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Sleep architecture in children with narcolepsy treated with Sodium Oxybate

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INTRODUCTION

In 2016 NHS England's specialised services announced that they will routinely commission sodium oxybate for symptom control in post-pubertal children with narcolepsy with cataplexy.

In adults with narcolepsy, sodium oxybate has been shown to increase slow wave sleep (SWS) and subsequently improve daytime symptoms (Mamelak et al., 2004).

The paediatric narcolepsy project is a case-control study, with 23 children with narcolepsy and 23 age-and-gender matched controls. This study examined the relationship between sleep, activity, school performance and well-being in children with narcolepsy.



AIM

As part of this descriptive study, we aimed to investigate the differences in sleep architecture between:

- Children with narcolepsy treated with sodium oxybate
- Children with narcolepsy not treated with sodium oxybate
- Gender and age matched healthy controls

METHODS

- 23 children with narcolepsy (age: 8-15 years) and 23 healthy gender and age-matched controls were recruited from England and the Republic of Ireland. There were 15 males and 8 females in both groups.
- From this sample, 4 children with narcolepsy treated with sodium oxybate (age:10-15 years), 3 children with narcolepsy not treated with sodium oxybate (age:10-12) and their matched controls were selected.
- Children underwent home polysomnography (PSG) using a portable PSG system (Embla® Systems-Embletta MPR PG & ST+ Proxy was used with 9 children and Micromed-Morpheus was used with 2 children). A standard montage was used to measure sleep architecture with 9 EEG channels (F3, F4, C3, C4, O1, O2, M1, M2), two electro-oculography (EOG) and two electromyography (EMG) channels. Children were set up in their own homes and medication was taken as usual.

RESULTS

- All of the children with narcolepsy were being treated with medication (methylphenidate preparations (n=5), modafinil (n=2), clonidine (n=2), clomipramine (n=1), venlafaxine (n=2), fluoxetine (n=1)).
- All four of the children with narcolepsy treated with sodium oxybate were taking it twice during the night, once at bed time and once in the middle of the night.
- Table 1 displays the average sleep architecture in the three groups. Statistics were not performed due to the small numbers in this case series.

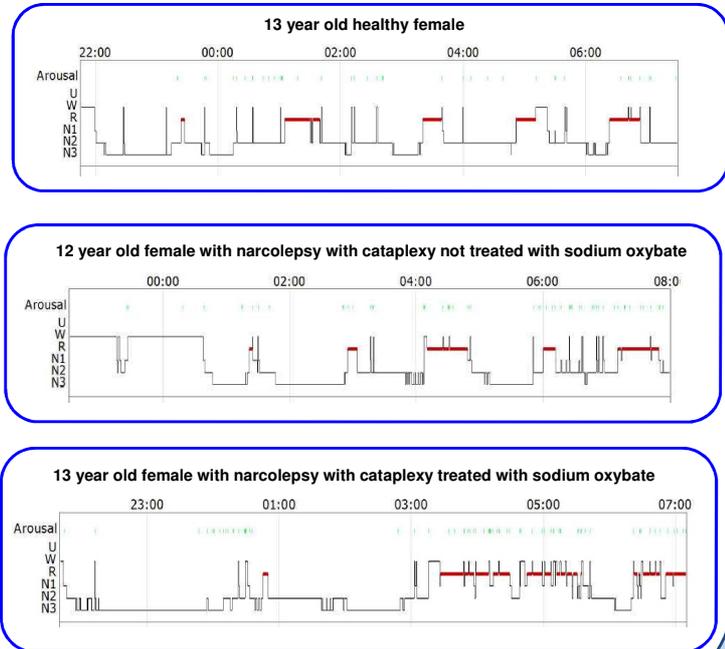
Table 1

Summary of the differences in the sleep architecture of children with narcolepsy (treated with sodium oxybate and not treated with sodium oxybate) and healthy matched controls

Sleep variable	Age & gender matched healthy controls (n=4)	Age & gender matched children with narcolepsy not treated with sodium oxybate (n=3)	Children with narcolepsy treated with sodium oxybate (n=4)
Mean ± SD			
Age (years)	12.5 ± 2.1	11.3 ± 1.2	12.5 ± 2.1
Sleep Onset Latency (minutes)	30.9 ± 20.2	23.3 ± 22.7	23.9 ± 27.9
Sleep Efficiency (%)	89.5 ± 3.5	82.6 ± 7.8	85.5 ± 9.0
Total Sleep Time (minutes)	500.6 ± 45.2	533.0 ± 87.2	442.8 ± 92.4
% N1 Sleep	3.5 ± 1.4	10.4 ± 7.2	4.4 ± 1.0
% N2 Sleep	48.7 ± 5.2	43.7 ± 5.7	35.4 ± 5.4
% Slow Wave Sleep	27.6 ± 2.9	33.2 ± 7.1	44.9 ± 10.4
% Rapid Eye Movement Sleep	20.2 ± 4.9	12.6 ± 9.0	15.5 ± 7.3
Arousal Frequency Index (/hr sleep)	6.9 ± 1.7	8.5 ± 2.7	8.1 ± 3.4

Figure 1

The sleep architecture of a child with narcolepsy treated with sodium oxybate vs a healthy control child and a child with narcolepsy not treated with sodium oxybate



CONCLUSIONS

- Our case series suggests that the children with narcolepsy treated with sodium oxybate spend more time in slow wave sleep than those not treated with sodium oxybate and healthy controls.
- The hypnograms of the children with narcolepsy look visually more disrupted than the healthy controls (Figure 1 provides an example).
- This research suggests that sodium oxybate has an effect on the normal cycling of sleep stages in children.
- Further work is needed to examine the impact of the changes to the sleep hypnogram in a larger sample size.
- We are currently conducting further work in this area at Sheffield Children's Hospital by examining the differences in sleep architecture of children with narcolepsy before they began sodium oxybate treatment and after treatment commenced.

References

Mamelak, M., Black, J., Montplaisir, J., & Ristanovic, R. (2004). A pilot study on the effects of sodium oxybate on sleep architecture and daytime alertness in narcolepsy. *Sleep*, 27(7), 1327-1334.



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