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12-2015

EEG lead safety: Summary

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Office of Evidence Based Practice – Specific Care Question: EEG Leads

Specific Care Question :

In the child undergoing an EEG what are risk factors for development of skin break down, and are there known techniques to decrease the occurrence of skin breakdown?

Question Originator:

Audrey Kennedy, PharmD, Clinical Safety Officer

Plain Language Summary from The Office of Evidence Based Practice:

Based on very low quality evidence no recommendations can be made on known techniques to decrease skin breakdown. We reviewed two very low quality papers. (Berlin et al., 2011) is a compilation of “technique tips” to decrease problems with EEG electrode placement. (Jarrar, Buchhalter, Williams, McKay, & Luketich, 2011) is a retrospective review of factors related to EEG related skin breakdown at a single institution. Although evidence is limited, practices to consider when considering the problem of EEG electrode related skin breakdown are:

1. Use of a soft adhesive paste for conduction and a thicker paste as an electrode adhesive product instead of collodion (Berlin 2011).
2. For neonates, a decrease in skin breakdown was reported when 3M Red Dot™ 2269T electrodes, with HydroDot SkinSavers were used as lead stabilizers (Berlin et al., 2011)
3. Assess the hydration status of patients who have skin breakdown. Dehydration due to fluid restrictions or high fluid losses may play a role in skin integrity.
4. Are skin assessment completed before and after electrode placement, and after reapplication of electrodes.

EBP team member responsible for reviewing, synthesizing, and developing this literature:

Nancy Allen, MS, MLS, RD, LD

Search Strategy and Results:

Search strategy "Electroencephalography/adverse effects"[Mesh] OR "Electroencephalography/complications"[Mesh-] 98 articles were returned. From title and abstract 7 were selected. Of these, 2 are included in this review.

Studies included in this review:

Berlin et al., 2011

Jarrar et al., 2011



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Studies not included in this review with rationale for exclusion:

Citation	Reason for exclusion
Guillod, Hauser, Ruffieux, Masouye, & Harms, 2002	Case study
Mancuso et al., 1990	Report of 2 case studies
Morris, Klem, & Gilmore-Pollak, 1992	Report of 5 case studies
Pousman, Eilers, Johns, & Jung, 2002	Adult who was monitored with a Bispectral Index and developed pressure ulcers
Wiley & Eaglstein, 1979	Case study

Method Used for Appraisal and Synthesis:

The Cochrane Collaborative computer program, Review Manager (RevMan 5.3.5), was used to report the 2 included studies.

Updated December 4 2015 December 11 2015, December 15 2015

Tables:

Composition of EEG pastes (will complete with other products if necessary)

Product	Ingredients	Date information was acquired
Elefix conductive EEG paste	Water / Polyoxyethylene Oleyether Phosphate / Glycerin / Calcium Carbonate / Liquid Petrolatum / Propylene Glycol / Lanolin Alcohol / Sodium Chloride/ Sodium Hydroxide / Polyoxyethylene Hydrogenated Lanolin / Coconut Fatty Acid Diethanolamide / Polyoxyethylene Stearylether / Polyoxyethylrne Oleylether / Egg Yolk Oil / Dibutylhydroxytoluene / Methl Parahydroxybenzoate / Propyl Parahydroxybenzoate.	12/11/2015 MSDS
Ten20® Conductive paste	Polyoxyethylene(20) Cetyl Ether, Water, Glycerin, Calcium Carbonate, 1,2-Propanediol, Potassium Chloride, Gelwhite, Sodium Chloride, Polyoxyethylene (20) Sorbitol, Methylparaben, and Propylparaben	12/11/2015 MSDS sheet

Characteristics of the included studies :



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Berlin et al., 2011

Methods

Compilation of suggestions and opinions from EEG technologists to assure correct electrode placement and avoid skin breakdown due to the EEG leads.

Outcomes

- 1. Vanderbilt, Tennessee-** Pony tail method- pulls hair out of the way, provided a flat surface for electrode placement, easy to reposition electrodes if necessary and easier to find and remove. Claw clips are the recommended clip to make the ponytails, plus they are easy to clean and inexpensive to replace. Once you begin, do not leave the patient unattended. part the hair midline from nasion to inion. The lead wire should point toward the back of the head. Apply electrodes posterior to anterior on the head. Bundle and wrap the leads
Sellers
- 2. Digitrace, a Division of SleepMed Inc. Ohio-** Use adhesive tape to apply electrodes for EEG monitoring. The product is called Cover-Roll Stretch Adhesive Gauze <http://www.amazon.com/Cover-Roll-Stretch-Adhesive-Bandage-Gauze/dp/B000HFMHGS> Cut the tape in to smaller pieces that are ~ 2 inches in length. Use the tape to cover the electrode and paste. Benefit over collodion is less residue
- 3. Phoenix Children's Hospital, AZ-**Use a relatively soft conductive paste as the conductor and a thicker one as the glue. They use Ten20[®] Conductive Paste for the soft paste (states Elefix[®] works well too. and they use EC2[®] Genuine Grass Electrode Cream on the gauze to cover the electrode and hold the lead in place. They note the impedances of the electrodes should be less than 5000 Ohms and balanced. Once they are operational, secure with a tape like Micropore and wrap the leads
- 4. Staten Island University Hospital, NY-** Use the silver/silver chloride 3M[™] Red Dot[™] 2269T Neonatal Monitoring Electrodes for the frontal electrodes (Fp1 and Fp2) on pediatric and adult patients, and a full set of the Red Dot electrodes on neonates. They use a plastic spiral cable to secure the leads
- 5. Children's Hospital Boston, MA -** changed from metal to disposable electrodes for frontal electrodes. They found " electrode drift" in the frontal electrodes where the disposable electrodes had been applied. They adapted their plan, went back to the metal leads, but placed a product called HydroDot SkinSavers under the electrode. They are small sticky pads. Skin breakdown was seen in 1/50 (2%) patients
- 6. .St. Mary's Neurology Associates, ME-** Recommend that patients are well hydrated prior to electrode placement.

Jarrar et al., 2011

Methods

Retrospective survey review

Participants

Population: Pediatric patients in the Epilepsy Monitoring Unit (EMU), PICU or NICU
N= 166; PICU/NICU n=53 (32%)

Materials: Electrodes used: International 10-20 System usually with the addition of T1, T2, and TP9, and TP10



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electrodes. The electrodes were either gold or oxidized silver electrodes.

Inclusion criteria: Patient who had an EEG

Exclusion criteria: patients with skin problems noted before the EEG

Interventions

Application Product	Number of patients
EC2® Electrode Cream and Ten20™ Conductive	137
EC2 only	1
Ten20™	5
Collodion	4
Collodion and Ten20™	1
Unknown	18

Outcomes

1. EEG technologists and nurses are required to fill a skin assessment prior to electrode placement and after electrode removal. A skin assessment is also made if an electrode has to be reapplied
2. Breakdown (blister, abrasion, unspecified) was seen in
 - 22/166 (11.4%) of all patients
 - 12/113(10.6%) of the EMU patients
 - 10/53 (18.8%) of the PICU/NICU patients.
3. Products used in children with breakdown:
 - EMU-
 - Ten20™ and EC2® n= 10
 - Collodion n=1
 - Unknown n=1
 - PICU/NICU-
 - Ten20™ and EC2® n=9
 - Unknown n=1

Notes

It is interesting that the number of patients do not add up.

It is also very interesting that the authors state "electrode related skin breakdown appears to be uncommon in children with an incidence of 11.4% at our institution"



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References

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