Introduction

In adults, electrical grounding (EG) has been shown to improve parasympathetic (vagal) tone as measured by improved heart rate variability (HRV). Adult studies have also shown that EG reduces sympathetic nervous system activity as measured by skin conductance (SC).

SC is a validated, non-invasive measure of sympathetic arousal. It is a measure of the amplitude and number of waves of electrical conductance that travel across the skin surface. In arousal, sympathetic mediated sweat glands are activated and sweat is released onto the surface of the skin. In arousal, sympathetic mediated sweat glands are activated and sweat is released onto the surface of the skin (Fig. 1). When sweat is released, there is an increase in the number of electrodermal responses per second (EDR/s) from baseline, and when the sweat is reabsorbed, there is a decrease in EDR/s back to baseline.

Methods

15 clinically stable, non-ventilated preterm (34-36 weeks PMA) infants were enrolled in this study. Infants with cardiovascular defects, intracranial abnormalities, or those exposed to opiates in utero were excluded. Characteristics of the sample are presented in Table 1.

Continuous recording of SC was obtained by placing 3 surface electrodes on the infant’s foot. The measurement electrode is placed on the plantar surface of the foot and the other two are placed adjacent to the medial and lateral malleolus as seen in Fig 2. SC is measured as μSiemens.

Testing was done in our intermediate care nursery, 1 hour post-feeding and between the hours of 4-8 pm to standardize for environmental stimuli, post-prandial sleep state, and time of day respectively.

In order to electrically ground the infant, an additional electrode was placed on the infant’s chest. This electrode was then connected to a ground outlet to provide EG when desired.

Data were collected in three phases, each lasting 20 minutes:

- **Phase 1 (Ph1)** = pre-grounded phase; 20 minutes prior to grounding
- **Phase 2 (Ph2)** = grounded phase
- **Phase 3 (Ph3)** = post-grounded phase; the first 20 minute after grounding was discontinued

Results

Recordings from the full duration of each phase were analyzed to determine the EDR/s for each phase. The phase results for the 15 subjects are depicted as median (IQR) EDR/s. Ph1 0.01(0.002), Ph2 0.003 (0.006) and Ph3 0.001(0.01).

The 10 fold decrease in EDR/s between Ph1 and Ph3 was significant p=0.023, using the non-parametric Wilcoxon Signed Rank test. The difference between Ph1 and Ph2 showed a trend to lower values p=0.07.

Conclusions

These preliminary results suggest that EG was associated with a significant (10 fold) decrease in sympathetic activity in Phase 3.

We speculate that the effects of grounding may be sustained after grounding is discontinued.

Additional subjects are needed to confirm the timing of the grounding effect.

Selected References