

are of little or of no importance in determining the relative value of conservative and operative treatment.

From the reports of the Confederate army, as published in the *Confederate States Medical Journal*, we learn that of 221 cases of gunshot fractures of the thigh, treated without amputation or resection, 105 died and 116 recovered. The shortest period of recovery was 41 days; the longest, 255 days; the average, 104 days. The shortest period of fatal

FIG. 259.



Gunshot fracture of thigh. (Author's collection.)  
Side view.

FIG. 260.



Front view.

termination was one day; the longest, 185 days; average, 52 days. Greatest shortening, five inches; least, half an inch; average, one inch and nine-tenths.<sup>1</sup>

Of 507 amputations for gunshot fractures of the thigh, 250 recovered.<sup>2</sup>

<sup>1</sup> Richmond Med. Journ., Feb. 1866, from Confederate States Med. Journ.

<sup>2</sup> Ibid., January, 1866, p. 52.

## PART II.

## DISLOCATIONS.



# DISLOCATIONS.

## CHAPTER I.

### GENERAL CONSIDERATIONS.

#### § 1. General Division and Nomenclature.

A DISLOCATION is the displacement of one bone from another bone or cartilage at the place of natural articulation.

Dislocations may be divided into accidental or traumatic, spontaneous or pathologic, and congenital.

Our remarks upon the etiology, pathology, symptomatology, prognosis, and treatment of these injuries must be considered as applicable only to accidental or traumatic dislocations, unless the fact is in any case otherwise stated.

Accidental dislocations are those in which the bones have suffered displacement in consequence of the application of a sudden force; and surgeons have divided these accidents into Complete and Partial, Simple, Compound and Complicated, Recent and Ancient, Primitive and Consecutive.

A complete dislocation is one in which no portions of the articular surfaces remain in contact.

A partial dislocation is one in which the articular surfaces are not completely removed from each other.

A simple dislocation is that form of the accident in which the bone has only slid from its articulation, and is accompanied with the least or only an average amount of injury to the soft parts or to the bones adjacent to the joint.

A compound dislocation implies that the articulating surface of the bone has been thrust through the flesh and skin; or that in some other way a wound has been made which communicates with the joint.

Complicated dislocation is a term employed by some writers to designate a condition wholly differing from a compound dislocation, or, in some cases, a condition of extra complication. Thus, a simple dislocation may be complicated with a fracture, or with the laceration of an important bloodvessel, etc.; and a compound dislocation may be complicated in the same way, and with the addition, perhaps, of extensive laceration and destruction of integument, muscles, nerves, etc.

A recent luxation has taken place within a period of a few days, or, at most, of a few weeks; and an ancient luxation has existed during a longer period. The exact point of time at which a dislocation shall be



called recent or ancient is not fully determined by surgeons, and the application of these terms is therefore always somewhat arbitrary.

A primitive luxation is a luxation in which the bone remains nearly or precisely in the position into which it was at first thrown; while a secondary or consecutive luxation is one in which the bone has subsequently, in consequence of the action of the muscles, or from unsuccessful efforts at reduction, or from some other cause, changed its position sufficiently to entitle the accident to a new designation. Thus a primitive dislocation upon the ischiatic notch may become a secondary dislocation upon the dorsum ilii, or the reverse.

### § 2. General Predisposing Causes.

*Age.*—According to Malgaigne, whose conclusions are based upon an analysis of six hundred and forty-three cases, dislocations are very rare in infancy, only one having occurred under five years; but the frequency increases gradually up to the fifteenth year, from this period more rapidly up to the sixty-fifth year, and from this time onward again dislocations become more rare. He has mentioned none after the ninetieth year; and the period of greatest frequency is between the thirtieth and sixty-fifth year. To this middle period belong four hundred and seven of the whole number.

Kronlein<sup>1</sup> from an analysis of 400 cases has constructed the following table:

Articulations.	1-10 yrs.	11-20.	21-30.	31-40.	41-50.	51-60.	61-70.	71-80.
Hip, . . . . .	4	...	...	1	...	2	1	
Knee, . . . . .	...	3	2	1	...	1	...	
Foot, . . . . .	...	...	...	1	...	...	1	
Metatarso-phalangeal, . . . . .	...	1	...	...	...	2	...	
Shoulder, . . . . .	...	2	55	45	48	36	19	2
Elbow, . . . . .	31	49	15	5	4	3	1	1
Hand, . . . . .	...	...	1	...	...	...	...	
Metacarpo-phalangeal, . . . . .	6	8	4	8	1	...	...	
Interphalangeal, . . . . .	1	...	5	1	1	...	...	
Sterno-clavicular, . . . . .	1	3	2	...	...	...	...	
Acromio-clavicular, . . . . .	...	1	...	2	4	3	1	
Lower jaw, . . . . .	...	2	4	1	2	1	...	
Spine, . . . . .	1	...	...	...	...	...	...	
	44	69	88	65	60	48	28	3

The inference from these analyses may be thus briefly stated: age, as a general predisposing cause, is most active in middle life, and least active in advanced and in early life.

It is proper, however, to observe that while such statistics may be relied upon as indicating the relative frequency of these accidents at different periods of life, they cannot be regarded as determining absolutely the value of age alone as a predisposing cause, since the direct or exciting causes may be more active at one period than another, and in some measure these latter causes may be, and doubtless are, responsible for such results.

<sup>1</sup> Kronlein, Luxationen, Deutsche Chir. Von. Billroth u. Luecke, 1882, p. 5.

*Constitution and Condition of the Muscles and Ligaments.*—It may be stated as a general fact that persons of feeble constitutions, and whose muscular systems are much weakened, suffer dislocation from slighter causes than those who are in health, and whose muscular systems are firm and vigorous; and that a relaxation of the ligaments which surround a joint, however this may have been occasioned, predisposes to dislocation. Thus, a paralyzed and atrophied limb is predisposed to luxation; a joint in which the capsule has become stretched by effusions, or by violent extension, or weakened by laceration from a previous dislocation, or by ulceration, or if in any other way the articulation is deprived of these natural protections, we need scarcely say, it is thereby rendered more liable to luxation.

Ball-and-socket joints, other things being equal, are more liable to displacement than ginglymoid; but then much more depends upon the relative exposure of the joint than upon its anatomical structure, so that the elbow is much more frequently dislocated than the hip; the shoulder-joint, however, being, from its position and extent of motion, peculiarly exposed, and being also a ball-and-socket joint, is, of all others, most liable to dislocation.

### § 3. Direct or Exciting Causes.

These may be classed under two general heads, namely, external violence and muscular contraction. The action of certain ligaments in determining the direction of some dislocations, is also a direct cause, but only subsidiary to the other causes named.

External violence operates either directly or indirectly. When a person falls upon the knee and dislocates the head of the femur, the force is said to have acted indirectly, and this is by far the most frequent mode of dislocation; but when the blow is received upon the upper end of the humerus, and its head is sent into the axilla, it is said to have been dislocated by direct violence.

Muscular action produces a dislocation slowly, as in some cases of chronic rheumatism, and then it is termed a spontaneous or pathologic dislocation; or suddenly, as in the violent spasmodic contractions which accompany convulsions; or sometimes by the mere voluntary effort of the muscles; and both of these latter are true accidental luxations.

It is very probable that external force can seldom be regarded as the sole cause of a dislocation, but that, in a large majority of cases, muscular action consenting with the shock, performs an important rôle in the history of the accident. The limb, being driven obliquely across its socket by the external violence, is seized by the stretched and excited muscles with such vigor as to contribute not a little to the unfortunate result. Thus it will be found that the same force which is adequate to the production of a dislocation in the living and healthy subject is wholly insufficient to accomplish the same in the dead; and a man who is fully intoxicated seldom suffers a dislocation.



## § 4. General Symptoms.

As fractures are characterized by preternatural mobility and crepitus, to which may be generally added the circumstance that when reduced the fragments will not remain in place without external support; so, on the other hand, dislocations are characterized by preternatural rigidity, an absence of crepitus, and by the fact that when reduced the bone does not generally require support to maintain it in position.

These three are the usual, and they may be termed the common, signs of distinction between fractures and dislocations, but no one of them can be alone depended upon as positively diagnostic. Generally, when a bone has been dislocated, we shall find the limb in a certain position, which is uniform for all dislocations of the same character, and almost immovably fixed; but when the ligaments and muscles about the joint have been extensively torn, or the whole body is still suffering under the shock, or in any other circumstances where the power of the muscles is weakened, this rigidity may give place to extreme mobility.

True crepitus does not exist without fracture, but it is not always present in fractures; and there is often a sensation produced in the rubbing and chafing of dislocated bones which very much resembles certain kinds of crepitus, and by the inexperienced has been often mistaken for it. I allude to the subdued rasping sound or sensation which is found generally on the second or third day, and sometimes earlier, and which is the result of fibrinous effusions, or, perhaps, in some instances, of the mere rubbing of firmly compressed ligamentous and cartilaginous surfaces upon each other. The crepitus of a recent fracture can be scarcely confounded with this obscure sensation, unless it is in some cases of incomplete fracture, or of a fracture situated remote from the surface, as in the case of the hip; but a fracture which is a few days old, whose surface has become softened by inflammation and more or less covered with lymph, when the rigidity is great, may sometimes deceive the most experienced surgeon; so exactly will it be found to imitate the sensations produced by the chafing of an inflamed joint, or of closely approximated fibrous surfaces.

I have said that a true crepitus does not exist without a fracture; but then a very minute fracture, such as the detachment of a scale of bone by the tearing away of a tendon or of a ligament, may produce crepitus; or even the separation of a piece of cartilage may sufficiently expose the bone to determine the presence of this phenomenon. These are, however, no longer examples of simple dislocation.

Nor are the two inverse propositions, in relation to the retention of the bones in place, invariable in their application. A broken bone, well reduced, does not always manifest a tendency to displacement; nor does a dislocated limb, when restored to its socket, in all cases maintain its position without support.

The other general signs of dislocation are pain, swelling, and discoloration. The pain is generally more intense in dislocations than in fractures, the expanded end of the bone resting often upon one or more large nerves, which usually, with the arteries, approach very near the

joints; this pressure being also greatly increased by the extreme tension of the muscles. Not unfrequently numbness and temporary paralysis of the whole limb are the consequences. In other cases the pain is due solely to the pressure upon the muscles or to the tension of the muscles, or, perhaps, to the tension of the untorn ligaments and capsule.

Generally the limb is shortened, but in a few cases it is found slightly lengthened, while the natural axis of the bone with its socket is always changed. If examined early, and before the supervention of swelling, the joint end of the displaced bone may be felt in its unnatural position, and a corresponding depression may be discovered in the situation of the articulation, especially if the bones are superficial.

## § 5. Pathology.

The dissection of recent dislocations produced by external violence, shows the capsular ligaments more or less torn, and also a rupture of some of the lateral and other short ligaments, with a complete rupture in most cases of some of the tendons which immediately surround the joint, or of those which are attached to the capsule: the muscles, nerves, arteries, etc., through which the bone in its passage has passed, or upon which it is found resting, being also contused, stretched, or torn asunder.

This description, however, does not apply to dislocations produced by muscular action alone, in a majority of which cases the capsule is only stretched, and not torn, and no lesions of other structures are necessarily present.

If the dislocation remains unreduced, the margins of the old socket, in the cases of enarthrodial articulations, become gradually depressed, while the concavity of the socket is filling in with a fibrous or bony tissue, until at length the whole of this portion of the joint apparatus is nearly or entirely obliterated. This process is generally very slow, and may not be consummated until after the lapse of many years.

At the same time, but with much greater rapidity, the head of the bone in its new position, and the soft or hard parts upon which it rests, are undergoing certain changes to adapt them to their new relations, and calculated in some measure to restore the limb to its normal functions. If the head of the bone rests upon muscle, the cellular and fibrous tissues which enter into the composition of the muscle become condensed and thickened, forming a shallow or elongated cup, whose margins are attached to the neck, or shaft of the bone, and whose walls are lubricated with synovia. If it rests upon bone, by a process of interstitial absorption a true socket is formed, sometimes deep and sometimes shallow, whose edges, receiving additional ossific depositions, become lifted so as to form a rim. At the same time the head of the bone is undergoing corresponding changes, to adapt itself to the newly formed socket; it is flattened or otherwise changed in form, and in the progress of this change its natural secreting and cartilaginous surfaces are gradually removed, a porcelaneous deposit taking its place. The same kind of hard, polished, ivory-like deposit is found also in those portions of the new socket which have been especially exposed to pressure and friction.



Instead of the eburnation, an imperfect fibro-serous surface or synovial capsule may be formed.

I have in my cabinet an example of ancient luxation of the hip-joint in which the head of the femur, having rested upon the dorsum ilii, has formed a nearly flat but smooth surface—a kind of elevated plateau; in other cases I have seen the margins of the new socket so elevated as to rest against the neck of the femur, and completely lock it in.

Coincident with these changes, and in consequence partly of the disuse of the limb, the muscle, and even the bones sometimes suffer a gradual atrophy. In some measure these alterations may be due also to the pressure of the dislocated bone upon arterial and nervous trunks, by which their functions become partially or completely annihilated, and their structure even may be wholly obliterated. In consequence also of the inflammation which immediately results, we ought not to omit to notice that the trunk of a large artery sometimes becomes firmly adherent to the capsule or periosteum of a displaced bone, and its reduction is attended with imminent danger of laceration and of a fatal hæmorrhage. Numerous instances of this grave accident, especially in attempts to reduce old dislocations of the shoulder-joint, are upon record.

#### § 6. General Prognosis.

We shall study the prognosis of these accidents to better advantage when we come to speak of the individual bones and their various forms of dislocation; but it is proper to state in this place, generally, that very few joints, having been once completely displaced from their sockets by external violence, are ever so completely restored as not to leave some traces of the accident, for many years, if not for the whole of the subsequent life of the patient, either in the partial limitation of their motions, or in the diminished size and power of the muscles of the limbs, or in the presence of an occasional arthritic pain: the degree and permanence of these sequences depending upon the joint which is the subject of the displacement, the extent of the original injury, the length of time it has remained unreduced, the means employed in its reduction, the health and condition of the patient, with so many other contingent circumstances as to preclude the idea of a complete specification.

If the bone is not reduced, a permanent maiming is inevitable; but it is surprising how much, time and the intelligent processes of nature can eventually accomplish toward a restoration of the natural functions, especially when aided by a good constitution and judicious treatment. If the symmetry of form and grace of motion are never replaced, the value of the limb, for all the practical purposes of life, is not unfrequently completely reëstablished.

#### § 7. General Treatment.

The first indication of treatment is to reduce the bone. Whatever delays may be proper or justifiable in certain cases of fracture, such delays are never to be argued in cases of dislocation. The sooner the reduction

is accomplished the better. For this purpose we resort at once to such manipulations or mechanical contrivances as the nature of the case demands; and if these fail, or if at the first they are deemed insufficient, we invoke the aid of constitutional means, or such as are calculated to diminish the power and antagonism of the muscles.

Many dislocations may be reduced promptly by manipulation alone; which mode is always to be preferred when it will prove sufficient, for the reasons that it is generally the least painful to the patient, and the least apt to inflict additional injury upon the muscles and ligaments.

A person wholly unacquainted with anatomy or surgery may occasionally succeed in reducing a dislocated limb; indeed it frequently happens that the patient himself, by mere accident in getting up or in lying down, accomplishes the reduction; and even in a very large majority of cases, force and perseverance will finally succeed by whomsoever they may be employed; but the observing student of surgery will soon discover the difference between accident and brute force on the one hand, and intelligent manipulation on the other. The charlatan bone-setter does not often allow himself to fail, unless the courage of his patient gives out, or he ignorantly supposes the reduction to be effected when it is not; but his success, achieved through great and unnecessary suffering, is often obtained, also, at the expense of the limb; while the surgeon, whose knowledge of anatomy enables him to understand in what direction the muscles are offering resistance, and through what ligaments the head of the bone must be guided, lifts the limb gently in his hands, and the bone seeks its socket promptly and without disturbance, as if it needed only the opportunity that it might demonstrate its willingness to return.

We must understand not only what muscles and ligaments antagonize the reduction, if we would be most successful, but also what muscles, by being provoked to contraction, will themselves aid in the reduction. In short, to become expert bone-setters in the department of dislocations, one must possess a complete knowledge of the physiognomy or the external aspect of joints, acquired only by repeated and careful examinations, he must be familiar with the anatomy and functions of the muscles, he must understand thoroughly the ligaments, he must have experience, tact, and fertility of resource.

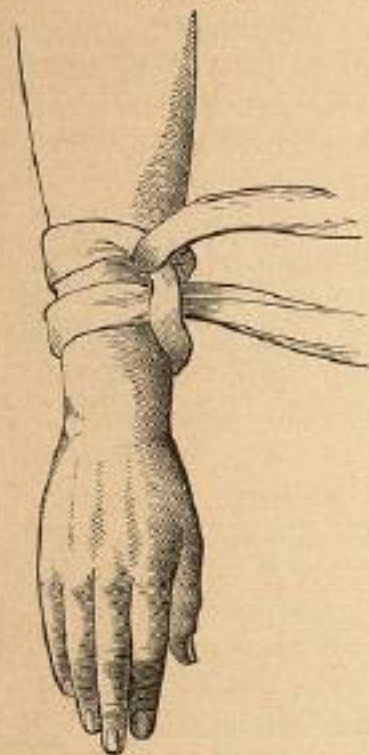
Without these qualifications a man will do better never to undertake to treat dislocations, since he is constantly liable to mistake fractures for dislocations, and dislocations for fractures; he will submit a sprained wrist to violent extension, under the conviction that the joint is displaced; he will mistake natural projections for deformities, and fail to recognize the real deformity when it actually exists; he will leave bones unreduced, fully believing that they are reduced; and he will, all in all, within a few years, accomplish vastly more evil than he can ever do good. Let a man practise any other branch of surgery if he will, without experience or scientific knowledge, but he must not attempt to reduce dislocated bones. The most learned and the most skilful we shall find falling into error, embarrassed by the uncertainty of the diagnosis, or successfully resisted by the power of the opposing agents. What, then, can be expected of those who are both ignorant and inexperienced but failures and disasters?



As a means of disarming the muscles, or of placing them off their guard, we often practise successfully the diversion of the mind of the patient. At the very moment that the limb is moved or extension is made, a question is addressed to him, or he may be suddenly surprised by some unexpected intelligence.

Extension and counter-extension, made with our own hands or with the hands of assistants, constitute the second resort where manipulation alone has failed. The surgeon, seizing upon the limb firmly with his

FIG. 261.



Clove-hitch. (From Erichsen.)

hands, makes the extension, while the assistants make the counter-extension; or, instead of grasping the limb directly, the operator may use for this purpose circular and longitudinal bandages, or the bandage or handkerchief tied in the form of the clove-hitch. Extension is thus applied in connection with manipulation, aided, perhaps, by direct pressure upon the head of the displaced bone. Failing in this, we employ some one of the various mechanical contrivances which, while they are capable of exerting much more power, possess also the important advantage of operating gradually and steadily, by which mode the resistance of the muscles is always more speedily and more completely overcome.

For this purpose, Legros and Anger<sup>1</sup> have proposed the use of India-rubber tubes, to the number of five or six, extended gradually and successively to a proper tension, and maintained in this degree of tension for twenty or thirty minutes; and others have advised the use of the pulley and weights, the latter of which methods I have often employed myself; but surgeons employ generally, in the case of the large limbs, the compound pulleys, or the simple rope windlass, which latter is thus described by Dr. Gilbert, of Philadelphia: "Place the patient, and adjust the extending and counter-extending bands as for pulleys; then procure an ordinary bed-cord or a wash-line, tie the ends together, and again double it upon itself, pass it through the extending tapes or towels, doubling the whole once more, and fasten the distal end, consisting of four loops of rope, to a window-sill, door-sill, or staple, so that the cords are drawn moderately tight; finally, pass a stick through the centre of the double rope, then by revolving the stick as an axis or double lever, the power is produced precisely as it should be in such cases, viz., slowly, steadily, and continuously."

Jarvis's adjuster, although very complex, possesses some advantages over the pulleys, which may, perhaps, entitle it to the preference in a few cases. (See Dislocations of the Thigh.)

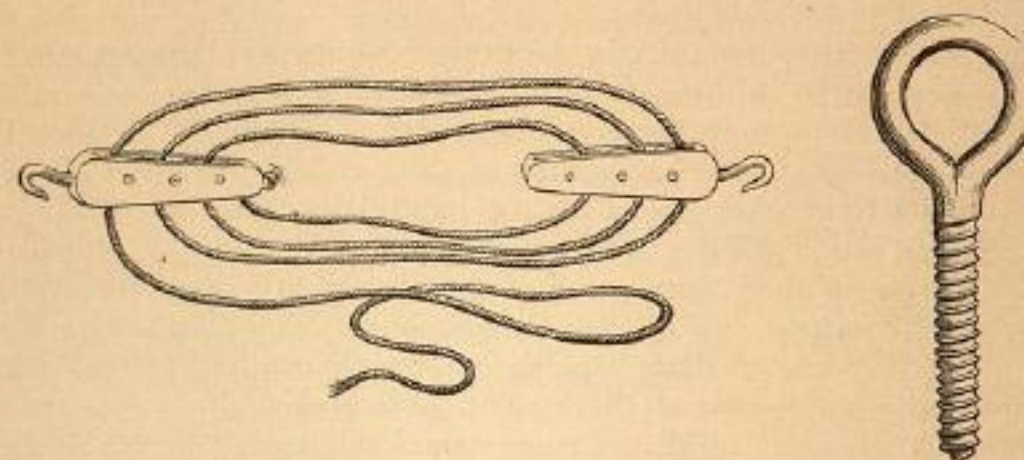
Sédillot,<sup>2</sup> recognizing the danger of over-extension in the employment

<sup>1</sup> Legros and Anger, Arch. Gén. de Méd., 1867.

<sup>2</sup> Sédillot et Gross, Art. Luxations, Dic. Encyc. Sci. Méd., Ser. 2d, t. 3, p. 295.

of mechanical apparatus, and especially in the employment of the pulleys, conceived the idea of attaching to the latter a dynamometer, by which the exact amount of force applied could be determined. It is not, however, by any means certain that the dangers would be lessened by this means, since the amount of force which can safely be employed is seldom the same in any two cases which may be presented; but, depending, as it must, upon the limb to which the traction is applied, its muscular power or resistance, the age, sex, and general condition of the

FIG. 262.



Compound pulleys, and ring to which one end of the pulley-rope is fastened.

patient, it is apparent that the limits of safety must be determined by the constant and careful observation of the limb while the extension is being applied, and, in short, by the judgment of the surgeon rather than by any fixed dynamic rule.

Among the constitutional means, ether and chloroform occupy the first rank; indeed, they are, at the present day, almost the only means of this class to which surgeons resort, and their value in this point of view can scarcely be over-estimated. Only when some unusual circumstance or condition of the patient forbade the use of an anæsthetic, would the surgeon return to the ancient practice of bleeding *ad deliquium*, of prostrating the system with antimony, or to the use of those vastly less efficient agents, opium and the warm bath.

## CHAPTER II.

### DISLOCATIONS OF THE LOWER JAW (TEMPORO-MAXILLARY).

THERE are two principal forms of this dislocation, namely, the double or bilateral dislocation, and the single or unilateral; in both of which the direction of the displacement is forwards. To these there may be added as having been occasionally observed an outward displacement accompanied with a fracture, and occasionally a backward dislocation, with fracture of the meatus auditorius externus.