Opinion Paper

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Selective termination: a life-saving procedure for complicated monochorionic gestations

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Abstract: Monochorionic twin pregnancies are a subset of twin pregnancies that face potential complications related to a shared circulation between the fetuses. These complications are related to anastomotic placental vessels connecting the cardiovascular systems of the two fetuses, which can result in significant sequela if one twin experiences intrauterine death. The sudden cardiovascular collapse in this scenario leads to a massive blood shift away from the healthy co-twin, significantly jeopardizing its life and long-term neurodevelopmental outcome. Such conditions include selective fetal growth restriction with abnormal Doppler findings, twin-twin transfusion with impending death in one twin and discordant fetal anomalies, for which fetal interventions are ineffective in improving outcomes or preventing the imminent death of the abnormal twin. Obstetricians have a professional obligation to respect the autonomy of pregnant patients and to maximize beneficence-based obligations to both pregnant and fetal patients. The goal of a selective termination is to maximize the health and life of the surviving fetal patient. It is recommended that policymakers consider including selective termination as an exemption to abortion ban laws.

Keywords: discordant fetal anomaly; post-Dobbs; selective feticide; selective fetal growth restriction; selective fetal reduction; selective fetal termination

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Introduction

Over the past decades, the rate of twinning has dramatically increased due to the wide application and outstanding progress of infertility treatments [1]. According to the United States national birth registry, there were 114,161 twin births in 2021 [2]. Twin pregnancies can be either monozygotic or dizygotic depending on the number of fertilized eggs. Monozygotic twins, which result from the division of a single fertilized egg into two embryo masses, make up about 30 % of all twin pregnancies [3]. The timing of the separation of the initial zygote into two zygotes determines the chorionicity and amnionicity of the pregnancy. In 60–70 % of monozygotic pregnancies, the two fetuses will share the same placenta. These monochorionic (MC) twins face several unique life-threatening conditions, in addition to the higher risk of structural malformations and perinatal complications secondary to the doubling of the placental mass in all twin pregnancies [4].

In MC pregnancies, a single placental mass is shared between two fetuses, including the anastomotic vascular connections between the two territories. These vascular connections can have uni- or bidirectional blood flow and are almost present in all MC placentas [5, 6]. The complications associated with monochorionicity present a pathophysiological spectrum of conditions ranging from unequal placental sharing between the fetuses to imbalanced blood flow in the anastomotic vessels. This can result in a clinical spectrum of complications, from selective fetal growth restriction (sFGR) due to a small placental territory, to hemodynamic disturbances in the fetuses due to imbalanced blood flow from one fetus to the other [5]. This imbalance can lead to growth restriction, anemia, or oligohydramnios in the donor twin, and polycythemia, polyhydramnios, or high-output cardiac failure in the recipient twin. In most patients, these conditions are progressive, and evidence from the review of historical literature reports that only one out of four fetuses is likely to survive if the condition is left untreated [7].

Among pregnant patients with MC twin pregnancies, there exists a subgroup in which one fetus experiences severe compromise from two possible scenarios. The first scenario involves patients with severe monochorionicity-related complications, where the condition of the unhealthy twin is so severe that any fetal therapy, including fetoscopic laser photocoagulation (FLP), is unlikely to correct or improve its outcome. The second scenario involves discordant fetal anomalies, where one fetus has a severe anomaly that is incompatible with life outside the uterus. In both scenarios, the intrauterine death of the abnormal fetus can occur.

Due to the vascular anastomoses in MC twins, the sudden death of one twin can leads to a massive shift of blood from the healthy co-twin to the dead twin because of the pressure gradient between the two circulatory systems and the low-resistant vascular anastomosis [5, 8]. This massive transfusion causes profound hypotension in the surviving co-twin, which poses a considerable risk of death or long-term neurologic sequelae [5, 8]. These data mainly come from observations in the nineties that nearly half of the MC twin pregnancies with the death of one fetus ended up with the intrauterine fetal death, neonatal death, or severe long-term sequelae of the surviving twin [9]. In addition, the postmortem evaluation of the fetus who died after the first twin showed evidence of acute anemia, which further leads to the fact that damage in the surviving twin is associated with fetal anemia [9]. Accordingly, the controlled termination of a severely ill fetus has been suggested with the primary aim of preventing the long-term morbidity and even mortality of the healthy co-twin [10]. More recent data describe that in MC pregnancies with a single fetal death, there is a 15 % risk of co-twin death, a 68 % risk of preterm delivery, a 34 % risk of abnormal postnatal cranial imaging, and a 26 % risk of neurodevelopmental morbidity [11].

This review discusses the current evidence regarding selective termination in optimizing the outcome of these pregnancies. Additionally, we examine the ethical aspects of selective termination in these clinical scenarios and argue the need for selective termination to be considered a life-saving procedure for complicated MC pregnancies and therefore should be seen as a rescue procedure.

Selective fetal growth restriction

Selective fetal growth restriction (sFGR) in one of the twins is the discordant growth of fetuses in MC pregnancies which affects 10–15 % of MC pregnancies [12–14]. The pathophysiology of sFGR is believed to be associated with the unequal distribution of the placenta between the two fetuses. As the unbalanced blood flow through the anastomotic vessels is not a contributing factor to this condition, fetal therapy with FLP cannot be effective, and there is no treatment available that directly address placental insufficiency.

The severity of sFGR is assessed based on Doppler studies of the umbilical artery (UA) of the growth-restricted fetus. If the UA Doppler remains normal (type I), the outcome would be generally favorable and expectant management is reasonable in most patients [15–17]. However, abnormal Doppler findings (types II and III) have been linked to high perinatal death rate and neurological morbidity for the growth-restricted fetus [15–17]. On the other hand, the anastomotic vessels between the two fetuses can cause sudden hemodynamic shifts between the growth-restricted and healthier fetuses in the event of the growth-restricted twin's intrauterine death, further jeopardizing the life and long-term outcome of the healthier larger twin. The rates of intrauterine fetal death and neonatal death in the healthier larger twin with type II sFGR with expectant management have been reported at 6 % and 11.1 %, respectively [18].

Accordingly, in patients with severe forms of sFGR, FLP and selective termination can be offered as potential treatment options. In patients without any concomitant TTTS or TAPS, FLP cannot address the underlying pathophysiology of the disease, which is unequal placental sharing. The main goal of therapy is to prevent any sudden hemodynamic shifts. It is noticeable to consider that after FLP, the placenta will theoretically be divided into two separate functional masses, and the placental support for the growth-restricted twin can be very minimal.

It has been shown that in a specific subgroup of patients – type II with abnormal Doppler findings in the middle cerebral artery and/or ductus venosus – the survival of the growth-restricted twin is very unlikely [19, 20]. Accordingly, offering selective termination as an alternative approach can be reasonable in specific circumstances. It is important to note that, unlike TTTS, sFGR typically presents with normal amniotic fluid volume, making complete ablation of the placental vascular equator from the larger twin sac very challenging and sometimes impossible [21–23]. According to one study, 11.1 % of intrauterine procedures for sFGR type III were not completed due to technical difficulties, and 12.5 % required a second procedure [22]. In addition, the FLP can be associated with higher adverse perinatal outcomes compared to selective termination, as shown by the lower mean gestational age at delivery; 31.88 (30.78, 33.02) vs. 35.17 (33.38, 37.05) weeks [24].

In addition, data from singleton pregnancies with early-onset fetal growth restriction (FGR) can help to better understand the prognosis and intrauterine death risk factors of growth-restricted fetuses in sFGR, as both conditions are assumed to share the same pathophysiology due to insufficient placental support. It has been shown that in early-onset severe FGR, lower estimated fetal weight (EFW), abnormal UA Doppler at diagnosis and during gestation, and lower gestational age at diagnosis are associated with intrauterine death [25, 26]. Abnormal middle cerebral artery Doppler has also been shown to be a strong predictor of intrauterine death in this population [27]. These findings in singleton pregnancies with severe FGR are consistent with studies on sFGR twin pregnancies described above. Accordingly, there are various markers that, in combination, can identify fetuses who are unlikely to survive intrauterine life.

Altogether, it appears that in a subset of patients in which the condition of the growth-restricted twin is deemed irreversible and fetal death is expected, selective termination can be a viable option to offer. This is because the other management plans – expectant management and FLP – seem to be either technically impossible, ineffective, or associated with a high rate of complications, morbidity, and mortality for the healthier twin.

Discordant fetal anomaly

Congenital anomalies are more frequently diagnosed in twin pregnancies [28, 29]. MC twins have a higher risk of congenital anomalies, with an estimated rate of nearly 11 % [30]. The genetic mechanisms underlying discordant fetal anomalies in MC twins are complex and not fully understood. Genetic differences between two fetuses in monozygotic MC twins can be caused by various post-fertilization mitotic errors and *de novo* genetic mutations [31]. However, the phenotypic variation could also occur despite presumed identical genetic content because of mosaicism and epigenetic modifications [32].

These anomalies are more commonly observed in the cardiovascular and nervous systems and can affect the outcome of the healthy co-twin in several ways [29, 33]. First, there is the risk of intrauterine death of the abnormal fetus, reported in 10–20 % of cases, which can further lead to the intrauterine death of the other twin [30, 33, 34]. Second, certain conditions can lead to pregnancy complications that indirectly affect the outcome of the healthy fetus. For example, polyhydramnios from brain anomalies or esophageal atresia, which impairs swallowing, can lead to preterm birth [35]. Lastly, some conditions necessitate a scheduled preterm delivery to provide postnatal care to the abnormal fetus and prevent further damage from remaining *in utero*. These conditions include congenital heart diseases.

The management of discordant fetal anomalies in MC twins is complex and requires careful consideration of multiple factors. Treatment options in such situations are limited to (1) close monitoring with observation, where the goal is to achieve a gestational age for delivery that minimizes risks from prematurity that will further compromise an anomalous twin as well as the normal co-twin (2), pregnancy termination or (3) intrauterine surgical intervention such as selective termination of the abnormal twin. Selective termination is a reasonable approach with promising outcomes for the healthy co-twin with survival rates reported from 73 to 91 % [24, 36–41]. Furthermore, it has been reported that in selected patients, selective termination can also prevent the morbidity of the healthy co-twin, as it is associated with a lower rate of preterm delivery and a higher birth weight of the healthy co-twin [42].

Ethical considerations

A multiple pregnancy has significant medical, financial, ethical, and psychosocial implications [43]. In some cases, selective termination has been proposed to improve pregnancy outcome [44]. Chervenak *et al.* proposed an ethical justification for three indications for performing selective termination of multiple pregnancies [44]. These indications are (1) achieving a pregnancy that results in a live birth of one or more infants with minimal neonatal morbidity and mortality (2), achieving a pregnancy that results in a live birth of one or more infants without antenatally detected anomalies, and (3) achieving a pregnancy that results in a singleton live birth. This ethical justification is based on two basic approaches to obstetric ethics that emphasize that these indications must be established on the basis of informed consent.

Autonomy based obligations to the pregnant patient

Physicians have the professional obligation to respect a pregnant patient's autonomy. Prior to fetal viability, it is the pregnant patient's right to confer the status of patienthood on the fetus (es) or to have an abortion of one or more fetuses. When discussing selective termination, the informed consent process should be followed and options should be non-directive.

Beneficence based obligations to the pregnant patient

A multiple pregnancy potentially poses health related risks to the pregnant patient including preeclampsia, preterm birth, and an increase in cesarean delivery [45–49]. Selective termination of pregnancy, which reduces the number of fetuses, can be viewed as beneficial to the pregnant patient.

Beneficence based obligations to the fetus as a patient

Prior to fetal viability the fetus is a patient solely at the discretion of the pregnant patient. After fetal viability the obstetrician has obligations to both the pregnant and the fetal patients [44, 50]. The consent process governs the three ethically justified indications.

Achieving a pregnancy that results in a live birth of one or more infants with minimal neonatal morbidity and mortality

With each additional fetus, morbidity and mortality risks increase. For pregnancies with higher order gestations, pregnancy risks are minimized with selective termination, so the procedure can be seen as a life-saving procedure to the remaining fetus (es) [46, 47].

Achieving a pregnancy that results in a live birth of one or more infants without antenatally detected anomalies

For a multiple pregnancy where one or more fetuses have a serious anomaly and the pregnant patient contemplates termination of the entire pregnancy, selective termination of the anomalous fetus can be seen as a life-saving procedure to the remaining fetus (es). If the pregnant patient opts to terminate the whole pregnancy, then no fetus survives.

Achieving a pregnancy that results in a singleton live birth

For a twin pregnancy, in which the pregnant patient contemplates termination of the entire pregnancy, selective termination to a singleton pregnancy can be seen as a life-saving procedure to the remaining fetus (es). If the pregnant patient opts to terminate the whole pregnancy, then no fetus survives.

The balance between risks and benefits

We believe that selective termination in certain cases is a medically reasonable option to improve pregnancy outcomes. Some patients may chose against this procedure due to personal beliefs. It is imperative that the informed consent is presented in a sensitive and neutral fashion respecting the pregnant patient's decision. It should be remembered that this procedure is being performed to improve pregnancy outcomes overall while respecting the pregnant patient's autonomy.

Selective termination: a life-saving procedure for some pregnancies with multiple fetuses

The United States Supreme Court decision in *Dobbs v. Jackson Women's Health Organization (Dobbs)* on June 24, 2022, overruled the precedents set by *Roe v. Wade (1973)* and *Planned Parenthood v. Casey (1992)* [51]. The Court noted that "Abortion is a profoundly difficult and contentious issue because it presents an irreconcilable conflict between the interests of a pregnant woman who seeks an abortion and the interests in protecting fetal life." According to *Dobbs 19-1392*, the Court discarded the balance between two interests and clearly argued that "protecting fetal life is rational, States will feel free to enact all manner of restrictions."

We believe that selective termination in some pregnancies is different in intent and outcome from almost all abortions. Pregnant patients opting for selective termination opt to have a healthy pregnancy and child. In this case, there is no conflict between the desire of the pregnant patient to electively terminate the pregnancy and protecting fetal life. Selective termination should be offered to protect the life and health of the healthy surviving fetus.

This topic has also been investigated from the patients' perspective. Most of the qualitative data we have on fetal reduction arises from patients' experiences after conceiving with more than two fetuses through assisted reproductive therapy [52–54]. It is undoubted that most patients reported anxiety and stress following the consultations for fetal reduction, and their reactions were dependent on their cultural and spiritual backgrounds. However, the decision-making process was influenced by the belief that the procedure would ultimately help the remaining fetus (es), and they used the concept of persuading themselves to consider the “big picture” [52]. This quote from one of the parents in this study is particularly explanatory: “*My husband and I finally adjusted our thoughts and agreed that the reduction is great love for the remaining babies*” [52].

In conclusion selective termination should be viewed as a life-saving procedure. Policymakers should provide an exemption for patients who are committed to protecting the remaining fetal patient’s health and life through selective termination.

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