SOME COMPLICATIONS ARISING DURING ELECTRICAL CONVULSIVE THERAPY.

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In 1938 Wespi (1) in Germany and Stalker (2) in this country reported cases of crush fracture of the spine following cardiazol convulsion therapy. It was not until then, some four years after its introduction, that attention was focused on the risk of fracture in this form of therapy. During 1939 alarming reports appeared, especially in the United States, regarding the occurrence of such mechanical injury. Polatin *et al.* (3) radiographed 51 cases following metrazol convulsive therapy and reported spinal fractures in 43 per cent. Bennett and Fitzpatrick (4) in a similarly treated series of cases recorded 47 per cent. spinal fractures. However, the latter figure was obtained from a series of only 18 cases, and should therefore be accepted with reserve. In this country H. A. Palmer (5) in a series of 20 cases treated by cardiazol shock therapy found spinal fractures in no less than 5 cases (25 per cent.).

In view of these publications the method fell into some disrepute, despite von Meduna and Friedman's (6) reputed series of 3,000 cases of mental diseases treated by shock therapy, of which only 1·1 per cent. showed mechanical injury. Kolb and Vogel (7) have given the figure of 9 per 1,000 for the incidence of mechanical injuries following electrical shock therapy. Kalinowsky (8) stated that Cerletti and Bini, the originators of this form of shock therapy, " had produced several thousand fits in some hundred patients without any accident whatever."

During the present investigation it has been the practice, on the grounds of economy, only to radiograph patients who showed symptoms or signs during the course of treatment. Of 420 patients who were treated by electrical convulsion therapy, 12 (2·8 per cent.) showed bony injury. As all patients were not radiographed after treatment it is likely that the figure of 2·8 per cent. is too low.

It would appear that despite the somewhat conflicting figures given for the incidence of fractures in metrazol therapy there is *less* risk of fracture after electrical shock.

Material Investigated.

In the present series 12 (2·8 per cent.) cases of fracture were noted in 420 consecutive cases treated by electrical shock therapy.

Sites of Fracture.

Table I shows the distribution of the sites of fractures. Whilst the spine is the commonest site, fractures appearing in the extremities are not uncommon, and have a far more dramatic immediate result than spinal injuries.

Table I.

	Cases.
Spines	5
Fracture dislocation of humerus	2
Simple fracture right humerus	1
Femoral neck	5
Pelvis	1

The difference in the total number of fractures to the number of cases is accounted for by the fact that two cases showed multiple fractures.

Considerable displacement was present in all the fractures of the extremities. In the fractures of the humerus, which were all at the surgical neck, two cases were associated with posterior dislocation of the humeral head which remained on the posterior lip of the glenoid cavity. Possibly hyperextension of the arm during convulsion accounted for the unusual displacement in these fracture dislocations. Folding the arms across the chest may help to lessen the likelihood of this injury.

Five fractures of the femoral neck occurred and the site of fracture varied from an intra-capsular to an extra-capsular type. In one case a fracture of the neck of both femora occurred. In another case a fracture of the other femoral neck occurred after one hip had been placed in a plaster spica. It is possible that the restraint imposed by a Whitman's spica so altered the mechanics of the pelvis that fracture of the femoral neck on the other side occurred more readily.

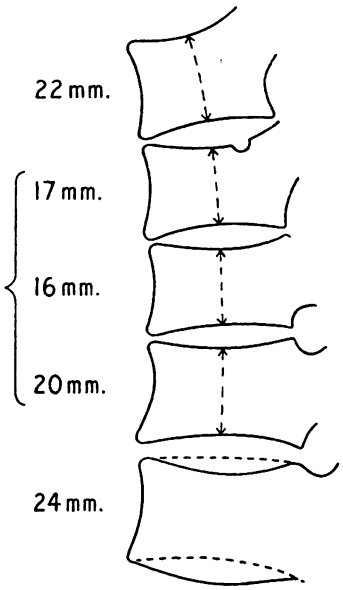

FIG. 1.—Tracing from a radiograph of the upper dorsal spine showing the rounded kyphus and the minor degree of compression of several of the vertebral borders. Note that the narrowing appears to be greatest at the mid-part of the body and not in the anterior part. With further treatment complete collapse might have appeared.

One of the cases showed a traumatic intra-pelvic protrusion of the femoral head. A moderate protrusion of the femoral head was present. This unusual complication has been previously described after cardiazol therapy by Meduna and Friedman.

Five cases of fracture of vertebral bodies were seen, and in two cases more than one vertebral body was affected. The commonest site for vertebral fractures to occur is the upper dorsal spine, and in this respect vertebral fractures following electrical convulsion therapy are similar to those following cardiazol therapy.

The recognition of these fractures requires careful examination of the radiographs. Radiographs showing good detail of this part are difficult to obtain, especially so in non-co-operative patients. By not suspending respiration during the exposure and by using a high k.v. and millamperage with a short exposure time satisfactory radiographs can be obtained. The antero-posterior view is not of as much value as the lateral view. In some cases inspection of the radiographs will show a typical crush fracture; in others (Fig. 1) careful measurement of the depth of the vertebral bodies is necessary to detect these fractures. In many cases a round kyphus of the upper dorsal spine will be seen to be composed of small degrees of compression fractures of several adjacent vertebral bodies (Fig. 1).

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Palmer has classified vertebral fractures into three groups, depending on the severity of the injury:

Type I: Fracture of anterior tip of vertebral body.

Type II: Minor degree of compression of vertebral body with striae along lines of compression.

Type III: Complete collapse of the vertebral body.

No case belonging to the first type was met with in this series, but cases showing instances of type II and type III were noted. This subdivision appears to be somewhat artificial, as both type II and type III may be met with in any single case.

In the author's series the original injury appeared to be in the mid part of the body beneath the widest part of the intervertebral disc (Fig. 2). This fact, coupled with the tendency of vertebral fractures to occur after three or four shocks, rather than with the original shock, suggests that herniation of a portion of the disc into the vertebral body may be the primary cause of the collapse. Certainly it is difficult to follow the argument (3, 4) that hyperflexion is the cause of these injuries. If hyperflexion with a jack knife effect is the main cause, it is hard to see why the upper dorsal region, the most immobile part of the spine, should be chosen as the commonest site for fracture.

In all the cases of vertebral fractures reported in this series, symptoms such as backache were complained of and none was symptomless. It has been suggested (9) that these fractures are of no importance, and certainly their appearance is far less dramatic than fractures of the extremities. Osteo-arthritis must, however, occur as a delayed sequel, and it is possible that the pain induced by these changes may hasten a late relapse in the mental condition. A result of numerous fits over a period of time is illustrated in Fig. 2. This patient was an epileptic who had several *grand mal* attacks each week for many years, showed at the age of 41 marked spinal osteoarthritic changes and multiple fractures.

One case of a crush fracture of a vertebral body from previous cardiazol convulsion therapy was able to undergo a further course of electrical therapy without any further spinal damage.

Three cases of dislocation of the jaw were noted, but in each case even casual examination revealed the injury and reduction was quickly effected.

Use of Radiographs before Treatment.

Amputation stumps.

Amputation stumps were noted to be especially liable to fracture. This may be the result of disuse atrophy and altered muscle mechanics. The responsible person in these cases should be warned of the added risk. Fixing the amputation stump does not appear to be effective in preventing fracture; in fact fixation, like any form of mechanical restraint, appears to enhance the risk of fracture.

Any case which was judged clinically to be undersized was submitted to pre-therapy radiographs to estimate the degree of decalcification. A patient of the same age, sex and stature was used as a control. The patients' limbs were radiographed, and correspondingly the control limits on the same film, both being given the same exposure. It was not found to be practical to place the patient's limb and the control's limb on the film at the same time and thus give the exact degree of radiation to both. It was, however, possible to give an almost identical exposure to the control and thus obtain films which were comparable (Fig. 3).

Sites at which fractures commonly occur, such as the surgical neck of the humerus, were especially carefully scrutinized, and experience showed that a fair prognostication of the risk of fracture could be made. It is not possible to give a dogmatic opinion, and for this reason and on the grounds of economy the method was not used in all cases. Only those patients whose clinical examination suggested the possibility of decalcified bones were submitted to radiography.

The risk of fracture is proportionate to the degree of decalcification. Evans (10) first noted this fact in a case having generalized osteoporosis.

Steiner suggested that this decalcification was due in many cases to a starvation osteomalacia, but in a considerable number of melancholics lack of muscular tone, accompanying the apathetic mental state, must contribute to the atrophy of the skeleton. The continued muscular inactivity of these patients also contributes to