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Original Article *Özgün Araştırma*

CAN MACROSOMIC FETUSES BE DELIVERED AT 38 WEEKS OF GESTATION?

Makrozomik Fetuslar 38. Gebelik Haftasında Doğurtulabilir Mi?

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ABSTRACT

Objective: Numerous articles have been written on macrosomic fetuses, including the American College of Obstetricians and Gynecologists practice bulletin. However, there is no clear consensus about the time of birth. The aim of this study was to compare the maternal and fetal outcomes of women giving birth at 38^{+0}-38^{+6} weeks and those with deliveries at ≥39 weeks in pregnancies complicated by fetal macrosomia, and to determine the effect on morbidity and mortality of delivery in the 38th gestational week.

Material and Methods: Data of women and their infants born in Kayseri Training and Research Hospital between 01 May 2018 and 31 March 2020 were analyzed retrospectively. The patients included were those with a singleton pregnancy delivered at ≥38 weeks with a birthweight of ≥4000 gr. Demographic data and medical history and birth outcomes of the patients were recorded from the hospital data system. Multiple pregnancies, those with fetal anomalies and births <38 weeks were excluded from the study. The patients were separated into two groups as those who gave birth at 38^{+0}-38^{+6} gestational weeks (Group 1) and those who gave birth at ≥39 weeks (Group 2).

Results: Maternal and/or fetal trauma was found to be statistically significantly higher in nulliparous women with vaginal delivery ≥39 weeks compared to those with vaginal delivery at 38^{+0}-38^{+6} weeks (p=0.017). No significant difference was observed between the groups in respect of fetal morbidity and mortality.

Conclusion: When fetal macrosomia is determined antenatally, rates of fetal and/or maternal trauma can be reduced with delivery planned for the 38th week without increasing fetal morbidity and mortality.

***Keywords**: Macrosomia, trauma, LGA, dystocia*

ÖZ

Amaç: Makrozomik fetüsler hakkında, Amerikan Obstetrik ve Jinekoloji Derneğinin bültenleri de dahil olmak üzere çok sayıda makale yazılmıştır. Ancak doğum zamanı konusunda net bir fikir birliği yoktur. Bu çalışmanın amacı fetal makrozomi ile komplike gebeliklerde 38^{+0}-38^{+6} hafta arasında doğum yapan kadınlar ile ≥39 hafta sonrasında doğum yapan kadınların maternal ve fetal sonuçlarını karşılaştırmak ve doğum haftasının 38. haftaya çekilmesinin yenidoğanın morbidite ve mortalitesini etkileme düzeyini belirlemektir.

Gereç ve Yöntemler: Bu retrospektif çalışmada, 01 Mayıs 2018-31 Mart 2020 tarihleri arasında Kayseri Eğitim ve Araştırma Hastanesinde doğum yapan kadınların ve bebeklerinin verileri geriye dönük olarak tarandı. Doğum ağırlığı ≥4000 gram, tekil, ≥38 hafta üzerinde doğum yapan hastalar çalışmaya dâhil edildi. Hastaların demografik ve medikal öyküleri ve doğum sonuçları hastane veri sisteminden kayıt edildi. Çoğul gebelikler, fetal anomaliler ve <38 gebelik haftasındaki doğumlar çalışma haricinde tutuldu. Hastalar 38^{+0}- 38^{+6} hafta arasında doğum yapanlar (Grup 1) ve ≥39 haftada doğum yapanlar (Grup 2) olarak iki gruba ayrıldı.

Bulgular: ≥39 haftadan sonra vajinal doğum yapan (grup 2) nullipar kadınlarda maternal veya fetal travma 38^{+0} - 38^{+6} (grup 1) hafta arasında vajinal doğum yapan nullipar kadınlara oranla istatistiksel anlamlı olarak yüksek bulundu (p=0.017). İki grup arasında fetal morbidite ve mortalite incelendiğinde gruplar arasında anlamlı farklılık izlenmedi.

Sonuç: Doğum öncesi değerlendirmede fetal makrozomi saptanan gebelerde fetal ve/veya maternal travma oranları, fetal morbidite ve mortalite arttırılmadan 38. haftada planlanacak bir doğum ile azaltılabilir.

***Anahtar Kelimeler**: Makrozomi, travma, LGA, distosi*

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INTRODUCTION

Fetal macrosomia is defined as birthweight of >4000 gr or >4500 gr, and >90th percentile for gestational week (1). The incidence of fetal macrosomia is 9%, it shows variations between countries, and has been associated with several factors, primarily maternal obesity, maternal diabetes mellitus (DM), a history of macrosomic fetus and gestational week at birth (1-6). The clinical importance of fetal macrosomia includes the increased risk of caesarean delivery, outcomes of maternal and fetal trauma, increased endocrinological problems later in childhood, and stillbirth (1,7, 8)

When there is suspected fetal macrosomia diagnosed with prenatal ultrasonography, clinical examination and maternal risk factors together, to prevent the fetus becoming bigger and to avoid the above-mentioned complications, various solutions are recommended such as bringing maternal DM under control, lifestyle changes, diet and physical activity. However, despite these recommendations, there is still no clear consensus on the gestational week at which the fetus should be delivered (1,9,10).

The aim of this study was to compare the maternal and fetal outcomes of women giving birth at 38^{+0}-38^{+6} weeks and those with deliveries at ≥39 weeks in pregnancies complicated by fetal macrosomia, and to determine the effect on infant morbidity and mortality of delivery in the 38th gestational week.

MATERIALS AND METHODS

The data of women and their infants were analyzed retrospectively between 01 May 2018 and 31 March 2020. Approval for the study was granted by the Ethics Committee of Erciyes University (Erciyes University Clinical Research Ethics Committee, date: 25.12.2019, issue number: 2019/886). All procedures were made in compliance with the principles of the Helsinki Declaration.

The study included women with a single pregnancy of ≥38 weeks with infant birthweight ≥4000 gr. The patients were separated into two groups as those who gave birth at 38^{+0}-38^{+6} gestational weeks (Group 1) and those who gave birth at ≥39 weeks (Group 2).

The groups were compared in respect of demographic data, obstetric and additional chronic disease history, the results of the oral glucose tolerance test performed at 24-28 gestational weeks, pre-pregnancy diabetic status, smoking status, maternal complications (deep vaginal tear, obstetric anal sphincter damage, bladder and urethra damage, uterine atonia, placenta retention, placenta detachment, uterine rupture), and fetal complications (shoulder dystocia, asphyxia, clavicle or humerus fracture, brachial nerve paralysis, the need for neonatal intensive care, meconium aspiration syndrome, respiratory distress syndrome (RDS), fetal loss during labour).

To evaluate the morbidity and mortality of the newborns, the hospital data recording system was scanned for the Apgar scores and the hemoglobin and bilirubin values of the infants in the first 24 hours. Gestational DM was defined according to the standards of the American College of Obstetricians and Gynecologists (ACOG). Gestational age at birth was defined according to correlation made to the last menstrual date or the fetal crown-rump distance on first trimester ultrasonography, if available. All these parameters were compared between the two groups. Patients with multiple pregnancies, fetal anomalies or delivery <38 weeks were excluded from the study.

Statistical Analysis

Data obtained in the study were analyzed statistically using SPSS version 25.0 (IBM Corporation, Armonk, NY, USA) software. Categorical data were stated as number (n) and percentage (%), and continuous data as mean ± standard deviation (SD), or median, minimum and maximum values. In the comparisons of categorical variables, the Chi-square test or the Fisher exact test statistic were used. In the comparisons of

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continuous measurements between the groups, the Student's t-test was applied to data showing normal distribution, and the Mann Whitney U-test to data not showing normal distribution. Logistic regression analysis was performed to determine independent risk factors that have had influence on macrosomia. A value of $p<0.05$ was accepted as statistically significant in all the tests.

RESULTS

The study included 689 women with a birth weight of ≥4000 grams and a singleton pregnancy >38 weeks.

Demographic Data

The mean age of the patients included in the study was 28.3±9.2 years. Group 1 comprised 208 (30.2%) patients who gave birth at 38^{+0}-38^{+6} weeks, and group 2 comprised 481 (69.8%) patients who gave birth at ≥39 weeks. No significant difference was determined between the groups in respect of the type of birth as normal vaginal route or caesarean section (C/S) delivery. C/S requirement was lower in group 1 but not statistically significant. The demographic data of the patients are shown in Table 1. Gestational DM was 8.7% in the group born between 38^{+0}-38^{+6} weeks and 9.1% in the group born at ≥39 weeks. Type II diabetes rate was 4.8% in the group 1 and 1.5% in the group 2 (Table 1). This result was statistically significant (p=0.034). The causes of delivery in pregnant women who delivered between 38^{+0}-38^{+6} weeks were rupture of membranes 16.82% (n=35), preeclampsia 12.01% (n=25), spontaneous labor 33.65% (n=70), cord prolapse was 2.40% (n=5) and the previous cesarean section rate was 35.09% (n=73).

Table 1: Demographic data of patients and comparative data of groups

	All Patients (n=689)		**38^{+0}-38^{+6} Week (Group 1) (n=208)**		**≥39 Week (Group 2) (n=481)**		**P**	OddsRatio (95% CI)
	Mean±SD	n (%)	Mean±SD	n (%)	Mean±SD	n (%)		
Age (year)	28.3±9.2		28.2±6.7		27.9±5.6		0.477	
Gravida	2.9±1.6		3(1-11)		3(1-10)		0.446	
Parity	2.7±1.5		3(0-9)		2(0-10)		0.225	
Gestational week	39.4±0.9		38.4±0.2		39.9±0.8		0.0001	
Maternal BMI (kg/m²)	31.7±7.1		31.8±5.0		31.6±7.9		0.788	
Infant weight (gr)	4208.9±215.9		4192.0±224.4		4216.3±212		0.176	
Diabetes Melitus (DM)								
Gestationel DM		62 (9.0)		18 (8.7)		44 (9.1)	0.034	3.4 (1.3-9.1)
Type II DM		17 (2.5)		10 (4.8)		7 (1.5)		3.5 (1.2-10.6)
Smoking		7 (1.0)		1 (0.5)		6 (1.2)	0.681	
APGAR 1.dk	7.9±0.9		7.9±1.0		8.0±0.9		0.370	
APGAR 5.dk	9.2±0.7		9.2±0.8		9.3±0.7		0.982	
Induction of labour		102(14.8)		40 (19.23)		82(17.04)		1.000
Vaginal delivery		408(59.2)		121(58.2)		287(59.9)		0.674
Cesarean delivery		281(40.8)		87(41.8)		194(40.1)		0.094

BMI: body mass index, DM: diabetes mellitus

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In total, 102 patients (14.8%) received labor induction. The causes of induction of these patients were rupture of membranes (58.82%, n=60), preeclampsia (21.56%, n=22) and DM (19.60%, n=20). Complications in these patients were placental retention (1.96%, n=2/102), shoulder dystocia (2.94%, n=3/102), and deep vaginal laceration (2.94%, n=3/102).

When all the births were analyzed, maternal and fetal complications were seen at a higher rate in the cases with the infant born at ≥39 weeks but the difference was not statistically significant. After removal of the multiparous women, the rate of maternal and fetal trauma in the nulliparous women in the group who gave birth at ≥39 weeks was seen to be statistically significantly high (0/30 (0%) vs. 8/41 (19.5%) p=0.017) (Tables 2, 3). No statistically significant difference was determined between the groups in respect of complications that can develop associated with early birth such as the requirement for neonatal intensive care, RDS development, intraventricular hemorrhage and necrotizing enterocolitis (Table 3).

No statistically significant difference was determined between the groups in respect of complications that can develop associated with early birth such as the requirement for neonatal intensive care, RDS development, intraventricular hemorrhage and necrotizing enterocolitis (Table 3).

Table 2: Comparision of maternal complications

	All Patients (n=689)	**38^{+0}-38^{+6} Week (Group 1) (n=208)**	**≥39 week (Group 2) (n=481)**	**p**
	N (%)	N (%)	N (%)	
Deep vaginal laseration	8 (1.2)	2 (1.0)	6 (1.3)	1.000
Obstetric anal sphincter injury	4 (0.6)	0 (0)	4 (0.8)	0.321
Bladder and urethra injury	0 (0)	0 (0)	0 (0)	
Placenta retention	4 (0.6)	2 (1.0)	2 (0.4)	0.588
Uterine atony	14 (2.0)	4 (1.9)	10 (2.1)	1.000
Ablation placenta	1 (0.1)	0 (0)	1 (0.2)	1.000
Uterine rupture	0 (0)	0 (0)	0 (0)	

Table 3: Comparision of fetal complications

	All Patients (n=689)	**38^{+0}-38^{+6} week (Group 1) (n=208)**	**≥39 week (Group 2) (n=481)**	**p**
	n (%)	n (%)	n (%)	
Clavicula fracture	5 (0.7)	1 (0.5)	4 (0.8)	1.000
Humerous fracture	0 (0)	0 (0)	0 (0)	
Brachial plexus injury	2 (0.3)	0 (0)	2 (0.4)	1.000
Shoulder dystocia	5 (0.7)	0 (0)	5 (1.0)	0.330
Cephal hematoma	4 (0.6)	0 (0)	4 (0.8)	0.321
Asphyxia	6 (0.8)	1 (0.5)	5 (1.0)	0.674
Pneumonia	1 (0.14)	0 (0)	1 (0.2)	1.000
Meconium aspiration	4 (0.6)	0 (0)	4 (0.8)	0.321
Stillbirth	4 (0.6)	2 (1.0)	2 (0.4)	0.588
Respiratuar distress syndrome	9 (1.3)	4 (1.92)	5 (1.03)	1.000
Necrotisian enterocolit	0 (0)	0 (0)	0 (0)	
Intraventricular bleeding	0 (0)	0 (0)	0 (0)	

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DISCUSSION

When fetal macrosomia is determined, there are three options: (i) elective caesarean delivery, but this is recommended only when the estimated fetal weight is≥4500g for diabetic women and 5000g for non-diabetic women; (ii) expectant management, but infants with birth weight ≥4500gr have a significantly increased risk of perinatal mortality, neonatal asphyxia, trauma, and cesarean delivery; (iii) induction of labour, thereby reducing the possibility of further fetal growth, and reducing the risk of cesarean delivery for cephalopelvic incompatibility and shoulder dystocia.

Induction in the early weeks is known to reduce the rates of caesarean delivery, maternal morbidity and complications and decrease shoulder dystocia and fetal trauma in labour. However, there are limited data related to the frequency of neonatal complications and morbidity in macrosomic fetuses induced at an early birth week.

In the current study it was aimed to determine the maternal and fetal outcomes of induced delivery of macrosomic fetuses after completion of 38 gestational weeks by comparing the maternal and fetal outcomes of macrosomic singleton pregnancies born at 38^{+0}-38^{+6} gestational weeks with those born at ≥39 weeks.

The recommended approach throughout the world for non-diabetic pregnant patients with estimated fetal birthweight of ≥4500gr is elective caesarean delivery. In our study aiming to determine the benefits of induction of vaginal delivery before reaching the estimated birthweight of 4500 gr, for both mother and infant, the results showed that although not statistically significant, delivery in the 38th gestational week reduced the rate of maternal and fetal trauma, there was a lower rate of C/S delivery because of macrosomic fetus and the need for neonatal intensive care and neonatal complications were reduced. Moreover, as no maternal and fetal trauma was observed in the nulliparous women giving birth in the 38th week, there was a statistically significant difference compared to those who gave birth at ≥39 weeks (p=0.017). In this study type II diabetes rate was 4.8% in the 1st group and 1.5% in the 2nd group (Table 1). This result was statistically significant (p=0.034). This explains the fact that there are fewer diabetic pregnant women at ≥39 weeks due to the fact that type II diabetic pregnant women had given birth at earlier weeks.

In the vast majority of previous studies, elective birth induction has been planned for the 39th gestational week, and when the results are compared, a much lower rate of maternal and fetal complications compared to the observation strategy has been observed (11). Although there are studies that have proposed that birth induction of macrosomic fetuses reduces maternal and fetal trauma compared to the watch-and-wait strategy, ACOG does not recommend induction because of macrosomia, stating that birth induction does not improve maternal and fetal outcomes (1). According to the results of the current study, induction was applied to 18.3% of the patients, and there was a statistically significantly higher rate of vaginal delivery in the women with birth induction (p=0.026). The most common indication for C/S delivery in these women was stalled labour/failed induction (p=0.0001). However, the rate of C/S delivery because of macrosomic fetus was observed to be significantly higher in patients who were not induced (p=0.001).

It is known that macrosomic fetuses, defined as birthweight >4000 gr or >4500 gr, are exposed to more birth trauma, and similarly there is an increased risk of birth trauma for the mother, and this is affected by gestational age, birth weight and macrosomia risk (1). According to the current study results, although not statistically significant, the birthweight of infants born at 38^{+0}-38^{+6} weeks was observed to be lower than that of those born at ≥39 weeks (p=0.176). This supports the fact that as the gestational week increases, so the infant weight increases (1,8-10).

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It has been reported in literature that clavicular fracture is seen in approximately 0.4%-0.6% of all births and generally heals without any sequelae, but the incidence of clavicular fracture in a macrosomic fetus increases 10-fold (1). In the current study, clavicular fracture was determined at the rate of 0.7% in the study group formed of all the macrosomic fetuses. Brachial plexus injury has been determined at the rate of approximately 1.5% in births in the USA, and this rate has been reported to be 2.6%-7% in vaginal births. When infant birthweight is >4500gr, this risk is increased 18-21-fold (1). In the current study, the rate of brachial plexus injury was determined as 0.3%, and the rate was similar in patients with vaginal birth and those who underwent C/S delivery because of macrosomic fetus (p=0.329). The incidence of shoulder dystocia is not clearly known as it has not been well documented but the incidence has been reported as 0.2%- 3% (12). In the current study, shoulder dystocia was determined at the rate of 0.7%.

If there is no medical indication, American Academy of Pediatrics does not recommend birth before 39 gestational weeks because of macrosomia to reduce neonatal complications (1). However, the results of the current study showed a reduction, although not statistically significant, in birth trauma and the need for neonatal intensive care in infants born in the 38th gestational week compared to those born ≥39 weeks, especially in nulliparous women. The neonatal complications of the infants born at 38-39 weeks were not greater in any infant compared to those born at ±39 weeks. Therefore, based on the results of this study, it can be suggested that macrosomic fetuses can be delivered in the 38th gestational week as they are not greatly affected by maternal and fetal trauma, and birth in these weeks does not put the infant at risk of neonatal complications. Just as multiparity is a factor, so birth induction is also a factor affecting normal birth. It is clear that each birth will be easier and quicker than the previous one, and maternal and fetal trauma will decrease. This is also valid for macrosomic fetuses. When the factors of multiparity and induction were removed from the current study analysis, no maternal or fetal trauma was observed in the nulliparous patient group who gave birth at 38^{+0}-38^{+6} gestational weeks and this rate was determined as 19.5% in those who gave birth at ≥39 weeks (p=0.017). Based on this result, as there was no difference in Apgar scores and the need for neonatal intensive care, birth in the 38th gestational week for women with a suspected macrosomic fetus, especially for nulliparous women, can be considered as an appropriate approach to reduce maternal trauma.

One of the limitations of the study is that it was conducted retrospectively. In addition, the study did not compare nulliparas with multiparas. In the study, only the effect of the difference between gestational weeks on birth trauma was examined.

In conclusion, the results of this study showed that maternal trauma in nulliparous women giving birth in the 38th gestational week was significantly lower than that of women who gave birth ≥39 weeks. However, it must be said that a definitive diagnosis of fetal macrosomia can only be made by weighing the infant at birth. When there is a suspicion of fetal macrosomia supported by maternal demographic characteristics, clinical examination and ultrasonographic measurements, with lifestyle changes before further gestational weeks and earlier delivery with induction, birth in the 38th gestational week can be recommended.

Conflict of Interest: The authors certify that they have no affiliations with or involvement any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional

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