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Short communication

EEG artefacts caused by a Clinitron bed

Dwar Sewgobind [a], J.L.A. Eekhof [b], L.J. Bour [a], F.E. Posthumus Meyjes [a] and M.J. Lubbers [c]

[a] *Department of Clinical Neurophysiology,* [b] *Department of Neurology, and* [c] *Department of Surgery, Academic Medical Centre, 1105 AZ Amsterdam (The Netherlands)*

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Summary Clinitron beds, often used to prevent decubitus ulcers, may cause an EEG artefact by static electricity. The best way to prevent this artefact is to turn off the bed during EEG registrations.

Key words: EEG; Artefact; Clinitron bed

EEG records may be disturbed by many artefacts, especially when they are made in intensive care departments. It is important for the clinical neurophysiologist to recognize such artefacts. Here we describe and explain an artefact caused by Clinitron beds [1] which, as far as we know, has been mentioned only once, in the French literature (Brunel et al. 1989).

Case history

A 61-year-old woman was treated in the intensive care unit for multiple rib fractures. Neurological examination on admission was normal. She was intubated, sedated and artificially ventilated. One month later she developed an epileptic status, the origin of which remained unknown despite a thorough evaluation of laboratory examinations, CT scans and lumbar punctures. Because the usual treatment with diazepam i.v. and phenytoin i.v. in repeated doses was not successful, a continuous pentobarbital infusion was started, with monitoring of the plasma levels. One day after the start of this treatment an EEG was recorded (Fig. 1A), which showed a burst-suppression pattern: flat periods intermixed with periods of sharp waves. Next morning the EEG showed the same pattern with more frequent bursts. That evening the patient showed slight contractions of the left thorax and small jerks of the tracheostomy tube. Because they were considered as probably being of epileptic origin the dose of pentobarbital was increased. The same day the patient was placed on a Clinitron bed. Next morning the EEG showed continuous sharp waves over the right hemisphere only (Fig. 1B). The contractions were no longer observed. The pentobarbital dose was further increased.

Three days later the EEG demonstrated the same sharp waves, but now over both hemispheres. After the Clinitron bed had been turned off these sharp waves disappeared and an isoelectric EEG remained (Fig. 1C). The dose of pentobarbital was lowered. A week later the patient died of cardiovascular failure. A postmortem was not permitted.

Experimental study

The Clinitron bed is an important aid in the prevention of bedsores in immobilized patients. The bed consists of a big sac filled with microparticles. By an upward airstream, provided by a motor-pump, the effect of a dry waterbed is created. Bubbles of air and microparticles reach the surface of the bed and cause local movements.

Brunel et al. (1989) described the EEG of a patient with a Guillain-Barré syndrome who exhibited an artefact of slow and sharp waves and polyspike waves, with inconstant location, as long as the Clinitron bed was turned on. They assumed that the artefact resulted from an electrical field generated by the microparticles, but no experiments were carried out to support this assumption.

We examined two other patients to establish the origin of the artefact, but finally we performed an experiment with a piece of cotton wool, soaked in an NaCl 0.9% solution. Ag/AgCl electrodes were applied to a piece of cotton-wool the size of a child's head, approximately positioned as on the patient's head. The impedance was < 5 kΩ. In this manner we were able to obtain bipolar records of the artefact not disturbed by physiological potentials. An accelerometer (Brüel and Kjaer type 4375) was attached to the bed to monitor the movements of the surface. After the bed was turned on the artefact gradually appeared (Fig. 2A). This excluded the motor as a cause. Placement of the accelerometer near the electrode leads showed at first sight a perfect match between the artefact and the position output of the accelerometer (Fig. 2B). However, when a piece of aluminium foil was put underneath the cotton wool and the electrode leads the artefact became much smaller. The movement of the foil was considerable, as was demonstrated after the accelerometer had been

Correspondence to: Dr. F.E. Posthumus Meyjes, Department of Neurophysiology, Academic Medical Centre, Meibergdreef 9, 1105 AZ Amsterdam (The Netherlands).

[1] Clinitron Air Fluidised Therapy from Support Systems International.

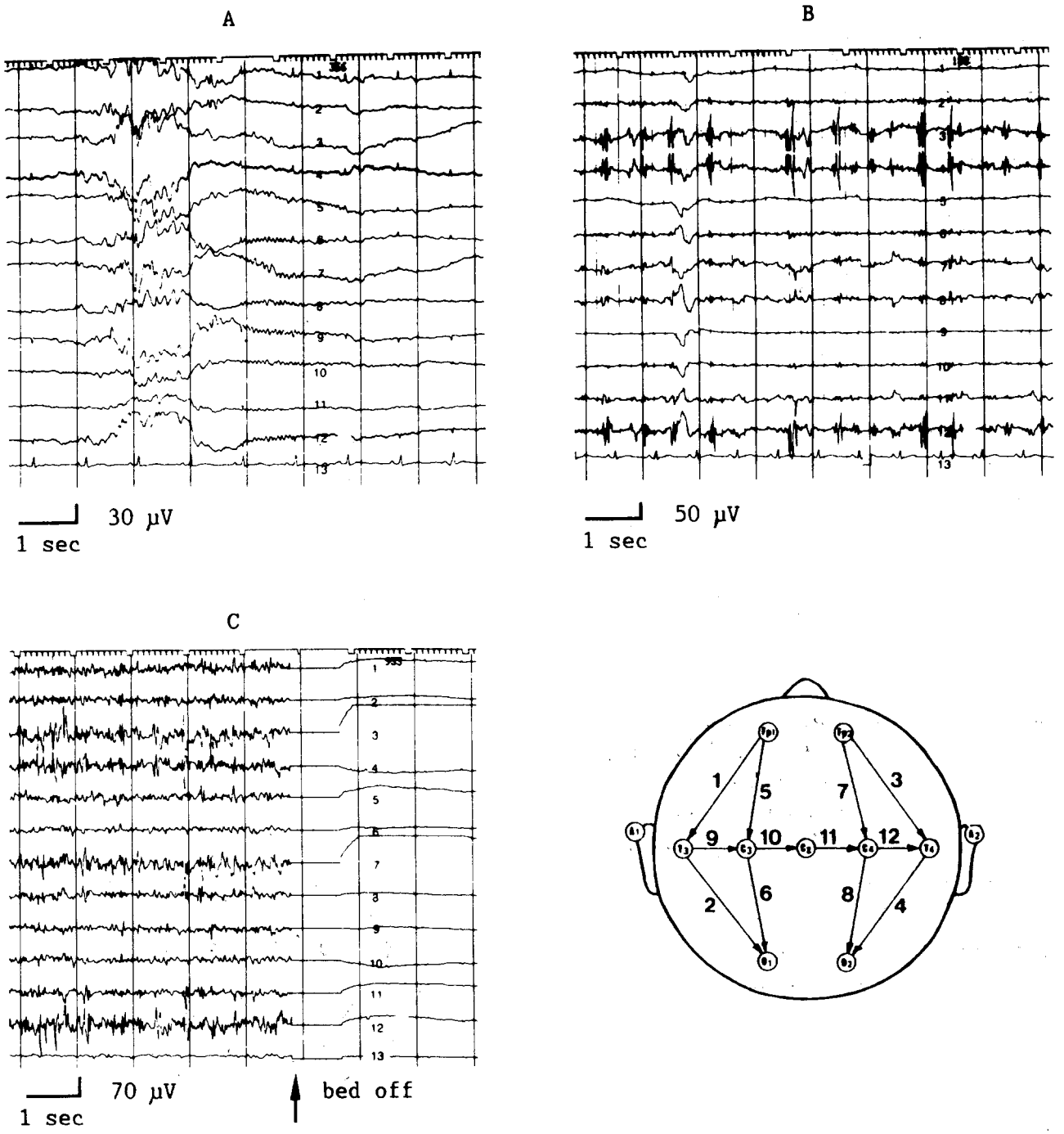

Fig. 1. Registrations of the patient. High frequency filter (HF) = 70 Hz. A: EEG from day 2 after the start of pentobarbital. Time constant (TC) = 1.0 sec. Burst-suppression pattern with epileptiform activity during the bursts. B: day 4; TC = 0.3 sec. Continuous polyspikes and sharp waves in the right hemisphere. C: day 7; TC = 0.3 sec. Continuous spikes and sharp waves in both hemispheres, which disappear after the bed is turned off.

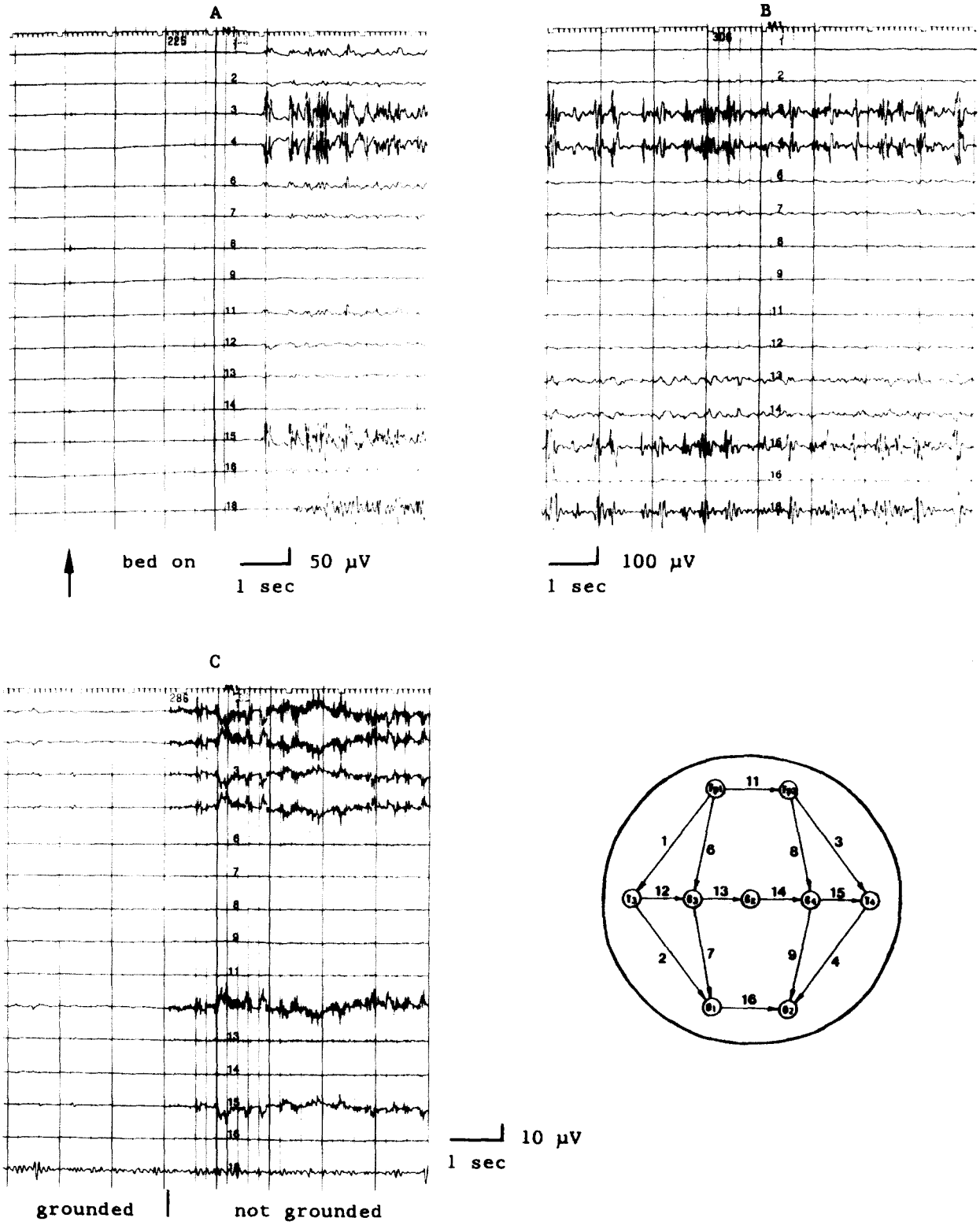

Fig. 2. Measurements on a piece of cotton wool. Bipolar recording as indicated. TC = 0.1 sec, HF = 70 Hz, channel 18 = accelerometer. A: the artefact appears after the bed is turned on and takes several seconds to reach its maximal amplitude. B: the artefact matches the registration of the accelerometer. C: a piece of aluminium foil is placed under the electrodes and under the cotton wool. When this is grounded the artefact is almost absent; when the earth electrode is removed from the foil the artefact still has a much smaller amplitude than without it.

attached to it (not shown). When the foil was grounded the artefact almost disappeared (Fig. 2C).

Discussion

Our conclusion from this experiment is that the bubbles which reach the bed's surface are probably charged with static electricity and that this moving electrical charge in the vicinity of the electrodes causes the EEG artefact.

The best way to prevent the artefact is, of course, to turn off the bed during EEG recording.

Reference

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