

SUMMARY.

In this lecture I have approached dullness and backwardness from the clinical point of view rather than from that of the psychologist.

Backwardness may be divided into essential (that due to primary mental defect), and non-essential (that in which the potential capacity of the mind is unimpaired).

Non-essential backwardness has been considered under four headings :—

- A. That due to environment.
- B. That due to physical disorders.
- C. Lack of self-esteem.
- D. Late mental development.

Under backwardness due to physical disorders has been mentioned that due to the following conditions :—

- Sense deprivation.
- Tonsils and adenoids.
- Ductless gland defects.
- Infantilism.

Finally, the following states have been mentioned which should be distinguished from backwardness :—

- Nervousness.
- Educational overstrain.
- Night and day terrors.
- Epilepsy.
- Speech defects.

HYPERTROPHIC STENOSIS OF THE PYLORUS.

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MODERN surgical literature appears to be rarely free of some reference to the treatment of that peculiar and interesting condition to which the above title is applied. The reason

for this is perhaps not far to seek, for within the last ten years a profound change has occurred both in the prognosis of the disease and in the attitude which both physicians and surgeons adopt towards treatment. So rapid has been this change that many have found it difficult to accommodate themselves to the new viewpoint, and the attempt to gain a proper perspective has produced an abundant literature. Despite this fact, however, we are little further on as far as the ætiology of the condition is concerned. The two theories of origin still remain, neither being proven, the one that the condition is a congenital abnormality strictly comparable with other deformities, while the second theory assumes that the hypertrophy is secondary to spasm, brought about by irritation either in the stomach itself, or reflexly from more remote situations. When these two theories are critically examined, it is found that while some of the main facts support, others disprove each in turn. For instance, if the condition is congenital, one would expect the symptoms to start at birth, whereas there is usually a latent period of two or three weeks, which may even be extended to as many months, before the onset. Again, congenital abnormalities are apt to be multiple, but it is rarely that other abnormalities are found in association with the hypertrophied pylorus. In some thirty-five cases only two showed any other abnormality; one a gluteal hernia, and the other a minor degree of hypospadias which could be ignored. On the other hand, if the condition is secondary to spasm, then the cause of the irritation should be demonstrable. Clinical examination, however, never reveals such, and in such cases as have come to post-mortem examination no irritative lesion has been discovered. It should here be mentioned that at one time it was held that phimosis might be the origin of a reflex irritation. It is true that the condition is commoner in boys than in girls; in the author's cases the proportion was nearly three to one, nevertheless, it is not extra-

ordinarily uncommon in girls, and many of the boys had been circumcised at birth.

Phimosis has been blamed for so many diseases from time to time, that it is not surprising a condition of doubtful ætiology should be included; the preponderance of cases in the male sex, however, is probably explained by some other factor, in which connection it must not be forgotten that male infants are on the whole less robust, as is proved by the fact that the general mortality during the first year of life is much greater among males than females. If the irritation were local, one would expect to find evidences of gastritis or ulceration, either at operation or on the post-mortem table, but such is not the case. It should be remembered also that nearly all the infants have been breast-fed up to the onset of the illness, artificial diets only being adopted when the vomiting appeared to indicate that the breast milk did not agree with the child. And so the ætiology must be left an enigma, and no guidance can be obtained from it as to prevention or logical treatment. The pathology of the disease is comparatively simple. There is a tumour of the pylorus about the size of a large Barcelona nut, which produces such constriction of the pyloric canal as almost to obliterate it; in addition, the musculature of the pyloric antrum is hypertrophied, usually being, however, well demarcated from the tumour, but occasionally continuous with it, and this hypertrophy extends all over the stomach, becoming less marked towards the cardiac end. The mucosa rarely shows any change, except in untreated cases where there may be a mild inflammation present secondary to decomposition of the stomach contents. The intestines beyond are empty, thin-walled and obviously under-developed, a point not to be forgotten in the after-treatment of the case. Microscopically, the tumour consists of involuntary muscle fibres showing both simple and numerical hypertrophy. The resistance of these infants is

so reduced that secondary infections in the lungs and elsewhere are common.

The signs and symptoms of the disease are fairly straightforward if properly interpreted. The baby born apparently healthy, although rarely weighing more than 6 or 7 lb., takes the breast well for two or three weeks, and begins to gain weight. It is then noticed that a little vomiting occurs after each feed; this at first is thought to be merely the return of excess food. With a varying degree of rapidity, however, the vomiting becomes more urgent, frequently the whole feed is returned almost immediately after it is taken, and the vomiting is typically projectile. At this period the child is usually taken off the breast and artificial foods are tried. Instead of improving, however, the condition is only made worse, and in succession a whole series of different foods are tried without any amelioration of the symptoms.

The baby rapidly loses weight and becomes obstinately constipated, the bowels in some cases not being opened for a week on end. It is also obvious from the attacks of screaming which occur that violent colicky pains accompany each emesis. No sooner is the vomiting over than the baby shows signs of its great hunger, and will take another feed immediately with avidity. Such a history is very strongly suggestive, but by no means diagnostic of the condition. There are two physical signs, however, which when elicited place the diagnosis beyond doubt; they are visible peristalsis and the presence of a tumour. With patience, experience and skill, these two signs can always be demonstrated, and the greatest of these is patience. To the novice in the handling of infants the author recommends the following routine, which may have to be carried out on several occasions on the same case before success is attained. As the ultimate diagnosis rests upon these two signs, and cannot be assured by any other form of investigation, it is essential that the utmost care and patience be displayed. A

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suitable feed having been prepared, the infant is placed on the nurse's lap lying on its back. The room should be warm, indeed the examination is best conducted in front of a fire, and it is very important that the examining hand should be warm, too. The child is now allowed to take the feed, and in an oblique illumination the peristaltic waves passing from left to right can be easily seen. With the utmost of gentleness the hand is now placed upon the abdomen, which is lightly palpated to allow the child to get accustomed to the manipulation. The thighs are now flexed right up over this hand and held in position with the other.

If the child cries the hand is not withdrawn, but held in position until the spasm is over. Frequently the stomach can now be felt as each peristaltic wave passes over it. In order to feel the tumour, however, much deeper palpation is necessary. It must be borne in mind that the tumour is a small one and freely mobile, lying usually under cover of the liver. In this situation, therefore, the whole of the abdominal wall is picked up between the fingers and thumb, dipping them deeply under the liver edge. It is surprising how well babies stand this type of palpation if properly carried out, and after two or three tries the examiner is usually rewarded by feeling the nut-like tumour slip between his fingers. This renders the diagnosis certain, but in hospital cases two other methods of investigation are carried out as a routine, namely, X-ray examination after bismuth meal, and chemical analysis of the gastric contents. The X-rays invariably show an enormous delay, the food not leaving the stomach for upwards of seven hours; in many cases none leaves and the meal is eventually returned. Some cases, too, demonstrate that the whole of the pyloric antrum is in a condition of spasm, since the food is all retained in the fundus high up under the diaphragm. The test meals have all shown a great hypochlorhydria, amounting in most

cases to complete absence of free hydrochloric acid, and diminution of the total chlorides. Fractional test meals have not been carried out, obvious difficulties making them almost impossible of performance.

In reviewing the diagnosis of these cases it must be remembered that in practice they display considerable variation, some being acute, others only subacute; in many the vomiting is frequent and urgent, yet in others it may only occur once in the twenty-four hours, while at the same time there are other conditions capable of causing very similar symptoms. It is for this reason that the importance of the two cardinal physical signs has been emphasized.

The treatment of hypertrophic stenosis has given rise to an immense amount of controversy, since it falls under two headings, operative and non-operative. Ten years ago it would have taken a highly judicial mind to have decided between the respective merits and demerits of medical and surgical treatment. At the present time, thanks to the enormous advances which have been made in the surgical treatment, the outlook is clearer. In order to appreciate these advances, however, it is necessary to give a very brief historical summary of the changes which have occurred in the surgical aspect, for the medical remains in essence the same as it was. The physician has for long treated these cases by placing them upon a suitable diet, into the details of which I need not enter, except to say that the feeds are usually partially or wholly predigested, given in small quantities at frequent intervals, and accompanied by daily, or sometimes more frequent, lavage of the stomach. When we examine the *modus operandi* of this treatment, we are forced to the conclusion that at best it may prevent the onset of a secondary gastritis, and that it provides the baby with a certain quantity of essential fluid, and perhaps carbohydrate, which may just keep it alive until such time as the spasm relaxes and the hypertrophy undergoes relative diminution.

That this is not an exaggerated statement can be vouched for by anyone who has seen these cases under such treatment gradually lose weight until they are at the point of death, when one must imagine every muscle in the body completely relaxed, even including the pyloric sphincter. Some 45 to 50 per cent. just turn the corner and get better, the others succumb. This, then, represents the mortality of the disease under medical treatment, and high though it is, it nevertheless is better than that of the older surgical treatments, at least in all but a very few especially skilled hands. Of the surgical methods of treatment, the first to attract attention was gastro-enterostomy. When one remembers that the jejunum in these infants is often no larger than a lead pencil, it is little short of astounding that Scudder, in 1914, was able to publish seventeen cases thus treated with only four deaths.

It cannot be stated, however, that this figure represents a fair estimate of the mortality, for in other hands it frequently rose to well over 70 per cent. Then came a series of pyloroplasty operations. Nicoll, of Glasgow, performing a pyloroplasty of his own design was able, in 1906, to report six cases with only one death. But again, in average hands the mortality of these operations was at least as great as that of medical treatment. The Loreta type of operation, in which the pylorus was dilated by the finger or by bougies introduced into the stomach, was certainly an improvement, and in the most skilled hands gave a mortality as low as 10 per cent. The average percentage, however, still remained about 30, and the advantages over medical treatment were as yet not sufficiently well marked to induce a general alteration of attitude. It remained for the introduction of the Rammstedt operation towards the end of the war to bring about this revolutionary change. This operation has now been performed upon many hundreds of cases by different operators, and has given almost uniformly satisfactory results. While I do not propose to enter

into a detailed discussion of the technique of this operation, for it is the type of operation in which only practice makes perfect, it is nevertheless essential to give a brief description. Although some operators lay great stress upon the anæsthetic, one advocating gas and oxygen, another local infiltration, and so on, I have found the ordinary general anæsthetics when administered by competent persons quite satisfactory. The majority of my cases have had ethanesal, but others equally successful have had chloroform or its mixtures. The operating table should be suitably warmed. A mid-line incision is made in the epigastrium a little over two inches long. The peritoneum, which is exceedingly fragile in these infants, is opened, and without exposing any intestine two fingers are introduced and the tumour is delivered as rapidly as possible. It is held under tension by the thumb and forefinger of the left hand, while a longitudinal incision is made across the hypertrophied muscle fibres in the bloodless area just above the centre. Before the mucosa is reached the knife is discarded and the division completed by using the blades of a pair of dissecting scissors the reverse way. The mucosa bulges into the wound and must be protected from injury. No sutures are necessary, and the whole is now returned to the abdomen, the parieties being closed by a few through-and-through fishing-gut sutures. Simple as it appears, there are many pitfalls for the inexperienced. Rapidity is probably of more importance here than in any other operation of surgery. The average time taken in the author's cases was six minutes, the shortest being four, and the longest twelve. This speed can only be attained by calm, deliberate and methodical movements on the part of the surgeon, and by good anæsthetization while the peritoneum is open to prevent prolapse of the intestines through the wound. The immediate after-care consists in combating shock by warmth, salines, and perhaps a little pituitary extract. In satisfactory cases, however, the infants

rapidly recover, and will be taking feeds again within a few hours.

The dieting afterwards is of the utmost importance, and the co-operation of the physician in this respect is of the greatest value. It was suggested at one time that the pancreas, not having received the usual stimulation from the duodenum in these cases, remained undeveloped and that therefore feeding with pancreatized food was essential for some time following the operation. Probably this is not correct, but we have already seen that the intestine is always small and under-developed, so that the feeds should be small and frequent for the first week or two. If breast feeds are available, they will be found more satisfactory than any other in most cases; the amount of the feed must, however, be strictly limited. As will be seen from the statistics given later, one of the risks is the onset of enteritis, which occasionally seems to occur despite the utmost precautions; in children's hospitals, where there may be cases of acute intestinal infections in the wards, it is advisable to isolate these infants as far as possible, since their resistance is so low that they almost invariably succumb to such infections. It is a little difficult to express the mortality of this operation in figures at present, since few have had any great experience in its performance, but there appears to be no reason why, under the best of circumstances, it should not be reduced to less than 5 per cent. Several operators have produced records showing a mortality of 12 to 15 per cent., and with this the author's figures agree, but it must be remembered that amongst these cases are included many that have been allowed to go down-hill under other treatments before the operation was performed. In the series of cases recorded below, one death occurred after the infant had made good progress for a fortnight and was thought to be well enough for discharge. A mild epidemic of gastro-enteritis broke out in the ward, to which the child succumbed on the fifteenth day. The second death was

of an infant weighing only a little over 3 lb. who had for some time been treated with subcutaneous saline. Infection had crept in along one of the needles, with the result that at the time of the operation there was an enormous abscess extending over the whole of the lower abdomen and leaving only just sufficient space for the incision to be made. The abscess was opened at the finish of the operation, but death nevertheless occurred on the fifth day from septicæmia. The stomach of this case is preserved in the Charing Cross Museum, and shows the tissue-paper scar which rapidly forms over the pyloric incision.

The third death was of an infant in Charing Cross Hospital, who developed the most acute gastro-enteritis immediately after the operation and died on the second day, there being no other case of intestinal infection in the children's ward at the time. It will be seen, therefore, that two of the deaths could scarcely by a stretch of imagination be thought of as due to the operation; it is only proper, however, that they should be included in compiling statistics. With more care, both before and after operation, they could possibly have been prevented, and the mortality-rate would then be a very inconsiderable one.

Even with a mortality-rate as high as 15 per cent., the advantage over medical treatment is one which can be no longer denied or ignored, and this is especially so in view of the fact that the medical statistics include many cases in which neither peristalsis nor tumour was demonstrated, the diagnosis being likely enough in error. Indeed, some modern writers upon this subject state that the mortality of proved cases showing a tumour is not short of 100 per cent. under medical treatment, and that the recoveries reported are all cases in which the diagnosis was never proven. However this may be, it is obvious that in future this condition must be considered a surgical one, until such time as a further study of the ætiology shall lead us to logical methods of prevention. The

question is often asked as to what happens to these cases in after-life, and it is surprisingly difficult to answer. The author has only been able to follow cases for about four years, and certainly up to that time the children appear to be perfectly healthy and to suffer from no digestive troubles. It would be of still greater interest to know what eventually happens to such cases as are not operated upon and recover, for the suggestion made above that no definite case ever recovers without operation is almost certainly an exaggeration. Occasionally cases of hypertrophy of the pyloric sphincter are seen in adults, but unfortunately it is usually impossible to get any accurate history of the patient's infancy. It is, however, possible, even probable, that some of these cases are really congenital in origin, and the author has treated a few by means of the Rammstedt operation with satisfactory results.

The statistics compiled below are from a total of thirty-five cases, but in some instances where the notes are incomplete the averages have been obtained from a proportion only of these.

Average age upon admission—7 weeks, 2 days.

Average age at operation—8 weeks, 3 days.

Males, 26 ; females, 9.

Average number of days in hospital—28.

Average length of history before admission—29 days.

In three cases the symptoms were stated to have started at birth.

All cases originally breast-fed for an average period where noted of three weeks.

Artificial foods tried include humanized milk, Glaxo, Nestlé's Milk, Allenbury's Food, &c.

Visible peristalsis seen in all but two cases, where the examination was cursory on account of the obvious diagnosis.

Tumour felt in all but three of the earlier cases and one recent case.

Average weight upon admission—6 lb. 14 oz.

Average weight at operation—6 lb. 1 oz.

Average weight upon discharge—7 lbs. 11 oz.

Radiographer's report where noted shows delay in emptying stomach amounting usually to 7 hours.

Test meal report where recorded invariably shows hypochlorhydria or achlorhydria.

Mortality percentage—(five cases), 11.5.

Sequelæ—two cases developed ventral herniæ, one as the result of the onset of whooping-cough immediately after the operation, the other following some infection of the superficial wound.

Average duration of operation—6½ minutes.

Longest time, 12 minutes ; shortest time, 4 minutes.

Ultimate result for varying periods up to 6 years quite satisfactory.

HICCUP.

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(The opening paper on a discussion held by the Hunterian Society, March 19, 1928.)

HICCUP consists in a sudden involuntary contraction of the diaphragm, but the inrush of air which should follow is prevented by the fact of the glottis being closed. The abrupt arrest of inspiration produces the characteristic sound. If the spasm occurs during a pause in respiration there is no noise, but the louder the noise the less is the patient distressed. The frequency of the spasms is usually about one quarter or one fifth that of ordinary respiration.

The phrenic is the efferent nerve involved in the process. The afferent nerves concerned are the vagus, sympathetic, and sensory fibres in the phrenic. It was