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THE AFTER-TREATMENT OF LARGE AMPUTATIONS.

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The alterations in the treatment of large wounds which are from time to time suggested still leave room for further modifications, for we are far from having reached the most successful mode, or that which in its results gives unalloyed satisfaction.

The main feature of the present paper is the advocacy of the disuse of sutures, and the avoidance of all pressure in the shape of plasters and bandages in large lacerated wounds and primary amputations, where the skin and subjacent tissue have been much torn and contused, such, for instance, as a limb torn by machinery, where the bone has to be amputated some inches higher up, and there is skin to cover, but it is skin that has been much bruised and separated from its subjacent tissues, and consequently has its vascular supply greatly impaired; or, again, a secondary amputation, where the intermuscular spaces and the muscles themselves have become infiltrated with pus, and the patient has been reduced by profuse discharges and long confinement, and the amputation is resorted to as a *dernier ressort* to save the patient's life. In such cases the disuse of sutures would lead, not only to the formation of better stumps by avoiding sloughing or gangrene of any portion of skin, an occurrence so often resulting from the pressure put upon the skin by sutures when endeavouring to make the cut edges nicely approximate, but a far greater evil would be avoided—the grave constitutional effects, too often leading to a fatal issue, brought on by this same pressure of opposing sides, whose every vital action is thereby interfered with. When an attentive consideration is given to the state of a

limb after a severe injury, such as a large lacerated wound with much destruction, and consequent loss of substance, it will be found that the muscular fibre, cellular and adipose tissue, capillaries lymphatic and vascular, whose continuity has been abruptly severed, do necessarily exude during the immediate succeeding days a large quantity of half-organized material or plasma, above and beyond what is required to preserve the vitality of the tissues that are left. This vital plasma cannot be regarded as an inert substance; on the contrary, under its altered condition of exposure to air and light, it degenerates into another and probably lower form of vitality, and it then ceases to be a beneficent agent in contact with unimpaired tissue, and becomes a positively deleterious one, whose contiguity is replete with danger—a danger that is increased when, by careful approximation of the broad cut surfaces, as in the case of an amputation, we close a large number of mouths, and in this way block up every vessel, every capillary out of whose divided end material not required ought to be allowed to escape. But the most careful approximation will not prevent a good deal of surplus material welling forth and remaining between the flaps, here quickly to lose its inert character and become an irritant, and very rapidly a focus from which degenerative action may radiate. Such seems to be the explanation of the appearances so often observed to begin about the second and third days after an amputation in a limb put up in the ordinary way, with sutures, plasters, and bandages, particularly if the limb has been much lacerated or its structure impaired with infiltrations of pus. For about that time the flaps present a turgid appearance, and if not an actual general redness, there are streaks of a darkish red hue running up the limb; there is a general sloughy appearance of the edges of the flaps, the latter also having a dusky look, which extends from half to two or more inches in breadth; this gradually darkens, and all the skin and subjacent tissue which has assumed this appearance, be it much or little, half the flap or only a small portion, dies, separates, and, coming away, leaves what before promised to be a well-covered stump, bare, with bone exposed.

This I believe to be entirely due to pressure put upon the flaps

by sutures, plasters, pads, and bandages. It is even a question whether the fatal issue of an amputation within a day or two of the operation has not sometimes been brought about by the too careful closure of a large surface, whose structure may be in an unhealthy state, and its morbific material being thus forcibly retained, reacts upon the system. Certainly, when one sees a recent amputation, with its sutures imbedded deeply in the swollen skin, one cannot help feeling that to retain them there is fighting against nature, and can but lead to mischief of some sort, and we therefore let them go. But has not mischief already been done? And though we may remove the sutures in time to prevent gangrene of the strained skin, yet is it not probable that if we had left those edges free that there would have been no swelling at all, and if no swelling or engorgement then no throwing back upon the system of that surplus material which has been sent down, and so no alarming constitutional derangement?

The plan of treating large wounds at present adopted by those who keep in advance in the field of surgery is probably either that of Lister or Callender. The first is founded on the doctrine that no pus in excess need be formed, and since the plan has been introduced numerous striking instances of compound fracture treated on this principle have been related where there has been such rapid union of injured tissue, with so little expenditure of material in the form of increased secretion of any sort, as to justify the wonderful hold this mode of dressing has taken upon the minds of hospital surgeons. I would be most unwilling to detract from its value, simply maintaining that there is a certain class of cases, namely, those specified above, where it is powerless to prevent a large amount of new formative material being secreted, and that the attempt in such cases to carry out the plan, as it necessitates the close adaptation of parts, leads often to the sloughing of skin within the first few days by the undue strain put upon it, or to abscesses in the neighbourhood later on.

The most successful cases under Lister's method are compound fractures not needing amputation, abscesses, and small lacerated wounds. When we come to deal with a limb, one half of which

has been removed, the *status quo* is different, a fact too generally lost sight of. Here it is quite conceivable that we have often interfered injudiciously with nature's method of adapting supply to demand, and with her disposal of the surplus at first left on her hands, when we so carefully seal up the ends of a stump. She cannot at once contract the calibre of the supplying vessels, reduce the expenditure of force to the required amount, and diminish the supply to be transmitted to the mutilated limb. On the contrary, there is increase of action at first.

Mr. Callender's method, as representing, probably, the most perfect plan of those who do not believe in the power and influence of atmospheric germs, may be briefly summarised as follows:—The use of torsion rather than of ligatures to arrest hæmorrhage; the washing of the wound after all bleeding has been most carefully stopped with carbolic lotion; the bringing together of the flaps or sides of the wound with silver sutures; the fitting in of a drainage tube of improved construction, to secure for the first twenty-four hours the removal of all fluids, after which it is withdrawn; and, finally, in the after-treatment, the use of cotton wool as a first dressing, rest, isolation, and great attention to cleanliness—special means being adopted for attaining these ends.

To this plan of treatment it would be impossible to take exception save in two points—the use of sutures, and the substitution of torsion for ligatures. To speak of the latter first. In the hands of most surgeons, I think I shall not be wrong in saying, this method of arresting hæmorrhage from the larger vessels has often failed, and even where it has not, has been accompanied with a feeling of uncertainty, which is likely to prevent its ever coming into general use. There is the less necessity for adopting it now that the old form of ligaturing, and leaving one or both of the long ends dangling out of the wound, has been pretty well discarded, and ligatures either of carbolized catgut or silk, with ends cut quite short, substituted. These, as they come away in a day or two, are no source of irritation, and convey a feeling of security to the operator's mind, which the practice of torsion does not. It is a mistake to use so many ligatures; I have seldom,

even in the larger amputations, had to apply more than three; for the smaller arteries, torsion and the application of ice have never failed to arrest hæmorrhage. The subsequent washing of the wound with carbolic lotion blanches the surface completely.

The other point, that of bringing the flaps in all cases together with sutures, I object to for the reasons given in the first part of this paper. It was only after having met with a considerable number of instances where gangrene of a portion of the skin and subjacent tissue of the flaps and of others where grave constitutional disturbance had followed, which could be explained in no other way, that I came to the conclusion that these results were due to the pressure put upon the congested and contused flaps by the sutures. Where sutures are not used there is no occasion to introduce a drainage tube, as there is nothing to prevent the free escape of all fluids, and thus an objectionable foreign body, harmless though it may seem to be, is dispensed with.

In conclusion, a short account of four of the most recent cases treated on the plan advocated will serve to show, not only the success attending it, but the mode of carrying it out.

Case 1.—John E—, æt. 47, admitted into the Royal Southern Hospital on July 12th, 1873, with compound fracture of femur opening into the knee-joint, two scalp wounds, fracture of frontal bone, and fracture of left arm; fell from a ship's bow to the quay, about thirty feet. An attempt was made to save the leg, and for a long time he seemed to go on well, and it was hoped anchylosis of the knee-joint was steadily progressing; but early in September he began to fall off; large abscesses formed on the thigh; a great part of the outer condyle of femur was felt to be bare; he rapidly lost flesh; a bed-sore formed over the coccyx, and in October his state became very precarious. All hope of saving the limb was abandoned; it was even doubtful if amputation would save his life; he had sunk into such a state of blood-poisoning that a sickly, offensive odour emanated from him, and consecutive abscesses in other parts began to appear. As he was willing to submit to the operation, it was thought right to give him the chance, and on October the 16th the thigh was

removed about five inches above the knee-joint. The whole of the soft parts were found infiltrated with pus, and a portion of the femur above the fracture was found bare of periosteum. The flaps, which were of about equal length, were pale and bloodless, and pus oozed out from every part of them. He lost a moderate amount of blood, chiefly venous; three arteries were tied, and the ligatures cut short. The surfaces were well washed with carbolic lotion.

The flaps were not brought together, but the under flap was supported on a pillow with a good layer of cotton wool to rest upon; a covering of the same surrounded the upper flap, and thus the whole stump was imbedded in cotton wool without other dressing. He was very collapsed during the operation; it was even doubtful once or twice whether he would rally, the heart's action every now and then became so feeble. It was some hours before he could be removed from the table. In the course of the evening he became conscious, and was removed to bed, but it was not until the next day that he could speak. Fresh cotton wool was applied every day. The progress of the case need not be told in detail; it was steadily satisfactory, a free discharge of pus continuing from the first. The flaps drew together of themselves, well covering the bone. There was one circumstance which sufficiently showed the ill effects of pressure. On the tenth day I was induced to put three straps of plaster to hold up the lower flap, and facilitate the adhesion between the two. Within a few hours he complained of feverishness, loss of appetite, and not feeling so well; and the day but one after, when I again saw him, a blush of redness was noticed all round the thigh, and the latter had a full, swollen appearance. I removed the plaster at once, relying on the cotton wool alone, and in a few hours these symptoms subsided and he made a good recovery.

Case 2.—James M—, æt. 25, admitted October 4th; compound fracture of right thigh. He had slipped and fallen under the wheels of a moving railway waggon, by which the foot, leg, and lower part of the thigh had been crushed, and merely remained attached by pieces of muscle and skin. He was greatly

collapsed, having lost much blood, and without moving him from the trolly on which he lay, partly on his face, I amputated the thigh a few inches higher up, first securing the artery, and then trimmed the jagged ends of flaps, without removing more of the skin and soft parts than were actually in shreds. Thus a good deal of bruised tissue was left with which to cover the end of the bone. One or two ligatures were applied, and then after a good washing with carbolic lotion the stump was enveloped in cotton wool and comfortably arranged on a pillow. For some hours he lay in a partially unconscious state, after which he slowly rallied.

The cotton wool was daily removed, and fresh applied. There is a little difficulty in doing this, as after the first dressing it is apt to stick in the wound, but with a little care it can be picked off. To prevent decomposition, the outside of the wool was sprinkled with Calvert's carbolic powder. This case did well; none of the bruised skin died, and at the end of six weeks he left the hospital with a stump well covered both by muscle and skin.

Case 3.—Josiah W—, æt. 17, admitted October 21st. Had all the fingers and the thumb of right hand mangled by a circular saw. The skin on the dorsum of the hand was greatly lacerated, much of it having disappeared altogether; the thumb was gone, and the ends of all the metacarpal bones were fractured. The fingers themselves were mere pulps, only the skin on the palmar aspect of the third and fourth being intact. I removed all loose pieces of bone, also the ends of the metacarpal bones, but preserved the skin of the two fingers mentioned, this being the only skin left to cover a portion of the stump, two thirds having no covering but muscle. These two long strips were brought round and laid upon the dorsal aspect as far as they would reach, but no attempt was made to fix them there. The hand was laid upon a splint, and covered with cotton wool. There was no subsequent loss of tissue, not a particle of skin sloughed. After a few days the carbolic oil on lint was substituted for cotton wool, because the latter, adhering to the raw surface, became troublesome to remove. He has recovered, retaining a hand,

certainly without fingers or thumb, but which I have good hopes will prove more useful than none at all. Formerly we should have amputated in such a case at the wrist-joint.

Case 4.—Mary M—, æt. 8, admitted October 5th, 1873. Run over by tramway-omnibus, both arms being torn off, the one close to the shoulder-joint, the other a few inches lower down. The soft parts were much torn and bruised, so that in the amputations which I performed in about two hours after only about three inches of the humerus could be left on the one side, and the head of the bone merely on the other; there was then scarcely sufficient skin left to cover them. It was fully expected that the child could not survive such an injury many hours; the stumps were covered with the cotton wool, and she was placed in a cot. She slowly rallied, soon began to take food, and steadily progressed, making a good recovery. The stumps were dressed daily with cotton wool, the skin gradually closing over them. This poor little cripple, whom we almost wished would die, recovered without an untoward symptom.

In her case, as in the others, with the slight exception mentioned in Case 1, there was no interruption to the steady progress from the first towards convalescence.

Finally, the length of time occupied in the process of cure was not greater in these cases than in those where sutures were formerly used.