Low Apgar scores at 5 minutes in a low risk population: maternal and obstetrical factors and postnatal outcome

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Summary

Objective: To evaluate the association between Apgar scores of less than seven at five minutes ($AS^{5min} < 7$) and antenatal factors and postnatal outcomes. **Methods:** A retrospective cohort and case-control study of 27,252 consecutive term newborns in a low risk obstetrical population between January 2003 and December 2010. Maternal and infant databases were reviewed from all cases with $AS^{5min} < 7$ (n = 121; 0.4%) and 363 cases with $AS^{5min} \geq 7$ at 5 minutes who were randomly selected by a computer program. The main outcomes were neonatal death, newborn respiratory distress, need for orotracheal intubation and neonatal intensive care unit (NICU), and hypoxic-ischemic-encephalopathy. **Results:** After multiple regression analysis, repeated late decelerations on cardiotocography (OR: 2.4; 95% CI: 1.4-4.1) and prolonged second stage of labor (OR: 3.3; 95% CI: 1.3-8.3) were associated with $AS^{5min} < 7$, as well as neonatal respiratory distress (OR: 3.0; 95% CI: 1.3-6.9), orotracheal intubation (OR: 2.5; 95% CI: 1.2-4.8), need for NICU (OR: 9.5; 95% CI: 6.7-16.8), and hypoxic-ischemic-encephalopathy (OR: 14.1; 95% CI: 3.6-54.7). No other antenatal factors were associated with $AS^{5min} < 7$ ($p > 0.05$). **Conclusion:** Repeated late decelerations and prolonged second stage of labor in the low-risk population are predictors of $AS^{5min} < 7$, a situation associated with increased risk of neonatal respiratory distress, need for mechanical ventilatory support and NICU, and hypoxic-ischemic-encephalopathy.

Keywords: Apgar scores; term; asphyxia; neonatal mortality; hypoxic-ischemic-encephalopathy; delivery.

Resumo

Baixos índices de Apgar no quinto minuto de vida em população de baixo risco: fatores maternos e obstétricos e resultados pós-natais

Objetivo: Avaliar a associação entre índice de Apgar menor que sete no 5º minuto, os fatores pré-natais e resultados pós-natais. **Métodos:** Trata-se de estudo retrospectivo com 27.252 recém-nascidos em maternidade escola com população de baixo risco obstétrico, de janeiro de 2003 a dezembro de 2010. Prontuários de todos os casos com índice de Apgar < 7 no 5º minuto (n = 121; – 0,4%) e de 363 casos com Apgar ≥ 7 no 5º minuto, escolhidos ao acaso, foram revisados. Os principais desfechos estudados foram: óbito neonatal, insuficiência respiratória neonatal, necessidade de intubação orotraqueal e de unidade terapia intensiva (UTI) neonatal e encefalopatia hipóxico-isquêmica. **Resultados:** Após análise de regressão múltipla, desacelerações tardias (DIP II) (OR: 2,4; IC95%: 1,4-4,1) e período expulsivo prolongado (OR: 3,3; IC 95%: 1,3-8,3) se associaram com Apgar < 7 no 5º minuto; assim como com insuficiência respiratória ao nascimento (OR: 3,0; IC 95%: 1,3-6,9), intubação traqueal (OR: 2,5; IC 95%: 1,2-4,8), necessidade de UTI neonatal (OR: 9,5; IC 95%: 6,7-16,8) e encefalopatia hipóxico-isquêmica (OR: 14,1; IC 95%: 3,6-54,7). Nenhuma outra variável prénatal se associou com Apgar < 7 no 5º minuto ($p < 0,05$). **Conclusão:** DIP II e período expulsivo prolongado estão associados com Apgar < 7 no 5º minuto em população obstétrica de baixo risco; situação essa relacionada com maior risco de insuficiência respiratória no parto, necessidade de suporte ventilatório e encefalopatia hipóxico-isquêmica.

Unitermos: Índice de Apgar; parto; asfixia; mortalidade neonatal; encefalopatia hipóxico-isquêmica.

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Introduction

In 1952 the anesthesiologist Virginia Apgar proposed her score as a new method to evaluate the physical condition of newborns shortly after birth[1,2]. Initially the Apgar scores were created simply to classify the conditions of the newborn regarding obstetrical characteristics, maternal pain relief, and effects of resuscitation. Later, the Apgar scores determined at five minutes after delivery became widely used for the prediction of asphyxia as well as hypoxic-ischemic-encephalopathy and cerebral palsy[3-6]. A recent study showed that Apgar scores of less than 7 at five minutes ($AS^{5min} < 7$) after birth were associated with subtle cognitive impairment as measured by academic achievement at 16 years of age. However, the value of the $AS^{5min} < 7$ is still considered controversial by different studies and many neonatologists across the world[7,8].

In addition, it is not clear which maternal or obstetrical conditions may be associated with a low AS^{5min}. Studies suggested that multiparity, deficient prenatal care, low gestational age at birth, forceps, and abnormal cardiotocographic recording (CTG), such as repeated decelerations (DIP II), may be related to a low AS^{5min} [9-18].

The present study aimed to evaluate the consequences for the infant with $AS^{5min} < 7$ and the possible maternal or obstetrical factors that may be associated with this condition in a low-risk secondary maternity center at a university hospital.

Patients and methods

The hospital database was reviewed from January 2003 to December 2010. The present study was designed as a hospital-based cohort and a case-control format. All information was prospectively recorded in a computer database at this university hospital, which is a regional secondary hospital. The inclusion criteria were singleton pregnancy, and gestational age at delivery between 37 and 41 6-7 weeks. Exclusion criteria was fetal death. Since this maternity center is a secondary hospital, all pregnant women with any disease are referred to a tertiary hospital. Therefore, none of the patients included in the present study had any clinical disease.

Based on the database, a total of 27,254 consecutive term infants (37-42 weeks of gestation) were born during this period, and 121 (0.4%) newborns had an $AS^{5min} < 7$ at birth. In order to evaluate the possible associated predictor factors and the outcomes related to the $AS^{5min} < 7$, a total of 363 infants (three times the number of cases) with $AS^{5min} \geq 7$ were randomly selected by a computer program. The present protocol was approved by the institutional review board.

The following maternal and obstetrical data were evaluated: 1) maternal age; 2) parity; 3) prenatal care (yes or no) and number of visits; 4) gestational age at delivery (birth); 5) presence of repeated late decelerations considering the entire CTG trace during labor. A late deceleration is a smooth, gradual, symmetrical decrease in fetal heart rate beginning at or after the peak of the contraction and returning to baseline only after the contraction has ended. The onset, nadir, and recovery of the deceleration occur after the beginning, peak, and ending of the contraction, respectively. The magnitude of late decelerations is rarely more than 30 to 40 beats/min below baseline and typically not more than ten to 20 beats/min. Repeated late decelerations were considered as two repetitions every ten minutes, usually not accompanied by accelerations[19,20]; 6) presence of meconium; 7) umbilical cord prolapse; 8) shoulder dystocia; 9) clinical signs of chorioamnionitis; 10) presence and duration of premature rupture of the membranes (PROM); 11) type of delivery; 12) prolonged second stage of labor, defined as more than two hours from onset of second stage to birth, or three hours from onset of second stage to birth without or with regional anesthesia, respectively[21-23]; 13) vaginal delivery in breech presentation; 14) placental abruption; 15) uterine rupture; 16) episiotomy in vaginal deliveries; 17) maternal anesthesia and type (regional block or local pudendal anesthesia); and 18) small-size for gestational age, confirmed at birth by newborn weight below two standard deviations for gestational age[24].

Postnatal variables analyzed were: 1) newborn weight; 2) newborn respiratory distress, need for any respiratory support at the delivery room; 3) need for orotracheal intubation; 4) necessity for and duration of neonate intensive care unit (NICU); and 5) hypoxic-ischemic-encephalopathy defined according to the criteria by Sarnat and Sarnat[25], as altered level of consciousness, hypotonia, feeding difficulty of central origin or respiratory difficulty of central origin longer than 24 hours after birth associated with arterial blood pH lower than 7.20 within the first hours of life, confirmed by abnormal trasnfontanel ultrasonography (intracerebral or intraventricle hemorrhage) and abnormal eletroencephalogram (periodic pattern in wakefulness or obtundation, polymorphic sharp and slow waves of 50 μv to 200 μv, and alternating or continous delta activity, voltage intervals and isopotential). The diagnosis of hypoxic-ischemic-encephalopathy was confirmed in all cases at age six months.

During labor, all patients underwent continuous fetal heart monitoring with CTG. In the present study, all the data were collected by the first author (E.M.A.S.), but all CTG tracings were reanalyzed by R.R. who was blinded to the other information. The results were then analyzed by an independent author (J.A.D.B.C.).

The present protocol was approved by the institutional review board on October 17, 2008, under hospital ethical committee protocol number CEP-HU/USP: 854/09, and national Brazilian register number SISII-EP CAAE: 0064.0.198.000-08.