

Contributions to Military Surgery
from
The Siege of Delhi

Instead of writing a thesis on any special medical or surgical subject, which might be merely a recapitulation of the experiences and opinions of others, more or less, with but little if any original matter interpersed, I think that the object in view might be equally well, if not better, attained, and at the same time perhaps some points of interest brought out by narrating my own experiences in military surgery during the siege of Delhi in 1857. I was then young in the service, and, owing to the death of the surgeon and the invaliding of my fellow assistant surgeon both from cholera the very day that the siege commenced, found myself the only medical officer with



my regiment (the 75th). It was the first to take the field after the mutiny broke out, and having had to bear the brunt of the fighting, lost most in officers and second most in men of all the regiments composing the force. This position if it had its troubles, dangers, and hard work, and certainly it lacked none of these, nevertheless had its advantages in making me acquainted with a class of injuries which otherwise I could not have seen, and in giving me opportunities of operating which under the ordinary rules of the service would have fallen to the lot of my lamented senior. In order to appreciate the "situation" more exactly, perhaps I might be pardoned the digression of recalling briefly the circumstances under which the army of Delhi found itself, as these in some measure

were not without their effect on the surgery of it, altho' not to the same degree as was apparent in the causation and progress of diseases coming within the province of the physician. The siege commenced on the 8th of June, and ended with the capture of the city on the 20th Sept., a period embracing the hottest, most trying, and most unhealthy, parts of the year, in that climate. — The place to be taken was of great extent, the walls and bastions surrounded by a deep ditch being 6 or 7 miles in circumference. Its defenders were the flower of the Bengal Native Army, with a well stored first class arsenal at their elbow, and having the country on three sides of them open for the receipt of supplies or reinforcements. The attacking force was numbered by tens to their hundreds, with only one side open to

it for receiving provisions, ammunition &c
 and these had to be drawn from
 distant sources, communication with
 which could only be maintained
 by constant watchfulness, and fre-
 quent fights. In fact until the be-
 ginning of August, or nearly two
 months after the siege was supposed
 to have commenced when reinforcements
 began to arrive, the British force
 was certainly more the besieged
 than the besieging, - and sometimes
 too was hard enough pressed to
 maintain its position and repel
 the numerous and obstinate attacks
 made thereon. This entailed a
 strain on the powers both corporeal
 and mental which under the
 most favorable circumstances could
 not but affect the issues of life
 and death in surgery, - but when
 to these were added the great

heat, the insufficient shelter, & the depressing influence, immediate and remote, of cholera, fever, and dysentery, life among them, it will not be wondered at that cases which under happier auspices would have done well, should have sunk. On the other hand again, some for which under the most favorable conditions a successful result could scarcely have been looked for shewed an amount of vitality truly surprising - the bright streaks in a picture otherwise dark.

The advance of the British force was opposed by the mutineers at Badli ka Sarai about three miles on the Umballa side of Delhi, where they had taken up a strong position on the road and erected batteries. On the 8th of June in storming these, the 75th suffered heavily. Twenty two men and one

officer being killed while 61 men and six officers were wounded, 44 of the former and 2 of the latter so badly as to place them hors de combat.

I thus commenced the siege with my hands full. My usual custom throughout was to accompany the regiment into action, when a man dropped examine his wound as he lay, do only what was absolutely necessary to be done on the spot, and then run to the next one, leaving further details to be done either during a lull in the fight, or after it was over. For the first day or two my wounded were lodged partly in a ruined guard house, and partly in tents, after which I had them moved into a native infantry officers mess house that had escaped comparatively scatheless in the general work of destruction when the mutineers wrecked the can:

:tament. This afforded three large airy
 wards, besides two small rooms, which
 were reserved for wounded officers. Tents
 were also pitched outside the building,
 in which the slighter cases were treated.
 These were fitted up with as much re-
 :gard for the comfort of their inmates
 as the exigencies of active service would
 permit of. At first the patients had to
 lie on the ground, but at a later
 period the majority of them were pro-
 :vided with cots. At intervals during
 the siege the wounded who could bear
 removal were sent to the General Hos-
 :pital at Humboldt about 120 miles dis-
 :tant so as to keep as much spare room
 as possible, and thus provide for any
 sudden accession to the number of
 patients, a most necessary arrangement
 where almost every third day saw
 an action. The camp itself was in
 rear of a rocky ridge, on the other

side of which the ground sloped gently towards the city walls. The soil was of a clayey nature but nearer the ridge it was more gravelly. During the rainy season the camp was frequently one vast sea of mud and water. - There was one great comfort throughout the whole time, and that was, the supplies of food, hospital stores and medicines never once failed, or even fell short.

Wounds.

Of between two and three hundred cases of wounds that came under my care the majority were, of a severe nature, and, inflicted by round shot, shell, grape, and musket balls, with the addition of a few from cutting instruments. In many of them one or more of the three great cavities were involved. As a rule all flesh wounds did remarkably well, and in some cases where from the great destruction

of the soft parts it seemed almost hopeless to attempt to save the limb, the results were most satisfactory. This was particularly the case in wounds of the upper extremity. In illustration I will mention two cases.

Capt. R. Dawson 75th Regt. was wounded at Badli. Kaserai by the bursting of a shell which had fallen in the middle of a square that the regiment had just formed. The belly of the gastrocnemius with the parts covering it from below the popliteal space to within a short distance of the heel were carried away, while the soleus was cut thro', exposing the deeper muscles. There was remarkably little shock apparent, and the only anxiety he expressed was that the doctors should not remove the small portion of leg that the shell had left him, which some of them in consultation had thought was demand.

:ed. However, as the bones were intact and the circulation in the foot well maintained I saw no reason for having recourse to amputation. The result justified my opinion, for altho reduced a good deal by the profuse suppuration he recovered with a useful limb at least compared to what a wooden one would have been; while the risks of the operation were avoided.

Pt David Leckie 75th Regt. was wounded by a portion of the same shell that struck Capt. Dawson. The whole anterior surface of the forearm from the bend of the elbow to within two inches of the wrist was laid open, - the superficial layer of muscles torn away or much lacerated. The radius and ulna were untouched, - the hand was cold and pale, but the radial artery could be felt beating at the wrist. Con:

:ickrable shock was manifest. The
 same reasons that influenced me in the
 preceding case weighed with me in
 this, and I decided on trying to save
 the limb which also had been threatened
 with destruction. On the 17th of July when
 he left with some others for Mumballa
 the wound had contracted to half
 its original dimensions, the healing pro-
 :ess was going on satisfactorily, he could
 move his fingers a little, and his
 general health was good. The same
 principles of treatment obtained in
 both cases viz. Water dressing in the
 earlier stages, succeeded by linseed
 meal poultices, sprinkled with charcoal
 in powder to destroy faeta soon de-
 :oped by the heat, during the sloughing
 of the devitalised tissues, - Nature's powers
 in detaching these being assisted from
 time to time by the scissors. During
 granulation the parts were well supported

and the breach of surface reduced as much as possible by drawing the separated portions nearer to each other by sticking plaster.

While these cases illustrate the great extent of damage done by one form of missile, another will show how sometimes an almost miraculous immunity is observed when a person is struck by one equally, or even more powerful. On the same day the first shot that took effect was on a man close to me who had his leg smashed by a round shot. While putting a tourniquet on him, the next man on my left hand, Corporal Hampton, was caught by another, which struck him in the front of the chest, and turned him right heels over head. I thought of course that he was dead, but to my amazement heard him cry out that he

was "killed" his true, but still ^{found him} ~~alive~~ ^{alive} ~~altho~~
 in a great fright / and who would ~~not~~ have
 been under like circumstances? with a huge
 hole thro' the front of his jacket / a cotton
 drill one / and shirt, - on passing my
 hand along inside of this round to the
 back I found a mine primer shot
 lying snugly cocooned between it and
 his shirt! The appearance of the
 shot in my hand added strength
 to my assurances until at last he
 began to be convinced that he was
not killed! Whether his body in
 describing the operations in the air had
 broken the face of the ball, in a man-
 ner somewhat similar to that in
 which a cricketer breaks the face of
 a cricket ball that he is catching.
 (the only hypothesis I can think of) I can
 not say, - but I vouch for the facts
 stated. - With the exception of some
 chest symptoms which however were

not of any gravity he suffered no bad effects and after a few weeks stay in hospital was able to take his place again in the ranks. By a hard fate however he fell mortally wounded by a ball in the abdomen, in the 'deadly breach' on the day of the assault...

Injuries of the Bones

Gunshot fractures of the femur. Notwithstanding the adverse opinions expressed by Bellingall, Guthrie, Larrey and others to the practice of attempting to save the limb in injuries of this class, I was induced by the discouraging results of amputations of the thigh in the camp generally to adopt it in two instances. The impression they made on my mind was, that carefully selected cases afforded a good prospect of success, while in others, the danger would be less than usually attends primary amputations under the same cir:

circumstances. Lisfranc & Despondan treated one each with success. M. Lomme cured two out of eight, while equally happy results are cited by others. The Indian military furnished fourteen such cases in which the limb had been saved, the one about to be mentioned, among the number.

Privates Edward Collins & William Thompson 75th Regt. were wounded on the 8th and 27th June respectively by musket balls. In each, the missile entered on the outside of the right thigh, fractured the femur, in the former case lodging, in the latter making its exit on the opposite side of the thigh. In both cases the long splint was applied, a portion of the wood corresponding to the point of entrance being cut out so as to allow the wound to be dressed without disturbing it. In Collins' case (the fracture was in the upper third)

the wound healed up, - osseous union took place, and on his arrival at Fort Pitt, Chatham the result was thus noted "July 1858. Wound healed, - ends overlap, - and callus large, - $2\frac{1}{2}$ inches shortening, - "has nevertheless a good useful limb and he walks well. Passed to medical duty 6th Sept. 58. but discharged to pension by Horse Guards order." (Page 390 Army Medical Department reports - Blue book for 1859.) The other man (Thompson) went on very favorably for some time, - callus seemed to have united the broken ends, - no deformity was perceptible, - the wound of exit had closed, while the other had nearly so, in fact everything was so satisfactory that I was looking upon it as a cure. Unfortunately however I was premature in this, as the result will show. About two months after the receipt of the injury, at the earnest

solicitation of the patient who complained of the irksome position the long splint kept him in, it was removed. Two days afterwards while making my morning visit he mentioned that when tossing about in bed the bone had "given way" again. On throwing down the bed clothes I found to my disappointment and disgust that it had given way, indeed, for the bones were seen thro' the soft parts lying at an angle to each other! The splint was re-applied, - but from that time, the case went on from bad to worse, - the old wound broke out afresh, - a profuse & offensive sanguinous discharge took place, - several pieces of the shaft of the femur that had become detached were removed from it, - the appetite and general health which before were good began to fail, - the lower opening took on a stinking action, diarrhoea set in, and he sank

on the 15th Sept^r, eighty days after he received the injury. -

Three other cases of injuries of the bones possess some points of interest. These are 1st. that of P^t. Thomas Dabney aged 38 who in the action of the 8th of June was hit by a grape shot which entered the inner and posterior aspect of the right tibia about an inch above the ankle, and passed out thro' the external malleolus. Water dressing was applied and during the process of healing several pieces of bone came away. Williamson (Military Surgery p. 163) mentions the ultimate result as follows "July 1858. Wound healed, skin adherent to bone, and parts much thickened, ankle joint ankylosed - Considerable loss of bone in both tibia and fibula. November 11th Invalided". 2nd. P^t. George Steptoe was wounded at the assault of Delhi

on the 14th Sept. by a musket ball entering the left tibia immediately below the tubercle, and emerging on the outer side of the upper third of the leg. The usual water dressing was applied. Several pieces of bone at different times came away from both openings. In the Army Medical Reports for 1859 page 311 his condition in April of that year is thus described. "This case may be noticed from the peculiarity of a circular healed cavity at the upper end of the tibia remaining after gunshot perforation of the cancellous head of that bone. This cavity is $1\frac{1}{4}$ inch deep, lined with quasi cuticle, & broad enough to admit a large sized goose quill".

The 3rd is that of P. C. Leigh who was wounded in the forearm by a musket bullet which shattered the ulna in its passage thro' the arm. Several pieces of bone were removed, he made a good recovery. At the same page (op. cit.)

"he is thus alluded to. "Has a most useful
 "arm, altho' there remains an interval of
 "an inch between the fractured ends of the
 "shaft of that bone".-

Wounds of the head.

Simple scalp wounds, of which there were
 four, did well, and erysipelas usually
 dreaded in these cases was never observed.
 When the calvarium and brain were in-
 jured the danger became extreme. Of
 the latter cases (where the brain substance
 was injured) the majority died almost
 immediately, - and only one survived
 until he reached hospital, the bullet
 having passed thro the brain. Of the
 former kind three cases were treated.
 In one of these the external table only
 was fractured by a pistol ball, and re-
 covery took place. In the other two, both
 tables were implicated, and the patients
 went on very well without any head or
 constitutional symptoms, until the 5th day,

when they suddenly fell into a comatose state and died. In neither case was the dura mater torn through. The treatment in all consisted of the removal of the ball and loose spicule of bone, - a piece of wet lint applied to the wound, - shaving the head, & the constant application of cold lotions to it; the bowels were kept well moved by purgatives - the diet was low and as far as possible every source of excitement removed. One of them presented a feature which deserves special notice, inasmuch as it illustrates, what has often been remarked, that a comparatively slight obstruction, will sometimes modify in a remarkable degree, the course of the ball. The men wore cap covers made of American drill (cotton) & these projected beyond the caps and all round them, to afford shelter from the sun; - in this case the ball struck the cap cover in front, carried it in a secular form thro both tables

of the skull, making a hole therein just as if it had been punched, and remained there fixed so that in order to remove it, considerable tractive force had to be exerted, by dragging on the cap cover. The cloth left its impress on the bullet which accompanies this, and can be retained for the surgical museum of the university if thought a sufficiently interesting object to occupy a place there.

Penetrating wounds of the Thorax.

Of this most important class of injuries thirteen cases came under my care. Two of them were caused by grape shot, and eleven by musket balls; in four of the latter lodging, & in two complicated with injury of the shoulder joint. Ten proved fatal; the other three recovered altho' in each case the lung was involved and the ribs fractured. In one of them the ball lodged; and in another there was the additional complication, of an opening

into the oesophagus.

One was that of a bandsman, Thomas Johnstone, who was wounded by a musket ball entering the chest to the left & below the manubrium of the sternum. The ball lodged. I saw him a year afterwards, when he was doing his regular duty in the ranks, and in excellent health.

The second case was that of P^t James Moore 21 years of age, of middle stature and ordinary muscular development, who was wounded on the 18th of July, in one of the numerous actions outside of Delhi. He was struck by a musket ball, which entered the chest from $1\frac{1}{2}$ to 2 inches below and a little internal to the left mammilla, - passed backwards and outwards through the lung, and after a course of about seven inches, made its exit behind. Considerable hæmorrhage took place at the time, air bubbled from the wounds, & mouthfuls

of blood were brought up with coughing. The apex of the heart, caused the inner edge of the wound of entrance, to move with each pulsation. The respiration was hurried, and attended with much difficulty; he had a constant feeling of impending suffocation. Blueness of the face and lips were seen, while the countenance generally was expressive of great anxiety. A bit of lint kept in situ by sticking plaster was placed over each wound, and a broad bandage applied pretty tightly round the chest. For the first few days, the dyspnoea and cough were very distressing symptoms, but soon improvement followed; the wounds healed kindly, & altho subsequently, abscesses formed near them, and many fragments of rib were detached, yet he made a good recovery. In July 1858 - a year afterwards his state is thus described in Williamson's Military Surgery,

Page 89. "The wound is quite sound
 "but tender to touch along the whole
 "track. Percussion in immediate neigh-
 "bourhood of wound is dull, and respiratory
 "murmur not very audible. He is stout
 "and in excellent health".

The other case was one implicating
 the thoracic portion of the esophagus,
 a lesion the rarity of which may be
 judged of from the fact that out of
 8715 cases of penetrating wounds of the
 thorax that occurred in the Northern
 Army of the United States of America
 during their conflict with the Southern
 :ers. a war which perhaps is without
 parallel in the number of well au-
 :thenticated, and recorded, cases of gun-
 :shot wounds that it produced, and the
 statistics of which have been prepared
 with great care, only one of this nature
 was observed. In it, there was laceration,
 but no perforation, and it proved fatal.

(See Medical and Surgical history of the war of the Rebellion - Part First - Pages 536 & 606). Baudens (clinique des plaies d'armes à feu Paris 1836. p. 249) mentions a similar case, but also, fatal. - Boyer (Traité de mal chir. l. c. T. II. p. 606 gives an instance of recovery after a bayonet wound of the esophagus but in it the destruction of the parts would necessarily be less than was the case in the one presently to be noticed in which the missile was a grape shot.

Corporal Charles Greenfield, 75th Regt. of middle stature and rather weakly habit of body, was wounded in the action of Bad Lie-Sorai, on the 8th of June 1857 by a discharge of grape. A ball weighing four ounces, entered the thorax, a short way under the left clavicle, thro' the anterior fold of the axilla, & passing downwards, back.

wards, and inwards, stopped under the integuments on the left side of the spinous process of the tenth dorsal vertebra, from which situation ^{it was removed} by excision.

A good deal of hemorrhage occurred at the time, and he was suffering much from shock. The face was pale, anxious, and bathed in cold perspiration. The respiration was quick and gasping, - he had frequent and distressing fits of coughing, after which he expectorated quantities of frothy blood. At each respiratory act, bubbles of air were forced thro' the upper wound. - Pladgets of lint, wetted with water, were applied to both wounds, - the edges of the posterior one being first brought together with sutures. The patient was supported in a half sitting posture, the recumbent one being quite intolerable. When the shock had passed off, and reaction

set in, tartar emetic, in nauseating doses, was administered, so as to prevent its becoming excessive. This was found to relieve the urgent symptoms very much. During the first week, dyspnoea was the most distressing of these, but after that period, steady amelioration ensued. The wounds looked healthy, but union by the "first intention", of the posterior one, which was hoped for, was prevented by the escape of portions of his food, during the act of deglutition, indicating that the oesophagus had been opened into; - This continued until the wound healed by granulation. By the 1st of July he had recovered sufficiently to permit of his being sent to Umballa along with some other ineffectives. He there regained his health, but was easily put out of breath when he

exerted himself in any way, and on
 that account and from not having
 the proper use of the left arm he
 was subsequently invalided to England.
 The further history of the case is
 supplied by Dr. Williamson at pages 82
 and 83 of his *Military Surgery*. "April 12th.
 "1858. The external wounds have healed
 "but he suffers much from pain in
 "the side with a little cough and
 "much purulent expectoration. On ex-
 "amination there is dulness on percussion
 "and occasional moist râles, but
 "these have existed for some time &
 "are gradually diminishing, - the pain
 "is evidently muscular and has been treat-
 "ed as such with relief. 27th April.
 "On examining his lung, there is still
 "at the spot above noticed the same
 "dulness on percussion and increase
 "of vocal resonance. He is free from
 "cough, and the position of the physical

"signs just mentioned, correspond with
 "the course of the shot, thro' his lungs.
 "30th. Had an attack of pneumonia,
 "of lower lobe of left lung. June 1st
 "he vomited from the effects of anti-
 "mony, which he is taking, ^{this is worthy of notice,} on account
 "of the oesophagus having been wound-
 "ed. 5th. Quite well - - - August
 "26th. Modified duty". At page 91 in
 a chapter on wounds of the diaphragm
 Dr. W. again alludes to this case in
 these terms "There is every reason to
 "suppose, that the diaphragm was
 "wounded, on the left side, as the
 "wound in the chest, was so low, that
 "it was difficult to say, whether, the
 "food passed out from the oesophagus,
 "or from the stomach. just at its en-
 "trance". But Dr. Williamson wrote this
 in ignorance of the early history of
 the case. If he had been in possession
 of the whole facts, he would have seen,

that it was only, during the act of deglutition, that the food had escaped, a fact that negates his hypothesis. Again, he seems to have assumed, that the opening in the alimentary canal, must have corresponded, with the external wound. A natural assumption, if the line of direction of the ball, had been, from before, backwards, - but when it was in reality, one, not very far off the perpendicular, the oesophagus, must of necessity, have been impinged against, some distance above the level of the external opening.

The principle of treatment was the same in all the cases. If the ball lodged, and could not be traced by the little finger, inserted into the wound, further attempts at following it were desisted from, as being sure to add to the dangers, while the chance of finding it was infinitesimally small.

Wet lint was applied to the wounds, - the respiratory movements restrained somewhat, by the application of a broad bandage round the chest, perfect rest was enjoined; and during the stage of reaction nauseating doses of antimony given. Impressed with the conviction that in such a depressing climate as India, people require all the blood they possess, and can ill afford to lose it under any circumstances, I diverged from the beaten track so sedulously trod by the older surgeons up to, and during a portion of, the Crimean war, when the first formal protest against the practice ^{of blood-letting} was made by Dr. Patrick Fraser, but of whose observations at the time I was in ignorance, I eschewed venesection in such cases. The practice pursued by me, was, in the main, expectant - a practice which I am glad to see

was the prevailing one, in both the Union, and Confederate armies, - for out of the truly enormous total, which they presented, of cases in which the lung was wounded, only five cases were fatal, and the results shewed an average mortality of only 62 per cent, against 79 of the British hospitals in the Crimean campaign. (Medical & Surgical History of the War of the Rebellion Part First, pages 602 & 606). Attempts have been made to classify the cases according to the organs wounded, but all statistics that have yet been obtained bearing on this question are incomplete. In the first place, it is well known that a large proportion of the cases of wounds of the thorax never reach the hospitals at all, but die, and are buried on the field. Therefore in order to secure an approximation to accuracy, in arriving at the rate of mortality, these

would fall to be added to the number of cases treated, - but this has never been done in any campaign hitherto. Again, for purposes of accurate comparison, the total thus obtained would require to be subdivided according to the vital parts implicated; The facts necessary for such a classification, could be obtained in fatal cases, if time allowed (which in warfare seldom happens), - but not so where the patients survive, from the difficulty attending the investigation, owing to the eccentric course frequently taken by the ball.

Penetrating wounds of the abdomen next in point of numbers, if not in importance, may be reckoned, penetrating wounds of the abdomen, of which six came under my care. Five were caused by musket balls and the other by a portion of a shell. All proved fatal. One case is sufficiently interesting

to warrant more than a passing notice. Private James Hennessey, Aged 28 was wounded on the 23rd of July by a musket ball which entered the abdomen about two inches to the left and below the umbilicus, traversed the abdominal cavity, passed thro' the ala of the left ilium about an inch below the centre of the crest, and was seen in this situation lying under the integuments, whence I removed it by incision. A portion of intestine and omentum protruded from the wound of entrance, but no difficulty was experienced in reducing them. Considerable shock was manifested, the countenance was pale and anxious, the pulse small and weak, altho there was but little hemorrhage. The edges of the posterior wound were drawn together, to try and induce union by the first intention. A pad of lint was

applied over the anterior one, and this
 was retained in position by a bandage
~~applied~~ round the abdomen. He soon
 recovered from the shock, and felt com-
 paratively easy. He was kept on the
 strictest regimen, which want of appe-
 tite, made it the less irksome, ^{or hurt} to con-
 form to. For the first week he went
 on very well; - had little or no con-
 stitutional symptoms, - no pain or tender-
 ness over the abdomen, nor did the
 pressure of the bandage cause discomfort,
 he had free passage of his bowels, and
 the wounds looked as well as could be
 desired. Then fecal matter, began to
 be mixed with the pus, discharged
 from both wounds, and this increased,
 until two artificial ones became
 fully established, - while at the same
 time he continued to pass his feces
 by the natural one as well. Notwith-
 standing this state of matters, his appetite

improved, and he went on without a single bad symptom until the 4th of August (the 15th day) when he began to complain of abdominal tenderness, with heat of skin and quickened pulse, were at the same time observed, whereupon leeches were applied and calomel and opium administered at frequent intervals. Towards the afternoon, he complained that the bandage caused him pain, and on removing it, a large diffuse swelling was seen, extending from the anterior wound, to as low as Poupart's Ligament. On taking off the pad of lint, a large quantity of sero-sanguineous fluid, which had formed the swelling, escaped. He rapidly got worse, & sank on the 8th of August, or sixteen days after receipt of the injury.

The Ball, which presents a curious jagged appearance, with small spiculae

of bone adhering to it, accompanies this, and is also tendered for acceptance, in the University surgical museum.

Secondary hæmorrhage

As only one case occurred it is here given in extenso. Private Patrick Callan, was wounded at the assault, on the 14th of September. A musket ball struck him in the forearm, entering it about three inches above the wrist, on the radial side, traversing the limb in an upward, & inward, direction for about $3\frac{1}{2}$ inches, when it passed out. Some hæmorrhage took place at the time, but compresses of lint easily restrained it. Everything went on well, until the afternoon of the 20th, when arterial blood began to escape, from the lower opening, on the bandage being tightened, this stopped.

About midnight, it broke out afresh, whereupon the wound was exposed, and

the compress readjusted. No more bleeding took place, until next morning, when arterial blood, was observed coming from the upper opening. A graduated compress, the hint of which it was formed, being first soaked in Dr. Ferri's quickl., was applied to it. Fearing, that the cessation of the bleeding, might only be again temporary, I decided on enlarging the lower opening, and searching for the source of it; As the blood first began to flow from this I thought that it most likely proceeded from the distal end of the radial artery; and the tying of the brachial, at first thought of, was abandoned. An incision, was accordingly made, in the long axis of the radius, coagula cleared out, and with a little dissection, the bleeding point was reached, and, as surmised, was found to be, the distal extremity of the radial. This was secured by ligature, no more

hemorrhage occurred, and the case did well...

Operations

Lower extremities. From what has already been said, when on the subject of gunshot fractures of the femur, it will be anticipated, that the results, in amputations of the thigh, were not satisfactory. In the 75th Regiment, there were six primary amputations of the thigh, by the flap operation; three, of the lower; two, of the middle; and, one, at the upper third - in the latter case, the femur had to be sawn thro' at its surgical neck.

Of this number, four died between the 2nd and 3rd days; The fifth case was doing well, & the stump healing, when the patient was attacked with dysentery, and died, nearly two months after the operation; The sixth case, made a good recovery.. Amputation

at the ankle joint, (Syme's operation), was had recourse to in two cases. One recovered, with an excellent stump; in the other, sloughing of the posterior flap took place.

Upper extremity. Two amputations at the shoulder joint, were performed. In one of these, the soft parts were so destroyed, by the passage of two grape shots thro' them, that I had to be satisfied with a single flap, (an upper one) making a corresponding breach of surface in the thoracic portion of the axilla to which the flap was attached by sutures. Union took place throughout almost the whole length of the incisions, and he recovered with an excellent stump. The other case, also, made a very satisfactory recovery, as did also, the amputations of the upper and fore arms respectively of which there was one each. Amputation of the fingers and toes of which there were

a good many, did well.

Excision of the elbow joint. (Jaguer's operation) was performed in one instance. Corporal John M. C. Donald, was shot thro' the elbow joint, on the 15th of June by a musket ball, when an H incision was made in the usual manner, and the broken ends of the bones sawn across; The extent of the comminution necessitated the removal of unusually large portions of them. The sawn ends were put in apposition, and the wound closed by sutures. Owing to the transverse incision not uniting, the process of cure was somewhat tardy, still in the long run he possessed an arm that was of some use to him, while he escaped the extra risks of amputation. His case is thus alluded to in Williamson's Military Surgery (Page 226) "July 20th 1858 "Wound healed, - arm in an extended position, and can only be slightly

"bent; he can open the little and ring fingers; the arm is about three inches shorter than the right. Sept. 8th. Sent to modified duty."

General & Concluding Remarks.

A troublesome complication, in the progress of the gunshot wounds, at Delhi, was created, by the presence of the myriads of flies, which evil, amounted almost to a pest. These caused the development, of larvae in the wounds, with extraordinary rapidity, and often despite every precaution taken against them. Once established, it was most difficult to dislodge them, as they used to retreat up the track of the ball, when their extraction was attempted. After trying many plans, I found that the most effectual were both, for, preventing their development, and, getting rid of them when they were there, was to attach little bits of camphor to pieces of sticking

plaster stretched across the openings.
 Another circumstance worth mentioning
 is that among the numerous wounded
 (between two and three hundred) that
 came under my care there was
 not one case of erysipelas or hos:
 pital gangrene.

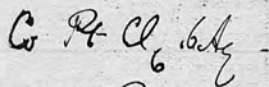
Certificate

I certify that the paper above
 written has been composed by
 myself.

J. A. Lithgow
 Surgeon Major 79th Highlanders

Edinburgh Castle
 29th April 1886.

Analyses



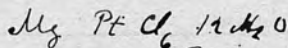
Pt

Found 34.2. 34.3. Calculated

H_2O

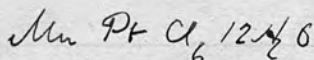
19.3

18.68



Found 28.14.

30.4 Calculated.



Pt

Found I 29.8. 29.03. Calculated

II 29.07.

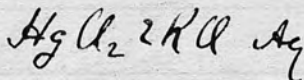


Pt

33.10

33.31

33.90 Calculated. $\text{H}_2\text{O} @ 195^\circ$ Found 17.86% 18.47 Calculated



Found HCl 33.63

HgCl 60.04

H_2O 5.95

99.62

Some HgCl_2 evaporated with the water.



1
Wt of Salt 1.086

Flask + oil + salt 18.9839
Flask + salt 11.4982
7.4857
7.7992

.3135 = oil displaced

$$\frac{1.086}{.3135} \times .8089 = 2.802$$

2
Wt of salt 1.7947

19.5374
12.2534
7.284
7.8018
5178

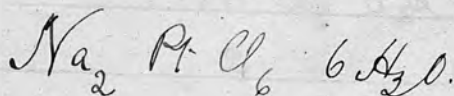
$$\frac{1.7947}{.5178} \times .8089 = 2.803$$

3
Wt of Salt 1.3913

19.2454
11.85
7.3954
7.7992
.4038

$$\frac{1.3913}{.4038} \times .8089 = 2.786$$

Former Expt 2.752



1
Wt of Salt 1.232

Flask + oil + salt 19.0545
11.6453
7.409
7.7992
.3902

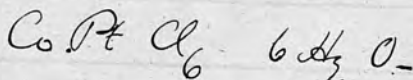
$$\frac{1.232}{.3902} \times .8089 = 2.5494$$

2

1.7020

19.3724
12.1142
7.2582
7.7992
5410

$$\frac{1.7020}{.5410} \times .8089 = 2.545$$



1
Wt of Salt 1.8991

19.598
12.3576
7.2404
7.8000
.5596

$$\frac{1.8991}{.5596} \times .8089 = 2.745$$

2
1.6693

19.4436
12.1278
7.3158
7.8000
.4842

$$\frac{1.6693}{.4842} \times .8089 = 2.789$$

3

1.2635

19.0994
11.6747
7.4247
7.7992
.3645

recrystallized

$$\frac{1.2635}{.3645} \times .8089 = 2.756$$

Former Expt 2.838



1

2

3

Salt

1.2640 gm

1.3195 gm

.1128 gm

$$\begin{array}{r} 18.9830 \\ 11.6775 \\ \hline 7.3055 \\ 7.8000 \\ \hline 1.4945 \end{array}$$

$$\begin{array}{r} 19.0175 \\ 10.0175 \\ \hline 11.7317 \\ 7.2858 \\ \hline 7.7992 \\ .5134 \end{array}$$

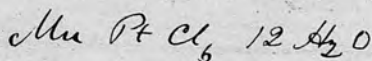
$$\begin{array}{r} 18.3573 \\ 10.5728 \\ \hline 7.7845 \\ 7.8289 \\ \hline .444 \end{array}$$

$$\frac{12640}{4945} \times 8089 = 2.042$$

$$\frac{13195}{5134} \times 8089 = 2.078$$

$$\frac{.1128 \times 812}{.044} = 2.061$$

Former Expt 20



1

2

Salt

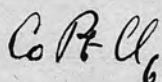
1.5848 gm

Salt .683 gm

$$\begin{array}{r} 19.3134 \\ 11.9983 \\ \hline 7.3151 \\ 7.7992 \\ \hline 4841 \end{array}$$

$$\begin{array}{r} 18.7620 \\ 11.1437 \\ \hline 7.6183 \\ 7.8289 \\ \hline 2106 \end{array}$$

$$\frac{15848}{4841} \times 8089 = 2.648 \quad \frac{.683}{2106} \times 812 = 2.634$$



Salt 1.1567

Salt 1.4021

$$\begin{array}{r} 19.1242 \\ 17.5695 \\ \hline 7.5548 \\ 7.7992 \\ \hline 2444 \end{array}$$

$$\begin{array}{r} 19.3202 \\ 17.8143 \\ \hline 7.5059 \\ 7.7992 \\ \hline 2933 \end{array}$$

$$\frac{11567}{2444} \times 8089 = 3.825$$

$$\frac{14021}{2933} \times 8089 = 3.866$$



3.485 Former Expt
3.50 20

Zn Pt Cl₆

Salt: .9608

Salt: 1.0441

$$\begin{array}{r} 18.98 \\ 11.373 \\ \hline 7.607 \\ 7.7992 \\ \hline .1922 \end{array}$$

$$\begin{array}{r} 19.0485 \\ 11.4563 \\ \hline 7.5922 \\ 7.7992 \\ \hline .2070 \end{array}$$

$$\frac{.9608}{.1922} \times 8089 = 4.044$$

$$\frac{1.0441}{.2070} \times 8089 = 4.076$$

Na Pt Cl₆

Salt 1.5365

Salt 1.4373

$$\begin{array}{r} 19.393 \\ 14.9492 \\ \hline 7.4438 \\ 7.8000 \\ \hline .3562 \end{array}$$

$$\begin{array}{r} 19.3238 \\ 11.8495 \\ \hline 7.4743 \\ 7.7992 \\ \hline .3249 \end{array}$$

$$\frac{1.5365}{.3562} \times 8089 = 3.489$$

$$\frac{1.4373}{.3249} \times 8089 = 3.578$$

Mg Pt Cl₆ 6H₂O

Salt 1.9737

Salt 1.4926

$$\begin{array}{r} 19.6156 \\ 12.4422 \\ \hline 7.1734 \\ 7.8000 \\ \hline .6266 \end{array}$$

$$\begin{array}{r} 19.2763 \\ 11.9511 \\ \hline 7.3252 \\ 7.8000 \\ \hline .4738 \end{array}$$

$$\frac{1.9737}{.6266} \times 8089 = 2.548$$

$$\frac{1.4926}{.4738} \times 8089 = 2.543$$

Former Exp 2.57

Mg Pt Cl₆ . ~~6H₂O~~

Salt 1.3157

$$\begin{array}{r} 19.155 \\ 11.7279 \\ \hline 7.4271 \\ 7.7992 \\ \hline .3721 \end{array}$$

$$\frac{1.3157}{.3721} \times 8089 = 2.833$$

Mu P + Cl₆

1.4253

19.3144
11.8375

7.4769
7.7992

3223

$$\frac{14253}{3223} \times 8089 = 3580$$

~~15848~~ Salt .879

~~193134~~
18.8987
11.2912

7.6045
7.7992

.1947

$$\frac{.879}{.1947} \times 8089 = 3651$$

2 KCl. CuCl₂. 2 Ag

Salt . 2.9837

20.2183
13.4422

6.7761
7.8018

1.0257 | 2.9837 (

$$\frac{29837}{10257} \times 8089 = 2353$$

2 KCl CuCl₂

Salt 2.1978

19.7137
12.6562

7.0574
7.7995

.3401

$$\frac{21978}{3401} \times 8089 = 2402$$

former exp 2.451

Salt 3.6727

20.6676
14.1312

6.5358
7.7975

1.2617

$$\frac{36727}{12617} \times 8089 = 2353$$

HgCl₂. 2 KCl

~~16684~~ .9781
18.9528
11.3903

7.5625
7.7995

.2367

$$\frac{16634}{3975} \times 8089 = 233$$

$$\frac{.9781}{.2367} \times 8089 = 3340$$

2nd exp 3.336

Ag Cl₂ 2nd cell Ag.

Salt 1.425

$$\begin{array}{r} 19.2943 \\ 11.8373 \\ \hline 7.4570 \\ 7.7992 \\ \hline 3422 \end{array}$$

$$\frac{1425}{3422} \times 8089 = 3.368$$

Formu. Expt 3.365

Salt 3.316

$$\begin{array}{r} 20.7749 \\ 13.7745 \\ \hline 7.0004 \\ 7.7982 \\ \hline .7978 \end{array}$$

$$\frac{3.316}{.7978} \times 8089 = 3.361$$

Pt Cl₄

1.2218

$$\begin{array}{r} 19.1167 \\ 14.6421 \\ \hline 7.4747 \\ 7.7992 \\ \hline 3545 \end{array}$$

$$\frac{1.2218}{3545} \times 8089 = 2.947$$

$$\begin{array}{r} \text{Formu. Expt } 2.964 \\ 911 \\ \hline 955 \end{array}$$