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Case Report

A case of endoscopic endonasal surgery for a tuberculum sellae meningioma resected in the third trimester of pregnancy

Yuki Ninomiya[1], Hiroyoshi Kino[1], Shuho Tanaka[2], Kazuho Karasudani[1], Miyuki Mayumi[3], Mana Obata-Yasuoka[3], Atsushi Tsukada[1], Hiromi Hamada[3], Toyomi Satoh[3], Eiichi Ishikawa[1]

Departments of [1]Neurosurgery, [2]Otolaryngology, [3]Obstetrics and Gynecology, University of Tsukuba, Tsukuba, Japan.

E-mail: Yuki Ninomiya - ninomiya.yuki.if@ms.hosp.tsukuba.ac.jp; *Hiroyoshi Kino - kino.h@md.tsukuba.ac.jp; Shuho Tanaka - ishutnk@gmail.com; Kazuho Karasudani - karasudani.kazuho.ss@alumni.tsukuba.ac.jp; Miyuki Mayumi - mmayumi@md.tsukuba.ac.jp; Mana Obata-Yasuoka - manobata@md.tsukuba.ac.jp; Atsushi Tsukada - tsukada.atsushi.nv@ms.hosp.tsukuba.ac.jp; Hiromi Hamada - hhamada@md.tsukuba.ac.jp; Toyomi Satoh - toyomi-s@md.tsukuba.ac.jp; Eiichi Ishikawa - e-ishikawa@md.tsukuba.ac.jp

***Corresponding author:**
Hiroyoshi Kino,
Department of Neurosurgery,
University of Tsukuba, Tsukuba,
Japan.

kino.h@md.tsukuba.ac.jp

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ABSTRACT

Background: Meningiomas are known to be able to grow rapidly during pregnancy. Moreover, tuberculum sellae meningiomas present with progressive visual dysfunction and occasionally require immediate surgical intervention. Here, we report on the intraoperative and perioperative management of a patient with a tuberculum sellae meningioma who underwent endoscopic endonasal surgery (EES) in the third trimester of pregnancy.

Case Description: A 43-year-old woman, gravida 1, para 1, presented with rapidly progressive visual impairment of the left eye. Head magnetic resonance imaging revealed a tuberculum sellae meningioma and surgical intervention was planned for after delivery. However, the patient's visual impairment progressed further during the pregnancy. Collaboration between the obstetricians and neurosurgeons was established, and the tumor was resected through EES in the third trimester of pregnancy. In surgeries performed in the third trimester of pregnancy, preterm delivery is a well-known complication. Therefore, perioperative uterine contraction monitoring and transvaginal ultrasonography were performed. Considering that the risk of postoperative cerebrospinal fluid leak is high in pregnant women, lumbar drainage was used while at the same time considering that the risk of deep venous thrombosis (DVT) was also increased. Perioperative lower limb ultrasonography was performed frequently, and anticoagulation therapy was initiated postoperatively. The patient was discharged on the 12th postoperative day and underwent a full-term delivery at 37 weeks of pregnancy.

Conclusion: EES for pregnant women in the third trimester must be done in close collaboration between obstetricians and neurosurgeons to detect preterm delivery and prevent DVT. This collaboration will lead to safe and effective treatment.

Keywords: Endoscopic endonasal surgery, Perioperative management, Pregnancy, Tuberculum sellae meningioma

INTRODUCTION

Meningiomas are commonly known to grow during pregnancy.[15] Due to the typically slow growth of meningiomas and the intraoperative and perioperative risks to the fetus and mother, postpartum surgeries have been mainly reported.[7] However, such an approach may not preserve the visual function of patients with tuberculum sellae meningiomas. The prognosis for visual

function is poor in patients who develop severe visual loss preoperatively,[4] making earlier surgery necessary in such cases. Tuberculum sellae meningiomas compress the optic nerve directly; thus, even if the tumor growth is slow, the visual function may deteriorate rapidly.[20] The problem is how to manage the perioperative period, which is considered high-risk, for pregnant women with tuberculum sellae meningiomas that cause progressive impairment of visual function. Perioperative management and risks vary depending on the trimester of pregnancy at the time of the surgical intervention[2] (first trimester, 0–13th week of pregnancy; second trimester, 14–27th week; and third trimester; 28–42th week).

We, here, report on the perioperative management of a patient with a tuberculum sellae meningioma who, while continuing pregnancy, underwent endoscopic endonasal surgery (EES) under general anesthesia to prevent left eye blindness. We also report on the collaboration between neurosurgeons and obstetricians at our hospital in managing such a case.

CASE DESCRIPTION

A 43-year-old woman, gravida 1, para 1, had rapidly progressive visual impairment for 3 months and consulted an ophthalmology outpatient clinic from the Department of Obstetrics. Subsequent head magnetic resonance imaging (MRI) identified a tuberculum sellae meningioma, and she was referred to the outpatient clinic of the Department of Neurosurgery. At the time of her visit to that clinic, she was 25 weeks pregnant. Since the tumor was small, with a maximum diameter of 2.0 cm, and her left corrected visual acuity was maintained at 0.6, stand-by surgery was planned postpartum. However, over the next 3 weeks, her left corrected visual acuity deteriorated to 0.15, and she was at risk of going blind in the left eye within a short period. She was fully informed about the risks and benefits of the available options: either continuing the pregnancy, undergoing tumor removal during pregnancy, and delivering the baby at full term or undergoing a cesarean section at 32 weeks gestation followed by tumor removal after delivery. The patient chose to continue the pregnancy, undergo tumor removal, and deliver the baby at full term. Neurosurgeons and obstetricians collaboratively planned the tumor removal while the patient continued her pregnancy. Given the size and location of the tumor, EES was adopted as usual. However, the risk of postoperative cerebrospinal fluid (CSF) leakage was considered high due to the increased abdominal pressure, circulating plasma volume, and cardiac output caused by the ongoing pregnancy. Due to the risk of postoperative CSF leakage, we also offered her a craniotomy; however, she preferred EES due to cosmetic concerns. Therefore, a lumbar drain was inserted after the induction of general anesthesia, and CSF drainage was maintained for 4 days after the surgery. The obstetrician performed preoperative and postoperative pelvic examinations along with abdominal and lower limb venous ultrasonography, and the fetal heart rate was monitored intraoperatively and postoperatively. Arrangements were made for an emergency cesarean section if the fetal heart rate dropped. This treatment plan was also shared with the anesthesiologist.

After waiting as long as possible to allow for fetal lung surfactant formation, we removed the tumor through EES at 33 weeks of pregnancy. Just before the surgery, the patient's left corrected visual acuity had decreased to <0.01. The nasal septal mucosa was dissected and cut as previously reported by us.[12,16] The operative time was 8 h and 52 min, and the tumor was completely removed. The dura mater was reconstructed with a fascia lata autograft, which was sutured and covered with a pedicled nasoseptal flap, as we previously reported.[10,11] Postoperatively, the patient had no CSF leakage. After 4 days of bed rest to prevent postoperative CSF leakage, the lumbar drain was removed, and the patient was allowed out of bed. Anticoagulation therapy using heparin for prevention of venous thrombosis, which is a fatal complication for pregnant women, was administered after computed tomography scans taken 48 h postoperatively confirmed the absence of intracranial hemorrhage. The obstetrician checked for the existence of deep venous thrombosis in the lower limbs while simultaneously performing an abdominal ultrasonographic examination to check the condition of the fetus. Figure 1 for details about postoperative management.

No residual tumor was identified on postoperative MRI, and the optic nerve deviation was improved [Figure 2]. The pathological diagnosis was meningothelial meningioma, World Health Organization grade I. The patient was discharged on the 12th postoperative day. At 37 weeks and 4 days of gestation (31 days postoperatively), a cesarean section was performed because she had received a cesarean section at her first delivery. She gave birth to a living male infant weighing 2518 g with an Apgar score of 9 at 5 min.

Her left corrected visual acuity had improved to 1.0 1 year after surgery.

After the publication process and use of images had been explained to her by both the neurosurgeon and the obstetrician, the patient provided informed consent for the publication of the clinical details of the case.

DISCUSSION

Several reports have been published on tuberculum sellae meningiomas that grew during pregnancy and required surgical intervention. Of the reports collected by the authors, seven cases of tuberculum sellae meningiomas resected during the third trimester of pregnancy have been reviewed [Table 1].[3,9,14,20,23,24]

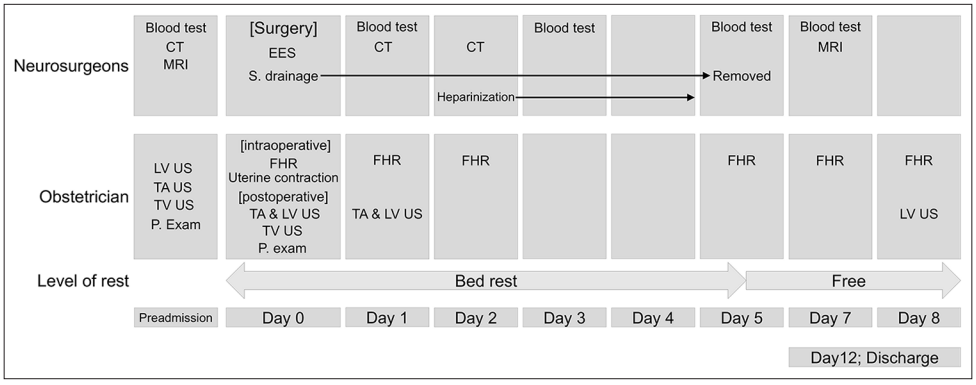

Figure 1: Neurosurgical and obstetrical perioperative management of endoscopic endonasal surgery for a pregnant woman with a tuberculum sellae meningioma in the third trimester. CT: Computed tomography; MRI: Magnetic resonance imaging; LV US: Lower limb venous ultrasonography; TA US: Transabdominal ultrasonography; TV US: Transvaginal ultrasonography; EES: Endoscopic endonasal surgery; P exam: Pelvic examination; S drainage: Spinal drainage; FHR: Fetal heart rate monitoring.

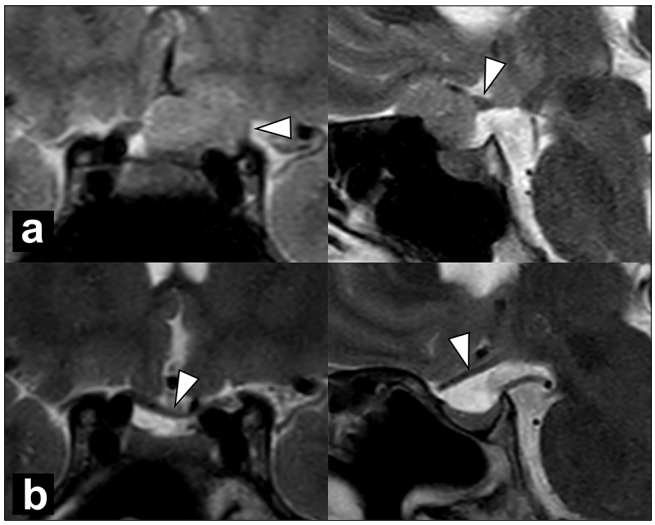

Figure 2: Preoperative and postoperative magnetic resonance imaging of the current case. (a) Preoperative coronal (left) and sagittal (right) T2-weighted images show a tuberculum sellae meningioma. The tumor was bending the optic nerve upward (arrowhead). The patient was pregnant and, therefore, could not receive preoperative examinations using gadolinium-enhanced contrast imaging. (b) Postoperative coronal (left) and sagittal (right) T2-weighted images show no obvious residual tumor. The optic nerve, which the tumor had bent, has recovered to its normal position (arrowhead).

The risks of surgical intervention differ depending on the trimester of pregnancy,[2] and surgical intervention in the second trimester or postpartum is recommended.[22] In the present case, we initially planned to perform the surgical intervention postpartum. However, due to the rapid progression of the visual impairment and due to the cooperation of obstetricians, surgical intervention could be performed in the third trimester of pregnancy as the patient requested. Surgery in the third trimester of pregnancy is considered a period of particularly high risk for preterm delivery.[2] This is the first report of radical EES performed in the third trimester of pregnancy. While the importance of interdisciplinary collaboration in neurosurgical procedures during pregnancy has been previously reported,[24] no reports have described the resection of tuberculum sellae meningiomas through EES in the third trimester of pregnancy. In such cases, given the risk of CSF leakage, a craniotomy may have been the preferred approach. Moreover, there are no detailed reports on managing pregnant patients requiring EES. However, as indications for EES continue to expand, our report on the perioperative management of a neurosurgical patient undergoing EES in the third trimester of pregnancy may serve as a valuable reference for future cases.

Operative risk and timing for pregnant women with tuberculum sellae meningioma

Meningiomas in pregnant women are most often detected in the third trimester of pregnancy.[19] These tumors are known to grow under the effects of estrogen and progesterone, which are secreted in excess during pregnancy, and although it has been reported that most occur in the second or third trimester,[15] the incidence by trimester of pregnancy is unclear. Neurosurgical intervention under general anesthesia in the third trimester of pregnancy is known to increase the risk of preterm delivery. In addition, mortality in pregnant women who undergo surgical procedures with general anesthesia is known to be 3.98 times higher, and hospital stays longer than in nonpregnant women.[1,13,18] In the present case, uterine contractions were monitored by the obstetrician, and transvaginal ultrasonography was sustained during the tumor resection to manage the risk of preterm delivery associated with the effects of general anesthesia. In addition, emergency cesarean section would have had to be performed if the fetus's well-being was impaired during

Table 1: Reports of a tuberculum sellae meningioma with neurosurgical intervention in the third trimester of pregnancy.

Author	Age	Trimester of surgery	Approach	Surgical complication	Details of perioperative management
Balki and Manninen[3]	33	3rd	Craniotomy	None	None
Johnson *et al*.[14]	30	3rd	Craniotomy	N.A.	None
Lusis *et al*.[20]	39	3rd	N.A.	N.A.	None
Greenberg *et al*.[9]	31	3rd	Craniotomy	None	None
Zhong *et al*.[24]	36	3rd	Supraorbital key hole	None	Only preoperative management
	36	3rd	Supraorbital key hole	None	Only preoperative management
Priddy *et al*.[23]	33	3rd	EES*+Craniotomy	None	None
Current case	43	3rd	EES	None	Yes

*Only decompression of the optic canal and superior orbital fissure. N.A.: Not available, EES: Endoscopic endonasal surgery

the perioperative period. Given its importance,[6] fetal heart rate monitoring was conducted both intraoperatively and postoperatively.

In this case, the patient was 33 weeks pregnant at the time of tumor removal, so the fetus would have required ventilator management after birth if preoperative delivery had been chosen. The patient wished for tumor removal with continued pregnancy; however, if fetal heart rate monitoring showed critical signs, a cesarean section was planned.

Deep venous thrombosis is one of the fatal complications in pregnant women.[5] Particularly in this case, postoperative bed rest and lumbar drainage were performed to prevent postoperative CSF leakage, a common complication of EES. The use of lumbar drainage, in this case, was justified by the relatively higher risk of postoperative CSF leakage in pregnant women due to higher intracranial pressure resulting from increased circulating plasma volume and up to 40-50% increased cardiac output as compared with that in nonpregnant women.[8] Lumbar drainage is known to reduce the risk of postoperative CSF leakage in EES.[25] However, postoperative bed rest and lumbar drainage increase the risk of deep vein thrombosis. Heparin is recommended for the prevention of deep venous thrombosis,[5] and heparin was used in this case also.

EES for pregnant women in the third trimester of pregnancy

In recent years, EES has increasingly replaced craniotomy in the neurosurgical approach for tuberculum sellae meningiomas.[21] In particular, EES has been shown to be more effective than craniotomy in preserving visual function.[17,21] A previous report described the use of EES for pregnant women in the first or second trimester, with good outcomes.[22] The current patient underwent EES in the third trimester of pregnancy; however, her preoperative visual impairment resolved well after surgery, and both mother and fetus were healthy as a result of the above-mentioned perioperative management. With appropriate collaborative perioperative management, EES for women in the third trimester of pregnancy may be a safe and effective treatment method.

CONCLUSION

A tuberculum sellae meningioma, which tends to grow in the third trimester of pregnancy, could be removed from a pregnant patient through EES. Close collaboration between obstetricians and neurosurgeons is necessary to detect preterm delivery, a common complication in the third trimester of pregnancy, and to prevent venous thrombosis, a fatal complication in pregnant women, and this collaboration will lead to safe and effective treatment.

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