

Does neonatal Apgar score affect chronological factor in postpartum uterine involution?

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Abstract: *Background:* Life begins with birth, which is the end of physiological performance of mother, placenta and newborn, hence, an attempt to find any relation of newborn's Apgar score to maternal postpartum uterine involution in apparently normal mothers, was tried here. Look for any possible postpartum subinvolution following the low level of Apgar score might draw attention for a potential incidence of any life threatening postpartum hemorrhage which usually associated with the uterine subinvolution and to be aware for whichever anticipated similar problem in the prospect deliveries. *Material and methods:* This research was carried out over the period of 5th of November 2012 till end of 3rd of February 2014. Selected two hundred mothers with their each own living infant, were encountered in this study. The mothers were admitted to Labor Room at Al-Khadraa' Private Hospital, in Baghdad, Iraq for a second normal vaginal delivery. On admission they were full termed, apparently normal pregnant with a single fetus. These selected mothers had absolute breastfed their babies afterwards. The mothers were divided into two groups according to the level of Apgar score of their newborns at the first minute of life; as low Apgar score group (group I) consisted of one hundred mothers with each own one hundred newborns and high Apgar score group (group II) consisted of one hundred mothers with each own one hundred newborns. The postpartum uterine size and peak systolic velocity (PSV) of uterine vessels by color Doppler ultrasonic examination (m/s); in each of these two groups were compared to find the significance of difference using Paired Samples T- test by the computerized program namely PASW Statistics 18. *Results:* Nearly all of mothers belonged to group I had delay time of uterine involution by abdominal palpation and prolonged time for cessation of vaginal bleeding, but they were responding well to conservative treatment. Moreover they had some degree of bad mood, so required more kind dealing by the working doctors. Uterine size of mothers belonged to group I had larger measurements which were of significant differences at earlier period of postpartum time selected at the ongoing study. Postpartum sonography of mothers belong to Group I showed no or scanty retained products of conception with increased vascularity of the myometrium of low-resistance dilated arteries at site of the preceding placental implantation. Pulsed wave Doppler sonography confirmed the vascular uniqueness of an increased peak systolic velocity (PSV) of a low-resistance. *Conclusion:* Any mother who delivers a fetus with low Apgar score for unknown reason, could have uterine subinvolution due to impaired recovery of placental bed; which is an important thought in postpartum management. This concept is vital both for retaining future fertility and prevention of any similar future conditions. Moreover, the instant results might provide the idea of existence of an exceptionally related "*birth triangle*"; consisted of fetus, placenta and uterus.

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1.Introduction:

Birth is the remark of giving life by all means. It is the critical outcome of interaction of three living entities; the uterus, placenta and newborn, moreover, birth is still an interesting model for medical studies till now^(1 & 2).

Generally speaking, within a day or two after mother giving a birth, the uterine level reaches roughly its gestational level at 18 weeks and gets progressively smaller over the next days⁽³⁾. Breastfeeding helps and encourages this involution and if healing is on track; a week out, her uterus will be impalpable; i.e. at gestational level of 12th week, and by the sixth week it should be back to its average

on gestational size^(4& 5). Ultrasound examination is regarded as the most accurate means to evaluate postpartum uterine involution. There is a strong relationship between monographic findings to assess postpartum uterine involution and prevention of postpartum complications⁽⁶⁾. Delivery mode and gestational age at delivery were found previously to affect time needed to get normal uterine involution at postpartum period⁽⁷⁾.

Doctor Virginia Apgar in 1952 put up a scoring design to assess the clinical rank of an infant at 1st minute of life^(8&9). Apgar score covers up 5 factors: *Appearance, Pulse, Grimace, Activity, and Respiration*, which are evaluated at 1st and/or 5th

minute of life. Normal Apgar score at 1st minute is at range of 7-10⁽¹⁰⁾. Apgar score is still the best scoring mean to evaluate the physical condition of a newborn and make decision for any need to resuscitation⁽¹¹⁾.

Aim:

This study was aimed to find any suspected effect of calculated Apgar score; the most vital way to assess the fetal health on surveillance of uterine involution; the most important event at the puerperium.

2. Material and Methods:

This study was conducted by the Department of Anatomy, Histology and Embryology, College of Medicine, Al-Mustansiriyah University, in cooperation with Al-Khadraa' Private Hospital, in Baghdad, Iraq, at the time period extended from 16th of January 2012 till end of 3rd of February 2014 and was approved by the local scientific committee of Department of Anatomy, Histology and Embryology, College of Medicine, Al-Mustansiriyah University and Specialists staff members of Al-Khadraa' Private Hospital. Selected two hundred mothers with their living infants were included at this study. All of mothers encountered in this study were selected to have one previous normal vaginal delivery. Any case of fetal loss, mother loss, twin or multiple pregnancy and cases of hysterectomy due to postpartum hemorrhages, within the time of this research were excluded. These mothers were admitted to Labor Room at Al-Khadraa' Private Hospital, in Baghdad, Iraq for a second normal vaginal delivery. At hospital attendance, they were selected to be at 38-40 week of gestation, non-smoker and apparently normal pregnant having single fetus; according to careful antenatal history, physical examination, laboratory investigation and ultrasound assessment. Mothers with congenital or acquired coagulopathy were excluded, too. The mothers should have absolute breastfed their babies throughout time of this study, or they were excluded. These mothers were divided into two groups, in relation to the level of Apgar score of their newborns; as group I having low Apgar score group (<7) and group II having high Apgar score (= \geq 7) depending on level of Apgar score at the first minute of life. Group II was regarded as the control group at this study. Each of these two groups was consisted of one hundred mothers with their each own newborn. At admission every pregnant was checked to have normal fetus by color Doppler study, otherwise the case was ruled out. The postpartum uterine size and peak systolic velocity (PSV) of myometrial vessel by Doppler ultrasonic examination (m/s); in each of these two groups were compared to find the significance of difference.

A verbal consent was obtained from each client and her family prior to the study. Newborns of these mothers were scored by pediatrician at 1st minute after delivery at the level of Apgar score. A low Apgar score was proposed by this study to be caused by neither maternal nor fetal basis.

The uterine involution was monitored by serial abdominal ultrasonic examinations by an Acuson Sequoia 512 system "Siemens Medical Solutions-Mountain View- CA". Ultrasonic examination included assessment of the uterine three dimensions (cm) as well as Doppler monitoring of the peak systolic velocity (PSV) of uterine vessel (m/s).

Cases of impaired uterine involution due to retained product of conception, abnormal placental implantation, fibroids, and even malignancy as choriocarcinoma; were excluded from this study.

All of the postpartum assessments for mothers encountered in this research were free charged, in order to encourage these mothers to keep coming, to be examined, at ongoing postpartum period, as the followings:

Twenty four hours, forty eight hours, at end of 1st week, at end of 6th week, at end of 8th week and at end of 10th week, from the birth time. All of the attended mothers were examined physically as well as ultrasonically in each visit.

Data were presented as mean \pm SD, then; by using Paired Samples T- test with the computerized program namely PASW Statistics 18, used on personal computer, the variables were compared. Statistical significance was considered at *P* value less than or equal to 0.05⁽¹²⁾. Ultrasonic uterine profiles including length, width and thickness were shown in table 1 and pulsed wave Doppler monographic study of uterine vessels was shown in table 2.

3. Results:

Nearly all of mothers belonged to group I (low Apgar score group) had somewhat delay in physical recovery; represented by delay time of uterine involution on abdominal palpation and prolonged time for cessation of vaginal bleeding, but they were in general responding well to conservative treatment. More over almost all of them had some degree of feeling unwell with bad mood, so required more kind dealing by the working doctors to give them confidence.

Table 1 highlighted that uterine size of mothers belonged to group I had larger uterine dimensions which were of significant differences at the earlier postpartum periods of the ongoing study. However, that difference in size was not significant at the late postpartum periods.

Postpartum sonography of mothers belong to Group I showed no or scanty retained products of

conception with increased vascularity of the myometrium of low-resistance some dilated arteries at site of the preceding placental implantation. Grey scale imaging in general showed some hypo echoic tortuous vessels within the internal third of the myometrium. Pulsed wave Doppler sonography confirmed the vascular uniqueness of an increased peak systolic velocity (PSV) of a low-resistance.

Postpartum uterine color Doppler study to assess flow of uterine vessels represented by peak

systolic velocity (m/s) was shown at table 2, which showed clear differences between Group I and Group II, for example; mothers belong to Group II had uterine vessels' peak systolic velocity (PSV) of 0.71 m/s after 24 hours from delivery and dropped to 0.10 m/s at end of the 6th week, while that of mothers belong to Group I showed uterine vessels of a peak systolic velocity (PSV) at level of 0.78 m/s 24 hours from delivery and went down to 0.11 m/s at end of the 6th week.

Table1: Postpartum uterine profiles by sonography

| Time of postpartum examination after birth | Postpartum uterine profiles by U/S examination (cm) | | | | | | | | |
|--|---|----------------------|---------|-----------------------|----------------------|---------|----------------------|----------------------|---------|
| | Uterine Length (cm) | | | Uterine Thickness(cm) | | | Uterine Wideness(cm) | | |
| | Low Apgar score <7 | High Apgar score =>7 | P value | Low Apgar score <7 | High Apgar score =>7 | P value | Low Apgar score <7 | High Apgar score =>7 | P value |
| After 24 hours | 19.271±4.124 | 16.674±3.316 | 0.0001 | 8.237±3.479 | 7.387±3.863 | 0.05 | 9.463±5.308 | 8.209±4.885 | 0.05 |
| After 48 hours | 16.052±16.052 | 14.550±6.796 | 0.02 | 7.4466±4.40853 | 6.2600±3.95331 | 0.05 | 7.284±4.018 | 6.322±2.942 | 0.05 |
| After 1 week | 15.063±3.316 | 13.950±4.467 | 0.03 | 6.817±4.632 | 5.390±3.879 | 0.03 | 5.158±3.349 | 4.352±2.045 | 0.03 |
| After 6 weeks | 11.234±8.856 | 9.735±6.423 | 0.21 | 4.860±4.789 | 4.200±2.348 | 0.21 | 4.587±2.903 | 3.867±2.491 | 0.04 |
| After 8 weeks | 9.404±7.919 | 8.165±6.394 | 0.23 | 4.130±3.724 | 3.730±2.260 | 0.32 | 4.286±4.225 | 3.786±3.389 | 0.31 |
| After 10 weeks | 8.293±7.302 | 7.295±6.086 | 0.27 | 3.321±2.921 | 3.2273±2.039 | 0.78 | 3.879±3.356 | 3.382±3.036 | 0.15 |

All data were represented by mean ± standard deviation (SD). The significant level was considered at level of 0.05 or less.

Table 2: Postpartum Uterine Doppler Study in mothers delivered neonates with Low or High Apgar Score.

| Time of postpartum examination after birth | color Doppler study of uterine vessels represented by peak systolic velocity (m/s) | | |
|--|--|----------------------|---------|
| | Low Apgar score <7 | High Apgar score =>7 | P value |
| After 24 hours | 0.78±0.13 | 0.7159±0.14 | 0.006 |
| After 48 hours | 0.37±0.10 | 0.23±0.02 | 0.001 |
| After 1 week | 0.19±0.08 | 0.16±0.09 | 0.003 |
| After 6 weeks | 0.11±0.07 | 0.10±0.08 | 0.03 |
| After 8 weeks | 0.10±0.08 | 0.10±0.8 | 0.6 |
| After 10 weeks | 0.10±0.8 | 0.10±0.8 | 0.7 |

All data were represented by mean ± standard deviation (SD). The significant level was considered at level of 0.05 or less.

4. Discussion:

Since years till then, birth is regarded as an imperative, interesting and controversial context of medical researches⁽¹³⁾, so this research was concerned with a couple of post delivery events; fetal condition and uterine condition.

In general, within 6 weeks after a birth, the uterine level reaches roughly its presentational size or a little bit larger than that⁽³⁾. Breastfeeding may probably speed up postpartum uterine involution, hence, all mothers within this study were selected to be absolute breastfeeding lactating, so that to exclude any differences due to the factor of lactation^(4 & 5).

In the instant study; the method used to monitor postpartum uterine involution was the Doppler color ultrasonography, because it is regarded as the most accurate means for that monitoring^(3 & 6). This research tried to draw attention to the importance of checking maternal uterine involution at postpartum period in attempt to prevent any related complication such as life threatening uterine bleeding^(7 & 14). At the current study the mode of delivery was selected as no more than the normal vaginal delivery and the gestational age was limited within the range of 38-40 week; since delivery mode and gestational age at time of birth, indeed affect the rate of uterine involution at postpartum period⁽⁸⁾.

Group II in this study had Apgar score at 1st minute at range of 7-10 just like that level of normal Apgar score so it was regarded as the control group^(9 & 10). Apgar score was the principal idea for this study, because it is the best known indicator to evaluate newborn's condition at birth time till now⁽¹¹⁾.

Delayed uterine involution in mothers and low level of fetal Apgar score within Group I; were decided according to this study to be initiated by a placental basis, since any maternal or fetal causes were excluded prior to delivery and it is well documented that placental source could be a possible pure reason of a low Apgar score as well as a pure reason of uterine subinvolution^(15 & 16), hence, the low Apgar score (<7) and delay uterine involution within group I were considered to be merely due to placental causes. An attempt was planned here to evaluate uterine recovery at postpartum period depending on fetal Apgar score where the placental cause was hidden to the staff managing the labor process.

Prolonged vaginal bleeding in women belonged to group I might be due to delay uterine involution and lacking of recovery, since all of the follow up laboratory investigations were normal and it is a well known that postpartum vaginal bleeding is strongly related to postpartum uterine involution in case of absence of congenital or acquired coagulopathy^(3, 16-18). Bad mood of most of mothers within Group I was anticipated as a normal response of another delivered

tired baby which precipitates an emotional stressful event to her⁽¹⁹⁾.

Postpartum uterine color Doppler sonography of mothers belong to Group II showed uterine vessels of a peak systolic velocity identical to these of normal postpartum uterine sonography^(3 & 6). Cases of retained product of conception, abnormal placental implantation, fibroids, and less frequently, malignancy as choriocarcinoma may induce impaired uterine involution⁽¹⁴⁾, so they were excluded from this study.

Table 1, 2 drew attention to significant differences between uterine involution of both variable groups, at different consecutive periods. These findings could be due to the fact that uterine postpartum subinvolution may be caused by any deleterious factor acting on the uterus^(20 & 21), hence, in this study the placental factor inducing the low Apgar score was regarded also as a deleterious factor for the uterus, not for the fetus alone.

It might be concluded here; the subinvolution due to impaired recovery of placental bed is an important thought in postpartum management of any mother who delivers a fetus with low Apgar score for unknown reason. The diagnosis must be considered in postpartum monographic characteristics of augmented myometrial vascularity with low resistance, therefore this concept is vital both for retaining future fertility and prevention of any similar future conditions. Moreover, the instant results might provide the idea of existence of an exceptionally related "*birth triangle*"; consisted of fetus, placenta and uterus.

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