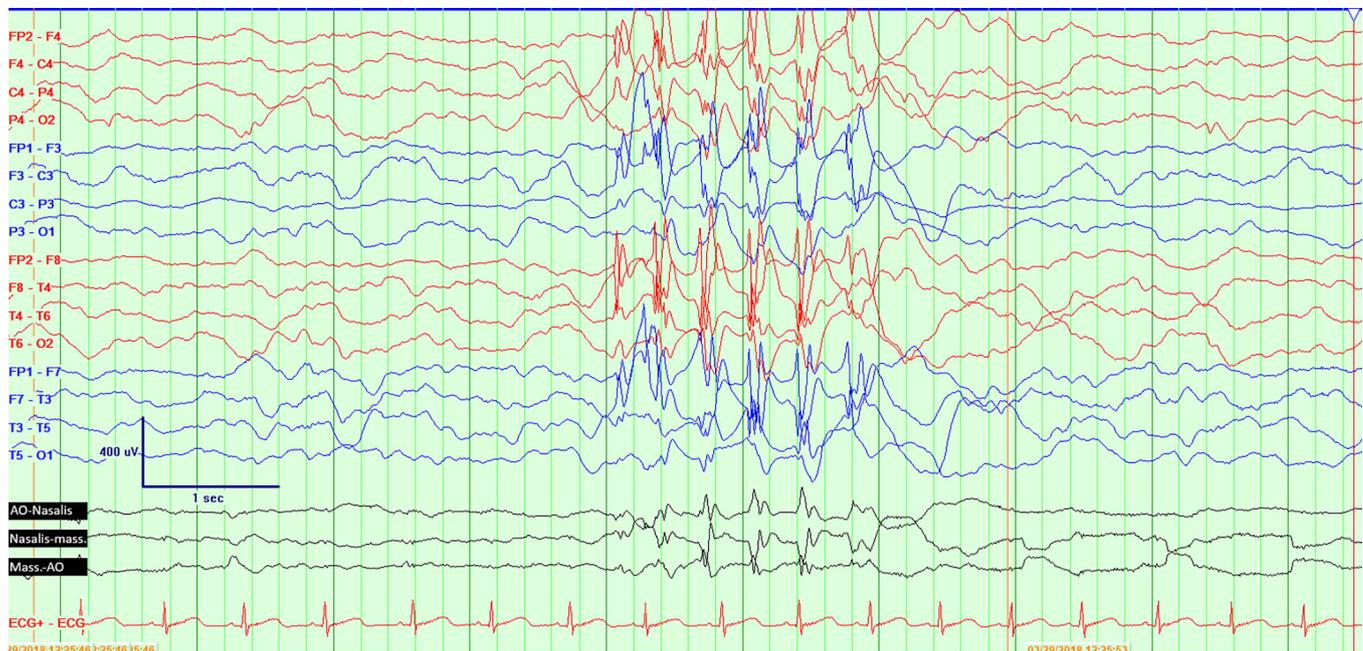


Fig. 1. Seizure discharge with isolated nostril myoclonus. The EEG recorded in a bipolar montage (red indicates right hemisphere, blue indicates left hemisphere). Please note reduced gain settings as indicated by the gain measure in the bottom left. The EEG reveals high amplitude anteriorly dominant spike-wave discharges without clear lateralisation. Aux 5–7 channels seen inferiorly are EMG channels, revealing a time-locked EMG activation synchronous with electrocortical discharges. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

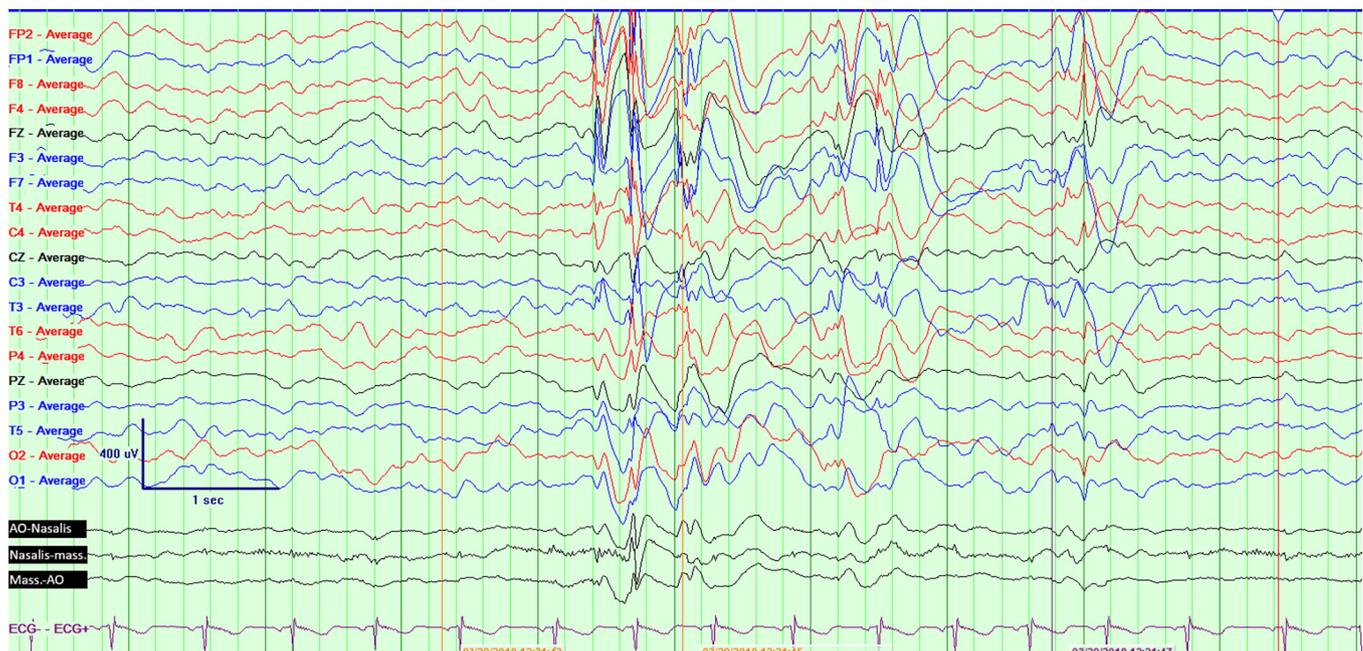


Fig. 2. Isolated spike-wave discharge with a single isolated nostril myoclonus. The EEG recorded in an average montage (red indicates right hemisphere, blue indicates L hemisphere, black indicates midline). Please note reduced gain and timebase settings as indicated by the gain measure in the bottom left. As is seen from this figure, the independent spike-wave discharge maximal anteriorly correlates with isolated EMG activation indicating nostril myoclonus. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

3. Investigations

Following the initial EEG the patient was begun on an escalating dose of Sodium Valproate where a marked reduction in seizure frequency was noted within the first month. Breakthroughs of nostril myoclonus and perioral myoclonus with absences were then increasingly noted until Sodium Valproate was titrated and seizure

control was achieved well within six months before the patient was lost to follow-up.

4. Discussion

Peri-oral myoclonus, whilst uncommon, is a recognised ictal semiology in both the symptomatic and idiopathic generalised

epilepsies (Mayer et al., 2006). It has been demonstrated in this case that seemingly interictal discharges may masquerade as interictal EEG changes in the absence of overt clinical changes. However the rare semiology revealed in this case of isolated nostril myoclonus is an otherwise undocumented seizure manifestation and warrants careful clinical examination to separate this ictal-interictal continuum.

This patients' primary seizure type consisted of typical POM where rhythmic contraction of the perioral musculature, particularly the Orbicularis Oris muscle, was seen. Whilst there have been documented cases of Perioral Myoclonus with Absences (PMA) in otherwise healthy participants, the patients clinical history of developmental delay, prematurity and delayed brain myelination makes a diagnosis of idiopathic generalised epilepsy such as PMA very unlikely (Bilgic et al., 2001). There are a small number of cases where a POM has been seen in the context of reflex epilepsy, however as expected these cases demonstrate a shorter duration myoclonus which, whilst may be more subtle clinically, is almost exclusively provoked through reading exercises which was not seen in this patient (Hallett, 1985; Wolf and Inoue, 2012). Whilst we perhaps cannot exclude this possibility as the patients disability prevented this assessment, other publications have documented that focal EEG abnormalities are far more common in perioral reflex myoclonus than in generalised epilepsies, making this an unlikely diagnosis (Mayer et al., 2006). Therefore, the true aetiology of this patients electroclinical syndrome remains uncertain, although generalised spike-wave discharges within the EEG strongly favour a symptomatic/structural generalised epilepsy.

Cortico-reticular epilepsy is likely to hold a fundamental pathological role in this patients seizure generation. It has been long known that bilaterally synchronous spike-wave discharges are likely a result of the 'generalised cortico-reticular epilepsies', of which the organic ("structural") forms can show diffuse cortical and subcortical grey matter abnormalities (Gloor, 1968). Certainly, whilst reticular reflex myoclonus is most common in the pre-dormitum periods, it also demonstrates a wider myoclonic distribution so is very unlikely to be seen in isolation as in this patient, which also often spares the facial nerve similar to the startle reflex (Rektor et al., 1991). The theory of cortico-thalamic networks is a more plausible explanation for driving epileptogenic generalised bisynchronous spike-wave phenomenon in both structural and genetic epilepsies. The clinical efferent semiology, however, may be ill-formed with respect to widespread bisynchronous discharges seen in cortico-thalamic or cortico-reticular epilepsies. However, interestingly some rodent models have demonstrated during spontaneous absence seizures, that cortical associations demonstrate a consistent foci in the perioral somatosensory cortex (Meeren et al., 2002). It is thought that this focus may initiate a cyclic behaviour thereafter, where the cortex and thalamus amplify and maintain the rhythmic discharge as the 'cortical focus theory' (Meeren et al., 2005). It is possible, therefore, that this patients ictal discharges are a result of generalised dysfunction in the thalamo-cortical circuitry which manifest as isolated perioral myoclonus, which correlates electrically to myoclonus synchronous with spike-discharges.

A second possible consideration would be that the descending efferent excitatory volley to the peri-oral musculature was not of a sufficient size to elicit a neuronal or neuromuscular cascade of significant size to produce simultaneous activation of all innervated muscles within the peri-oral region, due to the patients myelopathy. The semiology of the patients ictal POM was variable, between isolated nostril myoclonus, to include myoclonus of the mandible, perioral region and eyes. The perioral region is predominantly innervated by the facial cranial nerve, with the transverse segment of nasalis muscle responsible for nostril closure whereas the alar segment responsible for nostrils opening, which is seen

in this patient. It is somewhat peculiar that there are regional variants in myoclonus around the facial muscle innervation, despite otherwise electrographic similarities ictally. One can only, therefore, speculate that there may be descending variants in local excitability or regional differences in excitability which elicit the focal or more diffuse POM seen in this patient.

The use of polygraphic EEG in the evaluation of POM in this patient has allowed some more detailed delineation of the temporal characteristics in this complex patient and more accurately identified the patients true seizure burden. Such simple EEG modifications to include polygraphic analysis and high quality zoomed video clearly encourages its use in paediatric EEG testing to delineate the ictal-interictal continuum. Thus it is recommended in all cases where generalised paroxysms occur that very careful clinical examination is performed to characterise these accurately as ictal or interictal findings. Whilst high resolution video enabled correlation between discharges and clinical change, EMG correlates allow sub-clinical temporal information which provide valuable information regarding seizure semiology. Without careful clinical and electrographic examination in these complex patient groups and rare seizure types, the appreciation for the true seizure burden and semiology of subtle seizure types may not be identified, which would in-turn cause potential difficulty in optimum anti-epileptic prophylactic management.

5. Conclusion

Nostril myoclonus is a very rare and subtle seizure semiology being reported for the first time as part of a generalised epilepsy presenting with POM, most likely from a structural aetiology. This has demonstrated that seemingly interictal discharges in these patients should have careful and scrutinising examination during the EEG with polygraphic channels to differentiate interictal and ictal phenomenon in order to truly identify seizure burden in these complex patients. Such early identification can potentially allow more optimum management of seizure burden and anti-epileptic prophylaxis in these patients.

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Conflict of interest

None.

Author agreements

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