from whooping-cough and bronchopneumonia. In spite of treatment death occurred a few days later from this chest trouble.

REFERENCES.

¹ *British Journal of Children's Diseases*, 1908. ² *Lancet*, February 14th, 1914.

FURTHER EXPERIENCES IN THE TREATMENT OF IMPERFECTLY DESCENDED TESTICLES.

BY

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SOME months ago I was asked by a colleague how I treated cases of imperfectly descended testicles now, and appreciated clearly how impossible it was to give an answer sufficiently concise to be clear enough to satisfy the hearer. Going home I communed with the records of such cases which I had done in the last ten years—that is, since I published a full account of my opinions and practice on the subject. In the number of the *BRITISH MEDICAL JOURNAL* of June 4th, 1904, I published a paper on "The value of the imperfectly descended testicle, the advisability and value of the operations performed for its relief." Since then a period of ten years has elapsed, bringing much experience, which must of necessity have modified the conclusions arrived at in 1904. The advance of time has increased my interest in the subject, whilst the further experience has added to knowledge of the pathology of the condition and the results of treatment.

The imperfect descent of the testicle is in almost all cases a congenital malformation or deformity, due to some condition (or conditions) which, by depriving the gland of its full power of development, has arrested it in the course of its descent. The congenital malformation under consideration is practically always associated with arrested development of the tunica vaginalis, leaving a hernial sac (potential at least). In the associated deformity the tunica vaginalis remains in communication with the peritoneal cavity, a condition disposing to the development of a hernia, a total congenital hernial sac.

Fig. 1.—A, Congenital hernial sac. B, Acquired hernial sac. C, Infantile hydrocele. T, Testicle.

Upon being confronted with a patient with imperfect descent of the testicle it is often impossible to decide whether the condition of imperfect descent is temporary or permanent—that is to say, whether the testicle is merely belated in its descent or not. Various persons arrive at the same stage of development at very various times. So long as no hernia is present there need be no hurry in determining the answer to this question. Neither need there be any hurry if the malformation is unilateral.

This expectant attitude is terminated either by:

- (1) The recognition of a hernia accompanying the imperfect descent; or
- (2) The recognition that the imperfect descent is not mere tardiness.

Either of these two occurrences terminates the period of waiting, and indicates the need for active treatment by operation. As these factors are only two in number it is well to consider how and why they indicate the termination of the period of inactivity and initiate that of activity.

Hernia.

The presence of hernia in association with an imperfectly descended testicle indicates the fact that operation is necessary for its cure. Indeed, there is no other treatment for the hernia; a truss would press on the testicle or its vessels. Moreover, the non-separation of the tunica

vaginalis and peritoneum prevent the testicle from descending, even if it were capable of doing so. The hernial sac holds the gland up. Hence the cure of the accompanying hernial sac, by nature or art, will aid the testicular anomaly to be cured. In separating the sac from the cord great care must be exercised to avoid injury to the vessels, for such an injury is known to militate very greatly against the testicle subsequently having any physiological value.

The Persistence of the Deformity.

When the testicle has been imperfectly descended for sufficient time—say, until the patient is 7 years old—to show that the condition is a permanency and no temporary anomaly of a gland belated in its descent, it is necessary to operate. Such a proceeding may, in the main, be done in one of three ways:

1. The accompanying hernial sac may be divided and stripped of the cord, allowing the testicle to descend into the scrotum. Any but the mildest scrotal fixation is merely a prelude to failure, anatomical or physiological. Such an operation is called an orchidopexy or an orchidopexy.

2. The gland may be removed, as advocated by many. This line of treatment is specially indicated when the imperfect descent is unilateral. It is satisfactory in its after-results. The operation is an orchidectomy.

3. Especially when the condition is bilateral, the gland may be returned to the abdomen intraperitoneally. Any internal secretion which the gland may have is retained and will aid the patient to develop sexual characters, such as hair on face, male voice, male body, energy of mind and body. Such an operation is an orchidocoeleoplasty.

Which of the three operations shall be performed must to a great extent be decided by the surgeon at the operation. The great principle is, that should the testicle be unable to furnish an external secretion of its own power, no amount of surgical art can make it do so. Clinical experience has shown how very prone surgical art, in some form of orchidopexy, is to be followed by atrophy or fibrosis, the gland losing any power it might have possessed of developing any secretion, external or internal, which before the operation it might have been capable of doing. Hence it may be laid down that orchidopexies, except in unusual instances, rob the patient of something. Sufficient years have gone by for many workers and many patients to have proved this. As yet, surgeons have no great or extended experience of orchidopexy. But some—myself amongst them—can witness that it is sometimes followed by growth and descent of the gland; most often the descent is not as great as is normal, and very occasionally I have seen atrophy. But I can say that the more experienced a surgeon is with these cases the less likely he is to do an orchidopexy in an unsuitable case, and to incur a failure. Still, as surgeons can only work with the material supplied them, it is impossible to attain perfect success always. Imperfect success may be the greatest success that the provided material allows. In such doubtful cases an orchidocoeleoplasty is best. The results of this last operation are difficult to estimate. Though it has been done for about fifteen years, there is nothing much to be said, except:

(a) It has been urged on theoretical grounds that the returned testicles are prone to become malignant. This is not so.

(b) It has been urged that in the intra-abdominal position such common diseases as gonorrhoeal orchitis endanger life. This is not so.

(c) Apparently the intra-abdominal position abolishes any external secretion, but preserves and encourages the internal secretion. A very important point, as it is in the internal secretion that practically the whole value of the imperfectly descended testicle lies.

It is the operation more frequently done in these cases than any other. In my own work for the last ten years the percentage has been:

Orchidopexy ...	...	about 10 per cent.
Orchidocoeleoplasty ...	...	about 50 per cent.
Orchidectomy ...	...	40 per cent.

The infrequency of the performance of the operation of orchidopexy is the result of an extended experience of the results of that operation, not only when done by myself, but also when done by others. These may be very shortly

generalized. The immediate result of the operation is fair. Then the testicle begins to ascend, usually until the gland is in the neighbourhood of the pubic spine. Some of these organs descend again, taking upwards of eighteen months to do so. Such cases are the best results of the operation. And until a few years ago I thought that the last word of criticism had been said. But further experience taught that this was not so. Atrophy of the gland may come on any time within about two years of the operation. Even if a gland is well placed by operation it may atrophy. A badly situated gland may atrophy. And the conclusion was borne in upon me that the operation of orchidopexy more frequently fails from atrophy of the gland than by not retaining that gland in a good position.

The treatment suggested for the condition of imperfectly descended testicles can be summed up from the point of view of the age of the patient, as the condition is a congenital one.

At birth and up to the age of about five years: Watch the case to decide if the testicle is merely late in its descent or not. If a hernia is seen to be present operate and conclude by doing orchidoplasty.

From 7 to 20 years of age: Operate if a hernia is present or not. Do either orchidoplasty, orchidectomy, or orchidocoelioplasty.

Above 20 years of age: Do orchidectomy.

There is another point which further experience has taught me. In my book on the *Male Diseases of General Practice* (pp. 95-97), the subject of the "masked imperfect descent of the testicle" was considered, I believe for the first time. Shortly, the imperfect descent of the testicle is masked if the hernia which accompanies it pushes the testicle into the scrotum. Such a condition of imperfect descent is not recognizable until the hernial sac is fully stripped up and removed. The testicle then assumes the position of imperfect descent, or something near it. Since the publication of that book in 1910 I have met many examples of this condition, and am sure that it is a great deal more frequent than I formerly supposed. Such a conclusion supports Mr. Hamilton Russell's theory that every hernia depends for its cause on a congenital fault. Such a congenital fault in the tunica vaginalis is very likely to be accompanied by some fault in the descent of the testicle.

EXPERIMENTAL PROOF OF THE VALUE OF A MASK OVER THE SURGEON'S MOUTH DURING OPERATIONS.

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EXETER.

In order to demonstrate the value of a mask over the surgeon's mouth during operations I carried out the following experiments with *Bacillus prodigiosus*, which was used for three reasons: (1) It is absent from ordinary air and from the mouth; (2) it grows in red colonies, and therefore can easily be distinguished from other organisms macroscopically; (3) it is non-pathogenic.

The bacilli were added to water until the mixture was turbid and slightly pink. With this suspension of bacilli the experimenter filled his mouth and gargled, immediately proceeding to either breathe or speak or cough or sneeze, as the case might be, without or with a mask, over a series of sterile agar plates. Any red colonies of micro-organisms found on the plates after incubation must have come from within the experimenter's mouth.

The plates used were in Petri dishes of a diameter of 3½ in., and the mouth was held in all cases 18 in. away from the plate. Each experiment was conducted in a separate room, in order to avoid any air infection of the plates from a previous experiment.

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The mask was made of fine butter muslin of the pattern shown in the diagram. It is cool and acts as a covering for the hair during operations. The total length of the mask is 2 ft. and the width 18 in. Over the part of the

A, Portion for covering the hair; B, portion covering the nostrils, mouth, and chin.

mask which covers the nostrils and mouth plain gauze (shaded in diagram) was stitched. In some tests a mask with four layers of gauze and in others with eight layers was used.

Tests under which the Plates were Exposed.	Duration of Exposure.	Number of Colonies of <i>Bacillus prodigiosus</i> .		
		Without Mask.	With Mask of 4 Layers of Gauze.	With Mask of 8 Layers of Gauze.
Ordinary breathing with mouth open	2 minutes	0	0	0
Quiet speaking	"	0	0	0
Coughing	"	11	4	0
Sneezing	1 sneeze	About 130	0	0
Sneezing	2 minutes	—	About 220	4

It will be seen that with ordinary breathing and quiet speaking (such as easily could be heard by an assistant surgeon or nurse during an operation) no *Bacilli prodigiosi* left the mouth. This test has been tried several times with the same result.

Coughing for two minutes caused only a few bacilli to be emitted, and these were controlled by a mask of eight layers of gauze, one of four layers being insufficient. Since probably no bacilli had reached the larynx or trachea of the experimenter while he was gargling, it is assumed that the organisms emitted during coughing came from the mouth only. There is therefore

no proof in these experiments of infection from the larynx being controlled by a mask, but a surgeon with such an infection would not operate.

Sneezing is shown to be a most dangerous source of infection from the mouth, one sneeze, and that an artificial one, producing 130 colonies of micro-organisms in a circle of 3½ in. diameter at a distance of 18 in. A mask of eight layers is not sufficient to keep back all organisms

Sneezing with mask.

Sneezing without mask.