OBSTETRICS

Comparing pregnancy outcomes and loss rates in elective twin pregnancy reduction with ongoing twin gestations in a large contemporary cohort

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BACKGROUND: As compared with singleton gestations, twin pregnancies are associated with a significantly higher risk of preterm birth and maternal complications as well as fetal and neonatal morbidity and mortality. Multifetal pregnancy reduction is a technique developed in the 1980s to reduce the fetal number in higher-order multiple pregnancies to reduce the risk of adverse pregnancy outcomes, most importantly preterm birth.

OBJECTIVE: The objective of the study was to compare pregnancy outcomes and loss rates in elective twin pregnancy reduction to ongoing twin gestations in a large contemporary cohort.

STUDY DESIGN: This was a retrospective review of dichorionic diamniotic twin gestations that underwent first-trimester ultrasound at our institution from January 2008 to September 2016. Planned elective 2-to-1 multifetal pregnancy reductions at less than 15 weeks' gestation were compared with ongoing dichorionic diamniotic twin gestations. Data were collected via chart review. Demographics between 2-to-1 reduced singletons and ongoing twins were assessed using a Student *t* test or a Wilcoxon rank-sum test, as appropriate, for continuous variables and χ^2 or Fisher exact tests, as appropriate, for categorical variables. Univariable and multivariable logistic regressions were used to compare pregnancy outcomes between ongoing twins and reduced singletons adjusting for maternal age, body mass index, race, in vitro fertilization, use of chorionic villus sampling, prior term birth, and prior preterm birth.

RESULTS: Of 1070 dichorionic diamniotic twin pregnancies identified, completed follow-up data were available and analyzed for 855 patients (79.9%). Among those, 250 (29.2%) were 2-to-1 singletons and 605 (70.8%) were ongoing twins. Reduced singleton patients were slightly older, more likely white, and had lower body mass index. They were also more likely to have undergone in vitro fertilization (63.6% vs 48.8%), had chorionic villus sampling (92% vs 37.5%), and had prior term births (54% vs 35.7%). Compared with 2-to-1 singletons, the adjusted odds of having preterm delivery at 37 weeks for ongoing twins were 5.62 times (95% confidence interval, 3.67—8.61; $P < .001$) and 2.22 times (95% confidence interval, 1.20—4.11; $P < .001$) at 34 weeks. While intrauterine growth restriction, placental abruption, and gestational diabetes were not significant, ongoing twins were more likely to have a cesarean delivery (odds ratio, 5.53, 95% confidence interval, 3.60—8.49; $P < .001$) and preeclampsia (odds ratio, 3.33, 95% confidence interval, 1.60—6.96; $P < .001$) after adjusting for maternal characteristics. There were also significant differences between groups for preterm premature rupture of membranes and low birthweight at less than the fifth and 10th percentiles. Total pregnancy loss (at 24 and 20 weeks) was similar between singleton and ongoing twins (4% vs 2.5%, $P = .23$, and 3.6% vs 1.7%, $P = .09$ for respective weeks). There were no significant differences in the rate of unintended pregnancy loss (2.4% vs 2.3%; $P = .94$) and the rate of intrauterine fetal death greater than 24 weeks (1.2% vs 0.7%; $P = .43$) in reduced singleton versus ongoing twin group, respectively.

CONCLUSION: In our study, patients who elected to reduce to a singleton pregnancy had a higher gestational age of delivery and lower rates of preterm birth and pregnancy complications without an increased risk of pregnancy loss.

Key words: birthweight percentile, cesarean, elective multifetal pregnancy reduction, intrauterine growth restriction, multifetal pregnancy reduction, multiple gestation, preterm birth, preterm premature rupture of membranes, twin pregnancy outcomes

Multifetal pregnancy reduction (MPR) is a technique developed in the 1980s to reduce the fetal number in higher-order multiple pregnancies to decrease the risk of adverse pregnancy outcomes, most importantly preterm birth.[1] In recent years, there have been significant improvements in assisted reproductive technologies that have decreased the number of triplet and higher-order pregnancies by changing ovulation induction practices and limiting the number of embryos transferred.[2]

Reproductive endocrinology and infertility centers have also attempted to reduce the risk of twin pregnancy by recommending single-embryo transfers.[3] From 1980 to 2009, the twin birth rate rose by 76% to a peak of 33.9 per 1000 births in 2014. Although twin births have remained overall stable over the last several years, twin gestations still comprise 2.1% of births in the United States and they also account for 20.3% of preterm birth births.[4]

As compared with singleton gestations, twin pregnancies are associated with a significantly higher risk of preterm birth, maternal complications, and mortality[5] as well as fetal and infant morbidity and mortality.[6,7] In addition to preterm birth and preterm premature rupture of membranes (PPROM),[8] twin gestations have higher rates of gestational hypertension and preeclampsia,[9–11] gestational diabetes,[12,13] and fetal growth restriction.[8,14,15] Health care expenditure is also

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AJOG at a Glance

Why was this study conducted?

To compare the rates of preterm birth and adverse pregnancy outcomes in elective twin reduction to ongoing twin gestations.

Key findings

Elective twin pregnancy reduction resulted in lower odds of preterm delivery at less than 37 weeks and less than 34 weeks without an increased risk of pregnancy loss. Additionally, the odds of having cesarean delivery, preeclampsia, preterm premature rupture of membranes, and low birthweight (less than the fifth and 10th percentiles) is lower in reduced singletons compared with ongoing twins.

What does this add to what is known?

To our knowledge, this study is the largest cohort of elective twin pregnancy reductions and improved rates of preterm birth and adverse outcomes.

significantly higher in twin vs singleton gestation.[16]

Although the ideal strategy to reduce morbidity associated with multifetal pregnancy is prevention, 2-to-1 multifetal pregnancy reduction may be performed to decrease risk based on maternal or obstetric history, to decrease known complications of twin pregnancies, or for social reasons. Selective termination may also be performed for a known genetic or structural anomaly in 1 of the fetuses. At our institution, elective reduction (nonanomalous fetuses) to a singleton was first offered in 1993, and since then, a larger proportion of patients are requesting 2-to-1 multifetal pregnancy reduction.[17–19]

Several studies have documented the decrease of preterm delivery and low birthweight in reduced twin pregnancies, although most grouped elective multifetal pregnancy reduction with selective termination.[17–21] Only 1 previous study of 63 reduced pregnancies included only elective twin reduction.[22]

The purpose of this study was to compare pregnancy outcomes between a large cohort of elective 2-to-1 reduced singletons and ongoing twin gestations at a single institution.

Materials and Methods

This was a retrospective cohort of dichorionic diamniotic twin gestations that underwent first-trimester ultrasound at Mount Sinai Hospital from January 2008 to September 2016. A computerized ultrasound database was used to identify dichorionic diamniotic gestations that underwent first trimester ultrasound at our institution. Supplemental data and patient information were extracted from the electronic medical record. The collection of data was performed with institutional review board approval.

All MPR procedures were performed by the transabdominal injection of potassium chloride into the region of the fetal thorax under ultrasound guidance. Details of this procedure have been previously published.[19,23] All procedures were performed by 6 trained and experienced maternal fetal medicine attendings.

Selective terminations for fetal structural anomalies identified by ultrasound and genetic abnormalities identified by chorionic villus sampling were excluded. Patients received counseling on multifetal pregnancy reduction based on referral or parental request. Dichorionicity was confirmed with ultrasound by presence of 2 separate placentas or presence of a lambda sign of the intertwin membrane.

Prior to reduction, patients were offered chorionic villus sampling. As previously published by our group, this does not appear to increase the risk of loss.[24] After confirmation of dichorionicity, and prior to MPR, all patients underwent nondirective counseling. Risks of the procedure including potential fetal loss of the remaining fetus were discussed.

Maternal baseline characteristics including age, parity, race, obstetric history, prepregnancy body mass index

TABLE 1
Maternal demographic characteristics

Demographic characteristics	2-to-1 reduced singleton (n = 250)		Ongoing twins (n = 605)		*P* value
	n	Mean ± SD	n	Mean ± SD	
Maternal age	250	37.56 ± 4.67	605	35.44 ± 6.13	< .001
Body mass index, kg/m^2	235	23.41 ± 4.77	599	24.91 ± 5.63	< .001
	Patients, n, %		Patients, n, %		
In vitro fertilization	159/250 (63.6)		295/605 (48.8)		< .001
Race					< .001
White	180/250 (72)		361/605 (59.7)		
Nonwhite[a]	27/250 (10.8)		156/605 (25.8)		
Other	43/250 (17.2)		88/605 (14.5)		
Prior term births	135/250 (54)		216/605 (35.7)		< .001
Prior preterm births	17/250 (6.8)		28/605 (4.6)		.20
Chorionic villus sampling	230/250 (92)		227/605 (37.5)		< .001
Amniocentesis	11/250 (4.4)		46/605 (7.6)		.09

[a] Nonwhites include black, Hispanic, and Asian.

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TABLE 2
Univariable logistic regression analysis of perinatal outcomes comparing ongoing twins with 2-to-1 singletons

Outcomes	2-to-1 reduced singleton (n = 250) Patients, n, %	Ongoing twins (n = 605) Patients, n, %	Ongoing twins vs 2-to-1 reduced singletons Unadjusted OR (95% CI)	*P* value
Preterm delivery, wks				
<37	43/243 (17.7)	322/600 (53.7)	5.39 (3.73, 7.77)	< .001
<34	17/243 (7)	102/600 (17)	2.72 (1.59, 4.66)	< .001
<32	10/243 (4.1)	50/600 (8.3)	2.12 (1.06, 4.25)	.03
<28	7/243 (2.9)	25/600 (4.2)	1.47 (0.63, 3.44)	.38
IUGR[a]	13/240 (5.4)	81/593 (13.7)	2.76 (1.51, 5.06)	.001
Cesarean delivery	111/237 (46.8)	464/587 (79.1)	4.28 (3.10, 5.92)	< .001
Preeclampsia	10/238 (4.2)	99/588 (16.8)	4.62 (2.36, 9.01)	< .001
PPROM	14/238 (5.9)	115/593 (19.4)	3.85 (2.16, 6.86)	< .001
Placental abruption	4/237 (1.7)	10/525 (1.9)	1.13 (0.35, 3.64)	> .99
Gestational diabetes	11/236 (4.7)	54/593 (9.1)	2.05 (1.05, 3.99)	.03
Birthweight percentile[a]				
<10%	35/233 (15)	213/563 (37.8)	3.44 (2.31, 5.12)	< .001
<5%	20/233 (8.6)	125/563 (22.2)	3.04 (1.84, 5.01)	< .001

CI, confidence interval; *IUGR*, intrauterine growth restriction; *OR*, odds ratio; *PPROM*, preterm premature rupture of the membranes.

[a] At least 1 twin in ongoing twin group.

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(BMI), use of in vitro fertilization (IVF), and invasive testing were collected. Pregnancy outcomes included preterm birth, defined as less than 37, 34, 32, and 28 weeks gestational age of delivery, mode of delivery, preeclampsia, PPROM, placental abruption, and gestational diabetes.

Additional outcomes evaluated, for at least 1 twin for those in the ongoing twins group, were suspected intrauterine growth restriction (IUGR; estimated fetal weight less than 10th percentile) and low birthweight (less than 10th and 5th percentile). The rates of miscarriage of 1 twin and pregnancy loss before 24 weeks and 20 weeks were assessed. Complete pregnancy loss was defined as loss of the entire pregnancy before 24 weeks and 20 weeks. Unintended pregnancy loss was defined as unplanned loss of pregnancy.

Planned 2-to-1 multifetal reduction gestations at less than 15 weeks' gestations were compared with ongoing dichorionic diamniotic twin gestations. For demographic characteristics between 2-to-1 reduced singleton and ongoing twins, we used a Student *t* test or Wilcoxon rank-sum test, as appropriate, for continuous variables and χ^2 test or Fisher exact test, as appropriate, for categorical variables.

Univariable logistic regression analyses were performed to compare the pregnancy outcomes between the groups, and their respective unadjusted odds ratios (ORs) with 95% confidence intervals are reported. In multivariable logistic regression analyses, we modeled the effect of ongoing twins compared with 2-to-1 reduced on pregnancy outcomes, adjusting for maternal age, BMI, IVF, race, use of chorionic villus sampling (CVS), prior full-term and prior preterm birth.

Demographic or clinical factors between the groups that yielded a value of $P \leq .20$ on univariable analyses were included in the multivariable models. Pregnancy loss outcomes were not adjusted because there were too few events. A value of $P < .05$ is considered statistically significant. All statistical analyses were performed using SAS, version 9.4 (SAS Institute Inc, Cary, NC).

Results

Between January 2008 and September 2016, our practice performed first-trimester ultrasounds on 1070 dichorionic diamniotic twin gestations between 11 and 15 weeks' gestation. Of these, there were 727 ongoing twin pregnancies (67.9%) and 343 elective 2-to-1 multifetal pregnancy reductions (32.1%) performed at less than 15 weeks. Patients were excluded for not having complete follow-up data available or had early losses of twins. After exclusions, a total of 855 patients (79.9%) are included in this analysis, of which 250 (29.2%) were reduction cases and 605 (70.8%) were ongoing twins.

Baseline characteristics between 2-to-1 reduction and ongoing twin gestations are reported in Table 1 (baseline characteristics for all 1070 patients are included in Appendix 1). Patients with reduction to singletons were more likely

TABLE 3
Adjusted logistic regression analysis for the association between adverse pregnancy outcomes and multifetal pregnancy reduction

Outcomes	Ongoing twins vs 2-to-1 reduced singleton, adjusted OR (95% CI)	*P* value
Preterm delivery, wks		
<37	5.62 (3.67, 8.61)	< .001
<34	2.22 (1.20, 4.11)	.01
<32	1.29 (0.57, 2.95)	.54
<28	0.61 (0.21, 1.80)	.37
IUGR[a]	1.90 (0.95, 3.78)	.07
Cesarean delivery	5.53 (3.60, 8.49)	< .001
Preeclampsia	3.33 (1.60, 6.96)	< .001
PPROM	3.86 (2.00, 7.43)	< .001
Placental abruption	1.16 (0.29, 4.56)	.83
Gestational diabetes	1.94 (0.92, 4.09)	.08
Birthweight percentile[a]		
<10%	3.00 (1.89, 4.76)	< .001
<5%	2.70 (1.53, 4.76)	< .001

Models are adjusted by age, body mass index, race, use of in vitro fertilization, use of chorionic villus sampling, prior term birth, and prior preterm birth.

CI, confidence interval; *IUGR*, intrauterine growth restriction; *OR*, odds ratio; *PPROM*, preterm premature rupture of the membranes.

[a] At least 1 twin for those who are in the ongoing twins group.

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white, were slightly older, and had moderately lower prepregnancy BMI. The reduction group was also more likely to have undergone IVF and to have used invasive testing. History of spontaneous preterm births and use of amniocentesis was similar in both groups.

The differences in perinatal outcomes between the 2 groups are shown in Table 2. The distribution of gestational age at delivery was significantly higher in the reduced singleton group with a median of 39 weeks (interquartile range [IQR], 37.7, 39.7) compared with the ongoing twin group, which had a median of 36.7 weeks (IQR, 34.9, 37.9) ($P <$ .001). Similarly, birthweight was higher in the singleton compared with ongoing twin gestation (3051.5 g ± 567.9 vs 2378.0 g ± 519.0; $P <$ .001).

In the unadjusted analyses, the reduced 2-to-1 singleton group had a significantly lower rate of preterm delivery less than 37 weeks (17.7% vs 53.7%; $P <$ .001), preterm delivery less than 34 weeks (7% vs 17%; $P <$ .001), and preterm delivery less than 32 weeks (4.1% vs 8.3%; $P =$ .03). There was no significant association observed for preterm delivery when classified as less than 28 weeks (2.9% vs 4.1%; $P =$ .38).

Compared with the ongoing twin gestation, the reduced group had significantly less risk of IUGR (5.4% vs 13.7%; $P <$ .001), cesarean delivery (46.8% vs 79.1%; $P <$ .001), and preeclampsia (4.2% vs 16.8%; $P <$ .001).

Additionally, the reduced group was significantly less likely to develop PPROM or gestational diabetes and to present with low birthweight, as defined by a cutoff of less than the 10th and less than the 5th percentile (Table 2). Placental abruption was similar between the two groups.

The multivariable analysis for the association between adverse pregnancy outcomes and multifetal pregnancy reduction is shown in Table 3 and the Figure. The adjusted odds ratio controls for maternal age, BMI, race, use of IVF, use of CVS, prior preterm birth, and a history preterm birth. After adjusting for maternal characteristics, the odds of a preterm delivery are 5.62 times for ongoing twins (95% CI, 3.67−8.61; $P <$ .001) at less than 37 weeks and 2.22 times (95% CI, 1.20−4.11; $P <$ .001) at less than 34 weeks.

Additionally, ongoing twins were more likely to have cesarean delivery (adjusted OR, 5.53, 95% CI, 3.60−8.49; $P <$ .001) and preeclampsia (adjusted OR, 3.33, 95% CI, 1.60−6.96; $P <$ .001). Other adverse pregnancy outcomes including PPROM and low birthweight for the 5th and 10th percentiles remained significant.

Preterm delivery at less than 32 weeks, IUGR, and gestational diabetes were no longer significant after adjusting for other covariates. There remained no significant differences for preterm delivery at less than 28 weeks and placental abruption between the two groups.

Differences in pregnancy loss between 2-to-1 singletons vs ongoing twins are shown in Table 4. There were no significant differences in the rate of unintended pregnancy loss (2.4% vs 2.3%; $P =$ .94) and the rate of intrauterine fetal death greater than 24 weeks (1.2% vs 0.7%; $P =$ .43) in the reduced singleton vs the ongoing twin group, respectively. Rates for total pregnancy loss, at less than 24 and 20 weeks, and termination were also similar between groups.

Comment

Main findings

In the current study, we analyzed the outcome of elective twin pregnancy reduction at less than 15 weeks' gestation as compared with ongoing dichorionic diamniotic twin gestations in our cohort. Patients who elected to reduce to singleton pregnancy had a higher median gestational age at delivery (39 weeks vs 36.7 weeks) and after adjusting for maternal characteristics, lower odds of preterm delivery at less than 37 weeks and less than 34 weeks without an increased risk of pregnancy loss. Additionally, our study found that the odds of

having a cesarean delivery, preeclampsia, PPROM, and low birthweight when defined as less than the fifth and 10th percentiles is lower for the reduced singletons compared with the ongoing twins.

Although the rate of cesarean delivery was high in both the 2-to-1 reduced singletons and ongoing twin pregnancies (46.8% and 79.1%, respectively), our study cohort included a large percentage of patients (61.0%) who were of advanced maternal age (>35 years old). More specifically, 56.4% in the ongoing twin group (341 of 605) and 72.4% (181 of 250) in 2-to-1 reduced singleton group were of advanced maternal age. From the most recent available national vital statistics from 2017, the rate of cesarean delivery for mothers over the age of 35 years and over the age of 40 years is 40.2% and 48.2%, respectively,[25] which is consistent with the singleton rate of cesarean delivery within our cohort. Additionally, the cesarean delivery rate for twin gestations increased from 75% in 2006 to a peak of 78% in 2013, which is also consistent with our cohort.[26]

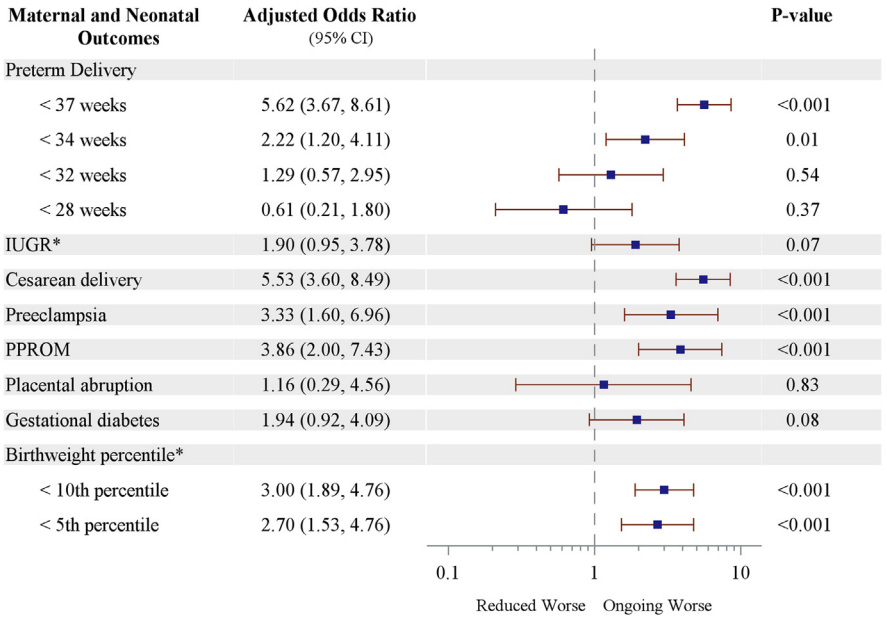
Implications of findings

Few studies have directly compared pregnancy outcomes in 2-to-1 reduced singletons vs ongoing twin pregnancies. Like our study, Gupta et al[21] found a decreased rate of preterm birth at less than 37 weeks or birthweight defined as less than 10th percentile. However, they did not find a difference in preterm birth less than 34 weeks. This difference in findings may have been due to a small sample size of 63 reduced pregnancies in their study.

Similarly, Haas et al[22] found a decreased risk of preterm birth less than 37 and 34 weeks. However, in this study, they did not find any significant differences in pregnancy outcomes of interest including hypertensive diseases of pregnancy and cesarean delivery. Like our study, there were no significant differences in loss rates (0% in reduced twins vs 4.8% in ongoing twins).

Two other studies[27,28] compared the risks of adverse pregnancy outcomes in 2-to-1 reduced twins with national databases of ongoing twins and showed similar results. Van de Mheen et al[29] compared reduced singletons with age-matched ongoing twins and singletons and found that reduction resulted in a 2-week prolongation of pregnancy as

FIGURE
Analysis between adverse pregnancy outcomes and multifetal pregnancy reduction



Adjusted logistic regression analysis for the association between adverse pregnancy outcomes and multifetal pregnancy reduction is shown. *Asterisk* indicates at least one twin for those who are in the ongoing twins group. IUGR, intrauterine growth restriction; PPROM, preterm premature rupture of the membranes. Models are adjusted by age, body mass index, race, use of in vitro fertilization, use of chorionic villus sampling, prior term birth, and prior preterm birth.

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TABLE 4
Comparison of pregnancy loss rates between ongoing twins with 2-to-1 singletons

	2-to-1 Reduced Singleton (n = 250)	Ongoing twins (n = 605)	
Outcomes	Patients, n, %	Patients, n, %	*P* value
Total pregnancy loss <24 wks	10/250 (4)	15/605 (2.5)	.23
Unintended pregnancy loss <24 wks	6/250 (2.4)	14/605 (2.3)	.94
Total pregnancy loss <20 wks	9/250 (3.6)	10/605 (1.7)	.09
IUFD >24 wks	3/250 (1.2)	4/605 (0.7)	.43
Termination[a]			.32
No	246/250 (98.4)	600/605 (99.2)	
Yes, complete	4/250 (1.6)	1/605 (0.2)	
Yes, selective	0/250 (0)	4/605 (0.7)	

IUFD, intrauterine fetal death.

[a] *P* value for termination is computed for those with a complete or selective termination compared with no termination.

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compared with twins (38.9 vs 37.1 weeks) but not to the level of a singleton gestation (40.1 weeks). They also found that reduction resulted in a higher rate of pregnancy loss prior to 24 weeks compared with nonreduced twins. However, in their study, the mean gestational age at reduction was 16.7 weeks and indications included chromosomal or structural anomalies, history of preterm birth, and on 11 elective cases in the cohort of 120 women. The later gestational age and indications for procedure may explain the difference in findings from our study.

Hasson et al[30] did not observe improved pregnancy outcomes among 32 twin pregnancies reduced to singletons. This may be explained by a small sample size, a large proportion of procedures performed at greater than15 weeks, and most cases being for selective termination because of anomalies. In the present study, the median gestational age delivery for reduced singletons is 39 weeks (IQR, 37.7, 39.7), which is similar to the gestational age of delivery for primary singletons.[29]

There have been multiple studies looking at the loss rates of fetal reduction in twin pregnancies. Older and smaller studies describe a range from 0% to 9.09%.[17–19,30–32] The largest and most recent studies range from 2.1% to 2.5%.[19,28] Our study found a total loss rate of 4.0% among reduced singletons; however, when intended losses and terminations for anomalies identified later were included, the unintended loss rate was only 2.4%, which is consistent with large previous studies.

Strengths and weaknesses

Strengths of our study include our robust cohort size and comparison group. To our knowledge, this study is the largest cohort of elective 2-to-1 multifetal pregnancy reductions. Notably, most previous studies included selective termination or reduced anomalous twins and later gestational age of procedure (greater than 15 weeks). Our findings may provide guidance to patients considering elective reduction of twin gestations in the first trimester.

This study has some limitations. Although our cohort is large compared with published literature, twin-to-singleton reductions are relatively infrequent procedures, and therefore, our single-center findings may not be generalizable to other populations. Inherent to its retrospective cohort study design, our analysis is subject to confounding and missing data bias. Additionally, our study lacks long-term outcome data for neonates.

Conclusions/future direction

Although most twin gestations result in favorable outcomes from an absolute perspective, the risk of preterm birth less than 34 weeks is 19.8% and 9 times higher in twins than singletons.[4] Because of the lack of proven interventions to reduce the risk of prematurity and adverse pregnancy and neonatal outcomes in twin gestations,[7] multifetal pregnancy reduction remains a method by which these risks may be decreased for patients wanting to optimize outcomes for their pregnancy.

We recognize that this remains a controversial procedure in the absence of medical or obstetrical indication; however, the option should be available to patients wanting to improve outcomes for their pregnancy. It is important to consider that a patient's decision to undergo 2-to-1 reduction includes a large psychological component. However, there may be both positive and negative effects, depending on the patient, their medical history, and their personal family situation.

It has been documented that parents of multiples are at an increased risk of a compromised quality of life.[2,33,34] In these instances, this procedure should also remain an option for a family's economic or social reasons.[2] Patients considering this decision should be given objective information that should not be influenced by the ethical or moral values of the consulting physician.[2,35] Our findings may be particularly useful to patients and their physicians considering this option to reduce risks of maternal and neonatal morbidity associated with twin gestations.[28]

In summary, elective 2-to-1 multifetal pregnancy reduction appears to be a safe procedure that reduces the risk of preterm birth and pregnancy complications such as PPROM, preeclampsia, and low birthweight without increasing the risk of unintended pregnancy loss. ■

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APPENDIX

Maternal demographic characteristics for total cohort

	Total DCDA pregnancies (n = 1070)		Total cohort (n = 855)	
Demographic characteristics	N	Mean ± SD	N	Mean ± SD
Maternal age	1062	36.33 ± 5.66	855	36.06 ± 5.82
Body mass index, kg/m^2	992	24.26 ± 5.36	834	24.48 ± 5.44
	No. of patients (%)		No. of patients (%)	
In vitro fertilization	568/1070 (53.1)		454/855 (53.1)	
Race				
White	646/1044 (61.9)		541/855 (63.3)	
Nonwhite[a]	219/1044 (21)		183/855 (21.4)	
Other	179/1044 (17.1)		131/855 (15.3)	
Prior term births	456/1056 (43.2)		351/855 (41.1)	
Prior preterm births	62/1056 (5.9)		45/855 (5.3)	
Chorionic villus sampling	632/1070 (59.1)		457/855 (53.5)	
Amniocentesis	65/1070 (6.1)		57/855 (6.7)	

[a] Nonwhites include black, Hispanic, and Asian.

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