Effect of Iron Overdose on Histological Pictures of Liver and Kidneys of Neonate Rabbits

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Abstract:

Twenty neonate Rabbits were used, and divided into two groups. The first group (control) includes 10neonate Rabbits, while the second 10neonate Rabbits were the experimental and recived25mg\kg iron sulphat dissolved in D.W. (suspension)\day for one month duration. The toxic effects of iron were clear in the different tissue. The histological change were clear in the hepatic cell atrophy, irregular hepatic cells, RBC cells in the blood sinusoid. However, the kidney tissue showed rupture or absence of Bowman's capsule, atrophy of glomeruli, and lymphatic cells infiltration. the distal convoluted tubules were lined with low cuboidal cells.

Introduction

Iron is a component of several metalloproteins and plays crucial role in vital biochemical activities, such as oxygen sensing and transport, electron transfer and catalysis. [1].According to the world health organization of the united nations WHO, iron deficiency anemia is one of the most common nutritional deficiencies in the world .It can be caused by low dietary iron, poor iron absorption or excessive blood loss,[1].Iron toxicity, is rare .consuming large quantity of alcohol may increase the absorption of iron. Hemochromatosis a genetic disorder, local damage of the gastrointestinal tract mucosa allow unregulated absorption lead to toxic levels,[2].while the clearance of iron only execrated through blood loss .[3] reported that excess iron will built up in tissues and organs .an over dose supplement, can cause toxicity in adult and children. Toxicity is mostly dependent on iron-induced free radical reaction and oxidative damage, in that iron is thought to play a role in carcinogenesis through the generation of oxygen free radicals, [4] .Evidence suggested that transitional metals ,in particular iron react with hydrogen peroxide in cell nuclei leading to DNA damage, [5].Since children and neonate were the most subjected to iron supplementation an over dose may affect their health. This study was designed to detect the adverse effect of iron on histological pictures of liver and kidney in neonate rabbit.

Materials and methods

Twenty weaned neonate rabbits weighing between (300-350) grams were used in this study. The animals were obtained from parents reared in special farm, and the neonates were maintained and acclimatized in the college of veterinary medicine –Tikrit university under laboratory conditions in group cages .The neonates were fed standard diet pellets and water was provided *ad lib.* The neonate rabbits were allocated randomly into two groups 10 each; group(A) was kept as control, group(B) was supplemented with 250 mg/kg body weight iron sulphate group. The iron sulphate doses were given individually as an oral daily dose, after crushing iron sulphate tablets (Samarra drug industry - SDI- Iraq) and suspended in distal water. Treatment was last for thirty days. The animals were killed at the day after the last dose under intensive dose of chloroform. Kidneys and livers of the animals were rapidly removed and micro dissected to obtain tissue samples for histological examination. Blocks of tissues were immediately fixed in 10% neutral buffered formalin, dehydrated with graded series of ethyl alcohol and embedded in paraffin. Sections of 5 microns were cut and stained with eosin and hemotoxylin according to[6]. Photomicrographs of the slides were taken using digital camera attached to light microscope. The whole photomicrographs were compared with those of liver and kidneys of control group (A).

Results

The control group in the present experiment showed normal lobular architecture of the liver tissues. Fig (1) shows normal hepatic cells around the central vein. In the meantime the kidney tissues also showed normal histological appearance of nephrons in that normal glomeruli and tubules Fig (2). While(group B)rabbits livers showed heavy iron deposition in the hepatocytes and kupffer cells in sinusoid , hepatic lesions as it appeared in the atrophied ,sinusoid liver containing red blood, necrosis of the peripheral cells, fibrosis and mild cirrhosis also aggregation lymphatic cell in portal area, hyperemia in central vein, irregular radial pattern showed Fig (3). while Fig (4) The kidneys sections of the iron treated showed degeneration of the renal cells, atrophy in some glomeruli and the glomeruli containing large capsular spaces, glomeruli uncoated or rupture of Bowman's capsule, Lymphatic aggregation ,cellular desquamation in renal tubule, distal convoluted tubule were lined with irregular cuboidal cells.

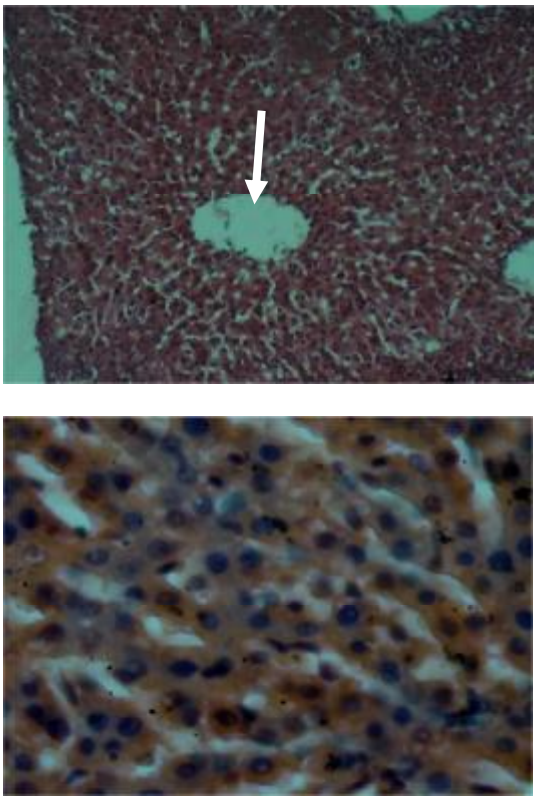


Figure (1):- control group of the neonate Rabbit shows arrow the portal vein and normal liver cells arranged (x40H&E).

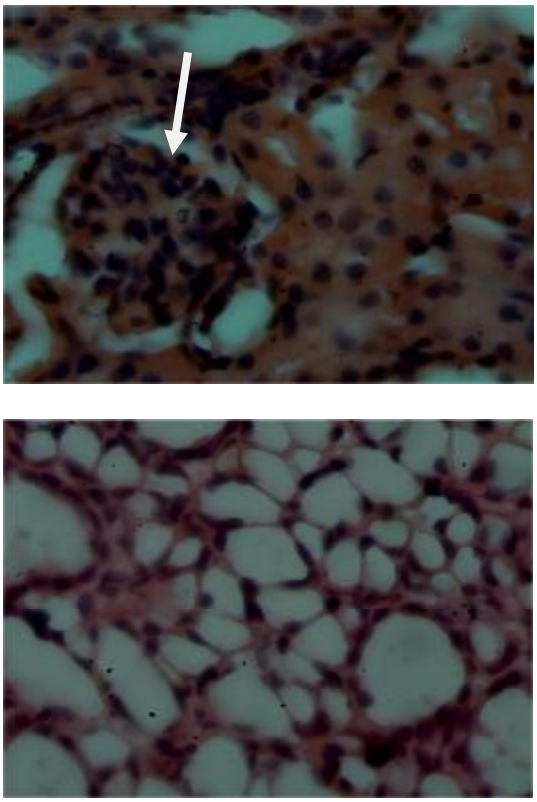
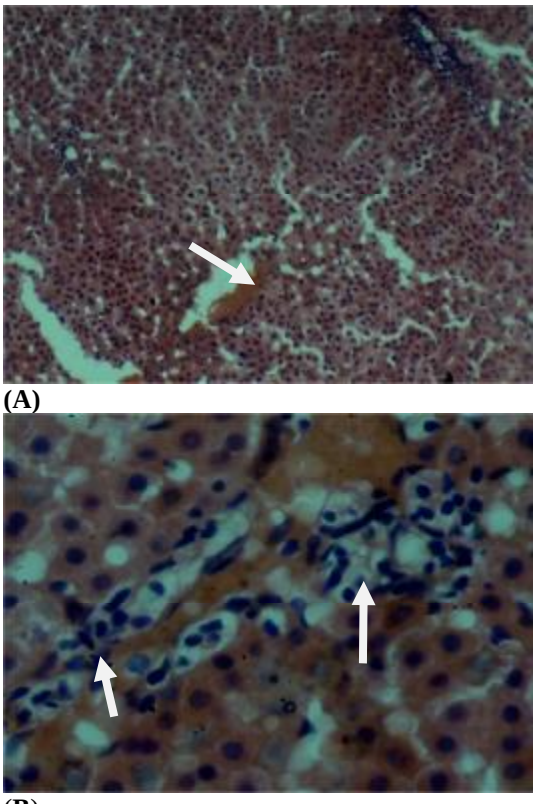
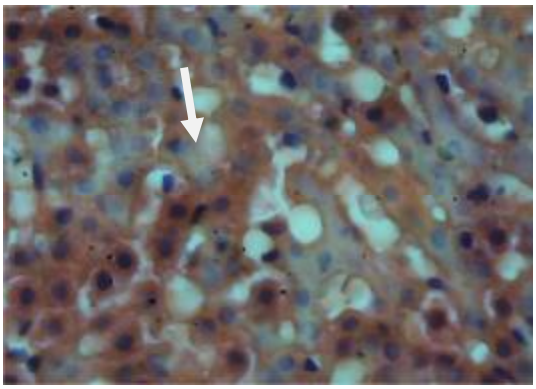


Figure (2) neonate rabbit control group showing kidney the tubules, glumuolar. With normal Bowmen's capsule (X40H&E)



(A)

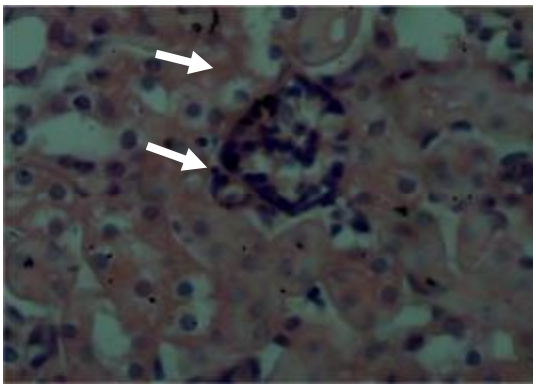
(**B**)



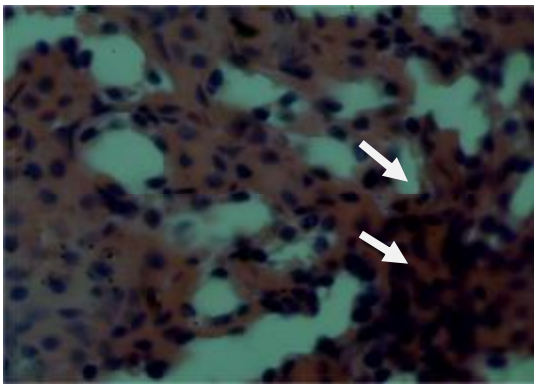
(**C**)

Figure (3):- liver neonate rabbit treated with 250mg showing (X40H&E)

a) hyperemia in central vein.
b) lymphatocyts aggregation in portal area, irregular radial pattern, atrophy hepatocytes.
c) light areas (cirrocess) necrotic.



(A)



(B)

Figure (4):-kidney of neonate rabbit treated with 250mg showing

(a) Light areas necrotic zone, none specific tubular atrophy, rapture in Bowman's capsule

(b) Thickening of the interstitial cellsو increase the cells, (X40H&E)

Discussion

Although, iron is the most essential elements in most biological systems, yet it is a toxic to cells in excessive amounts. The results obtained in the present study showed a wide range of liver and kidney lesions, such lesions were reported in rat´s liver under iron-sorbitol overload reported by Ozguner, and Sayin, and. Apple *et al* fond that iron was accumulated in liver, spleen, and kidney where it causes tissue damages [7],[8], .Iron in its free ferrous and ferric forms may serve as physiological regulator of normal intercellular functions ,but can be linked to several pathways of cellular toxicity [9]. The most acceptable theory in that is the oxidative damage caused by free radicals leading to necrosis which may promoted by increasing intracellular free ion which induce liver damage, [10].

Iron toxicity is largely due to catalytic activity of iron sufficient to yield hydroxy radicals (OH) from superoxide ($O2^{\cdot-}$) and hydrogen peroxide (H2O2), collectively known as reactive oxygen intermediates (ROIs), Haliwell and Gutteridge,. Raiola*et al* reported that excess iron manifested in almost all tissues but the majority is deposited in reticuloendothelial macrophages in spleen, liver, and bone marrow and in parenchymal tissues primarily in hepatocytes and endocrine glands[11],[12] . Recently Oruc*et al.* reported iron toxicity in dairy cattle due to increase iron intake which resulted many adverse symptoms including postmorttem finding characterized by dark and oedematous kidneys, dark and degenerate liver, orange-yellow discoloration of blood and all tissues [13]. The present results supported previous reports mentioned elsewhere, [14].

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تأثير الجرع العالية من الحديد على الصورة النسيجية للكبدوالكلية في الارانب الصغيرة

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الخلاصة:-

تم استخدام عشرون أرنب صغير بعد الفطام قسموا الى مجموعتين المجموعة الاولى عشرة أرانب وهي مجموعة السيطرة والمجموعة الثانية عشرة ارانب صغيرة جرعت mg\kg250 سلفات الحديد بعد أن طحن وذوب بقليل من ماء المقطر على شكل عالق جرعة يوميا لمدة شهر لنلاحظ التاثير السمي للحديد في الأعمار الصغيرة على الأعضاء الداخلية (الكبدوالكلية) ،لقد لوحظ تغيرات نسيجية عند مقارنتها بالأعضاء النسيجية من مجموعة السيطرة ،حيث لوحظ في الكبد ضمور في الخلايا الكبدية والعديد من الصفوف الخلوية غير منتظمة هناك العديد من الحبيبانيات الدموية تحتوي على الكريات الدم الحمراءوتغيرات اخرى،بينما في الكلية لوحظ الكبيبات الكلوية غير محاطة بمحفظة بومان وبدت الكبيبة ضامرة،هناك ارتشاح خلوي لمفي اما النبيبات القاصية ذات خلايا مكعبة واطئة .