deltoid muscle three inches below the shoulder, and be found lodged in the crest of the left ilium, and yet no serious damage was done to the chest, the abdomen, or either kidney.

Repair of Vessels and Nerves

In this war there should be a much higher percentage of suture of arteries and nerves. Every effort must be made to repair and preserve main arteries and nerves.

FIG. 5.—Arterial suture: Carrel's method. 1. Note adventitia drawn over cut end of artery preliminary to removal. 2. Three stay sutures in position, making vessel triangular to suture. 3. Suture of second triangle with vessel partly rotated and then continuous suture through all coats of vessel (vaselined Japanese silk used).

The outstanding contribution of Murray and his associates in the use of heparin should make it imperative that Governments at once take steps to have it produced in commercial quantities and at reasonable cost. Every casualty clearing station should have at hand, threaded and prepared for immediate use, small curved and straight needles (No. 15) for suture, and for special sutures such as Japanese silk. Two or three men in every casualty clearing station should be prepared to take on the suture of these important structures—men who have acquired a special aptitude for such work; and with the mass of surgery that passes through a casualty clearing station such surgeons can be rapidly trained and developed if not already proficient.

MORE NOTES ON PENETRATING CHEST WOUNDS

BY

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Dr. F. G. Thomson's paper on this subject in the *British Medical Journal* of January 13, 1940 (p. 44), brought into the foreground of my memory some of my experiences during the last war when I was in charge of a ward in a base hospital in France set aside for such cases. I regret that I cannot give figures as Dr. Thomson is fortunate enough to be able to do, because I was recalled in November, 1917, "to serve the needs of the civil population"; at that moment these were mainly represented by attendance on cases of whooping-cough and German measles in a colliery village in Fife!

But I would like to supplement Dr. Thomson's notes by some of the experiences which stand out as landmarks in my medical journey. One of these was the first case of penetrating chest wound which I saw in hospital.

I had only arrived at the base from the front a few days previously, and there was no special ward for such cases at the time. The patient had been admitted to my medical ward with an "e. and e." wound through his right chest. On examination I found all the physical signs of pneumonia, complete over his right side and also over the lower lobe of his left lung. He seemed perfectly well, with a normal pulse and temperature, and very little embarrassment of his breathing. Obviously he had no pneumonia at all, but I could not explain the physical signs present. I requested the services of our consulting physician, the late Sir John Rose Bradford, and while awaiting his arrival I talked over the case with our pathologist, the late Major Sydney Rowland (microscopist to the Lister Institute). I remarked to him, rather casually, I fear, that physical signs in the war zone were different from those met with at home. He countered with, "Physical signs *never* vary; it is your interpretation of them that is at fault." Does that not apply to very many aspects of our work? That lesson I have never forgotten.

Sir John quickly explained the apparent anomaly. The rifle bullet had traversed the right lung, producing a large haemothorax, with complete compression of the lung; this meant that although the right thoracic cavity was full of blood, almost up to the clavicle, there was a conducting medium all the way from my stethoscope to the main bronchus, through the blood and the solid lung; hence the tubular breathing with a few crepitations, suggestive of pneumonia, and not the "silent chest" associated with pleural effusion one meets in civil life. The condition of the left lung was due to "contralateral collapse" of the lower lobe, a condition fairly frequently associated with haemothorax, and possibly, according to Sir John Rose Bradford, due to mechanical causes, the whole mediastinum having been pushed over (in this case) to the left side.

Such was my introduction to the problems of penetrating chest wounds. The next lesson I learnt was that for accurate diagnosis, especially in such cases as these, an intimate knowledge of physical signs was valuable to an extent I had never before realized; and that, to acquire this, constant and unremitting practice was necessary and the use of a skin pencil essential, and when possible the results should be checked by radiographs. This seems so elementary that it should not need elaboration or even repetition, but my knowledge of final-year medical students and of recent graduates does not bear this out.

Another important point in the examination of the chest which Dr. Thomson has omitted to mention is the position of the apex beat. The heart is always displaced away from the effusion, and this is a valuable clue to the diagnosis.

I scarcely appreciate Dr. Thomson's statement in his paragraph on simple haemothorax, "the diagnosis is usually self-evident, but in case of doubt can be confirmed by exploratory puncture." In every case of pleural effusion in my wards an exploratory puncture was made and the specimen obtained sent to the laboratory for report. This was forthcoming in from ten to fifteen minutes, and the diagnosis of "sterile" or "infected" was decided. No instance of infection in a sterile case ever occurred.

The question of aspiration in sterile cases was always, to me, a difficult one, as leaving even a moderately sized haemothorax seemed to ignore the possibility of adhesions proving troublesome later. In some cases I used a modification of apparatus I saw in one of the American hospitals in France. It consisted of a Woulfe's bottle full of oxygen at atmospheric pressure. To the long tube was attached a fairly large aspirating needle or trocar, which was inserted as low down as seemed safe; when the blood began to run into the bottle a small needle attached to the short tube was inserted higher up in the thorax, as near the highest level of the effusion as possible. The escaping blood displaced an equal volume of the gas into the chest (it could be heard bubbling into the fluid in the thorax), and the whole apparatus then worked automatically until the chest was clear of fluid (or the needle blocked with clot). The patient suffered no discomfort, as there was no change of pressure in his chest, his heart was not incommoded, and the gas was gradually absorbed and the lung allowed to expand.

One of the most interesting of all the (over 100) cases under my care was that of a man who was wounded by a shrapnel bullet which entered his chest in the mid-axillary line in the seventh left intercostal space, passed upwards without touching his heart, then passed behind his left clavicle, severing his subclavian artery, and finally came to rest subcutaneously in the left anterior cervical triangle. Being probably red-hot at the beginning of its anatomical journey, it seared its way through all the tissues, and there was no trace of bleeding anywhere. The subclavian artery was apparently torn through so completely that the elastic fibres could curl up and close the gaps. He had, of course, no radial pulse (I saw him twenty-four hours after he was wounded), but the collateral circulation was established in two or three days.

His chest condition was most interesting: the left side was tympanic all over, and his heart was displaced so that his apex beat was outside the right nipple line. A radiograph showed his left lung squeezed up against his vertebral column by a pneumothorax which had not only compressed the lung to an airless mass but had completely flattened the whole of the left arch of the diaphragm.

The explanation was that there had been a valvular opening from the lung into the pleural cavity, permitting the air to escape and to accumulate there to such an extent as not only to compress the lung, displace the heart, and flatten the diaphragm, but to prevent the possibility of any bleeding. The man stated that he was very comfortable, had no pain, and had very little distress with his breathing. At the suggestion of our consulting physician and consulting surgeon (Sir J. R. Bradford and Sir George Makins), a needle was inserted with the idea of measuring the pressure, but the piston of the syringe to which the needle was attached was blown half-way across the ward before the manometer could be attached, and the needle was hurriedly removed to prevent any sudden release of the air pressure and the possibility of bleeding.

The patient was not long afterwards evacuated to Britain, convalescent.

The last point I wish to make is to support Dr. Thomson in insisting that in some cases of septic haemothorax the symptoms and signs of pneumonia may be so accurately reproduced that such a diagnosis may be made and the actual condition missed. I saw several such cases when in charge of the medical division of the hospital,

and it was sometimes difficult to persuade the medical officer attending the case that his diagnosis should be revised. The first clue to the real condition in such cases was always the position of the apex beat, "displaced away from the effusion," the corroborative detail being supplied by the insertion of a needle and the withdrawal of infected blood.

I thank Dr. Thomson for his paper, which must have given pleasure to many who had experience of such cases in the last war, and ought to prove valuable to their successors in the present one.

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INDUSTRIAL CONGESTION AND THE PUBLIC HEALTH

REPORT OF ROYAL COMMISSION

In 1937 a Royal Commission was appointed under the chairmanship of Sir Montague Barlow to inquire into the causes which have influenced the present geographical distribution of the industrial population of Great Britain, and to consider what social, economic, or strategical disadvantages (meaning vulnerability to air attack) arise from the concentration of industries in large towns. After the report¹ was completed but before it could be published the outbreak of war suddenly caused immense, though not well-considered, changes and transpositions in the location of British industry, and made parts of this report out of date and some of its terminology ambiguous. For example, the "post-war period" now becomes the "inter-war period."

It is not the Commission's fault if little attention is paid to its long series of majority and minority recommendations, because it seems inevitable that some much more drastic thinking along these lines will have to be done when peace comes. The Commission is unanimous in calling for a new central authority—some of the members want it to be a Government Department with full executive powers—to help in the redevelopment of congested urban areas, the decentralization of their industries and population, and the encouragement of a reasonable balance and diversification of industry throughout the country. Much is said about garden cities, satellite towns, and preservation of green belts which is of importance for future reference. But whatever happens to the recommendations the facts which the Commission has assembled from the 120 expert bodies and persons who tendered evidence are of great interest, and on the basis of this ascertainment a good deal of future planning will start.

The Gargantuan Town

The concentration of the population in great towns in the industrial era was followed by a disastrous harvest of slums, sickness, stunted physique, and human misery. This was most evident in mid-Victorian times, but the entail even now is not entirely cut off. Are these vast concentrations necessary? And if they are, must they continue to be a menace to the health and well-being of the people? England (not Great Britain) has a greater pressure of population than any of her European neighbours. Belgium, considered to be the most densely populated national area in the world, has 702 people to the square mile, but England has 766. The drift of population in recent years has been to London and the south-east. The Greater London "conurbation"—to use a word of which the Commission is rather fond—stretches over six counties and into the areas of 118 local authorities, and even the outer fringe of London has grown in proportion less rapidly than some near-by towns such as Chelmsford and Luton. In London and the home counties over a quarter of the "gainfully occupied"

¹ Cmd. 6153. H.M. Stationery Office, 1940. (5s. net.)