Comparative study of total dose infusion of iron and intramuscular iron administration in treatment of severe iron deficiency anemia during pregnancy

Thesis Submitted For Fulfillment
of Master Degree in Obstetrics and Gynecology

Presented by

Hossam El-Deen Mostafa Abdelghani

Resident at General Embaba Hospital

Supervised By

Prof. Mohamad Mohamad Ismaeil Albokl

Professor of Obstetrics and Gynecology
Faculty of medicine (Cairo University)

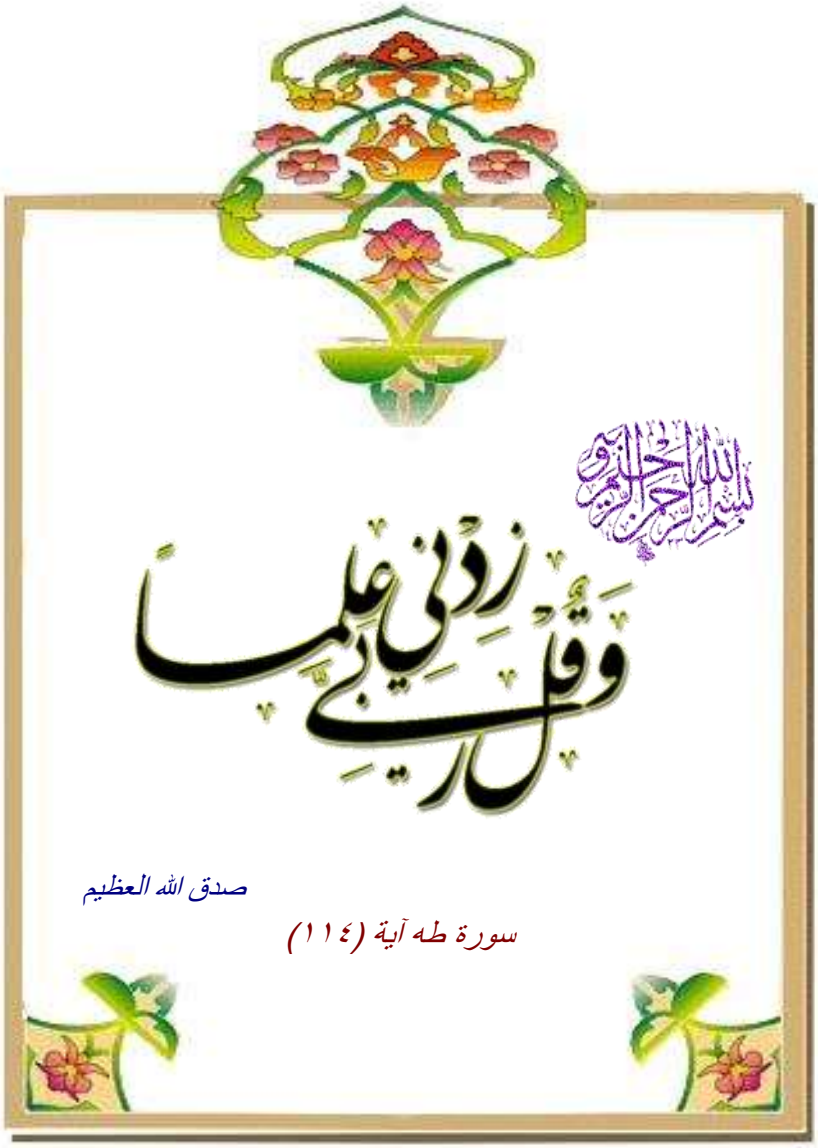
Dr. Ahmed Mohamad Maged

Assistant Professor of Obstetrics and Gynecology
Faculty of medicine (Cairo University)

Dr. Dina Sabry Abdel Fatah

Assistant Professor of clinical and chemical pathology
Faculty of medicine (Cairo University)

Faculty of Medicine
Cairo University
2016



صدق الله العظيم

سورة طه آية (١١٤)

Acknowledgement

First of all, all gratitude is due to **God** *almighty for blessing this work, until it has reached its end, as a part of his generous help, throughout my life.*

Really I can hardly find the words to express my gratitude to **Prof. Mohamad Mohamad Ismaeil Albokl,** *Professor of Obstetrics and Gynecology, Faculty of medicine (Cairo University), for his supervision, continuous help, encouragement throughout this work and tremendous effort he has done in the meticulous revision of the whole work. It is a great honor to work under his guidance and supervision.*

I would like also to express my sincere appreciation and gratitude to **Dr. Ahmed Mohamad Maged,** *Assistant Professor of Obstetrics and Gynecology, Faculty of medicine (Cairo University), for his continuous directions and support throughout the whole work.*

Really I can hardly find the words to express my gratitude to **Dr. Dina Sabry Abdel Fatah,** *Assistant Professor of clinical and chemical pathology, Faculty of medicine (Cairo University) for his continuous directions and meticulous revision throughout the whole work. I really appreciate their patience and support.*

Last but not least, I dedicate this work to my family, whom without their sincere emotional support, pushing me forward this work would not have ever been completed.

Hossam El-Deen Mostafa Abdelghani

Abstract

Anemia is a widespread public health problem associated with an increased risk of morbidity and mortality, especially in pregnant women Globally almost half of pregnant women and close to one third of non pregnant women suffer from anemia.

The aim of this study is to compare the effectiveness and safety of intramuscular and intravenous iron therapy in pregnant women with severe iron deficiency anemia.

The present study shows that the severity of iron deficiency anemia affects maternal and fetal outcomes.

Key words
Severe iron deficiency anemia.
Intravenous and intramascular iron therapy.

Contents

List of Abbreviations

ATP	: Adenosine triphosphate
BFUE	: Burst forming unit erythroid
C.S	: Caesarian section
CBC	: Complete blood count
CFUE	: Colony forming unit erythroid
CRF	: Case record form
EPO	: Erythropoietin
G.A	: Gestational age
Hb	: Hemoglobin
HCT	: Hematocrit
I.M	: Intramuscular
I.V	: Intravenous
IDA	: Iron deficiency anemia
LBW	: Low birth weight
LMW	:Low molecular weight
MCHC	:Mean corpuscular hemoglobin concentration
MCV	: Mean corpuscular volume
NVD	: Normal vaginal delivery
OB/GYN	: Obstetrical/Gynecological
P.P.H	: Postpartum hemorrhage
PG	: Primigravida
RBC	: Red blood cell
RDA	: Recommended daily allowance
RNA	: Ribonucleic acid
TIBC	: Total iron binding capacity
UTI	:Urinary tract infection

List of tables

List of Figures

List of Figures (Cont.)

List of Figures (Cont.)

Introduction

Anemia is generally defined according to hemoglobin levels, which may vary according to many factors most importantly age, gender, and ethnicity. Any level below 13g/dL for males, and below 12 g/dL for females is considered abnormal. ***(Thum and Anker, 2007).*** Hemoglobin levels of less than 11 g/dL at any time during pregnancy are considered abnormal. ***(Shill et al., 2014).***

Typical features of iron deficiency anemia are caused by lowered oxygen delivery to the tissues, and include pallor, fatigue, apathy, fainting, and breathlessness. Additional features include headache, palpitation, hair loss, and tinnitus. Chronic iron deficiency anemia lowers work tolerance, productivity, and the quality of life. This leads to further socio-economic difficulties. Dysfunction in the immune system results in increased risks for infections ***(Abbaspour et al., 2014).***

With more severe degrees of anemia, cardiac failure may develop. During pregnancy, iron deficiency anemia correlates with negative perinatal outcomes including premature labor, intrauterine growth retardation, low birth weight, birth asphyxia, and neonatal anemia. ***(Zimmerman and Hurrell, 2014).***

Throughout pregnancy, iron deficiency anemia adversely affects the maternal and fetal well-being, and is linked to increased morbidity and fetal death. Affected mothers frequently experience breathing difficulties, fainting, tiredness, palpitations, and sleep difficulties**.** ***(Lee et al., 2004)*****.** They also have an increased risk of developing perinatal infection, pre-eclampsia, and bleeding. Post-partum cognitive impairment and behavioral

difficulties were also reported ***(Murray-Kolb 2013).*** Adverse perinatal outcomes include intrauterine growth retardation, prematurity, and low birth weight, all with significant mortality risks, particularly in the developing world. ***(Bhutta et al., 2005).*** Iron deficiency during the first trimester, has a more negative impact on fetal growth than anemia developing later in pregnancy. This is also true for risk of premature labor. ***(Gautam et al.,2008).***

Over the past years, various routine methods like oral iron therapy, intramuscular iron therapy, and blood transfusion were used to treat anemia during pregnancy ***(Bayoumeu et al., 2002).*** These methods are not without deficiencies, and also there are conditions in which these conventional iron therapies are not helpful, like inadequate gastrointestinal absorption, late pregnancy, intolerance to required oral iron, requirement of emergency supplement, and severe anemia with contraindications to blood transfusion. So, to treat these conditions, we require a relatively new mode of iron therapy with better efficacy, less side effects, fast action, and better compliance. Intravenous iron therapy seems to be a safe, convenient, and more effective treatment for severe anemia during pregnancy ***(Perewusny et al., 2002).***

Intravenous iron therapy is safe, convenient, more effective, and faster acting than intramuscular iron therapy for the treatment of moderate to severe anemia during pregnancy. ***(Subhadra et al., 2013).***

Aim of the Work

The aim of this study is to compare the effectiveness and safety of intramuscular and intravenous iron therapy in pregnant women with severe iron deficiency anemia.

Chapter one

Anemia

Definition:

Anemia is defined as a reduction of the red blood cell volume or hemoglobin concentration below the range of values occurring in healthy persons to meet the tissue demands for oxygen delivery ***(Glader, 2007).***

ERYTHROPOIESIS:

Red blood cells (RBCs), also known as erythrocytes (Fig. 1-1) carry oxygen throughout the body to nourish tissues and sustain life. Red blood cells are the most abundant cells in our bodies. Newborns have about 4.7 million red blood cells per cubic millimeter of blood and women have about 4.7 million per cubic millimeter of blood ***(Karine et al., 2007).***

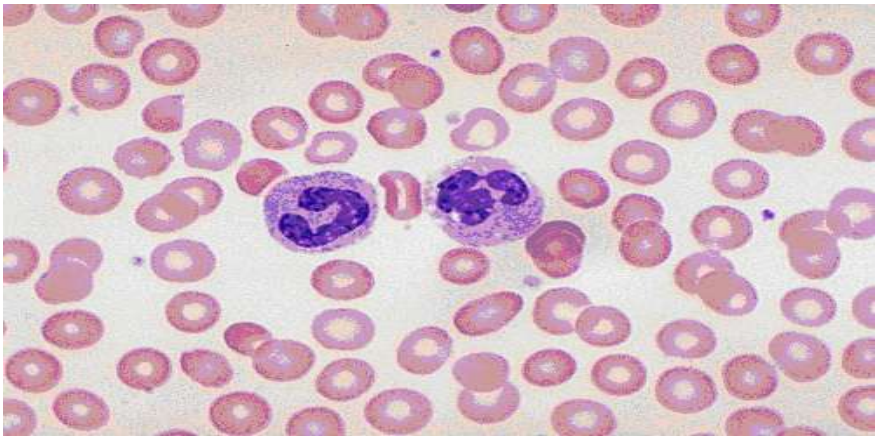
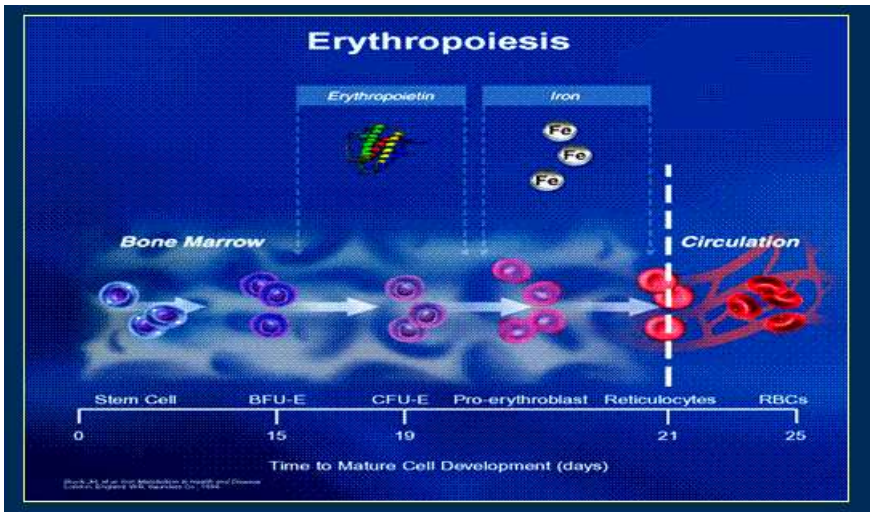


Fig. (1-1): Photomicrograph of a peripheral blood smear showing the normal red blood cells ***(Karine et al., 2007)***

The actual process of making red blood cells is called erythropoiesis. In Greek, erythro means "red," and poiesis means "the making of things." So Erythropoiesis is the process of manufacturing, recycling, and regulating the number of red blood cells ***(Van Meter, 2008).***

Most of the work of erythropoiesis occurs in the bone marrow it takes about 25 days (Fig. 1-2). In children younger than 5 years old, the marrow of all the bones of the body is enlisted for producing red blood cells. As a person ages, red blood cells are eventually produced only in the marrow of the spine, ribs, and pelvis ***(Kalantar et al., 2004).***



BFU-E (Burst forming unit erythroid) CFU-C(colony forming unit erythroid)

Fig. (1-2): Erythropoiesis ***(Kalantar et al., 2004)***

The body carefully regulates its production of red blood cells so that enough are manufactured to carry oxygen but not so many that the blood becomes thick or sticky (viscous) ***(Glader, 2007).***

If the body needs more oxygen, the kidney triggers the release of the hormone erythropoietin (EPO), a hormone that acts in the bone marrow to increase the production of red blood cells ***(Glader, 2007).***

EPO is a 30-39 kd glycoprotein that binds to specific receptors on the surface of erythroid precursors and stimulates their differentiation and clonal maturation into mature erythrocytes. The regulation of EPO gene expression involves an oxygen sensing mechanism, and both hypoxia and