FRACTURES OF THE UPPER END OF THE FEMUR IN STROKE HEMIPLEGIA

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(This paper was presented at the Joint Singapore/ Malaysia Orthopaedic Association Conference on Sept 23, 1979, Singapore.)

SYNOPSIS

Following stroke with hemiplegia, many patients i.e. 90% of stroke admissions to DRM, TTSH, achieve independence in ambulation with or without aids and/or appliances. Nevertheless, the increased mobility may predispose to falls if the gait pattern is poorly corrected. Although uncommon, such falls result in fractures of the upper end of the femur characteristically on the hemiplegic side. A simple short leg brace, in correcting the hemiplegic equinovarus deformity is a sound measure to prevent further disability.

INTRODUCTION

Human mobility is as important as living. Survival therefore is determined by independent mobility. After stroke with hemiplegia or hemiparesis, such mobility is significantly altered. Rehabilitation thus aims at restoring independent ambulation with or without aids and appliances. Independence in ambulation is however not enough. It has to be safe as well because increased mobility also increases the likelihood of falls and sustaining the common fractures of the upper end of the femur. This paper analyses how this happens and what can be done to prevent such accidents.

CHARACTERISTICS OF THE COMMON STROKE PATTERN

Hemiplegia or hemiparesis is the major somato-neurological deficit occurring in the majority of completed strokes arising usually from cerebral thrombosis, haemorrhage or embolism. In the early stages the paralysed muscles are usually flaccid but eventually a combination of rigidity and spasticity develops. In those whose general medical condition is satisfactory, the ability to stand first and then walk can be regained even if severe paresis of the lower limbs persists, the necessary stability being provided by stretch reflexes. On the other hand, it is quite common to have persisting dense paralysis of the upper limbs, irrespective of the reflex hypertonicity which usually results in a useless hand. This is the usual pattern when the arterial territory supplied by the middle cerebral artery is affected.

Other barriers towards independent and effective ambulation are:

1. Altered cerebration with mental confusion, giddiness, emotional and intellectual impairment.
2. Visual impairment and field defects (hemianopsia).
3. Impaired postural control with poor balance; vertigo occurring in vertebro-basilar insufficiency.
4. Perceptual-motor defect with deterioration of body image.
5. Gait apraxia.
6. Sensory loss and decreased sensory input.
7. Drop attacks; transient ischaemic attacks.
8. Associated arthropathy: osteoarthrosis.

MATERIALS AND METHOD

A study (unpublished) of 500 consecutive stroke admissions to the Dept of Rehabilitation Medicine between 1973 - 1978 revealed the following data: 90% of such patients regained functional independent ambulation with or without aids and appliances. In this study, it was found that 39 patients (7.8% of the stroke admissions) had fractures of the upper end of the femur following hemiplegia. These fractures occurred in the femoral neck and trochanteric regions and were studied in detail in comparison with the general clinical stroke pattern arising from the 500 patients quoted.

RESULTS

1. The sex distribution was significantly different in the fracture group where the male/female ratio was 2:3 (Table 1) compared with the stroke group which was 3:2 (Table 1). In addition, the age distribution showed a higher incidence of such fractures in the age group 60 yrs and above i.e. 78.5% (Table 2). The significance of the particular sex and age characteristics could be explained on the basis of senile or post-menoausal osteoporosis. Ethnically, there was no statistical significance except for a low incidence of such fractures in Malay stroke patients (Table 2A).
2. It is interesting to note that most of the fractures occurred after the first year of the stroke (Table 3) and while walking at home (Table 4 & 4A). As none of these patients had rehabilitative gait training after their stroke, it is obvious that they lacked the correct pattern of balance and progressive ambulation with proper aids and appliances which are mandatory if independent and safe mobility is the objective. Fractures occurring more than 1 year after the stroke could be associated with osteoporosis of disuse.

TABLE 1

	CLINICAL PATTERN BASED ON 500 CONSECUTIVE STROKE HEMIPLEGIC ADMISSIONS
NO. OF PATIENTS = 39	
MALE 16 (41.0%)	60.2%
FEMALE 23 (59.0%)	39.8%

TABLE 2

AGE DISTRIBUTION		CLINICAL PATTERN BASED ON 500 CONSECUTIVE STROKE ADMISSIONS
45 yrs and under	1 (2.5%)	14.6%
46-60 yrs	7 (18.0%)	41.8%
60 yrs and above	31 (79.5%)	43.6%

TABLE 2A

ETHNIC DISTRIBUTION		CLINICAL PATTERN BASED ON 500 CONSECUTIVE STROK HEMIPLEGIC ADMISSIONS
CHINESE	34 (87.3%)	76%
MALAY	1 (2.5%)	15%
INDIAN	3 (7.7%)	7%
EURASIAN	1 (2.5%)	2%

TABLE 3

DURATION OF STROKE PRIOR TO INJURY	
LESS THAN 1 YEAR	8 (20.5%)
1-3 YEARS	18 (46.2%)
MORE THAN 3 YEARS	13 (33.3%)

TABLE 4

AETIOLOGY		
DOMESTIC ACCIDENT	36	FELL WHILE WALKING
HOSPITAL ACCIDENT	2	FELL IN GYM, FELL FROM BED
ROAD TRAFFIC ACCIDENT	1	DIRECT INJURY

TABLE 4A

INDEPENDENCE IN AMBULATATION/MORBILITY PRIOR TO INJURY	
INDEPENDENT AMBULATION	37
WHEELCHAIR/BED BOUND	2

3. Although there was equal distribution between trochanteric and femoral neck fractures, it was quite obvious that most fractures occurred on the hemiplegic side i.e. 87.2% (Table 5). In the analysis of the typical hemiplegic gait with uncorrected equinovarus deformity one notices the following:

(a) **Swing phase:**
The affected foot is lifted off the ground in a circumductory manner to overcome the extended length due to the equinas position. Simultaneously, there is some adduction and external rotation at the hip due to muscular imbalance with flexion at the knee joint.

(b) **Stance phase:**
When the hemiplegic foot reaches the ground, there is varying degree of instability due to the equinovarus position with the affected foot taking the load on the lateral border or even the dorsolateral side and with the sole rotating to face medially depending on the degree of varus. This instability at the stance phase compounded at times with weakness, sensory loss and spasticity, causes the subject to lose control of balance and results in a fall on the affected side. Without the support of the hemiplegic hand, the hip joint takes the brunt of the fall with the femur adducted and externally rotated resulting in a trochanteric or femoral neck fracture.

TABLE 5

TYPE OF FRACTURE	HEMIPLEGIC SIDE	NORMAL SIDE
TROCHANTERIC FRACTURE	17	3
FRACTURE NECK OF FEMUR	17	2
TOTAL	34 (87.2%)	5 (12.8%)

4. All the fractures were managed surgically (Table 6). May & Chacha 1968 classified trochanteric fractures of the femur as follows:

Type I — proximal fragment consists of femoral head and neck.

Type II — proximal fragment consists of femoral head and neck and major part of the greater trochanter.

With reference to this classification it was found that most of the trochanteric fractures were type II (Table 7). The significance of this is not known.

TABLE 7

TROCHANTERIC FRACTURES ON THE HEMIPLEGIC SIDE	
TYPE I	2
TYPE II	15

REF: MAY AND CHACHA (1968)

5. **Post-operative rehabilitation**
Post-operative rehabilitative measures were successful in achieving independent ambulation in 24 of the fracture cases while the remaining 15 failed ambulation.

Mobility was better with the trochanteric fractures i.e. 75% post-operative ambulation than with the femoral neck fractures i.e. 47% post-operative ambulation (Table 8).

CONCLUSION

Hemiplegia following stroke may be complicated with fracture of the upper end of the femur (neck or trochanteric). This is a preventable condition if the gait is properly corrected with a simple short leg brace where the equinovarus deformity persists on the hemiplegic side. Nevertheless there are other factors which cause stroke patients to fall and these too

TABLE 6

SURGICAL MANAGEMENT

TYPE OF FRACTURE FEMUR	PIN/PLATE	LORENZO	MOORE'S	THOMPSON	SKELETAL TRACTION
TROCHANTERIC FRACTURE	18	—	—	—	2
NECK OF FEMUR	5	3	7	4	—
TOTAL	23	3	7	4	2

TABLE 8

POST-OPERATIVE RESULTS

HEMIPLEGIA WITH	INDEPENDENT AMBULATION	ASSISTED AMBULATION	FAILED AMBULATION	PERCENTAGE AMBULANT
TROCHANTERIC FRACTURE	6	9	5	75%
FRACTURE NECK OF FEMUR	4	5	10	47%

should be treated where possible. Postoperatively more stroke patients with trochanteric fractures regain ambulation than those with femoral neck fractures.

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