A third and fourth series of fifty cases of ovariotomy : with remarks on the situation and length of the incision required in the operation / by T. Spencer Wells.

A THIRD AND FOURTH SERIES

OF

FIFTY CASES OF OVARIOTOMY,

WITH

REMARKS ON THE SITUATION AND LENGTH OF THE INCISION REQUIRED IN THIS OPERATION.

BY

T. SPENCER WELLS, F.R.C.S.,

SURGEON IN ORDINARY TO HER MAJESTY'S HOUSEHOLD; SURGEON TO THE SAMARITAN HOSPITAL, ETC.

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Received June 10th.—Read June 28th, 1867.

My first series of 50 cases of ovariotomy is recorded in vol. xlvi of the 'Transactions' of this Society, with some account of the history and progress of the operation in Great Britain. In vol. xlviii a second series of 50 cases is also recorded, with some remarks on the selection of cases for this operation. I now bring before the Society a third and fourth series of 50 cases, making in all 200 cases in which I have completed the operation of ovariotomy. I have arranged these cases in tables, as with the former series, and after a few remarks on the age and social condition of the patients, I propose to consider the situation and extent of the incision by which the operation is commenced.

If it should be acceptable to the Society, and if I should be enabled to complete another hundred operations, I may at some future time ask for attention to some observations on other steps of the operation.

Table of Cases.

Series I.—Cases in which Ovariotomy was completed—100 Cases: 72 recoveries, 28 deaths.
„ II.—Cases in which Ovariotomy was commenced, but not completed—6 Cases; 3 recoveries, 3 deaths.
„ III.—Cases where an Exploratory Incision was made—3 Cases: 2 relieved, 1 died.

Series I.—*Cases in which Ovariotomy was completed.*

No.	Date.	Age.	Condition.	Connections; treatment of pedicle; weight of fluid or tumour; length of incision, etc.	Result.
	1864				
101	June	18	Single	Firm adhesions; pedicle returned; 12 lbs.; Hæmatocele; incision 4 in...	Recovered.
102	July	24	„	Slight omental adhesions; pedicle returned; about 20 lbs.; inc. 8 in. ...	Death in 92 hours. Septicæmia.
103	„	28	Married	No adhesions; pedicle returned; 18 lbs.; incision 3½ inches	Death in 30 days. Chronic peritonitis.
104	„	32	„	No adhesions; clamp; 17 lbs.; incision 4 inches	Recovered.
105	„	41	Single	No adhesions; clamp; 11 lbs.; incision 4 inches	„
106	„	35	„	Parietal adhesions; clamp; 18 lbs.; incision 4 inches	„
107	Oct.	44	Widow	Ruptured cyst; pedicle tied; 26 lbs.; incision 5 inches	Died on 11th day. Septic peritonitis.
108	Nov.	42	Single	Adherent tumour; clamp; 28 lbs; incision 8 inches	Recovered.
109	„	59	Married	No adhesions; clamp; 20 lbs.; incision 4 inches	„
110	„	49	„	Parietal adhesions; both ovaries removed; vessels in only one pedicle tied; 36 lbs.; incision 7 inches	„
111	„	45	Single	Adherent cyst; clamp; 16 lbs.; incision 5 inches	Convalescence, but death in six weeks. Cancer.
112	„	19	„	No adhesions: clamp; about 15 lbs.; incision 4 inches	Recovered.
113	„	51	„	Ruptured cyst; omental and intestinal adhesions; clamp; about 50 lbs.; incision 10 inches	Death on 3rd day. Exhaustion.
114	„	34	„	No adhesions; clamp; about 35 lbs.; incision 9 inches	Recovered.
115	Dec.	33	Married	Omental adhesions; clamp; 20 lbs.; incision 4 inches	„

116	Dec.	21	Single	No adhesions; clamp; 10 lbs.; incision 4 inches	Died 4th day. Septic peritonitis.
117	„	27	„	No adhesions; pedicle returned; 15 lbs.; incision 4 inches	Recovered.
	1865				
118	Jan.	42	„	No adhesions; clamp; 28 lbs.; incision 7 inches	„
119	„	19	„	Parietal and omental adhesions; clamp; 15 lbs.; incision 6 inches ...	„
120	„	54	Married	Parietal adhesions; clamp; 46 lbs.; incision 7 inches	„
121	Feb.	27	Single	Parietal adhesions; clamp; 33 lbs.; incision 7 inches	„
122	„	24	„	Parietal adhesions; clamp; 28 lbs.; incision 6 inches	„
123	„	50	Married	Adhesions; clamp; 20 lbs.; incision 6 inches	Death on 5th day. Peritonitis.
124	Mar.	36	„	No adhesions; clamp; 27 lbs.; incision 8 inches	Recovered.
125	„	25	Single	No adhesions; clamp; 32 lbs.; incision 5 inches	„
126	April	31	Married	Omental adhesions; clamp and ligature; 37 lbs. solid, 8 lbs. fluid; incision 20 inches	Died, 27 hours. Exhaustion.
127	„	41	„	Adhesions; clamp; 27 lbs.; incision 5 inches	Recovered.
128	May	33	„	Adhesions; ligature; 23 lbs.; incision 8 inches	„
129	„	38	„	Adhesions; clamp; 27 lbs.; incision 5 inches	„
130	June	56	Single	Adhesions; pedicle returned; 30 lbs.; incision 6 inches	„
131	„	56	Married	Both ovaries removed; intestinal and pelvic adhesions; ligature; 23 lbs.; incision 7 inches	Died in 30 hours. Exhaustion.
132	„	34	Single	No adhesions; clamp; 60 lbs. fluid; incision 3½ inches	Recovered.
133	„	54	Married	Adhesions; pedicle returned; 33 lbs.; incision 5 inches	Died on 5th day. Septicæmia.
134	„	37	„	Both ovaries removed; parietal and intestinal adhesions; pedicle returned; incision 5 inches...	Recovered.
135	July	41?	„	Omental adhesions; clamp; incision 8 inches	Died on 4th day. Peritonitis.
136	„	45	„	Adhesions; clamp; 48 lbs.; incision 8 inches	Recovered.
137	„	41	„	No adhesions; clamp; incision 5 inches	„
138	„	55	„	Adhesions; clamp; 75 lbs. fluid; incision 5 inches	Died on 9th day. Peritonitis.
139	Aug.	24	„	Adhesions; pregnant uterus; clamp on pedicle; uterine ligatures; 28 lbs.; incision 4½ inches	Recovered.
140	Oct.	46	Widow	Adhesions; clamp; incision 5 inches	„
141	„	53	Married	No adhesions; pedicle returned; 24 lbs.; incision 5 inches	„
142	„	59	„	Parietal and intestinal adhesions; ligature and cautery; incision 5 in....	Died 46 hours after. Exhaustion.

No.	Date.	Age.	Condition.	Connections; treatment of pedicle; weight of fluid or tumour; length of incision, etc.	Result.
	1865				
143	Oct.	34	Single	Adhesions; clamp; 30 lbs.; incision 6 inches	Recovered.
144	Nov.	42	,,	Adhesions; clamp; 30 lbs.; incision 5 inches	,,
145	,,	31	,,	No adhesions; pedicle returned; incision 5 inches	,,
146	,,	30	,,	Adhesions; pedicle returned; 28 lbs.; incision 5 inches	,,
147	,,	41	Married	Adhesions; clamp; incision 4 inches	,,
148	Dec.	50	,,	Both ovaries removed; pedicle returned; 34 lbs.; incision 5 inches ...	Died on 22nd day. Peritonitis.
149	,,	35	,,	Adhesions; clamp and ligature; 40 lbs.; incision 5 inches	Recovered.
150	,,	45	Single	No adhesions; clamp; 31 lbs.; incision 6 inches	,,
151	,,	44	,,	No adhesions; clamp; 24 lbs.; incision 5 inches	,,
	1866				
152	Jan.	25	,,	Slight adhesions; clamp; 17½ lbs.; incision 6 inches	,,
153	,,	20	,,	Parietal and omental adhesions; clamp; 22 lbs.; incision 4 inches ...	,,
154	,,	29	Married	No adhesions; pedicle returned; 16 lbs.; incision 4 inches	Died on 7th day.
155	,,	39	,,	Omental adhesions; clamp; 26 pints ascitic fluid, and 9 lbs. 6 ozs. malignant tumour; incision 8 inches	Died on 12th day.
156	Feb.	37	Single	No adhesions; wire clamp and ligature; 52 lbs.; incision 6 inches ...	Recovered.
157	,,	32	,,	Slight adhesions; clamp; 20 lbs.; incision 6 inches	,,
158	,,	34	Married	Parietal, omental, and intestinal adhesions; clamp; 7 lbs.; incision 4 in.	,,
159	Mar.	26	,,	Parietal adhesions; clamp; suppurating cyst; 8 lbs.; incision 5 inches	Died in 25 hours. Pyæmic fever.
160	,,	31	Single	No adhesions; clamp; ruptured colloid cyst; 30 lbs.; incision 6 inches	Died in 26 hours. Exhaustion.
161	,,	30	,,	Very firm adhesions, parietal, omental, and mesenteric; pedicle returned; 24 lbs.; incision 5 inches	Died in 35 hours. Peritonitis.
162	,,	23	,,	Firm and extensive adhesions; clamp; 69 lbs.; incision 4 inches ...	Died in 52 hrs. Pulmonary embolism.
163	,,	24	,,	No adhesions; pedicle returned; 16 lbs.; incision 7 inches	Recovered.
164	April	27	,,	No adhesions; clamp; 16½ lbs.; incision 7 inches	Died on 4th day. Peritonitis.
165	,,	46	Married	Omental adhesions; clamp; 14 lbs.; incision 8 inches	Recovered.
166	May	42	,,	Omental and parietal adhesions; clamp; 25½ lbs.; incision 5 inches ...	,,
167	,,	52	,,	Omental and parietal adhesions; pedicle returned; 25 lbs.; incision 8 in.	Died on 4th day. Peritonitis.

168	May	32	Single	No adhesions; pedicle returned; 16 lbs.; incision 5 inches	Recovered.
169	„	57	„	Extensive adhesions; clamp; 15 lbs.; incision 7 inches	„
170	June	24	„	No adhesions; cautery; 28 lbs.; incision 4 inches	„
171	July	50	Married	Slight adhesions; cautery; 23 lbs.; incision 4 inches	„
172	„	25	Widow	Parietal and omental adhesion; cautery; 15 lbs.; incision 7 inches ...	Died on 4th day. Septicæmia.
173	„	45	„	Parietal adhesions; cautery and ligatures; 17 lbs.; incision 7 inches ...	Recovered.
174	„	28	Married	Parietal, omental, and intestinal adhesions; clamp; 28½lbs.; incision 8 in.	„
175	„	30	„	Parietal and omental adhesions; pedicle returned; 23 lbs.; incision 4 in	„
176	„	32	„	No adhesions; clamp; 13 lbs.; incision 6 inches	„
177	„	39	„	No adhesions; clamp; 24½ lbs.; incision 5 inches	„
178	Aug.	22	Single	No adhesions; clamp; not weighed; incision 4 inches	„
179	„	59	Widow	Parietal and intestinal adhesions; clamp; not weighed; incision 5 in....	„
180	„	42	Single	Parietal adhesions; clamp; 21 lbs.; incision 4 inches	„
181	„	40	Married	No adhesions; cautery and ligatures; 15 lbs. and 18 pints ascitic fluid; incision 7 inches	Convalescence. Death after a month. Chronic peritonitis.
182	„	53	Widow	Slight adhesions; clamp; 28 lbs.; incision 5 inches	Recovered.
183	Oct.	48	Single	Omental and intestinal adhesions; clamp; 28 lbs.; incision 5 inches ...	„
184	„	37	Married	Omental and intestinal adhesions; clamp; 11 lbs. 13 ozs. and 7 pints ascitic fluid; incision 9 inches	„
185	„	48	„	Omental adhesions; cautery; 18 lbs.; incision 7 inches	Died on 5th day. Peritonitis.
186	„	43	„	Adhering capsule; cautery and ligature; 36 lbs.; incision 6 inches ...	Recovered.
187	„	21	Single	No adhesions; cautery and ligature; 20 lbs.; incision 6 inches ...	„
188	„	28	„	No adhesions; clamp; 14 lbs.; incision 5 inches	„
189	„	32	Married	Omental adhesions; pedicle returned; 44 lbs.; incision 9 inches ...	Died in 42 hours. Peritonitis.
190	Nov.	37	„	No adhesions; clamp; 24 lbs.; incision 4 inches	Recovered.
191	„	50	„	No adhesions; clamp; 23 lbs.; incision 4 inches	„
192	„	36	Single	No adhesions; clamp; 14 lbs.; incision 4 inches	„
193	Dec.	52	Married	Parietal and omental adhesions; clamp; 32 lbs.; incision 6 inches ...	„
194	„	31	„	Parietal and omental adhesions; clamp and ligature; 9 lbs. 5 ozs. and 13 pints ascitic fluid; incision 10 inches	Died in 33 hours. Peritonitis.
195	„	55	„	Parietal, omental, and intestinal adhesions; clamp; 15 lbs.; incision 6 in.	Died in 76 hours. Septicæmia.

No.	Date.	Age.	Condition.	Connections; treatment of pedicle; weight of fluid or tumour; length of incision, etc.	Result.
196	Dec. 1867	28	Married	Parietal, omental, and intestinal adhesions; clamp; 28 lbs.; incision 5 in.	Died on 5th day. Hectic.
197	Jan.	34	Widow	No adhesions; cautery and ligature; 12½ lbs.; incision 4 inches ...	Died on 4th day. Peritonitis.
198	Feb.	34	Married	No adhesions; clamp; 17 lbs.; incision 5 inches	Recovered.
199	,,	39	,,	Omental adhesions; cautery and ligature; 25 lbs.; incision 7 inches ...	,,
200	Mar.	38	,,	No adhesions; clamp; 28 lbs.; incision 6 inches	,,

Series II.—*Cases in which Ovariotomy was commenced but not completed.*

No.	Date.	Age.	Condition.	Connections; treatment of pedicle; weight of fluid or tumour; length of incision, etc.	Result.
1	1865 Feb.	22	Single	Pelvic adhesions; cyst emptied and fixed to abdominal wall; cure by suppuration	Recovered and remains in good health.
2	May	50	Married	Pelvic adhesions; loose part of cyst removed by ecraseur	Died in 76 hrs. Obstructed intestine.
3	Oct.	40	Single	Pelvic adhesions; cysts tapped and emptied	Recovered after suppuration.
4	1866 April	38	Married	Uterus and both ovaries diseased; part of a tumour of doubtful origin removed. *See* 'Pathological Transactions,' vol. xvii, p. 203 ...	Death in 32 hours. Peritonitis.
5	July	40	,,	Suppurating cyst opened and partially removed	Death in 14 hours. Exhaustion.
6	Dec.	33	Single	Cyst exposed and tapped; adhesions so extensive that no attempt at removal was made	Relieved.

SERIES III.—*Cases where an Exploratory Incision was made.*

No.	Date.	Age.	Condition.	Connections; treatment of pedicle; weight of fluid or tumour; length of incision, etc.	Result.
1	1866 Aug.	38	Married	Nineteen pints of ascitic fluid removed, and a malignant tumour exposed, involving uterus and ovaries	Relieved, but died a few weeks afterwards.
2	Dec.	39	„	Much ascitic fluid removed; solid tumour of uterus exposed and punctured	Relieved. Still alive.
3	„	43	„	Renal cyst exposed and tapped. *See* 'Dublin Quarterly Journal,' Feb., 1867	Death in 30 hours. Uræmia.

It is satisfactory to observe that increasing experience has been followed by a diminishing mortality.

Of the first 100 patients, 66 recovered and 34 died. Of the second 100, 72 recovered and 28 died. This is an addition of 6 per cent. to the recoveries, or a lower mortality of 6 per cent. in the second series of 100 cases.

The proportion of incomplete and exploratory operations is the same in both cases, namely 9 in each 100 cases; of the 9 in the second 100, 5 recovered or were relieved, and 4 died. I may repeat here what I stated before with regard to these incomplete or exploratory operations, that they must not be regarded "as instances of mistakes or even of imperfect diagnosis; because in nearly all of them the actual result was anticipated before the incision was made, and it was made rather to avoid possible error, or yielding to the urgent solicitation of dying women, than with any confident hope of success." The only exception to this in the present series is the case where a cyst-like enlargement of the left kidney was mistaken for a tumour of the left ovary.

Age.

The influence of the *age* of a patient upon the result of ovariotomy may be examined by the aid of the following table. It appears that below the age of 20, and between the ages of 40 and 50, the mortality is less than between 20 and 40 or above 50.

Ages.	Cases.	Recoveries.	Deaths.	Mortality per cent.
Under 20	7	7	...	...
20 to 30	49	32	17	34·69
30 to 40	63	41	22	34·92
40 to 50	44	35	9	20·45
50 to 60	36	22	14	38·88
Above 60	1	1	...	...
	200	138	62	31·

Conjugal condition.

Of the 200 patients there were—

		Recovered.		Died.		Mortality per cent.
105	Married or Widows	68	.....	37	.....	35·23
95	Unmarried	70	.....	25	.....	26·31
200		138		62		31·

In the first 100 cases the mortality among married and unmarried women was nearly equal. A much smaller mortality has been observed among the unmarried women in the second 100 cases.

Social condition.

In the first 100 cases the mortality was smaller in hospital than in private practice, the deaths averaging 29·6 per cent. in the hospital, and 39·1 in the private cases. In the second 100 cases this proportion is directly reversed. There were:

			Recovered.		Died.		Mortality per cent.
Hospital Cases	35	.....	23	.....	12	.....	34·2
Private Cases	65	.....	49	.....	16	.....	24·6
	100		72		28		

Thus in the first series there was a greater mortality of 10 per cent. in private than in hospital practice, and in the second series the greater mortality, also of 10 per cent., was in hospital practice. Taking the 200 cases there were—

			Recovered.		Died.		Per cent.
Hospital Cases	89	.....	61	.....	28	.....	30·4
Private Cases	111	.....	77	.....	34	.....	30·6
	200		138		62		31·

These results are so nearly identical that it is probable the difference in the two series is only accidental, or such as is almost certain to occur in statistical inquiries when only small numbers are dealt with, and which can only be corrected by the test of larger numbers.

I may preface some remarks upon the

Situation and length of the incision

by the following table, which shows the result of different lengths of incision in 200 cases:—

Length of incision.	Cases.	Recoveries.	Deaths.	Mortality per cent.
Under 4 inches.....	14	10	4	28·5
4 to 5.....	66	48	18	27·2
5 to 6.....	55	37	18	32·7
6	28	21	7	25·
7	15	10	5	33·3
8	13	8	5	38·4
9	6	4	2	33·3
10 and upwards ...	3	...	3	100·
	200	138	62	31·

If we compare the cases where the incision did not exceed 6 inches with the cases where this length was exceeded, the result appears considerably in favour of the shorter incision. There were—

	Cases.	Recoveries.	Deaths.	Mortality per cent.
Not exceeding 6 inches ...	163	116	47	28·33
Exceeding 6 inches	37	22	15	40·54
	200	138	62	31·

While, however, it appears that the mortality in my practice has been considerably greater where long incisions have been made, it also appears to have been of little consequence whether an incision of 4, 5, or 6 inches in length has been made.

This confirms an impression which I have formerly published to the effect that when an ovarian cyst or tumour can be removed by an incision which does not extend above the umbilicus, "the probability of success is much greater than when it becomes necessary to extend the incision much above the umbilicus."

If we endeavour to carry on this inquiry, and examine the comparative success of what has been called the "major operation," or the "long or large incision" with the "minor operation," or the "small or short incision," we are met at once by the difficulty that the practice of different operators has also differed in other important steps of the operation. A tumour has been removed entire by an incision from sternum to pubes, the pedicle has been tied by whipcord, the ends of

the ligature left as a seton in the peritoneal cavity, and the wound has been united by sutures, which have not brought together the whole thickness of the abdominal wall.

Another operator would remove a similar tumour after emptying it or breaking it up, through an incision of 4 to 6 inches in length below the umbilicus. The pedicle would be fixed between the edges of the wound with its secured end above the skin, and the whole thickness of the abdominal wall would be carefully brought together by sutures passing through its peritoneal coat.

It is obvious that the result in the two cases may be affected by other considerations than the length of the incision. So that a mere statistical inquiry as to the results obtained by different operators by incisions of different lengths, could be of very little value—certainly of less value than an equal number of cases by the same operator.

Historically, however, the inquiry is of interest, and may be of some importance as a guide to future progress, now that a considerable number of cases by the long and short incision may be compared in the practice of one operator.

In all my cases the *linea alba* has been selected as the seat of incision, and in a very large majority of the cases on record other operators have selected the same situation. But in some few cases the incision has been intentionally carried either to the right or left of this line. One of the *lineæ semilunares* has been occasionally, though very rarely, selected; and in some few exceptional cases oblique or transverse incisions have been made. Thus Dr. Atlee[1] in one successful case made an incision seventeen inches long, from the symphysis pubis to the middle of the crest of the right ilium. Bühring[2] made an incision at the outer border of the external oblique on the right side from the false ribs to the crest of the ilium.

In one of the earliest cases in England, Mr. King[3] made one vertical incision seven or eight inches long to the right of the

[1] 'American Journal Med. Science,' 1849 and 1855.

[2] 'Heilung der Eierstocks geschwülste,' 1848.

[3] 'Lancet,' January, 1837.

umbilicus, and another four inches long at right angles extending towards the spine. In this case no tumour could be found, and the patient recovered. In another case ('Lancet,' 1836, '37), he made "a division of about three inches through the integument and the linea semilunaris of the left side, a little above a line drawn across the abdomen from the umbilicus."

An incision nine inches long was made by Dr. Mercier,[1] from the "lower ribs to external edge of rectus muscle."

Dr. Haartmann[2] made an incision five inches long, parallel with Poupart's ligament; and Dr. Dorsey[3] met a vertical incision eight inches long, by a transverse incision in the left side six inches long. These are the principal examples on record of oblique or transverse incisions. Vertical incisions to one or other side of the linea alba have been less uncommon.

Dr. M'Dowell[4] in his first and second cases made his incisions nine inches long, three inches from and parallel to the left rectus. In his subsequent cases he seems to have selected the linea alba.

Some writers, as Hamilton,[5] who describes his incision as "corresponding to the inner margin of the right rectus," merely express in other words division of the linea alba. The object is to avoid either of the recti muscles. The only operator, so far as I know, who prefers division of one of the muscles is Dr. Storer, of Boston, who says, "I differ from most operators in that I prefer making the section in the track of a rectus muscle rather than in the linea alba, being thus much more certain, from the nature of the tissue divided, of a primary reunion."—('American Journal of Medical Science,' January, 1866.)

As I do not believe it possible that a divided and reunited muscle, even when most complete union results, can form so

[1] 'New Orleans Medical and Surg. Journal,' January, 1855.
[2] 'Monatschrift für Geburtskunde,' 1856.
[3] 'Ohio Med. and Surg. Journal,' 1859.
[4] 'Eclectic Repertory,' 1817, 1819.
[5] Ibid.

firm, unyielding, and perfect a portion of the abdominal wall as the uninjured muscle in its normal state—as I do not think that division of the muscle can make union of skin, peritoneum, or cellular tissue more certain or complete—and as I never once saw any want of union when the recti had been carefully avoided, I always endeavour to divide the linea alba accurately, without opening the sheath of either rectus.

It is not often easy to do this, for the weight of the tumour has generally either drawn the recti to one side, or the muscles have been spread out over the anterior surface of the cyst. *Anatomically,* it appears a matter of some importance not to open the sheath; but although it is well to try to hit the linea alba exactly, it does not appear of much importance *surgically* if one edge of the muscle be exposed, or if a division be made through the muscle parallel with the course of its fibres. If the incision be extended above the umbilicus, it is better to carry it round to the left side, because the round ligament of the liver passes diagonally upwards and backwards towards the right side, and might be wounded if the incision were carried either directly through the umbilicus, or to the right side. In some cases a wound of the round ligament might not be of consequence, but in others it might lead to serious hæmorrhage, as the embryonal umbilical vein is not always entirely obliterated, but remains patent, and is sometimes of considerable size.

When the linea alba is chosen for the incision the following structures are successively divided:

1. The skin.
2. The subcutaneous areolar tissue, with fat of varying thickness.
3. The interlaced fibres of the aponeuroses of the abdominal muscles constituting the linea alba.
4. Layers of the fascia transversalis with more or less fat. The uppermost layer adheres closely to the linea alba. The deepest layer is only very loosely connected with the peritoneum.
5. The peritoneum.

But this normal arrangement is often much modified.

When there is much œdema of the abdominal wall the different layers may be widely separated, and appear as if increased in number, or they may be agglutinated together by previous inflammatory processes; and, as before mentioned, the recti muscles are often carried so much to one side by the tumour that it is almost impossible to avoid exposure or division of some of their fibres.

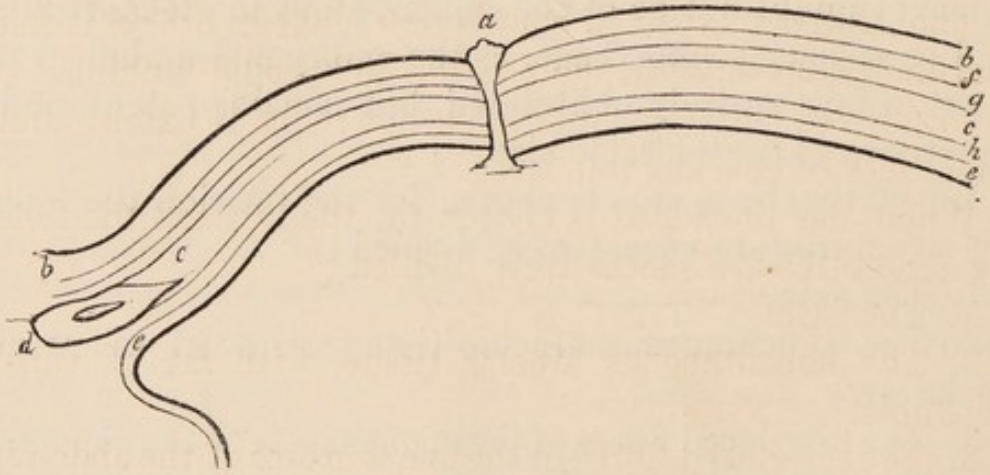
The anatomical question may, perhaps, be studied by the assistance of the accompanying diagrams, which show the structures necessarily divided if the abdominal wall be cut through—

1. Along the linea alba.
2. Through one of the recti muscles, and
3. Along one of the lineæ semilunares.

The effect of division in the upper and lower part of the linea alba is also shown.

Let diagram No. 1 represent the layers just enumerated as divided, when an incision is made through the anterior abdominal wall at the linea alba.

No. 1.

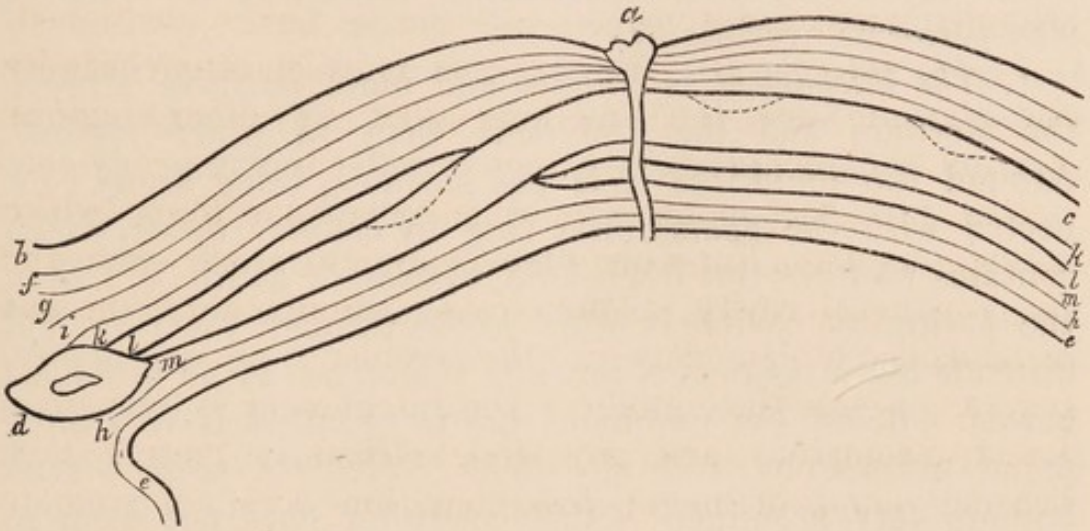


a. Umbilicus.
b. Skin.
c. Linea alba.
d. Symphysis pubis.
e. Peritoneum.
f. Superficial layer of areolar tissue.
g. Deep layer of ditto.
h. Areolar tissue rich in fat, or perimysium internum.

The following diagram (No. 2) will then show how many additional layers must be divided if the incision be carried

on either side of the linea alba through one of the recti muscles.

No. 2.



a. Umbilicus.
b. Skin.
c. The rectus muscle with its inscriptiones tendineæ.
d. Symphysis pubis.
e. Peritoneum.
f. Superficial layer of areolar tissue.
g. Deep layer of ditto.
h. Perimysium internum.
i. Aponeurosis of external oblique muscle.
k. Aponeurosis of internal oblique muscle.
l. Aponeurosis of transversalis muscle.
m. Fascia transversalis.

The diagram No. 3 shows the layers divided if the incision be made along one of the lineæ semilunares.

No. 3.

a. Crest of the ilium.
b. Skin.
e. Peritoneum.
f. Superficial layer of areolar tissue.
g. Fascia superficialis.
h. Perimysium internum.
i. Aponeurosis of external oblique muscle.
k. Aponeurosis of internal oblique muscle.
l. Aponeurosis of the transversalis muscle.
m. Fascia transversalis.

Each of the structures which make up the anterior abdominal wall, and are arranged in the layers represented in the above diagrams, are of some interest to the surgeon who performs ovariotomy.

1. *The integument* is thinner and more sensitive between the sternum and the umbilicus than in other regions. Around the umbilicus it is not movable, being firmly connected with the aponeurotic ring by cellular tissue, which contains no fat. But when fluid, ovarian or ascitic, is free in the peritoneal cavity, it often passes through the ring, and distends the integuments into the semblance of an umbilical hernia. Below the umbilicus the integument is very often found œdematous, and any *lineæ albicantes* present then become very prominent; this condition does not seem to interfere with union of the incision by first intention.

2. *The subcutaneous areolar tissue* in some parts of the abdominal wall presents two distinct and separate layers. The superficial layer is rich in fat-cells, and contains the superficial blood-vessels. The deeper layer has more the character of a fibrous fascia, and is the proper *fascia superficialis*. This separation is most apparent in the hypogastric and inguinal regions, and is more easily demonstrated in old than in young persons. Of the blood-vessels which ramify in the cellular tissue, only the external epigastric artery and vein are of practical interest. The artery, or some of its larger branches, are more likely to be divided when the incision is along one of the *lineæ semilunares*, or through one of the recti muscles, than when the *linea alba* is divided. But it can be readily tied before the peritoneum is opened. The external epigastric veins are frequently enlarged or varicose when tumours obstruct the current of blood along the inferior vena cava. In some rare cases a subcutaneous vein communicates through the umbilical ring with the pervious umbilical vein. A slight deviation in the line of incision will often enable the surgeon to avoid enlarged veins; and if this cannot be done, it is advisable to stop the current of blood through the vein before it is divided, by acupressure—passing a harelip pin through the skin and out again, after passing

under the vein. In this way, what might be otherwise a serious loss of blood is prevented.

3. *The sheaths of the recti,* complete anteriorly, incomplete posteriorly, from about two inches below the umbilicus, formed by the aponeurosis of the flat abdominal muscles, and terminating in the linea alba, hardly require more than a passing mention. But if much disturbed during the first incision, abscess is very likely to delay healing.

4. *The recti and pyramidales* muscles are almost always seen, and one or other is generally divided in ovariotomy. When the recti are unusually broad near the pubes, the pyramidales may be absent. When the recti are narrow below, the pyramidales lying in front of the recti, and inclosed in the sheath, are inserted into the inner border of the sheath, half-way between the pubes and the umbilicus, or even higher.

5. The fibres of the flat abdominal muscles cross each other in different directions, embrace the recti muscles, and conjoin on the *linea alba,* forming a tendinous band, which is very strong at the pubic end, and broader and weaker at the sternal end. The fibres of the aponeurosis on one side continue across the linea alba, and interlace with fibres coming from the opposite side, forming meshes which in the normal state are very small, only giving passage to nerves and vessels; but which, after great distension of the abdominal wall, form apertures through which small masses of fat may escape from beneath, forming what have been called *Herniæ adiposæ,* and often leading an inexperienced ovariotomist to think that he has opened the peritoneal cavity, and exposed the omentum.

6. The *umbilicus* is merely one of these openings in the linea alba; but the occasional permeability of the embryonal umbilical vein (already referred to) must be borne in mind, and the fact that the urachus may also remain permeable, and urine escape from the bladder through it at the umbilicus. I have never seen this in the adult; but in one case of ovariotomy I found the urachus, though closed at both ends, open for the whole length of my incision in the abdominal

wall, and filled by small urinary concretions. Usually it is obliterated, and forms the vesico-umbilical ligament running up along the linea alba from the bladder to the umbilicus.

7. The *deep fascia*, or the layers of areolar tissue between the inner surface of the transversalis muscle and the peritoneum, or rather between the fascia transversalis and the peritoneum, is very elastic, and only loosely adherent, so that it is easy to separate the peritoneum to a considerable extent without opening it. Indeed, if fluid be free in the peritoneal cavity, the membrane bulges up, like a bluish thin-walled cyst, as soon as the deep fascia is divided.

8. The *peritoneum*. It must be remembered that the obliterated umbilical vessels and urachus, passing from the fundus of the bladder to the umbilicus, are inclosed in a fold of the parietal peritoneum. The inferior epigastric artery, ascending obliquely from Poupart's ligament to the posterior surface of the rectus muscle, is inclosed in a similar but less prominent fold. The fold from the umbilicus forming the suspensory ligament of the liver has been already alluded to. It is with later steps of the operation of ovariotomy that the peritoneum and its reflections have the most important relations. In connection with the first incision it is only necessary to add that it must be useless to carry this incision nearer to the symphysis pubis than the reflection of the peritoneum from the anterior abdominal wall to the bladder; and it is a safe rule to stop short of this point, and not carry the lowest point of the incision nearer than two inches to the symphysis pubis.