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ON THE DIFFERENT FORMS
OF
HYDROCELE OF THE TUNICA VAGINALIS.

By SAMUEL OSBORN, F.R.C.S.

BEFORE commencing to examine the proper subject of this paper, I would desire to say a few words concerning the classification of hydrocele of the testis and cord, since the definition of the several subdivisions as at present given in text-books tends somewhat to mislead.

Classification should be based upon some definite principle, and that which appears to me both most natural and most convenient is the anatomical; I would therefore adopt a simple classification, based, like that of hernia by Mr. Birkett, upon the anatomical development of the part, and from which the disease is a divergence. With such a classification the name applied to any particular variety of hydrocele should explain the variety spoken of.

Following out this idea I would enumerate the four following varieties:

1st. Hydrocele of the tunica vaginalis, which may be either visceral or parietal.

2nd. Hydrocele of the whole vaginal process of peritoneum, which is necessarily congenital.

3rd. Hydrocele of the funicular portion of the vaginal process of peritoneum, which may be either congenital or acquired.

The acquired variety, varying in size, has unnecessarily received different names, according as to whether it be large or

small. When large it has been called diffused, when small encysted; these names, when applied to only one variety, varying in size, it becomes difficult to say when one is large enough to be called diffused, and when small enough to be encysted, as the latter can become the former by the pressure of the serous fluid opening up the areolar tissue, which feebly unites the two surfaces of the formerly open funicular process of peritoneum.

4th variety.—To this I would reserve the term encysted. It may be due to the dilatation of spaces in connective tissue, to the dilatation of the obliterated remains of the Müllerian duct, or of the organs of Giralaldès, and to any other cysts occurring external to the tunica vaginalis testis.

Hydrocele of the tunica vaginalis signifies an undue collection of that serum which normally exists in the serous sac enveloping the testis, and which allows for any movement of the testicle, and keeps the two surfaces of the tunica vaginalis lubricated during the alterations in size, which necessarily take place during seminal secretion, as well as acting as a protection against external violence. The serous sac is formed by a prolongation of peritoneum, previous to the descent of the testis, which subsequently coming down posteriorly is suspended in the pouch, and becomes enveloped by it on nearly all sides. This tubular prolongation becoming finally closed from above downwards, a sac results at the lowest part.

As the lining of this sac envelops the testis on the one side, it may be described as consisting of visceral and parietal portions, the opposed surfaces of which are kept continually moist during health by a continuous serous secretion; the fluid thus constantly secreted is as constantly reabsorbed into the circulation, and it is only when this finely adjusted balance becomes unequal that hydrocele results. The parietal portion forms a blind pouch above the testicle, and for about the space of three quarters of an inch envelopes the spermatic cord, covering it rather more on the inner than the outer side. Posteriorly it becomes the visceral portion by being reflected along the back part of the epididymis, a small portion of which remains uncovered where the vessels and duct enter or emerge.

The visceral portion envelopes both the body of the testicle and the epididymis, and on the outer side is reflected into the

small digital fossa which exists between them. Below the testicle, and on each side of it the membrane becomes continuous with the parietal portion.

In connection with the visceral portion, a fact of great importance should be mentioned, for which we are indebted to M. Gendrin, who at page 64 of his work, '*Histoire Anatomique des Inflammations*,' uses these words :

"The constant participation of the subserous cellular tissue, with the inflammation of serous membranes, can be explained by the fact that the inflammation extends itself to the parts which it covers, and reciprocally ; it also affords a reason for the limits that these inflammations meet with in their propagation. This proposition seems paradoxical, but it is nevertheless the consequence of facts.

"When the subserous cellular tissue extends into the contiguous organ, and penetrates into its thickness, one perceives that it becomes the means of communicating the inflammation ; whilst the propagation of the inflammation will not take place, however, when the contiguous organ shall be of different texture to that of the cellular tissue, or when this tissue shall be very different in the texture which it furnishes to the organ." Which, applied to the tunica vaginalis as to other serous membranes, means that where in connection with the epididymis the subserous cellular tissue penetrates and becomes continuous with that binding together the constituents of the epididymis, it readily becomes the means of communicating inflammation to the epididymis itself ; but where in connection with the tunica albuginea, which covers the body of the testicle, and not the epididymis, inflammation by contiguity does not take place. But, at the same time, to suppose that no areolar tissue exists between the body of the testicle and the tunica vaginalis is a mistake, as the base line of all serous tissues will show, that although small in comparison to that separating the epididymis, it is nevertheless sufficient to be easily affected by inflammation, whether it be from without or within. It is not the presence or absence of areolar tissue that limits the extension inwards of the inflammation to the body of the testicle, but the unyielding structure of the tunica albuginea, which resists inflammation from without. However, when the tunica albuginea is affected with inflammation, it is as liable to transmit it to the tunica

vaginalis, through the subserous cellular tissue, as the epididymis is; also the penetration of the areolar tissue among the interstices of the epididymis, making it the means of more ready communication of inflammation when the tunica vaginalis is primarily affected. Evidence in proof of this is frequently seen in disease.

The hydrocele in syphilitic orchitis is the result of the extension of the inflammation from the fibrous tissue, the tunica albuginea, to the adjacent tunica vaginalis; so, also, the hydrocele in gonorrhœal epididymitis is the result of the extension of the inflammation from the semi-muscular canal of the epididymis, both being examples of visceral hydrocele, or hydrocele produced by inflammation, extending from the body of the testicle in the one case and from the epididymis in the other to the tunica vaginalis.

On the other hand, the susceptibility of the epididymis to become indurated, as a secondary consequence to inflammation of the tunica vaginalis, led M. Panas, in the '*Archives Gén. de Méd.*,' to believe that simple hydrocele was always caused by a partial epididymitis; and orchitis, as the secondary consequence of an inflamed tunica vaginalis, does not take place, for reasons previously mentioned. The sac of the hydrocele is usually thin, but in old and chronic cases it becomes thick, and, as the result of inflammation, lined by a red velvety false membrane, with occasional membranous bands and septa passing from one side to the other, thus accounting in some cases for the want of translucency.

Having described the serous sac itself, it remains to speak of its contents. Excessive accumulation of serum may be due to excessive secretion, passive exudation, or to defective absorption, originating from some cause which in its origin may be either inflammatory or non-inflammatory, and the hydrocelic fluid must consequently vary in its chemical composition. If inflammatory the serum will contain fibrine in solution; if merely dropsical the liquid is merely serous, and of a specific gravity of 1024 to 1028; the fluid varies in character from that of the serum of the blood to one containing more or less fibrine, and frequently some cholesterine, especially in old and chronic cases. An analysis quoted by Mr. Curling gives—

Water	.	.	.	.	.	91.25
Albumen	.	.	.	.	.	6.85
Uncoagulable matter	.	.	.	.	.	1.1
Salts	.	.	.	.	.	.8
						100.000

The colour varies from a straw- and lemon-yellow to amber and yellowish-red, which may be clear or more or less opalescent, the turbidity varying according to the amount of fatty molecules it may contain. The reddish colour which is sometimes imparted to the fluid is due to a slight admixture of blood, and the opalescent appearance to crystals of cholesterine. As much as six quarts have at one time been extracted from a hydrocele, viz. that of the historian Gibbon, by Mr. Cline, quoted in Sir A. Cooper's work 'On the Structure and Diseases of the Testis,' page 251. The average quantity, however, is about six ounces.

Passing now to the varieties of hydrocele of the tunica vaginalis, I would divide them into two, viz. visceral and parietal. This division I consider of great importance, as the prefix of either of these words at once signifies the origin of the hydrocele, and also gives a clue to the line of treatment to be adopted. A hydrocele which is visceral in its origin requires the treatment of the original cause, and not of the hydrocele itself, which is only secondary, just in the same way as a dropsy of the extremities is often secondary to disease elsewhere, say of the kidneys, heart, liver, &c., in which case the original cause, and not the consequence, has to be the subject of treatment.

Without entering into the question whether tapping is justifiable in gonorrheal epididymitis associated with hydrocele, I would say broadly that when hydrocele is secondary to another disease the treatment of the hydrocele must and ought to be subsidiary to the treatment of the original complaint. I consider tapping in visceral hydrocele following epididymitis as unjustifiable as it is in hydrocele following syphilitic orchitis.

Of visceral hydrocele the following are examples—that following epididymitis, that following syphilitic orchitis, and that following cancerous enlargements of the testicle or other forms of hydro-sarcocele; in these cases the visceral layer of the tunica

vaginalis becomes affected by contact with the inflammation of the epididymis or the body of the testicle, as the case may be, and as a result effusion takes place into the tunica vaginalis.

Of parietal hydrocele it is more difficult to get a simple example, as the visceral portion is probably also at the same time affected, or will soon become so by the continuity of inflammation; but in this form the body of the testicle will never present any sign of disease, nor will the epididymis, except secondarily as the result of means used to effect the cure of the disease by inflammatory action.

The following effects caused by a blow afford a good example of this variety, and show one of the chief uses of the serous sac of the tunica vaginalis in acting as a buffer to withstand external violence, which might be applied to the extremely sensitive organ the testicle.

It occurred in a young man hit by a cricket ball, who suffered no pain and had no enlargement of his testicle, but hydrocele resulted in consequence.

I believe a blow upon the scrotum will produce parietal hydrocele, whilst a blow in excess of the expenditure of force required to cause hydrocele will produce orchitis.

Here as the result of the blow an excessive secretion of serum takes place, which distends the sac of the tunica vaginalis, and one of the forms of traumatic hydrocele is produced.

Traumatic hydrocele may also occur from a secondary inflammation of the tunica vaginalis following orchitis. Therefore traumatic hydrocele occurs on the side upon which the injury is received, and differs from idiopathic hydrocele, which is most frequently met with on the left side.

Parietal hydrocele may be also caused by the irritation of loose cartilaginous bodies consequent upon the rupture of the peduncle of the hydatid of Morgagni (see p. 81 of vol. v of 'St. Thomas's Hospital Reports').

Perhaps the best example of parietal hydrocele is that occurring in old people which is chiefly caused by passive exudation, resulting from the pendulous condition of the scrotum and due to the relaxation of the capillaries of the tunica vaginalis consequent upon the general arterial relaxation of old people, whereas hydrocele of the tunica vaginalis in young adults, except arising from injury, is essentially of the visceral form.

Hydrocele of the tunica vaginalis may occur on either or both sides, the relative frequency of the two sides being according to Curling in favour of the right side; but I am inclined to agree with Bryant, Velpeau, Gerdy, and Dujat, in believing the left side to be that most frequently affected, as during the time of my registration of cases at the hospital I carefully collected the notes of some years which show a little in excess of one half to be on the left side, one quarter on the right, and a little below one quarter double. The numbers are thirty-one on the left side, fourteen on the right, and eleven double.

In these statistics I have been careful to exclude all cases of traumatic hydrocele, and believe that if all authors classified only idiopathic hydrocele their statistics would also show a preponderance in favour of the left side.

The greater frequency of the left side is, I believe, due to the greater dependency of the left testis and the mode of exit of the blood into the renal vein, producing venous congestion and subsequently excessive transudation of serum. The question why the left testicle hangs lower than the other has never received a satisfactory solution. That it is the first to enter the scrotum is possibly the reason it is ultimately situated the lower, but why it should enter first is not accounted for by the fact that it has the longest way to travel, but possibly to the fact that in the process of the development of the great blood-vessels and the obliteration of the arches on the right side, the left becomes more fully supplied with blood and therefore precedes the right in its developmental activity.

Anyhow the chief cause of hydrocele is undoubtedly venous congestion determined by hepatic or renal enlargements or any obstruction to the outflow of blood, not omitting inguinal hernia, which Mr. Curling, observes to be "a disease obviously very favorable to the effusion of serum in the tunica vaginalis, owing to the pressure of the rupture on the veins of the spermatic cord, and which is often increased by the use of trusses and bandages."

Its greater frequency amongst inhabitants of warm climates, especially of the West Indies, is probably due to venous congestion arising from hepatic enlargements, which we know to be so common amongst those inhabitants.

Hydrocele of the tunica vaginalis is most frequently met

with in middle-aged persons between the ages of forty and fifty ; occasionally, however, in infants, but probably in these cases they are truly hydroceles of the vaginal process of peritoneum, there still remaining some patency of the opening into the peritoneal cavity, as the opening in the funicular portion may be small enough to allow of fluid percolating drop by drop into the tunica vaginalis, but yet not large enough to allow of its being returnable into the peritoneal cavity, the diagnostic symptom of hydrocele of the vaginal process of peritoneum. Amongst old people the disease is as prevalent as amongst the middle aged, for the proportion of old people living affected with hydrocele is as great as the proportion of middle-aged people affected with the same.

As to the effect of hydrocele upon the functions of the testicle, it seems a large hydrocele is likely to cause the suppression of the spermatic function on the side upon which it is situated, from the long-continued pressure of the fluid and by the stretching of the epididymis from the body of the testicle ; therefore double hydrocele, under certain conditions, should be enumerated as one of the causes of sterility in the male. These remarks apply only if the disease has been allowed to continue for any length of time, and therefore afford a great reason for early treatment. A paper on this subject was communicated by M. Lannelongue to the Société de Chirurgie, July 16th, 1873, and reported in '*L'Union Médicale*.' The author there states that in large hydroceles no spermatozoa were found either in the epididymis or vesiculæ seminalis ; whereas small hydroceles do not lead to complete suppression of spermatozooids, but the animalcules are modified and altered in the seminal passage. He therefore considers that early treatment is called for in cases of hydrocele, in order to prevent the weakening and abolition of the spermatic functions.

Hydrocele in the female, or a collection of serum in the lower part of the canal of Nuck, the analogue of the vaginal process of peritoneum in the male is occasionally met with ; of such I have been fortunate enough to see an example, and as the rarity of these cases is great the notes are here subjoined.

"E. D—, æt. 45, married, with two children, was admitted into the hospital on May 29th, under Mr. Wagstaffe. She first noticed a lump on the left side in the position of the inguinal

canal about nine years ago, and which in size was about that of a gooseberry. She was in the habit of pushing it up, but it seldom remained so, and she finally wore a truss, believing it to be a rupture; it always remained up when lying down.

"The tumour had grown much larger the last two years, principally, she thought, through having to do a good deal of standing about, and on admission was the size of three walnuts, very tense, not painful, evidently with fluid contents, not returnable into the abdomen, with no sickness or abdominal tenderness.

"The left hip-joint had been dislocated since childhood and ankylosed.

"30th.—Chloroform given and cyst punctured with fine trocar and about three ounces of reddish-yellow fluid withdrawn. Four days afterwards cyst was found to be refilling, and on June 10th the cyst was retapped, and after about two ounces had been withdrawn, one drachm of Tinct. Iodini was injected.

"The cyst subsequently refilled, but finally diminished, and she was presented cured on June 24th."

The absence of pain and impulse on coughing, with no disturbance of digestion, and the elongated form of the swelling, extending along the inguinal canal, and transparency, are the means of diagnosis from hernia.

The diagnosis of a hydrocele may be considered under the following headings:—Scrotal swelling, fluctuation, transparency, testicular sensation.

The presence of a scrotal swelling which on examination is found to be internal to the testicular coverings and external to the testicle (the testicle being in no way implicated, and in addition placed posteriorly and to the upper part of the swelling) points to a collection of fluid in connection with the tunica vaginalis which can be only one of two things, hydrocele or hæmatocele, and which if translucent can be definitely affirmed to be the former, but if opaque the diagnosis is one of extreme difficulty and can only be decided by the trocar.

For hydrocele and hæmatocele may both have in common the following symptoms—want of translucency, fluctuation, testicular sensation, sudden appearance and history of injury; so in forming an opinion it behoves one to speak with great caution,

for the shades of gradation from hæmatocele to a hydrocele containing a certain amount of blood are so gradual that any one speaking positively will frequently find himself in error. Especially is this likely to occur in cases of hæmatocele following hydrocele, but the sudden appearance of the swelling, history of injury with ecchymosis of the scrotum, and solidity, are points in favour of its being hæmatocele. An amendment should also be made as to the position of the testicle being always posterior; it is rarely found anterior, and when this occurs it must be accounted for by some abnormality in the descent of the testis at birth; but not unfrequently the testis is irregularly placed, owing to adhesions taking place between the two layers of the tunica vaginalis.

The size of this scrotal swelling will vary from that of a hen's egg to one of such magnitude that the penis is completely buried and merely represented by a button-like aperture, and is annoying to the patient in not only preventing the proper functions of the organ, but also, on account of size, cumbersomeness, and an inability of secreting it, and although no actual pain is occasioned, a feeling of weight and a dragging sensation along the cord is experienced. Its shape is oval in recent cases, pear-shaped in old ones, owing to the patency or the pressure of the hydrocelic fluid opening up the funicular portion of the tunica vaginalis. It not infrequently presents an hour-glass shape, owing to the natural contraction of the tunica vaginalis above the testicle or to the presence of a hydrocele of the funicular portion of the vaginal process opening into a hydrocele of the tunica vaginalis. The shape is, moreover, often irregular owing to the adhesion of the visceral and parietal portions of the tunica vaginalis together, "the outline of a hydrocele depending upon the anatomical conditions of the part in which it is situated and the pathological changes which may have resulted from the affection."

Fluctuation detected by palpation is a very important symptom in the diagnosis of hydrocele.

Translucency is, however, the chief aid to a correct diagnosis, although it cannot be solely relied upon, for transparency is at once indicative of some form of hydrocele, and should any malposition of the testicle be present this is at the same time seen and remembered in the course of treatment. Complete

translucency is spoken of by some French writers, but such a phenomenon is impossible unless in a case of undescended testicle.

Transparency is conclusive evidence in favour of one of the forms of hydrocele; but, on the other hand, its absence does not militate against its being a hydrocele, as an opaque fluid or a thick-walled sac will falsify the result. The best means for detecting transparency is by using a stethoscope applied firmly to the scrotum on the one side, the integument of which is tightly stretched by the left hand placed posteriorly, whilst a lighted candle is closely applied on the opposite side; the hand is frequently used as a tube, but imperfectly so, as rays of light cannot fail to pass between the fingers and render the transmission of light imperfect. Testicular sensation is that peculiar sickly feeling which results from squeezing a healthy testicle, and is always to be found in parietal hydrocele, but is frequently absent in visceral hydrocele, that is, when the hydrocele is secondary to some form of orchitis. On manipulating a hydrocele this should, if possible, be determined, as marking the position of the testicle will prevent any injury thereto in a subsequent tapping.

The cure of a hydrocele is effected in one of two ways, either by the simple withdrawal of the excess of serum, with or without the injection of mild styptics, whereby a fresh and healthy action is imparted to the tunica vaginalis and secretion and absorption are carried on reciprocally; or by the obliteration of the sac, either by the injection of strong styptics, whereby adhesive inflammation is set up and the sides of the tunica vaginalis become more or less approximated, and adhesions take place between the visceral and parietal layers, or by allowing the sac to suppurate and granulate up from the bottom.

Before commencing a description of the several modes adopted for attaining either of the above ends, it should be borne in mind that, according as constitutions vary in their degrees of stability, so in the same ratio will the effects of inflammation vary in those same constitutions; I propose, therefore, to consider the modes of treatment *seriatim*, taking the milder measures first, and I would lay down as a general rule of treatment that it is not advisable to resort to severe

measures to attain a result when milder ones will answer the same purpose.

In children the application of the ordinary evaporating lotions frequently succeeds in effecting a cure, probably due materially to the good feeding or tonic treatment with rest resorted to at the same time; spontaneous disappearance is not uncommon in children, and has been spoken of in connection with adults. I have never been so fortunate as to have seen an example, but Bryant, in his 'Practice of Surgery,' cites one case which he believes to have been one; but some of the cases quoted of spontaneous disappearance are ones actually cured by inflammation which has been set up by some accidental violence, or by inflammation extending from the urethra to the testicle, and thence to the tunica vaginalis. One case of spontaneous disappearance cured by inflammation resulting from external violence is quoted by Sir A. Cooper at page 257 in his work on 'The Structure and Diseases of the Testis.' The external application of iodine, blistering fluid, and mercurial inunction, have occasionally proved successful remedies in recent cases, but so rarely, and with, in addition, so much discomfort and pain, that it is but seldom resorted to.

Acupuncture is eminently successful, especially in young children; the hydrocele is punctured in two or three places with a broad needle, the flat of the needle being turned at right angles to the puncture before being withdrawn, allowing the hydrocele fluid to percolate into the cellular tissue external to the tunica vaginalis, substituting "an anasarca of the scrotum for a dropsy of the tunica vaginalis," the fluid being subsequently removed by absorption.

The cure results from the same cause as that by tapping, the withdrawal of the fluid allowing the tunica vaginalis to recover its lost balance between secretion and absorption. To say that the cure of the disease in these cases is effected by the support and compression afforded to the vaginal sac by the infiltration of the surrounding cellular tissue is, I believe, a mistake, as I have never yet known a hydrocele cured by compression.

Acupuncture is a mode of treatment which is simulated in nature by the accidental rupture of the tunica vaginalis and escape of the hydrocele fluid into the surrounding cellular tissue,

for when a hydrocele is of large size jumping from a height or a blow or bruise will readily burst it. This is followed by œdema of the penis and scrotum, and affords a striking analogy to what takes place when in the injection of iodine some of the injection is inadvertently thrown into the surrounding cellular tissue external to the tunica vaginalis. Such an accident as the latter may be due to the gradual instead of the sudden thrust of the trocar into the distended sac, the parietal portion being thereby separated from the scrotal tissues, a result which may also take place from an imperfectly fitting trocar and canula.

The result which follows such an injection of iodine into the cellular tissue is, I believe, exemplified in the case quoted by M. Gendrin at page 143 of his work on 'Inflammations,' where gangrene resulted in consequence. Simple tapping will sometimes effect a cure; at other times, however, the fluid will re-collect, but after repeated tapplings at increasing intervals an ultimate cure is established. It is said that this mode of treatment is most successful in former inhabitants of the West Indies, but it is not at all uncommon to find examples amongst others; in old people it is as well to temporise with tapping, as they are seldom able to stand more severe measures.

The position of the testicle having been first made out by the transmission of light or by manipulation, a well-fitting trocar and canula slightly oiled, with the finger placed about one inch from the point to prevent its being pushed onward too far and wounding the testicle, is quickly thrust, avoiding any superficial vein which may be perceptible, anteriorly through the scrotal coverings, which are rendered tense by being grasped firmly by the left hand; as the trocar is extracted the canula is pushed further home and the fluid withdrawn. Should any thickening of the testicle remain after the withdrawal of the fluid, the application of strapping should be employed.

After the withdrawal of the canula no application to the puncture is required, as the collapsed tunica vaginalis will fall as a valve over the opening, and if the scrotum has not been over-distended for some time, so that the muscular tissues be paralysed, the contraction of the dartos will also assist in its closure.

In tapping, then, the following things have to be avoided—

wounding the testicle, puncturing any superficial vein, injuring the spermatic vessels situated posteriorly, and separating the parietal layer of the tunica vaginalis from the scrotal tissues by slow puncture.

Tapping may be performed with supplemental means, such as irritating the internal surface of the tunica vaginalis by scratching it with the end of the canula, or by passing up the canula a probe coated with nitrate of silver and applying this to the surface of the tunica vaginalis, the latter being the better operation of the two and frequently productive of the best results.

A somewhat similar plan has been tried by Italian surgeons in the application after tapping of the negative pole of a battery to the inner surface of the tunica vaginalis, the positive pole being applied to the external surface of the scrotum.

Injections may also be used in connection with tapping, of what description is a matter of taste, any irritating fluid which is of sufficient strength to set up some inflammation of the tunica vaginalis answering the purpose. Cold water, milk, port wine, spirits of wine, a solution of alum or sulphate of zinc (3 grs. to ℥j), or tincture of iodine, have all been used with different results, port wine in the hands of some surgeons having succeeded where iodine has failed. The last-named remedy is the most popular since the excellent results obtained by Sir R. Martin in Calcutta. However, to place this treatment under the head of radical, and to leave out milder remedies, is to say that milder means are never radically curable, and that this mode of treatment never fails, both of which statements are incorrect.

I find on examining the records of old cases of hydrocele treated by injection of iodine that out of fifty-four cases nineteen had been previous iodine failures. Of these fifty-four treated by tapping and injection I have made inquiry, but from twenty-five only have I been able to get replies, and I find that of the twenty-five only seven have had no recurrence, whereas eighteen have recurred. It is further noticeable that of these eighteen two had failed once before.

Of iodine injected some prefer a solution, others ℥ij of the pure tincture; whichever is used does not apparently much matter, the chief point being the manipulation of the sac so

that the injection may be brought thoroughly in contact with the whole of the internal lining of the tunica vaginalis.

The amount of pain consequent upon the injection cannot be taken as a criterion as to the ultimate result, for facts show that not infrequently the best results are obtained in cases of the least suffering.

The operation should only be performed at the patient's own house or where no exertion has to be taken subsequently, as occasionally severe inflammation has been set up in consequence.

The subsequent treatment is also one of great importance, the patient being confined to his bed for three or four days, and the testicle supported and ice applied if pain or inflammation be excessive.

Another point of importance should be remembered, and that is that a platinum canula be used, as the ordinary silver canula is destroyed by the action of the iodine.

If port wine be chosen, about six to eight ounces pure are injected and manipulation used as in other cases, and after having been allowed to remain in from ten to fifteen minutes withdrawn. In injecting such a large quantity there may enter not infrequently a certain amount of air which gives the characteristic crackling sensation of emphysema, but this result is, however, of no great importance, and the air is soon absorbed.

The injection of a mixture of equal parts of carbolic acid and glycerine has been tried by Dr. Lewis, of Philadelphia, who considers it more certain in its action and less painful than iodine.

Under the head of secondary consequences, besides emphysema previously mentioned, there are refilling of the sac, orchitis, and gangrene.

Besides the refilling of the sac and failure of the treatment, there is another form of refilling not unfrequently met with, which is subsequently followed by reabsorption and ultimate cure, consequent upon the pouring out of inflammatory products; therefore in cases where a refilling of the sac takes place it behoves one to speak with caution as to the ultimate result.

Orchitis following injection is due to a primary epididymitis extending to the body of the testicle, in the same manner and

for the same reasons as was previously mentioned in the extension of disease from the epididymis to the visceral layer of the tunica vaginalis.

Gangrene seldom occurs if the operation be performed in a proper manner and upon fit subjects, as the result of the injection of iodine into the cellular tissue between the tunica vaginalis and scrotal tissues I have previously mentioned, and in aged persons it is advisable in all cases to temporise with tapping alone.

Tetanus has also occurred, of which Mr. Curling gives several examples; it is, however, so rare an occurrence that it hardly enters into the category of probabilities.

As to the treatment by setons, I would refer to the remarks made by Mr. Green on this subject at p. 73 in the old series of 'St. Thomas's Hospital Reports;' the success of the cases there cited speaks in favour of this mode of treatment when held to be necessary.

The seton has been used in two ways, either by allowing it to come away by ulceration and consequently laying open the tunica vaginalis, or only leaving it in a sufficient length of time for inflammation to be produced; the latter is the usual mode, viz. after the hydrocele has been tapped at the lower part by a trocar and canula and the fluid withdrawn, a long needle coated with wax, to prevent injuring the testicle and armed with the seton, is passed up the canula to the upper part of the sac; the needle is then made to perforate the scrotal tissues, the two ends of the seton being subsequently knotted together on the withdrawal of the canula. This seton is left in from thirteen to thirty-five hours, or rather should not be withdrawn "until some indication of febrile action in the system has been experienced."

The severe symptoms during treatment by the seton were apparently due to the retention of inflammatory materials by the seton itself, as pus in all cases followed its withdrawal, an objection which would be materially obviated by the substitution of a drainage tube for the threads of the seton, as thereby the interior of the tunica vaginalis could be thoroughly washed out by syringing, and retention of inflammatory products rendered inevitable.

Excluding accidental rupture, which is virtually an operative

procedure, a natural cure has rarely taken place, but of such, from excessive distension, Sir Astley Cooper gives an example at p. 256 in these words:—"A slough of the scrotum and tunica vaginalis is produced, and as it separates the water escapes, a suppurative inflammation succeeds, granulations arise, and in this way the hydrocele becomes spontaneously cured;" this is, however, too severe a proceeding to justify any surgeon in allowing things to proceed so far; it is, however, a process which has been simulated in the treatment by caustics, the continued application of which to the scrotum has produced a slough through to the tunica vaginalis, on the separation of which the serum escapes and the hydrocele is finally cured by adhesion or granulation.

The frequent application of the caustic, the painfulness of the operation, and the severe effects set up in consequence, would hinder any surgeon of the present day performing, or any patient submitting to, so severe a procedure; more especially will the same remark apply to the two following methods, which are more severe, viz. incision and excision.

Incision, which is solely applicable to those cases where the presence of loose cartilaginous bodies are the exciting cause of the hydrocele, or should any doubt exist as to its being a hernia, or as an aid to diagnosis previous to performing castration, should then be performed with a limited incision. The old method, the chief advocate of which was Mr. Bell, is performed in the following manner:—The external integuments are divided by one continued incision from the upper to the lower end of the tumour; an opening at the upper end of the incision is made into the vaginal coat large enough to admit the finger, which is passed down as a director for the bistoury and the tunica vaginalis laid open to a corresponding extent with the primary incision. The tumour being opened from above, the hydrocele does not collapse and consequently lessens the risk of injuring the testicle, the cavity of the tunica vaginalis being subsequently dressed with (carbolyzed) oiled lint, in a similar way as in the treatment of bursæ, thus allowing it to heal up by granulation, a mode of treatment which not unfrequently terminated fatally. Professor Volkman has since modified the seriousness of this operation by performing it antiseptically, and has had some good results, so also have

those surgeons who have performed the operation in the same way in England ; therefore, when incision is held to be necessary, the antiseptic method should be adopted.

Excision consists in the removal of more or less of the parietal layer or both layers of the tunica vaginalis after it has been gradually cut down upon ; but this operation requires to be mentioned only to be deprecated, and is only resorted to when less severe measures fail, which is but seldom.