THE OBSTETRIC SATCHEL: A PROBLEM IN ASEPSIS.

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THE speed of a fleet of ships is the rate at which the slowest vessel in that fleet can sail. The measure of the strength of a defence is found in its weakest point. The degree of immunity from septic infection in obstetric practice depends upon the completeness of the aseptic precautions adopted; the precaution which fails determines the quality of the success of the prophylaxis. If the fleet is to sail faster it is useless to accelerate the swift cruisers and destroyers to thirty knots while the other vessels can only do fifteen or eighteen; if the defending wall is to stand sure it is the weak part that requires to be strengthened and not the strong; and if obstetric asepsis is to be perfect it is the defective detail that must be corrected. To condense this wide argument down to a single point: I am hesitating about the adoption of rubber gloves in obstetric practice because I am not sure about the state of my midwifery bag. The meaning of this somewhat cryptic statement will become clear as the discussion advances.

To understand the position of aseptic midwifery at the present time it is necessary to cast a glance backward; it need not be a long look, but it is essential. In 1867 a new word began to be seen in the medical literature of the day: that word was *antiseptic*. It was not truly a new word (new things being altogether rare things in this world now so old), but it began to carry to the hearer's mind a new idea and to have new and beneficent associations. It was really an old word, for it was in use as far back as 1751 in the sense of "antiputrescent"; we can read in the *Gentleman's Magazine* of that time that "acids *per se* are most powerful antiseptics." It was employed figuratively, also, as something preventing moral decay; and Thomas Carlyle, in his *Latter-day Pamphlets*, published in 1850, characterized certain individuals as "not divine men, yet useful antiseptic products of their generation," a characterization which we obstetricians might well strive to earn for ourselves. Be this as it may, in 1867 Lister published his articles on A New Method of Treating Compound Fracture and On the Antiseptic Principle in the Practice of Surgery,¹ and launched the word afresh on its voyage down the stream of time with a new significance attached to it. I need not relate how Lister had grasped the all-important result of Pasteur's research on the microbic causes of putrefaction, "a secret wrung from Nature's close reserve," and had translated it into the practical everyday work of the surgeon; the marvel of thirty years ago has become the commonplace of to-day and requires no re-telling by me. It is well, however, for us to remember that during the decade that followed Lister's discovery surgeons relied upon the antiseptic rather than upon what we now call the aseptic principle in their management of wounds; the microbes that ventured near the operator perished (or were supposed to perish) in the noisome spray or were killed by strong carbolic lotions in the incision, and the tissue of the wound themselves did not always escape the fate prepared for the invading hordes of bacteria.

In the year 1868 carbolic lotion was being employed in Glasgow for the washing out of the uterus in puerperal septicaemia, as we learn from Professor J. G. Wilson's short note in the *Glasgow Medical Journal* (1, p. 322, 1869), and about the same time Bischoff paid a visit to Lister and took back with him to Basel the idea of obstetric antiseptics. In 1870 Stadtfeldt of Copenhagen systematized the new plan of conducting midwifery cases, and it is worth while remembering that the Danish obstetrician emphasized personal disinfection, the washing of the hands in carbolic lotion, and the daily bathing of the genitals with the same during the puerperium, as well as the employment of vaginal douches. Although this was so, yet there can be no doubt that during the ten or fifteen years that followed 1870 the outstanding feature of the treatment was the *post-partum* and puerperal vaginal douche. As we now know, this was not so essential a part of obstetric antiseptics as was thought, and was founded upon imperfect knowledge of the bacteriology of the vagina and uterus; more than this, it became in the hands of some a real danger. Nevertheless, much good was done by the new departure in the management of midwifery cases, how much Sir (then Dr.) Halliday Croom demonstrated in a paper which he read before the Edinburgh Obstetrical Society in November, 1880;² the mortality in obstetric practice fell rapidly and

the morbidity also decreased, sure indications of the success of any method of treatment. Still better things, however, were yet in store for the parturient and puerperal patient.

Asepsis is a newer and a better thing than antiseptics, for prevention is better than cure, and is very much better than a cure that brings dangers with it inherent in it. In a sentence, it is better to prevent the access of pathogenic organisms to the uterus than to pursue them there with strong antiseptics, which seriously reduce the vitality of the uterine tissues themselves and may do harm also in other ways. Chiefly through the painstaking investigations of the Germans a knowledge of the bacteriology of the genital tract from uterine fundus to vulva was built up during the last two decades of the nineteenth century, and the information thus obtained is being applied to the elaboration of a more perfect system of dealing with the risks of septic infection in labour and the puerperium. Under normal circumstances the uterine interior in pregnancy and labour is sterile; the cervical plug of mucus, while it does not kill bacteria, makes it at any rate difficult for them to pass in; by a germicidal action of the vaginal mucus, and possibly by other protective mechanisms of a more complex kind, microbes introduced into the vagina from without are rendered innocuous; the gush of liquor amni—practically a normal saline solution—which takes place at the close of the first stage of labour, and which is to some extent repeated at the end of the second, helps to wash away any microbes which the vaginal mucus, perhaps becoming scanty, has failed to kill; and finally, the placenta, like a huge sterilized sponge, sweeps through the passages, carrying clots, shreds of membrane, meconium, vernix, and all such putrescible matters before it. Outside the vaginal orifice, however, a very different state of matters exists; there are congregated multitudes of pathogenic and pyogenic organisms which may be carried in on examining finger, on instrument, and on douche nozzle; near the anus in particular there lurks, in all probability, the *bacillus coli communis*, more to be feared in its later developments than all the rest, because not vulnerable to the antistreptococcus serum.

As soon as the new conception of the bacteriology of the genital tract in labour began to become the common possession of obstetricians, so soon the methods of management of parturient patients began to undergo revision. The idea of a genital tract sterile in its upper (uterine) part, with self-protecting microbicidal mechanisms in its middle (vaginal) portion, and with a lower (vulvar) part swarming with dangerous micro-organisms—this idea revolutionized obstetric practice. If mischief had its abode outside the vagina, then it behoved the obstetrician to keep it there or to remove it further off. It was obvious that the examining finger of the attendant passing in and out over the vulva might carry in bacteria with it. These might, it was true, be rendered innocuous in the vagina, but there was, of course, a limit to the microbicidal powers of that canal, and there was no certainty that in the uterus any protective mechanism at all existed. The same conclusion applied to instruments or to the douche tube introduced over the vulva. The finger, douche, or forceps blade might all be aseptic when they reached the vulva and might yet be contaminated by contact with the skin over the perineal body and at the sides of the pudenda.

The attention of the careful obstetrician was now concentrated upon the vulva. Thorough cleansing of the external genitals and surrounding parts from before backwards began to take the place of importance formerly occupied by the vaginal douche; soap and water and an antiseptic lotion (sublimite, carbolic, lysol, creolin) were brought into operation, and special care was taken to remove sources of danger from the neighbourhood of the anus. Further, the obstetrician, when introducing his fingers or any instrument into the vagina, was careful to hold aside the labia so as to avoid contact therewith. The number of vaginal examinations was also reduced to a minimum, and careful abdominal palpation in great measure replaced the vaginal touch. All these precautions are wise, and must, to my mind, be in no way altered; they are essential to the safe practice of obstetrics. Further developments of the aseptic system soon appeared. More and more rigid methods of hand sterilization were adopted, culminating in the wearing of rubber gloves, and the care of the finger-nails was made almost a science. In maternity hospitals, at any rate, and to some extent in private practice, the boiling of instruments before their introduction into the vagina and uterus became a matter of routine. Operating coats began to be worn, and in this connexion I may say that since about 1894 or 1895, when

I commenced wearing an ovariectomy apron at my private cases, I have used this precaution. In all these ways the technique of obstetric asepsis was elaborated and established. Now, having very rapidly and cursorily enumerated the precautions usually taken at a midwifery case at the present time, I may proceed to discuss the question of the midwifery bag.

The midwifery bag is, to my mind, the weak point in the obstetric defence of the woman in labour against the assaults of sepsis. The bag is, indeed, no worse than it was years ago, in some respects it is, perhaps, a little better; but in its evolution it has not kept pace with the progress of the technique and armamentarium of modern obstetrics. While danger has been largely excluded from many directions, the midwifery bag still brings it to not a few cases of confinement. Edgar says that "the ordinary obstetric leather bag which has been from one case to another, in cabs and street cars, which of necessity has had its interior soiled by bloody fingers and instruments, green soap, ergot, or other drugs, has no place in the lying-in room in the present age of aseptic surgery." The words are strong, but I do not think they overstate the facts. Some years ago the contrast between the aseptic precautions I was adopting for abdominal sections and other gynaecological procedures and those with which I was contented at an instrumental delivery began to come home to me with some force; and it was not long before I began to try to bring the two groups of cases more into line. It was comparatively easy to approximate the protective procedures in most of their details; but I still found myself starting off to do, say, an ovariectomy, with all my instruments, swabs, and ligatures sterilized and in a metal sterilizer, while, when the call to a forceps or craniotomy case came, I picked up my midwifery bag and trusted that I should be able to sterilize its contents at the patient's house.

I do not think my methods differed much, if at all, from those in use by my medical brethren; but in obstetrical literature, and more especially in that of Germany, there began soon to be indications that the conscience of the profession was being exercised about the safety of the midwifery bags in common use. As far back as 1890 Professor Simpson showed to the Edinburgh Obstetrical Society a German midwives' obstetric bag, in which there was an attempt to overcome some of the more obvious risks;³ and in 1892 Veit demonstrated to the Gesellschaft für Geburtshilfe und Gynäkologie in Berlin his obstetric and gynaecological operating bag, containing a metal carrier for instruments which could be sterilized.⁴ In 1895 Professor von Herff brought out a somewhat complicated instrument-holder of aluminium,⁵ and Fehling a midwifery bag (*Geburtskoffer*) of the same metal about the same time.⁶ Towards the close of 1895 Albers-Schönberg described his new obstetric bag, shaped like a portmanteau, and covered with canvas.⁷ So recently as October of last year (1903) Dr. R. de Seigneux proposed to obtain an aseptic system by placing all the armamentarium in little sterilizable bags inside an ordinary obstetric leather bag;⁸ and in the fine work on obstetrics of Professor Edgar, of New York, published a few months ago, a good description is given of a midwifery bag, consisting of a double metal sterilizer containing the various instruments in canvas bags. To Edgar's bag I shall return immediately.

Meanwhile, my midwifery bag was, so to say, following in the wake of the inventions of Germany and America. At first it was an ordinary leather bag such as is commonly seen in the hands of the medical man, then it was exchanged for one of the same kind but with a detachable and washable lining—a step in the right direction I have no doubt when I remember what was the state of the lining of the former bag after some years' use. With this I suppose I was satisfied till some time ago when I began carrying my obstetric instruments about with me in a metal sterilizer; this was not a success, as it suggested to the lay mind the idea of a surgical operation, and there is such a thing as obstetric conventionality which calls for respect. So I immediately bought an ordinary midwifery bag to place the sterilizer in; but it had to be a big bag to contain it and it was very heavy and not a complete success. I then relaxed my efforts until the appearance of Professor Edgar's book, with his obstetric bag described in it, stimulated me to a fresh attempt.

At first I thought that Edgar's bag might be suitable for general use in this country, but, after obtaining one from New York, I discovered that it had features which I imagined might be modified with advantage. What these features were I shall mention immediately after I have stated very briefly wherein the bag differs from ordinary ones. The complete de-

scription is to be found in Edgar's *Practice of Obstetrics* (p. 502), and I need only refer to its general characters. The bag consists essentially of two trays or vessels with a leather cover of a portmanteau shape fitting over them both. The trays are of sheet iron, enamelled in white; one of them, the female, is shallower than the other, but slightly longer and broader, and in it the deeper but shorter and narrower male tray rests when the bag is ready for transportation. The male tray does not pass entirely within the female, a small space being left in the latter, in which is a canvas tray for the accommodation of the glass ware of the bag. The deep male tray contains the obstetrician's operating coat or apron, his douche, his dressings (iodoform or sterilized gauze, etc.), and his instruments (forceps, scissors, needles and needle-holder, etc.). Over the two metal trays, fitted together as above, there is passed the leather skeleton of a portmanteau of an extinguisher shape, and the whole is held together by two strong straps. The bag is 18 in. long, by 9 in. high and 8 in. wide, and it weighs when empty between 10 lb. and 11 lb. I may add that the instruments and other things in the deep tray are contained in small canvas bags. The bag, without the canvas tray, cases, and contents, can be obtained through instrument makers on this side of the Atlantic for about £3 3s.

Now, it seemed to me that the principle upon which Professor Edgar had proceeded was perfectly sound. The bag as a whole was simple; it did not contain the elaborate and complex arrangements sometimes seen for holding the various parts of the armamentarium. It was also sterilizable by boiling in all its parts except the cover; and it consisted of trays in which the various instruments might be sterilized beforehand or at the confinement. Further, it had a sufficient resemblance to the ordinary bag not to offend against the conventional. It appeared to me that if it could be made lighter and cheaper, and if a washable cover could be devised for it, there was the possibility of obtaining a bag which might be useful to the general practitioner and specialist alike, and yet fulfil all the requirements of the strictest aseptic regimen. Accordingly I asked Mr. Young to make for me the model which I now exhibit.

In the first place it seemed to me that it was necessary to give a name to the new bag which would denote that it differed essentially from the old one. I therefore propose that the name "obstetric satchel" be set aside for any form of metal sterilizer contained within a washable or leather cover, while the old name "midwifery bag" be retained for the ordinary bag closing with a lock or clasp. The word "satchel" has already been used in several slightly different senses, as any bag or sack or other means of carrying books or papers, and there is no violent dislocation of its significance in employing it in the way I suggest.

In the second place it was obvious that the satchel, if it were to become anything else than the appanage of the obstetric consulting physician, must be procurable at a lower price, and this suggested whether the material of the trays might not be advantageously altered. Cheaper and lighter were the essentials which were present in my mind. Aluminium occurred to Mr. Young and myself; but this metal, although light, has the disadvantage that it requires to be beaten out into the form needed for the trays, as it cannot be soldered together easily, and this would, of course, increase the cost. Copper was thought of, but was abandoned on account of its weight. Finally, it struck me when I happened to look at my ordinary small sterilizer (Caird's pattern) which had been in use for several years, and was looking none the worse, that tin was after all the material we were in search of. Tin it is, therefore. I may add that my objection to enamelled ware as used by Edgar is not only the price and weight, but the liability to chipping. In the bag which we got from New York the enamel was already badly chipped when it reached this country, and the possibility of keeping it quite aseptic thereby lessened.

In this way the price of the satchel was cut down and its weight lessened. In the next place it seemed to me that the trays were unnecessarily wide, and that they might fit more more closely to each other. So instead of having the trays 18 in. by 8½ in. by 3½ in., and 16½ in. by 8 in. by 6 in., I got them to measure 17½ in. by 7½ in. by 3½ in., and 17 in. by 7½ in. by 6 in. In this way the weight was further diminished and the satchel was narrowed slightly, approximating its form to that of the ordinary midwifery bag.*

* For ordinary midwifery practice the height and width of the satchel may be still further reduced; the above measurements are for a consultant's satchel capable of holding all the obstetric instruments. Messrs.

A minor modification was the abolition of the cross bar rests in the corners of the female tray, which seemed to prevent the easy cleansing of the tray, and to provide awkward sharp edges in manipulation. Instead of them, external brass ribs or flanges, four in number, were fixed (soldered on) to the exterior of the male tray; these prevented the male tray descending too far into the female, and so preserved the space in it for the canvas holder for the glass ware. They also provided us with a means of lifting the male tray out of the female, which is a distinct convenience (Figs. 1 and 2).

Fig. 1.—Longitudinal section.

Fig. 2.—Transverse section.

The satchel has a cover of washable brown canvas, which I regard as an advantage, for it also can be thoroughly cleansed now and again by boiling and is at the same time lighter than leather. Instead of having it fit over the trays like an extinguisher, an arrangement which almost necessitates a second pair of hands to hold it in order to extract the trays from it, it is so constructed that it opens at the side (not below), and easily allows the contents to be withdrawn or replaced. A single leather strap with a handle traverses its upper surface longitudinally, and surrounds it (Fig. 3).

Fig. 3.—External appearances.

A. Young and Son, Forrest Road, Edinburgh, have the satchel in both sizes. I may add that at a recent labour with grave complications I found the satchel most serviceable.

By these modifications the weight of the empty satchel and cover is reduced from 10½ lb. to 8 lb., and the cost from £3 3s. to between 35s. and 30s.; the cover also can be easily washed. Further, when it is placed on a hard surface, being surrounded on all sides with canvas, it does not rattle, and so gives no audible indication that it is aught else than a conventional bag. I may add that the glass ware inside as well as the instruments, being enclosed in canvas sacks and in sterilized towels, make no noise, and are ready for use when needed.

The advantages of such a satchel as I have described are many, but chief among them is its cleanness. After a case is over everything can be put into the tins and taken home; the instruments can then be boiled and put ready for the next case; the coat or apron can be washed and boiled and dried by ironing; so can the towels or canvas bags and cases; the tins also can be thoroughly sterilized. Then when another confinement comes on we can go to it with clean things in a clean bag; that at any rate is made certain; but if we are still in doubt as to the condition of any parts of our armamentarium we have a ready means with us to sterilize any or all of them afresh.

Then, at the confinement, as Edgar well points out, there is much to be gained. The deep tin, for instance, may be used for washing the hands in, and it is large enough to admit the whole forearm, which is useful when such an operation as version is in contemplation. The shallower female tin tray may be used as a sterilizer; the forceps pinned up in a towel may be placed in it and sent to the kitchen to be boiled; the water can be poured off and the tray and forceps still in its cover can then be brought back to the bedroom and used if occasion should arise. In an emergency, the two trays, deep and shallow, may be employed as baths with hot and cold water for the resuscitation of an asphyxiated infant. The canvas tray in the inside of the shallow tin has the advantage of keeping all the bottles and glassware together in a noiseless fashion. As a rule only the forceps need be carried, but if we suspect a serious operative labour the deep tin is large enough to contain a basilyst, a Braun's cranioclast, and a Bossi's dilator as well. Finally, the satchel has a perfectly conventional appearance and can be carried through the streets without attracting any attention, as I have personally proved.

It may be objected that there are disadvantages connected with its use. So there, undoubtedly are. It is rather large in size; its contents are not so easily got at as when they are in a bag which opens in a second of time with a catch arrangement (which, I may add, sometimes does not catch, with unhappy results); the tins may rust or leak (an ordinary bag may also get a hole in it); and the price is a little above that of the small leather midwifery bag. But what do all these amount to? Simply this; We are taking more pains in order to get a better result. The best results are built up upon attention to details; detail, in the long run, here, as elsewhere, overcoming dash. Doubtless it is easier for the surgeon to do an operation with a scalpel taken out of his waistcoat pocket; but the surgeon does not on that account neglect to boil his instruments nor to study with painstaking exactitude all the minutiae of aseptic technique. The surgeon has accepted the principle of asepsis in surgery, and he tries to carry it through in detail; in obstetrics we obstetricians have also accepted the aseptic plan, and we must likewise be thorough in the carrying of it out. At present the midwifery bag is the weak point; I hold it to be our duty to strengthen this point. After it has been dealt with, I am ready and willing to consider whether I ought to wear rubber gloves.

It may be objected that midwifery is not surgery, and that a confinement differs from an abdominal section. There is some force in this objection; at the same time, the obstetrician has often to be the surgeon, if we will keep in mind the etymology of that word; and further, although a labour may not resemble an ovariectomy or hysterectomy, yet it has much in common with any operation performed within a mucous cavity, such, for instance, as the removal of adenoids, and every one knows that such internal operative work requires asepsis as well as that in which the incision is a skin one. There is perhaps another objection that may be urged: Some one may say, "I have been carrying an ordinary midwifery bag for twenty years and have never lost a mother in labour in my private practice, and why should I change now to a more complicated method?" My reply is that this is not a question of mortality, but of morbidity. I do not hold that absence of mortality is cause for boasting, but rather for deep thankfulness; further, can it be said that there has been no morbidity, no slight attacks of cellulitis, no subinvolution,

no salpingitis, no threatenings of phlegmasia alba dolens? Is it not possible that with a more rigid system of sterilizing our instruments, our hands, and our midwifery bag, we might reduce that troublesome morbidity also to a vanishing point? Credo.

REFERENCES.

- ¹ *Lancet*, 1867, i, p. 326; ii, p. 353. ² *Trans. Edin. Obst. Soc.*, vi, p. 3, 1881. ³ *Ibid.*, xv, p. 110, 1890. ⁴ *Centrabl. f. Gynäk.*, xvi, p. 440, 1892. ⁵ *Ibid.*, xix, p. 1033, 1895. ⁶ *Ibid.*, p. 1062. ⁷ *Ibid.*, p. 1361. ⁸ *Ibid.*, xxvii, p. 1240, 1903.

A Lecture

ON

THE VALUE OF THE IMPERFECTLY-DESCENDED TESTIS, THE ADVISABILITY OF OPERATION, AND THE VALUE OF THE OPERATIONS PERFORMED FOR ITS RELIEF.

A Post-graduate Lecture delivered at the Hospital for Sick Children, Great Ormond Street.

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GENTLEMEN,—It is my intention to put before you as clear an account as is possible of the physiological value of the imperfectly-descended testicle, both before and after operation. The more common name of "undescended testicle" has been discarded as clumsy and inexact, and the above one has been employed in its stead. The lecture naturally falls into the three parts indicated by the title, the intermediate section dealing with the advisability of operation so leading from the one to the other of the above divisions. The first section on the value of the imperfectly-descended testis cannot be anything like adequately treated in the scope of this lecture, and an attempt only has been made to place before you some of the grounds which lead to the belief that the imperfect descent of the testicle is only the outward, anatomical and visible sign of an inward and much more extensive physiological defect. In order to estimate the value of the testis it is necessary to make inquiries along two lines: first, the capacity of the gland to produce spermatozoa, and, secondly, its effect on the perfection of the so-called secondary sexual characters of the organism, of which two the latter is by a very long way the more important with regard to the imperfectly-descended testis, and will naturally be considered first.

THE VALUE OF THE IMPERFECTLY-DESCENDED TESTIS.

It has been the custom of late to regard the testes and ovaries as responsible for the differences that exist between the sexes and to overlook the more obscure and probably more far-reaching cause or causes which have led to the differentiation of those glands themselves, and which may have given rise also to other sexually distinctive formations. On the latter view the testes or ovaries become merely incidents, though by far the most important, in the sexual development of the individual.

To bring before you the great importance of this more widely-acting and general factor in the sexual development of the individual or ontogeny, examples of very early sexual differentiation will be brought to your notice. The endothelium from which these glands are developed has been called the "germinal" epithelium, and is situated along the inner side of the Wolfian body or primitive kidney. The cells first elongate, becoming columnar; subsequently by division two layers are formed instead of one, further multiplication results in the presence of several rows of cells. The underlying tissue or mesoblast also becomes thickened and helps to give prominence to the germinal endothelium, so forming the genital ridge. At this very early stage of fetal life and before the generative glands or gonads are themselves formed, the first known sexual distinction can be found. In the female sex the germinal epithelium is several layers thick and grows down into the subjacent tissue or mesoblastic stroma in the form of columns of cells. In the male, the germinal epithelium is not nearly so thick and only small glands of cells grow down into the stroma. It will be observed that the distinction lies rather in quantity than in quality. The same property that gave rise to the testes and ovaries also causes the formation of the other external and internal genitalia, so that it is very doubtful if the principal glands have anything to do

with influencing these formations, which apparently arise independently. A good deal later, both glands undergo considerable changes in position. The ovary descends only as far as the side of the uterus, very occasionally it reaches as far as the groin. The testis, during the sixth month of fetal life, is at the internal abdominal ring, during the seventh month it is in the inguinal canal, and in the eighth month it enters the scrotum. These facts clearly indicate that the cause of the primary sexual characters of the organism are the results of inherent tendencies of the ovum, and are not due to any action of the ovaries or testes. Professor Arthur Thomson, of Oxford, emphasizes this early differentiation of sex by showing that sexual distinctions can be found in the pelvis at an early date when presumably the generative glands or gonads are as yet inactive. "My results, obtained independently, strikingly confirm what I believe is Fehling's main contention, that the differences of form and appearance are such as enable the observer to discriminate between the pelvis of the male and the female as early as the third month" of fetal life.

Nowadays a gland is looked upon as having both an internal as well as an external secretion. And it has been supposed that the secondary sexual characters are developed as the result of the action of the former. As yet we know nothing of the possible action of internal secretions during intrauterine life. But as in that period we are supposed to climb up our anatomical genealogical tree, so may we also ascend a similar physiological staircase. But, at least, it is unlikely that a gland can accomplish much before it is fully differentiated and functionally active. It may be further pointed out that some of the so-called secondary sexual differences exist at birth. For instance, male infants are already heavier and taller than female, their chest girth is greater; later they show more variations, different rates of growth, different ages for the incidence of puberty, etc. It may in consequence be suggested that many, if not all, of these so-called secondary sexual distinctions are independent for their origin of the testes and ovaries. Rather do they give the idea of being dependant on some innate property of the ovum, being found early and probably before those glands are active. At puberty all sexual differences are exaggerated and some new ones initiated, such as the growth of hair on the face, the breaking of the voice, etc. If the testes are removed before puberty many of the male characters do not appear to develop at all. But if a careful examination is made it will be found that these features are not absent, but are only very slightly developed. For example, one may instance the outward bodily form of the eunuchs of the East, or the more familiar bullock. But we are not interested at this moment in cases of absence of the testes, but rather in poorly-developed ones. For their origin the secondary sexual features are most probably dependent on the same obscure cause that brings about the advent of puberty, as well as the changes in the testes themselves; but, for their perfection the good development of those generative glands is necessary. When, however, these secondary characters are once established they seem to be independent of the integrity of those same glands. Now, by far the most important point in the treatment of imperfectly-descended testes is how to make the best of this factor for the development of manly characters, or how to estimate the value of the internal secretion of the testes. That an imperfectly-descended testis can so bring about the acquisition of manly beauty is certain. For instance, in its widest sense, one sees many and widely-varying degrees in the sexual development of cryptorchids. But this may be more neatly illustrated in animals than in man. A horse when young had had its only descended testis removed. The animal soon displayed the so-called rig or vicious and troublesome tendencies. Mr. Hobday, the veterinary surgeon, explored the inguinal canal and removed a mass at the top, which he thought might be the missing testis. For two years the animal remained fairly tractable, but then recommenced his rig habits. Mr. Hobday opened the abdomen and successfully removed the hidden testis. After this the animal became quiet and was no longer subject to attacks of sexual excitement.

The above must suffice for the subject of the internal secretion of the testicle and serves well enough to indicate that both primary and secondary sexual characters probably originate independently of the growth of the testes, though for their perfect development that growth is necessary. Again, the value of an imperfectly-descended testis depends almost entirely on this internal secretion and it must be our foremost duty to do our best to foster it.

The most important function of the normal testis is that of producing spermatozoa and so ensuring the perpetuation of