Original Article

The Possible Protective Role of Aloe Vera Against Indomethacin Induced Renal Cortical Injury in Rats

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ABSTRACT

Background: The use of indomethacin, as one of the non-steroidal anti-inflammatory drugs in different medical conditions, is often accompanied by harmful effects on the kidney.

Aim of the Work: Evaluating the potential protective role of the Aloe Vera (AV) intake against the deleterious effects of indomethacin on the adult albino rats' renal cortex structure, with special reference to the glomerular endothelial nitric oxide synthase (eNOS) and desmin immunohistochemical expression.

Material and Methods: Forty five adult albino rats are distributed into 4 groups; group I (control, n=15); group II is given AV orally 200 mg/kg BW twice daily; group III is given indomethacin subcutaneously 1mg/Kg BW twice daily; group IV is given indomethacin subcutaneously concurrently with AV orally. Serum creatinine (SC) is measured. After four weeks, paraffin sections of the kidneys are prepared. Some sections are stained with H&E, while others are immuno-stained for eNOS and desmin. Statistical analysis is performed.

Results: Histological examination of group III shows congested glomeruli with either partial obliteration or apparent widening of Bowman's space. There is interstitial mononuclear cell infiltrate and hemorrhage. Tubular cells show cytoplasmic vacuolation with pyknotic nuclei. There is highly statistical significant decrease and increase of eNOS and desmin immunoreactivity respectively compared to control. Group IV displayed apparently similar histological architecture of most of the glomeruli and convoluted tubules compared to the control group. SC level showed statistically high significant decrease compared to group III.

Conclusion: Aloe vera administration revealed a partial protective effect on the renal cortical injury produced by indomethacin.

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Key Words: AV, indomethacin, kidneys, rats.

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INTRODUCTION

Non-steroidal anti-inflammatory drugs (NSAIDS) are extensively used in different medical conditions as antipyretic, analgesic and anti-inflammatory[1]. Unfortunately, this use is often accompanied by deleterious effects on the kidney[2].

Being one of the NSAIDs, indomethacin has been investigated to demonstrate the clinical, biochemical and structural changes in different organs, as the liver and the kidney, after its acute and chronic use[1,3].

Endothelial nitric-oxide synthase (eNOS) is involved in many physiological processes concerned with regulation of vascular tone in the kidney. Its vasculo-protective effect is exerted by opposing the effects of the renin-angiotensin system leading to enhanced kidney blood flow[4]. Moreover, the intermediate filament desmin is considered as a marker of myogenic cells[5] and glomerular epithelial cells (podocytes)[6].

There is an increased tendency nowadays to use herbal medicine where about 80% of the population all over the world depend on it for their primary health care[7]. Aloe barbadensis Miller commonly known as Aloe vera (AV), is frequently used worldwide as a healing plant[8]. The leaf exudate and the mucilaginous gel extracted from the pulp of the leaf are the two most used preparations in medicine; the exudate is used as a laxative, while the mucilaginous gel is used for treatment of various skin disorders[9]. Moreover, Aloe vera is known to

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have antidiabetic property[10,11], cardio, hepato and nephro-protective effects[12-14] respectively. So, the current work was designed to evaluate the possible protective role of Aloe vera intake against the deleterious effects of indomethacin on the adult albino rats' renal cortex structure with special reference to the glomerular eNOS and desmin immunohistochemical expression.

MATERIAL AND METHODS

Drugs

- Indomethacin 50 mg /ampoule obtained from Nile Company for Pharmaceuticals and Chemical Industries, was dissolved in sterile distilled water and further diluted with saline to obtain the required dose to be administered subcutaneously (s.c.)[15].
- Aloe vera capsules containing 200 mg Aloe latex (Nature's way Company, GNC, USA) was dissolved in sterile distilled water. It was given to the rats by oral gavage.

Animals

Forty five male adult albino rats weighing 200 – 250 gms were purchased from the animal house, Faculty of Medicine, Ain Shams University. Animals were treated according to the guidelines of Ain Shams Committee of Animal Research Ethics (CARE). The animals were housed in suitable environment (12 hours light-dark cycle, good ventilation, suitable temperature 22˚- 25˚c and humidity 45-50%), fed on rat chaw and allowed free access to water. Rats were housed in metallic cages.

Experimental design

Animals were distributed into 4 groups; 15 rats in the control group and 10 rats in each one of the other three groups.

Group I (control group): It was further divided into three subgroups:

- **Group I (a):** Five rats served as negative control.
- **Group I (b):** Five rats received the vehicle (saline) s.c. twice daily for 4 weeks.
- **Group I (c):** Five rats received distilled water by oral gavage twice daily, for 4 weeks.

Group II (Aleo vera group): ten rats received Aloe vera in a dose of 200 mg/kg body weight by oral gavage twice daily, for 4 weeks[9].

Group III (indomethacin group): ten rats were maintained on a s.c. dose of 1mg/kg body weight of indomethacin twice daily for 4 weeks[16].

Group IV (indomethacin and Aloe vera group): ten rats concurrently received Aloe vera by oral gavage and indomethacin s.c. in similar doses and duration as group II and III, respectively.

Biochemical analysis

The animals were anaesthetized by ether inhalation, at the end of the experiment. The samples of blood were withdrawn from the retro-orbital sinus using capillary glass tubes for the measurement of the serum creatinine. Then the animals of all groups were sacrificed.

Histological study

After sacrification, the kidneys were dissected, extracted, divided longitudinally and immediately placed in 10% neutral formalin. After dehydration and embedding in paraffin blocks, sections (5 µm) were obtained. They were stained with hematoxylin and eosin (Hx & E)[17] and examined using light microscopy, then photographed.

Immunohistochemical study

Immunohistochemical staining was performed on paraffin sections. It was performed following manufacturer's Kit's manual. Xylene and ethanol were used for dewaxing of the sections. Antigen retrieval was performed by boiling tissue slides with 0.01 M citric buffer in a microwave power for 5 minutes. After antigen retrieval, hydrogen peroxide was used to quench endogenous peroxidase activity. Blocking was done with 10% serum-Tris buffer, pH 7.5 for 20 minutes at room temperature. Then sections were incubated with the primary antibody; primary polyclonal antibody to eNOS (Abcam, Cambridge, MA, USA) at a dilution of 1:50[18] and monoclonal antibody to desmin (clone D33; Dako, Trappes, France) at a dilution of 1/100[19], at room temperature for 120 minutes. Corresponding biotinylated conjugated secondary antibody from Dako staining system was used. Sections incubated in the absence of the primary antibody, were used as a negative control. Hematoxylin was used to counter stain the nuclei. Then the stained sections were examined using the light microscopy.

Image analysis

The area percentage of the positive glomeruli for eNOS and desmin was measured in different 30 glomeruli in each rat kidney with magnification

x400[20]. Image analysis was performed with Image J software.

Statistical study

The measured data including serum creatinine and area percent of the positive glomeruli for eNOS and desmin were displayed as mean ± standard error (mean ± SE). The analysis was performed using version 17 of the Statistical Package for Social Science (SPSS) (IBM Corporation, New York, USA). One-Way ANOVA followed by a post hoc test was used for comparison between groups. $P<0.05$ was considered significant and $P<0.001$ was considered highly significant.

RESULTS

The Biochemical results

The mean serum creatinine (SC) level in group II (Aloe vera group) showed statistical non-significant decrease compared with group I (control group). There was a statistically high significant increase in the mean SC level in group III (indomethacin group) compared with the control group ($p< 0.001$). In group IV (indomethacin and Aloe vera group), the mean SC level had a statistically non-significant increase ($p> 0.05$) compared to the control group, while it had a statistically high significant decrease ($p< 0.001$) compared with the indomethacin group. The mean SC level (mg/dl) and the standard error (SE) in different groups were summarized in (Table 1, Bar Chart 1).

Histological results

Group I (control group):`Sections stained with Hx & E in the kidney of adult albino rats from the control group I (b) and I (c) showed similar findings as those of the control group I (a).

Sections of control group I (a) showed that the nephrons were formed of renal corpuscles, proximal and distal convoluted tubules embedded in interstitial tissue. The renal corpuscles were formed of loops of glomerular capillaries and surrounded by double layered Bowman's capsule enclosing the Bowman's space (Figure 1). The parietal layer appeared as very thin layer formed of flattened epithelial cells forming the outer limit of the renal corpuscle. The visceral layer enveloped the patent glomerular capillary loops. These loops were associated with mesangial cells (Figure 2). The proximal convoluted tubules (PCTs) were lined by cuboidal cells with brush border and had narrow lumina. The cells showed acidophilic cytoplasm and basally situated vesicular nuclei. The distal convoluted tubules (DCTs) were lined with cuboidal cells with apically situated nuclei and had wide lumina (Figures 1,2).

Group II (Aleo vera group): Sections stained with Hx & E in the kidney of adult albino rats from group II (Aleo vera group) showed similar findings as those of the control group (Figure 3).

Group III (indomethacin group): Sections stained with Hx & E in the kidney of adult albino rats from group III (indomethacin group) showed congested capillary loops of the cortical glomeruli (Figures 4,5). There was an apparent increase in the mesangial cells (Figure 6). Some glomeruli showed focal thickening of the parietal layer of the Bowman's capsule with areas of disruption (Figure 6). Other glomeruli showed either partial obliteration of Bowman's space or apparent widening of the space (Figures 4,5). Focal areas of proximal and distal convoluted tubules were seen with prominent vacuolation of the cytoplasm of the tubular cells with pyknotic nuclei (Figure 5). There was partial loss of the brush border of the cells lining the PCT (Figure 6). Extensive interstitial and perivascular mononuclear cell infiltrate was observed (Figure 5). There was extensive interstitial hemorrhage (Figures 4,5,6). Some interstitial dilated blood vessels were observed (5).

Group IV (indomethacin and Aloe vera group): Sections stained with Hx & E in the kidney of adult albino rats from group IV revealed apparently normal histological architecture of the majority of the glomeruli (Figures 7,8). However few glomeruli showed partial obliteration of the Bowmen's space (Figure 7). Minimal interstitial hemorrhage was observed (8). Most of the proximal and distal convoluted tubules showed almost normal histological architecture similar to the control group (Figures 7,8).

Immunohistochemical results

Endothelial nitric oxide synthase (eNOS)

Immuno-stained kidney sections of adult albino rats from the control and Aloe vera groups (groups I & II) displayed positive eNOS immunoreactivity in the form of brown coloration in the endothelial cells of the glomerular capillary loops (Figures 9,10). Sections from indomethacin group (group III) expressed apparently negative eNOS immunoreactivity in the endothelial cells of the glomerular capillary loops (Figure 11).

However, sections from indomethacin and Aleo vera group (group IV) showed apparently positive eNOS immunoreactivity in the endothelial cells of the glomerular capillary loops (Figure 12).

The mean area percent of eNOS inside the renal glomeruli showed statistically high significant decrease (P<0.001) in indomethacin group (group III) when compared with the control and Aloe vera groups. The mean area percent of the eNOS in the renal glomeruli of indomethacin and Aloe vera (group IV) had a statistically significant decrease (P<0.05) compared to the control group, while it had a statistically high significant increase (P<0.001) compared with the indomethacin group. The mean area percent of eNOS and the standard error (SE) in different groups was summarized in (Table 2, Bar Chart 2).

Desmin

Immuno-stained kidney sections of adult albino rats from the control and Aloe vera groups (groups I & II) displayed apparently weak positive desmin immunoreactivity in the glomeruli (Figures 13,14). Sections from indomethacin group (group III) expressed apparently strong positive desmin immunoreactivity in the glomeruli (Figure 15) compared to the control and Aloe vera groups. However, sections from indomethacin and Aleo vera group (group IV) showed apparently weak positive desmin immunoreactivity in the glomeruli (Figure 16) compared to the indomethacin group.

The mean area percent of desmin inside the renal glomeruli showed statistically high significant increase (P<0.001) in indomethacin group (group III) compared to the control and Aloe vera groups. The mean area percent of the desmin in the renal glomeruli of indomethacin and Aloe vera (group IV) had a statistically significant increase (P<0.05) compared to the control group, while it had a statistically high significant decrease (P<0.001) compared with the indomethacin group. The mean area percent of desmin and the standard error (SE) in different groups was summarized in (Table 3, Bar Chart 3).

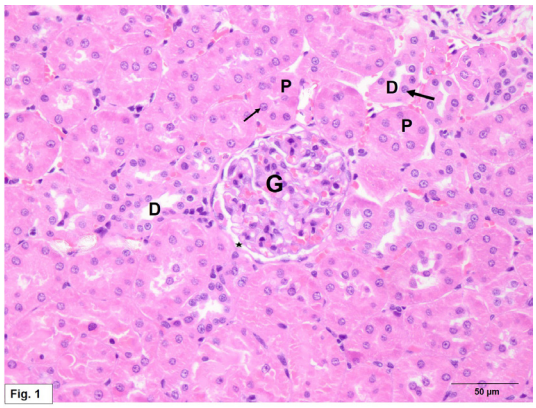


Fig. 1: A photomicrograph of a section in the kidney of an adult albino rat from the control group (group I) showing a glomerulus (G) surrounded by distinct Bowman's space (asterisk). The proximal convoluted tubules (P) are lined by cuboidal cells with its basal situated nuclei (thin arrow) and narrow lumina. The distal convoluted tubules (D) are lined by cuboidal cells having apical situated nuclei (thick arrow) and wide lumina. (Hx & E; x400)

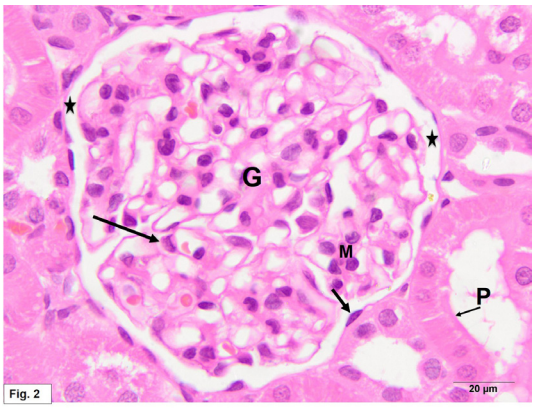


Fig. 2: A photomicrograph of a section in the kidney of an adult albino rat from the control group showing a glomerulus (G) surrounded by Bowman's space (asterisks). The parietal layer of the Bowman's capsule is formed of flattened epithelial cells (short thick arrow). The visceral layer (long thick arrow) envelops the patent glomerular capillary loops. Notice the brush border (thin arrow) of the proximal convoluted tubule (P). M = mesangial cells (Hx & E; x1000)

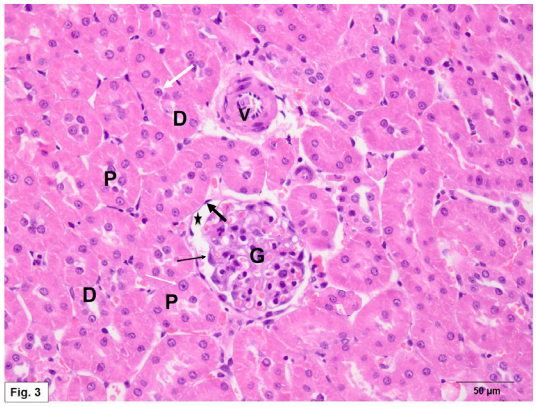


Fig. 3: A photomicrograph of a section in the kidney of an adult albino rat from the Aloe vera group (group II), showing a glomerulus (G) surrounded by Bowman's space (asterisk). The parietal layer of the Bowman's capsule is formed of flattened epithelial cells (thick black arrow). The visceral layer (thin black arrow) envelops the patent glomerular capillary loops. The proximal convoluted tubules (P) are lined by cuboidal cells with its basal situated nuclei (thin white arrow) and narrow lumina. The distal convoluted tubules (D) are lined with cuboidal cells having apical situated nuclei (thick white arrow) and wide lumina. V=blood vessel (Hx & E; x400)

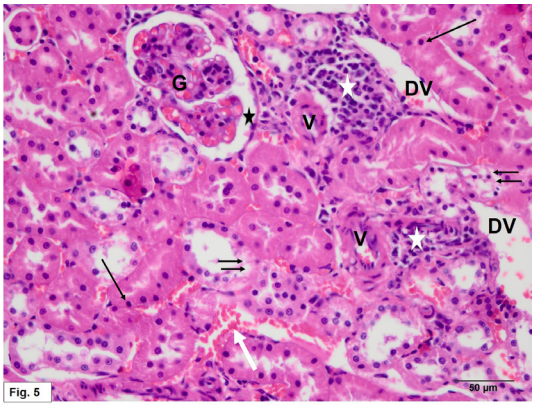


Fig. 5: A photomicrograph of a section in the kidney of an adult albino rat from indomethacin group showing a congested glomerulus (G) with apparent widening of Bowman's space (black asterisk). There is interstitial and perivascular (V) mononuclear cell infiltrate (white asterisks). The convoluted tubules show cytoplasmic vacuolation of the tubular cells (short thin arrows) with pyknotic nuclei (long thin arrows). Notice the interstitial hemorrhage (white arrow) and the dilated blood vessels (DV). (Hx & E; x 400)

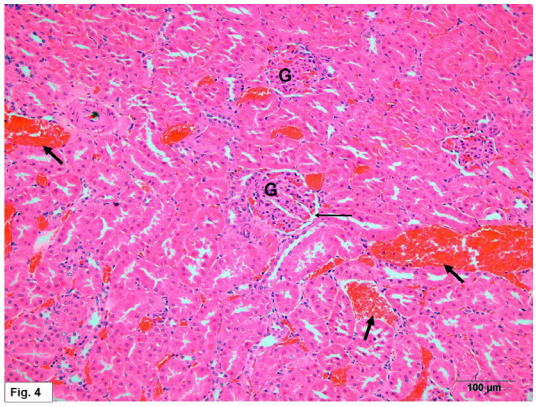


Fig. 4: A photomicrograph of a section in the kidney of an adult albino rat from the indomethacin group (group III) showing congested glomeruli (G) with Bowman's space (thin arrow) which is partially obliterated. Notice the marked interstitial hemorrhage (thick arrows). (Hx & E; x 200)

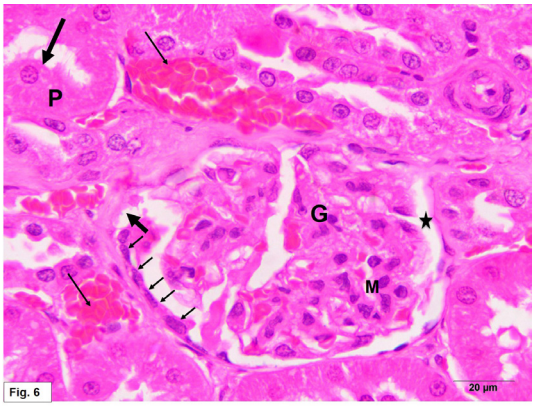


Fig. 6: A photomicrograph of a section in the kidney of an adult albino rat from indomethacin group showing a glomerulus (G) with an apparent increase in the mesangial cells (M), focal thickening of the parietal layer (short thin arrows) of the Bowman's capsule with areas of disruption (short thick arrow). The Bowman's space (asterisk) is partially obliterated. Notice interstitial hemorrhage (long thin arrows) and the focal loss of the brush border (long thick arrow) in proximal tubule (P). (Hx & E; x 1000)

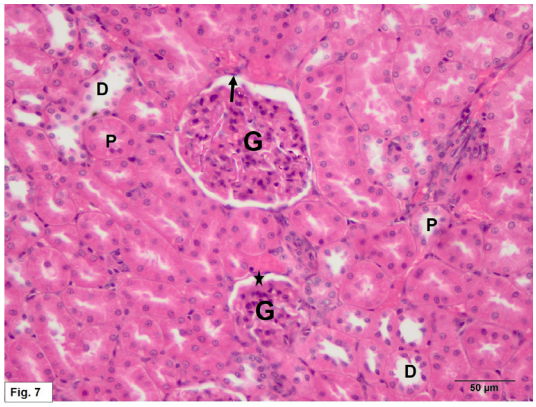


Fig. 7: A photomicrograph of a section in the kidney of an adult albino rat from indomethacin and Aleo vera group (group IV) showing a glomerulus (G), with apparently thin regular parietal layer of the Bowman's capsule (arrow). Notice the Bowman's space (asterisk) with partial obliteration. The proximal (P) and distal (D) convoluted tubules showing almost normal histological architecture. (Hx & E; x 400)

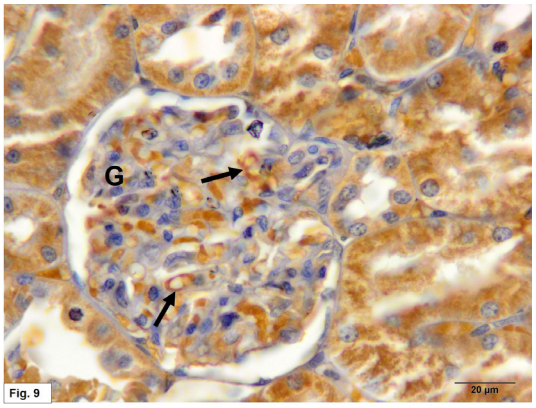


Fig. 9: A photomicrograph of a section in the kidney of an adult albino rat from the control group showing positive eNOS immunoreactivity (arrows) in the endothelial cells of the glomerular capillary loops (G). Notice the eNOS immunoreactivity in the tubules (eNOS; x1000)

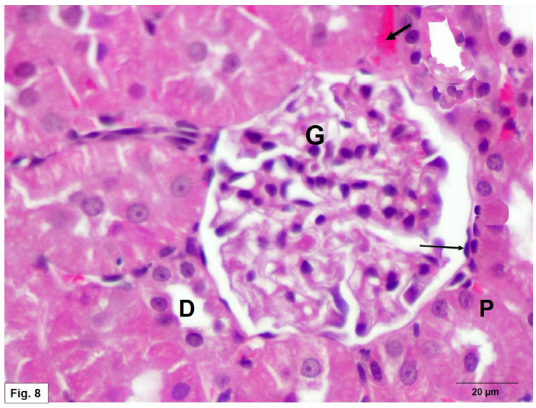


Fig. 8: A photomicrograph of a section in the kidney of an adult albino rat from indomethacin and Aleo vera group showing a glomerulus (G), with apparently regular parietal layer of the Bowman's capsule (thin arrow) and surrounded by proximal (P) and distal (D) convoluted tubules with apparent normal histological architecture. Notice the brush border of the proximal convoluted tubule and the slight interstitial hemorrhage (thick arrow). (Hx & E; x 1000)

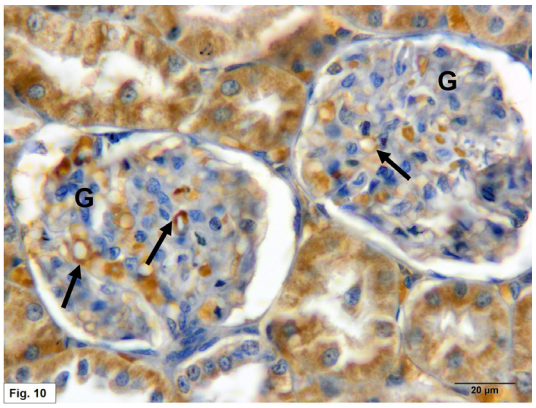


Fig. 10: A photomicrograph of a section in the kidney of an adult albino rat from Aleo vera group showing positive eNOS immunoreactivity (arrows) in the endothelial cells of the glomerular capillary loops (G). Notice the eNOS immunoreactivity in the tubules. (eNOS; x1000)

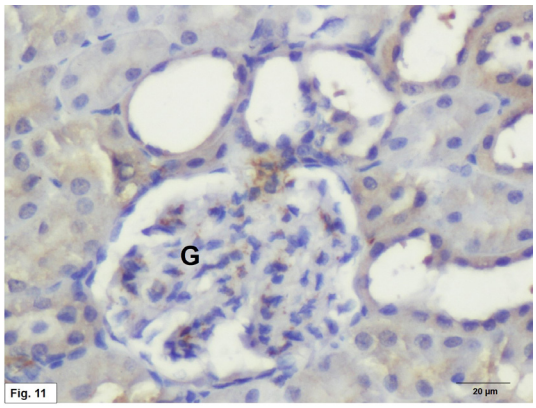


Fig. 11: A photomicrograph of a section in the kidney of an adult albino rat from indomethacin group showing negative eNOS immunoreactivity in the endothelial cells of the glomerular capillary loops (G). (eNOS; x1000)

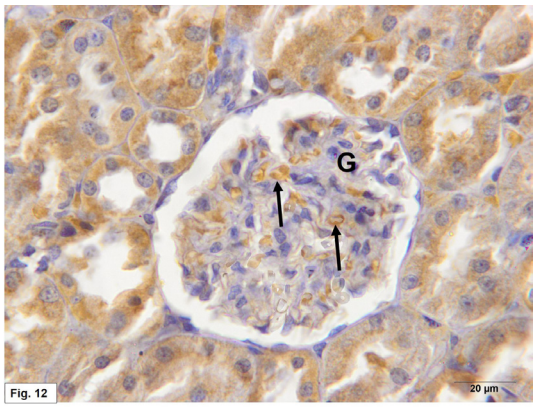


Fig. 12: A photomicrograph of a section in the kidney of an adult albino rat from indomethacin and Aleo vera group showing apparently positive eNOS immunoreactivity (arrows) in the endothelial cells of the glomerular capillary loops (G) and tubules. (eNOS; x1000)

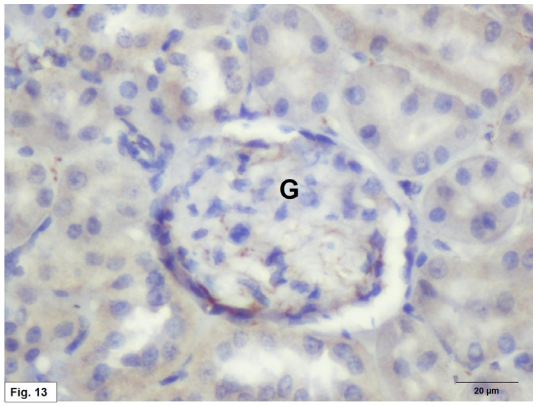


Fig. 13: A photomicrograph of a section in the kidney of an adult albino rat from the control group showing weak positive desmin immunoreactivity in the glomerulus (G). (Desmin; x1000)

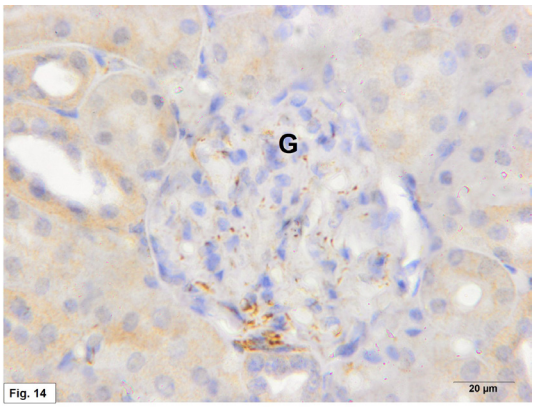


Fig. 14: A photomicrograph of a section in the kidney of an adult albino rat from Aloe vera group showing weak positive desmin immunoreactivity in the glomerulus (G). (Desmin; x1000)

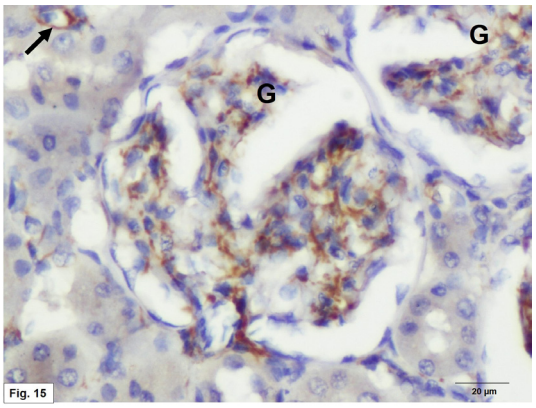


Fig. 15: A photomicrograph of a section in the kidney of an adult albino rat from indomethacin group showing strong positive desmin immunoreactivity in the glomeruli (G) and in the interstitial blood vessel (arrow). (Desmin; x1000)

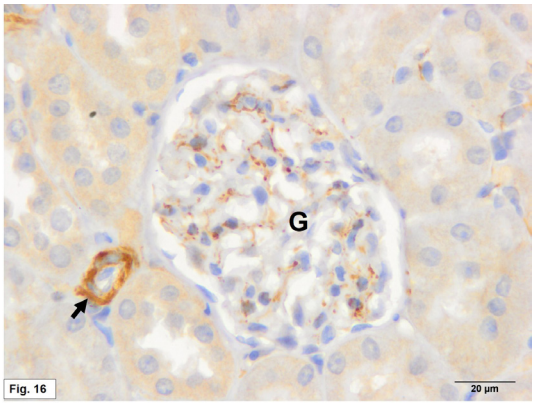


Fig. 16: A photomicrograph of a section in the kidney of an adult albino rat from indomethacin and Aleo vera group showing weak positive desmin immunoreactivity in the glomerulus (G). Notice the positive desmin immunoreactivity in the interstitial blood vessel (arrow). (Desmin; x1000)

Table 1: The mean serum creatinine level in the different groups

Groups	(I) Control	(II) AV	(III) Indomethacin	(IV) Indomethacin & AV
Serum creatinine Mean ± SE	0.457 + 0.07	0.415 + 0.06	1.506 + 0.11	0.61 + 0.06
			($P < 0.000005$)*	($P < 0.000003$)**

* Highly significant increase compared to group I
** Highly significant decrease compared to group III

Table 2: The mean area percent (%) of eNOS in the different groups

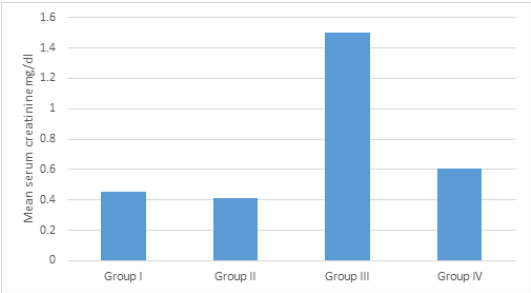
Groups	(I) Control	(II) AV	(III) Indomethacin	(IV) Indomethacin & AV
eNOS Mean area % + SE	20.64 + 0.72	20.1 + 0.6	10.77 + 0.37	18.21 + 0.45
			($P < 0.00000001$)*	($P < 0.00000001$)** ($p < 0.01017841$)***

* Highly significant increase compared to group I
** Highly significant decrease compared to group III

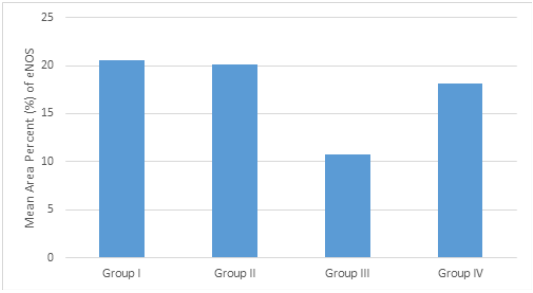
Table 3: The mean area percent (%) of desmin in the different groups

Groups	(I) Control	(II) AV	(III) Indomethacin	(IV) Indomethacin & AV
Desmin Mean area % ± SE	4.74 + 0.2	5.322 + 0.22	20.64 + 0.7	6.26 + 0.37
			($P < 0.00000001$)*	($P < 0.00000001$)** ($P < 0.00237001$)***

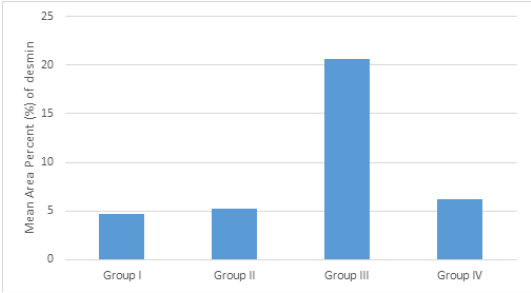
* Highly significant increase compared to group I
** Highly significant decrease compared to group III
*** Significant increase compared to group I



Bar chart 1: The mean serum creatinine level in the different groups



Bar chart 2: The mean area percent (%) of eNOS in the different groups



Bar chart 3: The mean area percent (%) of desmin in the different groups

DISCUSSION

The clinical use of NSAIDS in different medical conditions is usually associated with harmful effects on the kidney and gastrointestinal tract[2]. In the present study, indomethacin induced alterations in the normal histological architecture of the renal cortex. Some glomeruli were congested and showed focal thickening of the parietal layer of the Bowman's capsule with areas of disruption, while other glomeruli showed either partial obliteration or apparent widening of Bowman's space. Similar findings were observed in the kidney of rats given indomethacin orally[1,21]. In that respect, glomerular injury in the form of glomerular hypertrophy, mesangial expansion and podocyte injury leads to loss of renal function[22].

In the present study, podocyte injury was confirmed by the strong positive glomerular desmin-immunoreactivity in the indomethacin group. Similar finding was in line with studies which demonstrated podocyte injury where desmin was increased in the glomeruli in a hyperuricemia in a rat model[23] and in patients with acute kidney injury when compared to patients with non-acute kidney injury[24]. Desmin is an intermediate filament protein of podocyte cytoskeleton and is used as a marker of podocyte injury in various glomerular diseases where desmin expression is usually upregulated[6,25].

In the present study, indomethacin treated rats (group III) showed apparently negative eNOS immunoreactivity in the endothelium of glomerular capillaries compared to the control group. This result was confirmed by the statistical significant decrease of the area percent of eNOS in the glomeruli in indomethacin group compared to the control group. The vasodilator nitric oxide (NO) has a crucial role in kidney vascular tone regulation[26]. Synthesis of NO is done during conversion of l-arginine to l-citrulline using the enzyme nitric oxide synthase (NOS)[27]. This enzyme has three isoforms; endothelial (eNOS), neuronal (nNOS) and inducible (iNOS). eNOS is predominantly found in renal vasculature[28,29], and plays an important role in normal renal hemodynamics maintenance[30]. The decreased production of nitric oxide is either due to impaired synthesis or excessive oxidative degradation. This decreased production causes serious problems to the endothelial equilibrium[31]. Indomethacin decreased activated eNOS levels in the kidney resulting in decreased NO levels which leads to reduced renal perfusion and subsequent renal damage[2]. On the other hand, in the present work, eNOS positive immunoreactivity was observed in the tubules. Although eNOS is expressed in PCT, ascending loop of Henle (thick portion) and the collecting tubule, however, the exact role of NO in the PCT is not known[32]. That's why in this study area percent of eNOS was measured only in the glomeruli.

Extensive interstitial and perivascular mononuclear cell infiltrate was observed in the present work. This inflammatory reaction might be due to the interference of indomethacin with the renal antioxidant defense mechanism with subsequent generation of reactive oxygen species imitating inflammatory response[33].

In this study, serum creatinine showed statistical significant increase in group III (indomethacin group) compared to the control group. This increase in serum creatinine level confirms the histological and immunohistochemical results. Fuchus and Hewitt[34] declared that elevated levels of serum creatinine is one of the evidence of glomerular injury.

The proximal and distal convoluted tubules showed signs of degeneration in the form of prominent vacuolation of the cytoplasm of the tubular cells with pyknotic nuclei. Similar effects of indomethacin on the renal tubules in adult and neonatal rats were recorded[1,35] respectively. The cytoplasmic vacuolation of convoluted tubules in rats might be due to the disturbance of the cell membrane function which leads to extensive water and sodium ions influx[36].

Many cultures use Aleo vera in their traditional medicine due to its anti-oxidant and therapeutic properties[37]. In the present work, group IV revealed that the glomeruli and tubular changes induced by indomethacin were improved by the concurrent use of AV with indomethacin. This was evident by the biochemical, histological, and immunohistochemical results of this study. Although immunohistochemical results showed that highly significant increase and decrease in the mean area percent of glomerular eNOS and desmin immunoreaction respectively of group IV compared with the indomethacin group, yet, there was still statistical significant decrease and increase when compared to the control. This suggests that AV has partial protective protection on the renal cortex.

The mechanism by which AV exerted its reno-protective action is not certain. However, it is

well known that AV has an antioxidant action[38-40] which may have neutralized the reactive oxygen species (ROS) and oxidative stress documented in indomethacin-induced nephrotoxicity[3,41]. Moreover, AV treatment was able to improve the nephrotoxicity of other drugs that might have predisposed to the production of free radicals such as gentamicin and Bisphenol A[42,43]respectively.

CONCLUSION

This study showed that the biochemical, histological and immunohistochemical changes of indomethacin-induced renal cortical injury were partially improved by the concurrent administration of AV. Indomethacin should be carefully used clinically to prevent the occurrence of nephrotoxicity especially in high-risk patients. As the AV dose used in this study exerted partial protection against indomethacin induced nephrotoxicity, further investigation is required using larger doses to ascertain its clinical application.

CONFLICT OF INTERESTS

There are no conflicts of interest.

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الدور الوقائي المحتمل للصبار ضد إصابة القشرة الكلوية الناجمة عن استخدام الإندوميثاسين في الجرذان

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ملخص البحث

مقدمة : إن استخدام الإندوميثاسين ، كأحد الأدوية المضادة للألتهابات غير الستيرويدية في الحالات الطبية المختلفة ، غالباً ما يصاحبه آثار ضارة على الكلى.

الهدف من الدراسة : تقييم الدور الوقائي المحتمل للصبار ضد التأثيرات الضارة للإندوميثاسين على بنية القشرة الكلوية للجرذان البيضاء البالغة ، مع إشارة خاصة إلى التعبير المناعى لأكسيد النيتريك البطاني الكبيبي (eNOS) و ديسمين (desmin).

المواد والطرق : تنقسم خمسة وأربعون من ذكور الجرذان البيض إلى أربع مجموعات ؛ المجموعة الأولى (الضابطة) ، ن = 15 ؛ المجموعة الثانية تعطى الصبار عن طريق الفم 200 مج لكل كيلوجرام من وزن الجسم مرتين يوميًا ؛ المجموعة الثالثة تُعطى الإندوميثاسين تحت الجلد 1 مج لكل كيلوجرام من وزن الجسم مرتين يوميًا ؛ يتم إعطاء المجموعة الرابعة إندوميثاسين تحت الجلد مع الصبار عن طريق الفم. يتم قياس الكرياتينين في الدم. بعد أربعة أسابيع ، يتم إعداد شرائح البارافين من الكلى. بعض القطاعات تصبغ بـ الهمتوكسيلين و الأيوسين (H&E) ، في حين أن بعضها الآخر يصبغ مناعيا للأكسيد النيتريك البطاني الكبيبي (eNOS) والدسمين (desmin). يتم إجراء التحليل الإحصائي.

النتائج: يُظهر الفحص النسيجي للمجموعة الثالثة إحتقان الكبيبات مع وجود طمس جزئي أو اتساعًا واضحًا لمساحة بومان. يوجد هناك بعض الخلايا أحادية النواة ونزيف. تظهر خلايا الأنيبيبات بعض الفراغات فى السيتوبلازم مع انوية ضامرة. يوجد انخفاض وزيادة كبيرة إحصائيًا في نشاط المناعة للأكسيد النيتريك البطاني الكبيبي (eNOS) والدسمين (desmin) على التوالي مقارنةً بالمجموعة الضابطة. تظهر المجموعة الرابعة بنية نسيجية متشابهة ظاهريا لمعظم الكبيبات والأنيبيبات الملتوية فى المجموعة الضابطة.

الاستنتاج: كشف اعطاء الصبار تأثير وقائي جزئى على إصابة القشرة الكلوية نتيجة لاستخدام الإندوميثاسين.