

ticles. It is, strictly speaking, incipient bone; a newly formed structure, which will in part become bone, in part pass through other changes, degenerating into pus. It is simply a young structure, the future course of which will be determined by the influences to which it is exposed. So, surely, with the soft tissue formed in or on bone under other circumstances. It cannot be old material left behind, for this could never last. It is altogether a new structure, undergoing changes more or less divergent from those through which bone is normally formed. It may, indeed, very probably become bone; but there are no better grounds for regarding it as the remains of what was once bone than there are for a similar view of the periosteum or medulla.

Mr. Goodsir thus describes the process of exfoliation:—"When a portion of dead or dying bone is about to be separated from the living, the process which occurs is essentially the same as that which has been described [i. e., the progressive ulceration of soft parts]. The Haversian canals, which immediately bound the dead or dying bone, are enlarged contemporaneously with the filling of their cavities with a cellular growth. As this proceeds, contiguous canals are thrown into one another. At last the dead or dying bone is connected to the living by the cellular mass alone. It is now loose, and has become so in consequence of the cellular layer, which surrounds it, presenting a free surface and throwing off pus." It has been said: "This statement is of especial interest, as a confirmation of the accuracy of Hunter's view of the subject, obtained without the advantages enjoyed by the modern microscopic observer. The remark of Mr. Goodsir, that the dead bone, in the later stage of its exfoliation, is connected with the living bone by a cellular mass alone, corresponds with the representation of Hunter, that the process of exfoliation commences with the absorption of the earthy matter in the living bone contiguous to the dead bone." But is not the enlargement of the Haversian canals, so that they are at length thrown into one another, and the filling of their cavities contemporaneously with a "cellular growth," evidence, not merely of the absorption of earthy matter, but of the simultaneous removal of the old, and the production of a new tissue, a portion of which may at length pass into bone, but the surface of which degenerates into pus?

In caries, then, the normal nutrition of bone is no longer maintained. The fresh material which is to supply the place of the old is not converted into bone, but undergoes other changes: it degenerates. Its physical and chemical characters are changed. It remains soft, and does not yield an abundance of lime salts. More or less of it undergoes farther changes; still degenerating, it passes into pus. The abnormal substance which is found in carious bone varies in its characters according to the kind and degree of degeneration it has undergone, presenting either a cellular structure, as granulation or pus, or little more than fragments of disintegrating tissue with molecules and globules of oil.

The character of an ulcer of bone, like that of soft parts, may generally be diagnosed from its appearance, and still better from a careful examination of it. The healthy granulation substance of a healing ulcer—bright, florid, soft like velvet, vascular, bleeding upon the slightest violence, and sensitive, with healthy pus on the surface, and sound bone immediately underneath—contrasts strongly enough with the surface of a carious ulcer, which is of a dull dusky colour, with a rough and irregular surface, or more or less craggy, with minute spicula of disintegrating bone scattered throughout: in the more chronic forms almost dry upon the surface; in the more acute stages discharging a fluid which is for the most part ill-formed, decomposing pus, mingled with more or less blood and oil and the debris of disintegrating tissue; while, in either case, for some distance beneath the surface the bone is evidently unsound. It readily breaks down under pressure, or can be penetrated by a probe. A more minute examination yields evidence of rapid degeneration, such as the breaking up of the osseous tissue and the presence of an abundance of free oil.

(To be concluded.)

ADDENBROOKE'S HOSPITAL, CAMBRIDGE.—At the Quarterly Court of Governors of Addenbrooke's Hospital held on Monday last, Lord Hardwicke in the chair, the question of adopting Dr. Humphry's plan with regard to the erection of a new hospital was again discussed; and it was eventually agreed to refer the matter to the Committee for them to obtain from Mr. Wyatt a specification and working drawings, and then to apply to four substantial contractors for tenders as to the cost. A special meeting will be called to consider the subject.

REMARKS ON THE
RECENTLY PROPOSED AMERICAN PLAN
OF
TREATING GUNSHOT WOUNDS OF THE
CHEST BY "HERMETICALLY SEALING."*

By DEPUTY INSPECTOR-GENERAL T. LONGMORE,
PROFESSOR OF MILITARY SURGERY, ARMY MEDICAL SCHOOL.

A PLAN of treating chest wounds has been lately brought to notice in the *American Medical Times*† by Dr. B. Howard, of the United States Army, which is called by its author the "treatment by hermetically sealing;" and the editor states it to be understood that at the next engagement of the army of the Potomac an hospital is to be organized, under charge of Dr. Howard, for the sole purpose of treating gunshot wounds of the chest by the sealing process. Dr. Howard advocates the propriety of this treatment for all penetrating wounds of the chest by gunshot. He also describes it to be applicable to penetrating wounds of the abdomen, whether made by gunshot or stabbing instruments.

The following is a description, in Dr. Howard's own words, of the manner in which the operation of hermetically sealing is to be practised:—

"All accessible foreign bodies having been removed, introduce the point of a sharp-pointed bistoury perpendicularly to the surface just beyond the contused portion, and, with a sawing motion, pare the entire circumference of the wound, converting it into a simple incised wound of an elliptical form. Dissect away all the injured parts down to the ribs, then bring the edges of the wound together with silver sutures, deeply inserted, at not more than a quarter of an inch apart; secure them by twisting the ends, which are then cut off short and turned down out of the way. Carefully dry the surface, and with a camel's-hair pencil apply a free coating of collodion over the wound; let it dry, and repeat it at discretion.

"For greater security, shreds of charpie may now be arranged crosswise over the wound, after the manner of warp and woof; saturate it with collodion, and when dry repeat the process, until the wound is securely cemented over. As a still greater protection, a dossil of lint may then be placed over the part and retained with adhesive straps.

"If there be a tendency to undue heat in the part, it may be kept down with cold affusion; should any loosening of the dressing occur, an additional coating of collodion may be applied. The sutures must not be removed until healing by first intention is complete.

"Should suppuration occur, so as to occasion distressing dyspnoea, proceed to treat it in all respects as a case of empyema, introducing the trocar at the most dependent point, and taking special care to avoid the admission of air."

Dr. Howard describes particularly three advantages which are gained by this perfect closure of the wound. 1st. Hæmorrhage is controlled. At the worst, he says, the amount of blood lost after the operation cannot be more than would suffice to fill up the unoccupied space remaining in the pleural cavity; the elastic clot resulting furnishing a styptic *par excellence* for the wounded vessels of the yielding lung. 2nd. Dyspnoea is immediately relieved upon removal of the atmospheric pressure. 3rd. Suppuration, if not prevented, is greatly diminished by shutting out the constantly renewed currents of atmospheric air, and its character is very favourably modified. "Indeed, if the wound were closed soon enough," says Dr. Howard, "I deem it possible that the slough of the track through the lung, with the limited amount of attendant pus, might be entirely disposed of by absorption and expectoration."

As a proof of the successful results of the sealing plan of treatment, Dr. Howard mentions that some cases upon which he operated were six days in the ambulances before reaching a general hospital, part of the road travelled over being of the worst description: on the fifth day all but one of these so treated were able to walk comfortably.

In considering the proposed treatment, what first attracts

* Being part of a Lecture delivered at the Army Medical School on the 16th of December, 1863.

† "Treatment of Gunshot and Penetrating Wounds of Chest and Abdomen by Hermetically Sealing." By B. Howard M.D., Assist.-Surg. U.S.A., Surgeon in chief, Artillery Brigade, Fifth Corps, Army of the Potomac. Camp on Rappahannock, Va., Sept. 14th, 1863. In a communication to the *American Medical Times*, No. 14, vol. vii., p. 156.

notice is the absence of any limitations in its application, and the assumption that healing of the wound by the first intention can be secured in all such cases. It is the unqualified manner in which this plan of treatment is put forth that makes me think it important to notice it; for if put into practice as described, I feel certain it must lead not only to much disappointment, but occasionally do considerable harm. The wounds of the chest to which it is to be applied are simply designated "penetrating wounds;" but it is obvious from Dr. Howard's remarks that he includes perforating wounds, and indeed all wounds in which the cavity of the chest is opened by gunshot, with or without wound of the lung. As I have already explained, the variations which are constantly found in the accompanying circumstances of a number of wounds of the chest by gunshot involve corresponding variations in their degrees of gravity and probable issues. The difference between an ordinary penetrating wound by gunshot, and a perforating one, is immense: in the one case the projectile is probably lodged; in the other it has passed out. Again, in either a penetrating or a perforating wound most important differences arise in the nature of the injury and the effects of the treatment, according as the lung is penetrated or not; and serious differences also depend upon the part of the lung penetrated or traversed by the ball. All these circumstances should be noted and taken into account in estimating the value of a special plan of treatment in a given number of cases. If a ball passes through or near the root of the lung, it is scarcely possible to prevent a fatal result by any plan of treatment: if the track of the ball has been limited to the periphery of the lung, and the constitution of the patient and opportunities of treatment be favourable, we have a right to expect a favourable cure in a considerable proportion of cases under the mode of treatment which has hitherto been in ordinary use of late years, and which I have already described to you.

The surgeon's efforts to secure healing by the first intention in the way named in gunshot wounds will, I think, be attended with success in only a very small proportion of exceptional cases. It is the rule of practice among army surgeons to close completely, by sutures, compresses, adhesive plasters, and bandages, all wounds of the chest—such as incised and stabbing wounds—in which there is thought to be a probability of union by the first intention being obtained. Not only the relief to the breathing by rendering more complete inflation of the lungs practicable—which is the immediate effect of this operation in an incised wound of the soft parietes of the chest and periphery of the lung,—but the arrest of the hæmorrhage (if this complication exist), together with the prevention of subsequent extended pleuritis and pleuro pneumonia, are sought to be obtained by these means. And as in many cases the urgent symptoms have gradually abated under this treatment, and eventually respiration in the wounded lung been re-established, it has been rendered evident that the wounds had become closed by the adhesive process. You will find such cases fully recorded in the works of Guthrie, Larrey, Hennen, and others. But in treating cases of incised wounds we cannot rely upon obtaining healing by adhesion even of the external orifice, although this may be uncomplicated with injury to bone or cartilage; and we should be prepared to meet these abortive attempts by other definite plans of treatment. The restlessness of the patient, the natural movements of the chest in respiration, inflammatory action, cough, weakened health, habits of life, and special conditions of the tissues, may thwart our attempts to effect this object. When to these sources of failure we add continued hæmorrhage at the seat of injury in the parietes, and torn cartilage or divided ribs—such frequent concomitants of these injuries,—the difficulty of obtaining healing by the first intention is still further increased.

When we leave incised wounds and approach those of penetrating gunshot wounds—at least those inflicted by projectiles as large as ordinary musket-balls,—the probability of obtaining healing by the first intention seems to be altogether absent. Here not only all the ordinary sources of prevention of this desired result which I have just mentioned exist in an aggravated degree, but, in addition, a rib, when struck, is not simply divided as by a sword, but is contused and splintered, and the soft parts around the opening made by the ball, for a distance varying according to the size and shape of the projectile, and its amount of momentum, are bruised, and their vitality and reparative tendency proportionably diminished. To remove this sphacelated surface and surrounding bruised structures by incision, and then to force the edges of this enlarged opening together by sutures (for it is to be remembered, even in cases where ribs and their cartilages have escaped, the intercostal muscular tissues and pleura—not merely the integument—are

contused and torn), appears to involve the necessity of such a strain as would prevent all probability of cohesion by first intention, even if such further impediments as costal movements, sudden impulses by coughing, and symptoms of inflammation arising, were not in existence. Experience has hitherto taught that in these injuries provision must be allowed for the escape of sloughs and suppurative discharges from the parietal wounds—not to mention other circumstances; and that to pent them up by closed compresses is to thwart nature's plan of attempting cure, and to aggravate the evils which have been already inflicted. Hence the rule has arisen in all cases of *incised wounds* of the chest, whether hæmorrhage be present or not, to close the wound by suture and compress as early as possible, and to seek for union by adhesion; but in *gunshot wounds*, not to close by suture, and only to make accurate closure a matter of necessity where they are accompanied by active hæmorrhage.

Baron Larrey, in his memoirs of the Egyptian campaign,* has given an excellent explanation of the manner in which the urgent symptoms of an incised wound of the lung with hæmorrhage, when the hæmorrhage arises wholly from the pulmonary vessels, are frequently caused to cease, if the wound in the chest be accurately closed. While the wound is open, the inspired air, finding a ready way of exit by the opening in the lung, constantly opposes the cohesion of the margins of this opening, at the same time that its escape in this way prevents the distension of the air-cells of the surrounding lung-structure, which would lessen the arterial flow, and accelerate the return of the blood by the pulmonic veins. When the wound in the chest has been accurately closed, after allowing the blood already effused in the pleura to escape through the opening by favourable position, the air introduced into the lung by breathing, not finding the same way of issue, fills more completely the small bronchial tubes and air-cells, facilitates the return of blood to the heart, causes the divided lung surfaces to approach each other, favours the contraction of the orifices of the wounded vessels, and assists by these means, as a consequence, the adhesive process. But in the case of a contused and ragged canal being opened through the lung by a projectile passing into or through it, all the circumstances are manifestly changed: if bleeding is going on from its surface, neither the passage of the air through the wound in the chest-wall nor its restraint can exert influence upon it, for the track of the ball will remain patulous under all circumstances, so far as the act of respiration is concerned.

Let me briefly consider the three advantages which Dr. Howard advocates for the hermetically sealing treatment in gunshot wounds. Dr. Howard states the causes of fatality in gunshot wounds of the lungs to be hæmorrhage, dyspnoea, and suppuration; and that these may be restrained and modified, if not prevented or removed, by the simple operation already described.

Hæmorrhage, Dr. Howard rightly places first amongst the causes of fatality. It is the symptom which of all others alarms the surgeon; for he cannot but feel how much the power of nature to arrest the flow of blood, and how much the result of his own endeavours to aid nature in her efforts, must depend upon accidental circumstances connected with the course of the projectile and the injuries it has inflicted, which it is entirely out of his power to control. The track of the bullet is out of sight: the injury it has done to the lung is out of reach. It may be judged that vessels of the largest size have not been divided as it traversed the viscus, or death would have been nearly instantaneous: a surmise may even be made of the part of the lung wounded by the situation of the aperture of entrance, or, if two openings exist, by a supposed line connecting them. But such surmises are often proved to be erroneous by post-mortem inspection: even the source of the hæmorrhage, whether it be wholly pulmonic, or wholly parietal, or the two combined, cannot be diagnosed with certainty in these complicated wounds. It is not to be wondered at, then, that under such circumstances of doubt and consciousness of helplessness, surgeons, though recognising the differences between a gunshot and an incised wound of a lung, should nevertheless, almost instinctively, stop the gap through which the life-blood of the patient is seen to be flowing. Although the surfaces of the wound in the lung cannot be brought into contact and coaptation, there is still the hope that as the blood accumulates within the pleura it may exert such a pressure upon the wounded lung, and, perhaps, so plug up the mouths of the open vessels, as to stay the flow of blood and procure time for the saving processes of nature and the application of remedial measures on the part of the surgeon that may lead to the recovery of the patient. And the most experienced

* Mémoires de Chirurgie Militaire, tome ii., p. 155. Paris, 1812.

army surgeons have long recommended this course under circumstances of gunshot wounds with *profuse hæmorrhage*. "Hermetically sealing," thus applied, is only a new term: the practice is not new. Immediate closure of the wound is, at the present day, the general practice of all surgeons in such cases. The difference in the treatment between the practice of *closure* and *hermetically sealing* is, that in the one no attempt is made to obtain healing of the wound by the first intention, which it is not expected can be obtained in openings made by gunshot; and, secondly, that the continuation of the closure is made subject to other contingencies which are not unlikely to follow the injury. It frequently happens in such cases that the flow of blood, after the closure, is not arrested until the accumulation on the wounded side is so great that the pressure exerted upon the heart and sound lung is strong enough to threaten death from asphyxia. It is manifest under such circumstances that the wound cannot be kept hermetically sealed; it must be reopened, some of the effused blood allowed to escape, and there still remains the hope that the weakened state of the circulation, and the usual condition consequent on loss of much blood, with the aid of proper remedial measures, may favour the prevention of further hæmorrhage. If we persist, under these circumstances, in maintaining the hermetically sealing of the chest,—if Dr. Howard's injunction that the sutures are not to be removed until healing by the first intention is complete is attempted to be carried out,—I fear the risk will be run of causing the death of the patient by suffocation.

Dyspnœa is a symptom which may depend on several causes. It may be induced by the very circumstance I have just described, after closure of the wound—viz., continued hæmorrhage and accumulation of blood in the cavity of the chest, and sealing will not then afford relief: if it depend upon the interference with natural respiration such as has been described to exist in incised wounds of the lung, hermetically sealing might afford relief if there were no complication and the sealing could be maintained long enough. This continued sealing, however, it is believed, the circumstances connected with the discharges, and other consequences of gunshot wounds, will not admit of. But supposing that for the relief of this symptom the chest has been hermetically sealed, an irregularly torn lung, or a lung with the open track of a ball through it, will almost certainly give rise to pneumothorax, and the continued escape of air into the cavity will cause such compression on all the contents of the chest as to aggravate the dyspnœa extremely, and cause imminent danger to life from suffocation. In such a case, again, the wound must be reopened, or another opening practised by the trocar, to afford relief.

Lastly, Dr. Howard advances that *suppuration* is greatly diminished, if not prevented, by shutting out external air. This is doubtless the case with incised wounds, but can we expect it to be with penetrating gunshot wounds? An uncomplicated wound of this kind, without hæmorrhage, without lodgement of foreign bodies, is unfortunately rare indeed, and such complications can scarcely fail but lead to pleuritic effusion and empyema. If the hæmorrhage be slight, the blood may be absorbed; but if it be in its usual quantity, and not evacuated, it will irritate the serous sac, and produce the same effects as other foreign bodies. Mr. Guthrie's experience in the Peninsular War led him to state, that in cases in which there was not a free communication between the wound in the parietes and the cavity of the chest pleuritic effusion was the principal danger to be feared. "When the external wound," Mr. Guthrie says, "has been closed, or is so partially closed as not to allow the escape of the effused fluid, it is commonly the immediate cause of the death of the patient. Its secretion and early evacuation are, therefore, the most important points to be attended to in wounds of the chest."*

I have thought it right to consider this subject at some length because I fear, if penetrating gunshot wounds of the chest are treated indiscriminately by hermetically sealing the external wound or wounds, a fatal termination will be induced in some cases which might terminate otherwise under the more ordinary methods of treatment. But if my fears in this respect should be proved to be groundless, and practice shall bring to light an improved method of treating these serious injuries, military surgery will be greatly indebted to its author; for it is undoubtedly unhappily most true that hitherto, in all campaigns, the proportion of fatality in really penetrating and perforating wounds of the chest has always been excessively large. I believe the proportion of fatality would even appear greater than it does in some tables if the diagnoses were more accurately made in the various hospitals from the combined returns of which such tables have been composed. Easy as one might at

first suppose to be the diagnosis of a musket-ball wound of the chest, whether penetrating or non-penetrating, experience shows that it is not so. Partial circuits of balls beneath the integuments and the muscles of this region, beneath the scapula, perhaps complicated with great bruising, fracture, hæmorrhage, and attended with dyspnœa, hæmoptysis, and faintness, deceive the unwary at once into the belief that the chest must have been opened and traversed by the ball when the pleura has escaped entire. The circumstances of field hospitals for some time after a battle too often add to the chances of inaccurate diagnoses of particular wounds, and errors, once made, are not likely to be changed in the tabular returns, although the nature of each case may be more truly arrived at in the secondary or general hospitals, through which the patients subsequently pass. I have repeatedly seen cases returned as *penetrating wounds*, in which I have been able to demonstrate satisfactorily that the cavity of the chest has not been exposed at all. You will find several such cases described by me in the last volume of the "Army Medical Reports," under Wounds of the Chest. If, as has been stated, a field hospital should be established in America for the reception of gunshot wounds of the chest, and the cases be submitted to the treatment I have been commenting upon, it is especially to be hoped that the diagnosis in each case shall be in the first instance established and defined as accurately as possible, so that the value of the observations made on the effects of this treatment, and of the tabular deductions as to its final results, may not be impaired by any doubts as to the nature of the series of cases which have been subjected to it.

No pains appear to be spared by the authorities in America to encourage professional investigations of this nature; and under the able direction of the energetic Surgeon-General, Dr. Hammond, and from the observations of the hundreds of medical officers who are labouring in the immense field of campaigning practice which is now afforded in that country, we have every right to expect that great advances will be made there in the science of Military Surgery.

December, 1863.

A Mirror OF THE PRACTICE OF MEDICINE AND SURGERY IN THE HOSPITALS OF LONDON.

Nulla autem est alia pro certo noscendi via, nisi quamplurimas et morborum, et dissectionum historias, tum aliorum, tum proprias collectas habere, et inter se comparare.—MORGAGNI *De Sed. et Caus. Morb.*, lib. iv. Proœmium.

GUY'S HOSPITAL.

ICTERUS FROM ALMOST COMPLETE CLOSURE OF THE COMMON BILE-DUCT; DISTENSION OF THE HEPATIC DUCT TO THE SIZE OF A CHILD'S INTESTINE, AS WELL AS OF THE COMMON BILE-DUCT BEYOND THE CONSTRICTION.

(Under the care of Dr. PAVY.)

Of the many causes which give rise to obstruction of the natural flow of bile, we present two instances in illustration—namely, pressure upon the ducts by a cancerous tumour (the second case), and almost complete obliteration of the common bile-duct, resulting from contraction, probably supervening upon inflammation and ulceration, quite close to the duodenum. Dr. Thudichum mentions, in his elaborate work "On Gall-Stones," that these bodies remain the longest time at the place where the common duct passes obliquely through the membranes of the intestine, and are there most frequently found after death. In that situation inflammation is liable to be set up, followed by ulceration, contraction, and submucous thickening, as probably occurred in the following case; but whether all this arose from gall stones is conjectural, although not at all improbable, for the gall-bladder contained some solid matter. The case is, however, of much clinical interest from the peculiar colour of the patient, which also pervaded the bile and

* Commentaries on Surgery, 5th edit., p. 382.