

Pregnancy Outcomes and Nursing Care in a Large Cohort of Multiple Pregnancy Cases Undergoing Transvaginal Multifetal Pregnancy Reduction

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Abstract: Assisted reproductive techniques (ART) frequently result in multiple pregnancy, which in some cases poses a danger to the mother and may reduce fetal health and take-home baby rate. These adverse outcomes may be mitigated by transvaginal pregnancy reduction, but the perioperative nursing care related to good outcome has not been reported in large cohorts. This study therefore analyzed the pregnancy outcomes of twin and triplet pregnancies following early transvaginal multifetal pregnancy reduction, and summarized the experiences of perioperative nursing care. A total of 204 twin or triplet pregnancies conceived by ART who underwent transvaginal multifetal pregnancy reduction during gestational week 7 to 8 were retrospectively analyzed. Main outcome measures included operation success rate as well as rates of spontaneous abortion, preterm delivery, and cesarean section. Birth weight, gestational age at delivery, and take-home baby rate were also analyzed. The success rate of multifetal reduction was 100% with no perioperative complications. Pregnancy outcome after multifetal pregnancy reduction was satisfactory, with a take-home baby rate of 76.9% for twin-to singleton, 89.5% for triplet-to-twin reduction, and 92.3% for triplet-to singleton reduction. Perioperative nursing procedures critical for good outcome included facilitation of routine preoperative tests for surgical contraindications, pre- and intra-operative stress and anxiety counseling, disinfection and flushing of the vagina and perineum, inspection of aspiration equipment, postoperative management of diet, and education on postoperative signs of abnormality. In conclusion, multifetal reduction achieved satisfactory pregnancy outcomes. Efficient nursing care during the perioperative period is one of the most important factors for improved outcome following multifetal pregnancy reduction.

Keywords: Multifetal Fetal Reduction, Assisted Reproductive Technique, Multiple Pregnancy, Pregnancy Outcome, Nursing Care

1. Introduction

Recent advances in assisted reproductive techniques have allowed more infertile couples than ever to have healthy children; however, assisted reproductive technology (ART) such as controlled ovarian hyperstimulation (COH) used for in vitro fertilization-embryo transfer (IVF-ET) has greatly increased the rate of multiple pregnancy [1, 2]. Indeed, most cases of multiple pregnancy, especially polychorionic multiple

pregnancies, result from ART. The incidence rates of abortion, premature birth, fetal malformation, and low birth weight are significantly greater in women with multiple pregnancies than singletons [1, 3]. Further, risks of serious complications, such as hypertensive disorders of pregnancy, intrahepatic cholestasis of pregnancy, uterine inertia during delivery, and postpartum hemorrhage, are also significantly more frequent for multiple pregnancy [1, 4] and pose a serious threat to the health of mother and infants. Also, preterm birth

complications and birth defects may be a source of economic hardship for families. Embryo reduction by aspiration with transvaginal ultrasound during first trimester can reduce pregnancy complications and mitigate adverse outcomes of multiple pregnancy. Thus, embryo reduction has become the principal means for treatment of complications from multiple gestation after IVF-ET.

Most previous studies on multifetal reduction have involved relatively small sample sizes, so the optimal perioperative procedures are still uncertain. This study aims to retrospectively analyze the pregnancy outcomes of transvaginal ultrasound-guided multifetal pregnancy reduction for twin or triplet pregnancy in a large cohort and to summarize the key aspects of perioperative nursing care to provide guidance and promote further improvements in outcome following multifetal pregnancy reduction.

2. Methods

2.1. Patients

A total of 204 patients who had undergone multifetal pregnancy reduction under the guidance of transvaginal ultrasound for twin or triple pregnancy at the Reproductive Medicine Center of the First Affiliated Hospital of Sun Yat-sen University from January 2013 to December 2016 were included for retrospective study. Baseline characteristics are shown in Table 1. The age of these patients was 31.1 ± 3.7 years, and infertility duration was 3.5 ± 2.8 years. The cohort included 69 cases of primary infertility and 136 cases of secondary infertility. All multifetal pregnancy reductions were conducted during gestational weeks 7 and 8, with an average gestational age of 7.1 ± 0.7 weeks. There were 26 twin pregnancies, for which one fetus was reduced, and 178 triplet pregnancies, including 152 cases with one fetus reduced and 26 cases with two fetuses reduced.

2.2. Fetal Reduction Method

2.2.1. Indications

Indications for fetal reduction were as follows: (1) The presence of 2 or 3 intrauterine gestational sacs and no chorioamnionitis according to vaginal ultrasonic scan (performed at the reproductive center of our hospital), (2) fetal reduction requested by the patient and family, (3) no recent symptoms of threatened abortion such as colporrhagia, (4) preoperative examination to exclude the presence of systemic and reproductive system infections, and (5) no surgical contraindication. All fetal reductions were conducted during the 7th and 8th gestational week because the success rate of single suction is generally higher with minimal effects on maternal conditions due to the small embryonic tissue volume.

2.2.2. Principles for Fetal Reduction

The target embryo was chosen according to following criteria: the gestational sac containing the smallest embryo

according to ultrasonic scan; the gestational sac that is most easily punctured; the gestational sac closest to the cervix as well as monozygotic twins (while retaining the singleton).

2.2.3. Surgical Procedures and Follow-Up

Fetal reductions were performed by one of five highly skilled physicians during weeks 7–8 of gestation. A transvaginal aspiration method of embryo reduction without potassium chloride injection was used. The most accessible gestational sac was chosen, and the fetal heart was visualised and aligned with the puncture guideline on the screen. A detailed description of the procedure was reported previously [5–6]. Briefly, a 17-gauge needle was used for the puncture. After confirming that the needle had punctured the embryo, vacuum aspiration was performed with a negative pressure of 40 KPa at the beginning, and up to 70–80 KPa when necessary. When the embryo disappeared and the gestational sac shrank, the aspiration was stopped to avoid further loss of amniotic fluid. Embryonic tissue could be found in the catheter. Patients were requested to return to the outpatient clinic on days 1, 3 and 7 after the procedure. Luteal support was continued until 10–12 weeks of gestation.

Patients with ongoing pregnancy underwent subsequent prenatal routine follow-up care. Data of the conditions during pregnancy and perinatal information were collected via telephone follow-up until 2 months after the expected date of childbirth. The following data were retrieved from the medical records or telephone follow-up data: maternal age, paternal age, education of the couples, parity, causes of infertility, duration of infertility, BMI, maternal gravity and parity status, mode of ART treatment, type of embryo that was transferred, transfer of fresh or frozen embryo, fetal reduction procedure, gestational age (in weeks) of abortion/delivery, birthweights, number of live-born infants, neonatal defects and perinatal deaths.

3. Results

3.1. Outcome Summary

In this study, a total of 95 embryos were reduced from 205 patients, and the procedure was a one-attempt success in every case. Post-operative ultrasound scan examination confirmed no fetal heart beat in the reduced embryos, for a surgical success rate of 100%. All patients experienced smooth surgical procedures, with stable vital signs during operation and no complications such as massive hemorrhage or infection. The patients experienced no obvious abdominal pain during the operation and could tolerate the surgery.

Generally, the pregnancy outcomes after multifetal pregnancy reduction were satisfactory, with a take-home baby rate of 76.9% for twin-to singleton, 89.5% for triplet-to-twin reduction, and 92.3% for triplet-to singleton reduction. Detailed pregnancy outcomes are shown in Table 1.

Table 1. Pregnancy outcomes after multifetal pregnancy reduction.

	N	Abortion (cases)		Premature delivery (cases)	Full-term birth	Birth weight (kg)	Gestational age at delivery (weeks)	Take-home baby rate (%)
		Early miscarriage	Late miscarriage					
Twin-to-singleton reduction	26	3 (11.5%)	3 (11.5%)	1 (3.8%)	19 (73.1%)	2.9±0.7	37.8±2.4	76.9
Triplet-to-twin reduction	152	1 (0.66%)	15 (9.9%)	74 (48.7%)*	62 (40.8%)*	2.3±0.5*	35.7±2.7*	89.5*
Triplet-to-singleton reduction	26	1 (3.8%)	1 (3.8%)	2 (7.7%)	22 (84.6%)	3.2±0.5	38.8±1.7	92.3

* p < 0.05

3.2. Nursing Care

3.2.1. Psychological Care

Patients requesting or requiring vaginal multifetal pregnancy reduction after assisted reproduction may experience stress, anxiety, and other psychological symptoms. They mainly worry about whether fetal reduction will damage the retained embryo and affect fetal development and even lead to abortion. Second, due to the national one-child policy, some patients and their families are reluctant to receive pregnancy reduction. For this reason, the present study emphasized the risk of multiple pregnancies according to the specific condition of the patient and the necessity of multifetal pregnancies reduction. At the same time, we explain in detail the surgical process and stress that prognosis is generally good following fetal reduction, so as to eliminate doubt and confer a positive attitude prior to surgery. So long as the patient remains calm during the operation and cooperates in regular monitoring according to the doctor's advice after surgery, fetal reduction is generally free of perioperative complications, and postoperative abortion risk can be reduced. Good preoperative psychological nursing helps eliminate doubts and nervousness so that the patient can better cooperate during surgery.

3.2.2. Preoperative Preparation

Since the earliest time for confirmed diagnosis of multiple pregnancies is the 6th to 7th week of gestations while the best time for vaginal fetal reduction is the 7th to 8th week, it is necessary to arrange and assist patients in preoperative preparations as soon as possible. These preparations include all necessary routine blood tests, C reactive protein (CRP) test, routine bleeding and coagulation tests, and routine leucorrhea tests. Based on these test results, surgical contraindications such as acute infection were excluded. Explanations to the patients and their families the risks of multiple pregnancy, the necessity for multiple pregnancy reduction, and the possible preoperative and postoperative risks and complications were necessary, so that the patients could provide informed consent. There is no need for fasting on the day of fetal reduction, but the patient is instructed to eat only easily digestible food and avoid excessive intake of water and concomitant filling of the bladder, which will hamper fetal reduction surgery. The patient was instructed to void her bladder. Luminal was then administered by subcutaneous injection prior to the operation for sedation and miscarriage prevention. Nurses checked whether the negative pressure aspirator could be used normally before surgery.

3.2.3. Intraoperative Nursing Care and Cooperation

The perineum and vagina were disinfected with 0.5%

iodophor to prevent vaginal bacteria from entering the uterine cavity and causing infection, which can lead to abortion. However, disinfectant in the uterine cavity may also cause damage to the fetus. Therefore, it is necessary to use aseptic normal saline to repeatedly flush the vagina and wash out the disinfectant. Rough operations may cause ache or discomfort and occurrence of uterine contraction, while ache and discomfort will aggravate uterine contraction. Therefore, for the process of flushing, the skillful use of speculum with gentle movement should be emphasize so as to protect the vaginal mucosa from damage and prevent uterine contraction due to stimulation.

The integrity of the negative pressure aspiration system as well as the regulation and control of negative pressure are also critical for successful outcome. In the process of fetal reduction, if the system is not tightly connected and leakage occurs, embryo aspiration will be directly affected and the operation time prolonged. Therefore, it is necessary to inspect the negative pressure aspiration system before the operation. It is also critical to regulate the pressure according to the operational procedures of the surgeon and to minimize aspiration of amniotic fluid so as to prevent reduction in the size of the gestational sac from causing uterine cavity pressure drop and abortion.

In this study, no cases of intrauterine infection were encountered. Only one case developed fever, reaching 38.3 °C on the second day postsurgery, but no special treatment was required. The patient was merely asked to drink more water, after which body temperature returned to normal. During surgery, vital signs should be closely monitored. Nurses also inquired whether there was any discomfort, and both pacified and encouraged the patient so as to ease their anxiety. In the process of fetal reduction, if slow fetal heart beat is found in the retained embryo or the patient experiences such changes as pale face, perspiration, chest distress and/or dyspnea, the patient is given oxygen inhalation. In two cases, slow fetal heart beat was observed in the retained embryo, which was relieved by oxygen inhalation without further incidence.

3.2.4. Postoperative Health Guidance

After surgery, nurses closely monitored the patient for signs of abnormal conditions such as abdominal pain and colporrhagia. The patients were instructed to remain in bed and continue luteal support therapy and infection prevention. Patients were instructed to maintain a high-protein, high-vitamin, and easily digestible diet, to keep normal bowel movements, and to prevent constipation. The patients were advised to avoid heavy physical labor and any activity that

increases abdominal pressure. Tub bathing and sex were also prohibited. The patients were asked to self-monitor for abnormal symptoms and seek medical advice from hospital as soon as possible upon occurrence of conditions such as severe abdominal pain, fever, substantial vaginal bleeding, and/or anal pendant expansion. Patients were informed to return to hospital on the 1st day, 3rd day, and 1st week postsurgery to assess conditions of the retained fetus by transvaginal ultrasonic examination.

3.2.5. Postoperative Follow-up

Patients undergoing fetal reduction require regular follow-up after surgery. On the 1st, 3rd, and 7th day after surgery, patients returned to the hospital for ultrasound examination. During the gestation period and after delivery, the patient's conditions were followed-up, including abortion, premature delivery, and/or pregnancy complications, through telephone or the WeChat platform. Finally, we recorded the pregnancy outcomes.

4. Discussion

Multiple pregnancy is a common complication of assisted reproductive technology that can increase the rates of abortion, premature delivery, and neonatal mortality [1, 4]. For instance, the average gestational age of triplet pregnancy at delivery is only 31–32 weeks, and the newborns demonstrate low birth weight, low survival rate, many complications, and high rescue costs [7, 8]. Reproductive healthcare professionals throughout the world are actively adopting various measures to reduce the occurrence of multiple pregnancies, including single blastocyst transfer. In the meantime, multifetal pregnancy reduction by transvaginal ultrasound-guided negative pressure aspiration is frequently employed as a safe and effective remedial measure [9]. However, there are still many unresolved issues regarding implementation of multifetal pregnancy reduction, such as the best time for fetal reduction, the indications, the selection of the applicable population for fetal reduction of twin pregnancy, and whether one- or two-fetus reduction results in better pregnancy outcomes for triplet pregnancy [10–12].

Compared with previous studies [13–15], our study included a large sample of fetal reduction cases over a 3-year period and conducted careful follow-up to obtain detailed information on the final outcome (e.g., take-home baby rate). In addition to determining the success rate and the most likely perioperative complications, it is also feasible to analyze and compare the final clinical pregnancy outcomes after fetal reduction surgery between twin and triplet pregnancies and between one- and two-fetus reductions of triplet pregnancy. According to the results of this study, fetal reduction from twin pregnancy or triplet pregnancy has favorable prognosis, but the highest overall take-home baby rate followed two-fetus reduction from triplet pregnancy. Singleton deliveries after fetal reduction (namely one-fetus reduction from twin and two-fetus reduction from triplet pregnancy) demonstrated gestational ages of more than 37 weeks, with low premature birth rate, and average birth

weight reaching that of normal singleton delivery. However, in the cases of twins retained after fetal reduction, average gestational age and neonatal weight failed to reach the standard for full-term infants. These data can be used as a reference for medical care personnel to advise patients with multiple pregnancies in selecting fetal reduction and the number of embryos to be reduced. However, as the case number of triplet-to singleton reduction was limited, data accumulation with longer term and larger sample size is still needed to obtain a definite conclusion.

Our study has some limitations. First, as a retrospective study, some important data were not analyzed in our study, e.g. pregnancy complications such as hypertensive disorders. Other issues like financial costs for neonatal treatments and psychological burdens could not be measured. More studies are still needed in the future.

In this study, 204 patients with twins or triplets achieved good pregnancy outcomes following fetal reduction. These outcomes depended both on the operating techniques and on efficient and high-quality perioperative nursing. Since the women undergoing fetal reduction were all infertility patients receiving assisted reproduction, the reproductive nursing staff should emphasize psychological care as part of overall high-quality treatment. Fear and anxiety were particularly severe in patients undergoing multifetal pregnancy reduction. Negative emotions not only affect patient compliance with surgery, but may also have adverse effects on pregnancy outcomes, including higher risk of spontaneous abortion. Therefore, the nursing staff should implement high-quality and efficient preoperative, intra-operative, and postoperative measures to ease anxiety, promote patient acceptance of fetal reduction, help the patients to actively cooperate in therapy and nursing care, and prevent complications, thereby improving pregnancy outcomes.

5. Conclusion

In conclusion, our results showed that the overall pregnancy outcomes of patients undergoing early pregnancy reduction were satisfactory; however, even after fetal reduction, the number of fetuses retained may still have critical influences on pregnancy outcomes. In the meantime, high-quality and effective nursing measures, such as perioperative psychological counseling, rigorous and skillful intraoperative cooperation, and careful postoperative follow-up and monitoring can reduce the psychological burden of patients, thus playing an important auxiliary role in improving the success rate of surgery and preventing perioperative complications.

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Disclosure

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