

Half a Century of ECT Use in Young People

Joseph M. Rey, M.D., Ph.D., F.R.A.N.Z.C.P., and Garry Walter, M.D., F.R.A.N.Z.C.P.

***Objective:** Pharmacological treatments for certain psychiatric disorders in young people are often ineffective and may cause major side effects; thus, it is important to investigate other treatments. This article reviews the literature on the efficacy and safety of ECT in this age group and examines the evidence for the suggestion that it may be used inappropriately. **Method:** All studies published in English and other languages on the use of ECT in persons 18 years of age or younger were obtained. The reports were systematically reviewed and rated according to the quality of the information in several domains, yielding an overall quality score for each study. Individual cases from each report were then examined and grouped according to diagnosis and response to ECT. **Results:** Sixty reports describing ECT in 396 patients were identified; most (63%) were single case reports. The overall quality was poor but improved in the more recent studies. There were no controlled trials. Rates of improvement across studies were 63% for depression, 80% for mania, 42% for schizophrenia, and 80% for catatonia. Serious complications were very rare, whereas minor, transient side effects appeared common. **Conclusions:** ECT in the young seems similar in effectiveness and side effects to ECT in adults. However, this conclusion is qualified by the lack of systematic evidence. More research and education of professionals and the public are needed. It is suggested that ECT registers be set up, that surveys and controlled trials be conducted, and that seizure thresholds, the optimal anesthetic, effects of concurrent medications, and cognitive consequences of ECT in the young be investigated.*

(Am J Psychiatry 1997; 154:595-602)

There are several reasons for examining the use of ECT in young people. First, there is burgeoning interest in ECT, particularly in its application in the young (1, 2). Second, it is necessary to have information in order to accept or reject the criticisms of those who condemn or wish to ban the procedure for this age group (3, 4). Third, disorders that may potentially benefit from ECT are common, handicapping, and often resistant to alternative treatments. For example, depression in children and adolescents may be increasing in prevalence (5), it causes substantial morbidity and mortality (6), and it frequently does not improve with traditional antidepressants (7, 8).

Finally, psychotropic drugs can produce severe side effects, and there is often a lag before the onset of action.

The indications for, efficacy of, and unwanted effects of ECT in adults have been subjects of intense study and scrutiny. There is good evidence that ECT is effective in the treatment of a variety of disorders and is a safe procedure, even in elderly, frail, or physically ill patients (9, 10). However, results obtained with adults are not necessarily applicable to children and adolescents, as experience with tricyclic antidepressants has shown (7, 8).

Is the reluctance to use ECT in young people justified? Are we irrationally depriving our young patients of an effective and safe treatment, or would we be exposing them to a futile and risky procedure? The aim of this study was to answer these questions by conducting a systematic review of the literature on the use, efficacy, and unwanted effects of ECT in patients aged 18 years or younger. While there have been previous reviews (e.g., reference 11), they were not comprehensive, and a number of new studies have been published in the last few years.

Received March 28, 1996; revision received Oct. 4, 1996; accepted Nov. 1, 1996. From the Department of Psychological Medicine, University of Sydney, and the Rivendell Unit, Central Sydney Mental Health Services. Reprints not available. Address correspondence to Dr. Rey, Rivendell, Hospital Road, Concord West, N.S.W. 2138, Australia; jrey@mail.usyd.edu.au (e-mail).

The authors thank K. Walter and M. Rozska for assistance in translating papers; M. Fairley, G.F.S. Johnson, and P. Mitchell for suggestions; and H.A. Robinson and F.N. Moise for providing information not available in their reports.

HISTORICAL NOTE

In April 1942, in the midst of the German occupation, Georges Heuyer and his colleagues (12) reported to the Société Médico-Psychologique of Paris the positive effects of ECT in two teenagers. The following year, Heuyer et al. (13) reported on a series of 40 children and adolescents with a variety of conditions who had been treated with the new procedure. They concluded that ECT was safe for this age group and that it was effective in the treatment of melancholia, less consistently successful in the treatment of mania, and not beneficial in the treatment of schizophrenia. The first mention of a child treated with ECT (a 3-year-old with epilepsy) had occurred in 1941 (14).

Effective treatments for mental disorders in children and adolescents were few in the 1940s. It is not surprising that psychiatrists were keen to embrace a new therapy. For example, in 1947 Lauretta Bender (15) reported on the efficacy of ECT in a series of 98 children under the age of 12 years treated at Bellevue Hospital in New York. She had diagnosed them as suffering from "childhood schizophrenia" (it is unlikely that many would have met current criteria for schizophrenia; the majority probably had disruptive behavior or developmental disorders [16]). The children received courses of 20 daily unmodified ECTs. Bender observed a "positive change in behavior following treatment" in all but two or three of them. At the same time she recognized that "remissions such as are seen in adults occurred in only a few children."

Despite these encouraging early results reported in France and the United States, there are suggestions that the use of ECT in young patients then diminished. Such decline was probably due to apprehension about possible harmful effects (17, 18) as well as to the advent of psychotropic drugs. ECT for children and adolescents became a "controversial treatment" (19) of "last resort" (20). There have been moves recently in England to prohibit ECT for this age group (3), while ECT has been outlawed for various groups of young people in several states in the United States (21).

QUALITY OF THE EVIDENCE

In order to focus on the use of ECT in children and adolescents, as opposed to adults, we chose a conservative cutoff age of 18 years. Systematic searches of medical and psychological databases (including publications in English and in other languages), reports quoted by other writers, and manual searches up to March 1996 yielded 60 reports (11–13, 15, 17–72) describing 396 patients. Works in which individuals younger than 19 years could not be identified (e.g., reference 73) were excluded. Publications in languages other than English were translated into English; eight were in French (12, 13, 22–27), four in German (28–31), and one in Polish (32). Restricting the scope of the review to studies published in English (11, 15, 17–21, 33–72) would have resulted in a considerable loss of information.

The largest series were those described in the 1940s by Bender (15) and Heuyer et al. (13), with 98 and 40 cases, respectively. However, the vast majority of reports were either of single cases (N=38, 63%) (not all of these were single case reports; occasionally, a single case could be extracted from other series) or small, anecdotal collections of cases (N=9, 15%). The largest recent series had 28 cases (60).

The quality of the reports was evaluated independently by each author, and the independent ratings were then compared. When there was disagreement, reports were jointly reexamined and consensus was reached. Aspects rated included the following: whether gender and age were given; the system used for case detection; diagnostic information; whether previous and concurrent treatments were described; whether electrode position and number and frequency of treatments were mentioned; and whether unwanted effects, immediate results, and longer-term outcome were reported. A quality score was obtained by adding up the ratings on these variables. The maximum possible score was 20.

Overall, the quality of the reports was poor (mean score=8.9, SD=3.2, range=2–17); there were no controlled studies. The closest to a controlled study was the work by Kutcher and Robertson (56), which compared the outcome of a group of 16 patients (nine of them 19 years of age or older) who received ECT with the outcome of six patients who refused. This is also the only study that used a structured diagnostic interview.

Almost one-half of the studies (43%, N=26) provided no diagnosis, or there was insufficient information on symptoms to make a diagnosis. Previous and concurrent treatments were not indicated in 23% (N=14) and 68% (N=41), respectively. Electrode position and number and frequency of ECTs were not mentioned in 62% (N=37), 20% (N=12), and 72% (N=43), respectively. Unwanted effects were not reported in 63% (N=38). Short-term outcome was poorly described in 35% (N=21), while information on longer-term outcome (6 or more months after ECT) was provided in less than one-half (42%, N=25) of the studies. Only two reports (45, 56) used quantitative measures of outcome.

To examine the quality of the studies over time, we divided the reports into those published before DSM-III and those published after. Studies published after 1980 had higher scores for quality (mean=9.9, SD=2.9, versus mean=7.5, SD=3.2; $t=3.06$, $df=58$, $p=0.003$) and were more likely than earlier studies to supply better diagnostic information, to describe electrode placement, and to mention unwanted effects in more detail.

COLLATION OF INDIVIDUAL CASES

All individuals for whom there was sufficient information about diagnosis and outcome were coded in order to examine the response to ECT across reports. Patients from 15 studies (13, 15, 23, 25, 28, 30, 35, 38, 41, 44–46, 48, 57, 60) were excluded because diagnosis or out-

TABLE 1. Initial Response to ECT and Longer-Term Outcome in Young Patients Described in the Literature, by Diagnosis

Diagnosis	Immediately After ECT			6 Months After ECT ^a		
	Number of Patients	Patients With Remission or Marked Improvement		Number of Patients	Patients With Good Functioning	
		N	%		N	%
Depression	40	25	63	18	13	72
Major	26	19	73	14	11	79
Psychotic	14	6	43	4	2	50
Manic episode	20	16	80	10	8	80
Bipolar disorder ^b	51	37	73	24	17	71
Schizophrenia	36	15	42	10	1	10
Schizoaffective disorder	2	1	50	—	—	—
Catatonia ^c	24	18	75	13	6	46
Neuroleptic malignant syndrome	4	2	50	2	1	50
Other disorders	28	4	14	6	2	33
Total ^d	154	81	53	59	31	53

^aMost patients had other treatments after ECT.

^bIncludes manic, depressed, and catatonic.

^cIncludes mood disorder with catatonic features, catatonic schizophrenia, and catatonia associated with physical illness.

^dExcludes bipolar disorder.

come was not described or could not be identified individually. Information about diagnosis and outcome was available for 39% (N=154) of the 396 reported cases.

Among the 98 patients for whom age was specified, the mean age was 15.4 years (SD=2.2). The youngest patient was 7 years old, and only five were younger than 12 years. About one-half (47%, N=55) of the 118 subjects whose gender was known were female. By contrast, female adults are more likely than male adults to be treated with ECT (74). This disparity is consistent with the smaller gender imbalance for mood disorders during childhood and adolescence.

Treatment prior to ECT was described for 57 patients; 35% (N=20) had courses of both antipsychotic and antidepressant drugs, 9% (N=5) received antidepressants alone, 26% (N=15) received antipsychotics alone, and the rest had other treatments or a combination of treatments. The reasons for using ECT were given for 57 individuals; failure to respond to other treatments together with severity of symptoms were the most common (92%). Seeking a second opinion before the administration of ECT was mentioned for 11 patients.

The number of ECTs was given for 95 individuals. The mean of 9.6 (SD=4.9, range=1–23) is similar to what has been reported for adults (75, 76).

When electrode position was mentioned (61 patients), 38% (N=23) had unilateral and 48% (N=29) bilateral electrode placement; a further 15% (N=9) had both. EEG monitoring of seizures was used in 38 cases from four studies (21, 49, 50, 67). The technique of "stimulus dosing" (77) was not mentioned in recent reports.

EFFECTIVENESS

The proportions of patients, according to diagnosis, who benefited from ECT are presented in table 1. Reliability of diagnosis was not reported in any of the stud-

ies. Cases in which there was clear evidence of bipolar disorder were included in two groups, the bipolar group and the depressed or manic group. To examine specifically the effectiveness of ECT in patients with catatonic symptoms (78), subjects with those symptoms (e.g., stupor) were included in a separate group (catatonia) irrespective of whether they had an affective, schizophrenic, or organic diagnosis. Twenty (24%) of the 85 patients in whom comorbidity could be ascertained had comorbid mental disorders, while 13 (15%) of the 85 had a comorbid physical illness.

Response to treatment was almost invariably described in an impressionistic, not quantitative, way. Consequently, we conservatively divided immediate outcome into two categories: patients who showed marked improvement or recovery and those who did not. This required a degree of inference in some cases. We divided outcome at 6 months into groups of patients who were described as functioning near or at the premorbid level and those who were not. Interpretation of these results warrants caution, for it is possible that published cases, especially single case studies, are biased.

Overall, 53% (N=81) of the 154 patients for whom data on diagnosis and outcome were available showed marked improvement or remission of symptoms by the end of the course of ECT. If those who had a mild or moderate response are also counted, the proportion who benefited increases to 67%. The results presented in table 1 are broadly similar to those described for adult patients. For example, Mukherjee et al. (79) showed a marked improvement in mania of 80% across studies of ECT. These data also suggest that ECT in this age group is comparatively less effective for schizophrenia than for mood disorders. The main incongruence with data on adults (80) refers to psychotic depression: table 1 shows a lower response rate than that for other types of mood disorder and similar to that for schizo-

phrenia. This may reflect difficulties in distinguishing between psychotic depression and schizophrenia in adolescents.

When all disorders were combined, there were no differences in the rates of improvement according to electrode placement (unilateral versus bilateral), age (younger [<16 years] versus older), or whether there was comorbidity. Cases from reports published after 1980 showed higher rates of response than earlier ones.

There was information in 22 cases about when improvement was first observed. This generally occurred early in the course of treatments, but in some cases it took up to 10 treatments (mean=3.7, SD=2.4, range=1-10).

ADVERSE EVENTS

When we examined adverse events, all 60 reports were considered. No fatalities among the young as a consequence of ECT have been described. A 16-year-old girl with neuroleptic malignant syndrome and a stuporous state had eight ECTs without improvement (55). She died of cardiac failure 10 days after the last treatment. Her death is likely to have been due to the continued administration of neuroleptic medication in spite of her neuroleptic malignant syndrome.

Earlier studies that tended to use a large number of treatments or very frequent ECTs did not report long-term problems. For example, Bauer (17) noted the case of a 15-year-old girl with schizophrenia who received 200 ECTs in 1 year. Heuyer et al. (25) described a 16-year-old girl diagnosed as suffering from dementia praecox who was treated with 15 unmodified ECTs in 3 days. She developed an organic brain syndrome, with an abnormal EEG, which subsided over a period of 3 weeks.

The presence of physical illness does not appear to be a contraindication for ECT in most cases. Mansheim (59) described a patient with meningocele, hydrocephalus with functioning shunt, and seizures who tolerated ECT well. Schneekloth et al. (67) reported on a patient with a kidney transplant who had no harmful effects from ECT. Warren et al. (70) described an individual with major depression and comorbid Down's syndrome who showed no unwanted effects.

Bender (15) reported one case of a fractured vertebra. This occurred before the introduction of modified ECT with muscle relaxants. Five patients were reported to have ended the course of ECT prematurely because of side effects (21, 26, 29, 30, 68). These included a depressed teenager who underwent a switch to mania after five ECTs (26); two whose treatment was discontinued because of increasing agitation (30, 68); one who showed marked confusion after two treatments (29); and an 18-year-old female patient with bipolar disorder who developed neuroleptic malignant syndrome following one ECT, after which the course was terminated (21). She had been given droperidol before and after ECT (F.N. Moise, personal communication).

Seizures

Prolonged seizures induced by ECT (lasting more than 180 seconds) (81) and post-ECT seizures have been described. Guttmacher and Cretella (49) reported prolonged convulsions in three cases. Two of these patients were taking concurrent medication (one was taking desipramine and one trifluoperazine). The third adolescent suffered from Tourette's disorder and pervasive developmental disorder and had had a seizure at the age of 11 years. Ghaziuddin et al. (45) also reported prolonged seizures in five of seven cases. However, details such as the actual length of the convulsion, whether the patients were taking concurrent medication, history of seizures, etc. were not given. Prolonged seizures were described in another three patients (2%) out of 142 treatments (21). It is not known whether they had concurrent medication.

Bender (15) reported one case of post-ECT seizures in a child who had had a convulsion at the age of 18 months. It is noteworthy that most (72%) of the children she described had abnormal EEGs prior to ECT. The EEG had worsened in only one of the 22 patients tested 6 months later (this was a child with petit mal before ECT), while the EEG had improved in eight (36%). Post-ECT seizures were described in another three patients (45, 63, 67). One of them, a mentally retarded boy, developed a nonconvulsive status epilepticus following the ninth ECT (63). He was also taking neuroleptics.

Although there is concern that the seizure threshold may be lower in children and adolescents (1), the evidence that young people are particularly at risk of having lengthy convulsions or of developing post-ECT seizures is not persuasive. The rate of lengthy seizures in the young does not seem to be greater than the rate of 1.1% cited for adults (82).

Other Adverse Events

Overall, the most common complaint was headache, reported in 16 cases. Subjective memory loss was described in nine patients (19, 26, 29, 39, 40) and manic symptoms in seven (23, 26, 29, 34, 62). Disinhibition was described in two subjects (40, 68) and hemifacial flushing in one (52).

The frequency of side effects was higher in recent studies that examined them systematically. Paillère-Martinot et al. (26) reported mild side effects in seven (78%) of nine patients, while Ghaziuddin et al. (45) reported headaches in their entire group. Kutcher and Robertson (56) reported mild, transient side effects following 28% of ECTs: headache, 15%; confusion, 5%; agitation, 3%; hypomanic symptoms, 2%; subjective memory loss, 2%; and vomiting, 1%. This suggests that minor, transient side effects have often been underreported or overlooked.

Cognitive Functioning

Cognitive functioning before and after ECT was seldom alluded to. The reason sometimes given was that

children were too sick to undergo psychometric tests. Unfortunately, too, the few studies that have formally assessed cognitive functioning after ECT were conducted in the 1940s and 1950s (15, 83–85). Nevertheless, they reported no permanent ill effects. Bender (15) carried out “extensive psychometric examination . . . before shock, immediately following shock and at intervals thereafter whenever possible.” Her data show no evidence of “a lasting effect on intellectual functioning.” In another study (84), children were asked to draw human figures and perform the “visual motor gestalt test” before and after ECT. The abnormalities that occurred lasted up to 6 hours after each daily ECT and increased throughout the course, but they cleared approximately 36 hours after the last treatment. Using a battery of tests, Des Lauriers and Halpern (83) found that after ECT, children and adolescents showed a slight increase in IQ and greater ability to concentrate but no change in reasoning or judgment. Another study (85) reported that intellectual “efficiency” was reduced immediately after a course of treatment but recovered at follow-up 5–27 months later. Six individuals in other studies (12, 25, 26, 29) developed an organic brain syndrome that resolved quickly after cessation of treatment.

Overall, adverse events appear similar in type and frequency to those described for adults. Because the literature has limitations, it is not certain that more serious adverse events did not occur. Also, side effects were often not commented upon and were seldom scrutinized systematically.

USE AND MISUSE OF ECT

It was estimated that approximately 500 (1.5%) of 33,384 patients who received ECT in the United States in 1980 were in the 11- to 20-year age range (86). On average, eight patients under the age of 18 received ECT each year in California in 1977–1983, 0.3% of all persons treated with ECT during those 7 years (87). Over 12 years, 22 patients aged 16–19 were treated with ECT at the University Hospital, Stony Brook, N.Y. (1). Five patients (all female and aged 17 years) were given ECT in Edinburgh between 1982 and 1992 (41), while ECT was used for adolescents three times in 10 years at Bethlem Hospital in London (88). Seven adolescents aged 15–18 years received ECT at the Hôpital de la Salpêtrière in Paris between 1986 and 1988 (26). No patient younger than 19 years was given ECT at an acute unit in Sydney, Australia, between 1982 and 1988 (76). Therefore, rates of ECT use in young people are low.

These findings are consistent with results of practice surveys. All psychiatrists working in psychiatric facilities in New York reported occasionally treating adolescent patients with ECT (89). Of 433 British psychiatrists surveyed, 31 (7%) had used this treatment in patients younger than 16 (90). Lower age limits are set by certain hospitals and governments (21). For example, ECT was not administered to children under the age of 16 in the former Soviet Union (91).

Although concerns have been expressed about inappropriate use of ECT in young people (3, 4) there is little systematic information to help determine whether such practices actually exist. When the very early studies, which do not reflect current practice, are excluded, it can be inferred that ECT is hardly ever used to treat prepubertal children and very rarely to treat adolescents. When administered, it is almost always after other treatments have failed and when the patient's symptoms are very incapacitating or life-threatening. That is, ECT is used almost exclusively as a treatment of last resort. Bearing in mind the severity and complexity of illness of the patients treated with ECT and the mild, transient nature of most adverse events, a rate of improvement across disorders of 67% (or 53% if only marked improvement or complete remission is counted) is more than heartening. If anything, the collective data suggest that ECT may be underutilized.

These conclusions should be tempered by the fact that we do not know whether the published cases are biased; that is, cases in which there was poor response or severe adverse events might have been less likely to be reported. However, the results of a recent survey (unpublished work of Walter and Rey) suggest that published reports, as a whole, actually reflect what happens in practice (at least in Australia). In that study, all persons aged 18 years or under who received ECT between 1990 and 1996 in the Australian state of New South Wales were identified. Forty-two patients had a total of 49 courses comprising 450 ECTs, about 1% of all treatments. The youngest patients were 14 years old. Marked improvement or resolution of symptoms occurred in one-half of the completed courses. Side effects were mild and transient. Prolonged seizures occurred in 0.4% of the treatments.

DIRECTIONS FOR RESEARCH

It is evident that our knowledge about ECT in children and adolescents is deficient. Given the scarcity of studies, funding agencies and clinicians must give more priority to ECT research. Randomized, controlled trials of ECT versus sham ECT are needed to show conclusively whether ECT is effective or not in this age group. While serious ethical arguments to prevent such trials are lacking (1, 8), public opinion may impede that research. Fortunately, alternatives that will also increase our knowledge are available. For example, it would be valuable to compare the outcome of youngsters who undergo ECT with that of others who refuse or do not receive ECT, to confirm and extend the results reported by Kutcher and Robertson (56). These authors found that the hospital stay was shorter for patients who received ECT; use of ECT also more than halved the cost of treatment. Long-term follow-up of these patients may clarify whether ECT influences the course of the illness (11). If so, this may be relevant, since early onset appears to be associated with a worse course in some disorders (92).

Epidemiological information on the use of ECT is also necessary to show whether published reports are biased. Setting up registers to collect systematic data about ECT in the young could provide this information at low cost. Such registers could also be used to monitor adverse events and standards of practice.

Increasing our knowledge about the seizure threshold in children and adolescents should be a priority because of both the suggestion that these patients may be more likely to experience prolonged seizures and concerns about post-ECT seizures. Whether propofol results in shorter seizures (93) in young people than do other induction agents is also worth studying, as are the structural and psychometric effects of ECT. Finally, it is necessary that the quality of the published reports be improved.

IMPLICATIONS FOR EDUCATION AND CLINICAL PRACTICE

ECT should be used with caution in young people because of the relative lack of knowledge. However, it may also be overlooked as a treatment alternative (2, 78). Although a detailed discussion is beyond the scope of this review, it is worth speculating about why sections of the psychiatric profession and the community oppose the use of ECT in the young. One reason may be an antipathy toward ECT generally. This, in turn, has many determinants (94). The fear of adverse effects of ECT on the developing brain and the assumption that children and adolescents cannot fully understand—and thus cannot properly consent to—the treatment are often mentioned. Lack of knowledge of, or familiarity with, the procedure, particularly in the case of child psychiatrists, may also contribute to a negative perception of ECT. This is not surprising because of the low rates of utilization and the paucity of reports and because ECT is often ignored in textbooks on child and adolescent psychiatry (e.g., reference 95). Preliminary results of a survey of the majority (83%) of Australian and New Zealand child and adolescent psychiatrists (unpublished work of Walter et al.) showed that 40% rated themselves as having no knowledge or negligible knowledge about ECT in the young, and only 31% had first-hand experience of it.

The American Psychiatric Association offers guidelines for the use of ECT in the young (81). Similar guidelines have been published recently by the Royal College of Psychiatrists (96). Other psychiatric associations should follow this lead.

Because of reports of increased length of seizure and post-ECT convulsions, clinicians are advised to stop all nonessential medications while administering ECT. Concurrent medications are used often and may be responsible for many of the adverse events. There is a case for determining the seizure threshold, for EEG monitoring, and possibly for EEG examinations before and after a course of ECT. Psychometric assessment before and some time after ECT would also be valuable.

Finally, consent issues require particular attention (81, 96). The parents and the child should be involved whenever possible and should be given adequate information. The opportunity to discuss ECT with other young people who have received it may be helpful (56).

CONCLUSIONS

“On February 10, 1977, electroconvulsive treatment was administered for the first time to a 16-year-old female who had not eaten, spoken or walked unaided for the past four months The first treatment produced an unclenching of the fists The second treatment produced consumption of small amounts of fluid The fifth was productive of eating and talking normally She was allowed to go home two days after the last treatment and for the past three months has been getting along nicely and doing all things previously done in a satisfactory fashion.” This account by Perkins and Tanaka (18) of the dramatic effect of seven ECTs is hardly unique but illustrates vividly why we need to learn more about this treatment. It is sobering that our knowledge has grown so little beyond that which Heuyer and his colleagues acquired half a century ago (13).

REFERENCES

1. Fink M: Electroconvulsive therapy in children and adolescents. *Convulsive Therapy* 1993; 9:155–157
2. Fink M, Carlson GA: ECT and prepubertal children. *J Am Acad Child Adolesc Psychiatry* 1995; 34:1256–1257
3. Baker T: ECT and young minds (letter). *Lancet* 1994; 345:65
4. Miller JP: ECT and prepubertal children. *J Am Acad Child Adolesc Psychiatry* 1995; 34:1257–1258
5. Weissman MM, Bruce ML, Leaf PJ, Florio LP, Holzer C: Affective disorders, in *Psychiatric Disorders in America*. Edited by Robins LN, Regier DA. New York, Free Press, 1991, pp 53–80
6. Rao U, Weissman MM, Martin JA, Hammond RW: Childhood depression and risk of suicide: a preliminary report of a longitudinal study. *J Am Acad Child Adolesc Psychiatry* 1993; 32:21–27
7. Campbell M, Cueva JE: Psychopharmacology in child and adolescent psychiatry: a review of the past seven years: part II. *J Am Acad Child Adolesc Psychiatry* 1995; 34:1262–1272
8. Hazell P, O'Connell D, Heathcote D, Robertson J, Henry D: Efficacy of tricyclic drugs in treating child and adolescent depression: a meta-analysis. *BMJ* 1995; 310:897–890
9. Devanand DP, Dwork AJ, Hutchinson ER, Bolwig TG, Sackeim HA: Does ECT alter brain structure? *Am J Psychiatry* 1994; 151:957–970
10. Rice EH, Sombrotto LB, Markowitz JC, Leon AC: Cardiovascular morbidity in high-risk patients during ECT. *Am J Psychiatry* 1994; 151:1637–1641
11. Bertagnoli MW, Borchardt CM: A review of ECT for children and adolescents. *J Am Acad Child Adolesc Psychiatry* 1990; 29:302–307
12. Heuyer G, Bour, Feld: Electrochoc chez des adolescents. *Ann Med Psychol (Paris)* 1942; 2:75–84
13. Heuyer G, Bour, Leroy R: L'électrochoc chez les enfants. *Ann Med Psychol (Paris)* 1943; 2:402–407
14. Hemphill RE, Walter WG: The treatment of mental disorders by electrically induced convulsions. *J Ment Sci* 1941; 87:256–275
15. Bender L: One hundred cases of childhood schizophrenia treated with electric shock. *Trans Am Neurol Soc* 1947; 72:165–169
16. Clardy ER, Rumpf EM: The effect of electric shock treatment on

- children having schizophrenic manifestations. *Psychiatr Q* 1954; 28:616-623
17. Bauer W: Treatment of a 15-year-old hebephrenic girl in a community hospital. *Dis Nerv Syst* 1976; 37:474-476
 18. Perkins IH, Tanaka K: The controversy that will not die is the treatment that can and does save lives: electroconvulsive therapy. *Adolescence* 1979; 14:607-616
 19. Sokol MS, Pfeffer CR, Solomon GE, Esman A, Robinson G, Gold RL, Orr-Adrawes A: An abused psychotic preadolescent at risk for Huntington's disease. *J Am Acad Child Adolesc Psychiatry* 1989; 28:612-617
 20. Berman E, Wolpert EA: Intractable manic-depressive psychosis with rapid cycling in an 18-year-old woman successfully treated with electroconvulsive therapy. *J Nerv Ment Dis* 1987; 175:236-239
 21. Moise FN, Petrides G: ECT in adolescents. *J Am Acad Child Adolesc Psychiatry* 1996; 35:312-318
 22. Constantidinis J: Etude clinique et psychologique de deux adolescents psychotiques jumeaux univitellins. *Ann Med Psychol (Paris)* 1969; 2:161-171
 23. Fillastre M, Fontaine A, Depecker L, Degiovanni A: Cinq cas de syndrome de Cotard de l'adolescent et de l'adult jeune. *Encephale* 1992; 18:65-66
 24. Heuyer G, Dauphin, Levovici S: La pratique de l'électrochoc chez l'enfant. *Zeitschrift fur Kinderspsychiatrie (Bern)* 1947; 14: 60-64
 25. Heuyer G, Lebovici S, Amado G: Les électrochocs en sommation. *Ann Med Psychol (Paris)* 1948; 1:205-208
 26. Paillère-Martinet ML, Zivi A, Basquin M: Utilisation de l'ECT chez l'adolescent. *Encephale* 1990; 16:399-404
 27. Revuelta E, Bordet R, Piquet T, Ghawche F, Destee A, Goude-mand M: Catatonie aigue et syndrome malin des neuroleptiques: un cas au cours d'une psychose infantile. *Encephale* 1994; 20: 351-354
 28. Friederich MH, Leixnering W: Zur problematik der elektro-schocktherapie jugendlicher psychosen. *Ideggyogyaszati Szemle* 1980; 33:278-284
 29. Hift C, Hift S, Spiel W: Ergebnisse der schockbehandlungen bei kindlichen schizophrenien. *Schweiz Arch Neurol Psychiatrie* 1960; 86:256-272
 30. Knitter H: Erfahrungen mit Elektrokrampftherapie bei Psychosen des Kindesalters. *Padiatr Grenzgeb* 1986; 25:449-452
 31. Sauer H, Koehler KG, Funfgeld EW: Folgen unterlassener elektrokrampftherapie: ein kasuistischer beitrag. *Nervenarzt* 1985; 56:150-152
 32. Bilikewitz T: A case of apallic syndrome (inaccurately so called) in a child in the light of a 17-year follow-up. *Psychiatr Pol* 1978; 12:619-622
 33. Addonizio G, Susman VL: ECT as a treatment alternative for patients with symptoms of neuroleptic malignant syndrome. *J Clin Psychiatry* 1987; 48:102-105
 34. Andrade C, Gangadhar BN, Channabasavanna SM: Further characterization of mania as a side effect of ECT. *Convulsive Therapy* 1990; 6:318-319
 35. Arajarvi T, Alanen YO, Viitamaki O: Psychoses in childhood. *Acta Psychiatr Scand Suppl* 1964; 174:1-93
 36. Black DW, Wilcox JA, Stewart M: The use of ECT in children: case report. *J Clin Psychiatry* 1985; 46:98-99
 37. Campbell JD: Manic depressive psychosis in children: report of 18 cases. *J Nerv Ment Dis* 1952; 116:424-439
 38. Campbell M: Biological interventions in psychoses in childhood. *J Autism Child Schizophr* 1973; 3:347-373
 39. Carr V, Dorrington C, Schrader G, Wale J: The use of ECT for mania in childhood bipolar disorder. *Br J Psychiatry* 1983; 143: 411-415
 40. Cizadlo BC, Wheaton A: Case study: ECT treatment of a young girl with catatonia. *J Am Acad Child Adolesc Psychiatry* 1995; 34:332-335
 41. Cook A, Scott A: ECT for young people. *Br J Psychiatry* 1992; 161:718-719
 42. Dinwiddie SH, Drevets WC, Smith DR: Treatment of phencyclidine-associated psychosis with ECT. *Convulsive Therapy* 1988; 4:230-235
 43. Frances A, Susman VL: Managing an acutely manic 17-year-old girl with neuroleptic malignant syndrome. *Hosp Community Psychiatry* 1986; 37:771-772, 788
 44. Gallinek A: Controversial indications for electric convulsive therapy. *Am J Psychiatry* 1952; 109:361-366
 45. Ghaziuddin N, King C, Naylor M, Ghaziuddin M, Chaudhary N, Greden J: Electroconvulsive treatment (ECT) in refractory adolescent depression (abstract). *Biol Psychiatry* 1995; 37:593
 46. Gillis A: A case of schizophrenia in childhood. *J Nerv Ment Dis* 1955; 121:471-472
 47. Gujavarty K, Greenberg LB, Fink M: Electroconvulsive therapy and neuroleptic medication in therapy-resistant positive-symptom psychosis. *Convulsive Therapy* 1987; 3:185-195
 48. Gutierrez-Esteinou R, Pope HG: Does fluoxetine prolong electrically induced seizures? *Convulsive Therapy* 1989; 5:344-348
 49. Guttmacher LB, Cretella H: Electroconvulsive therapy in one child and three adolescents. *J Clin Psychiatry* 1988; 49:20-23
 50. Guttmacher LB, Cretella H, Houghtalen R: ECT in children and adolescents. *J Clin Psychiatry* 1989; 50:106-107
 51. Hassanyeh F, Davison K: Bipolar affective psychosis with onset before age 16 years: report of 10 cases. *Br J Psychiatry* 1980; 137:530-539
 52. Idupuganti S, Mujica R: Hemifacial flushing during unilateral ECT (letter). *Am J Psychiatry* 1988; 145:1037-1038
 53. Jeffries JJ, Lefebvre A: Depression and mania associated with Kleine-Levin-Critchley syndrome. *Can Psychiatr Assoc J* 1973; 18:439-444
 54. Kaponen H, Repo E, Lepola U: Neuroleptic malignant syndrome. *Biol Psychiatry* 1988; 24:943-944
 55. Kish SJ, Kleinert R, Minauf M, Gilbert J, Walter GF, Slimovitch C, Maurer E, Rezvani Y, Myers R, Hornykiewicz O: Brain neurotransmitter changes in three patients who had a fatal hyperthermia syndrome. *Am J Psychiatry* 1990; 147:1358-1363
 56. Kutcher S, Robertson HA: Electroconvulsive therapy in treatment-resistant bipolar youth. *J Child and Adolescent Psychopharmacology* 1995; 5:167-175
 57. Krinsky LW, Jennings RM: The management and treatment of the pseudopsychopathic schizophrenic in an adolescent pavilion. *J Asthma Res* 1968; 5:207-212
 58. Levy S, Southcombe RH: Value of convulsive therapy in juvenile schizophrenia. *Arch Neurol Psychiatry* 1951; 65:54-59
 59. Mansheim P: ECT in the treatment of a depressed adolescent with meningomyelocele, hydrocephalus, and seizures. *J Clin Psychiatry* 1983; 44:385-386
 60. Otegui J, Lyford-Pike A, Zurmendi P, Savi P, Flores D, Castro G: Electroconvulsive therapy (ECT) in adolescents and children in private hospitals in Montevideo (Uruguay) (abstract). *Convulsive Therapy* 1995; 11:73
 61. Pataki J, Zervas IM, Jandorf L: Catatonia in a university inpatient service (1985-1990). *Convulsive Therapy* 1992; 8:163-173
 62. Powell JC, Silveira WR, Lindsay R: Pre-pubertal depressive stupor: a case report. *Br J Psychiatry* 1988; 153:689-692
 63. Rao KMJ, Gangadhar BN, Janakiramaiah N: Nonconvulsive status epilepticus after the ninth electroconvulsive therapy. *Convulsive Therapy* 1993; 9:128-129
 64. Ries RK, Schuckit MA: Catatonia and autonomic hyperactivity. *Psychosomatics* 1980; 21:349-350
 65. Rosen A: Case report: symptomatic mania and phencyclidine abuse. *Am J Psychiatry* 1979; 136:118-119
 66. Sands D: Acute psychotic disturbance and regression in an adolescent girl. *Nurs Times* 1978; 74:2055-2057
 67. Schneekloth TD, Rummans TA, Logan KM: Electroconvulsive therapy in adolescents. *Convulsive Therapy* 1993; 9:159-166
 68. Slack T, Stoudemire A: Reinstitution of neuroleptic treatment with molindone in a patient with a history of neuroleptic malignant syndrome. *Gen Hosp Psychiatry* 1989; 11:365-367
 69. Warneke L: A case of manic-depressive illness in childhood. *Can Psychiatr Assoc J* 1975; 20:195-200
 70. Warren AC, Holroyd S, Folstein MF: Major depression in Down's syndrome. *Br J Psychiatry* 1989; 155:202-205
 71. Weeston TF, Constantino J: High-dose T4 for rapid-cycling bipolar disorder. *J Am Acad Child Adolesc Psychiatry* 1996; 35: 131-132

72. Zorumski CF, Burke WJ, Rutherford JL, Reich T: ECT: clinical variables, seizure duration and outcome. *Convulsive Therapy* 1986; 2:109-119
73. Gralnick A, Rabiner EL, Del Castillo G, Zawel D: Treatment considerations in the adolescent inpatient. *Dis Nerv Syst* 1969; 30:833-842
74. Thompson JW, Weiner RD, Myers CP: Use of ECT in the United States in 1975, 1980, and 1986. *Am J Psychiatry* 1994; 151:1657-1661
75. Mills MJ, Pearsall DT, Yesavage JA, Salzman C: Electroconvulsive therapy in Massachusetts. *Am J Psychiatry* 1984; 141:534-538
76. Gassy JE, Rey JM: A survey of ECT in a general hospital psychiatry unit. *Aust NZ J Psychiatry* 1990; 24:385-390
77. Sackeim H, Decina P, Prohovik I, Malitz S: Seizure threshold in electroconvulsive therapy: effects of age, sex, electrode placement and number. *Arch Gen Psychiatry* 1987; 44:355-360
78. Fink M: Indications for the use of ECT. *Psychopharmacol Bull* 1994; 30:269-280
79. Mukherjee S, Sackeim HA, Schnur DB: Electroconvulsive therapy of acute manic episodes: a review of 50 years' experience. *Am J Psychiatry* 1994; 151:169-176
80. Parker G, Roy K, Hadzi-Pavlovic D, Pedic F: Psychotic (delusional) depression: a meta-analysis of physical treatments. *J Affect Disord* 1992; 24:17-24
81. *The Practice of Electroconvulsive Therapy: Recommendations for Treatment, Training, and Privileging: A Task Force Report of the American Psychiatric Association*. Washington, DC, APA, 1990
82. Greenberg LB: Detection of prolonged seizures during electroconvulsive therapy: a comparison of electroencephalogram and cuff monitoring. *Convulsive Therapy* 1985; 1:32-37
83. Des Lauriers A, Halpern F: Psychological tests in childhood schizophrenia. *Am J Orthopsychiatry* 1947; 17:57-67
84. Bender L, Keeler WR: The body image of schizophrenic children following electroshock therapy. *Am J Orthopsychiatry* 1952; 22:335-355
85. Gurevitz S, Helme WH: Effects of electroconvulsive therapy on personality and intellectual functioning of the schizophrenic child. *J Nerv Ment Dis* 1954; 120:213-226
86. Thompson JW, Blaine JD: Use of ECT in the United States in 1975 and 1980. *Am J Psychiatry* 1987; 144:557-562
87. Kramer BA: Use of ECT in California, 1977-1983. *Am J Psychiatry* 1985; 142:1190-1192
88. Steinberg D: *Basic Adolescent Psychiatry*. Oxford, England, Blackwell, 1987, p 243
89. Asnis GM, Fink M, Saferstein S: ECT in metropolitan New York hospitals: a survey of practice. *Am J Psychiatry* 1978; 135:479-482
90. Parmar R: Attitudes of child psychiatrists to electroconvulsive therapy. *Psychiatr Bull* 1983; 17:12-13
91. Bloch S: *The political misuse of psychiatry in the Soviet Union, in Psychiatric Ethics*, 2nd ed. Edited by Bloch S, Chodoff P. New York, Oxford University Press, 1991, pp 493-515
92. Lish JD, Dime-Meenan S, Whybrow PC, Price RA, Hirschfeld RMA: The National Depressive and Manic-Depressive Association (DMDA) survey of bipolar members. *J Affect Disord* 1994; 31:281-294
93. Fear CF, Littlejohns CS, Rouse E, McQuail P: Propofol anaesthesia in electroconvulsive therapy: reduced seizure duration may not be relevant. *Br J Psychiatry* 1994; 165:506-509
94. Durham J: Sources of public prejudice against ECT. *Aust NZ J Psychiatry* 1989; 23:453-460
95. Werry JS, Aman MG: *Practitioner's Guide to Psychoactive Drugs for Children and Adolescents*. New York, Plenum, 1993
96. Freeman CP: ECT in those under 18 years old, in *The ECT Handbook*. Edited by Freeman CP. London, Royal College of Psychiatrists, 1995, pp 18-21