Melatonin versus chloral hydrate as the sedating agent in performing electroencephalogram in paediatric patients

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ABSTRACT

Electroencephalography (EEG) is a valuable tool in the diagnosis of epilepsy. The attainment of a high quality EEG requires patient’s co-operation which is particularly difficult in children. Chloral hydrate has been used as a sedating agent in EEGs but it has potential serious adverse effects and anti-epileptic activity. Melatonin is used increasingly in different investigations as a safe alternative. Our study is to compare their effectiveness as sedating agents in performing EEGs and the detection rate of abnormal EEGs. This is a retrospective study performed in a regional hospital in Hong Kong. One hundred and ninety two EEG studies were included from December 2010 to July 2014. One hundred and two children were given chloral hydrate (50 mg/Kg) in the first half of the period and 90 children were given melatonin (3 mg for <5 years or 6 mg for >5 year) in the later half. The two groups are compared with Pearson’s Chi-squared test with Yates’ continuity correction. The successful rate in sedation was similar between the two groups while the pick up rate of abnormal EEGs was 52.56% in the melatonin group and 21.57% in the chloral hydrate group (p<0.05). Subgroup analysis among patients with epilepsy or mental retardation and intellectual disability shared same findings with higher detection rate of abnormal EEGs in the melatonin group. No side effect was documented in the study. Compare with chloral hydrate, melatonin is a safe and effective alternative and probably has less interference with the electrographic activity.

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1. Introduction

A high quality EEG requires cooperation of the individual which is particularly difficult for paediatric populations and patients with intellectual problems. Behavioural trainings and sleep deprivation can work in selected cases but they are time consuming and require immense input from both the carers and medical staff. Chloral hydrate has been widely used as an effective sedating agent in EEGs in adult and paediatric populations. However, it has the drawback of altering the sleep architectures, potential anti-epileptic effects as well as the rare occurrence of serious side effects due to deep sedation. Therefore the exploration of an alternative sedating agents is warranted. Melatonin (N-acetyl-5-methoxytryptamine), a natural hormone, is found effective and safe as a sedation in different diagnostic procedures. The aim of this study is to compare the effectiveness of melatonin against chloral hydrate as a sedating agent for EEGs and would there be any difference in the detection rate of abnormal electrographic discharges.

2. Methods

This study is a retrospective study of patients requiring sedation for routine EEGs in the department of paediatrics of a regional hospital in Hong Kong from December 2010 to July 2014. There was a change in sedation protocol in the middle of this period in October 2012 from chloral hydrate to melatonin as the primary sedative agent. There was no change in all other details of the sedation protocol. Sleep deprivation before the EEG session is a standard, parents were instructed to put the children in bed 2 h later and wake the children 2 h earlier. Patients who were unable to cooperate for EEG setups were indicated for sedation. Under the old protocol, oral chloral hydrate (50 mg/kg, maximum 2 g) in syrup form was given to patients requiring sedation, additional dose of chloral hydrate at 25 mg/kg would be given if the child was not sedated. In the new policy, syrup melatonin (3 mg for <5
hyperventilation
were
in
parameters
artefacts
studied
chloral
45
years
EEG
IJEP-58; G
Epileptic
Recognised
the
tolerate
tomeal.
EEGs
and
procedures.
Assessing
A
with
EEG
and
including
the
and
assessing
drugs
in
the
melatonin
the
respectively
drug
was
oraly
30–
45
min
to
the
EEGs
by
nursing
staff.
Body
parameters
including
heart
rate,
respiratory
rate
and
oxygen
saturation
were
monitored
before
and
after
the
investigation.
The
patients
were
discharged
when
they
became
fully
aware
and
able
to
tolerate
a
meal.

All
the
EEGs
were
performed
in
a
single
neurophysiological
laboratory
with
the
same
EEG
machine
(Biologic
EEG)
under
the
international
10–20
system
for
20–60
min.
The
EEGs
were
performed
by
the
same
electrophysiological
technicians
and
were
interpreted
by
the
same
paediatric
neurologists.
Asleep
state,
awake
state,
activations
including
photic
stimulation
and
hyperventilation
(if
cooperation
allowed)
were
included
as
the
standard
procedures.
Data
were
collected
from
the
hospital
records
and
EEG
request
forms.
The
primary
outcome
is
the
effectiveness
of
melatonin
as
a
sedation
when
compared
with
chloral
hydrate.
The
sedation
was
considered
a
failure
if
there
was
a
need
of
additional
doses
of
chloral
hydrate
in
the
chloral
hydrate
or
the
need
to
provide
chloral
hydrate
on
top
of
melatonin
in
the
melatonin
group.
Successful
EEG
was
defined
as
being
able
to
complete
the
whole
session
with
acceptable
motion
artefacts
for
interpretation.
The
secondary
outcome
was
the
number
of
abnormal
EEGs
in
each
group
and
subgroup.
The
different
EEG
abnormalities
are
listed
in
Table
1.
The
data
were
compared
with
the
Chi-squared
test
with
Yates’
continuity
correction.
A
p
value
of
less
than
0.05
was
taken
as
statistically
significant.

Table 1
EEG abnormalities [3].

<table>
<thead>
<tr>
<th>Recognised EEG abnormalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epileptic discharges</td>
</tr>
<tr>
<td>Ictal epileptic discharges with or without clinical event seen during recording</td>
</tr>
<tr>
<td>Interictal epileptic discharges:</td>
</tr>
<tr>
<td>Sharp/spike wave, spike and slow wave complex</td>
</tr>
<tr>
<td>Polyspikes/polyspike and slow waves complex</td>
</tr>
<tr>
<td>Periodic lateralised epileptiform discharge (PLEDS)</td>
</tr>
<tr>
<td>Hypsarrhythmia</td>
</tr>
<tr>
<td>Non-epileptic discharges</td>
</tr>
<tr>
<td>Burst suppression</td>
</tr>
<tr>
<td>Hypoactivity</td>
</tr>
<tr>
<td>Focal/generalised slowing</td>
</tr>
<tr>
<td>Excessive slowing/encephalopathic pattern</td>
</tr>
</tbody>
</table>

3. Results

Baseline characteristics, including age, sex and underlying
conditions
were
similar
in
both
groups,
they
are
summarised
in
Table
2.
The
background
information
about
any
previous
history
of
febrile
convulsion,
whether
or
not
the
patient
was
on
anti-epileptic
agents,
the
pre-existing
diagnosis
of
epilepsy,
developmental
delay
or
intellectual
disability,
cerebral
palsy,
hyperactivity
and
attention
deficiency,
autism
and
history
delay
were
of
particular
interests
as
these
conditions
associate
with
an
increased
potential
of
having
epilepsy.
Moreover,
patients
with
underlying
developmental
problems
are
less
readily
to
coopera,
we
 performed
a
 subgroup
analysis
to
assess
the
efficacy
of
the
two
studied
sedative
agents
in
dating
this
group
of
patients.

For
the
primary
outcome
in
assessing
the
effectiveness
in
sedating
patients
(Fig. 1),
there
is
no
statistically
significant
difference
between
the
2
studied
agents,
melatonin’s
sedation
effect
is
comparable
to
chloral
hydrate:
75
(83.33%)
in
90
cases
of
those
in
melatonin
group
succeeded
in
completing
the
EEGs
without
the
need
for
additional
drugs
while
in
chloral
hydrate
group,
89
(87.25%)
in
102
cases
succeeded
(p = 0.57). A
subgroup
analysis
regarding
patients
with
chronic
neurological
problems
as
mentioned
above
was
performed.
Melatonin
is
equally
effective
among
patients
with
chronic
neurological
problems
(Fig.
2): 46
(79.31%)
in
58
patients
with
developmental
delay,
mental
retardation
or
cerebral
palsy
succeeded
in
completing
the
EEG
in
melatonin
group
and
40
(83.33%)
in
48
patients
with
similar
conditions
succeeded
in
the
chloral
hydrate
(p = 0.78).
There
is
no
statistically
significant
difference.
The
cases
which
were
successfully
sedated
by
either
melatonin
or
chloral
hydrate
alone
were
then
included
in
the
comparisons
of
the
detection
rate
of
abnormal
EEGs.
The
cases
failed
to
be
sedated
by
any
one
of
the
above
agents
were
excluded
because
they
either

Please
cite
this
article
in
press
as:
Yuen
CL,
et
al.
Melatonin
versus
chloral
hydrate
as
the
sedating
agent
in
performing
electroencephalogram
in
paediatric
patients,
Int
J
Epilepsy.
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http://dx.doi.org/10.1016/j.ijep.2016.11.004

![Fig. 1. Successful EEG (p = 0.57).](image-url)
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