LECTURES ON THE DIAGNOSIS AND SURGICAL TREATMENT OF ABDOMINAL TUMOURS.

Delivered at the Royal College of Surgeons of England.

BY
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LECTURE VI.—June 21st, 1878 (concluded).

I WILL now turn to the last subject mentioned in the programme of these lectures:

"THE SURGICAL TREATMENT OF UTERINE TUMOURS."

The whole of my experience in the surgical treatment of uterine tumours, operated upon through the abdominal wall, amounts to forty-five cases. I exclude all cases treated by the vagina, such as the removal of fibrous polypi, or attempts to enucleate growths from the uterine walls or the cavity. In twenty-four of these forty-five cases, the tumours were completely removed, and in twenty-one cases exploratory incisions only were made, or the tumours

were not completely removed, after the abdominal wall had been incised. I have arranged all the facts relating to these cases in two series of tables, which I have no doubt will be printed in the journals which have already begun to publish these lectures, so that anyone interested in the subject will have an opportunity of examining all the particulars of each case. In the tables, you may see the name of the medical attendant of the patient, the date of the operation, the age and condition of the patient, the nature of the operation performed, the length of the incision, the result, the cause of death if the patient died, and what became of her if she recovered. It would occupy too much time now to go through these cases one by one; but I will give you, in a few words, the result. In some of the twenty-four cases of removal, it was found necessary not only to remove the large uterine tumour, but to remove one ovary or both ovaries with it. Sometimes the ovary was closely connected with the tumour; in other cases, the broad ligament was so injured that it was better to remove the ovary also. The results of the operation, when compared with ovariectomy, show that the removal of uterine tumours is a much more dangerous operation than the removal of ovarian tumours. Fifteen out of the twenty-four patients died at various intervals, from three hours to fourteen days, after the operation; while only nine recovered; and one of the patients who recovered died six months afterwards of cancer of the remaining portion of the uterus. The other eight are believed to be now in good health. One of them would certainly have died in 1871 if the operation had not been performed, and others have enjoyed good health since 1874-5-6 who, if left without operation, would not be living now, or, if living, instead of being as well as they now are, would be passing their time as hopeless invalids.

TABLE I.—Cases of Removal of Uterine Tumours.

No.	Medical Attendant.	Date of Operation.	Age.	Condition.	Adhesions.	Treatment of Pedicle.	Weight and Nature of Tumour.	Length of Incision.	Result.	Subsequent History for Cause of Death.
1	Professor Pirrie, Aberdeen	1861, Oct.	33	Married	None	Ligature brought out of the wound	Fundus & body of uterus, 27 lbs.; both ovaries removed	10 inches	Died 4 days afterwards	Exhaustion
2	Dr. Sim, Naples	1863, Jan.	35	Single	None	No pedicle; tumour enucleated	17 lbs., solid; fibroid intramural	About 6 inches	Died in 4 hrs.	Hæmorrhage and chloroform shock; chloroform (?)
3	Mr. Ellis, Sloane Street	1863, April	53	Single	Omental and parietal	Ligature brought out through the wound	Fibroid cystic outgrowth from fundus; solid, 16 lbs.; 26 pints fluid; 4 lbs. clot in cyst; right ovary adherent, and removed with tumour	9 inches	Death in 3 hrs.	
4	Samaritan Hospital	1868, April	40	Married	Omental and mesenteric	Ligature returned	Fibroid, size of cocoanut	5 inches	Died 44 hours after operation	Peritonitis
5	Dr. McMurty, West Bromwich	1869, April	36	Single	Parietal	Acupressure	Solid tumour, 34 lbs. 10 oz.	11 inches	Died in 40 hrs.	Peritonitis
6	Dr. Fuller	1869, May	37	Married	None	Ligature	Fundus and body of uterus removed	5 inches	Recovered	Died 6 mos. afterwards of cancer of cervix
7	Dr. Brandt, Oporto	1870, June	36	Single	Omental	Pin and ligature; extra-peritoneal	Solid myoma, 22 lbs.	9 inches	Died 14th day	Dysmic gleetary
8	M. Nélaton, Paris	1871, June	46	Married	None	Pin and ligature; extra-peritoneal	11 lbs. 11 ozs. solid; 59 pts. peritoneal fluid	11 inches	Recovered	Well June 1878
9	Dr. Protheroe Smith	1872, Jan.	38	Single	None	Ligature returned	20 lbs.; fibroid removed with left ovary	8 inches	Died 5 days afterwards	Peritonitis
10	Dr. Conrad, Berlin	1872, Mar.	44	Single	None	Pin and ligature	Uterus and both ovaries, 26 lbs.	10 inches	Died in 2 hrs.	Hæmorrhage
11	Dr. Roberts, Rhyl	1872, May	36	Married	Notes defective	Notes defective	Uterine fibroid and right ovary removed	(?)	Died	Suppurative peritonitis
12	Mr. Soper, Dartmouth	1874, April	33	Married	Omental	Clamp	Fibroid myoma, 11½ lbs.; right ovary	8 inches	Recovered	Well June 1878
13	Sir William Jenner, Bart.	1874, Dec.	39	Single	None	Ligature returned	Fibroid myoma, 9 lbs.	8 inches	Died in 40 hrs.	Hæmorrhage
14	Dr. Schantz, Witten	1875, May	40	Single	Omental	Clamp	Fibro-cystic uterine and right ovary, 19 lbs.	6 inches	Recovered	Well in 1878
15	Dr. Schönfeld, Labes	1875, May	40	Widow	None	Ligature and drainage	Fibroma moluscum cysticum, 29 lbs., and right ovary	6 inches	Recovered	Well in 1878
16	Mr. Peck, Yalding	1876, April	37	Single	Omental and parietal	Clamp	Subperitoneal outgrowth from fundus	7 inches	Recovered	Well in 1878; tumour in Museum
17	Dr. Playfair	1876, Aug.	49	Single	None	Clamp	Large uterine fibroid, and both ovaries	9 inches	Died 5th day	Pneumonia
18	Dr. Kidd, Dublin	1876, Oct.	36	Single	None	Ligature returned	Fibroid: subperitoneal removed	4 inches	Recovered	Well in 1878
19	Dr. Neild, Plymouth	1876, Nov.	40	Single	Peritoneal, omental, mesenteric, and intestinal	Ligature returned	Fibro-cystic; two outgrowths, 2½ lbs.	6 inches	Died 4th day	Peritonitis
20	Dr. Jack, Hampton Court	1877, Mar.	49	Single	Parietal	Clamp	Fibro-cystic, 20 lbs., and left ovary	6 inches	Died in 20 hrs.	
21	Dr. Day	1877, April	52	Single	None	Ligature returned	Two fibroid outgrowths removed, 4 lbs. 4 ozs.	6 inches	Recovered	
22	Dr. Freeborn, Oxford	1877, July	36	Single	None	Ligature returned	Solid fibroid outgrowth from fundus, 5 lbs.	6 inches	Died 6th day	Septic peritonitis
23	Dr. Hetley, Norwood	1877, July	50	Single	None	Needle and suture-chain; extra-peritoneal	Uterine fibroid, 12 lbs., & both ovaries	8 inches	Died 3rd day	Septic peritonitis
24	Mr. Symonds, Oxford	1878, Mar.	36	Single	Parietal, mesenteric, and omental	Ligatures returned	Fibro-cellular, 70 lbs.	16 inches	Recovered	Remains weak

TABLE II.—*Cases of Exploratory Incision and Partial Removal of Fibro-Cystic Tumours of the Uterus.*

No.	Medical Attendant.	Date of Operation.	Age.	Condition.	Adhesions and Character of Tumour.	Incision.	Result.	Subsequent History and Cause of Death.
1	Dr. Shorthouse, Carshalton	1863, April	33	Single	None; solid tumour punctured; no fluid	Short	Left hospital 10th day	Died 16 months after operation; the tumour then weighed 25 lbs.; had 34 pints of fluid around it
2	Dr. Stokes, Dublin	1864, June	45	Single	To intestines and omentum; 30 pints of ascitic fluid; 13 pints of cystic fluid and 20 lbs. fibroid tumour removed	6 inches	Death in 3 hrs.	Hæmorrhage; portion of tumour not removed, 18 inches in length, 16 in breadth, and 7 in thickness; not weighed. A second tumour, 11 in. broad, 6 in. long, and 6 in. deep
3	Samaritan Hospital	1866, Dec.	39	Married	Ascitic fluid removed; solid uterine tumour punctured		Relieved	Died some months afterwards
4	Dr. Churchill, Dublin	1867, Aug.	48	Married	Uterine fibroid punctured	5 inches	Suppuration and relief	Patient died in 1871
5	Dr. Garrod, London	1868, Feb.	58	Widow	Parietal; fibro-cystic tumour punctured; 8 pints purulent fluid removed	No note	Recovered	Remained well two years, but died in 1872
6	Dr. Arthur Farre	1869, Jan.	48	Married	Large uterine fibroid not disturbed	4 inches	Recovered	In fairly good health, June 1878
7	Mr. Turner, Hereford	1869, Nov.	25	Married	Ascitic fluid only removed; fibroid tumour not disturbed	4 inches	Recovered	
8	Dr. Marsden	1870, June	43	Married	Incision only		Recovered	Died two years afterwards, 1872
9	Dr. Whitehead, Manchester	1870, Dec.	35	Single	None; incision only	5 inches	Recovered	Alive in 1878
10	Dr. Wane	1871, Aug.	63	Married	None; ascitic fluid removed; uterine cyst tapped	5 inches	Died 15 days after operation	
11	Dr. Sutton, Dover	1872, June	42	Married	Parietal adhesions; incision and removal of 9 pints from uterine cyst	4 inches	Recovered	Died in 1873
12	Dr. De la Camp, Hamburg	1873, April	36	Married	None; ascitic fluid only removed	4 inches	Recovered	Died in 1877
13	Dr. Philpot	1873, July	30	Single	Parietal; incision only	4 inches	Recovered	Well in 1877
14	Dr. Gason, Rome	1875, May	31	Single	Incision only	5 inches	Recovered	Well in 1878
15	Dr. Hodgson, Hornsea	1876, June	33	Married	None; cyst tapped and emptied; solid fibroid not disturbed	5 inches	Recovered	Well in 1878
16	Dr. Thursfield, Leamington	1876, June	35	Married	Incision only	5 inches	Recovered	Died of diphtheria Feb. 1878
17	Dr. Arthur Farre	1876, Oct.	46	Married	Fibro-cystic uterine drained; parietal and omental	5 inches	Recovered	Well in 1878
18	Mr. Sweeting, King's Lynn	1876, Nov.	38	Married	Incision only	5 inches	Recovered	
19	Dr. Hall Davis	1876, Sept.	34	Widow	Incision; ascitic fluid; fibroid tumour untouched	5 inches	Recovered	Died in 1878
20	Dr. Whitehead, Manchester	1878, Feb.	41	Married	Incision; removal of nodule	5 inches	Recovered	Well in June 1878
21	Mr. Claremont, Hampstead Road	1878, May	42	Single	Incision only	4 inches	Recovered	Died July 11th, 1878

Besides the twenty-four cases of complete removal of uterine tumours, I have operated upon twenty-one other patients with uterine tumours; in some, only making an incision in the abdominal wall; in others, puncturing or incising the tumour, and in some removing a larger or smaller portion of the tumour. It is a remarkable fact that of these the death of only one was accelerated by the operation; and it is doubtful whether, if she had been left untouched, she would have lived many days longer. In some cases, evacuation of fluid, or suppuration following the puncture, greatly improved the condition of the patient, and several are still alive. Seven died at various periods from a few months to four years after the operation. This much at least is proved by these cases: that, if the abdominal wall alone be divided, ascitic fluid removed, or an uterine cyst punctured, and the solid part of the tumour not much interfered with, the risk of the operation is very small. In twenty-one such cases in this table, only one has died; her death (fifteen days after) probably not hastened by the operation; the only death which did immediately follow the operation having been the case of a patient from whom thirty pints of ascitic fluid, thirteen pints of cystic fluid, and twenty pounds of solid fibroid tissue were removed, a large mass still remaining.

The tumours from two of these cases are upon the table. Here is one that I removed in 1871. The patient was a Parisian dressmaker, who was sent to me by M. Nélaton. She was forty-six years of age, and married. Around this tumour, which occupied the lower portion of the abdominal cavity, was a large quantity of ascitic fluid—about fifty-nine pints. This was removed, and an incision in the abdominal wall, eleven inches long, was made; the tumour was then turned out. A pin was passed through a sort of band connecting it with the uterus, and a figure-of-8 ligature was twisted round it. The pin was fixed outside the abdominal cavity, and it acted as a sort of clamp. The patient recovered perfectly, and she is now in full business in London as a fashionable dressmaker. Certainly, if that operation had not been performed, she must have died seven or eight years ago. Here is another tumour which I removed in 1870 from a Portuguese lady, who was sent to me by Dr. Brandt of Oporto. She was thirty-six years of age, and single. The tumour weighed twenty-two pounds, and it was removed through a long incision in the abdominal wall. You can see where it was cut off from the uterus. It was secured in the same way as the case I have just mentioned, by a strong pin, and a piece of silk was twisted round it and the connecting medium with the uterus, and that pin was fastened outside the abdominal wall just as if it were a clamp. The patient went on very well for fourteen days, and then she died with

a sort of embolic pneumonia. It was a thing most disappointing to a surgeon; for there was only a small superficial abscess in the abdominal wall, and no other reason to account for the condition of lung which caused death. I dressed the wound every day, and had not noticed any particular hardness, or anything to attract my attention to this collection of pus; but, in about thirteen or fourteen days, she became feverish, had symptoms of pyæmic pneumonia, and she died owing to this small abscess in the abdominal wall; for inside the peritoneum everything was absolutely healed. There was nothing about the uterus to attract attention. Its surface was quite smooth, the peritoneal edges of the incision perfectly united, and no traces whatever of any peritonitis.

With regard to the mode of operating, the only difference between the removal of these large tumours and the removal of ovarian tumours consists in the longer incision and the somewhat greater difficulty there is in securing the bleeding vessels—the large vessels in the broad ligament, and in any uterine tissue divided—which require careful ligature. It is seldom that the pedicle is sufficiently long or large to admit of extraperitoneal treatment. The intraperitoneal treatment by ligature has not been so successful as the extraperitoneal treatment; and, when it has been possible to secure the pedicle and fix it outside the wound in the abdominal wall, the result has been much more satisfactory. I believe it is chiefly the difficulty of treating these pedicles, or the medium of connection between the tumour and the uterus, extraperitoneally, that leads to the greater danger of this operation as compared with ovariectomy; although, in several cases which have been recorded, the intraperitoneal treatment by ligature either of the pedicle or of the separate vessels has been followed by very good results. There are several preparations here of cases in which uterine tumours have been removed. Here is one that I removed by enucleation. It was an extremely unpromising case; but the patient was very anxious that some attempt to save her life should be made, and, considering the whole circumstances of the case, I thought it was one in which I might try to enucleate this growth. After exposing the uterus, I made the long incision which you see in the anterior surface. There was a very thin shell of uterine tissue. Without much difficulty, I shelled out this mass. There was difficulty in stopping the bleeding, and the patient died principally, I believe, from hæmorrhage, though partly from chloroform, a very few hours after the operation. Here is a specimen from the Huxterian collection, showing remarkably well how only one lip of the cervix uteri may become so enlarged as to form a considerable tumour, while the other lip, the body, and the fundus remain of

their normal size. Here is an uterus with a fibroid tumour, which was removed during life by Mr. Nunneley of Leeds. Here also is another specimen, extremely interesting as regards diagnosis. Full particulars

Fig. 1.

of the case have been sent by Mr. Wheelhouse of Leeds. The difficulty in diagnosis arose from what is not very well shown in the specimen: the length of the pedicle or connection between the tumour and the uterus. The band here appears to be short; but Mr. Wheelhouse informs me that, when it was first removed, before it was shrunk by the action of the spirit, it was as long as the breadth of a large hand

Fig. 2.

—say three or four inches. The tumour was felt high up in the epigastrium. The uterus was large, and there were a great many different opinions expressed about it. The woman was in the hospital, and, while an operation was under discussion, she died. This shows as complete a pedicle as we meet with in these uterine tumours, or rather fibroid outgrowths from the uterus. Here is a calcified fibroid

which obstructed labour. It was taken from a patient of my colleague Dr. Wynn Williams, who has published particulars of the case.

I must not conclude without a few words about a very great improvement which has been recently introduced by Dr. Freund of Breslau, in the mode of removing entirely a cancerous uterus. Here is a specimen from a patient of mine, who died of cancer of the uterus. I sent it to the museum, that it might remain as evidence to show how cancer may destroy the cervix uteri and the portion of the vagina immediately in contact with it, and leave the rest of the uterus perfectly healthy. But I exhibit the specimen more particularly to assist in the explanation of this improved mode of removing the entire uterus, as shown by these three diagrams. Some years ago, Dr. Blundell, in four cases, removed an entire cancerous uterus through the vagina, pulling down the cervix uteri, then cutting through the roof of the vagina, cutting close to the cervix, all round it, first on one side, then in front, then behind, then on the other side, and securing the vessels in the best way he could. But only one of these four patients recovered; and the operation has fallen into disuse. Professor Freund of Breslau has lately sent me his last paper, and tells me that of three cases in which his operation has been performed, two patients have completely recovered, and the case in which it was not successful was not performed *lege artis*.

In performing this operation after Freund's method, the patient is placed in a position very different from that in ovariectomy. Her head is placed towards the light, with the shoulders low and the hips raised, the light falling upon the pelvis. An incision is made in the abdominal wall, then the intestines are drawn up out of the pelvis and protected by a carbolic cloth. Next, a needle and thread are carried through the fundus of the uterus and tied in a loop which serves to draw the uterus up out of the pelvis. (Fig. 1.) Then three ligatures are passed on each side, securing the broad ligament in the way shown by this diagram. (Fig. 2.) These three ligatures, passed on each side of the uterus, are seen in the first drawing before, and in the second after, the uterus has been cut away. Suppose *a a* to be the Fallopian tubes; *b b* the ovaries; *c c* the round ligaments; *d d*, *e e*, and *f f*, the upper, middle, and lower loops of the ligatures, which are all brought out together through the opening *k* left at the upper part of the vagina by the removal of the uterus. At *i i* the walls of the vagina are represented; *h h* the raw surface left by division of these walls; and *g g g* the divided surfaces of the broad ligaments. In the third drawing we have a front or transverse view of the condition after com-

Fig. 3.

pletion of the operation. *a a* are the Fallopian tubes; *b b* the ovaries; *c c* the round ligaments. The tied ends are brought down to the vaginal opening by the tied loops *f* of the ligatures. The vaginal walls *e e* are folded together by the tightened ligatures so as to make a sort

of prolapse into the vaginal canal, resembling a soft small vaginal portion of the cervix *uteri*. The peritoneal edges of the divided broad ligaments are brought together by a line of sutures *d d d*, so as to protect the peritoneal cavity from the entrance of anything upwards from the vagina.

I cannot take up more of your time with this subject, but I do say that should it, in some cases (no doubt they would be rare), be deemed desirable and justifiable to remove an entire uterus affected by cancer, this appears to me to be the best way hitherto described of doing it with a reasonable hope of success.

The hour is nearly complete, but I cannot conclude the very hasty and imperfect review of the subject of abdominal tumours, which I have been able to condense in six lectures, the operation now accepted as the only effectual means of relief in cases of ovarian tumours especially, and of the results which have been obtained in alleviating distress and prolonging valuable life, without some reference to the man who is justly looked upon as the "father of ovariectomy". Mc Dowell was wise, practical, and prophetic. He carefully studied the subject which filled his mind; did with an enviable success what his opportunities permitted; and looked with an anxious eye on the prospect opening up to his successors. We, more happy in our opportunities, have entered into full possession of what to him was little more than a promised land; and, speaking personally, I feel it my greatest happiness to have been able, chiefly through the encouragement of professional brethren (which at one time I had little reason to anticipate), to reach the point at which McDowell aimed. I have not only attained the amount of operative success which he gave as the standard; I have not only the almost daily gratification of seeing some living and enduring evidence, that my labours have not been in vain; but I have, for the rest of my days, the satisfaction of knowing that my example has emboldened others, and will be the means of still further extending to human suffering the consolatory assurance of the prospect of relief and ensuring the certainty of its realisation by the many skillful hands which are now betaking themselves to the work. This is a lot which falls to but few innovators. It is not given to every one to see the fruit of his labours; but the surest way of gaining that end is by studying the words and following the counsels of wisdom. The wish to do well what others have done is not all that is wanted. Step by step their course must be followed, difficult still, but somewhat easier from the result of experience; and while I content myself with a warning to aspirants that a fancied inspiration will not alone carry them on to success, I feel that I cannot quit them and the subject better than by repeating the words of McDowell, who though better known in the open rugged field of practice than in the paths of literature, was a man of broad and elevated views, and thus expressed the advanced opinions he had already formed respecting the operation he had inaugurated after years of patient waiting and zealous preparation. He strove to make ovariectomy a boon to humanity. He had reason to believe it had proved so, but he foresaw the dangers of its abuse from rash and indiscriminate rivalry amongst his followers. Listen to his own words. "I think my description of the mode of operating, and of the anatomy of the parts concerned, clear enough to enable any good anatomist, possessing the judgment requisite for a surgeon, to operate with safety. I hope no operator of any other description may ever attempt it. It is my most ardent wish that this operation may remain to the mechanical surgeon for ever incomprehensible. Such have been the bane of the science, intruding themselves into the ranks of the profession with no other qualification but boldness in undertaking, ignorance of their responsibility, and indifference to the lives of their patients; proceeding according to the special dictate of some author as mechanical as themselves, they cut and tear with fearless indifference, utterly incapable of exercising any judgment of their own in cases of emergency, and sometimes without possessing the slightest knowledge of the anatomy of the parts concerned. The preposterous and injurious attempts of such pretenders can seldom fail to prove destructive to the patients and disgraceful to the science. It is by such this noble science has been degraded, in the minds of many, to the rank of an art."

In conclusion, allow me to read a sentence or two from one of those able reviews which make one regret that the day of the medical quarterlies is passed. (*British and Foreign Medical Review*, April 1873.) "All honour to McDowell of Kentucky, who, to use the words of Hufeland, 'looked upon his profession as a high and holy office, who exercised it purely, not for his own advancement, not for his own honour, but for the glory of God and the good of his neighbour, and who, long since called to give an account of it, is no doubt reaping the reward of his faithful stewardship'."

CLINICAL LECTURE

ON

A CALCULUS LARGELY COMPOSED OF INDIGO.

Delivered at St. Thomas's Hospital.

By WILLIAM M. ORD, M.D. Lond., F.R.C.P.,
Physician to the Hospital.

THE preparation I now place before you contains two calculi; the upper one from the right, the lower one from the left, kidney of one and the same patient. They were sent to me, together with the kidneys containing them, by my friend Dr. Bloxam of Mount Street, the parts having been removed by him from the body of a patient who had died of malignant disease.

The left kidney had been reduced to the state of a lobulated cyst by a large medullary sarcoma. The ureter was obliterated; and this, no doubt, had led to the destruction of the kidney. In the cystic kidney was the branched calculus (lower specimen) here shown. The right kidney was increased in size, but was healthy. In its pelvis lay the flat blackish cake (upper specimen) here shown. This, at the time of its removal, was noticed to make a blackish-blue mark on paper, and I show you now the paper in which it was sent to me—the various parts were each carefully packed and labelled—marked on the outside "from the right kidney", and within showing blue-black blotches, where it had been pressed against the calculus.

I may say at once that, when I first handled the calculus, which is an oval disc, seven-eighths of an inch long, nine-sixteenths broad, and one-tenth thick, in shape and look not unlike one of the fruit-lozenges used as vehicles for throat medicines, I looked upon it as probably a mixture of blood and phosphates. In colour, it is partly dark-brown, in parts black; the black surface finely granular, but taking a polish when rubbed with the thumb-nail. It is of the consistence of a very fine hard chalk or slate. Although the surface looks friable, the substance is very firm, and the section is polished by the saw as it traverses the interior with some difficulty. The hard central part is blue-grey, and does not mark paper. There is no concentric lamination or nucleus.

EXAMINATION.—I. When a portion was heated on platinum foil—the first step in examination—it gave off an offensive smoke, partly like that of burning fibrin, but with a character of its own besides, which I did not recognise at the time, but, on subsequent comparison, found to be identical with the character of the odour of burning indigo. A considerable white ash was left, which consisted of phosphate of lime, with a little magnesia.

II. A small portion being powdered and examined in water, under the microscope, was found to be partly brown and transparent, without organic structure, and with transparent crystalline matters imbedded; partly black and opaque. But here and there the black and the brown were mingled; little tufts of dark matter being scattered among the brown. The smallest looked blue in colour, and the same colour was observed at some points on the margin of black pigmented fragments.

III. After the action of hydrochloric acid, a large mass of friable stuff remained insoluble, and, under the microscope, was found to consist mainly of blue pigment, with here and there a coppery lustre. These observations were repeated several times with great caution on specimens taken from various parts of the calculus. And now the idea of indigo began to take shape.

IV. Accordingly, about a grain of well-powdered calculus stuff was put in a dry test-tube, and the flame of a spirit lamp was slowly applied. A purple vapour, very like that of iodine, was disengaged and filled the tube as high as three-fourths of an inch from the bottom. On removal of the heat, the vapour at once condensed on the tube and on the powder from which it had been disengaged. The deposit on the tube is here shown. It is composed of blue crystals—elongated six-sided tablets, variously grouped in crosses and stars. The vapour, in colour and behaviour, is exactly like that of indigo which I now exhibit to you. The crystals now sublimed are, as seen under the microscope, exactly like those from the calculus.

For more ready comparison, I have prepared two slides of crystals for the microscope, which I now show you. They were made thus. Some powder, of the calculus in one case, of common commercial indigo in the other, was placed on a sheet of clean platinum foil. Round it was placed a glass ring, such as microscope cells are made with; and