

An Eyewitness Account of the Discovery of Electroshock

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Summary: The author was one of the pupils of U. Cerletti and his assistant for almost 20 years. He worked with his master in the discovery of electroshock and in its first application in man in 1938. The author has thought it useful to publish his own testimony for the purpose of making the truth about the events known—the same truth that has often been questioned.

The first application of electroshock in human beings occurred in April 1938, in a room of the Clinic for Mental and Nervous Diseases in Rome, then under the direction of Professor Ugo Cerletti. Vittorio Chailiol, an assistant in the clinic; Mario Felici; and I, and the aide Spartaco Mazzanti, are the only eyewitnesses still alive. Ugo Cerletti, Lucio Bini, and the nurse Ezio Capelletti are no longer with us.

Electroshock was discovered 32 years ago. It is uncommon in the history of modern medicine that a therapy survives unchanged in its technique and continues to be applied all over the world with positive results more than 30 years after its birth. It seems reasonable, then, that the discovery of electroshock assumes the dignity of an historic event.

Before I too abandon the group of living eyewitnesses I feel it is my duty to make public my testimony to the younger generation and to give my contribution to the verification of those historic events, which at some point have become the object of controversy.

Electroshock was discovered in a period of psychiatric revival. In 1935 Professor Ugo Cerletti, in the opening address for his election as chairman of Psychiatry at the University of Rome, pointed out that psychiatry had been regarded

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Translators' notes: "Certosini" refers to a Catholic congregation of brothers famous for very fine and meticulous craftsmanship. "Mythical resonance" probably refers to the belief during the time of the Roman Empire that a seizure attack in a person attending a "comitia," a public meeting in the forum, was a sign from the gods.

as a "funereal science" because of its lack of therapies but was now being "revived." In those years, research in psychiatry was regaining force and vigor in response to a growing interventionist attitude. Those of us who are no longer young remember that after the introduction of malarial therapies by Wagner-Jauregg in 1917 and prolonged sleep treatment by Klaesi in 1922, the era of the shock therapies began, with insulin shock therapy introduced by Sakel in 1933 and Cardiazol shock therapy by Meduna in 1935.

A dynamic spirit such as Ugo Cerletti's could not remain insensitive to events of such importance. Even before becoming the Chairman at the University of Rome, he had been working with Dr. Viale, a physiologist in Genoa, studying epileptic phenomena in dogs by the application of electric currents.

When Meduna demonstrated that epileptic events could be beneficial in the treatment of some psychopathologies, the Maestro (Cerletti) called together his assistants Bini, Longhi, and myself in October 1936. To Longhi, he assigned the study and application of Cardiazol therapy. He assigned me to the study of insulin therapy, and for this purpose, he put me in charge of a ward. To Bini, he explained and discussed a research project which he summarized in the following words: "We have seen that an electric current of 90-120 volts for one second provokes an epileptic attack in dogs. We now have to perfect the circuit, to make it safer, and eventually to attempt it in man. If we succeed, this method could have some advantages over Cardiazol shock therapy."

This was more easily said than done. It was true that epileptic attacks could be provoked by electric currents, but it was also true that approximately half the animals that underwent the treatment died of cardiac arrest, which left us perplexed.

The idea of the project was seductive, and the goals were certainly daring for the era in which the experiments were performed. At the time, I was directing the first Italian department of shock therapies and was an eyewitness to the course of these events. Bini, Mario Felici, and I were inseparable, spending all our time in the hospital.

After a series of experiments, Bini came to the conclusion that a high percentage of the animals could not tolerate the electric current because it traversed the heart: one electrode had been in the mouth and one in the anus of the animals. The heart was included in that circuit and at times would not tolerate the current. Other circuits were tried, until it was observed that if the electrodes were placed on the two temporal regions of the cranium of the dog, the epileptic attack was consistently produced and the animal survived.

Each week for almost a year, the van of the municipal dog catcher would stop in front of the department and unload the animals. At that time, even I experimented with dogs, provoking a hypoglycemic coma with insulin, and studying the changes induced in the brain. At times, Bini and I had more than 50 dogs undergoing experiments simultaneously. We were so absorbed by our mission that we frequently lost the awareness of time.

Whenever a dog died during an experiment, an autopsy was immediately performed. The brains were carefully sectioned and placed in glass containers with

fixative solutions. These containers multiplied on the laboratory tables in a geometric progression. Our laboratory technicians, the patient Mrs. Elvira and good, old, rough Parsi could not change the solutions fast enough, and the containers kept piling up on the tables. We ourselves were transformed into technicians, patiently and meticulously preparing, cutting, and staining specimens with the patience of the "Certosini."

Every day, after finishing our experiments, we would lock ourselves in the laboratory to examine under a microscope the brains of the dogs that had not survived. Bini, Felici, and I would exchange ideas and observations, often until the middle of the night. Not infrequently, the Maestro would look over the material we had accumulated.

Ugo Cerletti was particularly distinguished while standing at a microscope; under a prominent brow his half-closed eye would brighten while examining the details of the fibrils, the disintegration of a nucleus, or the abnormal coloration of a stratum. He was like a falcon high in the sky, searching for prey on the ground below.

During those moments, time stood still. When the Maestro spoke, we followed his words, not merely listening, but letting them "penetrate" into us. I am sure that without ever having said it, the Maestro felt the spirit that animated us, and I believe that he was greatly gratified to give us his knowledge.

We demonstrated the feasibility of inducing epileptic attacks in dogs by using electric currents without producing death. It was a step forward, but the step to a test in a human being was yet to be made and was not without risks.

In 1937, the first International Psychiatric Congress was held in Muensingen, Switzerland, with Max Mueller as President. The theme was "The New Therapies of Schizophrenia." Bini and I thought to participate, and before departing, we went to Professor Cerletti's office to obtain his advice on what we intended to present at the congress.

I was to present the clinical data and histological experiments on insulin shock therapy, a subject current at that time. Bini was to discuss the first results of his experimental research on the technique that from now on was to be called electroshock.

Bini's presentation referred to the experiments that had already been performed on animals, and we discussed with Prof. Cerletti whether it was opportune to announce that the final scope of the experiments was to apply the technique in human beings. These doubts could seem ingenuous today, when electroshock is applied in psychiatric institutions even in the remotest parts of the world. But at that time, no one had attempted to induce epileptic attacks in human beings using an electric current. Indeed, the only instance in which a loss of consciousness was intentionally provoked by the use of electricity was in the United States, where executions were performed using the electric chair. It would have been easy for a hostile and superficial critic to find an analogy, but unfortunately, in the history of scientific discoveries, superficial and hostile criticism has never been lacking.

In any case, after a long discussion and with understandable caution, Prof.

Cerletti approved Bini's suggestion to announce the possibility of a therapeutic application of an electrically induced epileptic attack in human beings. Bini announced it in Muensingen.

After we returned from Switzerland, we learned that pigs were being killed with electric currents at the slaughterhouse in Rome, and Prof. Cerletti advised us to see what this was about.

Bini and I went to the chief veterinarian, Prof. Ettore Torti, who directed the slaughterhouse. We were cordially greeted and permitted to perform experiments on pigs. We repeated our experiments and noticed some unusual facts. In using electric currents with the same characteristics that Bini had applied in dogs, we found that the pigs did not die. They were stunned and fell into epileptic fits, from which they rapidly awakened. There was a clear difference between the time necessary for a current to provoke a "fit" (<1 s) and the time necessary to provoke the death of an animal (60–150 s). This gave a wide margin of safety.

Thus, the experimental data were favorable and were repeatedly demonstrated. We were certain that nothing had been forgotten and that every possibility had been considered. But doubts still remained as we considered the move to human beings. The basic rule, "Primum non nocere," and respect for the individual, can never be too far from the physician's mind.

Bini, Felici, and I were impatient to attempt the experiment and were anxiously awaiting approval from the Maestro. At that time, the enthusiasm of youth made us brave to "bite the bullet"; today, we recognize that Prof. Cerletti's prudence was justified.

If the human experiment, for whatever unforeseen reason, had concluded with the death of a subject, the entire responsibility would have fallen on Prof. Cerletti; our school, which was already considered interventionist, would have been discredited and the head of the school would have felt the consequences. I am convinced that had we been in the position of the Maestro, we too would have requested an endless repetition of experiments, which by that time appeared safe. During that period, I believe Prof. Cerletti did not sleep peacefully.

Bini had constructed, with the help of Gradi the technician, a rudimentary apparatus which permitted the dosing of electric current in both time (fractions of a second) and voltage (80–100 V) for use on a human subject.

A schizophrenic man had been admitted several weeks previously to our psychiatric ward. He had been brought by the police who had found him wandering on the streets of Rome. He could not give any precise information regarding himself and his family. Inquiries were made, but we could not find anyone who was searching for him or seemed to care about him. From a psychiatric point of view, the illness had a poor prognosis, the clinical syndrome was clear, and the disease advanced.

The patient often expressed himself in a jargon of his own invention, which was very difficult to understand. He expressed delusions, and his thoughts were disorganized and without logic. He was unemotional, living passively, like a tree that does not give fruit. We concluded that we were dealing with a mentality that was completely unraveled, and gave little hope, even for a partial recovery.

The case seemed ideal for the trial. Not only did we wish to demonstrate that we could provoke an epileptic seizure in a human being using electric currents; above all, we wished to demonstrate that such seizures had a therapeutic value similar to that produced by the rapid intravenous infusion of Cardiazol. Therefore, it was necessary that the first patient be afflicted, as this man was, by unequivocal psychopathology. If the trial had the anticipated outcome, medicine would acquire a new and effective weapon against mental illness.

At that time in 1938, we had not yet seen a world conflict like the last one, which demonstrated vividly and cynically that a human life can often have no value. Above all other considerations, we believed that we had established every scientific and moral basis for the trial, so we decided to go ahead.

It was a morning in April 1938.

On the first floor of the hospital there was a spacious room used as a laboratory by a senior designer who had placed a bed in the room to rest from his work. Since the room was not used for anything else, was isolated, and was secure from indiscreet intrusions, it was chosen as the site for the experiment.

Bini's device was placed on a table, in a tangle of electric wires and instruments of measurement. Prof. Cerletti, Bini, Chailiol, Felici, and I were present. Chailiol would leave the room periodically to see whether any undesired person was lurking in the corridor.

The patient, his head shaved, totally indifferent, lay down with his head at the foot of the bed. The nurse, Capelletti, placed two electrodes over the patient's temples, while the aide, Mazzanti, placed a plastic tube covered with gauze in the patient's mouth.

Bini and Felici were near the device; Prof. Cerletti and I were near the patient. We displayed a great deal of confidence in ourselves, which if rationally justified, was not emotionally felt at all.

Everything was ready. Bini gave a questioning look to the Maestro, who nodded affirmatively.

The click of a switch; a brief, dull buzz from the timer for the current; and all our attention was on the patient. He had a sharp contraction—a tonic spasm throughout his body—then he relaxed and lay immobile. I put my stethoscope on the patient's chest; the heart was beating regularly, but the rate was increased. I didn't have to say anything, as my face brightened, and that was a sufficient response.

In response to a question, the patient responded as if he had no memory of the experiment.

I heard Bini say, "We gave 80 volts for $\frac{1}{10}$ of a second. The patient had an absence." "We need to increase the current," said Prof. Cerletti, "let's try another setting."

Bini set the device: "90 volts, $\frac{1}{10}$ of a second." "O.K. Go!"

Another click, another brief buzz. This time the patient fell in a slightly longer tonic spasm, similar to the first one, turned pale for a few seconds, and then relaxed with a deep breath. His heart rate was not changed. After about a minute, he opened his eyes, shook his head, sat up, and started to sing a popular, dirty

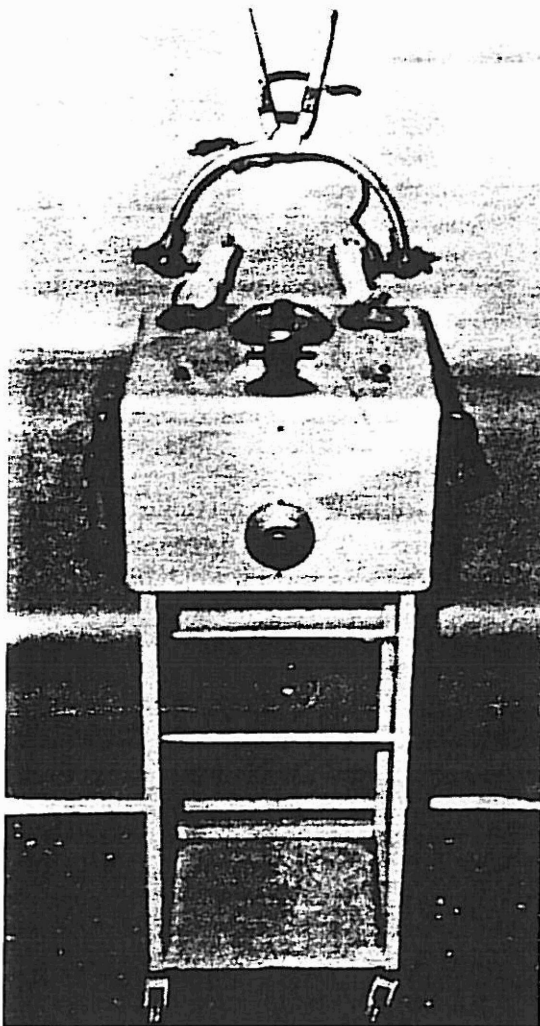


FIG. 1. First electroshock apparatus devised by Bini and Cerletti (Museum of the Institute of History of Medicine, University of Rome).

song, out of tune. (I believe that at that moment, a romance sung by Beniamino Gigli couldn't have lifted our spirits more.)

"This dose still wasn't sufficient to induce a seizure," Cerletti said. "Shall we try again?"

The question was unnecessary, since the affirmative answer could be read on everyone's face. "Well, another time at a higher voltage and with a longer duration, then no more."

The patient, who up to that point seemed completely indifferent to what was happening to him, said with a calm voice, "Be careful: the first one was a nuisance, the second one was deadly." (He had not been conscious of the first treatment.)

We looked at each other; what is this? A warning? Perhaps the magical thinking of an old superstition? We hesitated for a moment only. The Maestro's voice brought us back to reality: "Let's proceed."

Bini set the device to the maximum current. Felici pushed the button. One click, one buzz.

The patient had a tonic spasm of the muscles, but this time he did not relax. Instead, rhythmic spasms followed. It was the tonic-clonic phase of a seizure. He stopped breathing; his face was pale, then cyanotic; the mandible was clenched; and the corneal reflex was absent. I listened with my stethoscope: his heart beat faster and faster. Bini counted the seconds of apnea on his watch. "Five . . . ten . . . fifteen. . . ." The patient's face was purplish; he was still shaking.

"Twenty . . . twenty-five . . . thirty"

The heart rate kept increasing.

I could feel his pulse getting stronger under my fingers.

"Thirty-five . . . forty"

The shakes became less frequent; the muscles relaxed.

"Forty-five"

At the 48th second, the patient emitted a stertorous breath and became less cyanotic, and his pulse normalized. We sighed with relief. It was not hot, but our foreheads were wet with perspiration. Now the patient breathed regularly, was sleeping, and was calm; there was no evidence of abnormality in the cardiovascular and respiratory systems. We glanced at each other; in our eyes, there was a new shining light.

With a calm and decisive voice, the Maestro said, "I can therefore assume that an electric current can induce a seizure in man without risks." This short sentence summarized 2 years of work.

This experiment was the first application of electroshock in human beings. A few days later, the experiment was repeated in the presence of other colleagues and academicians, among them Prof. Bastianelli. This second session was "officially" considered the "first" electroshock treatment.

Now that electroshock is a routine and common tool of any young psychiatrist, it could seem that I overdramatized the description of an event that I witnessed more than 30 years ago. If, however, we recall that the induction of a seizure was then still regarded with fear and caution, despite the advent of Cardiazol shock therapy; and that seizures still hadn't lost the "mythical resonance" given them by our ancestors; and if we also remember that the use of electricity at voltages >10 v was believed extremely dangerous, perhaps then you, the reader, will be less severe in judging our emotions.

The first step was taken. The second goal was to determine whether an electrically induced seizure had the same therapeutic efficacy as a chemically induced seizure, and whether one held any advantages over the other.

The schizophrenic patient who underwent our experiments was probably the most carefully studied and observed patient at that time. After a course of nine treatments, he came out of his indifference and became interested in the events around him. He gave up his idiosyncratic jargon and rapidly improved to such a

point that when he was reunited with his wife, who was searching for him, he was lucid and in a good mental state. We continued his followup for two years; he returned to his special type of work and was able to support himself.

A new therapy was born. Prof. Ugo Cerletti named it electroshock.¹

The assistants, about 15 of us, met in the director's office. The Maestro planned our future work, like a general who was organizing a course of battle to the staff. Each had his own assignment. The electroshock schedule was made, and although it may sound humorous, we agreed to have each session announced with the sound of a trumpet to gather all the physicians in the clinic who might be interested in the event. For an entire year the aide, Spartaco, played an out-of-tune trumpet three or four times a week.

For each session, the electroshock room was crowded with about 10 physicians, each taking measurements of different parameters. I studied the respiratory and pulse rates, blood pressure, and temperature. At the end of the day, the cylinder of the kymograph (at that time we didn't have today's elaborate instruments) and my face were equally dirty with black smoke. As soon as each patient entered the room, he was literally assaulted by us. Felici used to draw a few tubes of blood peripherally and made blood smears. Bartolini requested urine from the patient and would get very irritated if the patient refused. I convinced the patient to have a lumbar puncture done under local anesthesia to get spinal fluid for analysis. Challiol and Vattuone, one with a syringe of Luminal, the other with a reflex hammer, were collecting data for their studies. Puddu was collecting cardiological data. Castellucci was studying changes in blood glucose. Ciotola examined the eye ground for changes in retinal circulation. Rizzo, just a few seconds before the induction of the seizure, would loudly play a station-master's trumpet close to the patient, intending to induce eventual conditioned reflexes.

I cannot assure you that all the patients liked our zeal. After our equipment was accurately situated, it was not unusual for a patient to show no consideration for the progress of science and to kick it all away. To our credit, we exhibited unlimited patience and we limited the patient's inconvenience to the minimum possible.

After about 1 year of work, the results of our studies were published, and any physician was then able to use electroshock with an adequate technique.

This narration of events was at the time approved by Cerletti and Bini. Unfortunately, they are no longer with us. Mario Felici, another eyewitness, also confirmed these observations.

A controversy arose around the issue of who contributed more to the discovery of this new treatment, but the participants rejected this controversy.

Having been one of the participants in the work that led to the discovery of electroshock, I can affirm that Ugo Cerletti and Lucio Bini merit the credit for the

¹ During the period 1940-1943, in that phase of collective stupidity during which "autocratism" was pursued even in language, the Anglo-Saxon part of the word "electroshock" was changed by some into Italian words equivalent to what in English would be "electro bump" or, even worse, "electro break." Only after the "liberation" was the original word used again. When later events are considered, the word wasn't a very good choice either. If instead of "electroshock," for example, the word "electrorelax" or a similar one had been used, perhaps today some patients and their families wouldn't have so much concern about receiving electroshock.

scientific discovery. Cerletti deserves the first place, because even with his understandable doubts and hesitations, he undoubtedly ignited the first spark that led to the idea of using electric currents to induce seizures. He had the professional stature to assume the great responsibility for the first human application of electroshock.

We should underscore that without the intelligence, discerning abilities, assiduous work, and persistence of Lucio Bini, electroshock would have been only a theoretical hypothesis and not a concrete reality.

Electroshock, more than 30 years after its discovery, alleviates much human suffering throughout the civilized world. Any specialized physician can use it, even at the patient's home with the help of a simple portable device, which is no more than an elaboration of Bini's elementary device. Today, electroshock is widely known by the lay public in every nation. Most do not know who discovered it and do not know the names of Cerletti and Bini, who are now part of the history of psychiatry.

I would like to conclude with some thoughts which I expressed on another occasion.

We are ready to abandon the past, when the future shows some promise. Today, we do not have a choice: either we treat our patients with the tools which we have or we can stop because of skepticism and inaction. The major criticism of electroshock is its empiricism, as if the great part of our art of medicine were based on well-proven pathogenetic data and as if the greatest philosophic minds had negated the value of empirical experience.

Perhaps there will be a day in which our present technology will be regarded as inadequate or childish; perhaps posterity will consider electroshock a product of an obscure science. I would be happy to see that day because it would mean that something better has been discovered. Ugo Cerletti said that it was not our duty to defend the shock therapies, but to relieve the suffering of the mentally ill.