TABLE III.

Causes of Death.	All ages over 20 in London in 1878.		Class B.		Class C.		Classes B and C.	
	Total.	Per cent.	Total.	Per cent.	Total.	Per cent.	Total.	Per cent.
All causes ...	41,829	—	1,005	—	397	—	1402	—
Pneumonia and Pleurisy ...	1,717	3.8	70	7.0	11	2.8	81	5.7
Bronchitis, Asthma, Emphysema, and Congestion of Lungs ...	6,408	15.5	107	10.0	11	2.74	118	8.4
Phthisis ...	7,966	19.2	162	16.1	22	5.54	184	13.1
Heart-Disease ...	4,517	10.77	76	7.56	13	3.3	89	6.36
Chylopoietic Viscera (diseases of) ...	1,715	4.0	164	16.0	150	38.0	314	22.4
Nervous Diseases ...	5,186	12.36	164	16.32	85	21.4	239	17.0
Kidney-Disease, Albuminuria, Uremia ...	1,361	3.22	75	7.45	20	5.0	95	6.77

37. The deaths in Class B from diseases of the nervous centres amount to 145, or 154 if we include 9 from delirium tremens. The former figure corresponds to 14.42 per cent. of all the deaths, the latter to 15.32; whereas, in the adult population of London generally, these causes only account for 12.36 per cent. of the deaths.

38. There is also some evidence that deaths from these causes occur at rather earlier ages among the intemperate. They are mainly diseases of advanced life; and the number of deaths referred to them in London is highest in the decade from 65 to 75, the figures for the preceding decade, 55 to 65, being much lower; but the sample of mortality from these causes among intemperate persons, with which we are dealing, shows as many deaths between 50 and 60 as between 60 and 70, and a somewhat larger proportion of the whole at ages between 50 and 70 than the general mortality shows at the somewhat later ages, 55—75.

39. The deaths from diseases of the heart, 76 in number, amount to 7.56 per cent. of the 1,005 deaths of intemperate persons in Class B, which is considerably below the percentage, 10.77, prevailing among adults in London generally.

40. To kidney-diseases, albuminuria, and uræmia, are referred 75 of the deaths, or 7.45 per cent.; whereas, in the adult metropolitan population generally, such deaths are only 3.22 per cent. of the whole. It would seem, therefore, that disorders of the kidney are conditions whose frequency or fatality is notably increased by intemperance.

41. The figures relating to diabetes and erysipelas are too small to be of much value. There are only six deaths from the former, and seven from the latter. Both figures are higher than we should expect from the Registrar-General's tables relating to London.

42. The only remaining important cause of death among adults is "old age" or "senile decay", which accounts for about 6 per cent. of the adult mortality in London, all the instances being over 65 years of age. Only 13 of the 1,005 deaths in Class B were registered under this head, which would yield a percentage of 1.29, or, if 2 deaths of persons under 60 be eliminated, as we think they should be, 1.1.

43. On the other hand, the 17 deaths registered under the heads of atrophy, debility, general infirmity, and syncope, are just twice as many as we should expect. Nine of these are of persons under 60 years of age; and we think it probable that these, with the two cases of senile decay, also under 60, do not differ materially from six others registered under the heads of alcoholism and chronic alcoholism; and should be classed with them.

44. There are also ten accidental deaths, in which either the accident or the fatal result is supposed to have been brought about in some measure by intemperate habits.

45. We find, therefore, upon the whole, reason to think that, in the metropolis, the mortality among any considerable group of intemperate persons will differ from that generally prevailing among adults in the following important particulars, viz., a fourfold increase in the deaths from diseases of the liver and chylopoietic viscera; a twofold increase in the deaths from disease of the kidney, a decrease of half as much again in those from heart-disease, a marked increase in those from pneumonia and pleurisy, a considerable increase and an earlier occurrence of those from disease of the central nervous system; a marked decrease in those from bronchitis, asthma, emphysema, and congestion of lungs, a decrease nearly as great in those from phthisis, and a later occurrence, or at least termination, of the disease; a very large decrease in those from old age, with an increase in those referred to atrophy, debility, etc., and the addition of a

considerable group referred in general terms to alcoholism or chronic alcoholism, or resulting from accidents.

46. Table III shows the number of deaths from some of the principal causes of death, and the rates per cent. in the 41,929 adult deaths in London in 1878, and in those comprised in Classes B and C respectively.

47. The figures to which we have throughout referred for comparison are those in the Registrar-General's Forty-first Annual Report, published in 1880, the year in which the bulk of our material was collected.

H. C. STEWART, *Chairman*; W. H. BROADBENT, W. SQUIRE, GEORGE FIELD, T. MORTON, WILLIAM HICKMAN, ROBERT FARQUHARSON, F. J. MARSHALL, HENRY POWER, HENRY JULER, WILLIAM SEDGWICK; MALCOLM MORRIS, W. H. LAMB, *Honorary Secretaries*.

COMPOUND FRACTURE OF THE FEMUR, ERYSIPELAS, PYÆMIA; AMPUTATION OF THE THIGH: SUBSEQUENT EXARTICULATION AT THE HIP: COMPLETE RECOVERY.

By ARTHUR E. BARKER, F.R.C.S., Eng.,

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THE following case appears to present several points of special surgical and pathological interest, and to deserve particular notice. It illustrates, in the first place, what is, however, unfortunately rare in experience, namely, the possibility of recovery from pyæmia, even in a patient weakened by a most severe injury, prolonged suppuration, and an attack of erysipelas. Secondly, it illustrates the feasibility, in some cases, of amputating with the best results through the thigh for compound fracture, leaving a second compound fracture in the neighbourhood of the hip-joint to be treated otherwise later on, when the first amputation wound is healed. Thirdly, it shows that in such a case it is possible to exarticulate the whole of the remaining bone up to the hip joint, without re-amputation through the soft parts, but through a moderate opening in the outer side of the stump.

These last considerations lead one to speculate whether in certain cases of extensive disease or injury about the hip-joint with or without disease or injury lower down, where, under ordinary circumstances, amputation at the hip-joint would appear called for, but, where, owing to the great weakness of the patient, such would almost inevitably prove fatal from shock, it might not be proper to amputate through the thigh lower down as a preliminary; and on recovery from this operation, deal with the mischief at the hip-joint with the diminished risk (*quoad* shock) of operating on a stump instead of a whole limb. Apart from shock, the other dangers of the two amputations (if re-amputation be decided on) are probably almost equal in these days of antiseptic surgery. Be this as it may, I am satisfied that if I had amputated in the first instance through the hip-joint in the case now to be recorded, the patient would not have survived, so great was his weakness at the time; whereas, by removing the limb at a point lower down the thigh he was best prepared for subsequent treatment of the compound fracture at the joint by ex-articulation of the bone or even re-amputation, had this been necessary.

For the following digest of the very extended notes of the case in the hospital clinical register, I am indebted to Mr. John Walker, dresser to the patient.

W. W., a healthy man, aged 29, a rivetter, fell from a roof to the ground, on November 30th, 1880, and was at once placed in University College Hospital, under the care of my colleague, Mr. Berkeley Hill. On admission, he was suffering from the shock of the fall and an oblique compound fracture of the femur, a little below its middle was diagnosed. The external wound was only about an inch and a half long, but communicated with a cavity extending upwards for five or six inches, and full of soft clot, in which the bone lay partially bare. The wound was carefully washed out with carbolic lotion one to twenty, and was dressed according to Listerian principles, the limb being then placed upon a bracketed splint.

For the first few days, the patient went on fairly well on the whole, but, at the end of the week, began to complain of much throbbing and starting in the limb, the temperature rising to 101.6°. On December 10th, Mr. Hill found, on removing the dressings, considerable œdema from the wound to the knee, but no redness. The dressings were now re-applied, and the limb put up on a straight splint,

with the Scotch sheet and weight extension. At 6 P.M., the temperature was 103°, and the patient passed a very bad night, vomiting frequently. For the next few days, the temperature ranged from 101° to 103°. On December 20th, pus was found in the dressings, doubtfully odorous. Two or three ounces came away from the cavity, into which a probe could be passed for about six inches in the direction of the great trochanter. Counter openings were now made close behind the latter for drain-tubes. On December 24th, there was much vomiting, with several rigors, rise of temperature to 104.6°, and severe pain; there was also carboluria. On examination, no callosus was found, but a large blood-clot breaking down. The wound was washed out with carbolic lotion, larger tubes were inserted, and a dressing of boracic lint and oakum applied. After this, the temperature gradually fell to 102°.

On December 28th, erysipelas set in round the wound, and the patient was removed to the infectious ward. For the next four days he vomited much; temperature 100° to 102.4°. The patches of erysipelas were painted over with tincture of perchloride of iron. On January 3rd, much drowsiness was noticed all day, and, on the 5th, a bed-sore commenced to form; pain was also noticed in the right arm.

On the 9th, the wound is described as rather "boggy," very foul, and discharging freely, with a blush around it; there was also a faint blush on the dorsum of the right foot. A small abscess now appeared over the extensor tendons of the right thumb, and yielded about a drachm of yellowish pus when opened; temperature fluctuated about 102°. On the 14th, the wound made on the 9th was reopened to evacuate pus. On the 18th, incisions were made into a small abscess on the outer side of the left forearm, and dark inodorous pus evacuated; also, into a small purulent collection over the external condyle of the right humerus, and into the right heel for fluctuation; in the latter situation, however, only serum escaped. On the 22nd, another small abscess had to be opened on the inner side of the right olecranon. On the 29th, the right elbow joint was found to be disorganised by suppuration, the bones grating freely. After drainage, it was fixed on an angle splint. From this, as the erysipelas disappeared, the various pyæmic abscesses gradually healed, and, on February 7th, the patient was removed from the erysipelas ward, and came under my care. A sinus, leading into the elbow-joint, was still open, and bare bone could be felt there. A few hyaline casts were found in the urine, but no albumen.

As the patient was now plainly running down from prolonged and profuse discharge from the wound round the fracture, and as the latter on being explored showed no signs of repair, and as there was much fever, I amputated the limb a little above the middle of the thigh, on February 16th, by two oval flaps. While these were being cut, pus poured out of the tissues around in large quantities. Having scraped away all granulations within reach of the face of the stump, especially those in the long sinus, reaching up to the great trochanter, and having secured a number of vessels with catgut ligatures, the whole wound was sponged with carbolic oil, and united by seven silver sutures, drain tubes being inserted in the usual way. It was then covered with lint dipped in carbolic oil, overlaid with a thick layer of salicylic wool. Over this again I packed, as high as the top of the pelvis, a quantity of ordinary wool, which had been freshly baked at a very high temperature. This being very firmly bandaged round the stump and up to the pelvis, completed the dressing. Although very little blood had been lost, the patient's pulse became bad several times during the operation, and the respiration almost ceased at one time. Brandy enemata and ether hypodermically, however, soon produced a much better state of things, and the patient passed a quiet night. The temperature at 9 P.M. was 102.6°, but the next morning had fallen to 99.4°.

On February 18th I dressed the wound for the first time, and found it looking well, though the discharge was free and offensive. On the 26th it was again dressed, and four stitches were removed, the flaps having united except at the drain openings. A good deal of offensive pus was found in the old dressing. After this, the amputation wound healed steadily and, on the whole, rapidly; but the old sinus leading from it to the trochanteric region, still discharged very freely. It was noticed now that the stump about the hip-joint was very cedematous and brawny, although there was no retention of discharge. The condition was such as to suggest the presence of dead bone near the joint (although I found nothing in the original notes of the case pointing to fracture there), and, on the other hand, from the state of the end of the stump, there was nothing to warrant the conclusion that death of the remainder of the stump had taken place after amputation. On March 3rd, therefore, I enlarged the sinus over the trochanter, and found a comminuted fracture of the

femur there (not before suspected), and about six or seven loose fragments were removed. The line of fracture plainly ran into the neck of the femur. The question now arose, whether the dead bone should be left alone, to be cast off by the usual process, or whether reamputation at the joint should be performed. The first of these issues of the case could hardly be hoped for, however, in view of the fact that the man, whose condition had much improved after the first amputation, was now commencing to suffer much from the discharge and fever, consequent upon the extensive bone suppuration, and the oedema, on the other hand, was steadily increasing. But amputation at the hip joint also appeared, under the circumstances, a very great risk. I therefore determined on a middle course, namely, to attempt to exarticulate what remained of the femur, though the trochanteric wound still further enlarged downwards. This seemed feasible, as there was already a good sized wound over the broken bone, and also as the latter appeared separated to a considerable extent above by suppuration. I hoped that a vertical incision on the outer side of the thigh only would produce less shock than amputation at the joint, and would also admit of the freest drainage of the suppurating structures.

On March 30th, therefore, I enlarged the trochanteric wound downwards for some inches, thus gaining free access to the joint, and found the head of the femur loose and necrosed within the latter, the fracture having regularly comminuted the neck. Having lifted out the head, I then seized the upper end of the shaft, and, dragging strongly on it, gradually dissected it out of the stump from above downwards to its lower end. The only real difficulty met with in performing this exarticulation was in reaching and dividing the insertions of the psoas and iliacus muscles. This was, however, overcome by using a pair of curved scissors which reached the deep-seated small trochanter with less difficulty and danger than the knife. But little blood was lost during the operation, owing to the incision being external and in the long axis of the limb, and also to the fact that the enucleation was performed for the most part with a blunt elevator working close to the surface of the bone. The pulse and respiration, however, became at one time very rapid and feeble, and artificial respiration was resorted to for a minute or so. This and some brandy by mouth soon brought the patient round, and 6 P.M. he appeared very well. The large resulting wound was packed with strips of lint soaked in carbolic oil, and its edges were brought together temporarily with a few stout wire sutures. On the next day, under chloroform, the lint was removed, and the stitches were tightened, one deep supporting wire being passed through the whole thickness of the stump, and secured with lead buttons. The wound was now covered with lint dipped in carbolic oil, and a large sponge wrung out of carbolic solution was placed under it to receive the discharge, which was free at first; this sponge was changed every four hours. On April 5th, all the stitches were taken out except the deep supporting one, which was left in until the 19th, when it, too, was removed, and the drain tubes were shortened.

But little remains to be said after this, except that the healing process went on uninterruptedly, the patient being up in a chair, without any further need of drainage on the 30th. On May 15th, the man was rolling himself about in a wheeled chair, having gained flesh rapidly and looking well. On June 8th he left hospital for the convalescent home, using crutches. When he returned some weeks later, he was looking the picture of health, having become fat and strong. The long, boneless stump was soft and healthy, and gave him no trouble. A little later, I gave him a leather buckle splint and pin, with which he was soon able to walk fairly well. During the last year he has frequently shown himself at the hospital, and a healthier looking man could hardly be found in spite of the loss of the whole right lower limb and complete ankylosis of the right elbow. The latter is the only bad result of the pyæmic condition, from which his constitution does not appear to have suffered permanently in the least.

I cannot conclude these notes without saying that it appears probable, that the very satisfactory issue of the two grave operations just described may be in a great measure attributed to the complete rest, local and general, which was rendered possible by the use of the unfrequent, dry, antiseptic dressing in the subsequent treatment. Next to the thorough cleansing of the wound, it appeared to me urgently necessary that the very large raw surfaces should be kept firmly in contact, steadied, and compressed by strong elastic pressure, and by some material which would not readily lose its elasticity nor require to be changed soon. The wound would thus have continuous rest for some days, and the patient be spared the anxiety and extra shock of early disturbance. I therefore employed a form of dressing I have found perfectly adequate in a considerable number of serious amputations. This was, moreover, a case unsuited for

the Listerian dressing, however valuable in other cases, as the patient was peculiarly susceptible to the ill effects of carbolic acid, even in small quantities. The amount, therefore, that would have been absorbed had I performed these two very large operations with the spray, etc., would have probably been sufficient to produce grave danger and seriously to have complicated the case.

REMARKS ON INDIAN ENTERIC FEVER.

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THE very great divergence of opinion as to the etiology of enteric fever in India, which exists among medical men practising there, warrants me in thinking that any contribution (be it ever so small) towards the elucidation of this subject cannot fail to be of some interest to the profession at large. It is this belief, at any rate, which permits me to venture on the consideration of a subject already very fully explored by physicians so competent in aught that appertains to tropical medicine as Sir J. Fayer, Professor W. C. Maclean of Netley, and Brigade-Surgeon Marston, A.M.D.

For the sake of clearness, I will commence by briefly stating what these opposite views on the etiology of enteric fever in India are.

On one side, it is held with much confidence that the entrance into the human system of faecal impurity (though not necessarily of a specific character) is undoubtedly the cause of enteric fever in India, in just the same way as such a cause produces that fever at home; while an opposite sect of thinkers (and whose number, I would say, seems to be yearly increasing) hold that the great majority of cases of enteric fever in India are due to what they call "climatic causes"—a very loose term, it must be confessed, but one which, for the present, does not seem capable of being made more exact. It is very desirable to decide which of these beliefs is deserving of credence. Those who hold that every case of enteric fever in India owes its origin to some faecal infection of the blood must, as a natural consequence, admit that the disease is then one which can be effectually guarded against by the exercise of sanitary vigilance; and further, that, by the introduction of additional and more perfect sanitary precautions, as time goes on, it may be eliminated almost completely from the diseases to which the soldier serving in India is subject. This, it must be acknowledged, is a very satisfactory and pleasant belief. But, on the other hand, if it be clearly proved that the most painstaking inquiry fails to connect the occurrence of cases of enteric fever in India with any faecal impurity, and, moreover, that strong grounds exist for believing that the cause of this fever lies in the climate of India, then we must confess that the utmost perfection in the sanitary condition of a cantonment furnishes no guarantee against the presence in it of that which is capable of producing enteric fever. One thing, however, is very plain; and that is, that the giving of our adherence to the theory of the climatic origin of enteric fever in India in no way absolves us from paying the most thorough and anxious attention to the sanitary condition of any station in which we may be.

If enteric fever were a disease unfrequently met with in India, there might be some reason in not attempting the solution of a problem so surrounded by difficulties as is the etiology of that disease as met with in India; but, when the fact is forced upon us that (with the exception of cholera) there is no disease which causes so great a mortality among British troops in India, as does enteric fever, then there is, I consider, an obligation placed upon all who have the opportunity, to endeavour (as best they can) to shed light upon a question of so great an interest to the State.

Besides this mortality, the lengthened period of inefficiency which enteric fever entails upon its victims must not be forgotten. Only the very lightest duties can be safely undertaken by a soldier for a considerable time after convalescing from an attack of enteric fever. It leaves him anemic, debilitated, and very prone to suffer from intestinal disturbances on the smallest exposure to chill or over-exertion. Indeed, I am so impressed with a consideration of the difficulty which convalescents from enteric fever in India experience in shaking off thoroughly that disease, that I think it would be wise to rule "that anyone who has suffered from a severe and well marked attack of enteric fever while serving in India shall be sent home for a change of air for a period of not less than six months". In the case of a soldier, he would be sent to the regimental depot, where, under the influence of good food, plenty of fresh air, and prompt medical aid on the advent of any relapse, he would have a far better chance of complete restoration to health than at his own home, which, in

nine cases out of ten, would be found to be anything but a desirable health-resort.

In relation to this question of change of air, I would say here, as my individual opinion, that change of air to a hill-station is (for enteric cases) in no way to be considered as an efficient substitute for a change to home. At all hill-stations, the difference between the temperature of the day and night-time is very marked; as a result of this, delicate men (especially if they happen to be convalescing from any abdominal affection) are very liable to become easily chilled; a sharp attack of diarrhoea or hepatic congestion follows, either of which tends in no small degree to doing away with the benefit the man's health may have previously derived from the comparatively speaking bracing hill-climate. Recovery from such attacks is, only too often, followed by a second or a third one; and in this way convalescence, instead of being hastened and consolidated by hill residence, is, I believe, in many instances absolutely retarded.

This subject might, with ease, be considerably enlarged upon, but I will not here pursue it further, as what I am especially desirous of considering is, the perplexing question of the etiology of Indian enteric fever.

No one protests more confidently against the climatic origin of enteric fever in India, and argues his case with greater acuteness, than does Professor W. C. Maclean of Netley; and the opinion of no one on tropical diseases, I may be permitted to say, deserves greater consideration than does his. As tending to corroborate the views held by Professor Maclean on this question, I am desirous of giving the result of an examination I have made of the annual returns of sick and wounded, from 1875 to 1881, of the troops at my present station, Assirgarh Fortress, Central India. I would first say that Assirgarh was unoccupied by British troops during the years 1876 and 1877 (I cannot, at least, find any returns for these years). I must not then be considered as referring to these years in the remarks which follow.

For the development of the purpose in view, some account of Assirgarh, in regard to its position and its sanitary arrangements, is necessary; hence the following brief description of the fortress is unavoidable. The fortress of Assirgarh is situated in the north-east angle of the Bombay Presidency. It is an isolated hill of the Sathpura range, and is elevated about 800 feet above the surrounding country. For miles around the fortress, in fact, as far as the eye can reach, nothing is to be seen but dense and luxuriant jungle, intersected here and there by irregular ravines. With the exception of a small native village at the foot of the fortress (outside the walls), and a small railway station about seven miles distant, there is, I may say, no human habitation within a radius of twelve miles. There are no drains of any sort in the fortress, with the exception of a few surface ones, made for the carrying off of the rain-water, and for the receiving of any refuse-water which may flow into the houses. All these surface-drains open outside the fortress.

The conservancy is carried out by the "dry earth system", all the details of which are strictly adhered to. The latrines are cleaned twice each day (morning and evening); their contents lowered from the walls in covered iron buckets, and then thrown into a large and deep ravine, about two hundred yards distant; from there, the sewage is quickly and efficiently removed by the denizens of the jungle, who, I have every reason to suppose, look with much favour on the method adopted at Assirgarh for the disposal of its sewage.

The water-supply is dependent upon the annual rainfall, which is received into three large tanks. One of these tanks is specially set apart for the supply of drinking water to the residents in the fortress; at the upper end of this tank is placed a species of filter-bed, which purifies the water fairly well. As a further precaution, however, the water, before being used by the troops, is passed through Macnamara filters, one of which is placed in each barrack-room. After this last filtration, the water is perfectly clear, and free from either taste or smell.

From this brief account of Assirgarh, it will, I think, be plain that the danger of the troops quartered there suffering from exposure to faecal impurity is very small; and that, in consequence, we should expect those diseases which are known to be faecal in their origin to be of very rare occurrence there. Such an expectation is, indeed, fully borne out by facts. I have carefully examined the sick returns of Assirgarh between the years 1875 and 1881, and during that period (the average strength of the troops being little over one hundred), I have not been able to discover one single admission for enteric fever, and but very few for remittent fever, none of which were of a severe type. When to this statement I add, that the great majority of the soldiers at Assirgarh, during the years I have named, were under twenty-five years of age, and had a service in India of less than