

appears to be so closely connected with the existence of an undue amount of pressure. In fig. II. I find it rather difficult to think that the degree of pressure did not in some way modify the form of the tracing. Of course if, as is most probable, reversal of the tracing depends solely on the cause I have pointed out, and can be produced in no other way, no possible effect can be attributed to any alteration of the spring-pressure, as the spring is dissociated from the cause of motion.

The only notice I have found in Marey's work of any thing like such traces as I have described occurs at p. 282, where he says :—"Type 84 presents a singular peculiarity, the rebound has not had time to finish before the arrival of a fresh pulsation ; the result is a form which might be taken for a tracing inverted (*écrit en sens inverse*) ; but this depends only on the phenomena of dirotism not having had time to work themselves out (*s'accomplir*) between two successive pulsations."

The circumstance that the aortic notch is preserved during the arterial systole taking place under such altered circumstances is noteworthy, and shows the essentiality of this event. It was remarking the presence of this notch which first made me suspect that the sloping ascent of the inverted tracing was not equivalent to the ascent of the ordinary.

The chief practical lesson to be derived from the foregoing statements is, that we need, in using the Sanderson-Marey sphygmograph, to be very careful that the brass plate is so placed as not to rest upon the artery. If the artery is pressed on by the spring and the brass plate, the pressure of the latter being materially the greatest, the amplitude of the tracing may be factitiously increased. If the brass plate alone press on the artery the tracing will be reversed. I think the arch in the middle of the plate should be much wider than it is often made.

III. "Note on the Discharge of Ova, and its relation in point of Time to Menstruation." By JOHN WILLIAMS, M.D. Lond., Assistant Obstetric Physician to University College Hospital. Communicated by Dr. SHARPEY, F.R.S. Received April 7, 1875.

It is a recognized fact in physiology that ova are discharged in connexion with the menstrual function, but it is uncertain at what time in the course of the month the separation takes place. It is generally understood to occur towards the end of the discharge, or immediately after its cessation. I have, however, reason to believe, from observations made in several subjects, that such is not the case, but that it takes place before the appearance of the monthly flow with which it is connected. The cases which have come under my observation fall into four series, as follows :—

A. Cases, six in number, in which a Graafian follicle had been matured and actually ruptured.

(1) The first of these was a young girl who died through the effects of a fall, three or four days before the expected return of the catamenia. In the left ovary was a recently ruptured Graafian follicle. The cavity of the follicle was about $\frac{3}{4}$ inch in diameter, and contained a recent clot, which projected slightly through the rupture; the clot was of a fresh red colour, nowhere adherent to the parts around, for on making a section through the follicle it fell out. The wall of the vesicle was of a pale yellowish colour, and slightly wrinkled. The rupture had evidently taken place a short time only before death.

(2) The second subject was a woman who died suddenly through a fall, probably a fortnight after the cessation of the last menstrual flow. On examination a considerable quantity of blood was found in the cavity of the peritoneum, and the liver was torn. In the left ovary was a ruptured follicle, with corrugated and collapsed walls; its cavity contained no blood, but there was a slight effusion between its lining membrane and its outer coat. The depth of the follicle from the rupture to the furthest point of the opposite wall measured nearly $\frac{3}{4}$ inch. It is not impossible that this follicle was ruptured somewhat prematurely by the shock of the fall.

(3) The next example was observed during life. Mr. Christopher Heath performed ovariectomy on a patient on the fourteenth day after the cessation of the last catamenial discharge. Menstruation lasted usually three days, and the patient had always been regular every four weeks. In the ordinary course of things the next flow would have appeared in eleven days. When the diseased ovary had been removed, the remaining one was raised up, with a view to see if it were healthy, and it was observed that it contained an enlarged Graafian follicle, which became ruptured when being held in the hand. I ought to add that the flow returned three days after the operation, and eight days before it was due.

(4) The next case was a young woman who died of pleurisy on the fifth day of menstruation. On the surface of the left ovary was a rough, brownish-coloured, star-like cicatrix. On section there was seen under the cicatrix a corpus luteum, dilated in the middle and narrow at both ends, nearly $\frac{3}{4}$ inch in length and $\frac{1}{2}$ inch in width; its walls were in some parts of a pinkish and in others of a yellowish colour, slightly if at all thicker than those previously mentioned, and had small prominences on its inner surface. In the centre was a partially decolorized clot, which was but slightly adherent to the surrounding walls. From these characters it is evident that the rupture of the follicle had taken place several days before.

(5) The fifth member of this series was a patient who died on the fourth day of menstruation, and about the ninth of typhoid fever. One ovary contained a corpus luteum similar to the one just described.

(6) The last example occurred in a young girl, who died of pneumonia

six days after the cessation of the catamenia. On the surface of the right ovary was a small cicatrix, beneath which was a corpus luteum with the following characters :—It was of an irregular, elongated shape, nearly $\frac{1}{2}$ inch in length and $\frac{1}{4}$ in width ; had thick, yellow, convoluted walls, and enclosed a small whitish mass, in which were two dark-coloured spots, which were evidently the remains of a clot. This ovary contained also a Graafian follicle of the size of a small pea. The determination of the age of effused blood is always difficult. In the Graafian follicle which becomes ruptured without impregnation taking place it is known that certain definite changes occur ; the wall of the vesicle becomes thick, yellow, and convoluted ; the blood which flowed into it and filled it becomes decolorized and absorbed. The exact length of time in which these changes in the follicle are brought about is not accurately determined, but it is known that the corpus luteum of one menstruation has become considerably atrophied by the return of the next.

It appears to me that the yellow body in the last example of this group was considerably older than the two preceding ones, and that it was more than a fortnight old, and that the two preceding ones were from eight to ten days.

B. Cases, four in number, in which a Graafian follicle had been matured, and hæmorrhage had taken place into its cavity, but no actual rupture had occurred.

(1) The first case was a patient who died of pyæmia in the third week after the cessation of the last catamenial flow. The left ovary contained a follicle $\frac{3}{4}$ inch in diameter, distended by a recent non-adherent, softish coagulum, uniform in consistence and colour. This follicle was prominent above the adjacent surface of the ovary ; and its superficial wall was thick, and presented no tendency to point or rupture. There was no recent rupture to be seen on the surface of either ovary.

(2) The second example was a woman who had undergone an operation for fistula in ano. The monthly flow made its appearance a week before the expected time for its return, and she died five days after. One ovary contained a follicle measuring $\frac{5}{8}$ inch by $\frac{1}{3}$ inch ; this follicle contained a bright red, fresh, loose clot, and its walls were thin and not corrugated. From these characters it appears that the hæmorrhage into the follicle had taken place but a short time before death.

(3) The next was a patient who had undergone an operation for the removal of an ovarian tumour. She died a fortnight after the operation, when she had menstruated for one day. At the inner extremity of the left ovary was a large, dark-coloured, softish mass, which, on section, proved to be a Graafian follicle containing a brick-red-coloured clot, which appeared to be of a spongy texture. It could with difficulty be turned out of the sac. After its removal it was seen that the wall of the sac was formed by a thin yellowish substance.

(4) The last example in this group was a person who suffered with fibroid tumour of the uterus. She died on the third or fourth day of the

menstrual flow. Both ovaries were bound to the surrounding structures by tough and firm false membranes. The left contained a follicle nearly an inch in length, in which was found a softish, dark-coloured clot, having a spongy texture, which appeared to be several days old.

In the first and third members of this group hæmorrhage had taken place into the follicle unquestionably before the appearance of the catamenial discharge.

In the second, hæmorrhage had occurred before the flow had become due; but the latter, owing to surgical interference, having returned a week before its time, the hæmorrhage took place while the discharge was in progress.

In the fourth, the condition of the clot makes it almost certain that the hæmorrhage had taken place before the appearance of the catamenia.

C. One case, in which a Graafian follicle had matured, but where neither rupture nor hæmorrhage had actually occurred.

This was a patient who died of typhoid fever just before the appearance of the catamenia. In one ovary there was an enlarged Graafian follicle, which was highly vascular, and projected like a nipple beyond the surrounding surface. It was evidently on the point of bursting, and it is doubtful whether rupture of the follicle or the appearance of the discharge would have taken place first.

D. Cases, three in number, in which no Graafian follicle had become enlarged to the size exhibited by it at maturity.

The first was a patient in whom the menstrual flow had almost ceased. There was no rupture in either ovary, but the right contained a Graafian follicle about the size of a small pea.

The next was a young suicide, who died three days after the cessation of the catamenial discharge. There was no recent rupture in either ovary, but the left contained a follicle similar to the one seen in the preceding case.

The last member of the series was a girl who died of peritonitis, caused by the rupture of an abscess on the right ovary. In the left was a Graafian follicle about the size of a small pea, but no recent rupture. The state of the lining membrane of the uterus showed that in this case menstruation was imminent.

Besides the appearances described, there were in all the preceding cases numerous Graafian follicles, varying in size from a millet-seed downwards, together with some superficial pits and atrophied corpora lutea.

These cases appear to me to bear out the opinion stated at the beginning of the paper, that, in the great majority of subjects, the discharge of ova takes place before the appearance of the menstrual flow with which it is connected; for in ten out of the fourteen rupture of a follicle, or hæmorrhage into its cavity, had occurred before the return of the catamenia; in one it was doubtful whether rupture of a follicle, or the appearance of the discharge would have taken place first; in two a menstrual period had passed without maturation of a follicle; and in one

a periodical discharge was imminent, though the ovaries contained no matured Graafian follicle. It is not improbable that the follicles which were found in the three last cases, and which were enlarged to the size of a small pea, would have become mature by the next return of the flow.

I have carefully considered the cases recorded by Cruikshank, Jones, Paterson, Lee, Girdwood, Negrier, Coste and others, and find that, though they do not contribute materially to the solution of the question discussed in this paper, yet, in so far as they go, they favour the view put forward here—a view which derives support from the custom imposed by the Levitical law, and observed to this day by the stricter sect of the Hebrew community.

Postscript. Received June 10, 1875. Communicated by
Dr. SHARPEY, F.R.S.

Since writing the above, I have had opportunities to examine two subjects in whom the date of the last menstruation was known.

The first was a girl aged 17 years, who died on the fifth day after admission to the Middlesex Hospital of traumatic tetanus. She was said to have ceased to menstruate just before admission; and the condition of the inner surface of the uterus confirmed that statement. The uterus and ovaries were small and imperfectly developed. On the surface of the right ovary was found a patch $\frac{1}{2}$ inch in diameter, slightly injected, and presenting a punctated appearance. In its centre was a cicatrix, appearing as a white spot, beneath which was situated a yellow body, elongated and irregularly flattened in shape. This appeared to be due to pressure from several Graafian follicles growing in close proximity to it, the largest of which was as large as a small pea. The yellow body measured nearly $\frac{1}{2}$ inch in length; it had folded walls, and in its centre was a thin elongated clot, the middle of which was of a dark colour.

The second subject was aged 26 years; she died of Bright's disease. The last menstruation began May 13th, ceased May 19th, and death occurred May 28th, 15 days after the appearance of the flow. Hæmorrhage had taken place into the superficial tissue of the ovaries, probably by reason of the condition of the blood.

In the right was a small superficial prominence formed by a yellow body, which measured about $\frac{3}{8}$ inch in diameter; it was throughout of a yellowish colour, and contained no trace of the colouring-matter of blood. On comparing these organs with one another and with those previously described, I am led to infer that in the first 12 to 14 days, and in the second about 20 days had elapsed since rupture of the follicle occurred.

Reichert has examined 23 organs in which signs of menstruation were recognizable. In four cases a Graafian follicle had matured but not ruptured, nor had hæmorrhage taken place, though the decidua menstrualis was in a state of greater or less development; in eighteen cases a Graafian follicle

had ruptured, and hæmorrhage had taken place into the decidua; in one case only, in which bleeding had not begun, had a Graafian follicle been ruptured. The latter statement appears opposed to the conclusions at which I have arrived; but this is only apparent; for in one case a follicle had ruptured, in four a Graafian follicle had matured before hæmorrhage began, and in one of these rupture was on the eve of taking place; in eighteen a follicle had ruptured, and hæmorrhage had taken place into the decidua menstrualis. Put in this form, Reichert's cases are not opposed to the conclusions arrived at in the preceding note; and as his cases have not been described, it is not possible to say what their actual bearing may be. The conclusion arrived at by Reichert, after examination of the 23 specimens, however, is that rupture of the Graafian follicle takes place at an early stage of the menstrual flow.

IV. "Note on Mr. Mallet's Paper on the Mechanism of Stromboli"*. By ROBERT MALLETT, F.R.S. Received May 21, 1875.

Since the appearance of my paper on Stromboli some strictures hostile to the views therein contained have been published†, in which it is urged that the elevation of the fundus, or bottom of the visible crater, which I have assumed at 300 to 400 feet above the sea, is greatly below the truth, that being, it is affirmed, at least 2000 feet above the sea-level. It is added that "Mr. Mallet's whole theory hangs upon the proximity of the bottom of the crater to the sea-level," and that "Mr. Mallet's hypothesis of the mechanism of Stromboli is based entirely on these grossly inaccurate measurements." It is unnecessary that I should occupy the time of the Society by any discussion as to the correctness or incorrectness of either of the above levels, neither of which are more than loose approximations; but I beg permission to point out that the theory of the rhythmical action of Stromboli which I have proposed does not rest upon the proximity of the fundus to the sea-level, and stands equally valid whether the height of the tube C (see diagram no. 4, p. 512, Proc. Roy. Soc. 1874), or, what is the same thing, the difference in level between the sea and the bottom of the crater, be 300 to 400 feet or 2000 feet. That tube, whether long or short, is never filled, according to my views, by a column of liquid lava or water, but only with steam more or less dense before being blown off to a lower pressure; and the only change introduced by lengthening the tube C is, that a greater volume of steam is required to fill it; so that the tube being supposed of uniform calibre, the volume of steam required to produce equal tensions in the shorter or longer tube, as above stated, would be about as one to five; and no difficulty can suggest itself to the mind of any physicist as to the adequacy of the mechanism that I have suggested for such supply.

* Proc. Roy. Soc. 1874, vol. xxii. p. 496.

† Geol. Mag., Dec. 1874 and May 1875.