Compound and comminuted gun-shot fractures of the thigh and means for their transportations, etc / John Swinburne.

COMPOUND AND COMMINUTED

GUN-SHOT FRACTURES OF THE THIGH

AND MEANS FOR THEIR TRANSPORTATIONS, ETC.

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COMPOUND AND COMMINUTED GUN-SHOT FRACTURES OF THE THIGH, AND MEANS FOR THEIR TRANSPORTATIONS, ETC.

In my last year's report to your society, I gave, at full length, the impressions which I then entertained as the result of reading and experience, and the conclusions drawn from the same. I now call your attention to the same in a condensed form, with some immaterial alteration, which, however, consists more in a material plan for carrying them into effect. This seeming repetition I deem justifiable, after hearing the subject of compound and comminuted gun-shot fractures of the thigh discussed in the surgical section of the Academy of Medicine, by Frank H. Hamilton, E. Krackowiser and others, all concurring in the opinion or impression that those injuries not involving the knee joint, did not call for amputation. In fact, more recovered without amputation than with it, but with defective limbs. Still, the great question: what plan for carrying out this humane object was the most feasible? None was presented except Smith's anterior splint, Prof. Buck's arrangement and the long straight splint—none of which, however, are available on the field, on the march, in temporary hospital, or while being transported to such hospitals; and hence days of valuable time are consumed before the patient is placed under treatment. In the meantime he may die from pain and exhaustion, or the parts may become so conditioned as not to be amenable to scientific treatment. The result of the recoveries as shown that evening, as well as those I had myself seen, confirmed this view. Their reports showed that this distortion is all ended, even without the loss of bony spicula or substance. The lateral as well as longitudinal distortion was in most instances very great. This result was evidently induced by the deficiency in immediate treatment; the delay causing permanent shortening of the muscle, while the imperfect extension subsequently applied, left the parts in the position above mentioned.

Through the politeness of its president, Prof. Jas. R. Wood*, I

* Jas. R. Wood, M. D., president of the Academy of Medicine, N. Y.

was invited to participate in the discussion of the important subject, and in so doing, laid before the society, in cursory manner, the plan herein proposed for carrying into immediate effect the system of extension whereby the *stretcher* becomes the *splint*, in accordance with the diagram hereinafter presented.

A still further inducement for me to present this plan of treatment is that my efforts of last season on this subject met with favor from scientific medical men.* I now desire to present some of the data as extracted from the statements of Doctors Hamilton and Krackowiser in the American Medical Times, of December 2nd and 19th, 1863.

Prof. Frank H. Hamilton reports the results of 58 successful cases of compound and comminuted fractures of the thigh; in 13 of which no mention is made of lateral distortion; 15 are mentioned as straight; in 27, there is more or less lateral distortion, and they are characterized as crooked, quite crooked, bent back at fracture. very crooked, much bent out, pretty straight, &c. The longitudinal distortion varied from $1\frac{1}{4}$ to $4\frac{1}{2}$ inches. Now here is a point worthy of note, viz: that only 15 are mentioned as straight, and still the average of those mentioned are nearly two inches short, or longitudinally distorted. Now, I simply ask of you, gentlemen, ought we to have this large proportion of the cases with such decided lateral distortion? I concede we cannot prevent some shortening, but we ought certainly to devise some means by which this almost constant record of "crooked," "very crooked," "not straight," &c., being made, else nature's efforts to save those limbs without the application of the surgeon's knife, will avail little.

The remarks of Dr. Krackowiser consisted principally of statistics; those from the Franco-Sardinian army are in point, and show most fully the advantage of a conservative in opposition to a heroic plan. In 165 cases of gun shot fractures of the thigh, conservative treatment gives 50 per cent. of deaths, while 431

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* A kindly and encouraging notice appeared in the American Medical Journal of Nov. 4, 1863, in which it says: "The section on resections of joints and conservative surgery is an able defence of exsections as opposed to amputations, and a judicious discrimination of the rules that should be observed in the selection of cases and performing the operation. We most heartily concur in the opinions put forward, and can only hope that they will be widely circulated in the army, where they must be productive of good results.

"The simple truth seems to be, that in wounds of the upper extremities, amputations should be rarely performed. Nothing but life can compensate the loss of the arm. Without the overpowering weight of statistics which Dr. Swinburne brings to his aid, we should be prepared to accept his arguments as conclusive."

of the same class of cases, treated by amputation, gives 74.50 per cent. of deaths—here no mention is made of the manner of treatment, and still it leaves 24.50 per cent. in favor of conservative surgery. He gives also a table of 318 amputations performed during the Crimean war, with a percentage of nearly 64.00 of deaths. In proof of the propriety of the stand I have taken as to the importance of having the limb placed under treatment as soon as possible after the receipt of the injury.*

My first experience in military surgery was at the old Hygiea hospital at Fort Monroe, which was under the charge of that accomplished surgeon R. B. Bonticou, of Troy, N. Y. I then urged that those compound fractures of the thigh, of which he had about 30, should not be amputated, but rather straightened and kept in that position the same as a compound fracture from any other cause. In fact, I dressed a great number of these after this method, but which were subsequently either amputated or resected with fatal results in the main. These were the wounded from Williamsburgh and West Point. By my request W. Van Steinburgh, surgeon to the 55th N. Y. Vols., tried the experiment as well as he could, though all his patients were in such a condition before the treatment was commenced that distortion must follow as a consequence. In order more fully to elucidate this point and the result of his efforts, I quote from last season's report, as published in the transactions of the society.† (Page 188.)

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* I quote rules from this paper as the deductions from Larey and Sendemne:

"1st. The extraction of loose fragments and foreign substances ought to be made before the swelling commences, and if possible under chloroform. Splinters adherent should not be moved.

"2d. The first dressing should be made on the field, and if *possible* after the *adjustment* of *dislocation* (fracture).

"3d. If the *first dressing be well done* it ought not to be *disturbed* in the *hospital*, if pain, dislocation and swelling be moderate.

"If no dressing on the field was made, the patients are generally received in the hospitals with limbs so swollen and shortened that no permanent dressings can do any good.

"5th. The dilation of the wound with the knife is only indicated if there be *considerable serous* infiltration and closure of the wound from swelling; but even then bleeding and ice is frequently preferable, because the enlargement of the wound admits air and favors the increase of suppuration.

"6th. Enlargement of the wounds is absolutely necessary when there is bloody infiltration.

"7th. Where the serous infiltration forbids the application of permanent dressing, the patient ought to be put on a good mattress in Pott's position."

† He says he treated by extension twenty-one cases of compound and comminuted fracture of the thigh. Of these there were thirteen fractured in the upper third and one death

Starting then with the data that more lives are saved in compound gun-shot fractures of the thigh without amputation than with, and that too by the imperfect measures adapted for the cure, is significant; and it will be remembered that in this class of accident, no recommendation for immediate relief has been proposed, except, perhaps, the brief article I gave last year in a paper entitled "Peninsular Campaign Surgical Experience, &c."* This, though brief, may have served in some degree to call attention more fully to the subject that the different plans proposed can be fairly discussed and digested, while the best one can be carried out.

There has been no extended, systematic or concerted plan of action in the medical department of the army. For instance, if

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twelve fractured in the middle third and one death; six fractured in the lower third and no death.

These were treated by extension, supported by sand bags applied in the long axis of the bone. This notice is due to the doctor's sagacity and skill. The profession should know the comparative results, and I therefore submit his table and remarks entire. If the doctor could have taken the same cases from the field, and before material injury was done to the soft parts by bandaging and rough movement, placed them on stretchers and kept them thereon with appropriate extension, his success would have been much more perfect, since, after irritation and forcing of the muscles has to any considerable degree taken place, extension cannot be effected as it could at first, and hence the imperfection spoken of.

Williamsburgh, secondary, extension of shaft	1		recovered.
Big Bethel, by extension	2		recovered.
Fair Oaks, by extension	9	2	died.
June 30th	3		all recovered.
Malvern Hills	3		all recovered.
Bull Run 2d	1		recovered.
Chantilly	2		all recovered.
Upper third	3	1	death.
Middle	12	1	death.
Lower	6	0	death.
Total cases	21	Total deaths 2	

Out of twenty-one cases of compound and comminuted fracture of the thigh, taken indiscriminately, 19 recovered with tolerably useful limbs.

My plan of treatment has been by simple extension as taught me by Dr. Swinburne. One case I will relate as well as possible from memory. Adj. Wallace, 1st N. Y., was struck by a rifle shot at the junction of a lower and middle third, the ball passing directly through "antero posteriorly," comminuting the bone and driving the fragments into the muscles of the posterior part of the thigh. These I removed, and placed him on a stretcher, making extension from either end of it. I placed a leg of an old pair of knit drawers filled with sand upon each side of the broken limb, and told him not to suffer any one to remove him until he reached the General Hospital. He was taken to Washington and there placed upon a bed and the extension kept up. The wound was made on the 30th June, and in October he returned to the regiment with a leg two inches shorter and foot everted. The eversion was the result of neglect in treatment evidently.

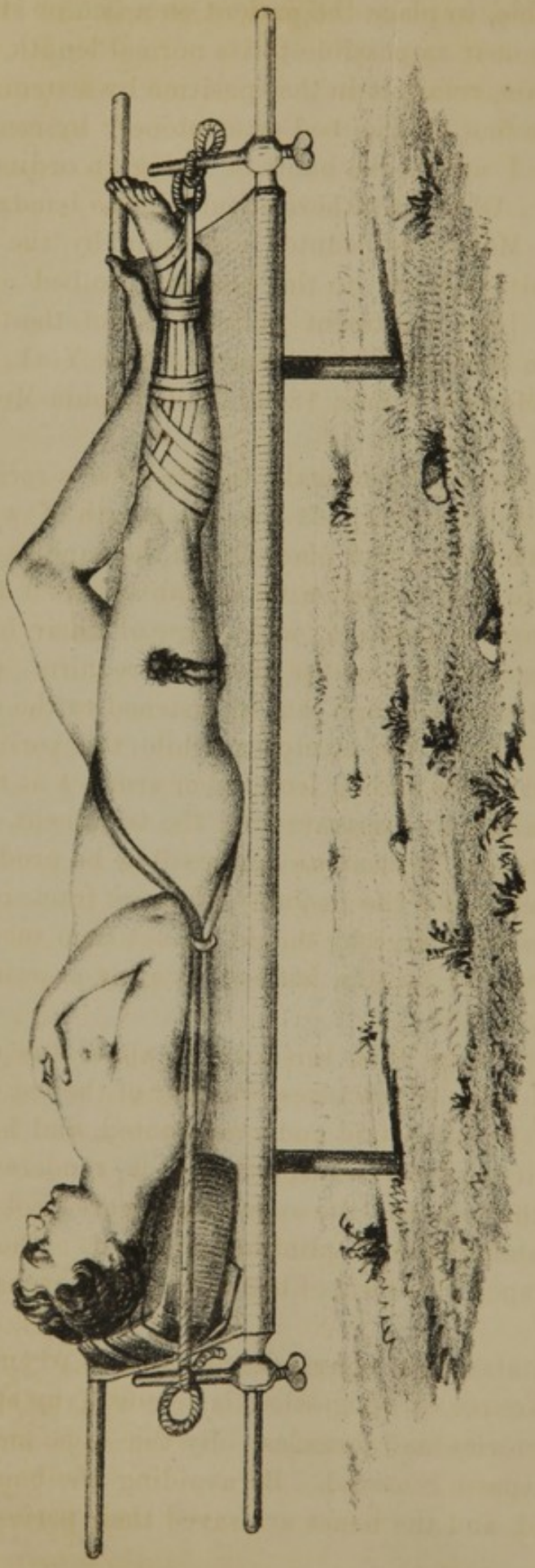
* See Transactions of the Medical Society State of New York, 1863.

A, desired to save a limb without amputation; the unfortunate possessor is, perhaps, in the course of time, dispatched to some general hospital, where the limb is ordinarily sacrificed, and that too at a time when the parts were not in a condition for amputation. Now, A has dressed the broken limb secundum artem, with bandages and army splints, which, in the course of 24 hours, become equal to ligaturing, and hence either mortification or great congestion and œdema of the parts follow. This is not the worst misfortune. The bones, also, are compressed and their periosteum destroyed. The ordinary splints do not prevent shortening, and hence the soft tissues, vessels, &c., which have not shortened and become accommodated to the altered position of the parts, are folded up, so to speak, upon themselves, when congestion, effusion and destruction of tissue follow. Nor is this all. The bones, which are still imperfectly confined by the bandaging and splints, are constantly cutting and goring the nerves, arteries and other soft tissues producing profuse hemorrhage, distension and great spasms and renewed injury and pain upon every effort at movement. All this is accelerated in transportation by ambulances, cars, &c. In many instances, patients with this class of injury, are transported without any dressing. Need there be any surprise then that this class of injury should suffer materially from this treatment? Nor would the wonder be increased when it is known that these patients arrive at a general hospital only to be again bandaged and perhaps the soft parts confined still more closely. Can there be any cruelty more refined than to dress (if dressed at all), a fractured thigh or leg as is ordinarily done in the army, and thus be transported in ambulances or even freight cars to some distant region, as is constantly being done. If no dressing is applied the same arguments may hold good, since the broken and shattered bone is constantly goring the nerves and muscles and thereby increasing the spasm which, in turn, injures the vessels, thus giving rise to renewed hemorrhage, destruction of the periosteum, exfoliation of bone, consequent permanent shortening of muscles, inflammation, deposit and absorption of pus, and other serious results too numerous to mention. Now, how can all these defects be obviated? I hoped to hear some plan or plans proposed from the distinguished medical gentlemen who so ably discussed (on the occasion referred to previously), the subject of gun-shot fractures of the thigh. In response to a call to give my views on the subject, I stated in

substance that I could add but little to what I had already said on the subject, except, perhaps, some matters of detail. That the efforts of this State Medical Society had resulted in the appropriation of the sum of $200,000, one object of which was for the better carrying out of some plan for surgical and medical relief for the wounded or sick. That, under the bill, we proposed to have several surgeons of pre-eminent ability, some of whom were to be placed upon the staff of the medical directors of the army, and who, during the times of quiet to the army were to act as special inspectors of the regiments of their respective States, report the condition in person to said medical directors, and also to transmit reports of the condition of said regiments to the governors of their State, giving the names of the dead and condition of the sick, from time to time, and such other information as may be important to said medical directors or State officers; in this manner to insure a healthful and efficient condition of the troops composing the regiments.

Then during an engagement to act as surgical advisers to such army surgeons as may desire counsel, also to see that some general plan for conservative surgery is carried out, such as may have been previously agreed upon in the general council either at the office of the Surgeon-General, U. S. A., or the Medical Director of the army, as the case may be. The decision rendered here upon the field should be final; at least until the true secondary stage has arrived, and that no operations be allowed in the intermediate stage, which is neither primary nor secondary. Indeed, I was pleased to hear Prof. Hamilton unmeasurably condemn operations after the lapse of forty-eight hours, or after serous effusion had taken place, as in that case the chances of life are less, and that the operations, when necessary ought to be done as soon as possible after the injury, and that after the primary stage has passed, the operations should be deferred and condemned until the true secondary stage arrives, which might extend to weeks, while the primary does not mean the 8th, 7th, 5th, or even the 4th day after the injury. Nor does the secondary mean the 9th, 10th, 12th and 15th, nor even the 25th day after the injury.

Then to insure success in the treatment of this kind of injury, I know of no plan more feasible than the one I proposed at the last meeting of this society, which is: "as soon after the injury



Plan for Counter Extension without splints.
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as practicable, to place the patient on a bed or stretcher, extend the limb as near as possible to its normal length, without giving too great pain, retain it in that position by fastening the patient's foot to the foot of the bed or stretcher, by means of adhesive plaster, as I am in the habit of doing in ordinary fractures of the thigh." Of course, there should be no bandaging of the leg or thigh. Make the counter extension by the use of a large perineal belt fastened to the head of the bed or stretcher [see diagram]. [See treatment of fractures of the thigh—Transactions of the Medical Society, State of New York, 1859-61. Also American Medical Times, 1862; Philadelphia Medical Reporter, 1862.]

In order more fully to make the *stretcher* a *splint*, I propose to place two sliding iron rods 4 4, the length of which should be from 8 to 12 inches, and placed upon the handles of the stretcher which are to be provided with thumb screws 3 3, to keep them in any desirable position, and allow of their being depressed, elevated or extended, as the case may require. [See fig.]

The foot-strap or cord can be fastened to the sliding iron rod 4 4 at the foot of the stretcher, while the perineal belt 2 can be fastened to the sliding iron rod or arm 4 4 at the opposite end.

Thus making an apparatus for the treatment of this fracture, as complete and perfect as can possibly be produced in private practice, and since the majority of these fractured bones suffer no loss of substance, why should we not then succeed in effecting as good results by this method in army practice as in private practice?

It will be seen that this form of apparatus answers equally well in all forms of fractures, whether of the leg or thigh, simple, compound, or compound and comminuted, and hence its extreme applicability. Thus transportation is rendered easy and not painful—thus are all the evils which were spoken of under the head of bandaging and splinting, obviated. They can be treated until well upon this form of bed or stetcher, even without hospital tents.

These statements are rendered obvious when we reflect that the main source of congestion is removed by straightening the nerves, arteries and muscles, By the same means (*i. e.* extension), is spasm removed. By avoiding the bandaging stricture is obviated, and the bones are saved their periosteum.

Extension obviates the goring and irritation of the tender and sensitive tissues.

The parts while thus extended are firm and immoveable while the extension restores temporarily the forces which were lost in breaking the bone, and the muscles are kept in as straight and normal a condition as they would have been had the bone remained entire.

Then by retaining the muscles in a state of tension, the bone unites, and that too with no lateral, and little or no longitudinal distortion, depending upon the degree of destruction to the bone at the time of the accident. I have said before that the apparatus herein described is suitable for the treatment of compound and comminuted gun-shot fracture of any portion of the leg or thigh from the ankle to the hip-joint. If the fracture occur near the ankle-joint, the plasters must not envelope the wound, but rather take its grasp from a point below the wound. Still, though applicable to all cases, the grand object of the paper is the elucidation of the treatment of fractures of the thigh. The only addition to the ordinary stretcher is the iron slides, rods or arms with thumb screws, and which can be attached to any ordinary army stretcher. Then the addition of an india-rubber blanket completes the apparatus and makes a tent of itself, without the attendant risk of foul air and its sequel, hospital gangrene, pyemia, &c. The rubber can be used during rain storms and at night, while the shade of the forest will afford protection from the sun. If it is desirable to transport these cases in ambulances, its front can be perforated for the arms of the stretcher to protrude through, as can also the rear of the same, thus removing the only possible objection to this apparatus.

The stretcher is always easily obtained on the field, and the extra transportation of the sliding arm, the adhesive plaster, perineal belt, &c., is certainly not more difficult or troublesome of transportation than would be splints; besides this apparatus obviates the absolute necessity of hospital tents.

If the army is not moving, men can be detailed to carry these stretchers and their precious loads even for miles, if needs be, to a place of safety, thus avoiding the necessity of ambulance transportation; or, if worse comes to worse, these cases can be carried in the army baggage wagons, or ambulances with long bodies can be provided to correspond with the stretchers, or, as I said before, the ordinary ambulance can be perforated front and rear so that

the arms of the stretcher can protrude through. There are several objections which might be raised, but all can be as easily disposed of as those above—since, if there is a will there is always a way. To my mind a little ingenuity and common sense can overcome all obstacles.

I have adopted the following plan, and have given directions for the management of this kind of fracture in private practice. I have now treated about fifty in private and public practice, using the bed ordinarily met with in practice instead of the stretcher. I know of many others treated by this plan, and in none have I known of an unfavorable result. In the aggregate the patients have been able to use the limb at an earlier period than under any other mode of treatment.

In fracture of the femur I recommend simply extension and *counter-extension without splints*, and in the leg I sometimes do the same, making use of the following plan by which the extension and counter-extension is effected. The patient is placed on a stretcher, and a broad, well-padded perineal belt, made from two to two and a half inches in diameter where it comes in contact with the perineum, (in order more fully to equalize the pressure) is adjusted as indicated in the plate, so that the line of extension shall be through the long axis of the femur.

This perineal belt is secured to the moveable iron rod *a a* at the head of the stretcher, and no splint at all is made use of, as the powerful muscles and fascia that envelope the femur are amply competent to support and fix the bone. The pelvis being thus fixed by the perineal belt, extension is obtained by means of adhesive strips secured to the leg. The plasters are cut proportionally to the size of the limb, from one-half to one inch in breadth, and of sufficient length to be applied along the outside of the leg, descending spirally, protruding so as to form a strong loop under the sole of the foot, and then extending up on the inside of the leg. These strips are not applied one directly over the other, but at small distances apart, so as to embrace a larger surface of the leg, thus equalizing the tension upon the integument. Then a number of shorter strips are applied in a manner similar to the many tailed bandage, surrounding and securing the long plasters against possible detachment. The shorter strips are not indispensable, as the same end may be attained by a simple roller.

All that is now necessary is to pass a strong cord through the loop of plasters, and secure it to a moveable iron rod at the foot of the stretcher. The simplicity of this method is a strong recommendation. For the treatment by this method nothing is required but ordinary adhesive plaster, which can be obtained very readily; and an old sheet or rope stretcher and the moveable iron rod or nibs will furnish the remaining complement of apparatus.

The patient can move about on the stretcher as much as is necessary, with greater freedom than when embarrassed by a long splint, and with really less danger of displacement. The seat of fracture can be examined at any moment without having a long bandage to unroll, and wet cloths or other local applications can be used, with as great facility as if the limb were well. The wound of the muscles and integument is as perfectly accessible as if it were not complicated with a fracture. Perfect cleanliness may be preserved, which is an important consideration, and which it is impossible to obtain when the splint and bandage are used, without much trouble both to the surgeon and patient.

The limb can be measured as often as is desired, and the amount of extension regulated accordingly, with scarcely any trouble, by merely tightening the cord which secures the foot to the end of the bedstead. The circulation is not interfered with, as is often the case when the splint and roller is used; especially when not rightly applied; and, what is to be considered of great importance, the patient is far more comfortable than when trammeled by the usual dressings.

There is no danger of sloughing of the heel or malleolus, a complication by no means seldom met with under the usual treatment, because here there need be no pressure upon the prominent bony projections, either from the bed or the dressings; and with regard to the perineal belt, the chances of excoriation are not greater than when the long splint is applied. In fact, the line of traction in the latter case being more oblique, has greater tendency to press the upper part of the thigh outward, and is consequently more painful than when the force is applied more directly to the pelvis, which effect may always be obtained by a proper adjustment of the perineal belt.

After a few days the patient can set up in bed or lift his hips for the calls of nature, with impunity and without apparent

injury. He can roll from side to side, or even sit up, and thereby relieve the tedium of confinement.

One other, and not the least advantage claimed, is, that in this form of treatment there is no agglutination of the muscles to the bone, or each other, and consequently no stiffening of the limb from that source; and as soon as the bone is strong enough to bear the weight of the patient, the muscles are ready to do their part in the locomotion.

One objection, and by the way the only one which possesses a show of validity, has been made, that the foot is liable to evert or invert; but a single moment's reflection will satisfy any one that no great ingenuity is required to avoid this—a bag of sand or bran on either side of the foot, or a strip of plaster, or of cloth, any of these simple means can be so employed as to maintain the foot in a proper position.

The fact to be dwelt upon is, that but little extension is necessary during the first stage of treatment. In order to prevent perineal excoriations, and accustom the patient to the necessary pressure when union is taking place, cleanliness must be observed. It is essential, at first, to overcome spasmodic muscular contraction, and keep the limb from lateral distortion. When there is much loss of bony substance, less extension is required. In fact, some longitudinal distortion is necessary for a bony union. Still, the muscles must be kept sufficiently upon the stretch in order to keep the limb from lateral distortion, else the sharp ends of the bone will gore the muscles, nerves, &c., and thereby produce great pain, and other irreparable mischief.

The efficacy of this treatment, like that of many and all others, is to be tested by its practical results. So far as an experience of about thirteen years in private practice, (with data of about fifty cases of simple, compound and comminuted fractures of where the bed took the place of the stretcher,) which, it is granted, is only a limited time and data, can be depended upon, there is no method more reliable than this. There is none in private practice, under which more favorable results have proceeded, none in which there have been fewer failures (in this there have been no unfavorable results), considering the variety of fractures to which it is applicable, and in which it has been used; it has been eminently successful, and the result has been such as to warrant its indiscriminate use.

I give here the character of injury which requires amputation:

1st. Cases where the artery or arteries are destroyed or so lacerated as to cut off circulation below the wound, where circulation ceases and gangrene is the inevitable result.

2d. In cases where a limb is torn nearly or quite off, as with a solid shot or any other analogous missile, leaving an irregular or ragged stump.

3d. Cases of extensive injury to the soft parts alone, where gangrene would be likely to follow from the loss of the principal nerves or arteries.

4th. Cases of compound and comminuted fracture of the knee and ankle joints require amputation, while the passage of small balls which do not shatter or open the joint do not necessitate amputation, and particularly is this true of the ankle-joint. Compound and comminuted fracture of the femur or tibia which extend into the knee *joint* require amputation.

Rules for Excision of Joints and Simple Fracture of the Shaft of the Long Bones.

1st. Excision should be confined to the upper extremities—the shoulder and elbow being the principal parts upon which that operation should be practiced.

2d. If the head of the humerus is shattered by a gunshot, excision is the only remedy. If the comminution extends to the shaft, the loose portions only which are deprived of periosteum need be removed—the residue left to granulate. If the glenoid cavity is crushed, its loose spiculæ can be removed or its injured portion gouged out.

3d. If the elbow-joint is crushed or comminuted by a ball, excision is the only remedy. If the injury is confined to the articulating end of the humerus, remove it, but do not disturb the ends of the radius or ulna; on the contrary, if the injury be confined to the articulating ends of the radius or radius and ulna, remove both, but not the humeral articulation.

If the articulating ends of the humerus, radius and ulna are crushed, remove them all. What is meant, in the books, by partial excision is the removal of a portion of the joint—such as a part of the humeral articulation, or the articulating ends of the radius or ulna only.

On the contrary, the removal of the entire half of the joint results in a new articulation, and not in anchylosis, as is often

the case in partial excision. If the comminution extends to the shaft of the humerus or radius and ulna, remove its loose spiculæ and leave the rest to nature.

4th. In comminuted compound fracture of the carpel end of the radius or radius and ulna, excision of the articulating ends affords the most reasonable prospect of success. Leaving it to nature is far preferable to amputation. Never amputate for this injury.

5th. Compound gunshot injuries of the carpus or metacarpus, seldom if ever require either excision or amputation. Remove the loose bones and treat as a simple wound.

6th. In compound gunshot injuries of the phalanges, excision can be practiced only with varying success, owing to the size of the bullet and the smallness of the member. The rule is to save as much as possible. Injuries to these parts, sustained by buck-shot or pistol balls, do not, as a rule, require amputation. On the contrary, most of them can be saved.

7th. In compound and comminuted injuries of the humeral shaft, excision or amputation should never be performed. The loose spiculæ should be removed, and the case treated as an ordinary compound fracture. If, however, the comminution extends to the articulation, it (the articulation end) should be excised with the loose spiculæ, while the fragments of the shaft, which still retain their periosteum, should not be disturbed.

8th. The same rule applies to the shaft of either or both bones of the forearm. In all cases avoid constriction by bandaging.

9th. Cases of compound fracture of any portion of the femur not involving the knee-joint ought not to be treated as hereinafter detailed, *i.e.*, by simple extension and counter-extension. Making the *stretcher* the *splint*. [see diagram.]

10th. Cases of compound and comminuted gunshot fractures of the tibia, or tibia and fibula, not involving the knee or ankle-joint, should be treated as above stated for the femur. [see diagram.]

11th. Simple gunshot injuries of the ankle-joint do not necessitate amputation, while compound and comminuted fracture of this joint, and particularly when the arteries are much injured, may require amputation. Though with proper support, water dressings, irrigation, free incisions, &c., a great majority will recover without operative interference.

The same rule is applicable to gunshot wounds of the foot as of the hand, and I can safely say that there is scarcely a bullet

wound of the foot which requires amputation. I have seen the whole scaphoid bone carried away and still a good recovery take place. So the destruction of the astragalus may occur and still recovery go on favorably. See the case of Garibaldi, in whose ankle-joint a ball remained for some months, and without unfavorable results.

12th. In compound and comminuted gunshot injuries of the tarsal and metatarsal bones, the same rule of action should be adopted as in like injuries of the hand, with the exception that a slight deformity is not of such vital importance in the former as in the latter.

13th. *No excision or amputation should be performed in the second or inflammatory stage.** If the operation cannot be performed before this stage sets in, we ought to defer operation until the true second or suppurative stage appears.

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* The second stage here spoken of is the true congestive or one intermediate to the first and second stage of authors.