died we heard of 229 who recovered. These 886 cases occurred in 627 actual dwellings—that is, an average of 1·4 per house. The remaining 884 cases, all of which, so far as is known, recovered, occurred in 547 houses—that is, again, 1·6 per house. Although these numbers are not very large, they yet afford a certain amount of material for comparison. In order to make the comparison more striking it will be convenient to regard the houses in which the 884 patients recovered as if they had been 884 houses instead of 547. Each patient lived in a house, and the condition of such house has been recorded. In this way many conditions, favourable or otherwise, which may have affected the recovery, are repeated for every measles patient exposed to their influence. The information is regarded as dealing with what has been elsewhere called “recovery houses.” In the same way the 657 deaths, which occurred in 627 actual houses, are dealt with as if there were 657 “death houses,” the 229 recoveries in these houses being for this purpose ignored. There is, however, one exception to this mode of dealing with the figures—that is, in regard to the actual density of population in the houses themselves. In obtaining the relation of houses to inmates, houses to rooms, and rooms to inmates, it has been thought better to deal only with actual houses in both cases. I will deal with this exceptional matter first.

Density of population.—In the 627 actual houses in which one or more deaths occurred there was an average of 5·98 inmates per dwelling, while in the 547 actual houses in which the 884 cases of measles recovered, without a death, the average number of inmates was 5·93. There were, therefore, rather more persons per house where death occurred than where recovery was the rule. The number of persons per house, or rather per tenement, in the whole of Leeds at the 1891 census was 4·66. The density of population in these measles houses, both where death occurred and where death did not occur, was therefore considerably in excess of the average house population of Leeds. The excess is probably even greater than the figures show, for wherever we have been able to compare the number of inhabitants enumerated in any group of houses by the census officials, and by our own private inquiry, it has always been greater in the former. The difference between 5·98 and 5·93 does not look very much, but it is close upon 1 per cent. In the actual houses in which death occurred there was an average of 3·18 rooms per house. In the 547 in which all the patients recovered the rooms averaged 3·80. When we come, therefore, to examine into the ratio between the rooms and occupants it is not surprising to find that in the 627 actual houses in which death occurred the number of persons per room was 1·88, while in the 547 in which measles did not prove fatal it was 1·56—that is to say, there were about 20 per cent. more persons per room in the former than in the latter. If we deduct a living-room from each house the number of rooms in the 627 houses in which death occurred becomes 1363, and the inmates per room become 2·7. Similarly the rooms in the 547 houses with no death become 1534, and the inmates per room 2·1, or as 9 is to 7.

Back-to-back dwellings.—I will now quit the actual houses for the death houses and recovery houses, as explained before. The 657 death houses comprised 542 which were either back to back, “salt pie,” or single houses without opening in the rear, and they included 115 death houses which had a through draught. These numbers represent 82·5 per cent. of death houses without, and 17·5 per cent. of death houses with, a through draught. The corresponding percentages for the recovery houses were 78·5 without, and 21·5 with, a through draught. These figures are altogether irrespective of other surroundings, such as, for instance, where a through house might have its back yard largely occupied by a midden privy, or where a back-to-back house might stand in a thinly populated district. Generally the larger houses in which measles occurred would be through houses. Our inspectors, however, would naturally investigate chiefly the outbreaks in populous parts, although the death houses, whether large or small, would all be visited. That is to say, while all death houses are in the list, the recovery houses would naturally be chosen from those most easily reached along with other work.

Disconnexion of drains.—Of the 657 death houses 24·4 per cent. had drains which were severed entirely from the sewer, 71·2 per cent. were not severed from the sewer, and 4·4 had no drain at all. The corresponding figures for the 884 recovery houses were 27·5 disconnected, 70·2 not, and 2·3

without any sort of drain. Measles would, therefore, seem to have been more fatal in houses not properly severed from the sewer and in those which had no drain.

Closet arrangements.—In regard to the arrangement of closets I propose to divide the houses into three groups—viz., (1) those which had inside or outside waterclosets; (2) those which had the use of latrines (or trough waterclosets); and (3) those which had closets on the midden or pail system. Amongst the death-houses the watercloset system was found in 17·2 per cent., the latrine system in 38·8, and the dry—that is, the midden or pail—system in 44·0 per cent. Amongst the recovery houses those using waterclosets jumped up to 33·6 per cent., those with latrines were only 24·7 per cent., and those with one of the dry systems of refuse removal were 41·7 per cent. Measles was therefore less fatal amongst the houses with waterclosets, and more fatal amongst those with latrines and middens or pails. There are of course certain fallacies about this method of computation. It has been necessary, for instance, to reduce the number of conveniences of this kind to one for each house, and a slight variation might occur with regard to the waterclosets if the computation were otherwise made, but as the difference in this respect between the death houses and the recovery houses is nearly as 17 to 34, it is probable that the possible fallacy may be safely disregarded.

In conclusion, dealing with sanitary conditions other than the question of back-to-back houses, and air space or latrine accommodation, the houses in each group may be divided as follows. First, taking all the houses to which there is a drain, in which every drain is severed from the sewer, and in which (if a watercloset exists within) the soilpipe is properly ventilated, and deducting from these all such as were found by the inspectors in a dirty condition, overcrowded (that is, having not less than three inmates per room), and all such as had drainage or other serious nuisance (such as a midden within three yards of the house), the remaining houses which might be regarded as sanitary in regard to drainage, cleanliness, &c., made up in the first, or death, group 19 (19·03) per cent. of the whole. Those having some or other of these sanitary defects (exclusive of want of through draught or existence of a midden if such were remote from the house) formed 81 per cent. (80·97). Amongst the recovery houses the corresponding percentages were as follows: in a sanitary condition 24 (24·43) per cent., and in an insanitary condition 76 (75·57) per cent. On the whole, the conclusion seems to be warranted that the fresh air provided by a through draught tended to produce recovery where measles had attacked the family, while overcrowding, dirt, and structural or other insanitary conditions assisted in bringing about a fatal result.

Leeds.

SEVEN CASES OF AMPUTATION AT THE HIP-JOINT.

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SURGEON TO THE LIVERPOOL ROYAL INFIRMARY.

THE following seven cases constitute my series of secondary amputations at the hip-joint. The patients all recovered, and none of them suffered more shock than they would have done from any other major operation. This amputation would, I imagine, be more frequently put in practice in hopeless cases of hip disease were it not for its bad reputation in the way of mortality. The high death-rate is due to shock, and it is by correctly appreciating the conditions which create shock that we may hope to obtain better success. Statistics show that the mortality after amputations increases as they approach the trunk; yet after an experience of a considerable number of amputations of all kinds I have arrived at the conclusion that the severity of the shock is not at all regulated by the number of inches removed. On the other hand, it has appeared to me that when a limb has been a great source of pain and exhaustion to a child, its rapid and comparatively bloodless removal may be followed by an almost immediate improvement in the general condition. In my judgment, hæmorrhage is commonly the first factor in the causation of shock following amputation, and the second is the combined effect of the extent and duration of the tissue injury. Of course, these are often in proportion to the height of the amputation, but they are

not necessarily so. The wound is, or need be, very little larger in hip than in middle-thigh amputation, and as the latter involves division of a large bone, whilst the former can be completed without, any little inequality in the size of the wound is thus neutralised. Then, as regards duration, a hip-joint amputation may be performed in about the same time as any major amputation. If, therefore, it were conceded that neither the extent of the wound, nor the time necessary to complete the operation satisfactorily, contributed materially to the production of an undue amount of shock, there remain only the two factors of inches and hæmorrhage. The former, as I have said, seems to me to have *per se* very little effect; and if this is true the higher mortality of amputations at the hip-joint must be attributed to the greater difficulty which has been experienced in controlling the hæmorrhage. That the want of a good method has been severely felt is evidenced by the number of suggestions which have been made with a view to overcome this difficulty, and it is only because no method is so satisfactory as to be universally adopted that I mention the simple plan of fixing an Esmarch's tourniquet adopted in my cases. It has proved reliable and effectual, and in no case was there any more troublesome bleeding than in an ordinary amputation through the thigh. The operation employed was a large anterior flap cut from without inwards, disarticulation, and a shorter posterior flap cut from within outwards. The femoral artery was always tied as soon as the anterior flap had been cut, from fear of accidents, and I think this should be the rule, as half a minute's

Diagram showing simple mode of applying Esmarch's tourniquet in operations on the hip-joint.

free bleeding from the femoral artery would probably be fatal in one of these exhausted children. The mode of fixing the elastic tourniquet is almost childishly simple. Two pieces of calico bandage are placed in position, as shown in the engraving, one crossing the opposite shoulder and the other the opposite hip. The tourniquet is applied over these pieces of bandage round the innominate bone, being hitched above the crest of the ilium in front and the tuberosity of the ischium behind. Then the free ends of the bandages are carried back to the shoulder and hip and tied sufficiently tight to prevent slipping when the limb is removed. This takes off some of the elastic strain over the external iliac artery, so a roller bandage is pushed under the tourniquet at this spot to increase the pressure on the vessel. The plan described is certainly less severe than Wyeth's method with steel mattress needles, and is, I believe, equally secure; at

any rate, I have used it in all my cases and feel that I can recommend it with confidence, for I attribute the success obtained almost entirely to the absence of any appreciable loss of blood, due to the satisfactory manner in which the tourniquet controlled the vessels.

CASE 1.—A boy aged eight years was admitted in 1882 suffering from chronic hip-joint disease, for which excision had been performed in 1881. There was continued discharge and commencing lardaceous disease. He recovered well from the amputation, but when last seen, a few months subsequently, still had discharging sinuses.

CASE 2.—A girl aged eleven years was admitted with hip-joint disease in December, 1882. Excision was performed. There was extension of caries to the femur, with copious discharge and rapid emaciation, as well as marked lardaceous disease; the liver was very large, extending to the umbilicus. Amputation at the hip-joint was performed on Oct. 24th, 1883. The patient was collapsed for a short time, but soon rallied and had the usual temperature of 101° F. the same evening. She made a splendid recovery, and became very fat and strong before she left the hospital. The lardaceous disease retrogressed day by day, and at the end of three months there was not a trace of it. The reason of the better recovery in this case was that the disease was limited to the femur, for the patient was more exhausted at the time of operation than any of the others.

CASE 3.—The patient was a girl aged twelve years, who had spent most of her life in hospital on account of chronic disease of the hip-joint. She was for years in the Royal Infirmary, and then went to the Home for Incurables. From the latter institution she was sent to me by Mr. Hopper for amputation. The operation was performed on Jan. 12th, 1887, and in the course of a few months she was sufficiently well to return to the Home for Incurables, where, I am informed, she was subsequently "cured." Although she had been so long ill, the liver and spleen were only slightly enlarged.

CASE 4.—The patient, a woman aged twenty years, had a sarcoma of the knee, for which I amputated through the middle of the thigh on Jan. 29th, 1890. She returned with recurrence in the stump on June 2nd, for which she was amputated at the hip-joint on the 3rd. The temperature the same evening was 98° F. There was no shock. The temperature next evening was 98.2°. She made a rapid recovery, and was discharged well on July 9th, but ultimately died from recurrence in the lungs and other parts.

CASE 5.—The patient, a girl aged twelve years, was another old case of hip joint disease with exhaustion. After sending her to the country for three months to try to put a little fresh life into her I amputated the limb on Sept. 27th, 1892. There was very little shock. The temperature the same evening was 98.6° F., and the next night 99.4°, whereupon it continued as before, between 98° and 100°. She was discharged in March, 1893, being able to get about, but still with some sinuses unhealed.

CASE 6.—The patient, a man aged forty years, was admitted on March 24th, 1893, for a sarcoma of the inter-muscular fascia of the thigh, the size of a small cocoanut. Amputation at the hip-joint was performed on the 25th. There was no appreciable shock. The temperature the same night was 100° F., and continued slightly above normal for several days. The wound suppurated, but he was able to go home on May 8th, and subsequently gained flesh, becoming stronger than he had been for a long time. He is still (January, 1895) free from recurrence.

CASE 7.—The patient, a boy aged eleven years, had hip and knee disease on the same side. The knee was quiet and firmly ankylosed at a right angle. The hip was discharging freely through long sinuses. He was admitted on March 21st. Amputation at the hip-joint took place on the 29th. The axillary temperature for the same evening is recorded as 96.4° F., but he certainly did not suffer acutely from shock, as I cannot remember feeling any anxiety about him, and the subsequent progress was good. The temperature only once reached 100°—viz., on the fourth evening—and after the seventh day it was normal. On May 10th he began to get about on crutches, and on the 17th he was discharged.

Rodney-street, Liverpool.

MR. W. G. EVANS, public vaccinator to the second district of the Frome Union, has been awarded the Government grant for successful vaccination for the fifth time.