# GALEAZZI FRACTURE—DISLOCATIONS IN SINGAPORE 1960-64 INCIDENCE AND RESULTS OF TREATMENT

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## INTRODUCTION

Galeazzi has generally been accredited to have been the first to observe that isolated fractures of the lower radial shaft are not infrequently complicated by a derangement of the distal radio—ulnar joint. His findings were communicated to the Lombard Surgical Society in 1934.

They are almost the exact counter part of the Monteggia fracture—dislocations, and like them they are uncommon injuries. There is universal agreement that they are difficult to treat; conservative methods seldom succeed and there is a high incidence of complications even in those which are treated operatively.

In the 30 years since the injuries were first described, in both British and American surgical writing, only one article gives information as to end results following treatment in a large series (41 cases, Hughston, 1957).

## DISTRIBUTION (Table I)

In the five years 1960-64, 1318 fractures of the shaft of the fore arm bones were treated in Singapore of which 44 (3%) were injuries of the Galeazzi type.

Thirty six occurred in men and only eight in women. The male to female ratio is therefore 9:2.

In males the annual absolute age specific incidence is maximal at middle age being 2 per 100,000 of the middle age male population, and in females this occurs in the elderly, being 1 per 100,000 of the elderly female population.

In women incidence tends to rise with increase in age but is below that of the men in all the age groups except in the elderly. Galeazzi fracture dislocations per 1,000 shaft fractures of of the fore-arm in males rise from boys through young adults to a maximum in middle age and decline in the elderly. In women the rate per 1,000 rises progressively with age with a maximum in old age.

Twenty three of the injuries occur on the right side and 21 on the left. There is therefore no side predominance.

Two of the series are compound *i.e.* 4·5%.

## SITE OF FRACTURE

Classically the fracture site in the radius is at the junction of the middle third with the distal third *i.e.* approximately 8 cms above the wrist joint. In the present series the break is situated in the mid shaft in 6 *i.e.* 13·6%.

## MODE OF INJURY (Table III)

A direct blow to the dorsolateral aspect of the fore arm has been considered by Hughston (1957) to be the usual cause of this injury. This mechanism, however is responsible for only 9 (20%) of the 44 cases in this series. By far the greater proportion *i.e.* 34 (77%), result from indirect violence—a fall onto the outstretched hand with a rotational force super imposed. (Evans, 1951; Apley, 1959). The mode of injury is unknown in 1 case.

## DIAGNOSIS

Documentation in many of the cases is incomplete; the number of occasions in which the disrupted distal radio—ulnar joint was overlooked cannot, therefore, be accurately assessed. The suspicion, however, is that the percentage of misdiagnoses is high.

## TREATMENT (Tables II, III)

The 44 injuries were treated by almost an equivalent number of practitioners.

The initial treatment was manipulative reduction followed by immobilization in plaster in 34 of the cases. Immobilization in plaster without any attempt at reduction was carried out in 4 cases, and operation was performed on 6 cases in the first instance (Table II).

Of the 34 attempts at closed manipulation, satisfactory alignment of the radius and reduc-

TABLE I

| | | Children (0-19) | Young Adults (20-39) | Middle Age (40-59) | Elderly (60+) |
|---|---|---|---|---|---|
| No. of Galeazzi Fracture Dislocations 1960-64 | M | 4 | 16 | 15 | 1 |
| | F | 2 | 2 | 2 | 2 |
| No. of Fore Arm Shaft Fractures 1960-64 | M | 772 | 179 | 102 | 20 |
| | F | 182 | 29 | 20 | 14 |
| No. of Galeazzi Fracture Dislocations per 1,000 of Fore Arm Shaft Fractures | M | 5 | 90 | 147 | 50 |
| | F | 11 | 70 | 100 | 143 |
| Annual Absolute Age Specific Incidence of Galeazzi Fracture Dislocations per 100,000 of Population. | M | 0·2 | 1·3 | 2 | 0·6 |
| | F | 0·1 | 0·2 | 0·3 | 1 |

TABLE II

| Mode of Treatment | No. of Cases | Successful | Failure |
|---|---|---|---|
| Manipulation and Plaster. | 34 | 3 | 31 |
| No Attempt at Manipulation, Plaster, No Further Treatment. | 4 | 0 | 4 |
| Surgery in First Instance. | | | |
| Open Reduction, Fixation. | 3 | 1 | 2 |
| Open Reduction, No Fixation. | 1 | 0 | 1 |
| Excision of Distal Ulna, Open Reduction Fixation. | 1 | - | - |
| Excision of Distal Ulna. | 1 | - | - |
| Surgery After Failed Manipulation | | | |
| Open Reduction, Fixation. | 7 | 2 | 5 |
| Excision of Distal Ulna. | 1 | - | - |

Successful Treatment Defined as Satisfactory Alignment of Radius and a Stable Radio-Ulnar Joint.

Successful Result After Manipulation. 3/34 ( 9%).

Successful Result After Surgery. 3/10 (30%).

TABLE III

GROUP 1

| Case No | Age | Sex | Mode of injury | Method of Treatment | | Time of union | Stability of radio-Ulnar joint | FUNCTIONAL RESULT | | | | Grip | Follow up period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Manipulative | Operative | | | Flexion | Extension | Pronation | Supination | | |
| H16131/60 | 38 | M | Indirect | Failed | Plating 12/52 Later | 12/52 | Unstable | Full | Full | Full | - 45° | Normal | 6 yrs 3/12 |
| H16800/60 | 53 | M | Indirect | No Attempt | Osteotomy, Plating 2/12 Later. Screws and Plate Loosen. These were removed after 20/12 | Non-Union Pseud-Arthro-sis | Unstable | - 25° | Full | Full | - 25° | Weak | 6 yrs |
| H17062/60 | 29 | M | Direct | No Attempt | Immediate Excision of Distal Ulna. Plating of Radius 1/12 Later | 16/52 | | - 30° | - 15° | Full | - 45° | Normal | 6 yrs |
| C2263/60 | 32 | M | Indirect | Failed | Plating 1/52 Later | 20/52 | Unstable | Full | Full | Full | - 15° | Normal | 6 yrs 5/12 |
| C39043/60 | 42 | M | Indirect | Alignment of Radius, Radio-Ulnar Joint Satisfactory in the 1st Instance. Sub-sequent Displace-ment of both in Plaster. | | ? | Unstable | Full | Full | Full | - 45° | Weak | 6 yrs |

TABLE III

GROUP 1 *(Continued)*

| Case No | Age | Sex | Mode of injury | Method of Treatment | | Time of union | Stability of radio-Ulnar joint | FUNCTIONAL RESULT | | | | Grip | Follow up period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Manipulative | Operative | | | Flexion | Extension | Pronation | Supination | | |
| H3491/61 | 42 | M | Indirect | Failed | | 12/52 | Unstable | Full | Full | Full | - 45° | Normal | 5 yrs 5/12 |
| H10492/61 | 13 | M | Indirect | Failed | | 7/52 | Unstable | Full | Full | - 30° | Full | Normal | 5 yrs 3/12 |
| H30052/61 | 25 | M | Direct | Failed | | 8/52 | Unstable | Full | Full | Full | - 30° | Normal | 5 yrs 1/12 |
| H4417/61 | 50 | M | Indirect | Successful | | 8/52 | Stable | - 15° | Full | - 45° | - 45° | Weak | 5 yrs 2/12 |
| H5255/61 | 47 | F | Direct | Failed | | 7/52 | Unstable | Full | Full | - 25° | - 25° | ? | 1 yr |
| H11161/62 | 22 | F | Indirect | Failed | K.W. 5 days Later | 16/52 | Unstable | Full | Full | Full | - 25° | Normal | 4 yrs |
| H18040/62 | 26 | M | Direct | Failed | Plating 5/52 Later | 12/52 | Unstable | Full | Full | Full | - 30° | Normal | 3 yrs 4/12 |
| H19719/63 | 59 | M | Indirect | Failed | | 6/52 | Unstable | Full | - 20° | Full | - 25° | ? | 3 yrs 6/12 |
| H19897/63 | 28 | M | Indirect | No Attempt | Plating 2 days Later Fascial Sling. | 12/52 | Unstable | Full | Full | Full | - 45° | Normal | 3 yrs 6/12 |
| H30170/63 | 42 | M | Indirect | Successful | | ? | Stable | Full | Full | Full | - 45° | Normal | 3 yrs 4/12 |
| C48363/63 | 44 | M | Indirect | Failed | Plating and Grafting 4/12 Later. | ? 7/52 | Stable | Full | Full | Full | - 45° | Normal | 1 yr 1/12 |
| H36930/64 | 58 | M | Direct | Failed | | 16/52 | Unstable | - 25° | Full | Full | - 30° | Normal | 1 yr 6/12 |
| H39386/64 | 26 | M | Indirect | Failed | | 8/52 | Unstable | Full | Full | Full | - 30° | Normal | 1 yr 5/12 |
| H59976/64 | 44 | M | Indirect | Failed | | 8/52 | Unstable | - 25° | Full | - 35° | - 35° | Normal | 2 yrs. |
| C53385/64 | 47 | M | Direct | Failed | Dorroch 11/52 | 8/52 8/52 | | - 45° | - 25° | - 40° | - 40° | Weak | 2 yrs 5/12 |
| C63193/64 | 45 | F | Direct | Failed | | 12/52 | Unstable | Full | - 25° | Full | - 45° | ? | 1 yr |
| C65072/64 | 32 | M | Direct | No Attempt | | 8/52 | Unstable | Full | Full | Full | - 45° | Normal | 1 yr 5/12 |

TABLE III

GROUP 2

| Case No. | Age | Sex | Mode of Injury | Method of Treatment | | Time of Union | Stability of Radio-Ulnar Joint |
|---|---|---|---|---|---|---|---|
| | | | | Manipulative | Operative | | |
| H29626/60 | 11 | F | Indirect | Failed | | 6/52 | Unstable |
| C4592/60 | 47 | M | Indirect | Successful | | 12/52 | Stable |
| H5535/61 | 25 | M | Direct | Failed | | ? | Unstable |
| H6450/61 | 18 | M | Indirect | Failed | | ? | Unstable |
| H6801/61 | 15 | M | Indirect | Failed | | 7/52 | Unstable |
| H7363/61 | 56 | M | Indirect | No Attempt | | 9/52 | Unstable |
| H9001/61 | 5 | F | Indirect | Failed | | 7/52 | Unstable |
| C23704/61 | 20 | F | Indirect | Failed | | | |
| H14919/62 | 52 | M | Indirect | Failed | Plating 4/12 Later | 18/12 | Unstable |
| H21384/63 | 63 | M | Indirect | Failed | | ? | Unstable |
| H37783/64 | 37 | M | Indirect | Successful in First Instance. Subsequent Slip in P.O.P. | | Not United After 4/12 | Unstable |

TABLE III

GROUP 3

| Case No. | Age | Sex | Mode of Injury | Method of Treatment | | Time of Union | Stability of Radio-Ulnar Joint | Functional Pronation | Result Supination | Follow Up Period |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Manipulative | Operative | | | | | |
| C3634/60 | 27 | M | ? | Failed | Plating 1/52 Later | ? | Stable | - 45° | - 45° | 5 years |
| H9015/61 | 29 | M | Indirect | No Attempt | | 6/52 | Unstable | Full | - 25° | 7/12 |
| H9586/61 | 14 | M | Indirect | Failed | | 8/52 | Unstable | - 25° | - 25° | 3/12 |
| H13285/62 | 32 | M | Indirect | No Attempt | | ? | Unstable | - 60° | - 60° | 3/12 |
| H16455/62 | 59 | M | Indirect | Failed | | 8/52 | Unstable | - 45° | - 45° | 9/12 |
| H19551/63 | 63 | F | Indirect | No Attempt | Immediate Open Reduction No Fixation. Subsequent Redis-Placement. | 6/52 | Unstable | - 60° | - 60° | 3/12 |
| H21493/63 | 79 | F | Indirect | Failed | | ? | Unstable | - 45° | - 45° | 3/12 |
| H25278/63 | 26 | M | Indirect | Successful In First Instance. Subsequent Slip In Plaster. | | 6/52 | Unstable | - 30° | - 30° | 3/12 |
| H25322/63 | 40 | M | Indirect | Failed | | 8/52 | Unstable | - 25° | - 25° | 5/12 |
| C22/64 | 23 | M | Indirect | No Attempt | Darroch, 6/12 Later | ? | | - 60° | - 60° | 3/12 |
| C57440/64 | 33 | M | Indirect | No Attempt | Plating 10 days Later | 9/52 | Stable | - 50° | Full | 4/12 |

tion of the distal radio-ulnar joint were achieved in 5 cases of which in 2 the deformity subsequently recurred in plaster.

A successful result is defined as one in which there is both a satisfactory alignment of the radial shaft and a stable distal radio-ulnar joint. This was achieved in only 3 of the 34 cases (9%) treated conservatively (Table II).

Of the 31 cases in which manipulative procedures failed, 8 were later treated operatively. The total number of cases treated by operation either in the first instance or as a subsequent procedure was therefore 14.

Open reduction of the radius was carried out in 12 cases; 9 of the fractures were fixed by plates and screws and 1 was stabilized by a Kirschner wire. In one of the compound injuries, the distal ulna protruded through the wound and was excised as a primary procedure. Open reduction and fixation of the radial fracture were carried out one month later when the compound wound had healed. In the other compound injury reduction of the fracture was achieved through the wound but the radius was not fixed. The deformity subsequently recurred in plaster. Excision of the distal ulna alone was carried out in 2 cases.

In the 10 cases treated by open reduction and internal fixation, although correct alignment of the radius was obtained in every case, stability of the distal radio-ulnar joint was achieved in only 3 *i.e.* a success rate of 30%. An accurate reduction of the radial shaft does not therefore necessarily ensure a replacement of the distal radio-ulnar joint.

## FUNCTION FOLLOWING TREATMENT (Tables III, IV)

TABLE IV

ROTATION IN 33 CASES

| Pronation | | Supination | |
|---|---|---|---|
| 0( 0%) | Full | Full | 0 ( 0%) |
| 13 (39%) | Restricted | Restricted | 13 (39%) |
| 18 (55%) | Full | Restricted | 18 (55%) |
| 2 ( 6%) | Restricted | Full | 2 ( 6%) |

| Pronation | Supination | Conservative | Surgery |
|---|---|---|---|
| Full | Full | 0 ( 0%) | 0 ( 0%) |
| Restricted | Restricted | 9 (45%) | 4 (31%) |
| Restricted | Full | 1 ( 5%) | 1 ( 8%) |
| Full | Restricted | 10 (50%) | 8 (61%) |

FLEXION AND EXTENSION IN 22 CASES

| Flexion | | Extension | |
|---|---|---|---|
| 10 (46%) | Full | Full | 10 (46%) |
| 2 ( 9%) | Restricted | Restricted | 2 ( 9%) |
| 4 (18%) | Full | Restricted | 4 (18%) |
| 6 (27%) | Restricted | Full | 6 (27%) |

Of the 33 cases in which rotation was known restoration of the latter to normal was recorded in none. Both supination and pronation were impaired in 13 cases (39%), supination alone was restricted in 18 cases (55%), and some loss of pronation only, was observed in 2 cases (6%).

In the 13 cases treated operatively both pronation and supination were restricted in 4 (31%); supination was normal but pronation was impaired in 1 (8%), and pronation was full but supination was limited in 8 (61%). In the 20 patients treated conservatively impairment of both pronation and supination occurred in 9 (45%); supination was normal but pronation was restricted in 1 (5%); and pronation was full but supination was limited in 10 (50%).

Rotation was therefore better restored in those cases following surgery than in those following conservative treatment.

In the 22 cases in which extention and flexion were also known, limitation of both occurred in 2 cases; flexion was restricted in 6 and extension was impaired in 4 cases; and in 19 cases in which the grip was recorded there was weakness on the affected side in 4 cases.

## UNION RATE (Table III)

Union time was established in 35 of the cases. In adults the average period was 10 weeks and in children this was 7 weeks. A significant, difference, however, was noted between those treated operatively and those which were treated conservatively. In the former, the average time was 14 weeks and in the latter union occurred on an average about 9 weeks.

There was non union in one case. This followed open reduction and internal fixation. The incidence of non union for the series is therefore 3%.

## FOLLOW UP PERIOD (Table III)

The average follow up period was 2 years 9 months. The longest period was 6 years 5 months and the shortest was 3 months. In approximately 1/3 of the cases in groups I, II the follow up period was less than 1 year.

## ULNAR NERVE IMPLICATION

Galeazzi fracture dislocations are sometimes associated with an ulnar nerve lesion (Odena 1952) and according to Apley (1959) this is common but recovery is invariable once the fracture has been reduced. (Apley, personal communication).

In the present series, ulnar nerve palsy complicated none of the injuries.

## DISCUSSION

A satisfactory result according to the Hughston (1957) standard is one in which there is union, perfect alignment of the radius, no loss of length, a stable distal radio-ulnar joint and no limitation of supination or pronation. Hughston achieved this in 3 of the 38 cases (8%) which were treated conservatively, in 14 of the 21 cases (67%) which were operated upon within one month and in 3 of the 9 cases (33%) which were operated upon later than 1 month.

None of the cases of the present series satisfies this standard. Four factors are considered to contribute to this failure.

1) Although the fracture of the shaft of the radius is obvious the associated dislocation of the distal radio-ulnar joint has been overlooked in a high proportion of cases so that the fracture dislocation has been treated as if the case is an isolated fracture.
2) In those cases in which a correct diagnosis has been made there is the failure to appreciate the fact that injuries of the Galeazzi type can seldom be treated successfully by manipulative means.
3) In those cases which have been treated operatively the interval between diagnosis and operation has been too long delayed in a considerable proportion of cases.
4) There has been a failure to appreciate the fact that unless rigid fixation is employed after reduction the deformity is likely to recur.

## SUMMARY AND CONCLUSIONS

Fracture dislocations of the Galeazzi type as occurring in the Singapore population over the 5 year period 1960-64 have been discussed with regards to distribution according to age and sex, mode of injury, difficulties in diagnosis and rate of union. Function following treatment is also reviewed. The results support views of Hughston (1957) *viz.*

1) Galeazzi injuries are difficult to treat successfully by closed reduction.
2) The treatment of choice is early open reduction with rigid fixation of the radius and
3) Resection of the distal ulna, open reduction, fixation and bone graft of the radial shaft should be seriously considered in those cases which have been brought to operation late.

## ACKNOWLEDGEMENT

The writer thanks both Professor Gunn and Mr. D. W. C. Gawne for access to the material which has been discussed in this article. Special thanks are due to Professor Gunn for helpful criticisms.

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