

In the case of groups numbering as many as 6000 to 8000 men this requirement may seem a counsel of perfection—desirable, perhaps, but not practically obtainable under military conditions. This is no longer the case; for, by use of the railway van, disinfection can be carried out on an almost unlimited scale. Such numbers can be dealt with in 4 or 5 days.

TABLE III.—Place C.

Month.	No. of natives.	No. of cases.	Per cent. of natives.	Per cent. of hospital admissions.	No. of disinfections.	Per cent. of labourers.
1916						
January ...					—	—
February ...					—	—
March ...				60	—	—
April ...	2963	309	10.43	83	—	—
May ...	4308	195	4.53	64	—	—
June ...	3864	120	3.11	34	2,749	71
July ...	3464	100	2.86	31	—	—
August ...	5876	56	0.96	12	3,305	56
September ..	6082	80	1.31	17	4,286	70
October ...	7601	64	0.84	13	8,023	105
November ...	9254	97	1.05	18	6,126	66
December ...	8495	195	2.29	35	10,834	127
1917						
January ...	8094	274	3.38	37	11,116	136
February ...	8347	215	2.58	36	7,837	93
March ...	8946	343	3.83	46	16,379	180
April ...	8737	443	4.55	41	25,011	280

The incidence of relapsing fevers in other groups of labourers in the area illustrates the same points.

Summary of Results in Egypt.

The sequel showed the following results:—

(a) The incidence was very effectively controlled by the amount of disinfection which it proved possible to carry out by means of van disinfectors among the natives, and its threatened incidence among the troops was immediately checked and controlled. (Chart 3.)

(b) The incidence among the natives, which when at its height, affected 6.5 per cent. of the labourers in any one month, never exceeded 2.6 per cent. in any one month in the following winter.

(c) Instead of constituting, when at its height, as much as 82 per cent. of the total admissions into hospital in any one month, it did not in any month exceed 30 per cent. (Chart 3.)

(d) Instead of affecting in any one month as many as 15 per cent. of the labourers in any one locality, it remained in nearly all places on a very low level—below 1 per cent. In only two places did it exceed 5 per cent., and even in these cases the incidence was at once checked by the extra and immediate disinfection which it was possible to bring to bear by means of the van disinfectors.

(e) Its spread to the troops was effectively prevented or controlled.

The total number of cases among them in the four months (March to June) following the introduction of the van disinfectors in February, 1916, was only 143—all cases then ceasing.

Although this incidence was a small and satisfactory one, having regard to the large number of troops and the presence amongst them of so many cases of relapsing fever among the native labourers, the number appeared to me to be relatively large, in view of the exceptionally large amount of disinfection that had been carried out among the troops during this period.

I therefore made a close analysis of the cases, ascertaining in each case the place and date of their reporting sick, whether in the Northern Section van, where van disinfectors had been chiefly at work (over 150,000 disinfections), or in the Southern Section where the van disinfectors had been little in use (only 7000 disinfections).

The interesting result that appeared was that out of the total 143 cases that had occurred—March to June—only 30 had occurred in the Northern Section among its large

	Natives.		Troops.	
	% of total number.	% of total cases.	% of total troops.	% of total cases.
Northern Section ...	60.0	50.0	80.0	20.0
Southern Section ...	40.0	46.0	20.0	80.0

number of troops (80 per cent. of the total troops), whereas no fewer than 113 cases had occurred in the Southern Section among its small number of troops (less than 20 per cent. of the total troops.)

There was thus a marked difference between the spread of the disease to the troops in the Northern and Southern Sections respectively.

(f) In the Southern Section reliance had been placed on the large disinfecting station at Place F to carry out the disinfection necessary in its neighbourhood. Nevertheless, the number of cases among the troops at this place was the largest in any place, totalling 91 cases out of the total of 113 cases in this Southern Section.

The official data regarding the amount of disinfection carried out by this large disinfecting station, equipped with four of the largest steam-pressure boilers, show that the total number of troops disinfected was about 32,000 in the six months, a number which one double van disinfectors (Cairo Van 5511) is capable of disinfecting, as shown on more than one occasion, in 14-21 days—e.g., 10,000 in 4 days, 18,000 in 9 days, 3800 in 1 day—a total of 31,800 in 14 days.

While stationary disinfectors can only be used for those in their neighbourhood, the van disinfectors can carry out this large number of disinfections daily over an area of 100 miles or more whenever and wherever they are required.

LICE-BORNE INFECTION AMONG TROOPS IN THE FIELD.

It is clear from the foregoing that to deal effectively with such conditions the disinfection must be capable of being brought to the troops, so as to be accessible to them wherever they are; it must be capable of dealing with them rapidly and in great numbers at a time, in order to interfere as little as possible with military duties; and be easily improvised on the spot and capable of being easily and expeditiously worked without need of special knowledge or technique or special personnel.

All these requirements are in my experience met—in a manner unapproached by any other type of disinfectors—by the van disinfectors (Cairo). Looking back at the circumstances in the Egyptian war area and on the results which I followed for a year and a half, I feel satisfied that in the absence of this form of disinfectors the problem of relapsing fever in the war area would have occasioned military difficulty and materially impeded the prosecution of the campaign. Before the introduction of the van disinfectors among the natives nearly one-fifth of the average number of labourers were attacked by relapsing fever, but by disinfection on the largest scale by this disinfectors the disease was effectively arrested or stamped out or controlled.

(To be concluded.)

THE RÔLE OF THE SCAPULA IN THORACOPLASTY.

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SOME ten years ago I performed an extensive thoracoplasty on a man, aged 21, who had a left-sided empyema containing no less than 10 pints of pus, drained for several weeks without any evidence of expansion of the lung or any sign of the displaced heart returning to its proper place. He was exhibited before the Royal Society of Medicine in January, 1910,<sup>1</sup> 18 months after operation, in a very good state of health, with very little deformity beyond flattening of the chest on the affected side, and physical signs pointing to the existence of a healthy lung on this side of rather more than half the normal size.

I was congratulated on the very satisfactory result, which those present appeared to attribute to the fact that the plastic operation was performed six weeks after the original drainage of the pleural cavity and the consequent expansion of the lung before the visceral pleura became very thick. Personally, I do not think this good result would have been obtained if the chest wall had been "allowed to fall in," as is usually said in text-books to be the object of a thoracoplasty, and I attributed it to the use of the scapular muscles to obliterate part of the cavity, to pull up the diaphragm, and to pull on the lung by movements of the arm, when the scapula was made to occupy the place of the excised ribs. Recent experience has confirmed my opinion, and it seems to me that hardly any case of old-standing empyema is likely to resist surgical intervention provided a proper use of the scapula and the muscles attached to it is made and every

<sup>1</sup> Transactions of the Royal Society of Medicine, Clinical Section, January, 1910.

effort is directed towards closure of the chest at the operation. The whole secret of success in recent war surgery of the chest has been shown to depend on the closure of the chest wall, and, if the expansibility of the lung remains, there is every prospect of complete cure even from severe lesions. I have recently operated along the same lines in the case of an empyema where another surgeon had operated twice and left a wide gaping wound after 15 months' treatment which showed no sign of closing. The first operation performed was decortication of the lung, and the second aimed at the division of adhesions between the parietal and thickened visceral pleura. Such operations are doomed to failure unless steps are taken to close the thoracic cavity, and this cannot be done by merely dissecting up skin flaps and bringing them across the mouth of the cavity; the lung will not expand if it lies exposed at the bottom of an open wound against atmospheric pressure, and my operative procedure aims at the closure of the cavity with muscle and the favouring of expansion of the lung both by active movements and conditions of intra-thoracic pressure.

*Notes of Case: Description of Operation.*

The notes of my case operated upon in 1908 are as follows:—

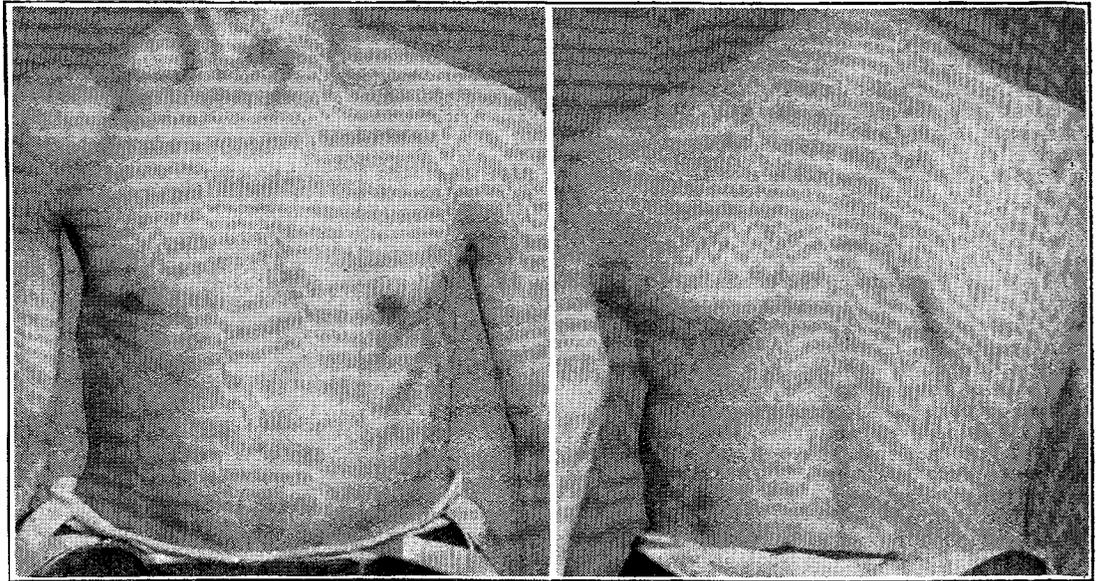
Patient, aged 21, a pale and thin man with marked respiratory distress, lying on his left side and perspiring freely. There was evidence of a total empyema on the left side; some tubular breath sounds were audible over the upper half of the lung, but they were absent over the lower half, and neither vocal fremitus nor resonance was conducted at all. There were no adventitious sounds. His respirations were 40 to the minute and the pulse-rate 120. The heart was displaced so far to the right that pulsation could be felt in the right axilla. Very shortly after admission the left side of the chest was aspirated, and seven pints of greenish-yellow, sweet-smelling pus were drawn off. Some few hours later two inches of the left seventh rib were resected just behind the mid-axillary line. Not less than three pints of pus escaped, some thickened fibrin was removed from the pleural cavity, and a drainage-tube just entering the pleura was fixed in the wound. From this pus the pneumococcus was grown in pure culture. The drainage of the empyema was satisfactory, taking into account the large size of the abscess cavity, and at the end of three weeks there was very little discharge. Four weeks after operation the heart was still displaced beyond the right border of the sternum, and there was very little evidence of function in the left lung. X ray examination revealed abnormal transparency of the left chest, with a thin strip of shadow, to the left of the median vertebral opacity, in which the collapsed lung lay.

At the request of the physician, Dr. T. D. Acland, I undertook a second operation to secure closure of the cavity and expansion of the lung. The patient was anaesthetised with chloroform and rolled over on to his right side. The left arm was pulled a short distance across the chest and a long incision, parallel to, and 1 inch behind, the vertebral border of the scapula, terminating in the original mid-axillary wound, was made down to the level of the ribs and intercostal muscles. This incision split the trapezius and the latissimus dorsi and the lower part of the rhomboideus major, leaving a large portion of them attached to the scapula. Portions of the sixth, seventh, eighth, and ninth ribs were then resected subperiosteally; 6 inches of the seventh and eighth being removed, 2½ inches of the ninth, and a smaller portion of the sixth rib. The intercostal muscles, periosteum of the ribs, and thickened parietal pleura were next cut away with scissors, and such vessels as bled were easily secured by underpinning with catgut sutures. There was very little loss of blood and the shock of this part of the operation, which is commonly supposed to be one of its dangers, was very slight. The resulting wound was an open trough, comprising the whole pleural cavity, with the shrunken lung at the bottom, lying close against the

thoracic spine. The lung though shrunken was still expanding a little with inspiration and the visceral pleura was not greatly thickened.

The next step in the operation consisted in suturing the muscular flap attached to the scapula to the lower portion of the lung and the diaphragm, the visceral pleura being just thick enough to hold catgut stitches when lightly tied; the scapula was then pushed into the cavity so that it occupied approximately the place of the resected ribs, and the stumps of the trapezius and latissimus dorsi were freed from the overlying skin and sutured to the surface of the muscle attached to the vertebral border of the scapula. The object of this procedure was immediately to lessen the size of the pleural cavity and to secure for the lung a space, half the size of the original pleural cavity, which it might be able to fill when its expansion was aided by the movements of the left arm and the pull of the muscles passing from scapula to lung. The cavity was gently sponged out with saline, but it did not appear sufficiently clean to close without drainage; therefore, a large rubber tube was left in the wound, its upper end reaching to the bottom of the new pleural cavity and its lower end emerging through the skin incision at its lowest anterior limit. The rest of the skin incision was closed with interrupted salmon-gut stitches. If I had done this operation to-day I might have risked the infection and closed the wound completely (leaving a new-formed pleural cavity part of whose bony wall would be formed by the scapula, divided into the upper pneumothorax and a lower space occupied by muscle). There was a good deal of discharge for a few days and the patient complained of slight pain on respiration. His left arm, which was not anchored by the bandage, he declined to move to any extent as this caused considerable pain. In a few days the patient's condition was markedly improved and breath sounds were audible over the front of the left chest. A fortnight after the operation breath sounds could be well heard all over the front of the chest down to the level of the skin incision and at the back to within 1 inch of it; the heart had returned very nearly to its correct position, and a radiogram revealed a pulmonary shadow extending midway between the left sternal border and the outer chest wall; expansion of the lung could be seen on the fluorescent screen, but there was less than the normal amount of brightening of the lung on inspiration. The patient soon began to look fat and well

FIG. 1.



Condition 18 months after operation.

and the amount of discharge steadily diminished. After five weeks in bed he was allowed to get up and he walked about the ward without any respiratory distress. The wound finally healed ten weeks from the time of operation and has never given any trouble since.

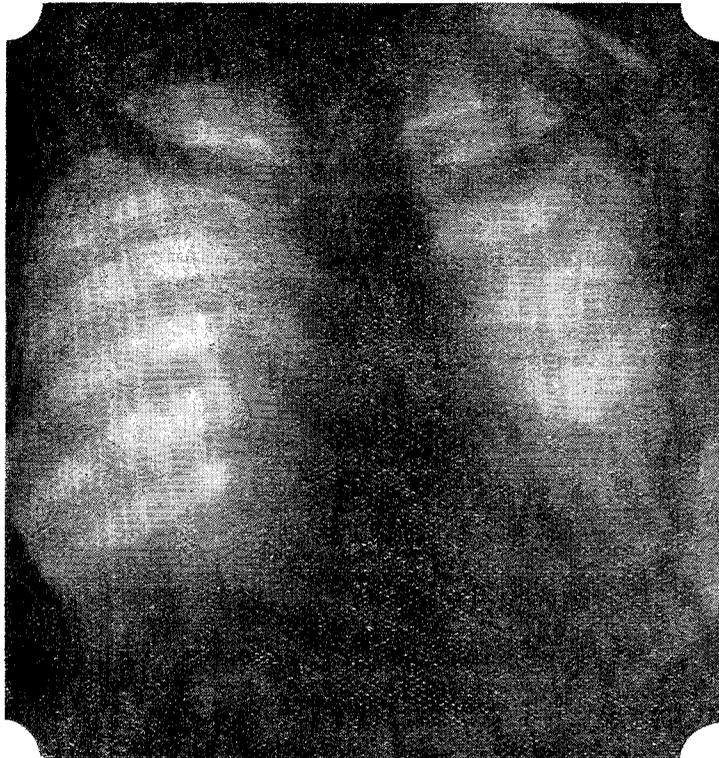
*Subsequent Condition.*

The condition 18 months after operation was as follows, the absence of any marked deformity of the chest being well shown in Fig. 1. There is some flattening of the left side of the chest and slight deviation of the dorsal spine with convexity of sixth to twelfth dorsal vertebrae to the left, presumably due to the pull of the scapula. The movements of the arm are perfectly free. The left chest is resonant from the apex to the site of the scar; breath sounds are normal in front as far down as the scar, and posteriorly down to 1 inch below this level; irregular breath

sounds can be heard as low as the eighth rib in front and a little way below the scar at the back. Vocal resonance and fremitus are both present. There is fair visible expansion of the upper part of the left chest on inspiration. No adventitious sounds. Skiagraphy shows equal movement of the diaphragm on both sides, but the left cupola is a little higher than the right. The right lung is seen from apex to upper border of the eleventh rib, the left lung from apex to upper border of ninth rib.

Examination on April 25th, 1918, revealed the same physical signs except that the right side of the chest was more developed, and therefore the relative sizes of the two sides of the chest showed to the disadvantage of the side which had been operated on. Auscultation and percussion gave the same results as in 1909, and the heart was in its

FIG. 2.



Radiogram showing the area of functional lung, the elevation of the left cupola of the diaphragm, and the slight deviation of the spine with convexity to the left. Taken ten years after the operation.

normal position. The patient was up to his normal weight, and the only inconvenience was dyspnoea on exertion, and for this reason he had very properly been rejected by the recruiting board. X ray examination showed a bright lung equivalent to rather more than half that present on the right side. The left cupola of the diaphragm was the higher, and it rose obliquely towards the outer chest wall.

Fig. 2 is a radiogram of the chest taken ten years after operation, which shows a large proportion of active lung on the affected side and practically no deformity of the chest.

The recent case which I have operated upon on similar lines unfortunately died suddenly of endocarditis, but the post-mortem examination afforded an opportunity of ascertaining that this operative procedure had secured firm adhesions between the scapular muscles and the lower part of the lung and diaphragm; the lung itself was considerably more expanded than it had been at the time of operation.

A careful review of the literature of thoracoplasty reveals the fact that the scapula is usually regarded as an obstruction, and a partial resection of it is recommended by some authorities. In my view, however, the bone of the scapular body may be utilised to take the place of resected ribs, and its muscles may be of value in securing mobilisation of the lung and raising of the diaphragm, both essential factors in healing of these cases.

Devonshire-place, W.

HOSPITAL SUNDAY FUND AT BRISTOL.—£4166 have been raised in Bristol as the result of the Hospital Sunday collections; this amount exceeds all former records by more than £1000.

Mr. J. Wickett, of Redruth, Cornwall, has given 1000 guineas to the funds of the West Cornwall Miners' and Women's Hospital.

## GUNSHOT WOUNDS OF THE KNEE-JOINT WITH SEPTIC ARTHRITIS.

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No further evidence is now required that most knee-joints which have been perforated by bullets or severely wounded by shell fragments, with injuries of the bones, may be saved by timely measures. Much credit is due to the overseas surgeons who have worked out the various methods and the careful technique by which this is achieved.

Our concern in this country is not with such cases, which only need rest and massage to complete the cure, but with the critical and threatening cases arriving in convoys, it may be from 7 to 14 days after being wounded, in which signs of infective arthritis are already well marked. It is such cases which tax the judgment of the surgeon as to the compatibility of conservation of the limb with safety to life.

The articles<sup>1</sup> by Sir George Makins, Colonel Barling, and other surgeons now with the B.E.F. in France show that the importance of the subject has been recognised, and also that the infective cases with septic arthritis, especially when associated with bony damage, stand in a separate category of infinitely greater impending danger than the others. The figures point to the gravity of the infected cases, which are not totalled separately. On a total of 845 cases of knee-joints of all kinds operated upon, of which a large majority may well have been free from septic arthritis, the amputations were 19 per cent. and the deaths 8.5 per cent. Max Page on a total of 70 cases gives 25 as infected, amputations 10, deaths 5 = 20 per cent. mortality. Rankin gives 29 cases of excision with 8 deaths, but of these 3 were due to other complications; 3 others were finally amputated. These and other figures emphasise the seriousness of the condition when once sepsis develops.

The more recent convoys from France received at Dartford have shown many encouraging results from early operation in France, with excision of the wound, removal of foreign bodies, thorough cleansing of the joint, and primary suture. At the time of writing there are 10 healed cases in this hospital, not one suppurating and not one amputated for arthritis. A year ago similar injuries would have arrived here in a highly septic condition. We never amputate septic knees speedily after admission. If the man was passed by the surgeons abroad as fit for the journey and not requiring immediate amputation we may so far endorse their opinion as to carry on conservative treatment until he has got over any special exacerbation due to the transit.

### Drainage.

Of late much has been written about the difficulties of drainage of the knee-joint, with all its bursæ and pouches. Some of us had been working at these problems long before the war.

The kernel of the question is how to obtain adequate posterior drainage, for the back of the joint is swathed in ligamentous and muscular structures, with interstitial bursæ and tendon sheaths, and in close contact with the posterior ligament is the popliteal artery. Obviously, any drainage-tube behind the crucial ligament would risk hæmorrhage. But postero-lateral incisions on both sides should be made to the synovial pouches behind the condyles by the method of Labey adopted by Campbell and Gill.<sup>2</sup> This is much simpler than Payr's method.

Anterior drainage is comparatively easy. The simplest way is to make an incision 1 inch long into the suprapatellar pouch on the side nearest to the surgeon, push curved forceps through to the other side, cut down on the points, and with them grasp a medium-sized drainage-tube, which is thus drawn through. Then the same procedure on either side of the ligamentum patellæ. This usually needs to be combined with posterior drainage. The excellent suggestion has been made that a patient should be placed and kept face downwards, with dependent drainage through an anterior wound and tubes, but this is only a temporary expedient.

<sup>1</sup> Makins: Brit. Med. Jour., 1917, i., 799. Barling, Gray, Rankin, Ogilvie, and Max Page: Ibid., 1917, ii., 277, 288. J. Campbell and H. F. Woolfenden: THE LANCET, 1917, ii., 185. T. S. Novis: THE LANCET, 1917, ii., 12. E. Garside Dixon: THE LANCET, 1918, i., 404.

<sup>2</sup> Brit. Med. Jour., 1917, i., 798.