THE VALUE OF SUSPENSION IN SURGERY.*

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THE value of suspension in the treatment of fractures and certain other injuries and diseases of the extremities may be described in a few words—viz., the prevention of motion in the part suspended, the affording comfort to the patient, and thereby aiding in the reparative process; for it is well known that whatever adds to the pain and discomfort of such patient is a hindrance to Nature's efforts to cure. To gain these ends, everything will depend on the manner in which the suspension is carried out.

The idea of slinging an injured limb was, I believe, first put into practice in this country by Mr. Luke, and in the simplest manner possible, by merely placing the limb in a couple of loops of broad webbing attached to the top of an ordinary cradle. Up to a very late period, this plan was adopted more with a view to afford relief to a bedridden patient than to form a part of the treatment.

In 1850, whilst a student in London, I devised a jointed iron frame, having two longitudinal rails on the top, from which hung four leather straps for suspending my "grasping-splint"; but it had no other recommendation beyond the power of simply suspending, and portability. About the same time, Mr. Salter introduced to the notice of the profession a "leg-sling", which not only suspended the limb, but afforded longitudinal motion, and, by means of a swivel, allowed the body to lie somewhat diagonally on the bed. This longitudinal movement, although a great gain, is comparatively seldom brought into play; and the swivel can only be acted on by moving the whole body on its short axis, an act not frequently performed, and only possible to a slight extent, on account of the narrowness of the framework from which the sling is hung. In 1864, I instructed Messrs. Weiss to make an apparatus whereby I hoped to gain every movement that could be desired. These instructions were carried out; but my success was

only partial. After making a number of experiments to accomplish my purpose, I was able to bring before the profession an invention whereby a patient would be enabled to move his injured limb about the bed with nearly the same freedom as he would his sound one (see *Lancet*, February 24th, 1866). This apparatus I have since improved in certain matters of detail, and it is now described in the catalogues of some of our instrument-makers as my "unilateral limb-suspender". I have also added to it a convertible splint for upper or lower extremity. Other surgeons have suspended limbs after their own fashion; but I am informed the appliances are all of an unpretending character. My apparatus consists of a base about two feet square; two shifting telescope-pillars, terminating above in an overhanging top, to which is attached traversing gear—namely, a central longitudinal rail and trucks (the only parts common to the sling known as "Salter's"); two side rails, also placed longitudinally; a transverse rail and trucks; and a swivel-bar, with shifting yokes for receiving straps which suspend a splint-holder. At the outer angles of the base, contrivances are fixed whereby the pillars are supported, and any inclination of the top can be corrected. For the sake of portability, the pillars can be folded underneath the top by removing a set-screw. (See engraving.)

To apply the suspender, the base is placed in the required position underneath the mattress from the side of the bed and its outer side is tied with cords to the bedstead. A back-splint, fixed to the holder, and padded, is placed underneath the fractured limb; and the latter having been attended to, the other portions of the apparatus are placed in position by dropping the pillars on to their supports at the edge of the bed, the traversing-gear overhanging the limb. The splinted limb is then slung by means of the straps and yokes from the swivel-bar. In the event of the limb not being properly balanced when the yokes are placed at the ends of the swivel-bar, the yoke at the depressed end should be moved to a notch nearer the swivel. The equilibrium will thus be obtained as in a steelyard. If the base of the apparatus were placed on a bedstead which dipped in the middle, the pillars would naturally incline inwards, and the top would cease to be horizontal. This evil is overcome by laying hold of the upper ends of the pillars and pulling outwards (their supports being hinged at the base) until they are perpendicular. By now turning a screw at the foot of each pillar to the required extent, their upright position will be maintained. If, during the treatment of the limb, the surgeon may require to remove the suspender from the bed, he has simply to slide the yokes off the swivel-bar, and then lift the pillars off the base, the latter remaining undisturbed. In certain rare instances, where the patient is lying on a thin mattress, the apparatus—even at its shortest—may be considered too lofty. This objection is done away with by placing an extra mattress on the bedstead. Where the opposite condition obtains, then the pillars can be lengthened by means of the telescope arrangement. A little oil or grease should be occasionally smeared over those parts of the traversing gear subject to friction.

Having described the apparatus, and the manner in which it should be applied, I would make a few remarks as to the advantages it offers, and therein embody my argument. The following are the principal advantages. Motion is prevented in a limb moved horizontally in any direction. The longitudinal trucks and rail, as in Salter's and certain other leg-slings, allow the patient to draw himself upwards or downwards in the bed, and prevent motion at the seat of injury or disease during such movement. This action, however, as I said before, is comparatively seldom brought into play. The transverse rail and trucks, the most frequently used, allow the body to be moved sideways, and, in conjunction with the swivel-bar, allow the patient with perfect safety to abduct or adduct his limb, or to lie in a diagonal position across the bed. The form of the instrument being unilateral, it can be used for the upper extremity; and a sound leg is not thrown aside from its fellow by any intervening framework, thus preventing distress in the hip and obviating other inconveniences. The base of the apparatus being placed underneath the mattress, there is no possibility of the under-bedclothes bulging up against the back of the limb and interfering with its free and easy movement. I have purposely omitted to provide for the patient's turning on his side, as I think the act would prove injurious.

It has been said, that the longitudinal movement should take place, for the sake of steadiness, on two rails instead of on one—and for the same reason that railway travelling on a broad-gauge line is superior to that

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on a narrow gauge. I think that argument cannot be accepted. In the case of the railway, the object to be moved is supported on wheels, and is consequently subject to oscillation, and might be upset; whilst, with the leg-suspender, the object to be moved is suspended from the wheels, and is therefore at its lowest point of gravitation, and is always tending to keep the wheels upright. An example of the steadiness of a body supported on two wheels, side by side, compared with that on one wheel only, may be seen in the case of a two-wheel handcart and a wheelbarrow. With the former, comparative steadiness is observed during motion; whilst, with the latter, a lurch takes place, answering to the movements of the wheeler's body. If, however, there be any service in having more than one rail, my suspender is amply furnished, although not for the object just mentioned, for it has three rails—a central one, on which run trucks, as guides, and two side rails (the bearing-bars) on which slides the arm connected with the longitudinal truck-holder. It will be thus seen the longitudinal motion in my instrument is gained by means of sleighs and wheels. The transverse trucks and swivel-bar, combined, answer like a "tell-tale" or a safety-valve to every side movement of the limb, whether voluntary or otherwise, thus obviating all strain or shock which occurs to an object suddenly brought to. Concussion of opposed surfaces is also reduced to a minimum. This action is not only a comfort to the patient, but it plays an important part in the actual treatment of a diseased joint or a fracture. To prevent motion in a limb, or strain on a limb, there must be no obstacle to the voluntary or involuntary movement of a limb, horizontally, in any direction. So perfect is the rest thus obtained, that splints might almost be dispensed with; and fractures, hitherto considered beyond the pale of treatment, have by this appliance been treated successfully. In many cases of severe fracture of the leg, treated in the ordinary way, the surgeon knows he has to a great extent to thank the patient for the successful issue; by the penance he has endured in the shape of watchfulness and caution. The swinging motion is very slight, owing to the straps being medially connected with lateral and longitudinal trucks, and not hanging from a fixed point. If necessary, even this slight undulatory motion might be obviated by having a rigid connection between the splint and the suspender instead of the yielding straps; but I do not think the substitution will ever be required, as the sensation is rather pleasant than otherwise. The moment there is any tendency to a swinging movement, the trucks begin to act. To gain a thorough lateral swinging motion, a swing must be suspended from a point which cannot be moved laterally. The patient should be instructed not to abuse the freedom thus given. Care should also be taken in seeing that the upper bedclothes do not touch the toes in any sweep the limb may make.

What is the result then, when a limb, fractured or diseased in its joints, is slung in an ordinary two-sided apparatus having only longitudinal action, and not embodying the advantages just set forth? Quite the converse. In the first place, if the apparatus be placed on a soft bed it sinks into the bedclothes, and causes the mattress to bulge up against the back of the leg, and thus to interfere with the free movement of the limb. This obstacle, when the limb swings against it, causes a jolt which is immediately felt in the part affected. Another objection to the narrow two-sided framework is, that one of the sides interferes with the comfort of the sound limb. In the next place, there being no transverse trucks, any voluntary or involuntary movement of the limb, sideways, is checked, thus causing a strong swinging motion and a lateral strain on the limb, which is sure to have an evil effect at the seat of injury or disease. Anything which hinders or impedes movement in a given direction is, for the moment, an opposing force.

Although my apparatus was designed for suspending fractured legs, it is evident it would be equally useful in any case requiring the removal of the "dead weight" of a limb from the bed, as in all fractures and diseased joints of the extremities, cases of resection, important wounds, gout, etc. When both legs are broken, I use my broad two-sided suspender, which covers both limbs, and has two sets of trucks on the transverse rail. In certain severe injuries of the upper extremity, where the patient is confined to his bed, suspension plays a useful part in the treatment. I have not had occasion to use my apparatus for such purpose in my own practice, but I was informed by Mr. Berkeley Hill, that it was used successfully in University College Hospital in a case of resection for ununited fracture below the elbow, when another mode of slinging had failed. The remarks I have made respecting the value of suspension in the treatment of fractures, are of still greater force when applied to the treatment of inflamed joints, where the slightest movement produces intense suffering. We all know there are many cases of simple fracture which do well without any special care, but even in such instances the suspension of the limb adds greatly to the patient's comfort.

A HOSPITAL AND ACCIDENT AMBULANCE SERVICE FOR LONDON.*

By BENJAMIN HOWARD, A.M., M.D., F.R.C.S.E.

It is now over seventeen years ago since the first ambulance system ever established had its earliest opportunity of proving its value as a distinct organisation. On that occasion, when over ten thousand men lay on the field about Antiatam, by the sudden disability of Dr. Letterman, the supreme responsibility was, by special order, placed upon me. Thus initiated in a work in which my interest has been active from then till now, it was, I can assure you, in no spirit of criticism I called attention, when in London three years ago, and again in the medical journals last July, to the manifest need of an ambulance system in this quasi-battlefield of London.

The Committee of the London Hospital having, upon my urgent representations, decided, last September, to adopt a hospital and accident ambulance service; and having now further arranged for a conference of the other general hospital authorities with themselves, within a few days, to be presided over by His Royal Highness the Duke of Cambridge, to consider the organisation of a hospital and accident ambulance system for London, it has been deemed of first importance that, in advance of this public meeting, the whole question be submitted to this Society, which so largely represents the profession of the entire metropolis.

As briefly as I may, therefore, after glancing at some general reasons for an ambulance system, I will allude to the pre-eminent force of these and other reasons when applied to this particular locality; will give some accounts of the different systems already in operation or adopted in other cities; describe the system recently initiated at the London Hospital; and lightly touch upon such points as are likely to invite special attention in the future determination of such system or systems, as may be practicable and best for this heterogeneous and unparalleled metropolis.

Some General Reasons for an Accident Ambulance System.—The influence of a right or wrong first care, and good or bad transportation, not only in surgical, but in many medical, emergency cases, towards determining the recovery or death of the patient, is not easy to exaggerate. In the present absence of system, the earliest diagnosis between apoplexy and "drunk and incapable" is made by the policeman. The treatment on the spot is as miscellaneous as the rival sympathisers can make it. As regards transportation, this, in two or three respects, has, since the middle ages, been slightly modified. The police-stretcher, or the shutter formerly carried by the hands, with the advantages of suspension, is now more usually borne upon the shoulders of unequal men, with the hoisting, lowering, jolting, risk, exposure, and fright, thus unavoidable. A wheelbarrow-litter has lately been occasionally used, in a description of which, under the head of "Police cruelty", the *Lancet* has denounced it as "worse than useless from every medical standpoint." A vivid description of the scenes attending an average transportation, in these ways, of a criminal or a patient, may be found in a pamphlet published last November by Mr. Harrison of Liverpool.

The other modification which I would fain not even mention is the cab, familiarly known as the "growler". In other respects, while the treatment of emergency patients within the hospitals has in every particular marvellously progressed, the provision for their first care on the spot, and their transportation to hospital, is in the main what it was a century ago.

Whatever the sex, age, rank, be the case one of cardiac syncope, or apoplexy; of fracture, dislocation, or "drunk and incapable", whether the one or the other of the means of transportation above mentioned be used, is left exclusively to the indiscrimination and convenience of the policeman. For the worst fracture in the most distinguished patient, there is no choice in removal except risking his reputation on the police-stretcher, or his life perhaps in the impossible cab.

For assurance against volunteer maltreatment of emergency cases and street accidents on the spot; against detention or rejection at the nearest hospital; for assurance that the first care shall be prompt, exclusive, skilful; that the transportation shall combine ease with seclusion, the only resource according to experience is such co-operation of police, hospital, and other authorities, as is implied in a hospital and accident ambulance system.

The Importance of an Ambulance System for London pre-eminently, as compared with other Cities.—The considerable proportion of the twenty-two thousand patients received into five only of the London hospitals in 1880, and all of the nearly three thousand due to horse

* Read before the Medical Society of London.