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We have come to learn by a slow deduction from cases recorded in medical literature that operations performed upon the pregnant uterus or its annexa during pregnancy are not attended by extreme danger. Thus out of forty-one cases subjected to operations on the annexa, which I have collected at random from the literature, thirty-two went to term and were delivered of living children, while seven aborted and two died. Statistics collated by other writers show results almost as good.

Myoma, complicating pregnancy, is rather uncommon on account of the tendency of this growth to cause sterility or, in the event of impregnation, to cause an early abortion. Virchow and Scanzoni state that fully fifty per cent. of women with myomata are sterile.

If pregnancy occurs notwithstanding the existence of myomata, the necessity for surgical interference must be considered, and the decision will depend upon the individual peculiarities of each case. A small myoma may not complicate labor no matter where situated. An interstitial myoma of the upper zone of the uterus, even though of considerable size, usually offers no mechanical obstruction to labor and, unless untoward symptoms arise which render an operation imperative, should not be touched.

Tumors, which in the early months of pregnancy are situated in the lower part of the body ot the uterus, may gradually ascend from

the pelvis and occupy such a position at term that labor is in no way complicated by their presence.*

A pedunculated myoma, blocking the pelvis and causing severe pressure symptoms, may frequently be freed from its confining position by careful manipulation. This is sometimes accomplished more readily by placing the patient in the knee-chest position. Occasionally manipulation fails either on account of the cramped environment of the tumor or on account of adhesions which bind it so firmly in the pelvis that attempts at displacement may be attended by disastrous consequences. Two cases, cited by Phillips,† aptly illustrate some of the dangers of too forcible or too persistent efforts in displacing these tumors. The first case was operated on by Knowsley Thornton ‡ for incarcerated pedunculated myoma. After making the abdominal incision the tumor was forced out of the pelvis and such profuse bleeding occurred that the patient's life was at first despaired of.

In the second case, operated on by Hanfield-Jones, a myoma, the size of a fœtal head, was impacted and adherent in the pelvis. Before the operation—a Porro-Cæsarean—persistent efforts were made to liberate the growth but without success. Following the operation the patient died of peritonitis. At the autopsy the tumor was found to be much "bruised" and Phillips who saw the case thought that the preliminary manipulation might have had some bearing on the fatal termination.

In considering the advisability of an operation it is necessary to weigh the risks of interference and non-interference.

The dangers from an operation are shock, abortion, hæmorrhage, intestinal obstruction, and infection. Shock depends in a great measure upon the dexterity of the operator and the duration of operation; abortion depends upon the amount of manipulation of the uterus, upon the extent of involvement of the uterine wall and upon the absence or presence of a tendency to abortion. If the uterine cavity is opened, abortion is inevitable. Hæmorrhage is to be feared on account of the great vascularity of the uterus. This applies only to the sessile myomata, and a series of successful operations performed for the removal of these growths show that even this fear is somewhat exaggerated.

Abortion and hæmorrhage after operation in the majority of in-

* Phillips. *British Medical Journal*, 1888, i, p. 1331.
† *Ibid.* ‡ Referred to in the table.

stances may be averted by prolonged rest in bed with a judicious administration of morphine. The danger of infection, which may be somewhat greater than in ordinary abdominal operations, depends upon the thoroughness of the surgical technique.

The dangers from non-interference with obstructing myomata are abortion, hæmorrhage, sepsis, rupture of uterus, pressure symptoms and intestinal obstruction. When there is a large myoma growing in the substance of the uterus the free hæmorrhages, frequently induced, tend to detach the ovum. Gusserow * thinks it is not yet proved that abortion is more frequent where myomata exist. He says, however, that abortion may be due directly to the tumor or to its effect on the uterine wall.

It has been stated by several writers that when pregnancy goes to term hæmorrhage is almost certain to occur in those cases in which an interstitial myoma is situated opposite the placental attachment and that, when abortion occurs under such circumstances, the hæmorrhage is always profuse and sometimes fatal. Although it is claimed by some writers that placenta prævia is more frequent in pregnancy complicated by myomata, the research of Nauss † seems to disprove this statement as he only found this anomaly twice in two hundred and forty-one cases.

Playfair ‡ says hæmorrhage is not so frequent as might at first be supposed and in twenty-six cases collected by Magdelaine no cases of this character are reported. In nineteen cases of hæmorrhage collected by Nauss,# eleven of the myomata were submucous, six interstitial and two subperitoneal.

During pregnancy myomata, as a rule, grow very rapidly. Cazeaux says: "I have known them in several instances to acquire a size in three or four months which they would not have done in several years in the non-pregnant condition." After labor the myoma, originally of low vitality, often passes through a degenerative or absorptive process, thus offering an opportunity for entrance and growth of pyogenic organisms.

A case is reported in the *Homœopathic Journal of Obstetrics*, for September, 1892, in which a myoma, the size of an orange, was detected in the left side of the fundus uteri. Twelve days after labor, which nearly terminated fatally, the patient developed all the symptoms of

* Gusserow. *Neubildungen des Uterus*, 1886.
† Playfair. *Midwifery*, 1889, p. 363. ‡ *Ibid.*
# Gusserow. *Neubildungen des Uterus*, 1886.

septic infection. The uterus gradually enlarged to its size at term and then suddenly discharged an enormous quantity of pus, containing shreds of myomatous tissue. A well-defined instance * has been recorded in which a myoma undergoing softening so weakened an area in the wall of a uterus already softened by pregnancy that it ruptured.

Peritonitis occasionally occurs during pregnancy apparently as a result of myomata † and deaths have been reported from this cause. Pressure from a large myoma may cause marked dyspnœa, obstinate constipation or suppression of urine, depending upon the location of the growth. Pain from pressure is also unendurable in some cases. Statistics collected to show the results of non-interference in pregnancy complicated with myomata are interesting. One author ‡ reports three hundred and seven cases in which thirty-nine abortions and fourteen maternal deaths occurred; another # two hundred and forty-one cases with forty-seven abortions. Süsserott ‖ in one hundred and forty-seven cases records eight deaths after application of the forceps, twelve after version and thirteen after artificial removal of the placenta.

Jetter △ records two hundred and fifteen deliveries in one hundred and sixty-five mothers with sixty-four maternal deaths. Gusserow ◊ reports two hundred and twenty-eight cases, collected from different sources, of which one hundred and twenty-three died. Suturgin ‡ states that scarcely one fifth of the cases complicated with myomata terminate without surgical assistance and that about one third of the mothers and one half of the children die during or soon after labor.

The immediate occasion of the remarks and analysis here presented was the occurrence of two cases in the gynæcological wards of the Johns Hopkins Hospital.

In 1892 two patients with myomata complicating pregnancy were admitted to the gynæcological wards who were operated upon by Dr. Kelly. The following is a synopsis of their histories:

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* *Alabama Med. and Surg. Journal*, October, 1891.

† Worship. *Obstet. Trans.*, London, vol. xiv, p. 305.

‡ Lefour. *Uterine Fibroids in Relation to Pregnancy*, Paris, 1880.

Nauss. *Inaug. Dissert.*, Halle, 1882.

‖ Süsserott. *Inaug. Dissert.*, Rostock, 1870.

△ *Die Neubildungen des Uterus*, 1886.

◊ *Ibid.*

‡ *Annual of Universal Medical Sciences*, 1891.

CASE I.—Mrs. S., aged twenty-five, admitted March 7, 1892; married eleven months before admission to hospital; menstruated first at eleven years of age, never regular, last period December 17, 1891; complained of occasional sharp pain in the ovarian and sacral region, severe headache and nausea. She was examined under anæsthesia, and a diagnosis of myoma of the posterior part of the fundus uteri, with pregnancy, was made. The pregnancy was judged to be about two and a half months advanced, by the size of the uterus and menstrual history. The tumor was about six centimetres in diameter, and its extirpation was deemed advisable on account of its probable interference with parturition. Operation, March 9th. A median incision exposed a firm sessile myoma directly behind the abdominal wall and situated on the posterior and right side of the fundus, forming a round boss about the size of an orange. An incision was made through the capsule of muscular fibers over the tumor, and it was removed without difficulty by enucleation, three or four silk sutures having first been passed under the tumor as it was drawn up out of its bed; these were tied immediately after the enucleation and at once re-enforced by others, in all ten or twelve. The bleeding was slight and easily controlled, the abdomen was closed without drainage and the patient made an uneventful recovery, and was delivered at term of a living, healthy child.

CASE II.—Mrs. W., aged thirty-five, admitted July 23, 1892; nullipara, menstruated first when thirteen years of age, flow regular; married twice; first time fourteen years before, second time four months before, admission. Last menstrual period occurred three weeks after her second marriage. She complained of a lump in the right ovarian region, which had been noticed for six weeks and which was growing very rapidly. For a week she had suffered with cramplike pains in the abdomen radiating into the back and down the right leg. These pains were very severe and resembled those of labor. On examination the lower part of the abdomen was found to be irregularly distended by two masses, evidently the pregnant uterus and a myoma. The uterus was rounded in outline, rather soft, extending fifteen centimetres to the right of the median line of the abdomen. The myoma was situated to the right and above the plain of the uterus; it was about eight centimetres in diameter, of firm consistence, and grew from the cornu of the uterus. Operation advised on account of threatened abortion. Operation, July 27, 1892. Incision made along the outer border of the right rectus muscle, revealing a myoma situated at the right cornu. The capsule was incised and the tumor

removed by enucleation, and the uterine wound closed by catgut sutures. There was free bleeding, until the sutures were tied. This patient likewise had an uncomplicated convalescence, and was delivered at term of a living child.

In reviewing the literature on this subject, thirty-one additional cases have been found which are tabulated here. Pozzi * reports seventeen, Landau † seventeen, and Routier ‡ fifteen cases, each writer having duplicated the cases of the others with one or two exceptions. Cases are reported # where enucleation was attempted before resorting to Porro's operation. Fibroid tumors of the ovary, which may produce symptoms identical with those of incarcerated pedunculated myomata, have been removed during pregnancy. Operations upon myomata, not involving cœliotomy, growing in the cervical portion of the uterus, have been performed several times, ‖ but as it is not the object of this paper to discuss them, they will be passed without further notice. The following table includes only those cases requiring opening of the abdominal cavity for the removal of myomata *per se*.

The indications for myomectomy are not always clear. An incarcerated myoma or one so situated as to cause great pressure upon such important structures as the blood-vessels, ureters, nerves, and intestines, or a myoma which constantly threatens abortion in cases where it is extremely desirable for reasons of inheritance that pregnancy should continue, or where the life of the patient is endangered from constant and profuse hæmorrhages, call for an operation. Any one of the following operations may be resorted to in these cases : The induction of abortion or premature labor, craniotomy, symphyseotomy, myomectomy, the Cæsarean, the Porro and the Porro-Cæsarean operation. Craniotomy, except in case of fœtal death, is practically an operation of the past. Symphyseotomy is a very safe operation, and is indicated in properly selected cases. The Porro and Cæsarean operations are sometimes called for, where myomectomy would be of no avail. The recent results in the last-named operations give them an important place in the consideration of the treatment of myomata complicating pregnancy. In five years, from 1885 to 1890, one hundred and fifty-

* *Gynæcology*, vol. i, p. 424, London, 1892.

† *Sammlung klin. Vorträge*, N. F., No. 26 ; *Gyn.*, No. 9, p. 217.

‡ *Bull. Soc. Chirurg.*, November, 1889.

\# *British Med. Journal*, 1888, vol. i, p. 1331.

Mundé, *Trans. Am. Gyn. Soc.*, 1884 ; Hicks, *Obs. Trans.*, xii, 1871, p. 273 ; Lomer, *Zeitschr. f. Geburt. et Gynäk.*, 1883, ix, p. 302 ; Sims, *Uterine Surgery*, p. 117 ; Schröder, Gusserow's *Die Neubildungen des Uterus*, 1886, etc.

seven Porro operations were performed, with forty-eight maternal deaths (30 + per cent.) and a fœtal mortality of twenty-five (15.9 per cent.). In 1887 there were fifty-three Cæsarean operations, with a maternal mortality of 20.8 per cent., and in 1888 seventy-nine operations, with a mortality of 24 per cent. The infant mortality in the one hundred and thirty-two cases was 5.3 per cent.

An analysis of the following table shows a maternal mortality of 24.25 per cent. or eight deaths in thirty-three cases. Of these deaths two were due to hæmorrhage, one to "long-standing aortic disease" and one to peritonitis. Three died after the occurrence of abortion, probably from infection, and in one case the cause was not specified.

Twenty-four of these cases have been reported since 1884 or nearly 80 per cent. of the whole number. Eliminating the cases operated upon before 1885 there remains a mortality of 16.66 per cent. Since 1889 seventeen cases have been reported or over one half of the whole number, with a death-rate of 11.75 per cent. The excellent results obtained in the later cases is unquestionably due to improved surgical technique. An investigation of the fœtal mortality shows a death-rate of 30.30 per cent. or nine abortions and one miscarriage. Twenty women were delivered at term of living children and one had a premature delivery in the eighth month, nearly six months after the operation. In three cases where the mothers died, no statement is made concerning abortion. Sixteen myomata are reported as pedunculated ; with these four deaths occurred, including the patient with aortic disease. One case aborted and one gave birth to a stillborn child, after which she died. In fifteen cases of sessile myoma six abortions occurred and four patients died. Nine were operated on in the last eight years with two deaths and one abortion, the abortion occurring in one of the cases that died.

From this analysis it is evident that operations performed during the last eight years have been attended with much better results than in former years, that operations for sessile myomata are more disastrous to the fœtus than are those for pedunculated tumors and that in properly selected cases myomectomy for pedunculated or sessile myomata is comparatively safe and thoroughly justifiable.

No. of case.	Name of operator.	Date of operation or reference to report of case.	Advancement of pregnancy at time of operation.	Characteristics of tumor.	Exact location.	Result to patient.	Result to fœtus.	Further remarks.
1	Péan.	Operation, Dec. 15, 1874. *Leçons de clin. chir.*, vol. i, p. 679.	5 months.	Large fibro-cystic tumor, containing ten litres of serous fluid, the solid portions weighing 7,300 grammes.	Situated on the upper and anterior part of uterus.	Recovery.	Abortion on the day following the operation.	Patient a widow nine years, pregnancy not suspected. Only a small portion of the sac was removed, the rest being stitched in the abdominal wound to shut out infection.
2	Thornton.	*Trans. Obstet. Soc.* June 4, 1879.	7 months.	Large pedunculated myoma.	Wedged in the pelvis.	Died on the seventh day.	Stillborn on the following day.	Tumor had thick pedicle, and was adherent to intestines and Douglas's *cul-de-sac*.
3	Schröder.	Operation, Nov. 16, 1879. Die Laparotomie in der Schwangerschaft, *Zeitschrift f. Geburt. und Gynäkol.*, Bd. v.	4 months.	Multiple pedunculated myomata, one sessile myoma.	Three large myomata, situated on the fundus; two pedunculated, one sessile.	Recovery.	Delivery at term.	Forceps delivery.
4	Hegar.	Operation, 1880. *Op. Gynäk.*, 3d ed., p. 475.	3 months.	Soft pedunculated myoma, with broad pedicle.	Not specified.	Died.	Not stated.	Death from peritonitis on third day.
5	Martin.	Operation, March, 1881. Landau, *Sammlung klin. Vorträge*, N. F., No. 26. *Gyn.*, No. 9, p. 217.	4 months.	Multiple myomata, with broad bases.	Not specified.	Died on the sixth day.	Abortion day after operation.	

6	Martin.	Operation, March, 1881. Landau, *Sammlung klin. Vorträge*, N. F., No. 26. *Gyn.*, No. 9, p. 217.	5 months.	Subserous myoma, with base size of hand; smaller one below and to the right.	Situated on fundus.	Died on the fifth day.	Abortion.	Enucleation. Time of operation sixty-five minutes. Patient had respiratory trouble.
7	Langenbuch.	Operation, July, 1882. *Berlin. klin. Wochenschrift*, 1886, quoted by Langner.	4 months.	Subserous myoma, with broad base covering surface, size of hand; two others, one size of hen's egg, the other size of pigeon's egg.	Situated on the anterior surface of the uterus.	Recovery.	Abortion.	Tumors all enucleated.
8	Studsgaard.	Operation, Dec. 19, 1882, quoted by Hegar. *Op. Gynäk.*, 3d ed.	3½ months.	Pedunculated myoma.	Not specified.	Recovery.	Delivery at term.	
9	Uzziel Ogden.	Operation, Nov. 5, 1884. *Canad. Practitioner*, April, 1885.	"Uterus considerably enlarged."	Myoma with a thick pedicle about an inch long. Weight, four pounds.	Attached to the right side of the uterus and inclosed in the broad ligament.	Recovery.	Twin pregnancy, aborted on twelfth day after operation.	The growth was supposed to be ovarian tumor. Operation consisted in clamping and cauterizing, then ligation on account of bleeding.
10	Landau.	*Berlin. klin. Wochenschrift*, No. 13, 1885, p. 195.	3 months.	Two subperitoneal myomata; one size of child's head, weighing three pounds, the other of a hen's egg.	Larger one situated at right cornu uteri, small one at left cornu.	Recovery.	Delivery at term.	Large myoma enucleated by circular incision around base.
11	Martin.	*Berlin. klin. Wochenschrift*, No. 3, 1885.	6 months.	Sessile myoma.	Situated on the fundus.	Died on the seventh day.	Abortion.	Died of hæmorrhage following abortion. Cuneiform incision of fundus.

No. of case.	Name of operator.	Date of operation or reference to report of case.	Advancement of pregnancy at time of operation.	Characteristics of tumor.	Exact location.	Result to patient.	Result to fœtus.	Further remarks.
12	Barnes.	Operation, 1885. *Annal. de gynec.*, March, 1890.	3 months.	Pedunculated myoma.	Not specified.	Died.	Not stated.	
13	Martin.	Operation, November, 1885. *Berlin. klin. Wochenschrift*, No. 29, 1886.	3½ months.	Myoma with thick pedicle, size of hand.	Located on fundus.	Recovery.	Delivery at term.	
14	Martin.	Operation, November, 1885. Landau, *Sammlung klin. Vorträge*, N. F., No. 26. *Gyn.*, No. 9, p. 217.	4 months.	Subserous myoma.	Located on fundus.	Recovery.	Delivery at term.	
15	Frommel.	*Münch. med. Wochenschrift*, No. 52, 1886.	5 months.	Myoma size of child's head; broad base.	.....	Recovery.	Delivery at term.	Peritonitis at time of operation. Tumor shelled out of bed in uterus and wound closed with several rows of sutures.
16	Martin.	Operation, Nov. 7, 1888. *Sammlung klin. Vorträge*, N. F., No. 26. *Gyn.*, No. 9, p. 217.	3 months.	Interstitial and subserous myomata.	Not specified.	Recovery.	Abortion.	Enucleation.
17	Gordon.	*Boston Med. Jour.*, October, 1889.	3 months.	Sessile myoma, size of orange.	Situated at middle of anterior surface of uterus.	Recovery.	Delivery at term.	Enucleation.

18	Routier.	*Bulletin soc. chir.*, November, 1889.	3 months.	Pedunculated myoma weighing five pounds, and shaped like a kidney.	Situated on fundus.	Recovery.	Delivery at term.	
19	Homann.	*Bulletin médicale*, 1889.	3 months.	Myoma weighing fifteen pounds.	Not specified.	Recovery.	Abortion ten days later.	Before operation a portion of tumor was removed by puncture, following which she had severe pains, and became delirious.
20	Bergh.	*Hygeia*, 1889, vol. li, p. 292.	4 months.	Two sessile myomata, larger size of two fists.	.....	Recovery.	Delivery at term.	Enucleation.
21	Frommel.	Operation, 1891. *Münch. med. Wochenschrift*, No. 14, 1893.	6 months.	Numerous myomata with broad bases pushing up the diaphragm.	Uterus studded with the tumors.	Died on the third day.	Abortion.	Only the two largest removed. Death due to hæmorrhage and exhaustion.
22	Croom.	*Edinburgh Med. Jour.*, October, 1892.	2½ months.	Pedunculated myoma, size of child's head.	Springing from left cornu uteri.	Recovery.	Pregnancy continued to eighth month.	Pedicle ligated.
23	Croom.	*Ibid.*	2 months.	Large, soft pedunculated myoma.	Connected with left side of uterus.	Died.	No record.	Patient succumbed to long-standing aortic disease immediately after operation.
24	Croom.	*Ibid.*	5 months.	Soft, vascular pedunculated myoma, size of cocoanut.	Posterior part of uterus.	Recovery.	Delivery at term.	
25	Flaischlen.	*Centralblatt für Gynäkologie*, p. 185, 1892.	3 months.	Two myomata, one, pedunculated, size of child's head; the other, sessile, size of apple.	First springing from posterior wall of uerus; second, from anterior wall.	Recovery.	Delivery at term.	Ligation of pedicle; enucleation.
26	Guinard.	Operation, 1892. *Annales de gynecol. et d'obstétrique*, 1893.	3 months.	Myoma of broad ligament, size of fœtus at term; thick pedicle.	Situated in right broad ligament.	Recovery.	Delivery at term.	

No. of case.	Name of operator.	Date of operation or reference to report of case.	Advancement of pregnancy at time of operation.	Characteristics of tumor.	Exact location.	Result to patient.	Result to fœtus.	Further remarks.
27	Kelly.	1892. Abstract from history of case for this article.	4 months.	Sessile myoma, size of orange.	Posterior surface of fundus uteri.	Recovery.	Delivery at term.	Enucleation.
28	Frommel.	Operation, 1892. *Münch. med. Wochenschrift*, No. 14, 1893.	4 months.	Intra-ligamentary myoma, size of child's head.	Situated on right side of uterus.	Recovery.	Delivery at term.	Broad ligament and tumor stripped out.
29	Kelly.	1892. Abstract from history of case for this article.	13 weeks.	Sessile myoma, size of duck's egg.	At right cornu uteri.	Recovery.	Delivery at term.	Enucleation.
30	Price.	Personal communication.	5 months.	Pedunculated myoma, size of fœtal head.	Growing from posterior and lateral surface of uterus, blocking the pelvis.	Recovery.	Delivery at term.	Ligation of pedicle.
31	Price.	Personal communication.	5 months.	Pedunculated myoma, size of fœtal head.	Growing from posterior and lateral surface of uterus, blocking the pelvis.	Recovery.	Delivery at term.	Ligation of pedicle.
32	Frommel.	Operation, 1893. *Münch. med. Wochenschrift*, No. 14, 1893.	5 months.	Pedunculated myoma, size of hen's egg.	Situated on anterior surface of uterus.	Recovery.	Delivery at term.	Ligation of pedicle.
33	Price.	Personal communication.	4 months.	Large pedunculated myoma.	Growing from posterior surface of uterus.	Recovery.	Delivery at term.	Incision through posterior vaginal fornix, clamping of pedicle.