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Myoma enucleation during cesarean section: elective procedure or incalculable risk?

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Abstract *Background:* Myomas are often located in the area of the lower uterine segment. During cesarean section they can lead to problems in delivering the baby and can make it difficult or impossible to close the uterine incision. The goal of the study was to determine the relative risk of a myoma enucleation in combination with a cesarean section. *Methods:* The study included ten pregnant patients in whom a myomatous uterus was expected to present difficulty during birth underwent delivery by cesarean section between 1993 and 2003 at the university departments of gynecology and obstetrics in Frankfurt and Erlangen, Germany. A detailed questionnaire was sent to patients retrospectively. *Results:* Three patients with enucleation of the myoma during cesarean section had a hemoglobin value less than 6.5 g/dl post-operatively. In all three cases the anemia was explained by enucleation of the myoma. The diameter of each myoma was more than 8 cm. *Conclusions:* Depending on the size and location of the myomas, a detailed discussion should be carried out with the patient regarding the associated risks, such as hysterectomy due to hemorrhage and the possible need for blood transfusions.

Keywords Myoma enucleation · Anemia · Cesarean section · Pregnancy · Complication

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Introduction

Owing to the increasing age of mothers in industrial countries, gynecologists are faced more often with problems involving leiomyomas during pregnancy. Reports in the literature give the incidence of leiomyomas in the pregnant uterus as 0.5–3.9% [1, 2]. Pregnancy usually has an asymptomatic course in patients with a myomatous uterus [3], but complications such as hemorrhage, abruptio placentae, and premature rupture of membrane or premature labor are due in part to myomas [4, 5].

Myomas increase in size by 22–25% during pregnancy [6, 7]. Depending on their initial size and location, myomas can reach a substantial volume and cause symptoms and in very rare cases can lead to fetal malformation due to compression. An example of the latter is provided by a case report describing a fist-sized intracavitary myoma that was considered to have caused dolichocephalism and a shortened right humerus [8]. Myomas are often located in the area of the lower uterine segment. During cesarean section they can lead to problems in delivering the baby and can make it difficult or impossible to close the uterine incision. The patient often requests that a previously diagnosed myoma be removed during cesarean section. This is possible in principle, but in view of the potential complications many surgeons are hesitant regarding the combined procedure. The indication for myomectomy during cesarean section has been a matter of controversy in the literature. However, the published reports have not distinguished between myomas with regard to location and size.

Materials and methods

Patient group

Ten pregnant patients in whom a myomatous uterus was expected to present difficulty during birth underwent delivery by cesarean section at the university departments of gynecology and obstetrics in Frankfurt am Main and Erlangen, Germany between 1993 and 2003. At the time of the operations the patients were aged between 22 and 41 years (mean 35.1). The surgical deliveries were carried out between the 34th and 39th weeks of pregnancy. All ten patients

underwent primary cesarean section, which was carried out using a modified Misgav Ladach technique. This operation method was developed in the Misgav Ladach Hospital in Israel by Dr. Michael Stark. The technique has a minimal surgical approach, opposed to the conventional method of cesarean section. Only skin, fascia, and uterus are opened by sharp incision. After a small incision the preparation of the abdominal wall layers and the uterus is done manually. Afterwards the uterine incision, fascia and skin is closed by a single layer. The myomas were enucleated after delivery of the child in each case.

Questionnaire

In this retrospective study a specially developed six-page questionnaire was sent to the patients by post. The questions were divided into four sections focusing in detail on the following aspects: (a) period before the current pregnancy (17 questions), (b) current pregnancy (6 questions), (c) puerperium, child's subsequent development (8 questions), (d) pregnancies after cesarean section with myoma enucleation (12 questions). All of the patients returned completed questionnaires. Each patient's medical files were used for analysis in addition to the questionnaires.

Results

The size of the resected myomas ranged from 2 to 9 cm, and their locations ranged from subserous to intramural. Nine of the myomas removed were located in the area of the uterine incision. The tenth myoma was classified at a preoperative ultrasound examination as a large cervical myoma. Intraoperatively it proved to be a pedunculated myoma of the uterine body in the pouch of Douglas. To prevent possible torsion, it was removed by ligation. Table 1 lists further information on the patients regarding gynecological diseases, medication, menses, previous births, previous miscarriages, and preoperative and postoperative hemoglobin values (some patients fall into several categories).

Analysis of the questionnaire

Period before pregnancy

The first diagnoses of myomatous uterus in these patients were made between 1985 and 2003. The presence of myomatous uterus had been known in three of the patients before the start of their pregnancies. In the remaining seven patients the diagnosis was made during the course of the pregnancy. Two of the ten patients stated that they had had menstrual disorders before the pregnancy. One patient reported only dysmenorrhea. In the second case hypermenorrhea and menorrhagia were present in addition to dysmenorrhea. One patient reported a feeling of pressure and tension in the abdominal cavity, particularly during the second half of the menses. A previous pregnancy had ended in a miscarriage in two of the other eight patients. No myomas had been diagnosed in these patients at the time. Only one patient reported any problems with regard to fertility; it had taken 60 months to achieve successful conception. It was only in the course of the

Table 1 Characteristics of ten patients with myomatous uterus in pregnancy ($n=11$; some patients fall into several categories)

Concomitant gynecological diseases	
No concomitant disease	9
Endometriosis	1
Previous births	
No births	7
One birth	2
Two births	—
Three births	1
Previous miscarriages	
No miscarriages	8
One miscarriage	2
Menses before pregnancy	
Regular	8
Irregular	1
No data	1
Medication	
No medication	3
Iron-containing drugs	3
Magnesium-containing drugs	5
Preoperative Hb values (g/dl)	
Lowest Hb value	8.2
Highest Hb value	12.8
Mean	10.7
Postoperative Hb values (g/dl)	
Lowest Hb value	5.8
Highest Hb value	12.7
Mean	9.5

pregnancy that myomatous uterus was diagnosed. The pregnancies had been spontaneous in all of the patients. All of the patients stated that they had had regular menses before pregnancy, with the shortest cycle being 24 days and the longest 29 (mean 27 days). After delivery regular cycles resumed in all of the patients. The length of the cycle was unchanged.

Course of pregnancy in patients with myomatous uterus

Complications developed in seven of the ten patients during pregnancy. The main symptoms were premature labor ($n=5$) and vaginal bleeding ($n=3$), but there were also single cases of hypertension, edema, and premature amniorrhexis. Treatment ranged from bed rest ($n=3$) to medical tocolysis ($n=4$). These complications of pregnancy were treated on an outpatient basis ($n=3$). In-hospital treatment was required in five patients; the hospitalization period in these five patients ranged from 3 to 72 days.

Puerperium and subsequent development of the child

Complications developed in two of the ten patients during the puerperium. Both cases involved infection of the surgical scar. A hemoglobin value of less than 6.5 g/dl occurred in three cases postoperatively. All three of these patients had multiple myomas up to 8 cm in size. Two of the patients each received transfusions of two units of packed red blood cells. The third patient declined postoperative blood transfusion and after receiving detailed information was treated for 14 days with epoetin alfa

(Erypo 4000) at her own request. Five boys and five girls were delivered. At the time of data collection the youngest child was 2 months old and the oldest 7. At the time of writing, the development of the ten children has been appropriate to their ages in all cases.

Later pregnancies after cesarean section with simultaneous myoma enucleation

One of the ten patients reported a later pregnancy after the cesarean. Conception had taken place spontaneously, and no complications occurred in the course of pregnancy, during birth, or in the puerperium. The patient spontaneously gave birth to a healthy girl who was 13 months old at the time of the questionnaire and whose development was in accordance with her age.

Discussion

Myomatous uterus, with an incidence of 20–50% in women aged over 30 years, is a challenging condition for the gynecologist in relation to bleeding anomalies and the provision of patient care during pregnancy [5]. With regard to the high incidence of myomas, published data reporting up to a 2.1% incidence of myomatous uterus in pregnancy appear to be very low [9].

In their responses to the questionnaire, two patients stated that they had each suffered a miscarriage before pregnancy. During pregnancy myomatous uterus is frequently responsible for miscarriages [9, 10, 11]. In some circumstances this can lead to recurrent abortion [12]. Using ultrasound check-up examinations, Exacoustos and Rosati [13] showed that the risk of miscarriage is significantly increased in pregnant patients with myomatous uterus. Buttram and Reiter [14] consider that the more frequent occurrence of miscarriage in pregnant women with myomatous uterus is due to the increased irritability and contractility of the uterus caused by the myomas. They also believe that changes in the endometrium and uterine vascular architecture are responsible for miscarriages. Vollenhoven et al. [15] and Keckstein et al. [16] also regard submucous myomas in particular as being a factor provoking miscarriages. The literature provides widely varying data on the incidence of complications in pregnant women with myomatous uterus. While Katz et al. [9] give an incidence of 10% of affected pregnancies, Davis et al. [3] observed complications in 37% of 85 affected pregnant women. No connection between the complications and the size, location, or number of myomas was established.

In all, complications during pregnancy were observed in seven of the ten patients in the present study, with inpatient treatment being required in five cases. All of the complications occurring in the course of these pregnancies has previously been reported several times in the literature. The issue arising here is whether myoma enucleation before pregnancy might have prevented these

complications. This is a difficult question to answer since myomatous uterus had been diagnosed before pregnancy in only three of the ten patients. If a myoma were to be removed before the start of pregnancy, the patient would be classified as having a high-risk pregnancy due to the uterine scar and would be at risk for other complications such as uterine rupture.

Once a pregnancy has started, severe lower abdominal pain may occur in the second trimester in particular. This is caused by degeneration of the myoma due to reduced perfusion, which occurs frequently and may be associated with nausea, vomiting and fever [17]. If the pain is resistant to treatment, some authors consider that myoma enucleation is indicated in the pregnant uterus. Lolis et al. [2], for example, report 12 successful births in 13 patients in whom myoma enucleation was carried out between the 15th and 19th weeks of pregnancy. In this type of procedure only the causative myoma is removed. Other myomas should only be enucleated during the cesarean section or later [18].

Chuang et al. [8] report the case of a 27-year-old patient who presented with vaginal bleeding and loss of amniotic fluid in the 33rd week of pregnancy. On the basis of the clinical picture it was decided to carry out an emergency cesarean section. A male infant with external deformities was delivered. The neck was slightly rotated, the right humerus was shortened, and in addition the occipitofrontal distance was enlarged. A further examination showed that the left lateral ventricle of the brain was enlarged. The cause of the malformation was found to be a fist-sized myoma located on the posterior fundus of the uterus.

Marked growth of myomas during the first trimester and degeneration of the tissue during the course of the pregnancy can lead to serious lower abdominal pain, which can usually be treated symptomatically [9]. Additional complications of pregnancy in myomatous uterus that have been reported include premature amniorrhexis, malformation of the child as mentioned above, extrauterine pregnancy, abruptio placentae, occlusion of the inferior vena cava, postpartum endomyometritis, and sepsis [8, 9, 15, 19]. Myomatous uterus was associated with premature rupture of membrane in one patient in the present study. Exacoustos and Rosati [13] also observed an association with premature amniorrhexis and with an increased frequency of abruptio placentae when the myoma was in a direct retroplacental location.

If a cesarean section becomes necessary either during the course of the birth or as a primary indication, the problem arises as to whether the myoma(s) should also be removed during the course of the operation. If the myoma is located in the area of the uterine incision, it should be enucleated, since it would otherwise not be possible to close the incision. However, what should one do in cases in which the myomas are located elsewhere but are not currently causing any problem and are only evident due to their growth? The literature data do not provide any clear information concerning whether to recommend myoma enucleation during a cesarean section. Exacoustos and Rosati [13] recommend that myoma enucleation not be

Table 2 Literature overview: cesarean section with myoma enucleation (*n.d.* no data)

Reference	<i>n</i>	Cases of blood transfusion	Complications
Burton et al. [10]	13	1	Intraoperative hemorrhage
Cobellis et al. [20]	322	34	None
Exacoustos and Rosati [13]	9	<i>n.d.</i>	3 hysterectomies
Kwawukume [22]	24	None	None
Ortac et al. [23]	22	None	None
This report	10	2	2 scar infections

carried out during cesarean section as there is a high risk of intraoperative hemorrhage. In their study the rate of intraoperative hemorrhage was 33%. The same view is taken by Burton et al. [10] They carried out simultaneous myoma enucleation during cesarean sections in 13 patients. One patient developed such severe hemorrhage intraoperatively that a transfusion of packed red blood cells was indicated.

Nine of the ten patients in the present study underwent myoma enucleation during cesarean section to ensure safe closure of the uterine incision. The tenth patient had a pedunculated uterine myoma, which it was possible to remove by ligation. Transfusions of packed red blood cells were indicated in three of the ten patients either intraoperatively or postoperatively due to severe blood loss. Two patients each received two units while the third declined blood transfusion. As an alternative, treatment with epoetin alfa (Erypo 4000) for 14 days was administered. On the basis of these observations we are in agreement with the view of Exacoustos and Rosati [13] and Burton et al. [10] that myoma enucleation during a cesarean section must be regarded as a high-risk procedure due to the increased risk of hemorrhage. The procedure should be carried out if the uterus cannot be closed due to the location of the myomas. An overview of all of the published results on this topic is given in Table 2.

In a report of two cases of patients with myomatous uterus Cobellis et al. [20] describe an alternative to myoma enucleation. They carried out electrocoagulation in five myomas up to a diameter of 3.2 cm. During enucleation of the remaining myomas after 10 and 13 months, respectively, the myomas that had been selected and electrocoagulated during the cesarean section were only evident as scars. It remains to be seen whether this method can also be used in myomas with larger diameters. In view of the controversial data, myoma enucleation during cesarean section cannot generally be recommended. Depending on the size and location of the myomas, a detailed discussion should be carried out with the patient regarding the associated risks, such as hysterectomy due to hemorrhage [21], and the possible need for blood transfusions.

References

- Kessler A, Mitchell DG, Kuhlman K, Goldberg BB (1993) Myoma vs. contraction in pregnancy: differentiation with color Doppler imaging. *J Clin Ultrasound* 21:241–244
- Lolis DE, Kalantaridou SN, Makrydimas G, Sotiriadis A, Navrozoglou I, Zikopoulos K, Paraskevaidis EA (2003) Successful myomectomy during pregnancy. *Hum Reprod* 18:1699–1702
- Davis JL, Ray-Mazumder S, Hobel CJ, Baley K, Sassoon D (1990) Uterine leiomyomas in pregnancy: a prospective study. *Obstet Gynecol* 75:41–44
- Muram D, Gillieson M, Walters JH (1980) Myomas of the uterus in pregnancy: ultrasonographic follow-up. *Am J Obstet Gynecol* 138:16–19
- Verkauf BS (1992) Myomectomy for fertility enhancement and preservation. *Fertil Steril* 58:1–15
- Aharoni A, Reiter A, Golan D, Paltiely Y, Sharf M (1988) Patterns of growth of uterine leiomyomas during pregnancy. A prospective longitudinal study. *Br J Obstet Gynaecol* 95:510–513
- Martius G, Breckwoldt M, Pfleiderer A (1996) *Lehrbuch der Gynäkologie und Geburtshilfe*, 2nd edn. Thieme, Stuttgart
- Chuang J, Tsai HW, Hwang JL (2001) Fetal compression syndrome caused by myoma in pregnancy: a case report. *Acta Obstet Gynecol Scand* 80:472–473
- Katz VL, Dotters DJ, Droegemueller W (1989) Complications of uterine leiomyomas in pregnancy. *Obstet Gynecol* 73:593–596
- Burton CA, Grimes DA, March CM (1989) Surgical management of leiomyomata during pregnancy. *Obstet Gynecol* 74:707–709
- Martius G, Breckwoldt M, Pfleiderer A (1994) *Lehrbuch der Gynäkologie und Geburtshilfe*, 1st edn. Thieme, Stuttgart
- Garcia CR, Tureck RW (1984) Submucosal leiomyomas and infertility. *Fertil Steril* 42:16–19
- Exacoustos C, Rosati P (1993) Ultrasound diagnosis of uterine myomas and complications in pregnancy. *Obstet Gynecol* 82:97–101
- Buttram VC, Reiter RC (1981) Uterine leiomyomata: etiology, symptomatology, and management. *Fertil Steril* 36:433–445
- Vollenhoven BJ, Lawrence AS, Healy DL (1990) Uterine fibroids. A clinical review. *Br J Obstet Gynaecol* 97:285–298
- Keckstein J, Huckle J (2000) Die endoskopischen Operationen in der Gynäkologie. Urban & Fischer, Munich
- Hasbargen U, Strauss A, Summerer-Moustaki M, Baretton G, Roth U, Kimmig R, Hepp H (2002) Myomectomy as a pregnancy-preserving option in the carefully selected patient. *Fetal Diagn Ther* 17:101–103
- Michalas SP, Oreopoulou FV, Papageorgiou JS (1995) Myomectomy during pregnancy and caesarean section. *Hum Reprod* 10:1869–1870
- Greene JF, DeRoche ME, Ingardia C, Curry SL (2002) Large myomatous uterus resulting in complete obstruction of the inferior vena cava during pregnancy. *Br J Obstet Gynaecol* 109:1189–1191
- Cobellis L, Florio P, Stradella L, Lucia ED, Messalli EM, Pezaglia F, Cobellis G (2002) Electro-cautery of myomas during caesarean section—two case reports. *Eur J Obstet Gynecol Reprod Biol* 102:98–99
- Mollica G, Pittini L, Minganti E, Perri G, Pansini F (1996) Elective uterine myomectomy in pregnant women. *Clin Exp Obstet Gynecol* 23:168–172
- Kwawukume EY (2002) Caesarean myomectomy. *Afr J Reprod Health* 6:38–43
- Ortac F, Gungor M, Sonmezer M (1999) Myomectomy during cesarean section. *Int J Gynaecol Obstet* 67:189–190