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Can neonatal staff site EEG leads in the correct position? A pilot study

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Under and over diagnosis of neonatal seizures is common, with 73% of suspected seizures

not being associated with epileptiform activity on electroencephalography (EEG) and 66% of

EEG detected seizures having no clinical features.(1) As a result, recent studies into

treatments for neonatal seizures have utilised prolonged EEG for accurate outcome

measurement.(2) Study design and funding is hampered by logistical and financial difficulties

in accessing EEG throughout the day and weekend. If neonatal staff could site EEG leads

and start monitoring then EEG could be started in a timely fashion with a view to, for

example, physiologist input within office hours. Commercial templates to aid EEG lead

positioning are available, using a modified neonatal EEG montage.(3)

For this pilot study, 24 participants (7 ST1-3 trainees; 6 ST4-8 trainees, 3 consultant

neonatologists, 3 advanced neonatal nurse practitioners and 5 staff nurses) from a neonatal

intensive care unit in Sheffield were recruited. Ethical approval was granted by the University

of Sheffield, and signed consent obtained. Participants reviewed a 10minute video

explaining how to site EEG leads on a resuscitation doll using a BraiNet template and EEG

paste. This is an elastic template with holes and colour boxes to indicate the correct location

for EEG leads (figure 1). A member of the neurophysiology team measured the linear

distance of each lead was away from the gold standard. In physiologst training, a lead within

5mm of the optimal site is considered satisfactory,(4) which was the standard adopted in this

study.

11(45.8%) participants sited all leads within 5mm of the ideal position. 9 (37.5%) sited all

but one lead in the correct location. The suboptimal leads varied: 2 participants T6, 2 O2,

and 1 each for FP2, F7, F8, T4, O1. The maximum distance away from the ideal location for

any of these leads was 10mm. One participant sited 2 leads incorrectly, and 2 participants

site 3 leads incorrectly. A final participant sited the 7 leads incorrectly, with the distances

from the ideal location for these leads ranging from 10-30mm. This participant adopted a

haphazard approach. Table one shows the frequency the EEG leads were sited within 5mm

of the correct location for each of the leads, and the median distances for each lead. Two

qualified physiologists also completed the study and sited all leads within 5mm of the

standard using the template.

These results show that 87.5% neonatal staff can site all EEG leads appropriately or with

only 1 or 2 leads in suboptimal position on a resuscitation doll. With adjustment to our

training package to rectify commonly made mistakes, this figure may increase. Future work

will examine whether these results are replicated in real babies, especially those who are

ventilated and whether neonatal staff can undertake the further requirements of EEG

recording such as skin preparation and impedance checking. Should this prove successful,

early EEG recording of neonates at high risk of seizures may be possible, particularly in

research studies.

Table one: Frequency each lead was sited to the optimal position, and medial (IQR) from the

optimal position

Lead	% within 5mm of ideal location	Median distance from optimal position (IQR)
FP1	100%	2mm(0.75,5)
FP2	95.8%	3.5mm(1.5,5)
F7	91.7%	5mm(1.75,5)
F8	95.8%	5mm(0,5)
Cz	95.8%	0mm(0,5)
C3	95.8%	0mm(0,5)
C4	95.8%	0mm(0,5)
T3	91.7%	5mm(0,5)
T4	91.7%	2mm(0,5)
T5	91.7%	0mm(0,5)
T6	79.2%	0mm(0,5)
O1	85.5%	5mm(3,5)
O2	87.5%	5mm(0,5)

Figure 1: EEG leads attached to the resuscitation doll using the BraiNET template

References:

1.   Murray DM, Boylan GB, Ali I, Ryan CA, Murphy BP, Connolly S. Defining the gap

between electrographic seizure burden, clinical expression and staff recognition of neonatal

seizures. Arch Dis Child Fetal Neonatal Ed. 2008;93(3):F187-91.

2.   Pressler RM, Boylan GB, Marlow N, Blennow M, Chiron C, Cross JH, et al. Bumetanide

for the treatment of seizures in newborn babies with hypoxic ischaemic encephalopathy

(NEMO): an open-label, dose finding, and feasibility phase 1/2 trial. Lancet Neurol.

2015;14(5):469-77.

3.   Alix JJP, Ponnusamy A, Pilling E, Hart AR. An introduction to neonatal EEG. Paediatr

Child Health. 2017;27(3):135-42.

4.   Association of Neurophysiological Scientists. National Standards for Clinical

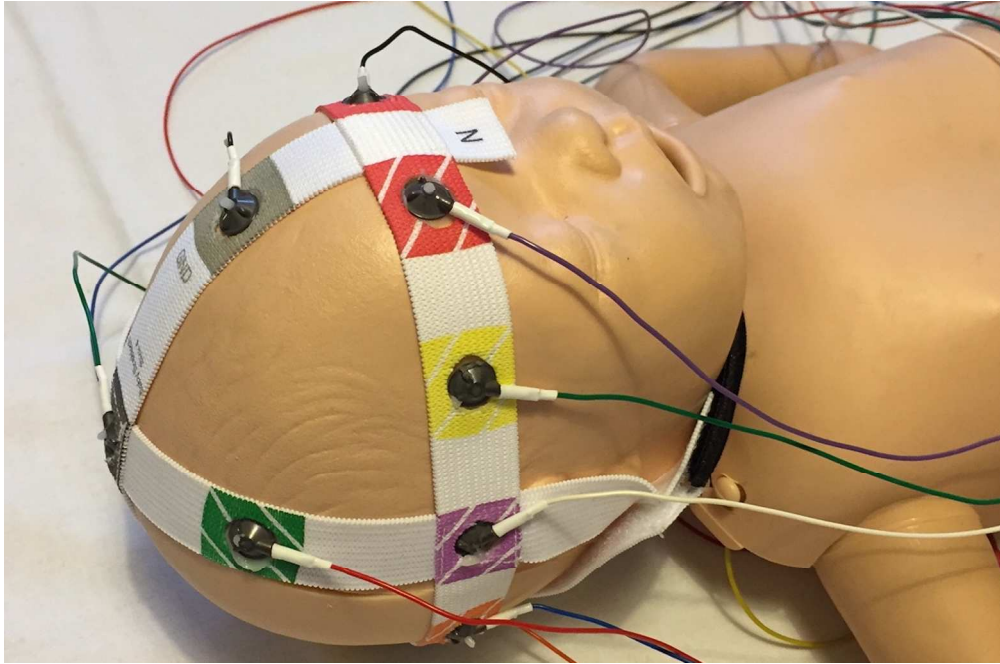Neurophysiology, Basic Level, EEG. 2014.

Figure 1: EEG leads attached to the resuscitation doll using the BraiNET template

412x272mm (300 x 300 DPI)