FRACTURE SCAPHOID

The Best Lines of Treatment
Complications and their Management

Thesis

Submitted in partial fulfilment for the degree of

M.Ch. (Orthopaedics)

By

Abd-El-Salam Sayed Gomaa
M.B.B.Ch., D.S., D.Orth.

Faculty of Medicine
Ein Shams University

1971

ACKNOWLEDGMENT

This work is suggested by Professor Dr. Mouhamed Mehriz, and it was supervised by Professor Dr. Ahmed Said Kattab and Assistant Professor Dr. Mamdouh El-Hifni. It was only through their continuous encouragement and enthusiasm that I was able to complete the work. To all of them I stand in great debt.

I also offer my gratitude to General Dr. Mouhamed Abdallah and Dr. Gamal Soliman for their sympathetic and encouraging attitude.

My thanks to Dr. Fahmy Abu Ahmed for his help in Arteriography, and to Dr. Engineer Hanna Abdel Meseih for his help in preparing the mechanical part of this work.

CONTENTS

INTRODUCTION

This thesis is presented to discuss the various fractures of the carpal navicular (scaphoid) regarding their clinical picture, mechanics, complications and treatment.

Next to fractures involving the lower end of the radius the most common bone injury encountered at the wrist is fracture of the carpal navicular. It is frequently met with in accident cases of the military life. Not only is this one of the commonest carpal injuries but from the disability standpoint, it is often most serious when overlooked and the frequency with which ununited fracture of navicular are still observed is testimony either to inadequate treatment of the fresh fracture or to the entire overlooking of the lesion by the patient or the doctor or both.

Over the years a great deal of progress has been made in the treatment of fracture scaphoid.

Treatment of fracture navicular diagnosed late and that complicated by aseptic necrosis of the proximal fragment still remains a difficult problem.

Avascular necrosis and non union of the carpal navicular following its fracture come next in frequency to fracture neck femur. In both of them, the traumatologist has a wide selection of procedures. This reflects the difficulties encountered in solving the problem. The late sequel of either complication, the painful wrist is a disastrous end for a freely mobile important joint to every body. The variant measures adopted for its management throws a light on difficulties in solving the problem.

I hope that in this work I will clarify and record what we use to follow up in the treatment of fracture navicular and to evaluate our results compared to other centres.

LITERATURE

1. Age :

Joseph Burnet (1937) said that 48 out of 100 patients treated with fracture scaphoid were 20 years of age or under.

Obletz (1938) said that all his patients were in the most active period of life : 18-48 years.

Sotto Hall (1941) said that the maximum age incidence occurred during the third and fourth decades of life. While Joseph Burnet (1953) said that the age is young adult age - military age. 90% of fracture of his series occurred under the age of 30, youngest being 18 and oldest 47.

2. Sex :

Joseph Burnet (1937) said that out of 100 patients treated with fracture scaphoid 6 were females. This is the same percentage as that of Sotto Hall (1941). Obletz (1938) studied 30 cases all were males. P.S. London (1961) said that the number of females is far less in old fractures than in recent ones.

3. Frequency :

Edelestein (1939) said that next to fracture involving the lower end of radius the most common bone

injury encountered at the wrist is fracture of the scaphoid. While Sotto Hall (1934) said that fracture of the scaphoid is frequent and it occurs about once in 10 times as often as Colles' fracture. Fracture tuberosity is very rare and may be dismissed by saying that it always unites by bone to the remainder of the navicular. Joseph Burnet (1953) said that out of 54 fractures that occurred around the wrist 7 cases were fractures of the scaphoid.

Milton Cobey (1946) said that fracture of the scaphoid is predominantly borne out in military life where one is apt to find a direct reversal of the usual ratio of the 10 Colles' fracture to one scaphoid.

4. Mechanism of injury :

Kellog Speed (1929) said that the navicular is the bone of contention, because in falls on the hand generally outstretched with the palmar surface down, when the body weight is transmitted via the arm and forearm to the hand and floor the wrist is usually forced upwards into maximal extension, while at the same time it is subjected to crushing violence. Frequently this trauma endsin a display of force which acts mostly on the lower end of the radius which is pulled away from

the rest of the shaft of the bone resulting in Colles' fracture. However, the position of the navicular at the instant of impact especially if the hand is in ulnar flexion may subject it to a bending force which exceeds its limits of elasticity and accomodation so that it is split across and the strain ends by navicular fracture as the trauma ceases. This bone may break and the surrounding ligaments may still carry sufficient force to the radius also. This is the mechanism that produces the commonest type of fracture scaphoid. The second type of fracture scaphoid is produced when the wrist in radial flexion is tucked under the protection of the lower end of the radius resulting in its comminution and compression with interfering with its blood supply and avascular necrosis. The third type of injury involves the tuberesity alone by means of the combination of extreme ulner flexion of the wrist and indirect crushing violence of a fall on the hand, the ligaments inserted into the tuberesity may pull out that portion of the bone away from the rest of its body.

Milton Cobey (1946) said that this fracture is predominant in military life. This has been explained on the basis that an active young man has strong supporting musculature which prevents hyperextension of the

wrist. The mechanism of this fracture can be justified on the following hypothesis: When hyperextension is prevented the force is transmitted upwards from the palm of the hand, the navicular is then jammed between the capitate bone and the radius. This force on the carpal navicular is one of compression and torsion at the wrist. The concave surface of the scaphoid receives the capitate bone like a wedge. This wedge action breaks the navicular when exerted at its point of maximum concavity which is at the waist. Fracture of the tubercle is extra-articular in relation to the carpus and is of the avulsion type, caused by excessive stress placed upon the radial collateral ligament which is attached to it. Joseph Burnet and Williams (1953) said that the mechanism of injury was a fall on the outstretched hand in 31 cases, a blow with the fist clenched in 3, a twisted wrist in 3, hyperextension of the wrist in 1, and the mechanism was not known in 8. Most of the injuries occurred during organized athletics only 3 occurred during combat. W. Jones (1956) said that the aetiology was a fall on the outstretched hand and a backfire injury when starting the engine of a car.

Meekison (1945) said that it is difficult to understand why a fracture occurs in the proximal third since

the bone is so well protected from strain at this level. On the other hand the fractures of the waist are quite logical since the scaphoid lies virtually ½ inch in the proximal row and half inch in the distal row of the carpus and thus is the only member of this carpal family subject to certain shearing and rotational strains. This bring up the interesting question of why so many fractures of the scaphoid are encountered in the services in contrast to the paucity of Colles' fracture. It would seem that the scaphoid fracture is one of youth due possibly to the fact that strong forearm muscles resist hyperextension, and thus projects the leverage more distally.

Which hand : Joseph Burnet (1953) said that although the left hand was more frequently injured in this series than the right. There was no statistically significant relationship between the side injured and the dominant hand. Out of 44 patients there were 24 cases on the left hand, 18 cases on the right and 2 cases bilateral. P.S. London (1961) said that whereas the 2 scaphoids are about equally liable to fresh fractures and to failure of bony union, non-union was seen twice as often in the right wrist as in the left.

Classification :

I. Types of fractures :

Kellog Speed (1925) classified fracture scaphoid into 3 types : (1) Crushing violence due to fall on outstretched hand with the palmar surface down leads to almost a straight fracture across its long axis. Direct violence has never caused such a fracture. (2) A crushing force against the bone when the wrist is in radial flexion, producing comminution of the bone and leads to its death. (3) Fracture tuberosity which results from combination of extreme ulnar flexion of the wrist and indirect crushing violence of the hand.

II. Level of fracture :

Sotto Hall (1934) said that : (1) fracture through the middle of the body which is entirely an intra-articular injury this is the most common type. (2) Avulsion fracture of the tuberosity which is extra-articular. (3) Comminuted fracture with considerable deformity and this in the least type.

III. Stability :

Stable type : (1) through or proximal to the waist of the scaphoid with an intact or incompletely

fractured articular cartilage or in which the soft tissue connections remained intact. As a result no shearing or rotational movement occurred between the fragments even on rotation of the wrist. This type unites regardless of the presence or absence of treatment provided the wrist was protected during the healing period against any further injury. (2) Unstable type : Where there is complete interruption of the articular cartilage. The slightest motion of the wrist or thumb resulted in shearing or rotatory motion of one fragment over the other, and this occur from muscle force (even within the best plaster dressing) resulted in some change in the position of the fragments.

IV. Dr. Otto Russe (1960) classified the fracture into transverse and oblique types according to the relation between the long axis of the navicular and the fracture line in the postero-anterior view. The oblique type is either horizontal or vertical. In the horizontal oblique type most of these fractures healed within six weeks, as the forces exerted by the wrist and finger muscles tend to compress the fracture surface. In the rare vertical oblique type the fracture cleft lies in

the long axis of the forearm and this type is sometimes difficult to visualize in the routing x-rays. In the transverse type of fracture the plane of fracture is not exactly vertical to the long axis of the forearm because of this oblique relationship, both compression and slight shearing forces act on the fracture line and some of these fractures do not unite in 6 weeks and need further immobilization for 4-6 weeks or more.

Pathology :

Edelestein (1939) said that the navicular has only a small surface posteriorly and anteriorly for the attachment of ligaments. Elsewhere it is covered with cartilage. The cancellous bone of the scaphoid is not as active in repair as in the long bones and its repair is inhibited by use and movement resulting from improper immobilization. It is markedly localised to the site of fracture as there is little periosteum to assist in the formation of callus. The formation of subperiosteal bone in the callus is slower than in other fractures. This may be due to the notoriously poor blood supply to the bone. Its blood supply is derived from 2 vessels one of which penetrates the tuberosity of the bone.

A fracture through the waist of the bone renders the proximal avascular. Because of the poor blood supply, union takes a long time, for vessels have to grow from the peripheral into the central fragment. These fine capillary vessels are ruptured with the slightest shearing movement, hence the necessity for complete immobilization; with adequate early immobilization no case of non-union should ever be seen.

Sotto Hall (1941) said that of the various factors concerned in the development of non-union considerable importance must be attached to the blood supply of this bone. A chief artery enters through the tub role at the distal end of the bone and one or more additional arterial foramina are found along various points of the body of the bone. Obletz and Holbstein found that the proximal 1/2 of the navicular had no foramina or only a single foramen in about 1/3 of the specimens studied. Aseptic necrosis is seen most frequently in small proximal fragments and in such cases is a formidable obstacle to union. The absence of periosteum from most of the surfaces of the navicular (those covered with articular cartilage) is probably responsible for a retarded rate of healing as compared