Long-term video EEG monitoring

VEEG's approach to medical technologists

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HIROSHIMA UNIVERSITY HOSPITAL

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Outline

1. What is the role of Japanese medical technologists?
2. About Long-term video EEG monitoring (VEEG) ～ From the point of view of a clinical laboratory technologists.
3. Tips for reducing EEG artifacts.

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Our job is to professionally test the condition of the patient.

- Technical skills are directly linked to the quality of tests.
- In physiological tests, technical skills are directly linked to the quality of the test.
- EEG inspection accuracy also depends on the inspector's skills and judgment.

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We are medical technologists in charge of physiological tests.

Medical technologist national qualification required

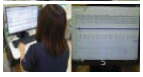
Hiroshima University Hospital Laboratory is accredited to ISO15189.



Professional qualification In Japan

Clinical neurophysiology technologist
Electrocardiographer
Sonographer





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The purpose of VEEG monitoring is to capture seizures.

It allows doctors to obtain:

- Definitive diagnosis of epilepsy
- Diagnosis of epilepsy type
- Assess seizure frequency
- Preoperative evaluation of surgical treatment
- Diagnosis and treatment of nonconvulsive status epilepticus in emergency care

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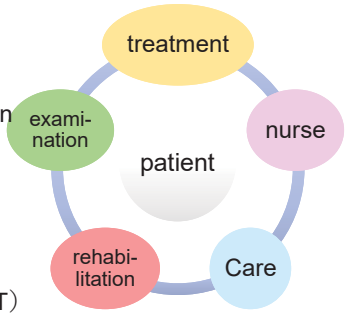
Hiroshima University epilepsy center team

【Treatment】
Doctor
Pharmacist
Nurse
Rehabilitation technician

【Examination】
Medical technologist
（EEG,VEEG）
Radiologist
（MRI/CT,SPECT/PET）
Clinical engineering technologist
（Intraoperative monitoring）



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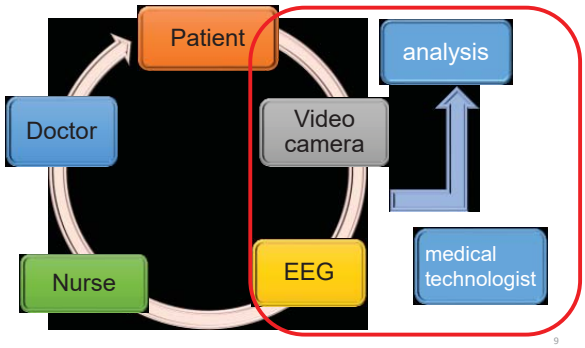
Epilepsy monitoring unit (EMU) system



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Benefits of medical technologist

1. Attaching to the correct EEG electrode position.
2. Understand the characteristics of equipment and guarantee the accuracy.
3. It is possible to deal with the case where the electrode comes off.
4. Goods management.
5. You can read EEG data, In the future...

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VEEG criteria

Laboratory	EEG	Video camera	Electrode	Impedance	montage
quiet	Digital EEG	High quality color	10-20 electrode method	10kΩ or less	Reference montage
Secure power	16 elements or more	Infrared	T1 T2 electrode	Little variation in resistance	Bipolar montage
ventilation	Auxiliary recording element		Silver		
air conditioning	Sampling frequency 500Hz (200Hz)		Silver-silver chloride		
Large enough	System reference	voice/○	Gold plate		
No noise					
ground					

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Micro shock and Macro shock

As long as equipment that uses commercial power is used, there is always a risk of electric shock.

Types of electric shock	Current (50, 60Hz)	Effects on the human body
Macro shock Electric current flows through the body surface.	100mA↑	Ventricular fibrillation induction
	10～20mA	Departure limit current
	1mA	Minimum sensing current
Micro shock Electric current flows directly to the heart.	0.1mA	Ventricular fibrillation induction

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Medical device safety measures

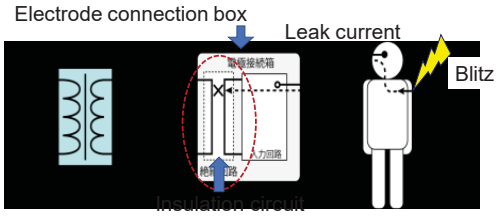
Classification of medical devices by protection against electric shock

Class I	Equipment with protective grounding added to prevent leakage current even if leakage occurs	Testing equipment that uses commercial power such as ECGand EMG
Class II	Equipment that can be used safely without protective grounding with double insulated power supply	Home respirators, etc.
Internal power supply ME device	Equipment driven by built-in battery	Holter monitor

Japan Medical Device Nomenclature

Safety circuit

Floating



The input circuit is isolated, so that the path through which the current flows is cut off, so that the current does not flow.

MEの知識と雑音対策　佐野　仁より

Protective ground ?

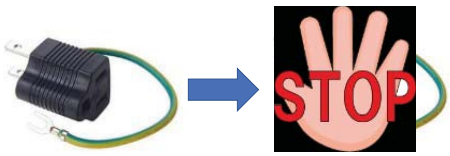
2P outlet plug + ground wire

Stop using it right away.

Multi taps with 3P plug?

ＭＥの知識と雑音対策　佐野　仁より

Protective ground ?



Stop using it as soon as you notice !

Adapter that converts a 3P plug into a 2P plug !

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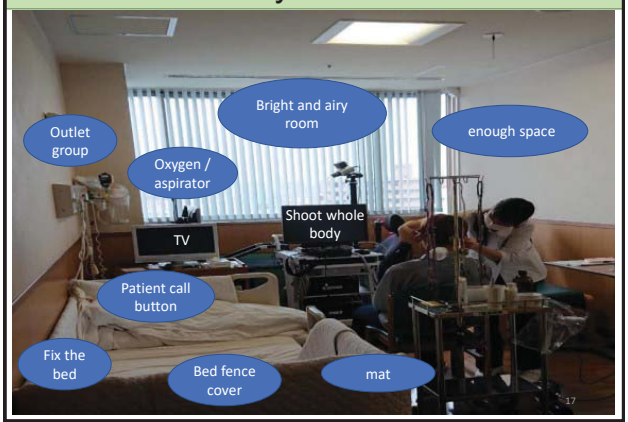
Safety measure



Safety measures for children

Distract with toys, etc.

- Relieve anxiety
- Pay attention to the compressor wind and sound
- When sedating, watch for respiratory depression and monitor with saturation

It is also effective to attach electrodes during the nap time.

What to prepare at VEEG

① Paste
② Conductive gel
③ Fixed gauze
④ Compressor
⑤ Sebum abrasive
⑥ Major
⑦ Scissor marker
⑧ Collodion
⑨ Swab
⑩ Fixing tape
⑪ Alcohol cotton
⑫ Fixing net

＊Collodion is stored on a locked shelf

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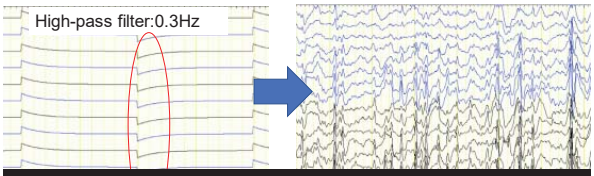
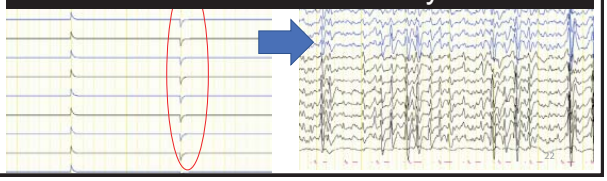


High-pass filter causes distortion of slow wave components.
Works to reduce baseline sway.



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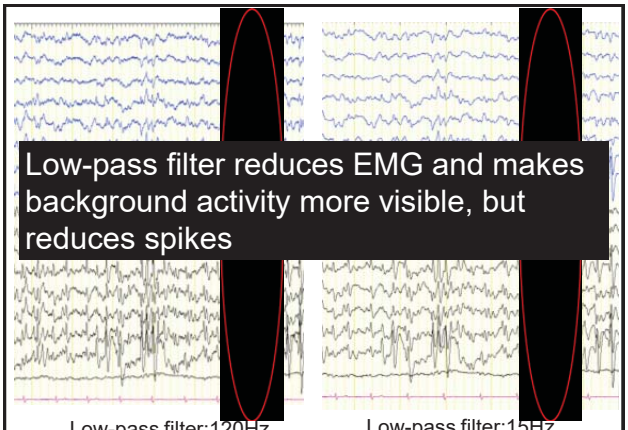

Low-pass filter reduces EMG and makes background activity more visible, but reduces spikes

Low-pass filter:120Hz　　Low-pass filter:15Hz

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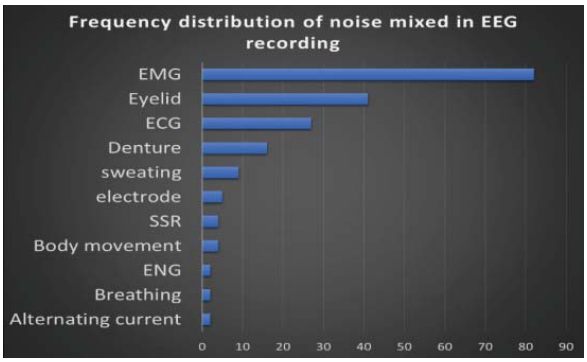
Artifacts mixed in EEG



Haradayo Noda et al : Artifacts in EEG: Kyosai Jiho 18: 120-123,1969（Break）

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How to identify artifacts and countermeasures

	Characteristic	Measures
EMG	Irregular waves with sharp rise	Except in morbid cases. Change pillow, change position, open mouth
Eyelid	Vertical waveforms in front of the forehead in synchronization with the opening and closing eyes. Slow movement of several Hz is also observed	Close your eyes and hold the eyelids with gauze
ECG	Mixed as a spike-like regular wave. Single pole derivation method	Turn your head clockwise looking from above
Denture	Sharp waves mixed in with metal contact	Open mouth
sweating	Irregular baseline wobble	Moderate room temperature. Wipe off sweat and replace electrode
electrode	Baseline fluctuation, steeply moving baseline	The electrode is floating. Uneven paste on electrode

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How to identify artifacts and countermeasures

SSR	Irregular baseline wobble	Reduce air conditioning.
Body movement	Irregular waves with sharp rises and baseline wobble	Encourage relaxation
ENG	Vertical movement on forehead, horizontal movement on temporal	Distinguish from falling asleep. Close your eyes and hold the eyelids with gauze
Breathing	Slow baseline wobble can be seen with breathing	Do not put the lead wire on the chest
Alternating current	A sharp rising wave persists at the same amplitude	Switch to battery operation, separate bed from side, ground metal bed

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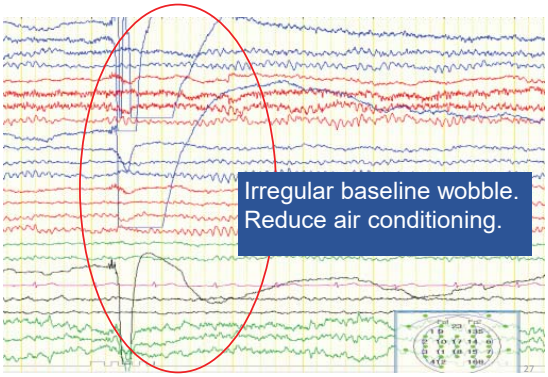
Sympathetic skin response: SSR



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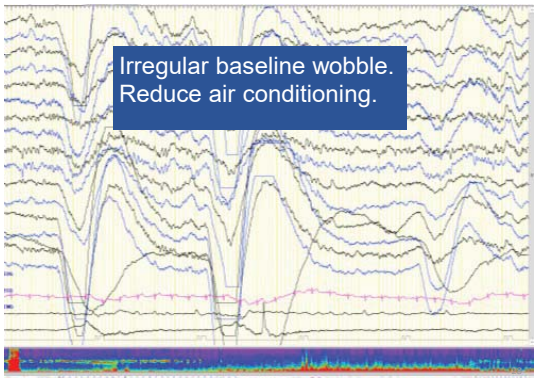
Sweating



If noise such as electromyogram enters the electrode ...

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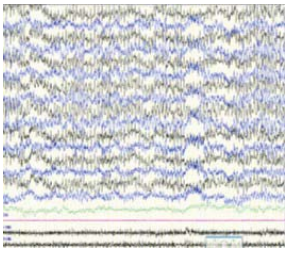
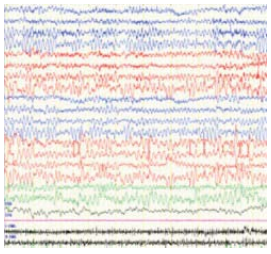
Changing the montage



Referential derivation



Bipolar derivation

Not having an EEG is a disadvantage for patients.

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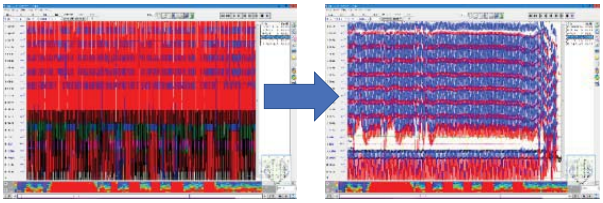
EEG cannot be performed while charging electrical equipment

Bring the outlet plug closer to the electrode

Unplug from outlet



Even if there is no equipment used, noise is mixed.

Unused machines should be unplugged from the wall outlet.

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Why should I lower the electrode contact resistance?

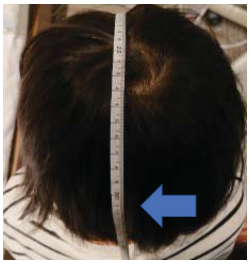
Noise occurs due to differences in electrode impedance

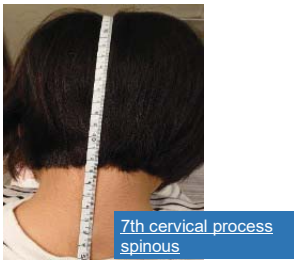
It is important to lower the electrode impedance, but

It is also important to match the electrode impedance

ＭＥの知識と雑音対策　佐野　彰仁より

Tips for 10-20 electrode mounting





If the external occipital protuberance is difficult to understand, fix the straight line using the 7th cervical process spine as a guide and measure the position.

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coronal plane　Pre-auricular　Cz point

The preauricular point connects the depressed portion just above the root of the cheekbone just in front of the ear.

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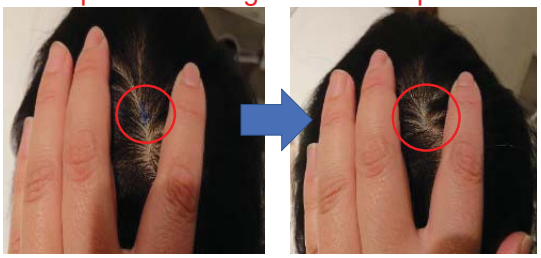
Tips for lowering electrode impedance



Squeeze the patient's hair firmly and rub with gauze or the like with abrasive.
if you rub with enough strength to make the marker disappear, the resistance will easily fall.

Too strong to hurt the skin.
Do not wipe with alcohol after scrubbing. It is painful.

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Attach paste and attach electrodes to attachment site

The electrode is hard to come off if paste is applied on the scalp

Conductive gel may be injected in cup electrode

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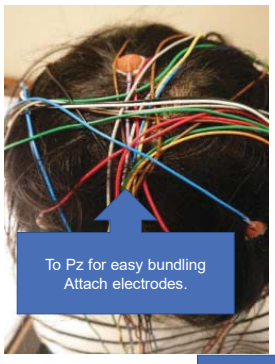

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Device for dipping collodion and drying with compressor

When the air is blown with the compressor floating, it does not adhere to the scalp.

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Take home message

1. In epilepsy treatment, many medical professionals work together to provide team medical care.
2. In VEEG performed for the purpose of surgical treatment, identification of the epilepsy site is important.
   An accurate EEG electrode position is required.
3. EEG is a fight against artifact removal. It is possible to reduce contamination by devising it.
4. The role of medical technologists in VEEG is significant, and the training of professional technicians is essential.

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Let's work together so that everyone involved in epilepsy care can contribute as a global team, transcending racial boundaries.

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