Electroshock Therapy Without Muscle Relaxants

J. M. RAJZINSKI, M.D.

The purpose of this article is twofold: 1) to evaluate critically some of the methods now being used in combating complications of electroshock therapy and 2) to show that shock therapy without muscle relaxants is reasonably safe not only in healthy individuals but in a great variety of physical risks. The latter point especially requires elaboration on medico-legal grounds because of intimations by some users of relaxants that non-employment of these latest "advances" in electroshock technique borders on negligence on the part of the therapist.

Aside from the question of error of observation, the incidence of fractures appears to depend on three factors: 1) the condition of the skeletal-muscular system of the patient, 2) type of restraint, 3) severity of convulsion. The last, in turn, is dependent on the type of current used. Since in general psychiatric practice patients of all physical types and states come for treatment, there remain but two factors to consider, restraint and the type of current. Restraint may be effected either by mechanical or chemical methods.

On the question of mechanical restraint, the trial and error method has followed the full gamut from rigid restraint of all major movable skeletal points to complete avoidance of restraint. Paul Cossa attributes the fewer reported fractures in France to less emphasis on restraint. Since the majority of skeletal complications occur in the dorsal spine, the general practice has been to favor extension of the spine by means of pillows or a Gatch bed. Kalinowsky has abandoned this practice and now treats his patients in slight flexion.

The incidence of fractures varies widely among reported series. The following table illustrates the wide discrepancy in the reported incidence of fractures:

<table>
<thead>
<tr>
<th>Authors</th>
<th>No. Patients</th>
<th>% Fractures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Koth &amp; Vogel</td>
<td>1000</td>
<td>9.5%</td>
</tr>
<tr>
<td>Semmel</td>
<td>470</td>
<td>2.8%</td>
</tr>
<tr>
<td>J. P. Kelly</td>
<td>2200</td>
<td>2.3%</td>
</tr>
<tr>
<td>Langley &amp; Bobbitt</td>
<td>250</td>
<td>25.0%</td>
</tr>
<tr>
<td>Webster, Colburn &amp; Sempua</td>
<td>212 M</td>
<td>25.0%</td>
</tr>
<tr>
<td>De Tovad, Morgulis, Weiner</td>
<td>283</td>
<td>20.0%</td>
</tr>
<tr>
<td>Hildreth &amp; Gordon</td>
<td>252</td>
<td>6.0%</td>
</tr>
</tbody>
</table>

Search for a current most suitable in shock therapy has stimulated experimentation with various currents with the object of softening the seizure or limiting it to a part of the body. To be sure, fractures have been reduced, if not eliminated by such currents, but at the cost of the subjective comfort of the patient. The gentler the effec-
tive current the greater the likelihood of its being felt and subsequently dreaded by the patient. I recall during my experimentation with "softer" currents how one young female patient never did forgive me for inflicting upon her temples the sensation of "a blow with a baseball bat."

The intolerable subjective discomfort associated with soft electrical procedures has led to the introduction of narcotizing and paralyzing drugs. The first preparation used extensively in the forties was D tubocurarine. Because of the sensation of suffocation associated with the paralytic stage, it was found necessary to narcotize the patient with pentothal. Although soon after the introduction of curare alarming reports of deaths and near deaths began to appear in the literature, A. E. Bennett, a pioneer in the field, as late as 1943 expressed strong approval of the curare technique.

It became clear, however, that the safety margin of curare was too narrow for comfort particularly in view of the fact that some individuals show a hypersensitivity to the drug. Even with adequate oxygen intake, some patients died, either because of an unfavorable central action of curare or from a complicating bronchospasm and circulatory collapse from a histamine-like effect.

Quest for safer relaxants brought on the market such synthetic preparations as flaxedyl and syneurine. These also were found to be dangerous. W. S. Maclay, in an excellent survey of treatment fatalities in England, collected 62 cases of death in the course of ECT. Of these cases, 28 had been premedicated with relaxant and other drugs. A number of these patients had previously tolerated straight ECT. Four of the patients died from the medication before the electric button was pressed.

Today, succinylcholine chloride (Anectine) is being recommended as answering all reasonable requirements of safety. An analysis of a typical report on the use of this drug leaves this writer unconvinced. W. P. Wilson and W. K. Nowill employed Anectine in 108 patients with a total of 1045 treatments. Apnea occurred in 100 of the patients, its average duration being 1.9 minutes. Two patients had an apnea of 10 minutes each. There was one fracture in this series involving the right transverse process of the fourth cervical vertebra. Another patient developed a mild aspiration pneumonia. A third aspirated a small amount of vomitus, and subsequently developed atelectasis of the right lung. "Prompt bronchial aspiration, inflation of the atelectatic lung and antibiotic therapy resulted in complete disappearance of the symptoms and X-ray findings in 24 hours."

Both curare and its synthetic equivalents affect the vital respiratory function. The efficacy of these drugs depends on premedication with atropin and an intravenous barbiturate — another respiratory depressant. Oxygen must be available for controlled respiration. Air passages must be kept clear of mucus etc. Thus an operational chain, no stronger than its weakest link, is forged against the iatrogenic complications of respiratory arrest, atelectasis, aspiration pneumonia, and circulatory collapse.

One cannot but note with misgivings the growing tendency among some therapists towards hazardous polypharmacology. At times it seems that the eager psychiatrist seeks to tempt fortune by skirting at the brink of disaster. Let me cite an example: A greatly disturbed male patient, 28 yrs. old, received on the day preceding his last ECT 800 mgs of Thorazine, 200 of it IM. Next morning he is given an inhalation of nitrous oxide (30 sec.), followed by inhalation of CO₂ in 70% oxygen (duration unspecified). This was followed by the ECT and then by "subconvulsive diencaphalic stimulation," in the course of which he died.

While some therapists exceed the limits of ordinary prudence by overdosage with potent pharmacologic agents, a few seem to have an attraction for the shock machine itself with the result that the patient is exposed to what may be called an iatrogenic status epilepticus. An example: "After intravenous injection of 2 cc of curare, the machine was set at 70 volts for 4 sec. and the stimulus administered. Immediately after the initial convolution, the stimulus was repeated. This was done four times." The patient, a 51 yr. old male, died after the fifth procedure.

The first principle in medical practice has...
always been to avoid harm— *null nocere*. Interference with the vital functions of respiration and circulation is justified only as a life-saving measure. Outside of certain psychiatric emergencies, such as extreme excitement leading to exhaustion or an irresistible suicidal urge, the role of shock therapy is mainly to shorten the course of a psychosis or to render a disturbed patient more tractable. It still remains to be proved whether in the schizophrenic group more patients recover with ECT than would eventually get well by other methods. Moreover, the relatively benign nature of electroshock complications renders dubious any need of placing the vital functions in jeopardy.

The theory that the pentothal-Anectine technique is easier on cardiac and otherwise debilitated patients is likewise open to question. Debilitated individuals in consequence of their wasted musculature have milder seizures than others. As for the lightened strain on the circulation with Anectine, there are indications that the opposite may actually be true. Studies by William L. Holt and associates* with Flaxedil and Anectine show a marked fluctuation in blood pressure from an initial drop to a secondary rise with Flaxedil and a somewhat smaller fluctuation with Anectine. But more arrhythmias were found with the latter. One patient on Flaxedil registered a drop in systolic pressure from 150 mm Hg. to 70 mm.—a near cataleptic effect.

Many workers have rightly expressed the opinion that muscle relaxants have substituted equal, if not greater, hazards in the respiratory and circulatory systems for those they are supposed to solve in the skeletal system.* A recent letter by Kalnowsky* reported correspondence with two European workers, one of whom had one and the other two fatalities with Anectine. Some workers, following Impastato's method, now avoid the hazards of Pentothal in their use of Anectine by first rendering the patient unconscious with a petit mal stimulus before administering the convulsive dose of current.

Relaxant drugs have not been alone in increasing hazards for the patient. Deaths have been reported with combined electroshock Thorazine and electroshock Serpasil therapy. At the recent panel discussion on electroshock at the APA meeting in Chicago (1955) the discussants who had used such combinations reported that when the patient dies "he goes out like a light."

The exact dynamics of spinal compressions which have been responsible for much of the relaxant controversy remain uncertain. One theory is that the fracture occurs as a result of a sudden flexion of the upper spine during the initial phase of the convolution.

Another theory is that the upper thoracic spine, the neck and the skull are compressed downwards by the longitudinal spinal musculature delivering a "hammer type" blow to the joint surfaces of the vertebral bodies. The "wedging" of the compressed vertebral bodies is explained by the simultaneous operation of both processes. It is doubtful whether the contraction of the relatively weak upper spinal musculature alone would be sufficient to crush a vertebra. It is more likely that the massive lumbar-sacral flexors and the abdominal muscles by tending to approximate the pubis to the xiphoid process indirectly contribute the decisive force in the crushing action. Why fractures occur in the upper dorsal spine has been explained by the more delicate structure of the vertebral bodies in that area and by their relative immobility. It has been shown that of all the dorsal vertebrae, the fifth is the least movable and the most readily crushed experimentally. It, therefore, may be regarded as the center of dorsal vulnerability and as the fulcrum from which the two ends of the spine extend cephalad and caudal as levers. Powerful flexor action at both extremities of the spine thus tend to converge towards the region of the fifth dorsal vertebra as the apex with crushing effect.

If these dynamics of spinal compressions are correct their prevention would be promoted by a more effective immobilization at both ends of the spine during treatment. I shall later describe a practical application of this theory.

During the past 18 years I have treated at St. Mary of Nazareth Hospital and at Pinal Sanitarium in Chicago about 2,000 psychiatric patients with a total of approximately 14,000 treatments without the use of relaxant drugs. The patients were of both sexes, though females predominated,
ranged in age from 16 to 85 yrs. There has been no fatality.

One gets the impression while observing these patients after treatment and watching the healthy glow of their flushed faces that they benefit not only from the central action of the current but from the stimulating metabolic effect of the convulsion itself. The muscle soreness of which many previously inactive patients complain following treatment is the same healthy soreness that normal persons find not unpleasant after vigorous exercise.

During the past two years, 233 patients received a total of 1643 treatments. Among them there were 29 with organic cardiovascular disease. Their clinical diagnoses confirmed by EKG were as follows:

- Hypertensive heart disease
- Coronary insufficiency
- Intraventricular block
- Frequent auricular and ventricular extrasystoles
- Old infarctions
- Mitral stenosis
- Auricular fibrillation

Only those cases were included in the hypertensive group whose systolic pressure was persistently 200 mm. Hg. or more. One 59 yr. old depressed male had a pressure of 260/150. He received 12 ECT with recovery. Another patient, a 27 yr. old female, had advanced chronic rheumatic valvular disease bordering on decompensation and with auricular fibrillation. Cardiac patients were given atropin and a short period of oxygen inhalation before and after treatment.

Two women in their ninth month of pregnancy received six treatments each without complications.

The record of skeletal complications was obtained in 87 of these cases. Among them were 23 repeaters with a history of one or more courses of ECT. There were 61 new cases. The results of this study are summarized in Table 2.

The incidence of fractures discovered in the repeaters was 39% in the new patients 9.5%. The difference in these figures is more striking when we consider that in the old cases there were 2.6 compressed vertebrae per fracture patient, in the new the ratio was 1.7. Three of the six new cases had only a mild degree of compression consisting of cupping of the dorsal surfaces with a slight decrease in the height of the vertebral bodies. The compression in the remaining three was moderate according to the classification described by Newbury and Etter.

The number of old cases is too small to have a significant statistical value though these patients were selected only on the basis of recurrence of the psychosis. Perhaps the high rate of compressions found among them is due to the fact that they had been treated with a machine giving an instantaneous rise of current. In the present series an apparatus with a glissando current was used. None of the patients with old compressions suffered any backache or any changes in the X-ray findings following their most recent ECT.

Among the 64 new patients there were five, aged 62 to 67 with advanced osteoarthritic changes in the spine, one with a marked rotary scoliosis and one 51 yr. old female with osteoporosis. None of these developed compressions or backache after treatment.

In this series of cases an attempt was made to neutralize the flexion factor in spinal compressions not by manual restraint of the lower extremities but by the use of a specially constructed belt applied to the pelvic region. The belt, shown in Fig. 1, is made of strong canvas 10 inches wide and long enough to pass across the bed or treatment table. The segment of the belt overlying the patient’s pelvis is padded with a layer of foam rubber 3-4 cm. thick. Three leather straps passing under the bed frame are used to secure the belt in position. The foam rubber permits an elastic restraint to
the contour of the pelvis without being rigidly unyielding. The belt is fastened with decreasing tightness from above downwards to allow some flexion of the thighs without danger of bruising the thigh muscles. At the cephalic end of the spine, the head is held firmly and under traction to counteract the "numbing type" effect of the contraction of the longitudinal spinal muscles. (Fig. 1.)

The foam rubber belt has been found useful not only in limiting pelvic flexion during the seizure but as an effective restraint during the post-seizural excitement. It is less at the field of returning consciousness than wrist and ankle restraints. In patients with previous or recent abdominal scars, it serves as an adequate abdominal support. Based on the series listed above, the belt appears to reduce the frequency and severity of compressions.

Summary and Conclusion

The subject of electroshock therapy has been reviewed from the point of view of the commoner skeletal complications and various methods designed to prevent them. The subject of relaxant drugs has been discussed and their hazards pointed out. Survey of the literature shows that while electroshock therapy without relaxant drugs carries a higher rate of skeletal injuries, the vast majority of those are not disabling. On the other hand, use of relaxant drugs unquestionably increases the risk of a fatal accident. In weighing the relative merits of shock therapy with or without relaxants, the therapist might well ask himself the question: How many vertebral compressions would he be willing to trade for one fatality traceable to a relaxant drug? On the subject of risks associated with cardio-vascular disease, it appears that if a patient can tolerate ECT combined with a barbiturate-relaxant cocktail, he can take it straight as well. A certain irreducible minimum of cardiac deaths will occur under any circumstances because the existing clinical and laboratory methods cannot predict accurately an impending coronary accident.

The use of a foam rubber belt is described which appears to aid in decreasing the incidence and severity of spinal compressions.

BIBLIOGRAPHY

15. Kelly, J. P.: Fractures Complicating Electroconvulsive Therapy and Chronic Epilepsy. J. of...