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Should we conduct a trial of labor in women with a macrosomic fetus?

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Abstract

Objectives: There is much debate about the best mode of delivery for the macrosomic fetus. This study compares maternal and neonatal outcomes of macrosomic in prelabor cesareans (PLC) vs. in trials of labor (TOL).

Methods: Retrospective cohort including neonates with birthweight of 4,000 g or more delivered in a public teaching hospital between October 2019 and December 2024. Exclusions: preterm, non cephalic, multiples, fetal death and malformed. Created three composite outcomes: “any serious adverse neonatal outcome”, “any adverse maternal outcome”, “neonatal respiratory morbidity”. Considered significant a value of $p < 0.05$.

Results: Included 611 births. There was no maternal death and, in the group of TOL, one neonatal death; 37.7 % had vaginal births and 62.3 % had cesareans. Were conducted 341 (56 %) TOL's; from these, 32.8 % failed. Among 231 vaginal births, we had 61 (26.4 %) cases of shoulder dystocia, among which 9 neonates were discharged with brachial plexus injury (3.9 % of vaginal births; 1/25). We found a greater frequency of “any neonatal adverse outcome” in TOL, adjusted Odds Ratio (aOR) 6.68; $p = 0.037$. No significant difference in “respiratory morbidity”. In TOL, the frequency of “any maternal adverse outcome” was higher: aOR 3.53; $p = 0.009$. A sensitivity analysis excluding birthweights of 4,500 g or more had basically the same results.

Conclusions: We had a high frequency of infants discharged with brachial plexus injury. Higher maternal morbidity in TOL could be because of the high rate of failed TOL. Not accessed in this work, there is still some difficulty in correctly identifying the macrosomic antenatally.

Keywords: macrosomic fetus; prelabor cesareans; trials of labor; mode of delivery; shoulder dystocia

Introduction

There is a special concern about neonatal and maternal adverse outcomes associated with the birth of neonates with 4,000 g or more [1–3]. Are reported a higher frequency of cesarean sections, operative vaginal deliveries, shoulder dystocia, low Apgar scores, metabolic abnormalities like hypoglycemia, neonatal death, and other [1, 3]. These neonates are named macrosomic [2], although some authors reserve this expression to neonates weighing 4,500 g or more [4, 5].

There is some debate about the best route of delivery for these neonates, as cesarean sections for pregnant women with an estimated fetal weight higher than 4,000 or 4,500 g could prevent some of the complications listed above. In the other hand, cesareans increase the risk of maternal morbidity [6, 7] and mortality [8–10], and respiratory morbidity of the neonate [11, 12]. Besides that, the antenatal detection of macrosomia still poses some difficulties, with non-negligible numbers of false positives and negatives [13].

Even with all these doubts, despite many research report the maternal and neonatal outcomes of the births of macrosomic fetuses, including the cesarean section rates, few studies compared these outcomes related to mode of delivery in an adequate manner [14, 15]. The objective of the present study is to compare the maternal and neonatal outcomes between prelabor cesareans (PLC) and trials of labor (TOL) in a cohort of births of macrosomic neonates.

Subjects and methods

It was conducted a retrospective cohort study with the births of macrosomic neonates who were assisted in Women's Hospital

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of São Bernardo do Campo, a public teaching hospital located in the metropolitan area of São Paulo, Brazil. We considered macrosomic the neonates weighing 4,000 g or more. The independent variable was mode of delivery, and the dependent variables were maternal and neonatal adverse outcomes.

However, on what regards to mode of delivery, the simple comparison between vaginal and cesarean delivery is not correct. This is because many times, cesarean section is the solution for the problems that arise during a trial of vaginal birth, like concern about fetal well being during labor, dystocia, and others. This means that many cases of cesarean sections performed in labor carries the risks of the procedure itself, together with the risks of failed trials of labor. Indeed, the highest frequencies of maternal and neonatal adverse outcomes are observed in intralabor cesareans [16, 17]. Besides this, in daily practice, one cannot offer the woman a vaginal delivery, but rather, a trial of labor/vaginal delivery, which sometimes finishes in a cesarean delivery. In 2006, the National Institutes of Health of the United States, in a conference Statement about cesarean section on maternal request, utilized this mode of comparison [18].

The macrosomic neonates were identified through the list of births, a list filled by the nurses in the labor ward with information about birthweight, besides other data. We then accessed the medical records of the identified neonates to collect more detailed clinical data through a pre specified chart. Data was collected by the authors, without the utilization of hired people. The maternal adverse outcomes were: blood transfusion, hysterectomy, puerperal infection, third or fourth perineal tears, dehiscence or hematomas in the surgical site, or death; the neonatal adverse outcomes were: Apgar score less than seven in the fifth minute, meconium aspiration syndrome, shoulder dystocia, brachial plexus injury, cefalohematoma, clavicle fracture and other trauma, oxygen administration (excluding administration in the labor room), assisted ventilation, admission to neonatal intensive care unit (NICU), and hypoglycemia. We also accessed neonatal and maternal length of stay, from birth to discharge. As we anticipated a small frequency of adverse outcomes, we proposed some composite maternal and neonatal adverse outcomes. We defined maternal composite outcome (“any maternal adverse outcome”) as any of the outcomes described above. We proposed two neonatal composite outcomes: a) “any serious neonatal adverse outcome”, including neonatal death, 5 min Apgar score less than seven, meconium aspiration syndrome, brachial plexus injury, cefalohematoma, and b) “neonatal respiratory morbidity”, including mechanical ventilation and/or receiving oxygen. We agree that mechanical ventilation and/or admission to neonatal intensive care unit can be considered adverse neonatal outcomes. However, it is expected that assisted

ventilation and oxygen administration be more frequent in PLC (“respiratory morbidity”) [11, 12], while the outcomes of “any serious neonatal adverse outcome” are expected to be more frequent in TOL. Grouping them all together would lead to the false conclusion that there are no differences between the two groups. The same holds for NICU or intermediate care unit admission. As there are many reasons for these admissions, the inclusion of this outcome in a composite outcome would tend to the null hypothesis.

We also accessed maternal and fetal/neonatal demographic and clinical data to utilize as control variables: a) maternal: age, parity, number of previous cesareans, gestational age, number of prenatal visits, induced or spontaneous labor, fundal height, maternal diseases: hypertension (chronic, gestational or preeclampsia), diabetes (overt or gestational) and “other diseases”; and b) neonatal: birthweight and sex.

We also looked for maternal/labor/fetal variables available before birth which could be predictors of shoulder dystocia in the group of vaginal birth, and still, variables which could be predictors of vaginal birth in the group of TOL.

Finally, considering the two distinct definitions of macrosomia mentioned above, we repeated the more important analyses, namely, association of mode of delivery with the composite outcomes “serious adverse neonatal outcomes” and “any maternal adverse outcome”, excluding from the sample the neonates with birthweight less than 4,500 g, as a sensitivity analysis.

For dichotomic variables, it was utilized the chi square test or Fischer’s test. For the continuous variables, as data were not normally distributed, it was utilized Mann-Whitney and Kruskal-Wallis tests. It was conducted multi-variable analyses. Considering the low frequency of outcomes, it was utilized the regression models of Poisson and of Firth. It was utilized the Odds Ratio (OR) as a measure of effect. The value of $p < 0.05$ was set as significant. Data was inserted in an Excel table, and later transported to statistical programs SPSS 20.0 and STATA 18.

The study was approved by the Ethics Committee of Faculty of Medicine of ABC, number 5.944.335, date March 15th, 2023.

Results

In the period of the study, we had 611 births included. There was no maternal death, no maternal near miss, and there was one neonatal death in the group of TOL. Table 1 shows the demographic and clinical profile of the two groups: TOL and PLC. The group of TOL had a significant higher frequency of one previous cesarean, gestational age above 40 weeks, and a significant lower frequency of hypertension and diabetes.

Only 19.3 % of the women had a diagnosis of diabetes, and 39 (6.4 %) of the neonates weighed 4,500 g or more. There were 231 vaginal births (37.7 %), from which 6 were forceps deliveries (0.98 % of all births). There were 381 cesareans (62.3 %). As comparison, during the period of the study, the average rate of cesarean in the whole population of births was of about 36 %. Were performed 269 (44 %) prelabor cesareans, from which 123 (45.7 %) were for suspected macrosomia (all by ultrasound weigh estimation). Were conducted 341 (56 %) TOL's; from these, 112 (32.8 %) finished in cesarean sections. From the group of 341 TOL's, if we exclude the six cesarean sections which were indicated for maternal request during labor, the proportion falls to 31.6 %. The indications for cesarean section were: suspected fetal distress, 38.4 % (of 112); arrest of dilatation: 25.9 %; cephalopelvic disproportion: 20.5 %; thick meconium in early labor: 9.8 %; maternal request during labor: 5.4 %. Macrosomia was suspected in 152 women, 24.9 % of the whole sample (all by ultrasound; in 29 of these cases with suspicion, there were other indications for cesarean section). In only six women with suspected macrosomia, TOL was conducted, and four achieved vaginal birth. Were submitted to labor induction 183 women (29.9 %). The rate of success (vaginal birth) was of 53 %.

Among 231 vaginal births, we had 61 (26.4 %) cases of shoulder dystocia, among which 9 neonates were discharged with brachial plexus injury (3.9 % of vaginal births; one out of 25; 14.8 % of all shoulder dystocia). There were 13 clavicle fractures, 2.1 % of all births, all in vaginal deliveries (one out of 47 vaginal births).

We found a greater frequency of “any serious neonatal adverse outcome” in the group of TOL (Table 2), adjusted OR 6.68, $p=0.037$; power of 79.4 %. A surprising finding was that in the group of TOL, the frequency of “any maternal adverse outcome” was significantly higher than in the group of PLC (Table 3), adjusted OR 3.31, $p=0.017$; power of 79.4 %.

Despite a lower frequency of “respiratory morbidity” in TOL, the difference was not significant. However, primiparity remained significantly associated with this outcome in the multivariable analysis (Table 4). In the same line, the lower frequency of admission to NICU in TOL did not reach significance (Table 5).

There was no significant association between TOL and hypoglycemia, adjusted OR 0.73; $p=0.350$. In the same line, it was not found significant associations between the variables tested (maternal age, primiparity, five or more births, more than 40 weeks gestation, one previous cesarean, fetal sex, less than six prenatal visits, maternal diabetes, maternal hypertension, “other diseases”, and fundal height) with shoulder dystocia in the population of vaginal births. In the other hand, within the population of TOL, when tested for the same variables as for shoulder dystocia, one previous cesarean and

Table 1: Maternal demographic and clinical variables of 611 births of macrosomic neonates related to trial of labor or not.

	Trial of labor		Total	p-Value
	Yes	No		
Maternal variables				
Age				0.068 ^a
From 15 to 18 years	5/271 (1.8)	8/339 (2.4)	13/610 (2.1)	
From 19 to 35 years	200/271 (73.8)	274/339 (80.8)	474/610 (77.7)	
36 years or more	66/271 (24.4)	57/339 (16.8)	123/610 (20.2)	
Primipara, n, %				0.464 ^a
Yes	195/271 (72.0)	234/338 (69.2)	429/609 (70.4)	
No	76/271 (28.0)	104/338 (30.8)	180/609 (29.6)	
1 previous cesarean, n, %				<0.001 ^a
Yes	168/271 (62.0)	277/338 (82.0)	445/609 (73.1)	
No	103/271 (38.0)	61/338 (18.0)	164/609 (26.9)	
Parity≥5, n, %				0.116 ^a
Yes	268/271 (98.9)	328/338 (97.0)	596/609 (97.9)	
No	3/271 (1.1)	10/338 (3.0)	13/609 (2.1)	
IG≥40+1, n, %				0.007 ^a
No	172/271 (63.5)	179/340 (52.6)	351/611 (57.4)	
Yes	99/271 (36.5)	161/340 (47.4)	260/611 (42.6)	
Number of prenatal visits n, %				0.901 ^a
6 or more visits	230/250 (92.0)	287/311 (92.3)	517/561 (92.2)	
1 to 5 visits	20/250 (8.0)	24/311 (7.7)	44/561 (7.8)	
Labor induction				<0.001 ^a
No	237/271 (87.5)	191/340 (56.2)	428/611 (70.0)	
Yes	34/271 (12.5)	149/340 (43.8)	183/611 (30.0)	
Maternal diabetes n, %				<0.001 ^a
No	201/271 (74.2)	292/340 (85.9)	493/611 (80.7)	
Yes	70/271 (25.8)	48/340 (14.1)	118/611 (19.3)	
Maternal hypertension n, %				0.003 ^a
No	201/271 (74.2)	285/340 (83.8)	486/611 (79.5)	
Yes	70/271 (25.8)	55/340 (16.2)	125/611 (20.5)	
Other maternal diseases n, %				0.099 ^a
No	222/271 (81.9)	295/340 (86.8)	517/611 (84.6)	

Table 1: (continued)

	Trial of labor		Total	p-Value
	Yes	No		
Yes	49/271 (18.1)	45/340 (13.2)	94/611 (15.4)	

Bold numbers mean significant results. ^aIt was utilized the chi square test.

Table 2: Multivariable analyses (^a) for the association of trial of labor with the composite outcome “any serious neonatal adverse outcome”.

	Univariable analyses		Multivariable analysis	
	Crude OR (95 %CI)	p-Value	Adjusted OR (95 %CI)	p-Value
Trial of labor, yes	6.80 (1.24 a 37.28)	0.027	6.68 (1.12 a 40.03)	0.037
Maternal age (from 19 to 35 years: Reference)		0.533		0.221
From 15 to 18 years	1.81 (0.10 a 32.67)	0.689	1.16 (0.05 a 24.55)	0.923
36 years or more	1.88 (0.60 a 5.89)	0.276	3.31 (0.86 a 12.79)	0.082
Primipara	1.12 (0.36 a 3.49)	0.843	1.58 (0.41 a 6.20)	0.508
One previous cesarean	0.90 (0.27 a 3.06)	0.868	0.55 (0.09 a 3.34)	0.515
Parity $\geq$ 5	1.58 (0.09 a 28.05)	0.754	0.78 (0.04 a 17.03)	0.875
Male sex	0.93 (0.31 a 2.75)	0.894	0.95 (0.29 a 3.11)	0.929
Gestational age $\geq$ 40+1	1.16 (0.40 a 3.36)	0.783	1.22 (0.37 a 4.04)	0.750
1 to 5 prenatal visits (reference: 6 or more visits)	0.50 (0.03 a 8.65)	0.635	0.76 (0.04 a 13.52)	0.850
Maternal diabetes	0.91 (0.23 a 3.62)	0.892	1.14 (0.25 a 5.14)	0.869
Maternal hypertension	1.86 (0.59 a 5.80)	0.287	2.61 (0.76 a 8.99)	0.128
Other maternal diseases	1.18 (0.29 a 4.70)	0.818	1.30 (0.30 a 5.59)	0.725

OR, odds ratios. ^aUtilized logistic regression with Firth model. Bold numbers means significant results.

primiparity were risk factors for failed TOL; for one previous cesarean: 47.5 vs. 29.2, $p=0.006$, and for primipara: 43.3 vs. 27.8 %, $p=0.005$. We also found a significant longer hospital stay for the neonates in the group of prelabor cesareans, 3.9 vs. 3.0 days, $p=0.007$. There was no significant difference in the hospital stay for the mothers. The results mentioned in this paragraph were not shown in tables.

Table 3: Multivariable analyses (^a) for the association of trial of labor with the composite outcome “any maternal adverse outcome”.

	Univariable analyses		Multivariable analysis	
	Crude OR (95 %CI)	p-Value	Adjusted OR (95 %CI)	p-Value
Trial of labor, yes	3.58 (1.40 a 9.20)	0.008	3.31 (1.23 a 8.85)	0.017
Maternal age (from 19 to 35 years: Reference)		0.500		0.886
From 15 to 18 years	2.30 (0.40 a 13.12)	0.350	1.58 (0.25 a 9.93)	0.626
36 years or more	0.72 (0.26 a 2.01)	0.532	1.04 (0.33 a 3.32)	0.941
Primipara	2.16 (1.02 a 4.59)	0.044	2.10 (0.84 a 5.25)	0.111
One previous cesarean	0.48 (0.17 a 1.35)	0.164	0.73 (0.21 a 2.55)	0.616
Parity $\geq$ 5	2.48 (0.44 a 14.06)	0.306	2.77 (0.40 a 19.15)	0.302
Male sex	0.90 (0.42 a 1.93)	0.791	0.82 (0.37 a 1.83)	0.634
Gestational age $\geq$ 40+1	0.75 (0.35 a 1.63)	0.469	0.76 (0.33 a 1.74)	0.515
1 to 5 prenatal visits (reference: 6 or more visits)	0.66 (0.12 a 3.54)	0.631	0.74 (0.13 a 4.16)	0.733
Maternal diabetes	0.76 (0.27 a 2.11)	0.597	0.87 (0.29 a 2.64)	0.804
Maternal hypertension	1.66 (0.73 a 3.78)	0.230	1.68 (0.68 a 4.13)	0.261
Other maternal diseases	1.00 (0.36 a 2.79)	0.996	1.12 (0.39 a 3.23)	0.827

Bold numbers mean significant results.

The analyses excluding birthweights of 4,500 g or more had basically the same results as those with the whole population (Tables 6 and 7).

Discussion

It is not easy to give a simple recommendation about the best mode of delivery for pregnancies with suspected macrosomia. We found higher frequency of a composite neonatal as well as composite maternal adverse outcome in TOL compared with PLC. However, the absolute frequency of adverse outcomes was low in mothers (4.6 %) as well as the frequency of serious adverse outcomes (2.2 %) in the neonates. As mentioned in Results, we had only one neonatal death secondary to severe hypoxia after shoulder dystocia, in the group of TOL; we had no maternal death and no maternal near miss. Perhaps more relevant than the

Table 4: Multivariable analyses ^(a) for the association of trial of labor with the composite outcome “respiratory morbidity”.

	Univariable analyses		Multivariable analysis	
	Crude OR (95 %CI)	p-Value	Adjusted OR (95 %CI)	p-Value
Trial of labor, yes	0.86 (0.60 a 1.24)	0.417	0.78 (0.52 a 1.17)	0.227
Maternal age (from 19 to 35 years: Reference)		0.084		0.128
From 15 to 18 years	2.53 (1.11 a 5.80)	0.028	1.96 (0.77 a 4.96)	0.158
36 years or more	1.14 (0.73 a 1.78)	0.555	1.48 (0.89 a 2.46)	0.132
Primipara	1.67 (1.16 a 2.42)	0.006	1.70 (1.05 a 2.73)	0.030
One previous cesarean	0.79 (0.51 a 1.22)	0.281	0.79 (0.45 a 1.37)	0.399
Parity $\geq$ 5	0.00 (–)	0.999	0.00 (–)	0.971
Male sex	0.81 (0.56 a 1.17)	0.263	0.74 (0.50 a 1.10)	0.140
Gestational age $\geq$ 40+1	0.72 (0.49 a 1.05)	0.091	0.86 (0.56 a 1.31)	0.477
1 to 5 prenatal visits (reference: 6 or more visits)	0.60 (0.24 a 1.46)	0.258	0.73 (0.29 a 1.80)	0.489
Maternal diabetes	1.33 (0.87 a 2.03)	0.193	1.30 (0.81 a 2.10)	0.275
Maternal hypertension	1.52 (1.02 a 2.28)	0.040	1.36 (0.87 a 2.12)	0.180
Other maternal diseases	0.74 (0.42 a 1.29)	0.288	0.67 (0.37 a 1.20)	0.178

OR, odds ratios. ^aUtilized the Poisson regression model. Bold numbers means significant results.

Table 5: Multivariable analyses ^(a) for the association of trial of labor with admission to neonatal intensive care unit.

	Univariable analyses		Multivariable analyses	
	Crude OR (95 %CI)	p-Value	Adjusted OR (95 %CI)	p-Value
Trial of labor, yes	0.76 (0.48 a 1.20)	0.238	0.62 (0.36 a 1.05)	0.076
Maternal age (from 19 to 35 years: Reference)		0.429		0.313
From 15 to 18 years	1.95 (0.52 a 7.27)	0.321	1.21 (0.24 a 6.04)	0.817
36 years or more	1.30 (0.75 a 2.25)	0.351	1.65 (0.86 a 3.17)	0.131
Primipara	1.52 (0.94 a 2.46)	0.085	1.63 (0.88 a 3.03)	0.121
One previous cesarean	0.75 (0.44 a 1.30)	0.312	0.65 (0.32 a 1.30)	0.223
Parity $\geq$ 5	0.00 (–)	0.999	0.00 (–)	0.999
Male sex	0.77 (0.48 a 1.23)	0.279	0.72 (0.43 a 1.21)	0.215
Gestational age $\geq$ 40+1	0.68 (0.42 a 1.09)	0.110	0.97 (0.56 a 1.68)	0.903
1 to 5 prenatal visits (reference: 6 or more visits)	0.64 (0.22 a 1.84)	0.404	0.79 (0.26 a 2.38)	0.679
Maternal diabetes	1.80 (1.07 a 3.03)	0.028	2.05 (1.12 a 3.76)	0.020
Maternal hypertension	1.41 (0.83 a 2.39)	0.209	1.14 (0.62 a 2.09)	0.665
Other maternal diseases	0.77 (0.39 a 1.51)	0.449	0.69 (0.33 a 1.44)	0.319

OR, odds ratios. ^aUtilized logistic regression. Bold numbers means significant results.

associations mentioned above was the high frequency of shoulder dystocia. It was 26.5 % of all vaginal births. It is more than the frequency reported by Lim et al., who had a frequency of 4.9 % of all vaginal births [21], and also more than Raio et al., with 13.1 % of all vaginal births [22]. These differences could be due to distinct definitions among the institutions. But more important than this is the frequency of brachial plexus injuries. As mentioned in Results, nine neonates (3.9 % of vaginal births; 14.8 % of all shoulder dystocia) were discharged with brachial plexus injury. Data are scarce in the literature to make comparisons. Elmas et al., in a sample of 560 cases of shoulder dystocia, had 15.7 % of transient and 2.1 % of permanent injuries [23]. Unfortunately, we were not able to follow up these infants to access their long term outcomes.

The frequency of failed TOL was 32.8 and 31.6 % if we exclude cesareans for maternal request during labor. As comparison, the frequency of failed TOL in multipara at

term with singleton fetus in cephalic presentation in spontaneous labor is about 5 % in our institution. Considering recent studies, Stimjanin et al. had 23 % [19]; Siggelkow had 27.4 % [20]. Levin et al. had 36 % in neonates with 4,500 g or more [15]. Lim et al. had, in 2002, a frequency of 31 % [21]. The rate of vaginal births in induced labors was 53 %. Of note, in our institution, it is not usual to indicate labor induction because of suspected macrosomy. Consequently, most of these inductions, if not all, are for other indications. As comparison, in the institution, the average rate of vaginal birth after labor induction in the whole population is around 75 %.

There was a significant higher frequency of neonatal adverse outcomes in the group of TOL. It is not a surprising finding, as this has already been reported when the comparison is between TOL vs. PLC, which is the adequate comparison (see Methods) [16, 17, 24]. Surprisingly, even recent studies simply compared cesarean vs. vaginal

Table 6: Multivariable analyses ^(a) for the association of trial of labor with the composite outcome “any serious neonatal adverse outcome” after excluding from the sample neonates with birthweight of 4,500 g or more.

	Univariable analyses		Multivariable analysis	
	Crude OR (95 %CI)	p-Value	Adjusted OR (95 %CI)	p-Value
Trial of labor, yes	5.99 (1.08 a 33.13)	0.040	4.99 (0.86 a 29.03)	0.074
Maternal age (from 19 to 35 years: Reference)		0.779		0.420
From 15 to 18 years	1.70 (0.09 a 30.70)	0.720	1.39 (0.07 a 28.13)	0.832
36 years or more	1.51 (0.43 a 5.23)	0.518	2.60 (0.62 a 10.92)	0.191
Primipara	1.22 (0.38 a 3.87)	0.738	1.53 (0.39 a 6.05)	0.544
One previous cesarean	1.03 (0.30 a 3.57)	0.960	0.58 (0.09 a 3.61)	0.556
Parity $\geq$ 5	1.73 (0.10 a 30.87)	0.709	1.12 (0.05 a 25.57)	0.944
Male sex	0.83 (0.27 a 2.52)	0.739	0.78 (0.23 a 2.63)	0.687
Gestational age $\geq$ 40+1	0.96 (0.32 a 2.92)	0.941	0.83 (0.23 a 2.95)	0.769
1 to 5 prenatal visits (reference: 6 or more visits)	0.52 (0.03 a 9.10)	0.657	0.71 (0.04 a 12.60)	0.818
Maternal diabetes	0.58 (0.10 a 3.20)	0.528	0.70 (0.11 a 4.24)	0.693
Maternal hypertension	1.50 (0.43 a 5.20)	0.523	2.02 (0.54 a 7.55)	0.294
Other maternal diseases	1.26 (0.31 a 5.08)	0.750	1.32 (0.31 a 5.67)	0.708

OR, odds ratios. ^aUtilized logistic regression with Firth model. Bold numbers means significant results.

Table 7: Multivariable analyses ^(a) for the association of trial of labor with the composite outcome “any maternal adverse outcome”, after excluding from the sample neonates with birthweight of 4,500 g or more.

	Univariable analyses		Multivariable analysis	
	Crude OR (95 %CI)	p-Value	Adjusted OR (95 %CI)	p-Value
Trial of labor, yes	3.29 (1.28 a 8.49)	0.014	3.16 (1.19 a 8.43)	0.021
Maternal age (from 9 to 35 years: Reference)		0.516		0.908
From 15 to 18 years	2.25 (0.39 a 12.91)	0.362	1.50 (0.24 a 9.45)	0.664
36 years or more	0.78 (0.28 a 2.19)	0.636	1.04 (0.33 a 3.31)	0.941
Primipara	2.25 (1.05 a 4.84)	0.037	2.08 (0.83 a 5.19)	0.118
One previous cesarean	0.52 (0.19 a 1.46)	0.214	0.73 (0.21 a 2.55)	0.616
Parity $\geq$ 5	2.61 (0.46 a 14.96)	0.281	2.73 (0.39 a 18.95)	0.310
Male sex	0.86 (0.40 a 1.86)	0.698	0.82 (0.37 a 1.83)	0.633
Gestational age $\geq$ 40+1	0.78 (0.36 a 1.71)	0.535	0.74 (0.32 a 1.71)	0.482
1 to 5 prenatal visits (reference: 6 or more visits)	0.63 (0.12 a 3.37)	0.590	0.70 (0.13 a 3.95)	0.691
Maternal diabetes	0.85 (0.30 a 2.37)	0.749	0.89 (0.30 a 2.71)	0.843
Maternal hypertension	1.52 (0.64 a 3.60)	0.341	1.70 (0.69 a 4.17)	0.249
Other maternal diseases	1.01 (0.36 a 2.85)	0.981	1.08 (0.37 a 3.10)	0.893

OR, odds ratios. ^aUtilized logistic regression with Firth model. Bold numbers means significant results.

delivery (see Methods) [4, 14, 25] and concluded for equal or higher frequency of neonatal adverse outcomes in cesareans vs. vaginal birth. As mentioned in Introduction, few studies about macrosomia compared maternal and neonatal adverse outcomes in the manner we consider adequate. Indeed, a review published by Boulet et al. did not find, in our opinion, studies which adequately addressed the issue of mode of birth in the macrosomic [14]. Levin et al., comparing TOL with PLC, found a higher frequency of meconium aspiration syndrome in TOL as the only significant result [15]. They did not find differences in maternal outcomes. However, they studied a smaller sample of 121 births, and did not propose composite outcomes.

A not expected finding was the higher significant frequency of the composite outcome “any maternal adverse outcome” in the group of TOL. One of the main arguments to

propose a trial of labor in this population is to avoid a cesarean section and, as result, lowering the risks of maternal morbidity. Consequently, this finding is an argument against TOL in the population of macrosomic. One possible explanation for this higher frequency in cases of TOL is the high frequency of failed tol (cesareans in labor), of 32.6 % in this group. The higher maternal risk of cesareans in labor, compared to prelabor cesareans, is well known in the literature. We can suppose that if the frequency of failed TOL is above a certain level in a specific population, trial of labor could increase the risks. This issue has been studied by Grobman et al. in a large sample of TOL after one previous cesarean. It is our opinion that this aspect in the care of birth is not given the deserved attention in the obstetrical community, as well in the literature. However, there are some reports about this issue [26]. In the other hand, the higher

short term frequency of adverse maternal outcomes must be viewed in light of the well documented higher risk of morbidity in future pregnancies, like placenta previa, abruptio and abnormally adherent placenta [27, 28]. But unfortunately, the design of our study does not allow us to access this last issue.

We were able to repeat the more important analyses after the exclusion of neonates with birthweights of 4,500 g or more. This has some importance, considering that some authors [5] consider this birthweight as the cut off point for defining macrosomia. Interestingly, we had basically the same results, with the exception that in the multivariate analysis the composite outcome “any neonatal serious adverse outcome” was marginally significant. But we can reasonably suppose that it would become significant with a larger sample.

In our sample, only 118 women (19.3 %) had the diagnosis of diabetes. Although there may have been some underdiagnosis, it shows that most of the mothers of macrosomic infants do not have diabetes. It is in line with the report of Jolly et al., who reported a frequency of 39.4 % of diabetic mothers, and showed that obesity can be a risk factor even more important than diabetes [29].

Another important aspect about the conduct in macrosomia is the accuracy of antenatal detection of this condition. Melamed et al. report 18.8 % of false positive and 30.1 % of false negative results [13]. Some authors believe that there is ground for improvement, through utilization of other tools like magnetic resonance [30], four dimensional ultrasound [31], other ultrasound parameters [32, 33], adding clinical and demographic parameters to ultrasound [34], among others. At least two studies [35, 36] showed higher accuracy when the interval between the ultrasound exam and the birth is of seven days or less. Another aspect is the low rate of detection of macrosomia and/or large for gestational age fetuses in the general population. Birene et al. reported a sensitivity of 37 % with third trimester ultrasound [37]. As an example, in only 24.9 % of our sample of 611 births there was suspicion of macrosomia. But it is better than the rate reported by Heywood et al. [38]; they studied a sample similar to the one of our study, a cohort of macrosomic neonates in a teaching hospital, with most of the mothers without ultrasound exams, and had an antenatal suspicion rate of 11 %.

The weak aspects of this study are, first, its retrospective character, which can introduce classification bias. Second, we utilized birthweight, an information which is acquired after birth, and did not study the question about how to correctly identify antenatally the macrosomic fetuses. However, we do believe that the antepartum detection of macrosomia has a tendency to improve in the long run.

The strong aspects of the study are, first, the size of the sample, which allowed us to conduct multivariable analyses for most of the outcomes. Second, the collection of data from medical records, which enabled us to access detailed clinical data. Third, the correct comparison of mode of delivery, that is TOL vs. PLC. Fourth, we conducted a sensitivity analysis excluding neonates with 4,500 g or more, and the results were consistent with the findings in the whole sample. Despite the results for the outcome “any serious neonatal outcome” was marginally significant ($p=0.074$), the high effect size (OR 4.99) is suggestive of a true association, and, as commented above, we can suppose that a larger sample would give a p value less than 0.05.

As conclusion, more than simply trying to answer the question of the title, that is, if we should or not conduct a trial of labor in the suspicion of macrosomia, this study aims to highlight to patients and professionals the risks and benefits associated with each of these two choices.

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