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ORIGINAL DEDUCTIONS

*BASED ON A STUDY OF ONE HUNDRED CASES OF
FRACTURES OF THE*

UPPER EXTREMITIES

EXCLUDING THE HAND

BY

SAMUEL W. SMITH, M.D.

ATTENDING SURGEON TO DEMILT DISPENSARY; CLINICAL ASSISTANT TO THE CHAIR OF SURGERY,
UNIVERSITY MEDICAL COLLEGE, NEW YORK

READ BEFORE THE NEW YORK ACADEMY OF MEDICINE

December 3, 1885

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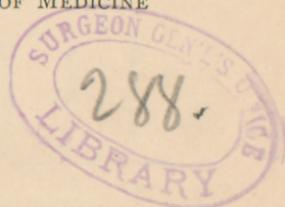
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ORIGINAL DEDUCTIONS BASED ON A STUDY OF ONE
HUNDRED CASES OF FRACTURES OF THE UPPER
EXTREMITIES EXCLUDING THE HAND.¹

In presenting my paper, entitled "Original Deductions based on a Study of One Hundred Cases of Fractures of the Upper Extremities, excluding the Hand," I claim no originality in my general plan of treatment of these cases except in the use of splints which I have invented, and which have, to my knowledge, never been used before. If, in the history of each case coming under my care during the past four years, I present any idea that may hereafter prove a new and substantial benefit to even one unfortunate laborer by shortening the term of enforced idleness resulting from accidental injury, and by bringing him or her out of such term with a useful instead of a crippled arm or joint, I shall consider my time well spent in reviewing my experiences in this line.

That fractures of the upper extremities are very common among children, as well as among older persons, is shown by the following tabulated list :

	6 years and under.	6 to 12 years.	12 to 50 years.	Over 50 years.	Total.
Scapula (3)—Acromion.....			2		2
Coracoid process.....				1	1
Clavicle (37).....	20	5	8	4	37
Humerus (15)—Surgical neck.....		1			1
Shaft of.....	2			1	3
Condyles: T-fractures.....		1	1		2
Internal condyle.....	1	2			3
External condyle.....	1	2	1		4
Epicondyle.....		1	1		2
Ulna (11)—Olecranon.....			3		3
Shaft.....			1	1	2
Head of.....			4		4
Styloid process.....				2	2
Radius (34)—Neck of.....		1			1
Shaft of.....	4		2		6
Lower { Transverse or short oblique.	1		9	2	12
end of { Colles'.....			3	12	15
Total.....	29	13	35	23	100

¹ Read before the New York Academy of Medicine, December 3, 1885.

Hence it becomes us as surgeons to employ our art in assisting nature's physiological laws of repair by placing the fragments in such a position as will most likely result in a complete union without deformity, and that such a position shall allow as much ease and comfort to the sufferer as possible. This has been my constant desire and aim, both in dispensary and private practice. The above table shows that nearly half of these fractures occurred to children under twelve years of age. Of these, twenty-five were fractures of the clavicle; eight were fractures of the condyles of the humerus, and but one a fracture of the lower end of the radius. In the cases over twelve years of age we have an altogether different state of affairs. But twelve were fractures of the clavicle, three fractures of the condyles of the humerus, and twenty-four fractures of the lower end of the radius. It seems to me important to give a minute description of the kind of fracture as well as of the location, otherwise, in recommending any particular splint or plan of treatment, we may easily mislead the more inexperienced of our profession and thus have a valuable aid in the treatment of those injuries deemed unworthy of a second trial; and therefore it is that I ask your indulgence while I refer to some of the peculiar characteristics of the more important fractures.

Fractures of the clavicle.—Of the twenty-five fractures of the clavicle of children under twelve years of age, twenty-two were transverse or short oblique, having the line of fracture near the outer edge of the middle third, with only slight displacement of the fragments. In some, there being no displacement, the periosteum evidently not having been torn through, the only evidence of fracture was a false point of motion and crepitus; while in the other three cases the fractures were near the middle of the bone, and long oblique in character, with considerable displacement and deformity. Of the eight fractures of persons between twelve and fifty years of age, three resulted from great violence to the upper and outer portion of the shoulder, the line of obliquity commencing near the inner edge of the middle third and running from above downward and inward, developing great displacement of the fragments with much deformity; the outer fragment being drawn downward and inward, so that it lay under and crossed the inner fragment like the letter x. [I think, when this particular kind of obliquity occurs, it is due to the clavicle being forced down across the first rib.] The other five fractures resulted either from a fall on the hand with the arm extended from the side, or a fall on the outer portion of the shoulder. Of these, three were long oblique, the line of obliquity run-

ning from the outer portion of the middle third backward and inward, having much less deformity and displacement than obtained in the three cases before mentioned. One was transverse or short oblique near the outer edge of the middle third, with very little deformity, the other being transverse outside the coraco-clavicular ligament, with considerable displacement and dropping of the shoulder. The remaining four cases of persons over fifty years of age, resulted from a fall on the hand while the arm was extended from the side, or from a fall on the outer portion of the shoulder; all were in the middle third, running obliquely backward and inward. In all of these cases, just as the fractures occurred within the attachment of the subclavius muscle, it became like difficult to overcome its tendency to draw the outer fragment inward and forward.

Fractures of the humerus.—At present I will speak only of those at the lower end of this bone. In speaking of these fractures, please understand me as referring to the condyles or separation of the epiphysis. That such are not infrequent, especially between the ages of six and twelve, is shown by the above table. Of eleven fractures of the condyles of the humerus two occurred in children under six years of age, one of the external and one of the internal condyle; six occurred between the ages of six and twelve; of these one was of the epicondyle, two of the external condyle, two of the internal condyle, and one of both condyles, or the so-called **T**-fracture. Three occurred in persons between the ages of twelve and fifty years; of these, one was of the epicondyle, one of the external condyle, and one of both condyles, or the so-called **T**-fracture.

Fractures of the lower end of the radius.—I will not occupy your time in reviewing the more simple fractures of the ulna and shaft of the radius, but will confine my remarks to the fracture of the lower end of the radius—the so-called “Colles fracture.” And here a word explanatory of my understanding of a “Colles fracture,” for I concede a marked difference between a “Colles fracture” and a transverse or short oblique fracture, which latter has not, under my observation, given rise to the characteristic deformity so particularly described by Mr. Colles, except when we have the fracture transverse through the more cancellated structure of the bone, with the lower fragment splintered and impaction of the upper fragment. All the text-books on surgery which I have consulted omit mention of the peculiar obliquity of this fracture. Mr. Colles’ own description in the *Edinburgh Medical and Surgical Journal*, vol. x., p. 182, 1814, deals

more particularly with its characteristic deformity and cause, without referring to the degree of obliquity. Prof. Alexander Gardner, of Queen's College, Belfast, in his treatise on "Fractures of the Lower End of the Radius and Clavicle," in 1875, says: "In justice to the man who first described this fracture, we should restrict ourselves to the form or variety which Mr. Colles described." He then asks, "Is the fracture transverse?" and says, "Of twenty-seven specimens examined, nineteen were oblique from before backward, and eight directly transverse," and again asks, "If the transverse fractures had been examined immediately after the accident, would they have been considered directly transverse?"

Erichsen, in his work on Surgery, vol. i., p. 420, says: "Colles' fracture is generally oblique from before backward;" and again, page 421, that a patient died in the hospital twelve days after receiving a "Colles fracture," the wrist presenting the characteristic deformity in a marked degree; and that he made a dissection of the limb and found the line of fracture transverse and about an inch above the articular surface, with impaction of the upper fragment, the lower fragment being somewhat comminuted.

Prof. E. M. Moore, of Rochester, in his very able paper read before the New York State Medical Society, and published in *THE MEDICAL RECORD*, vol. xvii., p. 305, 1880, says "the fracture is usually oblique." But he fails to describe the special character of the obliquity, and recommends the following treatment, viz.: A small roller or compress under the ulna, and over this and around the wrist, tightly drawn, a few turns of adhesive plaster, about two inches wide, and says that the best results are obtained thereby. This may be so in Dr. Moore's hands, but it utterly failed in mine, except in cases of the [short oblique or transverse fracture, without impaction, when I obtained as good results as with any other splint. It was during a trial of Dr. Moore's splint in the treatment of these fractures that I recognized a marked distinction between long obliquity and short or transverse fracture. However, when we have a short oblique or transverse fracture within an inch of the carpal articulation, and a comminution of the lower fragment with impaction, then we have a shortening of the radius, the carpal end of the lower fragment with the carpal bones being drawn backward, the hand also drawn outward and presenting the characteristic deformity described by Mr. Colles. The kind of splint used and the after-management of the case should, therefore, depend largely upon the fact whether the obliquity of the

fracture be long or short; and for this reason we have the action of the supinator longus with the extensors constantly drawing the lower fragment upward, and its carpal end with the carpal bones backward and the hand outward, which gives rise to the posterior deformity and appearance of dislocation of the ulna. Hence, as the obliquity is great, the difficulty of retaining the fragments in apposition after reduction is correspondingly great, and, by the drawing upward of the lower fragment, we have a shortening of the radius, giving rise to the unnatural convexity over the head of the ulna so common after treatment of these fractures. Dr. Moore, however, claims that the inner deformity over the head of the ulna is due to the giving way of the internal lateral ligament and the triangular fibro-cartilage, the styloid process and sometimes the head of the ulna being thrust through the annular ligament. This may or may not be the case, and is difficult of demonstration. Through the kindness of Dr. Dennis, I was shown a remarkable specimen of so-called Colles' fracture, with dislocation of the ulna, the head of the bone tearing through the annular ligament. This specimen was taken from a woman who had thrown herself head foremost from a third-story window, striking upon her hands. The force of the blow was greater than is necessary to produce a Colles fracture, hence the driving of the head of the ulna through the annular ligament and the comminution of the lower fragment of the radius.

In speaking of these fractures I will use the term Colles' fracture only where the fracture was of the long oblique variety, and gave rise to the characteristic deformity as described by Mr. Colles, and use the words short oblique or transverse where the fracture occurred in the same location, with the deformity less marked, and after the fragments had been brought into apposition, were easily held in their natural position.

There are in my list twenty-five fractures of the lower end of the radius. Of these, two occurred to children under twelve years of age, one of which was transverse, and one a separation of the epiphysis with no deformity. Eleven cases were between the ages of twelve and fifty years. Of these, eight were short oblique or transverse with some deformity, and three were Colles' fractures, deformity well marked. Twelve occurred to patients over fifty years of age, and of these two were short oblique or transverse, with considerable of the characteristic deformity of Colles' fracture, but easily reduced and readily held in position. The remaining ten were Colles'

fractures, the characteristic deformity being well marked in all of them.

Treatment.—I will not occupy your time in reviewing the various splints and devices for the treatment of these fractures. Professor F. H. Hamilton, in his treatise on "Fractures and Dislocations," page 194, says of the number of splints and devices for the treatment of the fractured clavicle: "A catalogue of the names only of the men who have upon this simple point exercised their ingenuity, would be formidable, nor would it present any mean array of talents and of practical skill." As much may be said relative to the number of splints and devices for the treatment of fractures of the condyles of the humerus and the lower end of the radius.

The main object to be obtained in the treatment of fracture of the clavicle is to lift the shoulder upward, outward, and backward, and to hold the fragments in apposition. The two splints most commonly used for this fracture are, on the Continent, Desault's, with the axillary wedge, and in this country Professor L. A. Sayre's adhesive plaster splint, and, to some extent, Professor E. M. Moore's shawl or elbow figure-of-eight splint. With these I will briefly compare my splint for fractured clavicle. In the use of Desault's splint for oblique fracture near the inner third of the clavicle, I have never been able to throw the shoulder sufficiently outward to overcome the deformity without seriously interfering with the circulation of the arm, though the forearm, from the fingers to the elbow, be bandaged. Cases are reported where paralysis was caused by the pressure of the wedge upon the brachial plexus. Professor Sayre's splint, properly applied, will overcome any of the ordinary results of an oblique fracture in the middle third, where the obliquity is from before backward; but where the bone is fractured in the great convexity and the obliquity is downward and inward, I have found it insufficient to overcome the deformity, and have also found it to interfere with the circulation of the arm. Its greatest objection, however, is the irritation of the skin by the adhesive plaster, which in some cases, especially those of young children, excoriates and results in superficial ulceration to such a degree, that several times I have felt obliged to remove the splint in less than a week from its application.

Professor Moore's figure-of-eight splint was an advanced step, and answered the purpose only where the fracture was near the outer edge of the middle third, and transverse or short oblique in character; but where the fracture is near the inner third and long oblique it does

not answer its intended purpose, but does the very opposite, for, passing the end of the shawl backward over the shoulder, it presses the outer fragment downward, rather than hold it up in apposition with the inner fragment. Nor does it suffice to draw the elbow backward and inward enough to overcome the action of the subclavius muscle, which, in my opinion, is one of the main factors in drawing the outer fragment inward. This led me to carry Dr. Moore's idea a



FIG. 1.

step farther, by making a clove hitch with a scarf around the forearm well up to the bend of the elbow, passing the loose ends across the back and over the uninjured shoulder. This enabled me to draw the elbow of the injured side farther backward, inward, and upward, and make the humerus a lever and the side of the chest a fulcrum by which I could lift the shoulder of the injured side upward, throw it out, and draw it backward. I then could completely overcome the action of the subclavius and other muscles of the shoulder, and also that of

the sterno-cleido-mastoid by tension upon the pectoralis major, fixing the scapula and firmly holding the fragments in apposition without at any time interfering with local circulation. This is what is desired from any splint for this fracture.

CASE II.—*Transverse or short oblique fracture of the clavicle, near the outer edge of middle third.*—Kate B——, aged eighteen months, on December 10, 1879, was sent to me from the eye class by Dr. Carey, of the Demilt Dispensary. She was suffering from fracture of the clavicle. The patient had fallen from the bed and struck upon the left shoulder. She cried somewhat, but as she had at the time a deep ulcer from vaccination upon the arm of the injured shoulder, the mother had thought nothing of the accident until she had noticed a black and blue spot over the clavicle. On examination I discovered a transverse or short oblique fracture near the outer third of the clavicle, upon the same side of the body as the ulcer from vaccination. To apply either the Sayre adhesive plaster splint or the axillary wedge splint was out of the question. Hence, as was suggested to me by the article of Dr. Moore, of Rochester, in relation to the use of a shawl for holding up the shoulder, I improvised a splint. I used a scarf of unbleached cotton, six inches wide by four yards long, and made a clove hitch around the forearm, near the elbow, which was well padded. I was enabled, by drawing the elbow backward, upward, and inward, to throw the shoulder outward and upward, and draw it backward. I passed the two ends of the scarf around the uninjured shoulder and fastened it with a safety pin, bringing the loose ends across the uninjured side of the shoulder, to form a hand-sling. I was thus enabled to completely readjust the fracture and keep the broken fragments in apposition. The patient wore the splint for three weeks without complaint or any evidence of injury to the arm. At the end of that time I removed it, and found the fragments firmly united, without deformity.

In some of the following cases I used Sayre's splint, in others my own. The results in every case of using my splint, whether for oblique or transverse fracture, were equally as good as where Professor Sayre's splint was used, and with no discomfort from confining the forearm across the chest, and without the excoriation and superficial ulceration so apt to follow the use of the adhesive plaster splint, to say nothing of its want of cleanliness and danger of slipping due to the perspiration.

After a fair trial of my scarf splint on the more severe fractures of the clavicle, where the obliquity was downward and inward through

the great convexity of the bone, I abandoned all other splints and confined myself to the use of my scarf splint, until I had made one more satisfactory in obtaining a fixation of the fragments with the elbow in the same position.

It is for this fracture, oblique, downward, and inward, and through the great convexity of the bone, that I claim for my new splint for fracture of the clavicle all the advantages of any other, as well as some advantages that no other splints have.



FIG. 2.

This splint is very simple, easily made, and not expensive. It is a padded gauntlet-shaped piece of leather, laced to fit the forearm, running on either side back of the bend of the elbow. To this part is attached a strap and buckle. A padded collar with strap, buckle, and ring is fitted to the uninjured shoulder. Through this ring the strap from the elbow piece passes, and by tightly drawing this strap the arm of the injured shoulder is under sufficient control to bring the fragments into perfect apposition. A sling is made to pass from the ring of the

collar on the uninjured side of the neck for the hand of the injured side.

CASE LIX.—*Long oblique fracture of middle third of clavicle; treated by backward position of elbow, and cured without deformity.*—John M—, aged seven years, in April, 1884, was brought to the dispensary by his mother, who informed me that her little boy, while climbing over a fence the day before, fell eight or ten feet headlong to the ground. Since then he had been unable to use his left arm. It hung like a dead weight by his side, the shoulder having dropped downward, forward, and inward to a very remarkable degree. The arm rotated, as it were, around in front of the chest. Examination showed a long oblique fracture near the inner edge of the middle third of clavicle, the obliquity running from above downward, inward, and backward. The patient was thin in flesh, and the line of obliquity was readily mapped out. The application of my scarf bandage splint did not seem quite satisfactory for holding the fragments in perfect apposition, as the adjustment is not so easily made as with my gauntlet and collar splint. By the application of this splint the broken fragments were held in apposition for three weeks, when I removed the splint. I found the broken bone firmly united, without any deformity or perceptible shortening of the clavicle.

CASE LXXXIII.—*Long oblique fracture of clavicle at inner edge of the middle third; obliquity running from above downward and inward.*—John F—, aged thirty-nine years, in January, 1884, came to the dispensary for advice in relation to a fracture of his right collar-bone, received three or four days before. He informed me that, while at work in a lumber yard, he and another workman were carrying a long, heavy piece of lumber; that the other man, who was in front of him, fell, dropping his end to the ground. The force of the plank's fall was communicated to Mr. F.'s shoulder, upon which rested the other end of the plank. The arm of the injured shoulder dropped by his side, and his end of the plank fell to the ground. Two days after he went to a college clinic, where a Sayre adhesive plaster splint was applied, and over this was placed a Velpeau bandage. When he presented himself at the dispensary he also complained of numbness in his hand and arm, as well as pain. I removed the bandage and found the splint in proper position for fracture of the clavicle. On examining the injury I found it to be a long, oblique fracture of the middle of the clavicle, the obliquity running from above downward and inward. The fragments were over-riding each other, and their long axes

crossing like the letter X. They presented sharp points to the skin at two different places, so that the fragments were far from being apposed in their natural position. I removed the Sayre splint and applied my splint, drawing the elbow backward and inward, as in Case LIX. With the elbow in this position I was able to entirely overcome the deformity of the fragments, bringing them into apposition and holding them there. At the end of three weeks firm union had taken place. The splint was worn for a week longer, and I removed it and discharged the patient cured, with little or no deformity.

CASE C.—*Long oblique fracture of the middle of the clavicle cured without deformity.*—Jesse F—, aged ten years, was brought to the Demilt Dispensary in September, 1885, by his mother, for treatment of an injury to the right shoulder. The patient informed me that while playing on the sidewalk, the day before, a boy pushed him down, the outer edge of his shoulder striking against a stone step, since which time he was unable to use his arm. The arm hung helpless by his side with the hand and forearm in a state of pronation in front, the shoulder considerably lower, and a shortening of the clavicular line as compared with the uninjured side. Examination showed that the injury sustained was that of a long oblique fracture near the inner edge of the middle third of the clavicle. The second day following the injury I applied my splint for fracture of the clavicle. With it I was enabled to bring the fragments in apposition and hold them firmly until consolidation took place. The splint was worn with little or no discomfort for three weeks. The result, a cure without deformity.

Fractures of the condyles of the humerus.—It is admitted that injury to, or fracture of, the elbow is a serious matter, and the result thereof is largely dependent upon appropriate local treatment and care. But when the line of fracture of either condyle of the humerus runs into the joint it is doubly serious, and has thoroughly tested the ingenuity and skill of our profession, not a few of whom have been prosecuted because of a resultant stiffened joint or the so-called gunstock deformity remaining after treatment was discontinued. This fracture is generally caused by direct violence with much injury to the soft parts; hence, it is of special importance in treating it to use means that will most effectually promote the absorption of the resulting inflammatory products in and around the joint, as well as the speedy coaptation of the fragments and the holding of them firmly in apposition.

My experience in treating injuries of the elbow-joint, whether

fracture obtained or not, has taught me that prompt and vigorous treatment, to combat local inflammation with effusion in and around the joint, and appropriate treatment for its reabsorption, is our only safety from false ankylosis or stiffened joint, so commonly resulting from these injuries, and so annoying to the surgeon as well as painful to the patient.

The splints generally used are the posterior, anterior, and the internal lateral angular, with or without movable joints, and each one is recommended by equally good authorities. Each has advantages and disadvantages, but, as Dr. Alis, of Philadelphia, states, none can be firmly enough applied to fix the joint without interfering with the perfect coaptation of the fragments; hence the loss of the so-called carrying point, besides the interference with local applications, which are so important in the early as well as the later treatment of these injuries.

Dr. Alis recommends semi-extension of the arm with a simple splint of flour paste or strips of adhesive plaster. Here, again, local treatment is obstructed, and I consider flour paste or adhesive plaster insufficient to hold the fragments in apposition, especially where the line of fracture is through the external condyle into the joint. At least it has proved so in my hands.

In fractures of the external condyle I have preferred the internal lateral splint, with the forearm in a state of semi-extension and the hand in a state of supination.

In cases of separation of the epiphysis I have given preference to the long anterior leather splint, extending from the shoulder to the hand and applied with the forearm in extension, then flexed to a right angle. With all of these fractures, and especially the so-called **T**-fracture, none of the splints in common use gave me entire satisfaction in preserving the lateral angle of the arm, so essential in retaining the carrying point and preventing the gunstock deformity—a deformity that seriously lessens the ability to use the limb for any work, especially carrying a weight by the side, to say nothing of the special distress the deformity causes to women.

CASE XII.—*Fracture of the external condyle of the humerus; treated with the internal lateral angular splint, resulting in loss of the "carrying point" with gunstock deformity.*—Geo. H—, aged twenty-three years, in June, 1880, came to the dispensary complaining of a painful injury to his right elbow. Two days before he had been knocked down by a rapidly moving express wagon. He

thought the horse had stepped on his arm. Examination showed that much injury had been done to the soft parts. Swelling was very great, and the skin was blackened from extravasation of blood on the outside of the lower end of humerus. The fragment of the condyle was drawn down, so that the lateral angle of the arm was reversed. By flexing the forearm and restoring the external lateral angle crepitation was readily obtained. The patient was confined to his bed for the next two days, and evaporating lotions, alternated with hot poultices, continually applied. It was impossible to keep the patient in bed longer, the swelling having greatly subsided. The natural contour of the arm was restored, and the broken fragments were nicely coaptated. The forearm was flexed to nearly a right angle, causing but little pain, and dressed with an internal lateral splint, with an opening for internal condyle. The patient was seen every second day at the dispensary for the next ten days, when the splint was removed and reapplied, and passive motion commenced on the tenth day. Although but little movement of the forearm could be made without causing severe pain, by the daily application of hot poultices to the elbow, at the end of four weeks from the first removal of the splint, sufficient extension of the forearm could be made to show that the external later angle of the arm, as well as the "carrying point," was lost. Patient continued to visit the dispensary, irregularly, for five or six months, but was never able to fully extend the forearm.

CASE XIII.—*Fracture of internal epicondyle; treated by position without a splint, and cured at the end of four weeks without any stiffness of the joint.*—John E—, aged fourteen years, in June, 1880, came to the dispensary for advice in relation to a severe injury he had received to his left elbow. He informed me that while leaving the school-room a few hours before, he was shoved by another boy and fell, striking his elbow against the edge of a stone step. Examination showed a swelling on the inside of the elbow-joint, with a slight abrasion under the epicondyle. By extension and supination of the forearm, with my fingers pressed against the condyle, crepitus was readily felt. A further examination showed that the epicondyle was broken off and slightly drawn downward; there was no other deformity, comparing the injured with the uninjured arm, and my diagnosis was a simple fracture of the epicondyle. I sent the patient home and had him confined to bed, the arm resting upon a pillow, flexed and pronated in the most comfortable position to him, and ordered cold applications to be kept to the elbow for forty-eight hours. On the third day following I called

at the house of the patient, and although cold applications had been faithfully applied, I found the elbow and forearm enormously swollen, and a large spot over the internal condyle, red and hot to the touch. The patient complained of a good deal of pain whenever the arm was moved. Tongue furred; temperature in the axilla, 101.5 degrees. I prescribed a mild cathartic, to be followed by a few doses of liquor ammonia acetatis, and locally a lotion of lead and opium, over which hot poultices of flaxseed-meal to be changed every two hours. On the second day following I called to see the patient, and found him much improved. The swelling had noticeably subsided, and the redness had quite disappeared. I now ordered an evaporating lotion to be applied to the swollen joint, and alternated with hot poultices, the patient to be kept in bed.

This plan of treatment was followed up for ten days, when I commenced passive motion, moving the joint but little at first, and increasing the degree of flexion and extension each day, and continuing the local treatment as well, until, at the end of four weeks, I discharged the patient cured, with perfect use of the joint. There was no deformity, no swelling around the joint, and full extension and flexion existed without pain or stiffness of the joint.

CASE LVI.—*Fracture of lower end of humerus; treated with a long anterior leather splint.*—Edward G—, aged six years, was brought by his mother to the dispensary, in March, 1882, for advice. She informed me that while the children were out playing upon a pile of boards the day before, her little boy was thrown off, some boards falling upon him. He was carried into the house, and when his left arm was moved he cried out with pain. The arm, at the elbow, was very much swollen, and black and blue to a considerable extent. It hung by the side, with the forearm extended, and midway between pronation and supination. There was very little pain, except when attempt was made to flex or rotate the forearm, and then it was very great. I put the little patient under ether, and carefully made an examination. On manipulation of the elbow, crepitus was readily obtained. The fracture was through both condyles, extending into the joint. The lower fragments were pulled backward; otherwise the position of the arm appeared normal. I had the little sufferer confined to bed, with the arm resting upon a pillow, and treated with evaporating lotions, alternated with hot applications, for the next three days. Four days after the injury, the swelling having very much subsided, the fragments were more easily made out, confirming my former diagnosis. I now

applied a long anterior leather splint, extending from the shoulder to the wrist, and held in place by adhesive plaster ; then gently flexing the forearm, I was able to bring the broken fragments into natural position. A roller bandage was now applied over the splint from hand to shoulder.



FIG. 3.

The splint was worn for four weeks, but was removed every three or four days to permit examination of the position of the broken fragments. At the end of three weeks passive motion was commenced. The splint was left off, permanently, at the end of four weeks. Passive motion continued daily until the end of two months, when I discharged the patient cured, with full extension and flexion of the forearm, but with

some gunstock deformity, the external fragment having been pulled downward by the application of the roller bandage, holding the splint in place with the forearm flexed.

A varied experience, full of disappointments, in the use of the known splints for the more severe fractures of the condyles, set me to work to make a splint with the following requisites :

1st. To hold the fragments in apposition.

2d. To allow the forearm to be flexed or extended, pronated or supinated, with fixation at any point.

3d. To lengthen or lessen the external lateral angle of the arm with fixation.

4th. To leave the entire elbow-joint exposed for local treatment, during the whole time of wearing the splint, without disturbing it.

The result of this work was a splint that my practice has proved to most happily meet every requisite mentioned.

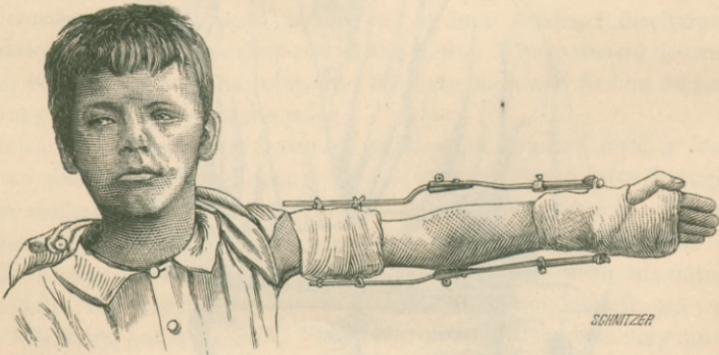


FIG. 4.

CASE LXXI.—**T**-fracture of both condyles of lower end of humerus ; treated by my elbow splint, and cured without deformity and with perfect use of elbow-joint.—William M—, aged eight years, in January, 1883, was brought to the dispensary by his mother. He was suffering intense pain from an injury to his right elbow-joint received the day before. His mother informed me that he had been knocked down by a horse and express wagon, falling forward on his face. The wheel of the wagon passed over his elbow. When I first saw the patient at the dispensary there was very much swelling about the joint, and the pain was so great that it was impossible to make out the extent of the injury without administering ether, which I did.

The examination showed that both condyles were broken through into the joint, and could be moved upon themselves as well as upon the shaft of the humerus. The deformity was not great, except in the reversing of the outer lateral angle of the arm. The elbow was drawn somewhat backward, with the fragments tilted forward, resembling a partial dislocation of the forearm backward. I applied my elbow splint, bringing the arm into semi-extension and restoring the natural lateral angle of the arm, with the hand midway between pronation and supination. By passing a roller bandage around the rods of my splint and under the lower part of the arm and elbow, I was enabled to form a cradle for resting this part of the arm and for holding the fragments more firmly in position. I now sent the patient home and had him confined to bed with his arm resting upon a pillow. Made local applications of hot poultices, alternating with evaporating lotions. There was a considerable elevation of temperature, with coated tongue, etc. Gave a mild calomel and jalap purge, and ordered a milk diet. On the second day following I visited the patient at his home and found him in a much improved condition. The swelling around the elbow-joint had greatly subsided, and the pain was much lessened. I could now ascertain the extent of the injury, which confirmed my former diagnosis. The same treatment was continued for three or four days longer, when I commenced flexion of the forearm. At the end of ten days I flexed the forearm to nearly a right angle with the arm, not, however, without causing some pain. With the forearm flexed and midway between pronation and supination, I fixed my splint, which was held with a sling from the neck, and allowed the patient to leave the bed and take exercise out of doors. At the end of two weeks passive motion was commenced and kept up daily. The arm was held alternately by my splint at the fullest point of extension and of flexion, as seemed most adapted to overcome the stiffness of the joint. Thus the splint was of much value in preserving the natural contour of the arm, as well as in holding the forearm fixed at the farthest point gained in either flexion or extension, until I again saw the patient. At the end of two months I removed the splint altogether. The forearm could be flexed and extended to a degree almost equal with the uninjured arm. Hot poultices were applied to the elbow at intervals of two or three days during this period, and I consider their application a great factor in the restoration of the mobility of the injured joint. I saw the patient for the last time at the dispensary three months after the injury.

He had the power of full extension and flexion of the forearm, with no loss of the so-called "carrying point," and with no "gun-stock" deformity.

My splint is made with two rods of untempered steel, extending from the upper part of the arm to the wrist, with a ball and socket joint at the elbow, and screws for fixation; the lower ends pass into a sheath-screw on either side of the wrist; the upper ends pass through two iron posts set in tin and made fast to the arm by plaster-of-Paris bandages, the rods being made firm in the posts by thumb-screws. On each side of the wrist is a post through which the sheath-screw passes, and made fast to the wrist in the same manner as the upper parts, and fastened with fixation-screws. By moving the sheath-screws the lateral angle of the arm may be contracted or widened as needed, thus overcoming any tendency to loss of the carrying point (or gunstock deformity). A turn of the fixation-screws at the elbow and wrist will allow the forearm to be flexed, extended, pronated, supinated, and fixed at any desired point without other interference with the splint.

PASSIVE MOTION.—Recognized authorities, of like high standing, differ materially as to the time when passive motion should be commenced.

While some advise commencing passive motion within a week of the injury, others say that under no circumstances should it be commenced before three to five weeks. My opinion is that passive motion should be commenced in each case according to the extent of injury to the soft parts, and our ability to hold in check and reduce the inflammation following the injury. Thus, while passive motion might be wisely commenced within a week of the injury in one case, in another it would be better surgery not to commence for three or four weeks.

COLLES' FRACTURE.—Not having as yet treated a sufficient number of Colles' fractures by my new extension splint to draw conclusions satisfactory to myself, I will leave the discussion of its application to these fractures for a future paper.

I will briefly say, however, that whether the fracture be transverse near the carpal articulation, with splintering of the lower fragment, or a long oblique higher up, the treatment is necessarily the same; that is, we make extension of the hand, drawing it well toward the ulnar side, and the deformity is reduced. The application of any splint in common use is to retain the fragments in their natural posi-

tion by forcible compression, and the daily removal of the splint to renew extension if we would secure repair of the fracture without deformity. I have undertaken to do this by making the hand and forearm the points of resistance to overcome the natural tendency to a shortening of the radius, which tendency is, in my opinion, so powerful, so constant and vigorous in action, that it is the cause, more than any other, of the unsightly convexity over the head of the ulna. I cannot close this paper without protesting against allowing any splint whatever being kept without removal on a Colles fracture for two or three weeks at a time, or even three days. My plan has been to remove the dressing for examination of the injury every second day, until consolidation of the fragments is obtained. To support this protest I will read you Case XCIX.

CASE XCIX. "*Colles' fracture;*" treated by permanent splint; deformity and a crippled hand resulting therefrom.—Mrs. G—, aged sixty-nine years, called at my office in October, 1884, to consult me in relation to a stiffness of her left hand and wrist accompanied by extreme pain. Patient gave me the following history: Three months previous, while descending the stairs, and when within three or four steps of the bottom, her heel caught on the edge of the step, throwing her forward to the floor. She fell on her left hand outstretched in front of her. A physician was called in to attend her within an hour after the injury. He said it was a "Colles' fracture," applied temporary dressing, and called the following day in company with a surgeon. After examining the fracture together a splint was applied, and left in position for two weeks, then removed and a plaster-of-Paris splint was put on, leaving it in position for six weeks longer. The result of this treatment, in this case, is a deformed wrist and crippled hand.

But, after all, this cast (cast shown) not only makes a stronger and more eloquent protest than can any words of mine, but also makes an appeal to every surgeon faithful to his human work.

