Fifty years of electroconvulsive therapy

Value undoubted, mode of action unknown

It was in Rome in 1938 that Cerletti and Bini first used an electric shock to induce convulsions in man as a treatment for mental illness.[1] Their first patient was an "incoherent schizophrenic" who two years after nine treatments was living a normal life and holding a skilled job. Fifty years on, electroconvulsive therapy survives when most of the physical treatments common to prewar psychiatry have been discarded. It is a safe and effective treatment for a carefully selected subgroup of patients with severe depression.

The idea that convulsions might influence the mental state had its origins partly in the Greek idea of epilepsy as a form of possession by a divine power. In 1785 Oliver reported giving camphor to a patient with mania, and after a generalised convulsion the patient recovered temporarily.[2] Throughout the nineteenth century physical methods of treatment, including electric shocks, were used to treat psychiatric conditions.[3,4]

In the early twentieth century there were reports of sudden improvements in patients with schizophrenia after spontaneous convulsions, leading to the hypothesis that there was a biological antagonism between schizophrenia and epilepsy. In the 1930s the Hungarian neuropsychiatrist Von Meduna studied postmortem material and concluded that in the brains of epileptics "there were tremendous changes... just the opposite of those found in schizophrenia."[5] His pathological results have never been substantiated, but they led him to build on the tradition of physical treatments and suggest that artificially induced fits might be therapeutic in schizophrenia. He used camphor and various other agents to induce fits, and, although he established that there was indeed some therapeutic effect, the fits were unpredictable in severity, frequency, and duration.

Cerletti and Bini's innovation was to establish that fits could be safely and predictably induced by passing an electrical current of 110 V for about half a second between electrodes placed on each side of the head. (The bitemporal position was crucial: early animal studies had included the heart in the electrical circuit, with often fatal results.) Kalinowsky wrote the first English language account of the new treatment in the *Lancet* in 1939 and assured readers that the story of inspiration being sought in the slaughterhouse was largely apocryphal.[6,7] Bini had already reported his animal studies when he heard that electrical current was being used in the slaughterhouse. He and Cerletti delayed the clinical application of the treatment and visited the slaughterhouse, where they found that animals were not killed by the electrical current but only stunned.

The introduction of muscle relaxants and short acting anaesthetic agents made electroconvulsive therapy a much safer and more dignified procedure. Nowadays electroconvulsive therapy is important in treating severe depression, although tricyclic and quadricyclic antidepressants have become the mainstay of treatment. Electroconvulsive therapy may, however, be dramatically effective in patients whose depression is resistant to treatment with drugs and in those whose illness is complicated by dehydration, suicidal intent, delusions, and prominent biological features such as severe weight loss. It is also said to be particularly effective in puerperal psychosis,[8] and as recent studies have shown this condition to be largely affective,[9] this is not surprising. Since the advent of neuroleptic drugs electroconvulsive therapy has been little used in patients with schizophrenia,[10] but it may occasionally be life saving in acute drug resistant mania when the patient is near exhaustion.

The treatment has always been controversial, as Bini himself commented. It still smacks of the electric chair for the general public, but it is in fact remarkably safe. Absolute contraindications are few, but raised intracranial pressure is one because of the considerable (though brief) increase in cerebral blood flow. There is a concomitant sharp rise in systolic blood pressure, which makes electroconvulsive therapy contraindicated in patients with a history of cerebrovascular disease, cerebral or aortic aneurysm, or recent myocardial infarction. The general anaesthetic may complicate severe cardiorespiratory disease. The side effects of electroconvulsive therapy are well known. Confusion, headache, and memory disturbance are common but usually mild and transitory. Most studies have failed to show any permanent deficit in memory.

The efficacy of electroconvulsive therapy in psychotic depression has been shown in many trials. Two large trials in the 1960s showed electroconvulsive therapy to be significantly more effective than pharmacological treatment and placebo.[11,12] Three controlled double blind trials found real electroconvulsive therapy to be significantly more effective than simulated electroconvulsive therapy,[13-15] but two other such trials did not produce such convincing evidence.[16,17] In an authoritative review, however, Kendell concluded that taken together "the evidence that electroconvulsive therapy is an effective treatment for severe depression is quite strong enough to justify the phrase 'substantial and incontrovertible' used in the Royal College of Psychiatrists (1977) report."[18]

Its precise mode of action is, however, unknown, although one important observation from animal studies is that single or massed electroconvulsive therapy does not produce the same behavioural or neurochemical changes as the spaced multiple electroconvulsive therapy given in clinical practice. Changes have been observed in animal models in the permeability of the blood brain barrier, the synthesis of proteins, the turnover of nucleic acids, and the activity of various neurotransmitters and the sensitivity of their receptors.[19]

Various animal studies have suggested that electroconvulsive therapy may modify and enhance monoaminergic neurotransmission,[20-22] but attempts to show similar enhancement in patients treated with electroconvulsive therapy have not shown any significant increase.[23]

The clinical value of electroconvulsive therapy cannot, however, be doubted. Fifty years ago in the back wards of many psychiatric hospitals there were not only patients with chronic schizophrenia but also patients with intractable melancholia. Felix Post, looking back in 1978 on his career in psychiatry wrote: "In terms of my personal experience of tremendous relief and hopefulness, the turning point occurred with the arrival of electroconvulsive therapy."[24]

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1 Cerletti D, Bini L. L'Elettroshock. *Archivio Generale Di Neurologia, Psichiatria e Psichoanalisi* 1938;19:266-8.

2 Oliver W. Account of the effects of camphor in a case of insanity. *London Medical Journal* 1785;6:120-30.
3 Sargent WW, Slater E. *An introduction to physical methods of treatment in psychiatry*. 5th ed. Edinburgh: Churchill Livingstone, 1972.
4 Showalter E. *The female malady: women, madness and English culture*. London: Virago, 1987:138.
5 Fink M. Meduna and the origins of convulsive therapy. *Am J Psychiatry* 1984;141:1034-41.
6 Kalinowsky L. The history of electroconvulsive therapy. In: Abrams R, Essman WB, eds. *Electroconvulsive therapy, biological foundations and clinical applications*. Lancaster: MTP Press, 1982:1-5.
7 Kalinowsky L. Electroconvulsive therapy in schizophrenia. *Lancet* 1939;ii:1232-3.
8 Protheroe C. Puerperal psychosis: a long term study 1927-61. *Br J Psychiatry* 1969;115:9-30.
9 Platz C, Kendell RE. A matched control follow-up and family study of "puerperal psychoses." *Br J Psychiatry* 1988;153:90-4.
10 Taylor PJ, Fleminger JJ. ECT for schizophrenia. *Lancet* 1980;i:1380-3.
11 Greenblatt M, Grosser GH, Wechsler H. Differential response of hospitalised depressed patients to somatic therapy. *Am J Psychiatry* 1964;120:935-43.
12 Medical Research Council Clinical Psychiatric Committee. Clinical trial of the treatment of depressive illness. *Br Med J* 1965;i:881-6.
13 Freeman CPL, Basson JV, Crichton A. A double blind controlled trial of electroconvulsive therapy (ECT) and simulated ECT in depressive illness. *Lancet* 1978;i:738-40.
14 West E. Electric convulsion therapy in depression. A double controlled trial. *Br Med J* 1981;282:355-7.
15 Gregory S, Shawcross CR, Gill D. The Nottingham ECT study: a double blind comparison of bilateral, unilateral and simulated ECT in depressive illness. *Br J Psychiatry* 1985;146:520-4.
16 Lambourn J, Gill D. A controlled comparison of simulated and real ECT. *Br J Psychiatry* 1978;133:514-9.
17 Johnstone EC, Deakin JFW, Lawler P, *et al*. The Northwick Park ECT trial. *Lancet* 1980;ii:1317-20.
18 Kendell RE. The present status of electroconvulsive therapy. *Br J Psychiatry* 1982;139:265-83.
19 Essman WB. Electroconvulsive shock and cerebral chemistry: changes and sequelae. In: Abrams R, Essman WB, eds. *Electroconvulsive therapy, biological foundations and clinical applications*. Lancaster: MTP Press, 1982:199-224.
20 Green AR, Heal DJ, Grahame-Smith DG. Further observations on the effect of repeated electroconvulsive shock on the behavioural responses of rats produced by increases in the functional activity of brain 5-hydroxytryptamine and dopamine. *Psychopharmacology* 1977;52:195-200.
21 Modigh K. Electroconvulsive shock and post-synaptic catecholamine effects: increased psychomotor stimulant action of apomorphine clonidine in resperpine pre-treated mice by repeated ECS. *J Neural Trans* 1975;36:191-232.
22 Pandey GN, Heinze WJ, Brown BD, Davis JM. Electroconvulsive shock treatment decreases β-adrenergic receptor sensitivity in rat brain. *Nature* 1979;280:234-5.
23 Slade AP, Checkley SA. A neuroendocrine study of the mechanisms of action of ECT. *Br J Psychiatry* 1980;137:217-21.
24 Post F. Then and now. *Br J Psychiatry* 1978;133:83-6.

DF-2 infection

May follow dog bites and hazardous to the immunosuppressed

DF-2 (dysgonic fermenter type 2) is the designation assigned by the Centers for Disease Control, Atlanta, to a slow growing, non-motile, pleomorphic, Gram negative bacillus first identified in 1973. Four years later Butler implicated this organism in "a new disease of man": a septicaemia that is associated with exposure to animals and pre-existing illness, particularly splenectomy and alcohol abuse, and that is often fatal.[1] Thus far 52 cases of DF-2 infection in man have been described in reports published in English.[2] Most have come from the United States. Only four cases have been notified to the Public Health Laboratory Service in Britain (N Barrett, PHLS Communicable Disease Surveillance Centre, personal communication). DF-2 infection must, however, be more common than these reports suggest.

DF-2 infections have been reported world wide,[2] and all ages seem to be vulnerable.[3] Epidemiological evidence shows that it is a zoonotic infection—over three quarters of patients have been exposed to dogs, although only two thirds of them have had a penetrating injury. Cats[4] and wild animals[1] have also been implicated. DF-2 is part of the normal oral flora of healthy dogs[5] and has been isolated from the mouth of a dog whose bite resulted in DF-2 infection.[6]

DF-2 is an opportunistic pathogen of low virulence.[7] A third of patients with the infection have had splenectomies, a quarter are alcoholics, and 15% have chronic respiratory disease.[2] Subjects whose immune systems are suppressed are also vulnerable.[2]

The clinical consequences of DF-2 infection range from the indolent to the rapidly catastrophic; overall, a quarter of reported patients have died. Most commonly it causes a severe community acquired septicaemia that affects many organs. Patients commonly suffer disseminated intravascular coagulation, endocarditis, pneumonia, purulent meningitis,[1,2] and symmetrical peripheral gangrene (often requiring amputation).[8] Oligoarticular arthritis,[9] myocardial infarction,[10] brain abscess, and membranoproliferative glomerulonephritis[11] have also been reported. In those who were previously healthy—that is, about a fifth of all cases—infection may be less dramatic, but deaths have occurred.[12,13]

A confluent, blanching, maculopapular rash is often seen,[14] and petechiae may indicate a coagulopathy. A necrotising eschar at the site of injury may be characteristic,[8,15] but cellulitis is more common. Inoculation of DF-2 into the eye has resulted in corneal perforation[16] and angular blepharitis[17] without systemic disturbance.

DF-2 has been isolated mostly from blood cultures, but also from cerebrospinal fluid and conjunctival swabs.[17] Gram staining of the buffy coat has allowed early diagnosis particularly in patients who have had a splenectomy.[18] The organism is difficult to culture and detect by standard methods because of its slow growth and fastidious requirements.[18] Reliance on conventional techniques may therefore result in it being missed altogether, discarded as a contaminant, or misidentified. DF-2 is sensitive to most antibiotics but—unusually for a Gram negative bacterium—is resistant to aminoglycosides.[1,18-20] Penicillin G is the best treatment.

There are about 200 000 dog bites in Britain each year,[21] and yet reports of DF-2 infection remain rare. Considerable underdiagnosis seems likely because of difficulties in isolating the organism, the widespread use of penicillin in the early management of dog bites, and the empirical treatment with antibiotics of patients with septicaemia in whom the causative organism is not identified.

DF-2 infection is a particular hazard to patients who are immunocompromised and those who have had a splenectomy, and such patients should be made aware of the dangers of keeping pets. Although the clinical features are usually non-specific, a history of animal contact and the well established predispositions should suggest the diagnosis. As the interval between injury and presentation may be up to two weeks, however, the history of animal exposure is easily overlooked and with it a vital clue to the diagnosis. If DF-2 infection is considered possible the laboratory needs to be told so that the organism is specifically sought. As laboratory confirmation is often delayed, however, prompt empirical treatment may have to be started on clinical suspicion alone.

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