Prognosis of the Babies Born from Placental Abruption - Difference between Intrauterine Fetal Death and Live-Born Infants

Yoshio Matsuda1,a, Masaki Ogawa1,2 and Jun Konno1

1Department of Obstetrics and Gynecology, Tokyo Women’s Medical University, Kawada-cho, B-1, Shinjuku-ku, Tokyo 162-8666, Japan
2Perinatal Medical Center, Tokyo Women’s Medical University, Kawada-cho, B-1, Shinjuku-ku, Tokyo 162-8666, Japan
3Department of Obstetrics and Gynecology, International University of Health and Welfare Hospital, 537-3, Iguchi Nasushiobara-City, Tochigi-Prefecture 329-2763, Japan

Abstract

Objective: To investigate the fetal/neonatal prognosis and to compare Intrauterine Fetal Death (IUFD) with live-born infants in placental abruption.

Methods: A retrospective review of 355 pregnancies was performed. An adverse fetal/neonatal outcome was defined as IUFD on admission, neonatal/infantile death at discharge and cerebral palsy.

Results: Eighty-nine fetuses were cases of IUFD, while the remaining 266 fetuses were alive on admission. The significant factor for IUFD was blood transfusion (OR (odds ratio) 2.21, 95% CI 1.02 - 4.76). The interval from the onset of symptoms to the diagnosis was significantly longer for IUFD than for the live-born infants (median, 213 vs. 130 min, p<0.0001) A logistic regression model showed bradycardia (28.25, 6.10 - 130.84), late decelerations (5.94, 1.02 - 34.61) and gestational age at less than 35 weeks of gestation (5.37, 1.94 - 14.85) were associated with adverse outcomes other than IUFD. The abruption prognosis score was calculated for the occurrence of an adverse neonatal outcome, using four items including gestational age, abdominal pain, bradycardia, and late decelerations.

Conclusions: The significant factor associated with IUFD was the interval to the diagnosis and the need for blood transfusion. Adverse outcomes other than IUFD were linked to the gestational age, bradycardia, or late decelerations.

Keywords: Placental abruption; Fetal/neonatal prognosis

Introduction

Placental abruption is potentially disastrous to the fetus, with a perinatal mortality rate as high as 60% [1]. Although perinatal mortality includes both Intrauterine Fetal Death (IUFD) and early neonatal death, it is unclear whether there are differences in the risk factors for these outcomes in cases of placental abruption.

In the proceeding paper, we showed the prediction of fetal acidemia in placental abruption [2]. It is also necessary to identify the important risk factors concerning the neonatal outcome other than IUFD, because the umbilical artery pH data cannot be obtained from all patients due to the emergency nature of the situation.

The purpose of this study was therefore to investigate the fetal and neonatal outcomes including IUFD and to compare IUFD with live-born infants in cases of placental abruption, by evaluating the clinical assessments, as well as the results of adjunctive laboratory tests, such as the ultrasonographic findings and FHR patterns.

Methods

The approval of the institutional review board (Tokyo Women’s Medical University) was obtained before the start of this retrospective study. All singleton births, born between 24 and 40 weeks of gestation between January 1, 2009, and December 31, 2009 were included. The medical records of mothers and neonates in the 94 institutes, comprising the Perinatal Research Network in Japan (PRNJ) listed in the ‘Acknowledgements’ were reviewed.

Gestational age was determined based on the mother’s last menstrual period and first and second trimester obstetric ultrasonography. More than 30 variables were assessed, including pregestational and antenatal factors. The details of the diagnosis, onset place, time from onset of symptoms to admission/delivery, and the clinical management of any relevant condition were recorded. We also included background data of the institutes such as the 24-hour anesthetic availability, presence of more than two specialists, and rapid access to blood and blood products as items for the multilevel analyses (Table 1).
Results and Discussion

Clinical background in the present study

There were 355 patients complicated by placental abruption. The overall number of deliveries in 94 institutes was 54,628 and the rate of placental abruption was 0.65%. Eighty-nine fetuses (nearly one-quarter) were dead on admission (Group 1), while the remaining 266 fetuses were alive. The mean gestational age at delivery was 34.3 ± 3.5 weeks (preterm: 266 patients, term: 89 patients).

Because the diagnosis of placental abruption in this study was based on the clinical manifestations, and the placental detachment was confirmed after delivery, the clinical background of patients in the present study may be more severe than that in some other studies [7,8]. As a result, the percentage of maternal and fetal/neonatal morbidity and mortality was high.

Abnormal ultrasonographic findings were observed in 263 patients (74.1%), mainly indicating retroplacental anechoicity (185 cases), and increased placental thickness (167 cases).

In the 266 fetuses that were alive on admission, abnormal FHR patterns were observed in 166 patients (62.4%). The main abnormal FHR results were persistent late decelerations in 51 cases and prolonged deceleration in 86 (including by auscultation) cases. A cesarean section was performed for 256 patients (96.2%).

Differences between IUFD and live-born infants

The clinical demographics of IUFD and live-born infants are given in Table 2. In a comparison of IUFD and live-born infants, statistically significant differences were observed in the maternal age, maternal transfer, on set of symptom outside obstetric facilities, abnormal ultrasonographic findings, and blood transfusion. The frequency of vaginal bleeding, gestational age at delivery and birth weight were lower in the IUFD group. There were no significant differences in the frequencies of preeclampsia, chronic hypertension, abdominal pain and cesarean section between these two groups. Using a logistic regression model, a blood transfusion (OR 2.21, 95%CI 1.02 - 4.76) was the only significant factor associated with the occurrence of IUFD (Table 3).

Massive detachment of placenta induces not only the maternal consumptive coagulopathy, but also the decrease of fetal oxygenation. As the degree of placental separation increases, the risk of fetal death also increases [1]. In addition, the frequency of coagulopathy is much lower in the IUFD group. There were no significant differences in the

<table>
<thead>
<tr>
<th>IUFD (N=89)</th>
<th>Live-born infants (N=266)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>&lt;Obstetric complications&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preeclampsia/eclampsia</td>
<td>14 (15.7%)</td>
<td>61 (22.9%)</td>
</tr>
<tr>
<td>Chronic hypertension</td>
<td>6 (6.7%)</td>
<td>33 (12.4%)</td>
</tr>
<tr>
<td><strong>&lt;Informations on admission&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal age (&gt; 40yrs)</td>
<td>24 (26.9%)</td>
<td>15 (5.6%)</td>
</tr>
<tr>
<td>Maternal transfer</td>
<td>67 (75.3%)</td>
<td>155 (58.3%)</td>
</tr>
<tr>
<td>Onset place of symptoms: outside obstetric facilities</td>
<td>88 (98.9%)</td>
<td>205 (77.1%)</td>
</tr>
<tr>
<td>Parity</td>
<td>1 (0-5)*</td>
<td>1 (0-6)*</td>
</tr>
<tr>
<td><strong>&lt;Final diagnoses&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal bleeding</td>
<td>32 (36%)</td>
<td>146 (54.9%)</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>41 (46.1%)</td>
<td>99 (37.2%)</td>
</tr>
<tr>
<td>Abnormal ultrasonographic finding</td>
<td>78 (87.6%)</td>
<td>185 (70%)</td>
</tr>
<tr>
<td><strong>&lt;Informations at/after delivery&gt;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cesarean section</td>
<td>28 (100%)</td>
<td>228 (95.8%)</td>
</tr>
<tr>
<td>Gestational week at delivery (weeks)</td>
<td>32 (24-40)*</td>
<td>35 (24-40)*</td>
</tr>
<tr>
<td>Birth weight (g)</td>
<td>1776 (517-3124)*</td>
<td>2063 (694-3504)*</td>
</tr>
<tr>
<td>Male</td>
<td>12 (42.9%)</td>
<td>136 (57.1%)</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>58 (65.2%)</td>
<td>72 (27.1%)</td>
</tr>
</tbody>
</table>

* Represents median (min-max)
to be significant by multivariate analysis. However, this might have been derived from the insufficient sample size.

Although the etiology of placental abruption is heterogeneous and speculative, and clinical abruption is the final culmination of a long-standing disease process within the placenta, controlling all of these factors may be important for reducing the incidence of IUFD in cases of placental abruption [9].

**Differences between case and control in live-born infants**

The clinical demographics of case (group 2) and control infants are given in Table 4. Using a logistic regression model, bradycardia (OR 28.25, 95%CI 6.1 - 130.84), late decelerations (OR 5.94, 1.02 - 34.61) and gestational age at delivery < 35 weeks (OR 5.37, 1.94 - 14.85), were all found to be associated with the occurrence of an adverse outcome (Table 5).

In the proceeding paper, the potential predictors for fetal acidemia (umbilical artery pH less than 7.0) in cases of placental abruption were bradycardia and late decelerations. For an adverse outcome, ‘gestational week at delivery <35 weeks’ was added as a significant factor. Allred and Batton previously reported a study of the short-term outcome of preterm infants (23 to 32 weeks) born from placental abruption, and concluded that abruption was not an independent risk factor for a poor outcome among infants born between 23 and 32 weeks gestation, but that the preterm delivery was the main determinant of outcome [10].

For the purpose of predicting an adverse neonatal outcome, higher in abortions in which fetal death has occurred. Because especially transfusion of fresh frozen plasma may be life saving and prevent patients to progress into the disseminated intravascular coagulation, blood transfusion itself is thought to be the result of an unstable maternal condition, which means that there is a close link between IUFD and the maternal status.

In the subgroup of cases in which the time course was confirmed, the interval from the onset of symptoms to the diagnosis (n=28, median 213, range 60 - 1020 min) was significantly longer than that for live-born infants (n=147, median 130, range 10 - 780 min, p<0.0001)

More frequent maternal transfer, onset of symptoms outside obstetric facilities, abnormal ultrasonographic findings, less frequent vaginal bleeding, younger gestational week at delivery, and low birth weight, which were cleared by the univariate analysis, might affect the interval from the onset to the diagnosis, although they were not found

![Figure 1: Relationship between the Abruption Prognosis Score (APS) and the probability of adverse outcome in the cases of placental abruption.](image-url)
the statistically significant factors identified by the multiple logistic regression analysis were subjected to stepwise regression analysis to construct a linear discriminant function: A+2B+3C+5D, where A was abdominal pain (0, no; 1, yes), B was gestational age less than 35 weeks (0, no; 1, yes), C was late decelerations (0, no; 1, yes), and D was bradycardia (0, no; 1, yes), because we could not obtain the pH data from all patients due to the emergency nature of the situation. This discriminant function was called 'Abruptio Prognosis Score' (APS). A logistic regression analysis was performed to make clear the relationship between the APS and the probability of an adverse outcome in Figure 1. The probability of this cut-off point of APS was calculated to be approximately 0.1. When this score was 8, the probability of an adverse outcome was almost 0.5.

We had established the score by using the above-mentioned concept and named it the 'Severe Abruptio Score (SAS)' that could be used to predict the occurrence of fetal acidemia in cases of placental abruption [2]. Similar to the 'SAS', the amount of vaginal bleeding correlates poorly with the degree of placental separation and does not serve as a useful marker of an impending adverse outcome. On the other hand, different from SAS score, abnormal ultrasonographic findings were not an important item for the prediction of adverse outcomes in cases of placental abruption.

There are several limitations to the present study. First, this study was done in a retrospective fashion; therefore, further studies are warranted to confirm the usefulness of this score prospectively. Second, since the abruption prognosis score was based only on cases where a diagnosis of abruption was confirmed according to placental appearance just after delivery and was designed to be used immediately after delivery, this score should be used with caution.

Conclusions

In conclusion, the significant factors associated with IUFD in cases of placental abruption were the interval to the diagnosis and the needs for blood transfusion. Adverse outcomes other than IUFD were linked to the gestational age, bradycardia, or late decelerations, regardless of the presence of genital bleeding or abnormal ultrasonographic findings.

Acknowledgement

We thank Mr Sugimoto for kindly providing analyses of the database.

We wish to thank the institutions and representative physicians enrolled in the database for Perinatal Research Network in Japan, which include:

Aichi Medical University: S Kinosita; Aikita University: A Sato; Asahi-chuo Hospital: H Udagawa, A Kurihara; Asahikawa Medical University: K Nishino; Ashikaga Red Cross Hospital: Y Kasuga, T Hirao; Ehime Prefectural Central Hospital: K Noda; Fukuchiyama City Hospital: T Okuda; Fukui University: T Yoshihara; Fukushima Medical University: H Takahashi; Gifu University: H Toyok; Haga Red Cross Hospital: A Ohtsuka; Hamamatsu University School of Medicine: K Suzuki; Hiroaki University: T Higuchi; Hiroshima City Hospital : O Ishida; Hiroshima General Hospital: Y Nakashima; Hiroshima University: Y Muka; Hokkaido University: S Yamada; Hyogo College of Medicine: T Takenobu; Hyogo Prefectural Kobe Children's Hospital: T Funakoshi; Japanese Red Cross Fukuoka Hospital: M Nishida; Japanese Red Cross Kyoto Daichi Hospital: H Yamamoto; Jichi Medical University: S Matsubara, R Usui; Juntendo University Urayasu Hospital: K Yosida, A Tajima; Kagawa University: H Tanaka; Kagoshima City Hospital: M Kamitomo; Kagoshima University: Y Yonemura; Kameda Medical Center: M Suzuki, H Takaya; Kanagawa Children's Medical Center: H Ishikawa; Kanazawa Medical University: T Fujita; Kinki University: M Shio, T Tsutani; Kitasato University: S Kawano; Kobe University: K Tanimura; Kumamoto City Hospital: J Ishimatsu, K Akou; Kurashiki Hospital: M Yamazaki, Kurume University: D Hori, R Hayashi; Kyoto Prefectural University of Medicine: T Okubo, S Fujisawa; Kyoraku Hospital: J Haminani; Kyushu University: K Fukushima; Maternal & Child Health Center ALIKU HOSPITAL: T Adachi, Y Kawana; Mie University: T Sugiyama; Miyazaki University: S Funukawa; Nagasaki Municipal Hospital: K Katori; Nagasaki University: Y Yonehara; Nagoya Daini Red Cross Hospital: N Kato, Nagoya University: T Kotani; Nara Medical University: T Sado; National Center for Child Health and Development: H Sagou, H Acki; National Center for Global Health and Medicine: J Kakogawa; National Defense Medical College: Y Hasegawa; National Hospital Organization East Saga Hospital: M Nomiya; National Hospital Organization Nagasaki Medical Center: I Yasuhi, M Fukuda; National Hospital Organization Nishisaitama Chuo National Hospital: A Yoshida; National Hospital Organization Okayama Medical Center: Y Taleihi; National Hospital Organization Takasaki General Medical Center: I Ito; National Hospital Organization Yokohama Medical Center: A Nakamura; Niigata University: T Serikawa; Nipppon Medical School: T Sato; Okita Prefectural Hospital: S Sato; Okita University: Y Nishida; Okayama University: T Segawa; Osaka City University: D Tachibana, M Tsuikoa; Osaka Medical Center and Research Institute for Maternal and Child Health: N Mitsuda, A Sasahasea; Osaka University: S Fujita; Saga Medical University: M Muro; Saiseiki Yokohamashi Tobu Hospital: Y Konishi, Y Sakakibara; Shiga University of Medical Science: T Ono; Shimane University: S Aoki; Shinshu University: N Kikuchi; Shiga University: R Matsuka; S Marrianna University School of Medicine, Yokohama City Seibu Hospital: J Saito, T Nakao; Takatsuki General Hospital: S Nakagai, Teikyo University Hospital: T Ayabe, K Kido; The Japan Baptist Hospital: H Egawa, S Suzuki; The Jikei University: S Wada; The University of Tokyo: Y Kamei; Toho University: Omori Medical Center: C Acki; Tokoh University: J Sugawara; Tokai University: H Ishimoto, K Mitzuoka; Tokyo Medical University Hachioji Medical Center: T Nohira; Tokyo Medical and Dental University, University Hospital of Medicine: Y Momohara; Tokyo Women's Medical University: Y Matsuda, Y Makino; Tottori University: T Harada; University of Occupational and Environmental Health, Japan: K Yoshimura; University of Toyama: S Saito, A Shizohi; University of the Ryukyus: K Sakamoto; Wakayama Medical University: S Yagi; Yamagata University: S Tsutsumi; Yamaguchi Red Cross Hospital: T Takahashi; Yokodai Christian Hospital: C Mikami; Yokohama City Medical Center: M Okuda; Yokohama Minami Kiyosai Hospital: H Nagase; Yokohama Rosai Hospital: M Nakayama.

References


