Effects of alcohol on myoclonus and somatosensory evoked potentials in dyssynergia cerebellaris myoclonica

Chin-Song Lu, Nai-Shin Chu

Abstract
Three brothers with dyssynergia cerebellaris myoclonica received alcohol to study the correlation between improvement of myoclonus and alteration in somatosensory evoked potentials (SEPs). Alcohol considerably improved myoclonus for about six hours in two patients (cases 1 and 2) but had only a mild effect in one (case 3). All three patients had giant cortical SEPs. The amplitudes of median N20-P25 and P25-N35 components and tibial N30-P40 and P40-N50 components were considerably decreased after alcohol ingestion in two patients (cases 1 and 2) but unchanged or slightly decreased in one (case 3). The peak latencies of those components were not affected by alcohol. There was thus a good correlation between the suppression of myoclonus and the decrease in giant SEP amplitude.

Ramsay Hunt had observed a temporary relief of action myoclonus by alcohol in one (case 1) of six patients with dyssynergia cerebellaris myoclonica (DCM), also known as Ramsay Hunt syndrome. He stated "they were usually diminished by the use of alcohol, and the patient sometimes took this means of relieving their severity". In 1963, Gilbert et al. also mentioned "his tremor was worsened by nervousness and anxiety but alleviated by drinking alcohol" in one (case 1) of four patients with familial myoclonus and ataxia. Nevertheless, this alcoholic remedy has rarely been reported subsequently. There was no further explanation concerning the electrophysiological mechanism underlying the effect of alcohol on myoclonus.

In 1947 Dawson first described in a myoclonic patient a pathological enhancement of cortical responses following sensory stimulation of the limbs. In cortical reflex myoclonus, myoclonic jerking is often evoked by the same stimulus that produces the giant somatosensory evoked potentials (SEPs). The size of the SEP may sometimes dissociate with reflex myoclonus, but it is generally correlated with the intensity of myoclonic activities. When therapeutic control of the myoclonus is effective there is also a reduction in the amplitude of giant SEPs. Although the enhanced cortical SEP is well documented in patients with DCM, neurophysiological study on the influence of alcohol on the enlarged SEPs, which seem to relate to the severity of myoclonus, has not been reported.

On reviewing eight consecutive patients with DCM, we were surprised to find three brothers who reported that their myoclonus was improved by alcohol. To confirm their observation and to elucidate the possible site of the effect of alcohol, we studied the improvement of myoclonus and the alteration in SEPs after alcohol in these three patients.

Subjects
The subjects were three brothers aged 28 (case 1), 26 (case 2) and 24 years (case 3), respectively. The age of onset of symptoms was around 16 years. They presented with marked action myoclonus, mild cerebellar ataxia and occasional generalised seizures. The past history including birth and development was normal in all three. The parents were non-consanguineous.

The action myoclonus was the most distressing symptom which appeared initially in the lower limbs and progressively involved the upper limbs and trunk. Voluntary movements of the limbs precipitated a salvo of focal or generalised muscle jerking. In addition, they had myoclonus of the face and tongue during speech. There was rare myoclonus at complete rest, but jerks could be induced by a pinprick or tactile stimulation. Occasional falling attacks without loss of consciousness could be provoked by unexpected loud noise. They walked with a wide-based gait and moved carefully along the wall for fear of falling.

Rarely, they also experienced generalised convulsions, which occurred most often in the early morning while asleep. There were about eight seizures in patients 2 and 3 and only one in patient 1 since the onset of their symptoms. After a seizure, the myoclonus was less evident for several hours.

On examination, they were alert and were mentally normal. There was no abnormality except myoclonus, particularly action myoclonus, and slight cerebellar ataxia. The possible existence of limb dysmetria, however, was difficult to evaluate because of the accompanying severe action myoclonus. Laboratory investigations were all normal including haematology, erythrocyte sedimentation rate, electrolytes, liver and thyroid function tests, lactate, pyruvate, serology for syphilis, folate, copper and ceruloplasmin, lysosomal enzyme tests in leukocyte, CSF, immunoelc-
phoresis, nerve conduction velocity, electro-
myography, electroencephalography, CT of
the brain, brain stem auditory evoked poten-
tial, pattern-reversal visual evoked potential,
and muscle biopsy.

The action myoclonus was considerably
improved by combined treatment with clona-
zapem 1-5 mg, piracetam 9 g and sodium va-
proate 600 mg daily. They still could not
execute fine movements such as writing and
holding chopsticks without jerking. However,
if they took several big gulps of alcohol,
usually about 200 ml, their myoclonus disap-
peared dramatically for several hours, par-
ticularly in two patients (cases 1 and 2).

**Methods**

SEP recording was conducted in a quiet and
semi-darkened room with the subject in a
supine position. Room temperature was kept
constant at 24°C by central air conditioning.
The median nerve was stimulated with a
biopolar disc electrode at the wrist with the
cathode placed square to the stimulation
electrode. Electric shocks delivered at 2/s
were square pulses of 0.2 ms duration with
the intensity adjusted to produce minimal twitch of
the thumb. The posterior tibial nerve was
stimulated at the ankle with the intensity
adjusted to elicit minimal flexion of the toes.
Median cortical SEPs were recorded between
an electrode at Fz and an electrode over the
scalp 2 cm posterior to C3 or C4 contralateral
to the side of nerve stimulation. Tibial cortical
SEPs were recorded between electrodes at Fz and
at the midline 2 cm posterior to Cz. Ground electrode was situated approximately
5 cm above the stimulation site. Electrode
impedance was kept below 5 K ohms. The
evoked responses were amplified with a band-
pass of 20–3 K Hz and summed over 200–300
responses. At least two averages were obtained
to ensure reproducibility.

All medications including clonazepam,
piracetam and sodium valproate were discon-
tinued for three days. A baseline median and
tibal SEP recordings were first performed. The
patients were then asked to drink 300 ml of
brandy (41%) within 30 minutes. SEPs from
the median and tibal nerve stimulation were
recorded within the following hour. The dura-
tion of the effect of alcohol on myoclonus was
also recorded. The latency and amplitude of
the median and tibal cortical SEPs were
measured. Paired t test was used to determine
the statistical differences.

**Results**

Before drinking alcohol, the patients had great
difficulty in walking or holding a cup because of
the severe action myoclonus. About 20 minutes
after alcohol ingestion, the action myoclonus
disappeared in patients 1 and 2 who could then
walk or pick up the cup easily. But in patient 3,
the myoclonus was only mildly improved.
Patient 1 complained of mild dizziness and
nausea after he had finished drinking. None of
the patients became intoxicated. They were
alert throughout the recordings. The alcohol
suppression of action myoclonus lasted six
hours in patient 1, and 5-5 hours in patient 2.
Although the action myoclonus stopped during
this period, mild dysmetria was observed in
finger-nose-finger tests. They still failed to walk
heel-to-toe along a straight line.

All three patients had giant median and tibal
cortical SEPs before drinking. However, the
peak latencies were normal. The normative
data from our laboratory showed that the mean
(SD) amplitude of median N20–P25 and P25–
N35 was respectively 2.36 (0.81) uV and 1.44
(0.85) uV. The mean (SD) amplitude of tibal
N30–P40 and P40–N50 was respectively 1.26
(0.74) uV and 1.41 (0.76) uV.† There was a
marked reduction in the amplitudes of the
median N20–P25 and P25–N35 and tibal
N30–P40 and P40–N50 components in patient
1 (fig) and patient 2 at one hour after drinking,
but these amplitudes were only slightly
decreased in patient 3. The SEP cortical com-
ponents later than median N35 and tibal N50
were also suppressed by alcohol in patients 1
and 2 but not in patient 3. The table summar-
ises the reduction of median and tibal cortical
SEPs at one hour after alcohol ingestion. Both
median and tibal cortical SEPs were similarly
affected by alcohol. The reduction in the
amplitude are statistically greater if the data
from patients 1 and 2 are used. The cortical
SEPs of patient 3 were unchanged or only

![Figure](image-url) Median and tibal cortical SEPs before (pre) and one hour after (post) alcohol ingestion in patient 1. The stimulation was at the beginning of the tracings. The upper calibration for median SEPs and the lower calibration for tibal SEPs.
Effects of alcohol on myoclonus and somatosensory evoked potentials in dys-synergia cerebellaris myoclonica

Table Effect of alcohol on the amplitude (uV) of median and tibial cortical SEPs

<table>
<thead>
<tr>
<th>Patient</th>
<th>Median SEP</th>
<th>Tibial SEP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N20-P25</td>
<td>N30-P40</td>
</tr>
<tr>
<td></td>
<td>Pre-</td>
<td>Post-</td>
</tr>
<tr>
<td>1</td>
<td>L 27.9</td>
<td>16.1</td>
</tr>
<tr>
<td></td>
<td>R 22.8</td>
<td>13.9</td>
</tr>
<tr>
<td>2</td>
<td>L 16.4</td>
<td>8.6</td>
</tr>
<tr>
<td></td>
<td>R 15.0</td>
<td>12.2</td>
</tr>
<tr>
<td>3</td>
<td>L 30.0</td>
<td>28.3</td>
</tr>
<tr>
<td></td>
<td>R 20.0</td>
<td>17.8</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>22.0 (5.9)</td>
<td>16.2 (6.2)*</td>
</tr>
</tbody>
</table>

1 Abreviations: Pre- = before alcohol, Post- = one hour after alcohol, L = left, R = right.
2 Statistical significance: * = p < 0.05 and ** = p < 0.001.

Slightly decreased by alcohol. However, the peak latencies of median N20, P25 and N35 and tibial N30, P40 and N50 components were not altered by alcohol.

Discussion

Recently there has been much discussion about the nosology of Ramsay Hunt syndrome.10-12 Our patients had marked action myoclonus, progressive cerebellar ataxia and rare generalised seizures which fulfilled the triad of this syndrome.10 Meanwhile, normal lactate and pyruvate levels in serum and muscle biopsy in our patients did not support a diagnosis of mitochondrial encephalomyopathy with ragged-red fibres.

Our results show that alcohol could effectively attenuate the giant cortical SEPs in two patients who also had dramatic improvement of action myoclonus. Although the quantity of alcohol given was quite a large amount, the myoclonus disappeared 20 minutes (about 180 ml alcohol) after they started to drink. In fact, they usually took 200 ml of spirit which suppressed the myoclonus. The third patient who gained little benefit from myoclonus by the alcohol did not have a reduction in enhanced cortical SEPs. Thus the alcohol suppression of enhanced cortical SEPs correlated with the degree of alcohol control of the muscle jerks.

The attenuation in the amplitude of cortical SEPs after alcohol ingestion has been demonstrated in humans.13 Alcohol has a similar effect on the giant SEPs in patients with DCM which has not been reported previously. Why the giant SEPs and myoclonus did not have a similar response to alcohol in the third patient is unknown. On the other hand, the selective improvement of myoclonus in our two patients with DCM needs further study.

The median N20-P25 and P25-N35 and tibial N30-P40 and P40-N50 components that were most affected by alcohol may originate within the primary somatosensory cortex,14-16 whereas the amplitude of median N20 and tibial N30 components which may originate from the thalamus, the thalamo-cortical pathways or both, remained unchanged. Our findings are consistent with previous reports that the main effect of alcohol is on the cerebral cortex, although the subcortical structures are also affected.13,17-18 The suppression of giant SEPs as well as the improvement of myoclonus, are also found in the therapeutic responses of myoclonus to various drugs.17-18

The mechanisms for suppressing both giant SEPs and myoclonus by alcohol remain unclear. It has been postulated that the myoclonic jerks provoked by different external stimuli may be due to an abnormal recruitment and hypersynchronisation of a large population of motor neurons by altered interneuronal inhibitory activity in the sensorimotor cortex.14 In addition, the influence by the supplementary motor area and cerebello-thalamic projections to the motor cortex before and during movement may also be exaggerated, leading to complex cortico-subcortical interactions.15-20 Thus alcohol may exert its effect on myoclonus not only at the sensorimotor cortex but also at other cortical and subcortical areas.

Clonazepam and piracetam may also reduce the giant SEPs and myoclonus. On one occasion, a moderate suppression of amplitude of SEPs were revealed in patients 1 and 2 being treated with clonazepam and piracetam. However, alcohol appears to have a more potent effect in control of action myoclonus than clonazepam or piracetam as suggested by the responses in two of our three patients. Piracetam is particularly effective against cortical reflex myoclonus, perhaps by acting on somatosensory cortex (afferent side).22 On the other hand, the alcoholic effect is different from that of primidone, which appears to act on the motor cortex (efferent side) as it considerably improves action myoclonus and reduces reflex myoclonus, but the SEPs usually become large in amplitude.14 Although the lesser response to alcohol in the third patient is difficult to explain, the dramatic improvement of myoclonus in two of our three patients encouraged us to give a trial of alcohol in patients with DCM. It also provides us with another pharmacological tool in determining the anatomical-physiological processes which cause myoclonus.

The authors acknowledge the technical assistance of Mrs Fang Fang.

1 Hunt JR. Dys-synergia cerebellaris myoclonica—primary atrophy of the dentate nucleus. Brain 1921;44:490-538.


10 Marsden CD, Obeso JA. The Ramsay Hunt syndrome is a useful clinical entity. Movement Disorders 1989;4:6-12.


