Case of traumatic spreading gangrene after severe compound fracture of the leg : for which amputation beneath the trochanters was performed and the arteries secured by four acupressure needles... / by P.D. Handyside.

CASE

OF

TRAUMATIC SPREADING GANGRENE,

AFTER SEVERE COMPOUND FRACTURE OF THE LEG, FOR WHICH AMPUTATION BENEATH THE TROCHANTERS WAS PERFORMED, AND THE ARTERIES SECURED

BY FOUR ACUPRESSURE NEEDLES:

THE FEMORAL ARTERY, AT ITS GIVING OFF THE PROFUNDA BRANCH, WAS RELIEVED FROM PRESSURE

AT THE FORTY-NINTH HOUR

AFTER THE OPERATION: WITH RECOVERY;

AND REMARKS.

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FORMERLY SENIOR ORDINARY SURGEON TO THE ROYAL INFIRMARY.

ILLUSTRATED BY A WOODCUT.

(*Read before the Edinburgh Medico-Chirurgical Society, 7th Nov.* 1860.)

[REPRINTED FROM THE EDINBURGH MEDICAL JOURNAL, DECEMBER 1860.]

CASE

OF

TRAUMATIC SPREADING GANGRENE.

JOHN M'——, aged 14 years, acted as "roadsman" in one of Lord Rosslyn's coal shafts near Dysart. Here is an incline, about 60 yards in length, with a fall of about one foot in every eight, furnished with a double line of rails, along which loaded and unloaded waggons are continually passing and repassing. The loaded waggons go down on the one line and on the other alternately,—let down by means of a rope-chain from the top of the incline to the bottom, where they are shunted to a level line of rails leading to the bottom of the "shaft."

On the 7th of July last, at 6.30 A.M., a loaded waggon, containing fully 7 cwt. of coals, had been despatched from the top of the incline in the customary way; but, when within about 30 yards of the bottom, the connecting ring gave way, and, now unchecked, it ran with increasing impetus down the slope. One of the neighbouring miners, on hearing the unusual noise, called to those below to stand clear of the incline, as something had gone wrong. M'——, instead of occupying his proper seat, about two yards away from the foot of the incline, there to await the due arrival of a full waggon for the purpose of uncoupling it, had been sitting, as was his wont, in the space between the two lines of rail at the foot of the incline. He, now alarmed, started to his feet to escape the danger; but, uncertain on which line the waggon might at this time be coming—the extreme height of the "mining road" being only $3\frac{1}{2}$ feet—he went right in the way of danger, and the loaded waggon ran tilt against him, knocked out his lamp, and carried him, in a vertical posture, for about a yard distance, when it forcibly impacted him against one of the "trees" at the extreme end of the slope.[1] The miners, on hurrying to the spot, found M'—— pinned by the lower projecting ledge of the waggon to the side of the pit so firmly, that the waggon had to be pulled back ere he could be extricated; when he was found insensible, with his left leg severely crushed, and having sustained a considerable loss of blood from the seat of the injury. He was at once taken to the bottom of the pit-shaft, and thence raised to the top, where a cart was procured, in which he was conveyed to his home in Dysart. Dr Todd, surgeon to the

[1] These so-called "trees" are, in general, portions of fir trees, with their branches coarsely lopped off, and set as upright props, a few feet apart, along the sides of the mining-roads, to prevent the roofs from giving way when the coal is being wrought out.

district collieries—to whose kindness, as well as to that of Dr Bonthron, I am indebted for most of the narrative of this case—was at the same time sent for, and at once arrived.

Dr Todd found that, with the exception of an immaterial flesh wound on the left elbow, the injuries received were entirely confined to the left leg, whence there now proceeded only a slight venous oozing. Sickness, and a small, quick pulse, with all the concomitants of severe shock to the system, were present. Examination showed two lacerated wounds in the leg, with compound fracture of both bones, extensive contusion, and ecchymosis of the integuments below the knee. The wound on the inner side of the *tibia* laid bare that bone, extended from about three inches above the inner ankle directly upwards for nearly four inches, having its edges lacerated and everted. The wound on the outer side of the leg was about one inch and a half in extent, but inverted and attenuated, as if caused by the penetration of some projecting body from without. It communicated directly with the *fibula*, and was situated about six inches and a half above the outer ankle, over the margin of the gastrocnemius tendon. Further examination showed that the *tibia* had been fractured very obliquely; and that the *fibula* was broken, but in an obscure manner. In neither case was there any apparent comminution, or much displacement. The soft parts, however, surrounding both wounds were greatly lacerated and destroyed,—at the outer wound, as if a penetrating body had been turned in all directions while within the limb. Pulsation was detected at the ankle-joint, but it was feeble and indistinct; and, "altogether, the appearances seemed," in the words of Dr Todd, "to indicate that the main arteries of the limb, with the nerves, were more or less injured; and that, therefore, the chances of the leg doing well, if put up for re-union, were so small, that primary amputation was both warrantable and necessary."

Under the circumstances, he called in Dr Dewar, of Kirkcaldy, for consultation; when, after mature deliberation, it was resolved that conservative principles should be tried, and that the boy should have the chance of retaining his limb.

Accordingly, four points of interrupted suture were put into the wound over the *tibia*, and two into that over the *fibula;* and the limb was placed in a M'Intyre's splint, so as to admit of the wounds being suitably dressed. The bowels were relieved, and an opiate thereafter given. Towards evening, the patient had slept a little; his countenance was less anxious; tongue dry; pulse stronger, and less rapid; leg swollen.

July 8, 10 A.M.—During the night has been rather restless; skin hot and dry; face somewhat flushed; pain at times very severe; tongue slightly furred in centre, red and clean at edges; thirst; pulse 86, full and strong; leg hot, swollen, and tense; wounds discharging a serous-like fluid—edges thick, red, and everted. 8 P.M.—Countenance more anxious; pulse harder, fuller, and 90; skin as

before; tongue glistening and red; thirst considerable; pain excruciating; patient restless and unmanageable; leg hot, swollen, and red; no discharge from wounds—edges elevated, swollen, and dry; slight tension on the sutures.

July 9, 10 A.M.—Countenance less indicative of pain, but still anxious; patient has slept but little; tongue moist, but furred; skin perspiring freely; thirst less intense; pulse softer, 96; pain much less severe, at times altogether absent; leg swollen, but puffy, mottled, red, and colourless; temperature rather below the normal standard; wounds discharging an offensive briny fluid, edges soft and flabby; gangrene is suspected. 8 P.M.—Pain almost gone; countenance anxious, but of a natural hue; tongue dry and coated; skin as before; thirst constant; pulse 100, and feeble; patient losing strength; mind irritable and unsettled; leg pits slightly on pressure—is colder and mottled—of a darker, almost purplish, colour in some parts; wounds not discharging, their edges are flattened, and of a dark red colour; gangrene evident, and spreading upwards, being already one inch higher than the wound over the tibia.

July 10.—Symptoms of gangrene more marked; pulse 104, getting weaker; patient restless, and losing strength rapidly; tongue brown, and mouth dry; countenance pale and meaningless; skin covered with a clammy perspiration; leg cold, and of a darker purple hue; one phlyctena near the wound over the tibia, beyond which the gangrene has spread 2½ inches upwards in irregular lines.

July 11.—Pulse 106, weak, and irregular; patient considerably weaker; tongue and mouth foul, and more dry; skin clammy; countenance pale and more meaningless; features small and pinched; patient disposed to lie quiet and silent, unless roused; gangrene of leg still spreading, now within two inches of knee-joint, of a purple colour, almost black, with shades of dark green and yellow interspersed; phlyctenæ general; offensive fetor; limb quite cold below line of wounds; patient still feels some pain on firm pressure being made on the gangrenous parts; wounds putrescent and moist; pulsation still distinct in popliteal space; no line of demarcation traceable. A consultation was held between Drs Todd, Dewar, and Bonthron, when it was resolved to amputate above the knee-joint.

July 12.—Gangrene yet spreading, is now within a few lines of knee-joint at advanced parts; physical phenomena in leg more distinctly and intensely marked; pulse rapid, weak, and irregular; respiration heavy and sighing; strength prostrated; mind unsettled, except when roused; speech somewhat inarticulate; countenance pale, and contracted in the features; skin cold, and bedewed with a clammy sweat; putrefaction going on rapidly in the dead limb.

That afternoon I was called in consultation, and met Drs Todd and Bonthron of Dysart, and Dr Dewar of Kirkcaldy, on the question as to whether amputation *at this late period* might save the patient.

I found M'—— with a sunken aspect; tongue dry and furred;

œdematous effusion, with phlyctenæ around the knee; no pulsation in the popliteal, and that in the femoral being 125, and weak. On examining the injured limb under chloroform, the thigh was found, by measurement, one inch thicker than the other, its lymphatics tense, and the inguinal glands much enlarged; yet, after satisfying myself, *first*, that the great cavities seemed free from effusion, and from other untoward effects likely to have followed so serious an accident; *secondly*, that there existed no constitutional contra-indication to the removal of the limb at as near a point as possible to the spreading gangrenous inflammation; and, *thirdly*, as it seemed thus sufficiently clear that the cause of the gangrene was external, and within reach of the knife,—I therefore advised the immediate adoption of amputation high in the thigh. Being asked by these gentlemen to undertake the responsibility of this operation, I accordingly, at 6 P.M., proceeded to remove the limb under chloroform, executing the usual oblique flaps, and sawing the bone just beneath the trochanters, a part of the limb too high for the employment of the tourniquet. Not above ℥iij. of blood were lost; and four needles (improvised for the occasion) sufficed—*one* for the external flap (on the inner surface of which was compressed apparently an ischiatic branch), and *three* for the internal flap (on which were compressed, 1st, the femoral, at the point where it gives off the profunda; 2dly, apparently the obturator; and, 3dly, apparently another ischiatic). (*See the accompanying Woodcut.*) Three or four smaller vessels were subjected to torsion only. After stitching together the flaps, slightly wetted lint was applied to the face of the stump, which was then supported with a roller. On removal to his bed, the patient got a little whisky and water, with two grains of opium.

On examination of the ablated limb, the muscles of the calf were found extensively lacerated, with intervening coagula of blood; the arterial trunks were found obliterated by coagula as high nearly as the ham; and the fractured, bruised, and lacerated parts were the seat of sero-purulent and sanguinolent effusion.

Four hours after the operation, the patient had not slept, though drowsy, and his mind was still wandering; pulse 108, weak, but soft; skin rather hot, but not too dry; tongue moister; complains of very severe pain in the stump, and in his (absent) leg; no trace of hæmorrhage. He had now two additional grains of opium. Shortly after this he went to sleep, and slept very softly all night, awakening only occasionally, when he asked his family to leave his room, and then he again fell over to sleep.

13*th*, 10 A.M.—Pulse 104, and improved; skin more natural; countenance free from anxiety; features soft and pleasant; tongue more moist, still furred, yet cleaning; takes soft food, but without relish; wound free of swelling and tension; femoral artery felt to pulsate to within an inch of its occluding needle.—At 6 P.M. I revisited M'——. Pulse soft, 100, regular; tongue soft, moist, cleaner; appetite returned; asks for bread and milk; skin cool,

moist; excreta natural; has slept since morning; stump soft, cool, of natural colour, less painful. A line of union by the first intention is begun. I removed two of the occluding needles—viz., that from the external flap, and that from the posterior of the three vessels of the internal flap. These two vessels were thus relieved from acupressure on *the twenty-fourth hour* after their occlusion, yet no trace of the slightest sanguineous oozing was perceptible. I simply reapplied the damp lint, and supported the stump by a pillow and a sling towards the abdomen.

14*th*, 10 A.M. (second day).—Has slept well; appetite fair; tongue cleaner, soft, and moist; countenance lively; complains of pain in the enlarged inguinal glands; femoral pulse felt to within one inch of the occluding needle; no oozing from the stump, which is cool and without tension or swelling of any kind.—At 7½ P.M. I saw M'—— for the third time, when I found him anxious and disturbed, on account of pain and tenderness in the enlarged inguinal glands; his skin was rather hot; thirst moderate; pulse 112, though soft and regular; tongue rather dry. His appetite was improved, and he asked for animal food. The stump was free of pain, but the granulations were weak-looking. There was no stain of blood on the dressings. It being now *the forty-ninth hour* after the operation, I removed the two remaining acupressure needles, and this without any apparent effect; ordered a moistened hot sponge to the groin; and prescribed a purgative enema (to be followed, if necessary, by castor oil in the morning), and a draught, consisting of three-fourths of a drop of Fleming's Tincture of Aconite, with a few grains of Epsom Salts and of Cream of Tartar, to be administered every two or three hours while awake.—At 10 P.M. (as reported by Dr Bonthron), the femoral pulsation continues to be felt, as formerly, to within an inch of the point at which it was occluded.

15*th*, 11 A.M.—Face a little flushed; tongue somewhat glistening and patchy; pulse 108; has slept pretty well; diet, which is low, is taken with appetite; stump cool, and looks well; no trace of hæmorrhage. 8 P.M.—Dr Todd wrote to me: "I am happy to say our patient looked somewhat brighter to-day than he did last night. The stump *in statu quo*, and no mottling of the skin; the glands in the groin less tense and painful; pulse 108; tongue not more unpromising, but still glistening and patchy."

16*th*, 10 A.M.—Has been restless, and had several indistinct rigors during the night; pulse 104; tongue moist and cleaning; inguinal glands remain enlarged; stump looks well. Aconite mixture to be taken now only every sixth hour *p.r.n.*

17*th* (fifth day).—Inguinal glands fallen; stump firm and solid, excepting at the centre of the cicatrice, from which, on pressure, there escaped, apparently from the deep femoral glands, about ʒvj. of creamy pus; pulse 104, soft, regular; appetite good; tongue clean and moist. At night the accession of fever that preceded

the escape of pus this morning returned, when a little remaining purulent matter was pressed from the posterior part of the flaps.

18*th*.—Dr Todd writes: "The fever not so high; both wounds discharging a good deal of pus."

19*th* (seventh day).—"Pus very much lessened. He still takes the Aconite mixture, but not so frequently, nor in such large doses."

20*th* (eighth day).—Pulse 106; skin cool; has an appetite and relish for food; ordered an advance in diet; a little pus escapes from the posterior, now the only, opening in the cicatrice.

21*st*.—Stump contracting firmly. Has slept soundly.

22*d*.—Pulse 102, soft and regular; stump looks well.

23*d* (eleventh day).—Pulse 100, stronger.

24*th*.—Pulse 98; tongue clean.

28*th*.—Passed a restless and sleepless night from neuralgia in the stump connected with indigestion. Pulse 100. The stump is improved in appearance.

29*th* (seventeenth day).—Tongue clean; pulse 90; neuralgia gone; appetite good. Ordered some wine daily. Sat up to-day.

30*th*.—Still improving. Towards evening Dr Todd was sent for to see the patient, whom he found in an unaccountably depressed state, thinking himself dying. Pulse 104, very weak and small; tongue dry and furred; states that he has no complaint; stump looks quite well. Additional wine ordered, to be followed in an hour with a full dose of opium. These acted well.

31*st*.—Patient entirely recovered from yesterday's nervous depression. Pulse 90; tongue clean.

Aug. 2 (being twenty-first day after the operation).—I this day visited M'—— for the fourth time, and found him in excellent health. His stump was healed, firm, and of a rounded form; so that I took a plaster cast of it with perfect ease to the patient.[1]

7*th*.—Patient well, and improving daily in strength and bulk. Stump sound and strong. He has since grown fat, and become an adept with the crutches, walking much faster and better, he says, than he could have done with his legs. He is preparing to enter a business establishment.

Upon the foregoing case it may be remarked,—

First, No room exists for any difference in opinion with the respected practitioners whom I met in consultation, who agreed that had the parents of the patient given their consent, *primary* amputation was the wise course to have adopted. That this was a clear case for such a step, both its previous history and the dissection of the removed limb afford ample proof. The condition, however, of the latter,—in which the scalpel laid bare extensive ecchymosis, with

[1] This cast, marked with the points of entrance and exit of the four Acupressure needles employed, is now in the Museum of the Royal College of Surgeons here. The accompanying Woodcut exhibits the points and lines of transfixion of the flaps.

a lacerated and contused state of the muscles of the calf, interspersed with thick coagula that extended as high nearly as the hough, and the obstructed state of the arteries,—renders it exceedingly doubtful whether *primary* amputation, had it been performed *below* the knee, would have been followed by recovery, or, at best, by a recovery unaccompanied by prolonged and exhausting suppurations, and probable sloughings; though it must at the same time be admitted, that in that case the ultimate danger to life would certainly, upon the whole, have proved less than under the spreading gangrene that eventually occurred, and that rendered a more severe operation necessary.

Secondly, We cannot but regard this case, in its ultimate result, as an important addition to Surgical Statistics. Mr Bryant's recent tables of the results of 300 cases of Amputation, collected from the records of Guy's Hospital,[1] exhibit a difference of 15 per cent. between *primary* and *secondary* Traumatic Amputations *through the thigh*, these severally being as 60 to 75 *per cent.* of a fatality,—and of + 4 *per cent. through the leg*, these severally being as 62·5 to 66·66 *per cent.* of a fatality. These tables show, moreover, that Traumatic Amputations of the *Leg* are at least as fatal as those of the *Thigh;* and, as a whole, that *secondary* amputations are more fatal than *primary*.

Thirdly, The limb was so involved in the gangrenous inflammation, that amputation lower down the thigh could not, with any hope of success, have been performed.

Fourthly, The rapid improvement in the condition of the patient immediately on the removal of the source of constitutional irritation by the operation, and by the exhibition of full doses of opium, was immediately seen in the restored sleep, appetite, and mental powers, and more slowly in the state of the pulse.

Fifthly, On the withdrawal of the acupressure needles, no suppurating points, Dr Todd states, presented;[2] and the punctures healed kindly.

Sixthly, Although the profession generally seems, as yet, scarcely prepared to admit the advantages which Dr Simpson seeks to attach to his discovery of Acupressure, yet, in due time, such additional experience will be acquired, that none, I believe, will hesitate in admitting the accuracy of his inductions. From the use that I have made of it in M'——'s case, without having seen the process previously employed on the dead or living body, the performance of Acupressure seems to me to be free from all difficulty. I may add, that the hæmorrhage from the divided vessels was arrested with greater expedition in this way than by ligature; for, in closing the bleeding orifices by needles, I wholly dispensed with an assistant:

[1] *Transactions of the Royal Medico-Chirurgical Society*, vol. xlii., p. 67.

[2] On Acupuncturations of the body, and the absence of all inflammation and its effects, see the *Edinburgh Med. and Surg. Journal*, vol. xxvii., p. 197, as quoted by Dr Simpson in the January number of the *Edin. Medical Journal*, p. 650.

and, in employing needles, I further effected a saving of blood as well as of time. We may hence reasonably conclude that the shock to this patient's system was thereby very probably lessened, and his recovery promoted.

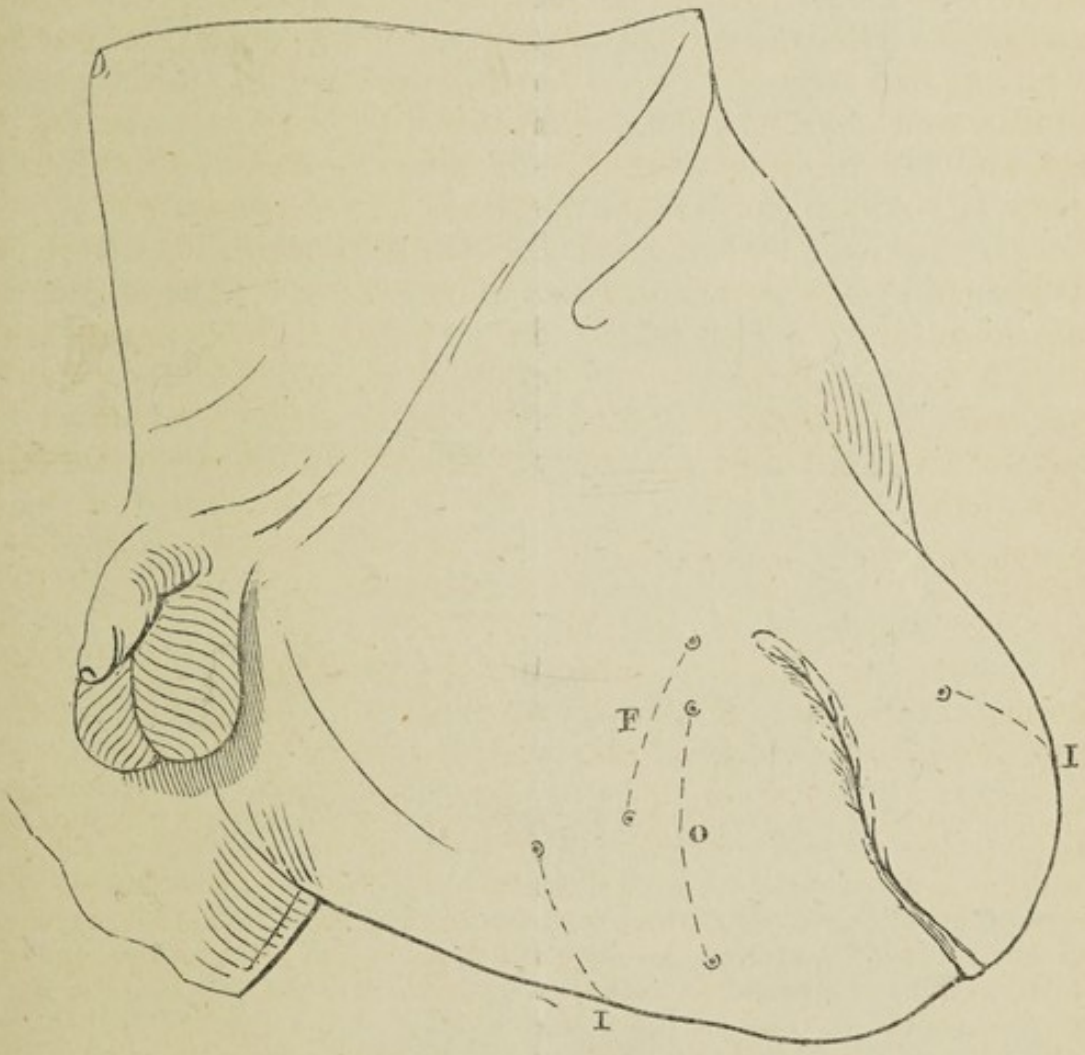
Seventhly, The face of the stump, in this case, seemed to me to close more speedily and kindly than in other cases of amputation equally high up the limb, in which I have had to deal with ligatures and their accompanying arterial sloughs. It may be objected, indeed, that M'——'s case presents no such favourable feature; in so far as, between the fifth and the ninth days after the operation, purulent collections had formed. These, however, seemed due to the previous irritation and swelling in the lymphatics of the upper third of the thigh and the inguinal glands,—the deep probably, as well as the superficial,—dependent on the spreading of the gangrene.

In the words of Dr Todd,—"The line of cicatrization of the flaps was healed by the *first intention*. The two collections of pus were quite separate from each other; the posterior one was deeper seated than the other. Whilst being formed they caused and kept up the fever, which subsided immediately on their being evacuated. To evacuate the pus, I used a bistoury in separating the recent adhesions of the flaps."

EDINBURGH, *7th November* 1860.

I append an Extract from the Proceedings of the Medico-Chirurgical Society, of the above date, as reported in the *Edinburgh Monthly Journal*, vol. vi., p. 571 :—

"*Dr Handyside* had found that the application of the needles was very easily managed; and he saw no difficulty in securing the bleeding vessels alone, and avoiding injurious pressure on the vein or nerve in the neighbourhood of the artery. It was a great advantage that the needles could be withdrawn so soon after an operation; for, in the use of ligatures, there was always some anxiety till the period of their separation; and it was well known that the risk of secondary hæmorrhage was increased by prolonged contact of the ligature with the coats of the artery. But he did not press the adoption of acupressure in place of the ligature: all he asked was, that the Society should suspend their judgment till further experience; and, meanwhile, that they would attach credit to the statements of those who made trial of this new method. It was matter of regret to him that in the Edinburgh Infirmary acupressure had not been practised, while the hospital surgeons of England, France, and America had already made a study of it. Since there was nothing in the proposal contrary to sound pathology, and since no bad results had followed from its employment, he certainly thought that it deserved a fair trial. If the case which he had read had been one of simple traumatic amputation, he believed that the wound would have healed by the first intention; for the suppuration which took place was undoubtedly due to the irritation of the lymphatics, caused by absorption from the gangrenous tissues. As a general rule, he was of opinion that less impediment to healing by the first intention would be offered by acupressure than by ligature of the vessels. At the same time, acupressure was susceptible of improvement. It was unnecessary to use long needles transfixing the flaps, as had been done at first; a short needle with a wire thread attached, by which it could be withdrawn, was all that was required."



Dr Handyside's Case of

ACUPRESSURE IN AMPUTATION

FOR TRAUMATIC SPREADING GANGRENE.