

Quantification of Fetomaternal Hemorrhage

Zahid Hussain, Tahira Tasneem, M. Tayyab

Background. Fetomaternal hemorrhage (FMH) can affect fetus in different ways. It can cause fetal distress, fetal death or neonatal anemia. The red cells of Rh-positive fetus may sensitize the Rh-negative mother, hence producing anti-Rhesus antibodies in the mother. Mode of delivery and removal of placenta may affect the extent of fetomaternal hemorrhage.

Methods. One hundred and fifty subjects having Cesarean section and 347 subjects having SVD were studied. Similarly 166 subjects having manual removal of placenta and 334 subjects having spontaneous removal of placenta were also evaluated in the study.

Blood samples were taken within four hours of delivery from mothers. Kleihauer² test was performed from samples. Adult blood and cord blood was used to prepare control slides.

Results. Incidence of FMH was 18.66% in Cesarean section and 14.08% in simple vaginal delivery. In 18.07% and in spontaneous removal of placenta it is 14.07%.

Conclusion. Cesarean section and manual removal of placenta increase the incidence of FMH as compared to simple vaginal delivery and spontaneous removal of placenta.

Keywords. Fetomaternal haemorrhage.

Introduction

Fetomaternal hemorrhage is the leakage of fetal blood through the placenta into the maternal circulation. It may occur at any time during pregnancy but is more commonly seen at the time of delivery¹. It is more common in some cases such as cesarean section and manual removal of placenta.

It can affect the fetus by causing blood loss which if extensive may cause fetal distress, fetal death or neonatal anemia. But its real importance is seen in Rh-negative mother with an Rh-positive fetus. In such cases the Rh-positive fetal cells sensitize the mother, the antibodies so formed can cross the placenta during a subsequent pregnancy with Rh-positive fetus and cause massive hemolysis in fetus leading to hemolytic disease of newborn (HDN). FMH can be estimated by Kleihauer's² acid elution test. The estimation of the volume of FMH is important to see the volume of blood loss and also to decide the dose of anti-D injection to be given to the mother to prevent the sensitization and formation of anti-D antibodies. According to WHO's recommendations³, the dose of anti-D injection is 25 microgram per milliliter of fetal red cells in the maternal circulation.

The frequency and volume of FMH depends on many factors². Cesarean section, manual removal of placenta and forceps delivery increase the incidence and volume of FMH. The present study was intended to see the incidence and volume of FMH in our setup.

Patients and Methods

The study was carried out in Pathology Department of Postgraduate Medical Institute, Lahore. One hundred and fifty subjects having cesarean section and 347 subjects having SVD were studied. Similarly 166 subjects having manual removal of placenta and 334 subjects having spontaneous removal of placenta were also evaluated in the study.

Blood samples were taken within four hours of delivery from mothers. Kleihauer² test was performed from samples. Adult blood and cord blood was used to prepare control slides. The volume of FMH was calculated by following formula.

$$\frac{\text{no of fetal red cells/HPF}}{\text{no of adult red cells/HPF}} = \frac{\text{Volume of FMH}}{\text{Volume of Maternal blood}}$$

Maternal blood volume was calculated as 65 ml per kg of body weight⁴.

Results

A total of 347 cases of SVD were seen in the study, out of them 50 (14.4%) had FMH, while a total of 150 patients had cesarean section and out of them 28(18.66%) were having FMH.

Similarly out of 166 patients having manual removal of placenta 30 (18.07%) had FMH while out of 334 cases having spontaneous removal of placenta 47(14.07%) had fetal blood in the maternal circulation.

Volume of FMH was also estimated and out of the total 77 cases positive for FMH 75 (97.40%) had FMH of less than 4ml. Only 2 cases (2.6%) had FMH of more than 4ml and out of them only one had FMH of more than 10ml and this was a case of cesarean section along with manual removal of placenta.

Table 1: Distribution of cases according to mode of delivery.

Mode	Percentage
Simple vaginal delivery	14.08
Cesarean	18.66
Spontaneous removal of placenta	14.07
Manual removal of placenta	18.07

Table 2: Volume of fetomaternal hemorrhage:

Vol of MFH	No of Cases	Percentage
< 0.5 ml	30	38.97
0.5 - 1 ml	20	25.98
1-2 ml	18	23.38
2-3 ml	4	5.2
4-5 ml	3	3.89
4-5 ml	1	1.29
4-5 ml	1	1.29
Total	77	100

Discussion

Kleihauer's acid elution test was introduced in 1957. It was used to identify fetal red cells in the maternal circulation, later called fetomaternal hemorrhage (FMH). In 1960 Finn⁴ described the mechanism of hemolytic disease of newborn and the possibility of preventing this disease. With his article the importance of fetomaternal hemorrhage and its identification by Kleihauer's test was felt. Soon the introduction of prophylactic anti-D injection led to

the prevention of HDN. It was achieved by anti-D antibodies given to the mother at the time of delivery to clean the fetal red cells leaked into maternal circulation. As the volume of FMH is different in each case thus it became mandatory to estimate the volume of FMH to decide the adequate dose of anti-D injection.

It was also realized that there are some high risk factors in which the incidence and volume of FMH increases.

In the present study, 18.66% of the mothers undergoing cesarean section had FMH which was higher than the incidence of FMH seen in mothers having SV, D which was 14.4%.

In the same way FMH was more common in patients having manual removal of placenta in whom it was 18.07% as compared to the incidence of FMH in patients having spontaneous removal of placenta in whom it was 14.07%.

Estimation of the volume of FHM is suggested in every Rh-negative mother giving birth to Rh-Positive fetus, so as to decide the adequate dose of anti-D injection.

Presently a fixed dose of 300 microgram of anti-D is given to every patient but it is better to follow the British protocol where a dose of 100 microgram anti-D injection is given to every Rh-negative mother having Rh-positive newborn and FMH is estimated to see if this dose is adequate to cover the FMH. An additional dose is given if the volume of FMH is more than 4 ml. Because in our setup 97.40% cases having FMH have a volume of FMH less than 4 ml, thus in most of the cases 100 micro gram anti-D is adequate. While the very few cases having more than 4 ml FMH can be identified by Kleihauer's acid elution test.

It is also suggested to estimate the volume of FMH in mothers giving birth to severely anemic babies to see whether it was due to excessive fetal blood leaked into maternal circulation.

*Department of Haematology
Services Hospital
Lahore*

theesculapio@hotmail.com

Reference

1. Bowman JM, Pollock M, Penston LE, Fetomaternal Hemorrhage during pregnancy and after delivery. *Vox Sang* 1986; 51: 117-21.
2. Duckett JRA, Constantine G. The Kleihauer technique: an accurate method of quantifying fetomaternal hemorrhage. *Br J obst Gynecol* 1997; 104: 840-6.
3. Anonymous. Prevention of Rh-Sensitization. Report of a WHO scientific group. WHO **technical report series 1971; 486: 1-36.**
4. Finn R. Erythroblastosis. *Lancet* 1960; 1: 526.
5. Kleihauer E, Braun H, Betke K, Demonstration von fetalem hemo-

Glogin in den erythrocyten eines Blutwässtrichs Klin Wscher 1957; 35:637-8.

6. Thalib VH, Wadhwa A, Verma AK, Das Ks. Fetomaternal hemorrhage following first trimester medical

termination of pregnancy. Pak J Path 1991; 2:724.

Guidelines

Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7)

The purpose of this report is to provide an evidence-based approach to the prevention and management of hypertension. The key messages of this report are these:

- In those older than age 50, systolic blood pressure (BP) of greater than 140 mm Hg is a more important cardiovascular disease (CVD) risk factor than diastolic BP
- Beginning at 115/75 mm Hg, CVD risk doubles for each increment of 20/10 mm Hg
- Those who are normotensive at 55 years of age will have a 90% lifetime risk of developing hypertension
- Prehypertensive individuals (systolic BP 120-139 mm Hg or diastolic BP 80-89 mm Hg) require health-promoting lifestyle modifications to prevent the progressive rise in blood pressure and CVD
- For uncomplicated hypertension, thiazide diuretic should be used in drug treatment for most, either alone or combined with drugs from other classes
- This report delineates specific high-risk conditions that are compelling indications for the use of other antihypertensive drug classes (angiotensin-converting enzyme inhibitors, angiotensin-receptor blockers, beta-blockers, calcium channel blockers)
- Two or more antihypertensive medications will be required to achieve goal BP (<140/90 mm hg, or <130/80 mm hg) for patients with diabetes and chronic kidney disease
- For patients whose BP is more than 20 mm Hg above the systolic BP goal or more than 10 mm Hg above the diastolic BP goal, initiation of therapy using two agents, one of which usually will be a thiazide diuretic, should be considered
- Regardless of therapy or care, hypertension will be controlled only if patients are motivated to stay on their treatment plan.