the ordinate may represent blood-pressure, pulse-rate, number of respirations, or degrees of temperature; and we may describe curves representing all of these on the same paper, distinguishing them from one another by the use of different coloured inks. Fig. 9 represents graphically the tables of blood-pressure and pulse-rate in Experiments I and II. We begin the pressure-curve by making a dot on the first perpendicular, at a height corresponding to the number 78. Passing along horizontally from this for a space corresponding to fifteen seconds to the abscissa, we make another dot; and at ten seconds further, at a height corresponding to 80, we make a third dot, and so on. We then connect the dots by lines, and thus obtain the curves we wish.

OBSERVATIONS ON THE TREATMENT OF SOME FORMS OF MENORRHAGIA.

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THERE is probably not any one symptom of uterine disease of more frequent occurrence, none certainly of greater gravity, or one causing more alarm to the patient, than menorrhagia. It depends, too, for its origin on such a great variety of causes, not only local, but also constitutional, that the exercise of great caution is necessary on the part of the physician, both as to diagnosis and to treatment; and if he fail to bring to the consideration of the case a perfect knowledge of the conditions capable of giving origin to this symptom, he will certainly meet with numerous disappointments in his practice. The subject, however, of menorrhagia in all its forms would be too extensive for the scope of such a communication as the present one; and I therefore propose to confine myself to the consideration of the treatment most suitable to cases of menorrhagia when occurring in connection with, or dependent on, subinvolution of the uterus, on granular ulceration of the cervix, or on an unhealthy condition of the mucous membrane lining the body of the uterus.

Defective involution of the uterus after labour or abortion occupies a prominent place among the causes giving rise to excessive menstruation. That this should be the case is but natural; for not only is there, when subinvolution exists, an undue amount of blood present in the organ, but also the relaxed condition of the uterine tissue favours its exudation, and therefore, when the periodic determination of blood to the uterus takes place, as it occurs at each menstrual period, the moderate flow which should relieve that congestion becomes a profuse discharge, and often an exhausting drain. But the mischief resulting from subinvolution does not end here, for that abnormal state of the uterus predisposes to that unhealthy condition known as "granular ulceration" of the os and cervix uteri: a condition in which the mucous membrane of the canal of the cervix is hypertrophied, becomes exceedingly vascular, and is often everted to a considerable extent: a condition which increases the previously existing tendency to hæmorrhage. Thus, in not a few cases do we find the two causes present in the same patient. The following case affords a well-marked instance of this.

Mrs. F., aged 48, the mother of twelve children, presented herself among the extern patients of the Adelaide Hospital nearly a year ago. She stated that ever since the date of her last confinement, five years since, menstruation had gradually become more profuse, the flow continuing for a longer time than usual, the intervals between the periods being correspondingly shortened. During the intervals she suffered much from profuse leucorrhœa, and, as a result of this nearly incessant drain, became greatly debilitated. On examining the uterus, the sound passed to the depth of three inches and a half. The os uteri was patulous; there was extensive ulceration of the os uteri; and on separating the lips, the mucous membrane lining the cervical canal was seen to be thickened and highly vascular. This was a case requiring energetic treatment, which I did not dare to attempt so long as she continued to follow her ordinary occupations; and, for a time, she refused to come into Hospital. But, finally, her condition becoming much worse, she consented to do so. My first step after her admission was to introduce several lengths of sea-tangle bougies through the os internum, with the view of being able to explore the cavity of the uterus, and to make the necessary applications to the entire extent of the cervix uteri. This proceeding having enabled me to decide that there was not any polypus or fibrous tumour in the uterus, I cauterised the entire of the inner surface of the uterus freely with the strong nitric acid; this did not cause any pain. She was, however, as a precaution, kept in bed for three or four days. On examining her after the lapse of a week, the condition of the ulceration which existed round the lips of

the os was found to have improved considerably, and she was discharged in a short time perfectly cured.

In the foregoing case, subinvolution was manifestly the primary cause of the menorrhagia, the ulceration being altogether secondary. But in many cases, subinvolution exists alone, or, on the other hand, ulceration may exist alone, either condition being fully sufficient to give origin to severe menorrhagia. As an instance of the former, the following serves as an example. F. L., aged 24, married about a year, was a delicate young woman of lymphatic temperament. Menstruation had always been profuse, especially if she took walking exercise, or exerted herself during the flow. She became pregnant after the occurrence of the second menstrual period following her marriage, but, having imprudently taken a long and fatiguing walk, she aborted at about the eighth week; the two subsequent menstrual periods were so profuse as to reduce her to a state of extreme debility. Ergot, gallic acid, etc., failed to do good. On examining her after the termination of these periods, the uterus proved to be considerably elongated, the sound passing to the depth of three inches and a half; there did not exist any ulceration. The history of the case being altogether against the supposition of the existence of polypus, I came to the conclusion that the menorrhagia depended on subinvolution; in fact, that the uterus had never regained its normal size and tone since the miscarriage, which had occurred two months previously. I therefore decided on carrying out a plan of treatment, the value of which I have repeatedly tested: I mean the introduction up to the fundus of the uterus of ten grains of the solid nitrate of silver, and leaving it to dissolve there. This I accordingly did. The application produced considerable pain, which lasted five or six hours, but no further unpleasant results followed. I confined this patient to bed for several days, but then allowed her to go about. Menstruation appeared at the regular time, and was moderate in quantity; and she became pregnant immediately afterwards.

I wish to call attention specially to this case; first, as illustrating the occurrence of subinvolution as a result of abortion—a fact which is overlooked by many; next, as showing the dangerous menorrhagia which may depend on this condition of the uterus; and, thirdly, as proving the excellent results which follow the treatment adopted. Ergot, gallic acid, and, indeed, all other medicines will frequently fail to check menorrhagia depending on subinvolution; and we must have recourse to treatment directed to the uterus itself; we must stimulate the organ to set up that healthy action by which it regains its normal size after pregnancy has terminated—a process to which Sir J. Simpson has applied the term "involution." With this view, I unhesitatingly advocate the adoption of the treatment practised in the preceding case. I know no other so efficacious.

The mode of carrying it out is simple. The instrument known as Sir Jas. Simpson's "*uterine porte caustique*" is introduced into the uterus just as an ordinary uterine sound. This little instrument consists of a hollow silver tube, in size and shape closely resembling a sound; it contains a flexible stilette, which it fits accurately. As soon as its point is found to have reached the fundus of the uterus, the stilette is withdrawn, and through the instrument is pushed up, by means of the stilette, a piece of solid nitrate of silver reduced to the requisite size and weight, till it is fairly lodged in the cavity of the uterus. In doing this, there is but one caution requisite to be attended to; namely, that as soon as the piece of nitrate of silver has reached the extremity of the *porte caustique*, and before it is finally pushed out of the instrument—a point of which we can always be certain by observing how much of the stilette remains still uninserted—the instrument should be withdrawn to the extent of about half an inch; for if this precaution be not observed, it is possible that the nitrate of silver might be forced into the substance of the uterine wall, instead of being left free in its cavity, an accident which, though possible, is very unlikely to occur. I have dwelt at some length on this plan of treatment, because I am satisfied that its value is far from being appreciated. It is looked upon by many practitioners as heroic and dangerous. I believe, and I have practised it for several years, that it is simple and safe. I do not say that it is always sufficient, and that a cure must always result; but in my hands it has been productive of marked success, and in no single instance have I known of its producing serious symptoms. The application of solid nitrate of silver to the interior of the uterus is by no means a novel practice. Dr. Evory Kennedy used to introduce it into the cavity of the body of the womb by means of an ordinary female catheter several years ago, but he did not leave it there to dissolve. To Sir J. Simpson we are indebted for the further development of the practice, and for the invention of the *porte caustique*. Dr. Kidd, I think, was the first of the Irish obstetricians who adopted his practice.

Menorrhagia resulting from ulceration of the os and cervix uteri is also of frequent occurrence. Mere abrasion of the lips of the os uteri is not sufficient to produce menorrhagia; but that unhealthy, spongy

condition of the os and cervix, in which the mucous membrane lining its canal becoming hypertrophied and thickened, and bleeds on the slightest touch, the os being patulous and the lips everted, is quite capable of originating severe menorrhagia.

Mrs. B., a young married woman, aged 24, who had never been pregnant, stated that she had become greatly debilitated by the excessive loss which occurred at each menstrual period. Ergot and astringents were exhibited by the mouth, and astringent lotions injected into the vagina, without producing the least effect. The use of the speculum proved the existence of extensive granular ulceration of the os and cervix uteri. Now, in severe cases such as the one I am referring to, the unhealthy condition of the mucous membrane extends at least as high as the os internum, and we will fail to effect a cure unless our treatment reach every portion of the diseased tissue; therefore, with the view of permitting the necessary applications to be made to the whole extent of the cervical canal, I commenced my treatment by introducing two tents of compressed sea-tangle; two pieces being sufficient for the object I had in view, which was not to open the uterus to such an extent as to enable me to examine its cavity, but only to permit me to treat the entire of the cervical canal. I left these pieces *in situ* for twenty-four hours, and on withdrawing them after the lapse of that time, cauterised freely the whole diseased surface with fuming nitric acid. This did not cause any pain. On examining the os uteri a few days subsequently, I found it in a much healthier state. *The menorrhagia was entirely checked and never returned*; and, although a considerable time elapsed before the uterus regained a healthy state, still the progress of the case was rapid and the cure perfect; the only treatment subsequently necessary being the occasional application of a twenty grain solution of nitrate of silver to the os uteri, and at a later period, of a small blister to the sacrum; finally, not the slightest trace of the ulceration remained, and menstruation became in all respects normal.

The foregoing case illustrates perfectly the mode of treatment which I as a rule adopt in cases of granular ulceration of the os and cervix uteri. Of course it is not always necessary to dilate the cervix uteri. If the case be recent, and we can satisfy ourselves that the unhealthy condition of the mucous membrane does not extend very high, the use of the solid nitrate of silver, of zinc points, or brushing the part over lightly with nitric acid, may be sufficient; but in the severer forms of the disease such treatment will merely be palliative, and the only effectual one will be found to consist in that which I now advocate. I believe that not a little of the opprobrium which rests on obstetric practitioners, from the length of time over which their treatment extends, is due to excessive timidity, and to the use of inefficient remedies. The case which I have just narrated was an example of that form of disease termed granular ulceration of the mucous membrane of the os and interior of the cervix uteri: but, though the term ulceration is applied to this condition, there is no true ulceration whatever; on the contrary, the mucous membrane is thickened and hypertrophied, its surface being covered with numerous papillæ, which, from the resemblance they present to ordinary healthy granulations, have given origin to the term "granular ulceration"; in point of fact, however, they are not new growths or granulations at all, but the ordinary papillæ which are numerous in this situation, and which have, under the influence of disease, become enlarged and vascular, and bleed on the slightest touch. This condition does not in general extend beyond the os internum; and the majority of writers, from their silence on the subject, allow it to be inferred that, in their opinion, it never does so. There is not, however, in my mind the slightest doubt that the same condition which we see in the canal of the cervix, also not unfrequently exists within the cavity of the uterus, and is the result of causes similar to those which originated it in the former situation: nor is there any reason why this should not be the case, since the mucous membrane lining the cavity of the uterus is directly continuous with that of the cervical canal. I have met with several instances of this affection. When this unhealthy granular condition of the mucous membrane of the cavity of the uterus exists, we frequently find that the mucous membrane lining the cervix participates in the disease. But this is far from being invariably the case; and then the diagnosis, always at first obscure, becomes more difficult; but the fact that the cervical canal is not implicated does not modify our treatment in any material degree. If we meet with a case of menorrhagia in an otherwise healthy woman, which a careful vaginal examination proves not to depend on granular ulceration of the os and cervix or on subinvolution, it is our manifest duty to dilate the cervix and os internum, with the view of determining what the condition of the interior of the body of the organ may be. As a rule, the uterus is seldom in these cases much elongated, the increase being not more than to the extent of perhaps half-an-inch. This point is of importance in enabling us to decide as to the possible presence of an intrauterine tumour; but the existence of these or of the condition

under consideration, can only be solved by dilating the cervix and then passing the finger fairly up to the fundus of the uterus. It is surprising how little the patient suffers from this process, and how rapidly the os regains its natural size. No less remarkable is the entire absence of all unpleasant symptoms after a proceeding apparently so severe; and I have not the least hesitation in recommending the practice.

The mode of dilating the cervix is now so well known, that I shall not dwell on it. I have quite given up the use of sponge-tents, and invariably adopt the plan, recommended by Dr. Kidd, of introducing a number of pieces of sea-tangle bougies. These are much superior for the purpose to the sea-tangle tents; for this reason, that they can be cut to any desired length, and that length should be the depth of the uterus, as previously ascertained by the use of the sound. The number of pieces introduced must vary considerably. If the cervix be rigid, three or four will be as many as can be safely inserted; but if it be relaxed, double, or even treble, that number may be with impunity inserted. If the smaller number be used, they should be withdrawn after the lapse of a few hours and a larger number inserted; but, in any case, the os internum must be dilated to a size sufficient to admit of the passage of the top of the index finger. To effect this by no means easy matter, the first step, after having withdrawn the sea-tangle, is to seize the anterior lip with a vulsellum, and with it to draw the uterus well down. This should be done by an assistant; pressure should also at the same time be made on the fundus: by these means the uterus will have been brought so low that, unless the pelvis be very deep, the point of the finger will reach the very fundus, and we are enabled to discover the presence of even a very small polypus, should it exist, or to detect that so-called "granular" condition of the mucous membrane, a condition which communicates a rough uneven feel to the finger. This condition of the mucous membrane I have several times met with. On the first occasion I was disappointed, and indeed surprised, at failing to detect a polypus, which, as I had announced to the class, I expected to find. Since then, enlarged experience has taught me that this granular condition of the lining membrane of the body of the uterus is a by no means infrequent cause of menorrhagia, and I now look on its detection as a possible result of the exploration of the cavity of the uterus. I believe it to be the result of congestion or of subacute inflammation of the membrane lining the uterine cavity, which has resulted in producing a thickened unhealthy vascular condition of that membrane. To cure this condition, it is essential to destroy the so-called granulation, and to endeavour to excite a healthy action in the diseased part. With this view I make use of the strong nitric acid, applying it with great freedom over the entire of the inner surface of the uterus by means of a bit of lint fastened securely to a piece of wood or inserted through a loop of iron wire. The os should be brought into view by means of the duck-bill speculum, which also serves to protect the posterior wall of the vagina. While the anterior wall is guarded by the vulsellum, with which the anterior lip should be still held firmly, the stick or wire, armed with the lint saturated with the acid, should then be passed rapidly through the cervix, and swept freely but quickly round the interior of the uterus. Another piece of lint, soaked in water, should be then passed up to the os to protect the vagina from the irritation which any acrid discharge from the os uteri might cause; and the lip being freed from the vulsellum, and the speculum withdrawn, the patient may be left, the only after-treatment necessary being that the vagina should be syringed out daily with tepid water, and absolute rest in bed enjoined for some days. With due attention to these precautions, no ill effects need be dreaded. Of several cases, I give the following as an example.

J. C., married, aged 28, was admitted into the Adelaide Hospital on the 26th November, 1870. She had never been pregnant. Menstruation was regular till within the last few months, when she observed the flow to become much more profuse than formerly, and also to last for a greater number of days; latterly the interval between each menstrual period had been but a fortnight. She had for a long time past suffered from severe pain in the back and over the left ovary. On making a vaginal examination, the cervix was felt to be soft and the os patulous. The sound penetrated to the depth of three inches. The existence of a small polypus being deemed possible, I proceeded to dilate the cervix, and for this purpose introduced five pieces of compressed sea-tangle. On removing these, after the lapse of twenty-four hours, the os internum being still too narrow to admit the finger, I introduced one of Barnes' smallest dilators, which was left *in situ* for a couple of hours. On removing it, the finger was passed and reached the fundus of the uterus; no polypus, however, was found to exist, but the inner surface of the uterus was felt to be rough and uneven. The entire of this surface was freely cauterised with the strong nitric acid; she did not suffer any pain, and was discharged in a fortnight's time perfectly well.

Such is a brief outline of the treatment which I adopt in cases of menorrhagia depending on the three causes I have mentioned, a line of treatment I have not ventured to advocate till I had first given it a full and protracted trial. My experience having now extended over a period of several years, a term sufficiently long to allow of my testing the results, I can now say that those results have been eminently satisfactory.

CAST OF THE URINARY BLADDER.

By J. R. WARDELL, M.D., F.R.C.P.,

Physician to the Tunbridge Wells Infirmary.

IN the rare case of the expulsion of a cast of the urinary bladder, given as a report of the Tunbridge Wells Infirmary in the JOURNAL of June 10th, it is said: "Dr. Wardell observed that he had referred to several works on pathology, but could find nothing like the case now narrated." It is evident, however, on further investigation, that a few similar instances have been recorded. Mr. Thomas Smith of St. Bartholomew's Hospital writes to me and says: "I have just read your most interesting case of cast of the female bladder. Should you care for references of similar cases, you will find them in the Pathological Society's *Transactions*, vol. xiii, page 150, and vol. xv, pages 137 to 140." Craigie says: "In the chronic form of cystitis, the mucous membrane may become thick, firm, and almost cartilaginous, with roughness and granular irregularity of its surface; and not unfrequently it is formed into pouches or cysts by the irregular contraction of the muscular coat" (*Prac. Physic*, vol. 1, p. 932). Copland, under the head of Complications of Cystitis, thus writes: "Coagulable lymph is sometimes found covering or attached to the mucous coat. This tunic in the most acute cases may be detached from the muscular in parts or even throughout, forming a greyish layer, resembling a false membrane" (*Med. Dictionary*, vol. iv, p. 1191). Dr. Tanner thus refers to this subject: "A few curious cases have been recorded where the whole mucous lining of the bladder has been thrown off in one piece. In the museum of the Royal College of Surgeons there is a preparation (pathological specimens, No. 1993) which illustrates the correctness of this remark." This author then cites the history of the foregoing case. It occurred to a man 70 years of age in Edinburgh, who fell from a scaffold and had retention of urine and cystitis. At the end of the third week nothing passed through the catheter, and its point was felt to impinge upon a membrane. Mr. Liston cut into the bladder above the pubes, and the man lived three months after the operation and died from exhaustion. The layer of membrane, as it is found in the museum, is of saccular form, measuring six inches long and four in diameter. The shape indicates that it lined the whole interior of the bladder, and was thrown from it in one piece. The outer surface is flocculent, and in parts distinctly fibrous; the inner surface is granular and reticulated like superficially ulcerated mucous membranes. As the College catalogue states, it exactly resembles the mucous membrane of a bladder separated as a slough in one piece. (Tanner's *Pract. Med.*, 6th Edition, vol. ii, p. 226.)

This description of the specimen in the College of Surgeons' museum singularly applies to the specimen which I now have in my possession. This kind of primary croupous process may occur in all mucous membranes; and it is albuminoid and semi-pellucid, and interlaced with fibrous flakes. If not thrown off, it assumes a partially organised and continuous texture. There is much redness with injection of the subjacent vascular coats, which at length becomes paler and more normal. I believe that diverticula have their origin in the vesical parietes throwing off this albuminoid exudation. Rokitsky says that primary croupous exudation of the vesical mucous membrane is extremely rare. This inner coat of coagulable exudation is liable to become the seat of urinary sediments; and if this adventitious covering be not thrown off, there may be an incrustment deposited from the saline urinary products, as I remarked it to be the fact in the specimen which I exhibited at the East Sussex meeting.

PROFESSOR FLOWER'S HUNTERIAN LECTURES ON THE TEETH AND ALLIED ORGANS IN THE MAMMALIA.

Delivered at the Royal College of Surgeons of England.

LECTURE XVIII.—Wednesday, March 29th.

Marsupialia.—These form an extensive group, agreeing in certain important characters, and at the same time presenting so many differences among themselves that some naturalists divide them into orders corresponding with those of placental Mammals.

In the Didelphia, represented by the Didelphys or Opossum, the dental formula is $i \frac{5}{3}, c \frac{1}{1}, p \frac{3}{3}, m \frac{4}{4}$. The incisors are small. The canines are large, much resembling the carnivorous type (the animals are all either carnivorous or insectivorous). The præmolars have compressed crowns and sharp points. The molars have many roots, and are tuberculated. It is to be noted that the Marsupialia have generally four molars, in place of three as in placental Mammals. The upper molars have two large cusps on the outer side and two small ones in front, giving a faint indication of the W-pattern. The lower molars have five cusps. It was formerly supposed that the front teeth of the Opossum were preceded by milk-teeth; but closer investigation has shown that this is not the case. The last præmolar alone has a predecessor: this is just like a true molar; but, when the animal is about half grown, another can be found beneath it. The permanent tooth appears when the animal has nearly attained its full growth.

The Dasyuridæ, represented by the Dasyurus, are essentially carnivorous. The Thylacine is externally very like a Dog—an instance of an animal of different origin but with similar habits, and having its structure modified to suit those habits. The incisor teeth are small, the canines are large, the præmolars pointed and compressed, and the true molars presenting a form intermediate between sectorial teeth and ordinary molars. The formula is $i \frac{3}{3}, c \frac{1}{1}, p \frac{3}{3}, m \frac{4}{4}$. Three of the upper molars and the four in the lower jaw present a rude resemblance to sectorial teeth. On examining a young Thylacine taken from the pouch, before the teeth have come through the gums, the incisors are found to be of the same size as in the adult animal; and at the edge of the gum there is a small tooth of the size of a pin's head, with the root already absorbed, lying over the third præmolar. This tooth is shed very soon afterwards. All the permanent teeth come through nearly at the same period.

In the Perameles or Bandicoot, the incisors are small, being $\frac{5}{3}$ in number; the molars are formed on the insectivorous type. The posterior milk-præmolar remains until the animal is nearly full grown.

The preceding Marsupials are termed polyprotodonts from their numerous small incisors. All the other members of the order are vegetable-eaters, and are diprotodont, having never more than one incisor on each side in the lower jaw. In the upper jaw, there may be two or three on each side.

In the Phalangista or Phalanger, which has an outward resemblance to the Opossum, the last præmolar, as far as is known, is the only tooth that has a milk-predecessor. The molars are square, with four cusps and transverse ridges. The Koala has a similar arrangement of teeth.

In the Tarsipes, which lives in trees and sucks out honey with its tongue, there are two long projecting incisors in front; the rudimentary teeth vary in number, and resemble needle-like points.

The Kangaroos have three incisors in the upper jaw, and one long procumbent sharp incisor below. After these comes a space, occupied in early life only by a canine. There is a præmolar tooth; then four teeth nearly alike, having two crests and a large transverse ridge, with a deep groove between. The mode of succession of the teeth is peculiar. A præmolar and a molar both drop out, and are succeeded by one true molar. In the old animal, some of the anterior molars fall out.

The Kangaroo Rat (*Hypsiprymnus*) has three incisors and a canine in the upper jaw. The præmolar is elongated from before backwards, and compressed, and marked by ridges on the side. The molars have tubercles. A small milk-præmolar and a molar are both shed, and are replaced by a præmolar.

The Wombat or Phascolumys has two incisors above and below, with (alone among Marsupials) persistent roots, as in Rodents. There are five molars, above and below, with pointed roots, and curved as in Rodents. They each present two columns, with a deep groove between; the anterior molar is single, and may be called a præmolar.

There are many extinct Mammalia in the oolitic formations. Many have been found in the upper oolite at Purbeck. One of them, named by Falconer *Plagiaulax*, had one incisor on each side in the lower jaw, together with some teeth which were apparently præmolars, and some true molars. Owen regards it as carnivorous; but as yet we only know its lower jaw.

The teeth of the Thylacoleo may be taken as a test of the value of teeth in determining the characters and affinities of animals. The complete dentition of this animal is known; it was very peculiar, and unlike that of any existing animals. Nothing is known for certain of any other of the bones of the animal. It has been the subject of much controversy, and of several papers by Owen. A fragment of the skull and two teeth were described by Owen in 1859; from this part, and a small portion of the lower jaw, he described it as having been of very