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A translation of “L’Elettroshock” by Cerletti & Bini, with an introduction

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ABSTRACT – The year 2013 marks the 75th anniversary of the invention of ECT. This paper provides a translation of the 1938 publication by Cerletti and Bini, with an introduction. The authors thought that it would be helpful, in the debate about ECT, to make accessible to people unfamiliar with Italian the first public account of ECT made by Cerletti and Bini in front of the Royal Medical Academy of Rome in May 1938. The introduction and translated paper refer to the methodical approach to the development of ECT, based on the scientific opinions and technological processes of the time, as well as the drive to provide treatment which is both cheaper and more acceptable to patients. The introduction also comments on changing attitudes to what remains an efficacious treatment. ECT has been wrongly represented as an obsolete, unscientific treatment more akin to a torture than to a therapy: some explanations for this are suggested.

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Introduction

This year marks 75 years since the invention of electroconvulsive therapy and the first publication about it. This treatment, with little modification of the original protocol, is still in use throughout the world. We thought it apposite to mark this anniversary by pro-

viding an English translation of the first public account of ECT carried out by Cerletti and Bini in May 1938 in front of the Royal Medical Academy of Rome¹.

Electroconvulsive therapy (ECT) –first known as electroshock– was one of the earliest physical psychiatric treatments which continues to be in use today, as it is currently

regarded as both specific and more effective than placebo². The technique was developed in the 1930s by Ugo Cerletti and his collaborators (among them, Lucio Bini, who was a clinician as well as designing the apparatus)³. The research team led by Cerletti was the first to use electricity to induce seizures.

Social and service background to ECT

In the 1930s, Europe and the USA were not only in the midst of “the great depression” (with a consequent shortage in funding for health care and increased demand), but also witnessed the rise of eugenics and totalitarian movements. In Germany mainly, but also in the USA, the eugenics movement was advocating forced sterilization; Nazi Germany went on to develop a “euthanasia” programme, in which hundreds of thousands of people with mental disorders were killed^{4,5}. In Italy, however, the fascist regime did not put a particular emphasis in the problem of mental health (although intervening heavily in other aspects of health care, e.g. infectious disease) and therefore clinical psychiatry and psychiatric research were underfunded with a consequent shortage of beds, an overcrowding of asylums (where living conditions were often abominable), and a cultural stagnation of the discipline^{6,7}. The situation was so severe in Italy that in 1942, Cerletti refused to become the president of the Italian Psychiatric Society, in protest against these conditions (despite pressure from politicians)⁸. It should be added that, after 1938, Italian psychiatry and psychoanalysis were also affected by the introduction in of the infamous “racial laws”, which caused the expulsion from their institutions of numerous academics and clinicians of Jewish religion or ancestry. Among these were Marco Levi Bianchini, director of the Asylum of Nocera and the

founder and editor of the “Archivio generale di neurologia, psichiatria e psicoanalisi” which published, in one of its last issues, the paper that is the subject of this article. The journal was confiscated and closed in 1938. In 1939 the journal reopened as “Archivio di psicologia, neurologia, psichiatria e psicoterapia” with no references to psychoanalysis (in disgrace due to Freud’s ancestry) and with a new Editor - Agostino Gemelli⁹.

In England and Wales, it was the peak of the asylum era: mental illness in-patients numbered over 140,000 from 1930 to 1955^{10,11}. The atmosphere of therapeutic nihilism (and later optimism) is clearly described by Rollin¹². It was reported that the head of the Maudsley (Britain’s new academic psychiatric centre) refused to recruit staff who had spent much time in asylums, believing they would have become inured to disillusioned inactivity¹³. In this context, a more successful treatment of mental disorders was desperately needed.

Research scientific background to ECT

The development of ECT was a confluence of two distinct themes in physical treatment –the use of electricity and the value of shock– brought together by research interest in epilepsy and convulsions.

Medical uses for electricity generated by fish or eels were described by ancient Romans¹⁴. Therapeutic applications of electricity were current from soon after modern discovery of electricity in the 18th century¹⁵ and continued to be used in neurology and psychiatry in the later 19th and earlier 20th centuries¹⁶.

In the 1920s, the concept of shock as a physical treatment for mental disorders resurfaced. After the successful treatment of neurosyphilis by Von Jauregg (by inoculating

malaria), Manfred Sakel introduced insulin shock by administering large doses of insulin to induce a coma. Sakel's treatment included people with addiction, neuroses, psychopathy, and psychosis¹⁷. He was aware hypoglycaemia could lead to a convulsion, and discussed making a convulsion more likely by omitting barbiturates and by adding Cardiazol, but did not seem to ascribe relative therapeutic value to the shock or the convulsion (if it occurred)¹⁸. The patients that recovered from the insulin administration, showed, in many cases, an improvement in their condition. The technique needed several treatments and was very expensive and dangerous. Numerous patients died or experienced severe harm, and insulin was extremely expensive¹⁸.

There was a century old observation and theory, then championed by Ladislav Meduna¹⁹, of a "biological antagonism" between epilepsy and schizophrenia. (Although we now know that *individuals* with epilepsy have an increased risk of schizophrenia and vice versa²⁰⁻²², at that time the large asylums had patients who could be grouped diagnostically, one large group being dementia praecox/schizophrenia, and another being epileptics: at an institutional level, the *groups* did show "antagonism"). Working in Budapest, after histopathological studies on epilepsy and schizophrenia, Meduna started treating individuals affected by schizophrenia with chemicals which induced seizures. He first used camphor, and subsequently adopted a synthetic derivative called Cardiazol in Europe and Metrazol in the USA. The first successful trial was in 1934 and subsequently the treatment spread internationally. While Sakel was inconsistent about the rationale of insulin treatment (sometimes stating it was the shock, sometimes stating it was the seizures induced), Meduna had a clear theoretical model about the antagonism between epilepsy and schizophrenia. Unfortunately Meduna's treat-

ment was dangerous, expensive and very little tolerated by patients: they complained of a feeling of impending death between the injection of Cardiazol and the onset of seizures. Cerletti and his co-workers (including Bini and Kalinowsky) travelled to Vienna and Budapest, met Meduna's team, and started to use his techniques in Rome.

Interestingly, Cerletti seems to have been surprised by the fact that Meduna did not use electricity to induce seizures. The research that led to the first experiments with ECT had been started by Cerletti and his team in Genoa in 1934 working on the effects of electricity. They started by using animals (dogs and pigs) and established the safety of the technique through histopathological studies of the dogs' brains to confirm absence of brain damage. Only after this preparatory work did they conduct the first experiment on a human being in April 1938 in Rome^{1,6,8,23}.

The "rise and fall" of ECT

Following its first description in 1938, ECT spread across different countries in the span of a few months: blueprints of machines were disseminated to Paris, Holland, and England in 1939, and ECT was practised in the U.S. from 1940. In 1943, it was noted that 350 publications had already appeared²⁴. The speed of diffusion appears remarkable, especially considering the political tensions of Europe in 1938 (although psychosurgery also spread from Moniz in Lisbon in 1936 to Freeman in USA by 1942, with over 10,000 operations having been carried out in UK by 1954²⁵. ECT became widely accepted and used in psychiatric practice²⁶.

The first patient ever treated (in April 1938) was diagnosed as schizophrenic²⁷. Some of the earliest English language publications on ECT involved only schizophrenic

patients^{28,29}; however, subsequently reported series included diagnoses of mania, depression, and neurosis, as well as hysteria³⁰ and organic states³¹. Even in the late 1930s and early 1940s, there was a view that Cardiazol and ECT were of greatest and most specific benefit in patients with severe depression³². The deployment of ECT became increasingly focussed on depressive illness: a 1980 British survey³³ listed 83% of courses were prescribed for depressive disorders, 13% for schizophrenia, and 2% for mania. Current English guidance³⁴ accepts depression as the only evidence-based indication, whilst supporting occasional use in mania (despite evidence of benefit³⁵ and tolerability³⁶ in schizophrenia).

Following its initial success, when ECT was widely accepted by clinicians and the public, the treatment later became controversial and largely lost the support of public opinion. During the rise of the antipsychiatry movement it was portrayed as barbaric, and often represented as a punishment by unskilled and cruel psychiatrists on patients who did not conform to the norm³⁷. By 1982, there was reference to prejudice against ECT³⁸. ECT appears to be in decline in Europe³⁹.

The facts of ECT were unchanged, and we suggest a number of non-rational factors were involved in these attitudinal and reputational changes, including the confusion of convulsive and non-convulsive uses of electricity.

1. If the number of therapeutic options is limited, the available options are liable to be overused or used outside their accepted remit (just as currently happens with medication⁴⁰): some over-use and over-enthusiasm has been acknowledged by advocates of ECT⁴¹.
2. ECT has been abused occasionally to manage an unruly patient or apparently as a punishment rather than a therapy^{42,43}.

3. It is conceivable that the rapid spread of the technology led to it being employed by staff with inadequate skill or training: for example, in Sylvia Plath's fictionalised autobiography (first published 1963), she describes remaining conscious and experiencing considerable pain, suggesting faulty procedure⁴⁴.
4. Non-convulsive electricity was used clinically as an aversive stimulus in behaviour modification⁴⁵.
5. The Milgram study of conformity to authority⁴⁶ involved a potent mix of non-convulsive electric shocks, punishment, mindless obedience, and turning a blind eye to potential harm.
6. Non-convulsive electricity has also been used non-clinically in true torture: one view argues this was pioneered in the 1950s and adopted by US forces in the 1960s⁴⁷.

A scientifically semi-literate population easily confuses these distinct issues, none of which should discredit correctly used ECT; sadly, such confusion continues until today⁴⁸. The issues above arose during the 1950s and 1960s in a social context of rising antipsychiatry, reflected in adverse media portrayals (e.g. ECT as an individual punishment within a punitive asylum regime⁴⁹ and multiple regressive ECT as a cause of severe amnesia, personality change, and loss of intelligence⁵⁰).

We conclude that since the early 1960s, there has been a negative narrative around ECT –that it is an anti-therapeutic punishment– a negative narrative determined by social, not scientific, factors.

The role of this account

Considering the importance that ECT has had, and continues to have, in the therapeutic

armamentarium of psychiatry, we think it important to remember the intellectual pathway that led to the development of ECT. The genesis of the invention in fact was neither barbaric nor accidental but was the outcome of systematic studies on the effect of seizures on the Central Nervous System begun centuries earlier and built on by Cerletti's team using a technology that was advanced for the time and with a solid scientific basis for the time⁸.

The first public account of ECT is extremely interesting, because it summarizes the scientific pathway that led to ECT and describes the early technique in considerable detail. Everybody that has performed or witnessed an ECT session would clearly recognize the phases (tonic contraction; tonic-clonic contractions; and subsequent muscle relaxation) described here.

Reading the first public account of ECT is also fascinating because it shows how psychiatry was then facing problems similar to the ones we are facing now. It is often forgotten that induced seizures were already used prior to ECT: a key driver for the development of ECT was to find better tolerability compared to the pre-existing treatments (seizures induced by Cardiazol and insulin) and with lower costs (limited to the cost of the device only). Pre World War II Psychiatry was facing, *mutatis mutandis*, a similar problem to the one that contemporary psychiatry is facing: shortage of funding and the need for new effective treatments with fewer side-effects. The need for innovative, safe and better tolerated treatment was overwhelming and ECT was the first of such treatments available. This is probably the explanation for the surprisingly rapid spread of ECT after only a few months from its presentation in May 1938.

Translating into English the very first publication on ECT will make this important

document available to the larger public. We hope also that this paper will contribute to the debate about the future of ECT and of psychiatric treatment at a time of economic and political uncertainty, acknowledging the changes in both scientific opinion and clinical practice.

It should be noted that the paper takes the form of an anonymous report of a presentation by Cerletti and Bini, although Cerletti and Bini are credited as authors and it states they approved the report.

Translation of L'Elettroshock by Ugo Cerletti and Lucio Bini published in 1938 in *Archivio Generale di Neurologia, Psichiatria e Psychoanalisi*, 19: 266-268.

Clinic for Nervous and Mental Disorders, Royal University of Rome, directed by Prof. Ugo Cerletti.

Electroshock

Summary of the original oral communication made by Cerletti and Bini at the Royal Medical Academy of Rome on May the 28th 1938, published with the consent of the authors.

Cerletti firstly expounded the reasons why, among different modern treatments for schizophrenia and other psychoses, convulsive therapy with Cardiazol became so popular. It is predominantly practical reasons that make it preferable to hypoglycaemic coma in many cases: less responsibility for the doctor; medical assistance is needed for much less time; a smaller number of sessions is required; there is much less cost. Cerletti mentioned the more or less severe (although uncommon) incidents that happened after rapid, massive injections of Cardiazol. Cerletti also

highlighted a significant side-effect caused by Cardiazol during the latency period (between the injection and the induction of the seizure); the patient experiences a most disturbing feeling of imminent death. This distress makes a lot of patients reluctant to be treated. Also, during the post-ictal period, the presence of Cardiazol in the body causes a state of psychomotor agitation lasting some hours.

For these reasons, Cerletti dedicated himself to researching easier and less toxic ways to cause epileptic convulsions. For several years, in Genoa, he carried out experimental studies of epilepsy, provoking epileptic seizures in animals (in particular in dogs) by using electricity. He used domestic electricity (alternating current at 125 V) for a fraction of a second, with two electrodes, placed one in the mouth and the other in the rectum (Viale). This technique, and the physio-pathological results from many dogs, were published by a pupil of Cerletti's in 1934 (Chiauzzi, *Pathologica XXVI*). Cerletti continued the experiments in Rome in 1935 with the support of Dr L. Bini, a very experienced electrical engineer, who built a simple but practical apparatus to precisely control the duration of the current and its voltage. Subsequently, trials were made of passing the current through the head, a technique previously used by other researchers (Prevost, etc.). Bini thus used this technique extensively in a large number of dogs.

When convulsive therapy with Cardiazol was announced (Sakel, Meduna), Prof. Cerletti immediately thought of using electricity for the same purpose. Important progress towards a clinical use of this technique was made possible by numerous experiments on pigs, under all sorts of different conditions, using the simple street electricity device employed in abattoirs to render animals unconscious before slaughter by means of an epileptiform shock. The authors therefore repeated in bigger animals the same experi-

ments carried out with dogs, testing the minimum and maximum current intensity which could be used, the duration of the current, and the solution to the awkward problem of the positioning of the electrodes.

In this way, it became possible to proceed to experiments in human beings and consequently determine the optimal conditions for inducing an epileptic seizure. A technical protocol to standardize the epileptic seizure is still under study, especially to minimize the risk for the patient in view of individual differences. Numerous experiments with human beings were performed over a period of two months: according to the different electric resistance, these employed currents with intensities between 300 and 600 mA, potential differences between 80 and 115 Volts, and durations of 0.5 – 0.7 seconds.

The ictus caused in this way looks like a typical epileptic seizure. Loss of consciousness instantaneously follows delivery of the current; without screaming, the patient has a strong, generalized, tonic contraction: torso, legs, arms and hands go into a semiflexed spasm. At first, the face becomes red, then pale and eventually cyanotic: breathing stops. The heart rate is regular. After about 30 seconds, the colour of the face returns to normal, and then becomes strongly congested. Then the limbs and the face display spastic tremors that quickly become clonic muscular contractions, which extend to all the body muscles with variable intensity and last one or two minutes. It is necessary, therefore, to insert a rubber bite to prevent the tongue being bitten. Sometimes there is foaming at the mouth, ejaculation of sperm, incontinence of urine and faeces. Afterwards, there is a phase of muscular relaxation with stertorous breathing. The state of unconsciousness lightens gradually and the patient becomes more alert, relaxes the jaw, moves the eyes and begins to answer to verbal stimuli. After 5 minutes he

can talk but remains clouded. After 8 – 10 minutes the patient is completely himself. If not disturbed, he falls asleep and after a few hours wakes up completely restored.

The advantage of this method, from our present knowledge, is the immediate and absolute loss of consciousness of the subject, lasting for all the length of the treatment. The patients, if asked about their experience, state they do not remember anything but having slept. Also absent is the state of sub-threshold arousal that often follows a treatment with Cardiazol. After ECT, the subjects sleep longer than those injected with Cardiazol, and after waking are calm and in a good mood. The cardiovascular system does not suffer during the treatment, only a slight increase of heart rate in relation to the muscular effort during the clonic phase has been noticed.

A significant advantage is being able to repeat the shock without causing any damage a few minutes after an aborted or even after a complete shock.

In cases of schizophrenia, there have been too few observations of the results (so far, truly excellent) to be able to draw conclusions about the therapeutic value of electroshock; however, as the shock is equivalent to the one caused by Cardiazol, we can infer that electroshock will lead to the same beneficial effects. There is a further advantage from the minimal costs incurred by the new procedure.

Bini explained the technical difficulties in measuring the intensity of the current that provokes the shock and the exact regulation of the timing, and described the machine currently used. The latter consists of a stop watch that can measure fractions of seconds and of apparatus that can measure and dose the alternating current. First, it is necessary to create a temporary and separate circuit with direct current to measure the electrical resistance of the patient's head. This measure is necessary to

dose the duration and the intensity of the current appropriately. The electrodes are applied using a special coil designed to obtain perfect application to the skull and to minimize dispersion of the current.

Bini referred to the particular effects of the current on animals in different experimental conditions and about the limits of the method's safety. Bini finally discussed the various effects observed in human beings, depending on different intensities and durations of the current.

In front of the Academy, at the end of the communication, there was a demonstration of a seizure caused by Cardiazol, and this seizure was contrasted with a seizure caused by electroshock in another patient.

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