subjected to a local stimulus reacts with the equivalent of an epileptic fit, for it is quite obvious from the literature and from cinematograph studies of foetal behaviour that this is not the case. All that is argued is that during a therapeutic fit there is a state of mass motor activity involving widespread irradiation of nervous impulse, which corresponds in principle to the type of activity displayed in the foetus in response to local stimulation; furthermore, that this is followed by an apparent segregating out from the original mass movement of certain independent movements, which again roughly corresponds to the pattern of development in the foetus. It is perhaps worth mentioning as an additional point that Barcroft (1941) refers to movements elicited in the sheep foetus as "spasms," and when widespread as amounting to "a trifling convulsion of most of the body."

Psychophysical Relationships

The theory that the convulsion represents a return to the foetal level of nervous functioning does not explain its beneficial therapeutic effect, but it promises a more fruitful line of approach to the problem than do current views about the nature of a fit. It has the merit of enabling one to investigate the psychic phenomena which follow a fit—namely, the post-convulsive confusional state—with certain possibilities in mind. For instance, if there has taken place during the fit a reversal of nervous evolution there may well have been a parallel reversal of psychic evolution, in which case one might find in the post-convulsive state a partial reliving of past experiences. The well-known retrograde amnesia associated with such fits would harmonize with this.

Again, the fusing of normally discrete movements during the fit might be correlated with a tendency to fuse psychic material after it. Indeed, this may be the reason why the term "confusion" is applied. The establishment of psychophysical relationships such as these—and they are not the only ones suggested by the theory outlined above—would be likely to throw light upon the problem of how multiple fits can benefit mental illness. The post-convulsive confusion represents the first demonstrable effect of the fit upon the mind, and it is reasonable to assume that some relationship exists between this and its later therapeutic influence. The frequent persistence of amnesic symptoms after recovery from the original mental symptoms supports such an assumption. Glandular and metabolic effects doubtless also occur, but the core of the matter seems to lie in an alteration of cerebral functioning and, by concomitance, of mental functioning, brought about by the direct action of the convulsive process.

Summary

Attention has been called to some of Hughlings Jackson's teachings regarding the nature of a convulsion. Reference follows to the physiological theory that local movements are evolved from mass movement, and authorities are quoted who support the theory. On the basis of this assumption an attempt has been made to explain the therapeutic convulsion as a reversion of behaviour to the level of the foetus.

REFERENCES

- Barcroft, J. (1941). *Nature, Lond.*, **147**, 762.
 — and Barron, D. H. (1936). *J. Physiol.*, **88**, 56.
 — (1939). *J. comp. Neurol.*, **70**, 477.
 Coghill, G. E. (1929a). *Anatomy and the Problem of Behaviour*, p. 18. Cambridge Univ. Press.
 — (1929b). *Arch. Neurol. Psychiat.*, Chicago, **21**, 989.
 Dewey, E. (1935). *Behaviour Development in Infants*, p. 106. New York.
 Hooker, D. (1936). *Yale J. Biol. Med.*, **8**, 579.
 Irwin, O. C. (1932). *Psychol. Rev.*, **39**, 189.
 Jackson, J. Hughlings (1931). *Selected Writings*, edited by J. Taylor, p. 354. Hodder and Stoughton, London.
 Langworthy, O. R. (1932). *Brain*, **55**, 265.
 Windle, W. F. (1944). *Physiol. Zool.*, **17**, 247.

TREATMENT OF INTERTROCHANTERIC FRACTURES OF THE FEMUR BY INTERNAL FIXATION

BY

G. P. ARDEN, M.B., F.R.C.S.

AND

G. J. WALLEY, B.M., F.R.C.S.

(From the Accident Service of the Windsor Group of Hospitals)

Only of recent years have surgeons been stimulated to treat intertrochanteric femoral fractures by internal fixation as a means of obviating the long inactivity and bed-stay of the aged patient. Previously Brittain (1942) had used a flanged pin alone, but in the most urgent group (the comminuted) the pin had tended to cut out. Extending the principle of a firm hold on the shaft cortex, the Capener-Neufeld and McKee type blade-plates were evolved. Reports on several American series of such cases have appeared, but only one in the United Kingdom.

Operative treatment has been advocated for the following reasons: (i) early ambulation; (ii) a more accurate and stable reduction of the fracture; (iii) improved final function; (iv) fewer general complications (chest, pressure sores, thrombosis, nerve lesions, incontinence); (v) shorter hospital stay and quicker turn-over; (vi) lower mortality.

Reports in the Literature

Cleveland *et al.* (1947) reported on 95 cases out of a total of 133 treated by internal fixation with a Neufeld-Capener nail. Their operative mortality was 12.6% and the average hospital stay 57 days. Complications reported by them were overdriving of the nail and breaking of the nail in three cases following early weight-bearing. They claimed a lower mortality and a lower incidence of all complications compared with cases treated conservatively. Hammond (1948) reported a series of cases treated by operative means, with a mortality of 21%. His patients were up on crutches in two to three weeks after operation and began weight-bearing at the end of four months. He also claimed a lowered mortality and complication rate compared with cases treated conservatively.

Evans (1949) reported on 22 unselected cases treated by operation with a Neufeld-Capener nail and claimed the same advantages of early ambulation, greater comfort for the patient, and quicker turn-over and lowered mortality. Murray and Frew (1949) have reported on 100 cases of trochanteric fractures of the femur treated conservatively, and claimed a low mortality, good function, and a low incidence of general complications (except for drop-foot). They stated that the operative complications of shock, infection, and haemorrhage more than outweighed any advantages.

Present Series

Our series comprises 43 consecutive fractures of the intertrochanteric area treated by us at five local hospitals in the last two years. Thirty-seven cases (90%) were treated by operation; these cases were selected. The remaining six were treated conservatively for the following reasons: (a) three patients were considered unfit (one died); (b) two were cases of crack fracture with no displacement; (c) one was a child aged 5.

We used a McKee nail-plate in 35 cases and a McLoughlin nail-plate in two. We preferred the separate nail and plate to the Capener-Neufeld because of its easier and more accurate insertion, and the non-rigid junction prevented the risk of the nail-plate breaking. All the nail-plates were made of stainless steel, and the screws used were vitallium with different electro-potential. No apparent harm results from the use of dissimilar metals, screws removed one year later being firmly held in by the bone.

Operative Technique

Cases were pinned as soon as the anaesthetist considered them to be fit for operation. In a few instances blood was transfused during the operation (six cases). Three others were given blood post-operatively for shock (two of these patients died). Under general anaesthesia on a Hawley table, reduction was accomplished by traction, wide abduction, and internal rotation.

A 5-in. (12.5-cm.) incision was made, exposing the upper end of the femur. Two 9-in. (22.8-cm.) guide wires were inserted through the base of the trochanter up into the head of the femur (the position of this was judged by bony points) and then checked by radiographs; no director was used. A suitable McKee nail was inserted so as to be at least $\frac{1}{2}$ in. (1.25 cm.) short of the joint line, and this was checked by radiographs. The nail advances $\frac{1}{4}$ in. (0.6 cm.) during the subsequent weeks as the fracture line absorbs, and may penetrate the joint.

The blade-plate was adjusted to fit the contours of the upper outer femoral cortex by plate-benders, and was fixed by four screws penetrating both cortices. The operation should be completed within 40 to 90 minutes.

After-treatment

No external support for the leg was used, the physio-therapist starting active exercise of the affected hip 24 hours post-operatively. General leg and breathing exercises were also given. Patients were given 250,000 units of penicillin twice daily post-operatively for 48 hours to control potential chest and wound infections. They were encouraged to get out of bed and sit in a chair within 12 days, and two weeks after the operation began walking on crutches without weight-bearing. At the end of four weeks they were discharged home, and attended the nearest physio-therapy department twice weekly for exercises and the fracture clinic for follow-up.

When radiographs showed satisfactory union the patient began weight-bearing; this was usually at 11 weeks after injury.

The average hospital stay of 37 days is considerably shorter than that mentioned in other papers (Table V).

TABLE I.—Analysis of Results

No. of cases	37
Deaths	5 post-operative (13.5%); 2 late (excluded: 4 months, 1 year post-operative)
Average age	69.7 years (37–88)
Sex	Male 11; female 26
Side	Right 20; left 17
Average time, injury to internal fixation	6 days (1–28 days)
Average time, fixation to getting up	12 days (3–31 days)
Average hospital time	37 days (4–105 days)

This has been helped by fairly good home conditions in this area; and two patients returned early to a mental home, where they could be nursed satisfactorily.

Out of 37 cases there were five deaths in hospital and two late deaths from unassociated conditions; two further cases were excluded as less than six months had elapsed

TABLE II.—Results at Follow-up

Follow-up	90%
Average time of weight-bearing	11 weeks (5–34)
Average time to walk in comfort	4.5 months
Still living	30
Bedridden (unconnected causes)	1
Shortening	13 cases in 25 recorded
Average hip flexion	90°
Stiff hip (0–45 degrees)	1
Stiff knee (0–45 degrees)	5 (1 rheumatoid)
Pain in hip	5 (1 old osteoarthritis of hip)
Pain in knee	5 (1 rheumatoid)

since operation. Several cases have been followed up for two years. Results of a follow-up are shown in Table II. One patient left hospital walking on crutches; but her general health began to fail, and, as she is now bedridden, in the final assessment the result in her case has been regarded as poor. In about half the cases shortening of $\frac{1}{2}$ to $1\frac{1}{2}$ in. (1.25–3.75 cm.) was recorded; in all of them this was due to a varus deformity of the neck. This result is unsatisfactory, and is probably due to loosening of the nut, although in two cases the nail bent (Fig. 1). A

FIG. 1.—Radiograph on twelfth post-operative day, showing bent nail.

third possibility is that the nail cuts upwards in the head. Details of complications occurring in the series are shown in Table III.

TABLE III.—Complications

Hospital deaths	2 shock, 1 heart failure, 1 liver failure, 1 unknown
Wound infection	6 (slight), all healed
Wound haematoma	3, all healed
Femoral vein thrombosis	3
Pressure sores, heel	4 (small), all healed
Chest infections	1 bronchopneumonia
Nail complications	2 bent, 2 penetrated head; 1 loose nut
Incontinence of urine	4
Deformity	9 (angle less than 120 degrees), with definite varus

One patient aged 42 developed a painful and stiff hip and knee after operation. She has not improved since, and in her case the result is assessed as poor; no cause,

FIG. 2.—Radiograph showing fracture with considerable displacement, also osteoarthritis of hip.

however, has been found for this. Of seven patients who complained of pain in the hip and/or knee, three had similar symptoms before their injury, due to pre-existing osteoarthritis and/or rheumatoid arthritis. Figs. 2 and 3 show the result before and after treatment of a fracture

FIG. 3.—Same case as in Fig. 2. Radiograph two months after operation, showing a satisfactory femoral angle and callus formation.

with considerable displacement, and associated with osteoarthritis of the hip.

Five patients died within a week of operation—two of them from post-operative shock. Operation in one of them, aged 86, was technically difficult owing to extreme density of the bone, and the operation time was long (3½ hours). The patient dying from liver failure was on dicoumarol for a femoral vein thrombosis, and it is possible that this was the cause of death. This case has, however, been regarded as a post-operative death. In one case with wound infection the whole wound gaped after the removal of the stitches. Healing occurred after a secondary suture despite mild wound infection. One patient, after return to work as an aircraft fitter, complained that the metal in his femur caused a magnetic compass deviation of 7 degrees. After some months the metal became “degaussed” and ceased to have any effect. Urinary incontinence was a troublesome complication, as it considerably increased the risk of wound infection.

In two cases the nail penetrated the head some weeks after operation. The nail and plate were removed after union and the final function in both cases was fair, with 90 degrees of hip flexion. The only deformity which

FIG. 4.—Intertrochanteric fracture with coxa vara deformity.

occurred was coxa vara (Figs. 4 and 5)—in nine cases the angle was less than 120 degrees, this giving rise to measurable shortening. In one case the nut loosened several turns, but did not come right off.

In one case the nail bent and was removed. This patient can flex her hip to 90 degrees, has 1-in. shortening, and gets some pain in the hip. She is able to walk short distances and the result has been assessed as fair. One nail bent after five days in bed with no weight-bearing at all. In another case union was unusually rapid, considerable callus being present at five weeks, as shown in a radiograph. She began weight-bearing at this stage.

Assessment in patients of 70 years of age is difficult, as some already had limited function before injury (Table IV). If they return to this state of activity, then the result is good. Two patients classified under “good” fall into this

FIG. 5.—Same fracture as in Fig. 4 three months after operation.

category; one had rheumatoid arthritis and the other was 88 years of age. Some cases classed as fair on account of shortening had excellent function; one such patient walked 8 miles at the age of 62. In Table V comparison is made with results obtained by other workers.

TABLE IV.—Final Assessment in 28 Surviving Cases

Result	Cases	Remarks
Good ..	17 (60.7%)	Can walk at least 1 mile or as far as before injury. Hip movements more than 90 degrees. No real hip or knee pain. Shortening less than $\frac{1}{2}$ in.
Fair ..	9 (32.1%)	Can walk up to half a mile. Hip movements more than 60 degrees. Shortening less than $1\frac{1}{2}$ in. Only slight hip or knee pain
Poor ..	2 (7.1%)	Unable to walk; pain + +. Stiff knee and/or hip

TABLE V.—Results Compared With Other Series

	No. of Cases	Mortality	Hospital Stay	Weight-bearing
Cleveland ..	95	12.6%	57 days	Not stated
Hammond ..	45	21%	Not stated	4 months
Evans ..	22	0	49 days	Not stated
Arden and Walley	37	12.5%	37 "	11 weeks

Conclusions

We are of the opinion that operative treatment of these fractures offers the following advantages: (a) early ambulation; (b) greater subjective comfort for the patient; (c) fewer general complications; (d) shorter hospital stay; (e) an earlier return to normal function. We do not consider that the mortality was lowered or that a more accurate reduction was maintained. These two factors might be improved with modification of the method used.

Suggested Modifications.—More blood transfusion at operation to control shock. Modification of the nail-plate: (i) four fins to prevent bending of nail; (ii) a single Egge-type slot in the plate to encourage early union; (iii) a serrated spring compression washer or lock nut to prevent the nut becoming loose, and thus prevent a varus deformity.

Summary

A selected series of 37 intertrochanteric fractures treated by internal fixation have been reviewed.

We are of the opinion that the advantages offered by this method should encourage its use in the great majority of cases of this fracture, but not as a routine.

Certain nail complications are mentioned, and modifications of the nail-plate are suggested.

REFERENCES

- Brittain, H. A. (1942). *British Medical Journal*, **1**, 463.
 Cleveland, M., Bosworth, D. M., and Thompson, F. R. (1947). *J. Bone Jt Surg.*, **29**, 1049.
 Evans, E. M. (1949). *Ibid.*, **31B**, 190.
 Hammond, G. (1948). *Penn. med. J.*, **51**, 759.
 Murray, R. C., and Frew, J. F. M. (1949). *J. Bone Jt Surg.*, **31B**, 204.

ACUTE POISONING WITH POTASSIUM BICHROMATE

BY

C. N. PARTINGTON, M.B., Ch.B., D.C.P.

Deputy Director, County Laboratory, Dorchester

Inorganic chemical poisoning is to-day probably the rarest form of food-poisoning, and therefore is likely to be overlooked. Accidental poisoning through taking potassium bichromate by mouth must be rare; few records are reported by Taylor (1934) or Glaister (1938). The apparent ease with which it occurred in the following cases illustrates that chemical poisoning must always be considered in patients presenting with unexplained acute gastro-enteritis.

Case Histories

Two people were taken suddenly ill with severe abdominal pain and vomiting 10 minutes after eating porridge. Diarrhoea occurred soon afterwards. The patients were initially distressed, but shortly after the symptoms abated they appeared little the worse for their experiences, and there have been no sequelae. The medical practitioner had noticed a blueness of their skin, and, with the history given, decided to seek advice, submitting a sample of the oatmeal for examination. On close questioning, one of the patients remarked that the supernatant fluid of the cooked oatmeal was bright yellow.

Examination of the Oatmeal.—The oatmeal (crushed oats) was seen to contain small red-orange particles. These were not evenly distributed throughout—one jar contained several, and another jar a few. The particles were crystalline and dissolved readily in water, giving a yellow solution. The oatmeal was further examined for mites, rancidity, and bacterial contamination, all with negative results. It was thought that the crystals could be those of potassium bichromate, and tests were undertaken to prove this. (1) The solution of the crystals released iodine from potassium iodide. (2) The weak solution gave a rose-pink solution with silver nitrate. (3) The dilute solution, acidified with sulphuric acid and sulphurous acid then added, produced a green colour. (4) A similar effect to No. 3 was produced by substituting alcohol for sulphurous acid and then warming the mixture. (5) The solution, acidified with sulphuric acid and treated with hydrogen peroxide, produced a blue colour due to the formation of perchromic acid;