Letter

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# Erythrocytes morphology in pregnancy

## *Les modifications morphologiques des hématies durant la grossesse*

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**Abstract.** Morphologic anomalies of the red blood cells (RBCs) during pregnancy are poorly known. Peripheral blood films from 69 healthy pregnant women were investigated for shape, color and content anomalies of the RBCs. A range of minor alterations was observed, without clinical significance. Only a slight increase of polychromatophilic RBCs was regularly observed. However, we would like to stress that spherocytes or schistocytes can occasionally be found, even in the absence of hemolysis.

***Key words:*** *red blood cell morphology, schistocyte, spherocyte, pregnancy*

**Résumé.** Les modifications morphologiques des hématies durant la grossesse sont mal connues. Nous avons étudié les frottis sanguins de 69 femmes sans pathologie au cours du dernier trimestre. Des anomalies non significatives concernant la forme et la couleur sont observées, la plus fréquente étant la polychromatophilie. Occasionnellement, quelques schizocytes et/ou sphérocytes sont notés, en dehors de toute hémolyse.

***Mots clés :*** *morphologie érythrocytaire, schizocyte, sphérocyte, grossesse*

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During pregnancy, the red blood cells (RBCs) show more variation in size and shape than it is seen in non-pregnant women. These changes occur independently of any deficiency of iron, folic acid or vitamin B12 [1]. However, to our knowledge, no extensive study of RBCs morphologic anomalies during pregnancy is available. Description and grading of RBCs morphological features were recently published, proposing uniform standardized systems to upgrade inconsistent or confusing informations [2-4]. We simplistically investigated the occurrence of morphologic alterations of the RBCs during pregnancy in a series of 69 healthy women.

The women were prospectively and randomly selected from out-patients, at the third trimester of pregnancy, and without any RBC pathology or gestational complications in particular diabetes or vasculopatic diseases. In particular, thalassemia trait was ruled out by hemoglobin electrophoresis. No information about a possible treatment with iron and/or vitamins or other potentially interfering drugs was recorded. Peripheral blood was collected in EDTA-anticoagulated tubes. Complete blood count was performed on a Sysmex XN-9000 automated analyzer (Kobe, Japan). Means +/- standard deviations were: RBCs $3.5 \times 10^{12}$/L (+/- 0.8), hemoglobin 11.2 g/dL (+/- 2.1), mean cell volume 95 fL (+/- 4), reticulocytes 1.8% +/- 0.6 or $63 \times 10^{9}$/L (+/- 21). Films were manually spread less than 6 hours from collection, then stained according to the May-Grünwald-Giemsa procedure. At least 1000 RBCs were carefully checked under the microscope by all authors in a well-spreaded area and all RBC anomalies (shape, color, inclusions) were recorded. The data are gathered in *table 1*. Concordance of inter-observer was checked using a multi-head microscope.

Among the anomalies observed, abnormal shapes dominated in particular acanthocytes, schistocytes and spherocytes, but none was significant. Some polychromatophilic erythrocytes, occasional elliptocytes/ovalocytes, echinocytes, irregularly contracted cells, dacryocytes were observed. Rarely bite cells, blister cells, stomatocytes, target cells, ghost (or fuzzy RBCs) and abnormal inclusions (basophilic stippling, Howell-Jolly bodies) could be seen. By contrast echinocytes, rouleaux or agglutination and dimorphism were never observed. All these morphological anomalies remained largely under 1%, and would not have been considered as significant according to reference publications [5].

Morphologic anomalies of the RBCs during pregnancy are poorly known [6]. In normal subjects, clearly

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**Table 1.** Published recommendations for reporting and grading red blood cell morphologic anomalies. Data of pregnant women (this series).

| | Constantino (2014) | | | ICSH (Palmer, 2015) | | | GFHC (Trimoreau, 2017) | this series | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Red blood cell anomaly** | **Grading system** | | | **Grading system** | | | **Mention even if rarely observed** | **(n=69) (%)** | | | |
| | **1+(%) (slight/few)** | **2+(%) (moderate)** | **3+(%) (marked)** | **few/1+** | **moderate/ 2+ (%)** | **many/ 3+ (%)** | **(lead to diagnostic information)** | **median** | **mean (+/-SD)** | **min** | **max** |
| Poikilocytosis | | | | - | - | - | No (not alone) | | Non significant | | |
| Anisocytosis | | | | N/A | 11-20 | >20 | No (not alone) | | Non significant | | |
| Macrocytes | | | | N/A | 11-20 | >20 | No | | Not reported | | |
| Oval macrocytes | | | | N/A | 2-5 | >5 | - | | Not reported | | |
| Microcytes | | | | N/A | 11-20 | >20 | No | | Not reported | | |
| Hypochromic cells | 5-15 | 16-40 | >40 | N/A | 11-20 | >20 | No | | Not reported | | |
| Polychromasia | 3-5 | 6-20 | >20 | N/A | 5-20 | >20 | - | 0.5 | 0.2 (+/-0.8) | 0.3 | 4.2 |
| Acanthocytes | 1-10 | 11-30 | >30 | N/A | 5-20 | >20 | No | 0.3 | 0.3 (+/-0.3) | 0 | 2.5 |
| Bite cells | | - | - | N/A | 1-2 | >2 | | | Three cases (0.1-0.4%) | | |
| Blister cells | | - | - | N/A | 1-2 | >2 | | | One case (0.1%) | | |
| Echinocytes/ burr cell | | - | - | N/A | 5-20 | >20 | | | None | | |
| Elliptocytes | 6-20 | 21-50 | >50 | N/A | 5-20 | >20 | | 0.2 | 0.2 (+/-0.2) 0 | 5 | |
| Irregularly contracted cells | | - | >4 | N/A | 1-2 | >2 | | 0.2 | 0.2 (+/-0.4) | 0 | 1.2 |
| Ovalocytes | | - | - | N/A | 5-20 | >20 | | | Pooled with elliptocytes | | |
| Schistocytes | 1-5 | 6-15 | >15 | <1% | 1-2 | >2 | Yes | 0.3 | 0.3 (+/-0.3) | 0 | 0.5 |
| Sickle cells | | - | - | N/A | 1-2 | >2 | Yes | | None | | |
| Spherocytes | 1-5 | 6-20 | >20 | N/A | 5-20 | >20 | Yes | 0.3 | 0.3 (+/-0.3) | 0 | 2 |
| Stomatocytes | | - | >30 | N/A | 5-20 | >20 | - | | Two cases (0.3 and 0.5%) | | |
| Target cells | 5-10 | 11-25 | >25 | N/A | 5-20 | >20 | No | | Two cases (0.1 and 0.4%) | | |
| Teardrop cells/ dacryocytes | | - | >4 | N/A | 5-20 | >20 | Yes | 0 | 0.8 (+/-1.1) | 0 | 4.5 |
| Basophilic stippling | | - | | N/A | 5-20 | >20 | - | | Two cases (0.1 and 0.5%) | | |
| Howell-Jolly bodies | | - | | N/A | 2-3 | >3 | Yes | | Two cases (0.1 and 0.3%) | | |
| Pappenheimer bodies | | - | | N/A | 2-3 | >3 | - | | None | | |
| Hemoglobin crystals | | - | | | | | Yes | | None | | |
| Ghosts/ hemighosts | | - | | | | | Yes | | Four cases (0.1-0.5%) | | |
| Rouleaux | | 11-50 | >50 | | | | No | | None | | |
| Dimorphism | | - | - | | | | - | | None | | |
| Agglutination | | - | - | | | | - | | None | | |

altered RBCs are mainly represented by echinocytes and knizocytes, but do not exceed a mean value of 1% [7]. We rigorously reviewed peripheral blood films from healthy pregnant women to investigate shape, color and content anomalies of the RBCs. A range of minor alterations was observed, without clinical significance. This was anticipated at first glance by the visual impression of the morphologist, but was confirmed by the data. As compared to non-pregnant women, only a slight increase of polychromatophilic RBCs was noted, remaining without clinical value. Polychromatophilic cells are more numerous as reticulocytes count is increased, which was not the case in this series. Though pregnant women do not present significant RBCs morphologic anomalies, we would like to stress that some morphological anomalies such as spherocytes or schistocytes can be seen, and could be confusing in particular for hemolysis suspicion [8]. It is thus crucial to carefully scan the blood film to reject/assess a pathologic interpretation.

**Ethic considerations:** The blood samples were always collected for medical purpose by the physicians. No woman was specifically collected for this study. As no relevant anomaly was found, no specific comments were added to the lab report.

**Conflict of interest:** none of the authors has any conflict of interest to disclosure.

## References

**1**. Bain BJ. Morphology in the diagnosis of red cell disorders. *Hematology* 2005 ; 10(Suppl. 1) : 178-81.

**2**. Constantino BT. Reporting and grading of abnormal red blood cell morphology. *Int J Lab Hematol* 2015 ; 37 : 1-7.

**3**. Palmer L, Briggs C, McFadden S, Zini G, Burthem J, Rozenberg G, *et al*. ICSH recommendations for the standardization of nomenclature and grading of peripheral blood cell morphological features. *Int J Lab Hematol* 2015 ; 37 : 287-303.

**4**. Trimoreau F, Galoisy AC, Geneviève F, Bardet V, Cornet E, Hurst JP, *et al*. French-Speaking Cellular Haematology Group. Harmonisation of full blood count reports, recommendations of the French-speaking cellular haematology group (GFHC). *J Clin Pathol* 2017 ; 70 : 395-402.

**5**. Ford JC, Milner R, Dix DB. Red blood cell morphology reporting: how much is a waste of time ? *J Pediatr Hematol Oncol* 2011 ; 33 : 10-4.

**6**. Bolton FG, Street MJ, Pace AJ. Changes in erythrocyte volume and shape in pregnancy. *Br J Obstet Gynaecol* 1982 ; 89 : 1018-20.

**7**. Turchetti V, De Matteis C, Leoncini F, Trabalzini L, Guerrini M, Forconi S. Variations of erythrocyte morphology in different pathologies. *Clin Hemorheol Microcirc* 1997 ; 17 : 209-15.

**8**. Ford J. Red blood cell morphology. *Int J Lab Hematol* 2013 ; 35 : 351-7.