

## § 4. Fracture of the Styloid Process of the Ulna.

The occasional complication of a Colles's fracture with a fracture of the styloid process of the ulna has already been noticed. Much more rarely this process is broken alone, as a result of direct violence.

I am unable to speak of the symptoms or treatment of this accident farther than to say, that it must be easily recognized by its mobility, and probably by the presence of crepitus; and that its treatment demands immobilization, while the wrist is maintained in a straight position, or in a position slightly inclined towards the ulna. At least a fibrous union ought thus to be easily obtained.

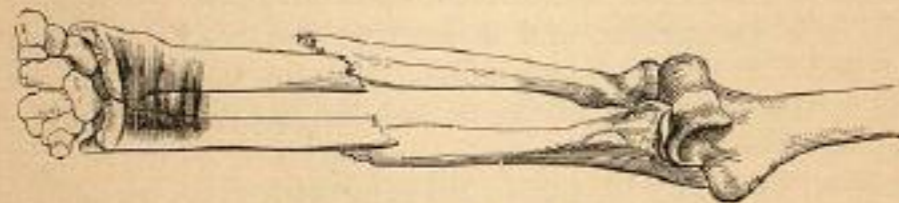
## CHAPTER XXIV.

## FRACTURES OF THE RADIUS AND ULNA.

*Causes.*—In a majority of the examples of this fracture seen by me, which have been of such a character as to warrant an attempt to save the limb, the accident has been occasioned by a fall upon the palm of the hand while the arm was extended in front of the body. Yet this cause is not so constant as in fractures of the radius alone, since a considerable number have been occasioned by direct blows; and if we were to add to this estimate all of those bad compound fractures which have demanded immediate amputation, the proportion of fractures occasioned by direct and indirect blows might be found to be pretty nearly balanced.

*Point of Fracture, Character, Direction of Displacement, etc.*—In a record of seventy-two fractures of both bones, not including gunshot

FIG. 119.



Fracture in the middle third.

fractures, or those demanding immediate amputation, I have found six broken in the upper third, thirty-one in the middle third, and thirty-five in the lower third.

In one case the radius was broken three-quarters of an inch above its lower end, and the ulna about one inch below the coronoid process. Four of the fractures belonging to the lower third were probably epiphyseal separations.

Fifty-eight were simple, eight compound, one was comminuted, three both compound and comminuted, one complicated with a fracture of the humerus, and one with a partial luxation of the lower end of the radius.

With three exceptions, all of these more serious accidents were arranged among fractures of the lower third, and generally the bones had been broken near the wrist.

Partial, or "green-stick," fractures have been frequently observed in children, but having treated of these accidents fully in the general chapter on Incomplete Fractures, I shall not think it necessary to make any further allusion to them in this place.

*Prognosis.*—Generally these bones unite in from twenty to thirty days; but I have seen the union occasionally delayed considerably beyond this time, and this delay has occurred especially in the case of the radius. Thus, in three cases of compound and comminuted fracture, the ulna united within four or five weeks, while the radius did not unite until the ninth or tenth week. Twice in simple fractures the ulna has united in the usual time, but the radius not until the sixteenth week. Once the ulna has united promptly and the radius remained ununited at the end of two years, at which time I practised resection of the broken ends of the radius, and union was speedily established.

On the other hand, I have once seen the union delayed four months in the case of the ulna, when the radius had united in the usual time; and in one example of compound fracture both bones refused to unite until after the fifth month. Muhlberg has recorded thirty-seven cases of delayed and non-union of both bones, out of a total of six hundred and fifty-six similar examples in all the long bones.

A majority of the whole number seen by me have united without any appreciable deformity, and fifteen are known to have left some marked defect, while two have resulted finally in the loss of the arm. Of the remainder I cannot speak positively.

I have seen the fragments deviate slightly in almost every direction, but most often it has been noticed that the deviation was to the radial or ulnar sides. Thus, in three examples, two of which had been compound fractures, the bones have united in such a position as that from the point of fracture downwards the forearm has been deflected to the ulnar side, and a marked projection has been left at the seat of fracture on the radial side; while in two examples, both of which were simple fractures, exactly the opposite condition has obtained, the lower part of the forearm being deflected to the radial side.

In most cases the hand has been left with some tendency to pronation; in many instances this tendency was very slight and scarcely appreciable,

FIG. 120.



Fracture in the lower third.

FIG. 121.



Union with slight lateral displacement.

but in others it has been quite marked, so that the patients have been wholly unable to supine the forearm except by a motion of the humerus in its socket.

From what has been said, it must be seen that the prognosis in these accidents takes the widest range; for while a larger proportion than in the case of almost any other of the long bones, unite without any appreciable deformity, a considerable number delay to unite, or do not unite at all, and some, even where the fracture is most simple, result in the complete loss of the limb. I am not now speaking of those more severe accidents in which the limb is at once condemned to amputation, and which, in the case of the arm, are numerous; but, as I have already mentioned, our observations here apply only to cases which came under treatment with a view especially to the fracture.

I shall state the facts more fully, and then perhaps we shall think it proper to inquire why, when, as a rule, the treatment is found to be so simple and successful, occasionally, and pretty often indeed, it results so disastrously.

A boy, aged about ten years, fell from a tree, April 22, 1856, fracturing the right forearm near the lower end of the middle third. It was evident that he had fallen upon the palm of his hand, as the lower fragments were inclined backwards, and one of the bones had been thrust through the skin on the front of the arm.

It was at first dressed carefully by Dr. Wilcox, but the father of the lad, on the following day, placed him under the care of an empiric.

Six days after the fracture occurred I was called to see him, with several other gentlemen. He was then suffering under a severe attack of tetanus which had commenced the night before. His arm was much swollen and very painful. He died the same evening.

I was unable to learn very particularly what had been the treatment since the patient was seen by Dr. Wilcox, except that the bandages had been most of the time very tight, and that the empiric had applied stimulating liniments, the boy constantly complaining greatly of the pain. I found the arm done up in a most slovenly manner with several narrow splints, underlaid with loose and knotty fragments of cotton-batting.

We removed all of these immediately, and laid the arm upon a cushion supported by a board, to both of which the arm was lightly secured by a few turns of a bandage; cool water lotions were diligently applied, and chloroform administered by inhalation; but the fatal event was delayed only a few hours.

I shall not stop to inquire the cause of a result so unfortunate, where the treatment has been so palpably unskillful.

I have already mentioned one case of gangrene of the hand, after a fracture of the lower part of the humerus. Norris, in a note to the American edition of Liston's Surgery, mentions a case which came under his observation in the Pennsylvania Hospital, the fracture having taken place just above the condyles; and still another has been related to me lately. I have brought together also no less than six cases of sloughing of the arm, after fracture of the radius, and one of sloughing

from tight bandaging, where the radius was supposed to be broken, although the dissection proves that it was not.

Robert Smith says that similar cases have been recorded in the *Gazette Médicale*. To these I shall now add eight examples of sloughing after fracture of both radius and ulna; making a total of eighteen cases in the upper extremities, in addition to those reported in the *Gazette Médicale*, an exact account of which I have not seen.

John McGrath, æt. 9, fell, July 2, 1847, from a ladder, about thirty feet to the ground, breaking the right radius and ulna in their middle thirds. A surgeon was in attendance about four or five hours after the accident occurred. He then reduced the fractures and applied two broad splints, one on the palmar and one on the dorsal surface of the forearm. Whether a roller was first applied to the arm or not, I am unable to say. The splints were secured in place by a roller and the arm laid in a sling.

The third day was our national holiday, and the patient was not visited. Nor was he seen on the fourth day, not being found at home. On the fifth day the surgeon removed the bandages and found the arm gangrenous; and within an hour afterwards I was requested to see it also.

I found him lying in a miserable apartment, with his right arm resting upon a pillow. The arm, forearm, and hand were gangrenous through their whole extent; and the skin of the right side, on the front of the chest, had assumed a dusky color, the extreme margin of which was indicated by an abrupt crescentic line. The thumb and fingers were black. His countenance was bright and cheerful, and his mind intelligent; pulse 75, and soft; tongue clean. He had slept undisturbed the night before, and he had all along felt perfectly well, except that he had a slight diarrhoea. I was assured by the surgeon, and by all of the family, that the bandages had not been applied tightly; but we were told that on the third day of the accident, having been locked into the house by his mother, who was a peddler, he climbed out of the window; and that during all of that and most of the following day he was running about the streets firing crackers, during most of which time his arm was removed from the sling and hanging by his side. On the morning of the fourth day his mother noticed that his fingers were black, but she thought they were stained with powder.

We ordered him to take one-quarter of a grain of opium every four hours, and applied a yeast poultice to the arm. On the seventh day the gangrene was still extending, and the pulse was 125; yet he continued to feel well and to eat as usual. On the tenth day the line of demarcation had commenced opposite the shoulder-joint; and the crescentic discoloration on the breast, which had at first spread rapidly until it covered nearly the whole upper half of the chest, was quite faint, in some parts almost lost.

In a few days more he was removed to the county almshouse, the separation continuing rapidly to take place until the arm fell off at the shoulder-joint; after which he made a good recovery.

A child, two years and three months old, had fallen from a chair

upon the floor, a distance of about two feet. A German physician being called, found, as he believed, a fracture of both bones of the left arm. The fracture was near the middle. He immediately applied a roller from the fingers to the elbow, and over this three narrow splints made of the wood of a cigar-box. One of these was laid upon the palmar, one upon the dorsal, and one upon the radial side of the forearm, and the whole were bound together by another roller. From this time until the tenth day the child continued to play about on the floor. Ten days after the accident occurred the doctor noticed that the ulnar side of the little finger was blue. The bandages were immediately removed, and were never again applied tightly.

Three or four days after, I was requested to see the arm with the attending physician. The gangrene had continued to extend, involving now the whole of the little finger and most of the thumb. There were also gangrenous spots over the hand and forearm, extending to within one inch from the elbow-joint; these spots were more numerous in front and on the back of the forearm, and seemed to correspond to the pressure of the splints. The hand was much swollen, and also the arm above the line of the gangrene. The sloughs had already commenced to be thrown off, and the gangrene was only extending in a few points. The child appeared well and rather playful, except when the arm was being dressed. I ordered a yeast poultice, and a nourishing diet.

I have since learned that the arm and a large portion of the hand were finally saved.

About the year 1865, as near as I can remember, a lad aged about nine years was brought to the Long Island College Hospital Dispensary, with a fracture of the radius and ulna. It was dressed by the visiting surgeon with splints and bandages. He did not return to the Dispensary as directed to do, and on the third or fourth day portions of the arm and hand were found in a gangrenous condition.

In March, 1867, I was consulted by the parents of D. C., of Cattaraugus Co., N. Y., on account of a serious distortion of the hand and forearm, caused by sloughing, splints and bandages having been applied by her surgeon for a supposed fracture; but when examined by me, about ten weeks after the accident, there was no evidence that the bones had ever been broken. She complained to her surgeon that the bandages were too tight, but he thought otherwise, and they were not removed until the third day, when the gangrene had already occurred. The child was five years old at the time of the accident.

A young man, æt. 20, suffered a simple fracture of the right radius and ulna March 14, 1874. On the same day it was dressed with a roller next to the skin and over this the splints. On the following day the fingers were black, but the same dressings were continued, and they were not removed completely until the next day. He was admitted to Bellevue on the 16th, and, by courtesy of Dr. Gouley I was permitted to examine the arm on the 7th of April. He had then lost all of his fingers, except a portion of the thumb, and there were extensive sloughing and suppuration along the forearm. His condition was very critical. His death took place a few days later. It is worthy of remark that,

after the first few hours, there was no pain in the arm, although the dressing had not been removed.<sup>1</sup>

Alice Thompson, æt. 50, fell upon her left hand in March, 1870, causing a compound fracture of the radius and ulna, about three inches above the wrist-joint. She went at once to one of the New York City Dispensaries, and the surgeon dressed the arm with splints, applying the bandages "snugly." Two days later she was brought to one of my wards at Bellevue, with the back of the hand and most of the forearm in a state of gangrene, evidently caused by the bandages. Seven or eight days later she died before the house surgeon could reach her, from a secondary hæmorrhage.

In the following case there was probably no fracture; no doubt could be entertained, therefore, as to the cause of the gangrene:

A girl, æt. 5, fell upon the palm of her hand in 1866. A surgeon saw her within one hour, put on two wooden splints, with cotton-batting laid loosely underneath, securing them with a roller. Half an hour after it was dressed the fingers were blue, and the pain was so great that the surgeon was recalled. On his arrival he said it was not too tight. On the following day the condition was the same, but the surgeon refused to loosen the dressings. Two days later he removed the bandage, and found a slough extending nearly the whole length of the palmar surface of the forearm. Some months later I found the arm straight, but the hand much distorted by the cicatrix.

I have now to relate a case in which sloughing and death occurred as the consequence of a tight bandage, the patient being under my own charge:

James Brachen, æt. 22, was admitted to ward 12, Bellevue Hospital, April 1, 1871, with a fracture of the left forearm, near its middle, caused by the kick of a horse on the day before. On the same day I dressed the fracture before the class of medical students in the hospital, using a palmar and dorsal board splint, covered and stuffed with cotton-batting, according to my usual method; securing the splints with a roller, including the hand and forearm. The arm was then placed in a sling and he was sent to his ward. The following day being Sunday, I did not visit the hospital. On Monday I inquired for him, and learned that he was out walking in the yard. Tuesday I met him, returning from a walk in the yard, just as I was leaving the ward. He was apparently in perfect health, but, as I stopped him a moment to look at his arm, I saw that the hand was swollen and purple. The dressings were immediately removed, and the patient placed in bed. There were upon the arm two spots looking like superficial sloughs. He was suffering no pain. The gangrene subsequently extended until it involved a large portion of the hand and forearm, and on the eighteenth day after the receipt of the injury he died.

I will submit the case without comment, except to say that a careful and daily observation of the condition of the hand, and a prompt removal or loosening of the dressings when the hand first showed symptoms of arrest of circulation, would probably have prevented this disastrous re-

<sup>1</sup> New York Journ. Med., June, 1874.

sult. The splints and bandages were removed the first time I saw him after the original dressings had been made, but this was too late; some one should have seen the approaching cloud and before it was ready to burst.

South also says that he has seen one or two instances of mortification produced by splints applied too tightly, and previous to the accession of the swelling after fracture, and which had not been loosened as the swelling increased.<sup>1</sup>

How shall we explain the frequency of these accidents after fracture, especially of the forearm?

Malgaigne, speaking of fractures of both bones of the forearm, remarks that "when the displacement is considerable, or more especially when the outward violence has been excessive, we frequently see follow a very intense inflammatory swelling, and there is no fracture which complicates itself so easily with gangrene under the pressure of apparatus."<sup>2</sup>

Says Nélaton: "If we make choice of the apparatus of J. L. Petit, it is necessary that it shall not be applied too tightly, for, as Professor Roux has long since remarked, fractures of the forearm are those which furnish most of the examples of gangrene in consequence of an arrest of the circulation. This is easily understood, if we consider on the one hand the superficial position of the two principal arteries of the forearm, and on the other the disposition of the apparel, which must almost infallibly compress the arteries to a great extent."<sup>3</sup>

I do not think that this accident is due always to the negligence of the surgeon. It may be due many times to the carelessness of the parents or of the patient himself; as in the case of the boy who came under my own observation, and who lost his arm at the shoulder-joint. Sometimes also it may be due rather to the severity of the original injury, which, the experience of every surgeon will prove, is occasionally competent to the production of such bad results. A number of unfortunate circumstances may have concurred, such as a severe injury, especially where the skin has remained unbroken and the effused blood has had no opportunity to escape—the broken bone may have rested against the trunk of a main artery, causing an arrest of its circulation—the constitution may be impaired by previous illness, or it may be suffering under the shock of the injury; yet that it may be and too often is the result of maltreatment on the part of the surgeon, is undeniable. It is proper, however, to discriminate between the responsibility which attaches to the surgeon as the true exponent of the state of his art, and that which attaches to the art itself as taught by the masters.

The old surgeons applied first a roller to the hand and forearm, and over this their various splints. J. L. Petit thought he had made a valuable improvement upon this simple plan, by laying over the roller a compress and splint; the compress being intended to press between the bones, and to antagonize the action of the roller in drawing the fragments toward each other. Duverney believed that this object would be best accomplished by placing the pad against the skin, and under a circular

<sup>1</sup> South, note to Chelius's Surg., vol. i. p. 69.

<sup>2</sup> Malgaigne, *Frac. et Disloc.*, tom. i. p. 589.

<sup>3</sup> Nélaton, *Pathologie Chirurgicale*, p. 735.

compress; while Desault declared all of these modes inefficient, and announced a method which he regarded as accomplishing at once and completely all of the indications; the sole peculiarity of which method consisted in placing graduated pads against the skin, and securing them in place by a roller. Boyer adopted the same method without any modifications, and Mr. Hind, in his illustrations of fractures, already referred to, has seen fit to recommend the same, at least in fractures of the radius.

It is quite obvious that between these various methods there remains very little if anything to choose, the differences being too trifling and unessential to claim serious consideration. Each alike is inadequate to accomplish any amount of useful pressure between the fragments; each alike is calculated to bind the bones one against the other, and each alike exposes to the danger of ligation and of gangrene.

Says M. Dupuytren: "The practice of rolling the arm before the splints are applied, whether internal or external to the pads and compresses, is eminently mischievous; and instead of fulfilling, directly counteracts the indications which it is most important to keep in view in the treatment of fractures of the forearm."

And notwithstanding the same sentiment has been reiterated by Velpeau, Malgaigne, Nélaton, Samuel Cooper, Bransby Cooper, Erichsen, Amesbury, Gibson, and others, yet we find the great surgeon of Heidelberg, Chelius, recommending the roller to be applied under the splints, after the manner of Desault; while Liston, Syme, and Fergusson, who perhaps represent the Edinburgh school, use only pasteboard splints above the compresses, over which is immediately applied the roller; a practice which differs very little from that recommended by Desault, and is equally obnoxious to criticism.

Among the American surgeons, I believe, the advice and practice of Dupuytren have received almost universal assent, only that we have always employed splints much wider than those recommended by this distinguished surgeon. I cannot therefore agree with my accomplished countryman, Dr. Reynell Coates, if in the following paragraph he means to imply that American surgeons generally adopt Desault's treatment. Such at least is not my experience. "It would be wrong," says Dr. Coates, "not to bear testimony, on every possible occasion, against the folly so universally prevalent, that induces surgeons to apply a bandage directly to the forearm before applying splints in injuries of this character. We have often asked for a rational explanation of this practice, without effect. It is directly at war with the acknowledged indications in the coaptation of the fragments, and when the object of the whole apparatus is to thrust asunder their extremities, it commences by binding them together. Few plans in surgery are more generally followed; none can be more absurd."

Of the estimate placed upon the roller by M. Mayor, the reader will judge by a reference to the passage which I shall quote farther on, when I shall speak of the value of the interosseous compresses.

Amesbury and Bransby Cooper use no rollers at all—not even to secure the splints in place, they being made fast to the forearm by straps or tapes.

Mr. Amesbury and Mr. South also endeavor to give to their splints an appropriate shape, by having them constructed with more or less convexity. It must be noticed, however, that the practice of these two gentlemen is very dissimilar, for while Mr. South applies the convex surface of his splint to the interosseous space, Mr. Amesbury reverses this plan, and applies the concave surface directly to the skin.

As to the width of the splints, surgeons are also very generally agreed, at the present day, that they ought to be wider than the arm, so as to prevent the roller or the tapes from resting against its sides.

I do not intend to deny peremptorily, and without qualification, the value of the graduated compresses, which, as we have seen, are usually laid along the interosseous space to press the fragments asunder. It is necessary, however, to caution the surgeon against their injudicious use. M. Nélaton has well remarked of the apparel employed by J. L. Petit, that it must inevitably compress, to a great extent, the arteries of the forearm; and the remark is applicable, in only a less degree, to all of those other plans in which the compress is employed. And I suspect that to this portion of the dressing, quite as much as to any other cause, are due those frightful accidents of which we have already spoken. The arteries are not only exposed, from their superficial position, to pressure from a compress, but, in addition to this, it will be noticed that the two principal arteries, the radial and the ulnar, are situated upon a broad and flat surface of bone, along which this pressure must operate most advantageously. So early as the year 1833, M. Lenoir, in his inaugural thesis at Paris, called attention to this danger, and from time to time surgeons have continued to advert to it, but they have seldom given to its consideration that prominence which its importance deserves.

I have observed another fact in this connection: when this compress is extended low down on the palmar surface, within an inch or two of the wrist-joint, it soon becomes excessively painful, and sometimes even wholly insupportable, in consequence of the pressure made upon the median nerve; and I find myself always obliged to exercise great care in the adaptation of the pads at this point. For this reason alone, I believe, in case of a fracture near the base of the radius, the lower fragment, if it were thrown toward the ulna, could not be retained in its place by graduated compresses.

In short, finding that broad splints, properly covered and padded, answer very well to crowd the muscles into the interosseous space, so far as it is proper to do so, and believing that this mode is less painful and less dangerous, I never resort to graduated compresses, nor can I appreciate their necessity, or, indeed, their utility. Mr. Lonsdale also concurs with me in attaching very little value to this part of the accustomed apparel.

But listen to the surgeon of Lausanne, M. Mayor: "What signify graduated compresses placed between the bones of the forearm for the purpose of separating them from each other? These bones will not have that constant tendency to approach each other which has been supposed, provided, first, that they have been well reduced; second, that for the purpose of maintaining them in position we do not make

use of a preliminary circular bandage, whose action is an absurdity; and, in short, provided we make the retentive means act chiefly upon the palmar and dorsal surfaces of the forearm."<sup>1</sup>

M. Mayor proceeds to declare these convictions to be the result of his own experience, both in the treatment of simple and compound fractures of the forearm, and he intimates that in the use of the circular bandage with compresses, surgeons seem to have rolled the arm into a cylinder and drawn the bones together, in order that they might tax their ingenuity to discover some means to again separate them.

Surgeons have generally, after the splints have been applied, placed the forearm in a position of semi-pronation, or midway between supination and pronation, so that the radius should be uppermost; it being assumed that in this position the two bones are most nearly parallel, and least inclined to displacement. Such, indeed, was the practice of Hippocrates, Paulus Ægineta, Celsus, Albucasis, and of most surgeons down to this day; but Lonsdale, Robert Smith, Nélaton, and South have lately called in question the correctness of this mode of dressing, at least when it is adopted as a universal rule.

I have before mentioned, when treating of fractures of the ulna, that M. Fleury had, in one instance, been unable to bring the fragments into apposition except by forced supination of the forearm; and in certain fractures we have seen the same position recommended by Lonsdale.

Says Mr. South, in a note to Chelius: "In fractures of both bones the forearm is best laid supine;" and Nélaton declares that in fractures of the radius and ulna at any point of their upper thirds it will be necessary to supine the arm, both in the reduction and during the subsequent treatment; but that in fractures of the inferior two-thirds we may place the limb in a condition of semi-pronation.

It seems very probable, however, that both of these gentlemen have received their suggestions from Mr. Lonsdale, who, as we have already seen, has treated the question very much at length, and who has finally declared his decided preference for the supine position in the treatment of all fractures of the forearm. His arguments are certainly very ingenious, and as applied to fractures of the radius above the insertion of the pronator radii teres, they seem altogether conclusive; and, indeed, they commend themselves very strongly to our judgment, as applied to all fractures of the forearm. They are sustained also by the results of his own experience, and I see no good reason why they should not be more thoroughly examined and tested by other surgeons. The advantages which he claims for this method are, more perfect coaptation of the broken ends, less liability of the fragments to encroach upon the interosseous space, and consequently less danger of ankylosis between the bones and of non-union of the fragments, more complete restoration of the power of supination, and less tendency to lateral distortion, or of falling off to the ulnar or radial sides.

My own cases, treated by the usual method, have shown that while

<sup>1</sup> Bandages et Appareils à Pansements, ou Nouveau Système Délégation Chirurgicale, par M. Mathias Mayor, Chirurg. en Chef de l'Hôpital de Lausanne, Switzerland. Paris ed., 1838, p. 345.

supination is frequently impaired, and sometimes entirely lost, pronation is rarely affected; and that lateral displacements are much more common than displacements forwards or backwards. How this position, semi-pronation, may tend to the production of a permanent pronation, I have fully explained when speaking of fractures of the head of the radius; and in the influence of the same position, the forearm resting upon its ulnar margin in the sling, in the production of a lateral deviation, is also easily understood. If the arm rests upon the sling so that its weight bears more upon the point of fracture than upon the extremities of the bones, then the ulna, or both ulna and radius, will incline gradually to the radial side, and the hand will fall off to the ulnar side; or if the sling rests under the wrist or hand chiefly, the hand will ascend to the radial side, and the broken ends of the two bones will project to the ulnar side.

If this plan be adopted, viz., laying the hand and forearm upon its back, instead of upon its ulnar margin, the elbow should remain at the side, the humerus falling perpendicularly from its socket; and the forearm should rest in the sling directed forwards from the body.

The following is the method usually employed by the author:

Two thin, but firm, wooden splints are prepared, of uniform breadth, sufficiently wide that when the roller is applied it shall touch only lightly

FIG. 122.



Palmar splint.

the radial and ulnar margins of the forearm. The palmar splint should be long enough to extend from the bend of the elbow, the arm being flexed, to the metacarpo-phalangeal articulations, the fingers being flexed. The dorsal splint should be a little shorter, or of a length to extend from the base of the olecranon process to the carpus. Both of these splints must be covered with cloth, and properly padded with cotton-batting; taking care to leave but little of the cotton placed where it might press upon the radial and ulnar arteries and median nerve; that is, at the front of the wrist.

The splints, being carefully fitted, are applied while the forearm is held at a right angle with the arm, and in a position midway between pronation and supination, one to the palmar and the other to the dorsal surface of the forearm, and secured with a roller. There must be no pressure against the humerus at the bend of the elbow; and the fingers must be flexed easily over the lower end of the palmar splint. The dorsal splint should not extend beyond the lower end of the radius and ulna. It is understood, of course, that while the splints are being secured in place, extension and counter-extension are maintained for the purpose of securing coaptation of the broken extremities as far as possible. The dressing being completed, the forearm is suspended in a sling.

Finally, whatever may be the mode of dressing, let me repeat the injunction to examine the arm frequently. No surgeon can do justice to himself, or to his patient, who does not look at the arm at least once in twenty-four hours during the first ten or fourteen days, and in some cases the patient ought to be seen twice daily.

When the fracture is compound, it is often quite impossible to retain

the forearm in the half-pronated position; since, when thus placed, and only slightly supported, as it must necessarily be, it inevitably falls over upon its palmar surface.

There can be no doubt that in such a case we ought, from the first, if it is found practicable, to place it upon its back, in a position of complete or nearly complete supination. For this purpose, a single broad splint, carefully cushioned, and covered with oiled cloth, is the most suitable. Upon this the forearm is to be laid, and secured gently with a few turns of the roller. If the patient is able to do so, and wishes to walk about, the board may be suspended to the neck, as recommended by M. Mayor.

I have said that we ought, in cases of compound fracture, to lay the forearm upon its back, if practicable. I am sure, however, that the surgeon will find very many patients who cannot endure this position, and he may be compelled, therefore, to lay the limb upon its palmar surface, or to leave it to assume any other position in which it may be the most at ease. In conclusion, I desire again to call attention to the splint employed by Dr. Scott, and of which an illustration is given in the chapter which treats of Fractures of the Radius.

Recently, in a letter from Dr. G. W. Burke, of New Castle, Indiana, I am informed that in the case of an oblique fracture of both bones of the forearm, occurring in a man thirty years of age, and at the junction of the lower and middle third, the fragments were thrust downwards and outwards until they had nearly penetrated the skin. Finding, after repeated efforts, that he was unable to extricate them from the muscles and fascia which they had penetrated, he made an incision, exposed the bones, and replaced the fragments. The arm was subsequently dressed in the usual way, and he made a good recovery. Resection of the fragments was not required. The practice in this case was no doubt sound, inasmuch as in no other way could the bony union of the fragments have been assured.

Of the 37 examples of *delayed and non-union* recorded by Muhlenberg, 30 were subjected to treatment. Of 4 treated by manual friction, 1 was cured and 3 failed. One treated by section was cured. Of 17 treated by resection, 11 were cured and 6 failed; 4 were treated by drilling, and all failed. Of 4 treated by mechanical appliances and immobilization, 2 were cured and 2 failed.<sup>1</sup>

## CHAPTER XXV.

### FRACTURES OF THE CARPAL BONES.

ALL of the cases of fracture of the carpal bones which have come under my observation were, without exception, compound and complicated, and have resulted in the complete loss of the hand, or in some less serious, but never inconsiderable, mutilation or maiming.

<sup>1</sup> Muhlenberg, Agnew's Surg., op. cit., vol. i. p. 805.