Original Article

Protective Effects of Ghrelin Following Experimentally Induced Ischemia-reperfusion in the Rat Ovary

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ABSTRACT

Background: Ovarian torsion, a critical gynecological emergency, leads to blockage of the ovarian artery and vein, ultimately causing ischemia in the ovary.

Objectives: This study aims to investigate the potential antioxidative effects of ghrelin in the context of ischemia-reperfusion (IR) injury in the rat ovary.

Methods: Twenty-one female adult Wistar rats (250-300 g) were divided into three groups: Sham-operated group (n=7); ischemia-saline group, 100 µL saline was administered intraperitoneally 30 min prior to a 2-h of ischemia and simultaneously with the beginning of 2-h reperfusion (n=7); ischemia-ghrelin group, 10 nmol ghrelin was administered intraperitoneally 30 min prior to the 2-h of ischemia and simultaneously with the beginning of 2-h reperfusion (n=7). The right ovaries were excised in each group and underwent biochemical analysis. Malondialdehyde (MDA), superoxide dismutase (SOD), glutathione peroxidase (GPx), total antioxidant capacity (TAC), and catalase (CAT) were assessed as biochemical parameters.

Results: There were no significant differences among groups in SOD and GPx levels (P>0.05). MDA level was higher in the ischemia-saline group compared to the sham group. However, it was significantly lower in the ischemia-ghrelin group compared to the ischemia-saline group (P≤0.05). CAT and TAC levels were significantly lower in the saline group compared to the sham-operated group and increased significantly in the ghrelin-treated group compared to the saline group (P≤0.05).

Conclusion: Overall, ghrelin with a dosage of 10 nmol preserved rat ovaries from damage caused by IR.

Keywords: Ghrelin, Ischemia-reperfusion (IR), Rat ovary, Torsion, Torsion/Detorsion

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Introduction

Ovarian torsion, a critical gynecological emergency, refers to the rotation of the ovary around its central line ligaments (infundibulopelvic and tubo-ovarian) (Omar & Al-Hendy, 2020; um Tumor & do Ovário, 2022). Reports indicate that the incidence of ovarian torsion is 5.9 per 100000 women, and the highest incidence is in premenopausal women (Vu & Goh, 2022). Ovarian torsion leads to blockage of the ovarian artery and vein, ultimately causing ischemia in the ovary. Ovarian ischemia, characterized by reduced energy production without oxygen, triggers oxidative stress, potentially leading to cell apoptosis. Upon detection of ovarian torsion, the twisted ovary's detorsion and tissue reperfusion evaluation is recommended to prevent future infertility (He et al., 2022; Omar & Al-Hendy, 2020). It is noteworthy that the process of restoring the ovary to its normal state, such as ovarian torsion, is accompanied by the production of reactive oxygen species (ROS) that results in oxidative damage to the ovary, known as ischemia-reperfusion (IR) injury (Celik et al., 2004). ROS, including superoxide anion, hydrogen peroxide, and hydroxyl radical, are byproducts of oxidative metabolism in mitochondria that can interact with biomolecules and harm cellular components such as DNA, RNA, and proteins (Juan et al., 2021; Ghotbitabar et al., 2022; Elahinia et al., 2023). These mediators also impact cell membrane lipids, producing toxic products like malondialdehyde (MDA). Additionally, ROS diminishes the levels of natural antioxidants such as glutathione peroxidase (GPx), superoxide dismutase (SOD), and catalase (CAT) while increasing oxidant molecules (Tok et al., 2012).

Cells employ several methods to safeguard themselves against damage from ROS. One approach involves scavenging enzyme systems, such as CAT, which converts hydrogen peroxide into water, and SOD. SOD plays a role in breaking down the superoxide radical (O_2^-) into either ordinary molecular oxygen (O_2) or hydrogen peroxide (H_2O_2) (Ighodaro and Akinloye, 2018).

Various antioxidant agents have been employed in previous studies to prevent tissue damage in ovaries resulting from the IR process. Numerous studies have provided data to identify the antioxidant effects of vardenafil, propolis, lycopene, eugenol, and dexamethasone (Yurtcu et al., 2015; Koc et al., 2019; Kirmizi et al., 2021; Barghi et al., 2021; Omairi et al., 2022; Parham et al., 2022). Although antioxidants effectively reduce damage caused by ovarian torsion/detorsion, the most effective drug has not been found yet.

Ghrelin, the natural ligand for the growth hormone secretagogue receptor (GHS-R), is a recently discovered 28-amino acid peptide mainly produced in the stomach and hypothalamus (Dar et al., 2020, Ketaby & Mohammad-Sadegh, 2023; Emadi et al., 2022). Moreover, the ghrelin gene is expressed in different tissues, including the small intestine, brain, adrenal glands, ovaries, and testes, with the highest expression found in the stomach (Motta et al., 2016). The functional ghrelin receptor (GHS-R1a) has been identified in oocytes, follicular cells, and luteal cells in the rat ovary, indicating a potential direct influence of ghrelin on ovarian function (Pan et al., 2020). Recent evidence suggests that ghrelin may act as an antioxidant. Numerous studies have shown that ghrelin can prevent lipid peroxidation and the reduction of antioxidant enzyme activities and glutathione levels, particularly in response to oxidative stress induced by pentylenetetrazole in rat erythrocytes (Bademci et al., 2021). Another research conducted by Alirezaei et al. (2015) has confirmed that ghrelin significantly increases the activity of antioxidant enzymes like GPx, SOD, and CAT in renal cells in lipopolysaccharide-mediated renal failure in rats.

As mentioned earlier, numerous studies have explored the role of ghrelin in IR injury. While most studies favor the daily administration of ghrelin before the surgical procedure, our objective was to investigate the potential protective effect of ghrelin on oxidative stress parameters, including SOD, GPx, CAT, and total antioxidant capacity (TAC) following ovarian ischemia/reperfusion, leading us to administer ghrelin prior to the procedure (Kheradmand et al., 2010). Several pharmacological agents exist for preventing reperfusion injury, but unfortunately, many of them are impractical for clinical use in cases of ovarian torsion. However, ghrelin stands out in this regard. Notably, the parenteral administration of ghrelin is advantageous, especially in emergencies.

Materials and Methods

Drugs and chemicals

Rat lyophilized acylated ghrelin (n-octanoylated research grade) was obtained from Tocris Cookson Ltd. (Bristol, UK). Ghrelin was dissolved in a sterile physiologic saline solution before injection. The kits used to measure antioxidant enzyme activities were provided by the Kiazist commercial assay kit (Kiazist, Hamedan, Iran). Unless specified otherwise, all other chemicals

were procured from the Sigma-Aldrich Company in St. Louis, MO, USA.

Animals

The experiment was conducted on 21 adult female Wistar rats (age: 10 weeks; weight: 250-300 g). The animals were obtained from the Razi Research Institute in Kermanshah City, Iran. The rats were housed (seven rats per cage) in the animal room under controlled lighting (14 h light: 10 h darkness, lights from 06:00 h) and temperature (21–24 ˚C) conditions. The rats were fed with standard rodent chow and had access to water ad libitum. All experimental procedures were carried out between 1.00 PM and 5.00 PM. All investigations were conducted in accordance with the guiding principles for the care and use of research animals. All animals were treated in compliance with the recommendations of the Animal Care Committee for the Vet College of Lorestan University (Khorram Abad, Iran). This study was carried out in compliance with standard guidelines.

Experimental design

Animals were randomly separated into three groups (n=21): The control (sham operation, n=7), the IR (torsion-detorsion, n=7), and the IR-G (torsion/detorsion plus ghrelin, n=7). The rats were anesthetized with 75 mg/kg ketamine hydrochloride (Ketalar, Eczacıbası, Turkey) and injection of xylazine hydrochloride (10 mg/kg, Rompun, Bayer, Leverkusen, Germany) intraperitoneally (Taheri et al., 2021; Raisi et al., 2020). In the control group or sham, after anesthesia, the abdominal area was shaved and scrapped as usual. Then, it was opened through the midline, and the ovaries were slightly manipulated and then closed with 3/0 silk sutures. A 2.5-3 cm incision was made from the midline in the IR group. The ovaries were twisted around the axis of the tubo-ovarian ligaments, and the vascular pedicle of the ovary was taken 1 cm above and below the ovary with hemostatic forceps. A tampon was placed on it, and it remained in this state for 2 hours; ischemic conditions were created for the animal, and then the forceps were removed from the vascular pedicle for 2 h, and then it remained in reperfusion mode for 2 h. Next, the right ovaries were removed to measure the biochemical parameters. Thirty minutes before ischemia and at the same time as the ovaries were restored to normal, 100 µL of saline was injected into the rats of the ischemia-saline group. In the group treated with ghrelin, the same procedure was performed, but 100 µL of ghrelin (10 nmol) was injected 30 minutes prior to ischemia and at the same time as reperfusion (Demir et al., 2021; Kalyoncu et al., 2020). The choice of a 10 nmol of ghrelin and the ovarian ischemia and reperfusion periods were chosen following a review of previously published studies, but we noted that there was a lack of data in the literature about the dose-related effects of ghrelin in animal studies (İşeri et al., 2005). At the end of the experiment and after removing the right ovaries, rats were euthanized under deep anesthesia with intracardiac injection of magnesium sulfate (Magnesiject 40%, Maki Dam, Tehran, Iran) (Underwood & Anthony, 2020), and the ovaries were frozen at -70 ˚C for antioxidant enzymes assays.

Sampling and tissue preparation for enzyme assay

Immediately after sacrificing the rats, the right ovaries were taken, carefully separated from fat and surrounding tissue, and processed immediately. To perform enzymatic and lipid peroxidation assays, frozen ovaries were quickly homogenized manually in cold phosphate buffer (pH 7.2), and the residues were removed by centrifugation at 4500×g for 15 min. The clear supernatants were recovered and stored at -70 ˚C for subsequent enzyme and protein assays (Davoodi et al., 2020).

Protein measurement

The total protein concentration in the tissue samples was determined according to Bradford's method using bovine serum albumin as a standard, and measures were provided as mg protein (Bradford, 1976).

Measurement of tissue lipid peroxidation

Lipid peroxidation in each tissue sample was evaluated by measuring the level of MDA as a thiobarbituric acid-reactive substance (TBARS). Briefly, Cayman's TBARS (TCA method) assay kit provides a simple, reproducible, and standardized tool for assaying lipid peroxidation in the ovary. The MDA-thiobarbituric acid (TBA) adduct formed by the reaction of MDA and TBA under high temperature (90-100 ˚C) and acidic conditions were measured calorimetrically at 530-540 nm MDA levels were calculated from a standard calibration curve using tetraethoxypropane and expressed as nmol/mg protein.

SOD assay

SOD catalyzes superoxide anion to molecular oxygen and hydrogen peroxide because it supplies the essential part of the antioxidant defense mechanism. In brief, a test volume sample and chloroform and ethanol mixture (3.5 V/V) were mixed in a centrifuge tube. The precipitate was removed by centrifuge at 3000 rpm for 40

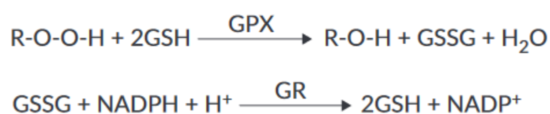
minutes. The assay solution contains sodium carbonate buffer (400 mM), xanthine 0.3 mM, 150 mmol/L nitro blue tetrazolium (NBT), 0.6 mmol/L Na_2EDTA, 1 g/L cattle serum albumin, xanthine oxidase 167 U/L and the sample were mixed in a cuvette. The activity was measured using xanthine and xanthine oxidase to produce superoxide radicals, which react with NBT. One unit of SOD was defined as the amount of protein that inhibited the rate of NBT reduction by 50%. As described by Sun et al. (1988), SOD level was reported as U/mg protein.

CAT assay

Cayman's CAT assay kit utilizes the peroxidic function of CAT to determine enzyme activity. The method is based on the enzyme's reaction with methanol in the presence of an optimal concentration of H_2O_2. The formaldehyde produced is measured calorimetrically with 4-amino-3-hydrazino-5-mercapto-1,2,4-triazole (Purpald) as the chromogen. 1,2 Purpald forms explicitly a bicyclic heterocycle with aldehydes, which, upon oxidation, changes from colorless to a purple color. The CAT activity was expressed as the unit defined as µmol of H_2O_2 consumed per min per gram of wet tissue (Johansson & Borg, 1988).

GPx assay

Cayman's GPx assay measures GPx activity indirectly by a coupled reaction with glutathione reductase (GR). Oxidized glutathione (GSSG), produced upon reduction of hydroperoxide by GPx, is recycled to its reduced state by GR and nicotinamide adenine dinucleotide phosphate (NADPH) (Paglia & Valentine, 1967) (Equation 1):
1.



$$R\text{-}O\text{-}O\text{-}H + 2GSH \xrightarrow{GPX} R\text{-}O\text{-}H + GSSG + H_2O$$

$$GSSG + NADPH + H^+ \xrightarrow{GR} 2GSH + NADP^+$$

The oxidation of NADPH to NADP+ is accompanied by a decrease in absorbance at 340 nm. Under conditions where the GPx activity is rate-limiting, the decrease in the A340 is directly proportional to the GPx activity in the sample.

TAC assay

TAC levels were measured using commercially available kits (Relassay, Turkey). Erel previously described TAS values against free radicals with a fully automatic method (Erel, 2005). This assay kit has a very low error rate of <3%. The results were presented as nmol/mg.

Statistical analysis

Data analyses were performed using SPSS software, version 16 for Windows. All quantitative data were tested for normality, followed by Levene's static test for homogeneity of variance. When the variance was homogenous, the results were analyzed separately using a one-way analysis of variance (ANOVA) and Tukey test as post hoc to determine group differences. The results are presented as Mean±SEM; $P<0.05$ were considered statistically significant.

Results

The mean values of antioxidants (SOD, CAT, GPx, and TAC) and oxidant (MDA) parameters in the rat ovaries among different groups are presented in 5 figures.

There were no significant differences among the groups for GPx and SOD levels ($P>0.05$). The Mean±SD levels of GPx (in the sham, ischemia-saline, and ischemia-ghrelin groups were 3.03±0.7, 3.63±0.8 and 3.07±0.83 u/mg protein, respectively (Figure 1).

The amount of SOD changes among different groups is shown in Figure 1. The Mean±SD levels of this enzyme in the sham, ischemia-saline, and ischemia-ghrelin groups were 5.6±2.95, 12.66±6.27 and 5.73±2.25 u/mg protein, respectively.

The level of CAT decreased significantly in the IR groups. However, intraperitoneal administration of ghrelin inverted the process and increased the activity of CAT in the ovarian tissue in the treated group. The value of the CAT level in the IRG group was significantly higher than those of the other experimental groups ($P\leq0.05$). The Mean±SD levels of this enzyme in the sham, ischemia-saline, and ischemia-ghrelin groups were 2.01±0.8, 1.46±0.13 and 2.08±0.13 u/mg protein, respectively (Figure 2).

TAC content was significantly lower in the ischemia-saline group compared to the sham and ischemia-ghrelin groups ($P\leq0.05$). Administration of ghrelin could enhance TAC level up to 1414.42±129.12 nmol/mg. The average values of this enzyme in the sham and ischemia-saline groups were 1381.86±118.6 and 928.01±79.53 nmol/mg protein, respectively (Figure 3).

MDA levels were significantly higher in the I/R group than in the sham + ischemia-ghrelin sham groups ($P\leq0.05$). The Mean±SD levels of this enzyme in the sham, ischemia-saline, and ischemia-ghrelin groups

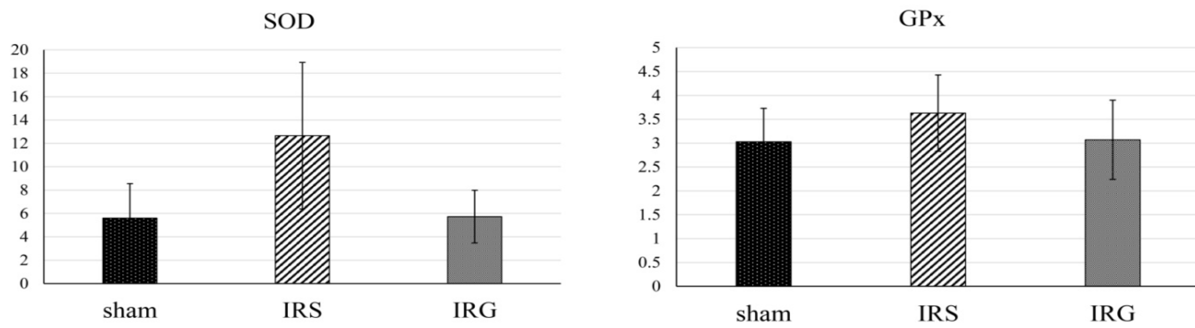


Figure 1. No significant differences among groups for SOD (u/mg protein) and GPx (u/mg protein)

SOD: Superoxide dismutase; GPx: Glutathione peroxidase.

Notes: IRS=Ischemia-saline group; IRG=Ischemia-ghrelin group.

were 972.81±98.42, 1388.46±125.99 and 811.36±103.68 nmol/mg protein, respectively (Figure 4).

Discussion

In this research, we investigated the protective capabilities of ghrelin against oxidative damage caused by ovarian IR injury in a rat model. The findings of our study demonstrated that the administered dose of ghrelin effectively mitigated biochemical damage associated with oxidative stress in ovarian IR injury.

Adnexal torsion occurs when the ovarian vascular pedicle twists, disrupting blood flow and causing ovarian ischemia (Ghosh & Mukharjee, 2022). This condition leads to elevated levels of lactic acid, hypoxanthine, and lipid peroxides in the blood. While detorsion is a common treatment, it can trigger oxidative stress, characterized by an imbalance between free oxygen radicals and antioxidants (Değer & Çavuş, 2020; Sengul et al., 2013; Park et al., 2013; Engwa et al., 2022).

After ovarian detorsion, increased oxygen levels interact with hypoxanthine and xanthine, generating ROS. These species, including superoxide, cause tissue damage by promoting cell membrane peroxidation and affecting mitochondrial lipids. This process, known as IR injury, exacerbates damage caused by ischemia (Sengul et al., 2013; Park et al., 2013; Soares et al., 2019). MDA, an indicator of oxidative damage, increases, leading to cell membrane disruption, disturbance in the ion transport system, reduced enzyme activity, and dysfunction in cell organelles (Liu et al., 2016; Akdemir et al., 2014).

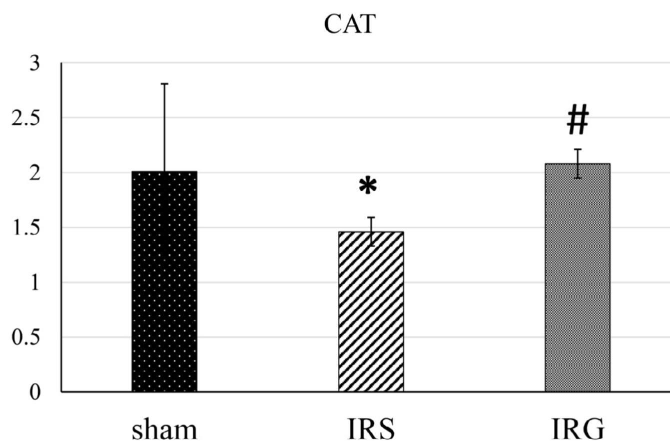


Figure 2. Ovarian CAT levels (u/mg protein) in three groups

*Significant changes compared to the sham group, #Significant changes compared to the saline group.

Notes: Values represent the Mean±SEM levels of CAT in each group. IRS=Ischemia-saline group; IRG=Ischemia-ghrelin group.

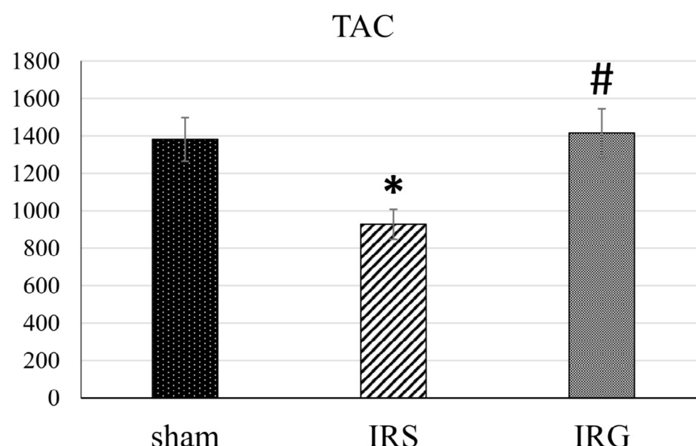


Figure 3. TAC level (nmol/mg protein) in the IRS, IRG, and sham groups (P≤0.05)

*Significant changes compared to the sham group, #Significant changes compared to the saline group.

Notes: IRS=Ischemia-saline group; IRG=Ischemia-ghrelin group.

Several studies demonstrate the impact of antioxidant molecules on the IR injury of the rat ovary. These studies motivated us to explore the influence of ghrelin on rat ovarian IR. Our findings indicate that administering ghrelin before IR positively affects oxidative damage in the ovaries. In our study, the level of MDA significantly decreased in the ghrelin group compared to the ischemia-saline rats, suggesting that ghrelin can reduce lipid peroxidation. Similarly, a report observed that agomelatine significantly decreased the ischemia/reperfusion-associated rise in MDA in ovarian tissue compared to the IR group (Gutteridge, 1995). Additionally, oxytocin administration decreased MDA levels significantly in rats treated with ovarian torsion (Lee et al., 2002).

The body maintains a balance between antioxidant and oxidant systems. Antioxidant systems, comprising enzymatic and non-enzymatic antioxidants, actively scavenge ROS to protect tissues from oxidative damage. However, if, for any reason, the oxidant mechanisms overpower this balance, it results in lipid peroxidation and tissue damage (Lee et al., 2002). One crucial antioxidant enzyme is SOD. It plays a significant role in rapidly converting superoxide into a less harmful component, namely hydrogen peroxide. Additionally, GPx and CAT

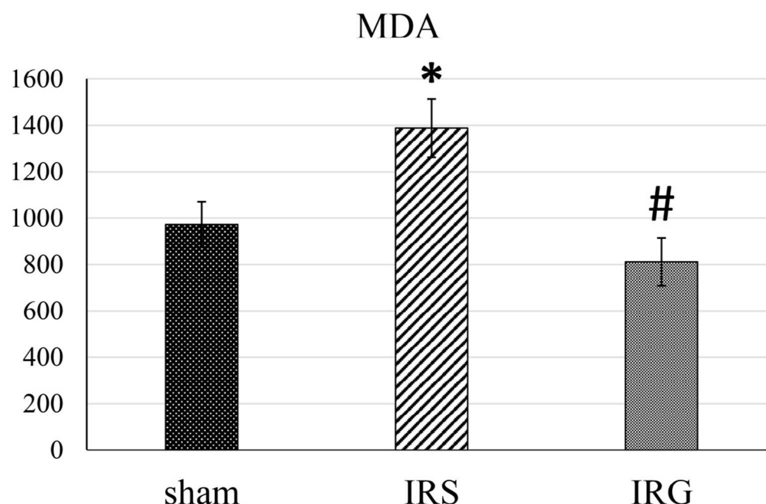


Figure 4. MDA levels (nmol/mg protein) in the IRS, IRG, and sham groups (P≤0.05)

Notes: IRS=Ischemia-saline group; IRG=Ischemia-ghrelin group.

further convert this hydrogen peroxide into water (Anjum et al., 2016).

In our study, SOD showed an increase in the IR group compared to the sham group and a decrease compared to the treated group, although these changes were not statistically significant. In contrast, Ozlem et al. (2018) observed statistically significant differences among SOD groups in rat ovaries (Ozlem et al., 2018). This discrepancy could be attributed to variations in the interval between the tests, IR duration, and other factors. Changes in SOD activity might be linked to fluctuations in the levels of its substrate, the superoxide radical (Cigsar et al., 2015). An increase in enzyme activity is often associated with a rise in the production of its substrate during metabolic processes.

On the other hand, the decrease in antioxidant enzyme activity in the treatment group could be explained by a reduction in the levels of ROS or their substrates (Cigsar et al., 2015). Consistent with our findings, a recent study investigating the antioxidant effects of osajin on IR injury in rat ovaries reported a decrease in SOD activity in the treatment group, along with a decrease in the level of MDA compared to the ischemia-saline group. This outcome suggests that similar to osajin, ghrelin can reduce lipid peroxidation of the cell membrane and the specific substrate of the SOD enzyme (superoxide) through pathways independent of antioxidant enzyme activity (Cigsar et al., 2015).

In our study, GPx increased in the IR-saline group compared to sham and decreased in the IR-ghrelin group compared to the ischemia-saline rats, and none of these changes were significant. One of the reasons for this finding is probably due to the presence of non-enzymatic antioxidants in the follicular fluid or the lack of changes in hydrogen peroxide concentration. In contrast to our study, in which the antioxidant effect of vardenafil on IR ovary had been investigated, a significant increase in GPx was observed in the treated group (Ugurel et al., 2017).

Another biochemical parameter in our study was CAT. CAT is a vital component of the cellular antioxidant system, converting hydrogen peroxide into water and molecular oxygen. This enzymatic process protects the cell from oxidative damage (Nandi et al., 2019). We observed a significant decrease in the saline group compared to the sham group, and a notable increase in CAT enzyme activity was observed in the ghrelin group compared to the saline group. This significant variation in CAT enzyme activity between the ischemia-saline and ischemia-ghrelin groups indicates a respective increase and decrease in the substrate of this enzyme (H_2O_2). Similar to our findings, in an investigation of erdosteine in ischemic-reperfusion ovary, CAT was significantly decreased in the saline group compared to the sham group and significantly increased in the ghrelin group compared to the saline group (Yao et al., 2007).

In the normal state, cells possess a biochemical defense system that includes low-weight molecules and reactive free radicals, such as vitamin C, along with enzyme components like GPx, SOD, and CAT, collectively contributing to the TAC (Yurtcu et al., 2015). In our study, we observed a significant decrease in the saline group compared to the sham group, and a noteworthy increase in TAC) was observed in the ghrelin group compared to the saline group. Similarly, Yurtcu et al. observed a significant change in total antioxidant capacity. Additionally, the antioxidative effects of the *Nigella sativa* plant on ischemic-reperfusion ovaries were investigated, and a significant increase in TAC in the treatment group was found (Yurtcu et al., 2015; Atasever & Bakacak, 2017). Consistent with our results, Demir et al. (2021) also reported a significant difference in TAC levels between groups. Although in our study, SOD and GPx parameters did not show a significant increase in the group treated with ghrelin, the substantial increase in CAT enzyme activity in the treatment group alone resulted in a significant enhancement of total antioxidant capacity. This finding underscores the crucial role of the CAT enzyme in managing oxidant parameters.

Ghrelin expression has been identified in interstitial and luteal hilus cells within the ovary, with its receptors in the oocyte and ovarian follicle. These observations suggest a potential role for ghrelin in directly regulating the function of follicular and luteal cells. Furthermore, studies have demonstrated the consistent expression of the ghrelin gene in the rat ovary throughout the estrus cycle, with the lowest expression in proestrus and the highest in diestrus. The presence of both the ghrelin ligand and receptor within the ovary indicates a regulatory pathway for this novel molecule in the physiological functions of the ovary (Caminos et al., 2003; Gaytan et al., 2003). One limitation of the present study was that only a single dose of ghrelin was evaluated. Further research is also needed to determine the different dosage effects of ghrelin on ovarian torsion/detorsion.

In our earlier study investigating the antioxidant effect of ghrelin on healthy rat ovaries, we noted a significant increase in the antioxidant enzymes CAT, SOD, and GPx, along with a significant decrease in the MDA index

in the ghrelin group (Kheradmand et al., 2010). However, in contrast to our findings, Iseri et al. (2005) explored the antioxidative effects of ghrelin on the stomach and reported a significant increase in GPx in the treated group. The probable reason for this may be the difference in tissues in which evaluations were performed.

Conclusion

This investigation aimed to assess the protective effects of ghrelin in ischemia/reperfusion damage caused by ovarian torsion/detorsion. The current study suggests that ghrelin is a potent antioxidant that can reduce oxidative stress. This result aligns with recent reports highlighting the antioxidative properties of ghrelin in various other tissues. One limitation of this study was that the precise timing of the administration of the ghrelin and the appropriate dose to achieve the best effect of the ghrelin were not precisely known, and the dose and time of injection in our study were based on previous documentation. Further research is required to understand the suitable dose and administration time to achieve the best treatment efficiency.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles are considered in this article.

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The paper was extracted from the DVM thesis of Mahyar Nazari, approved by the Department of Clinical Sciences, Faculty of Veterinary Medicine, Lorestan University, Khorram Abad, Iran.

Authors' contributions

Conceptualization and supervision: Arash Kheradmand; Methodology: Masoud Alirezaei and Abbas Raeisi; Investigation and writing the original draft: Mahyar Nazari; Review and editing: All authors.

Conflict of interest

The authors declared no conflict of interest.

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مقاله پژوهشی

اثرات محافظتی هورمون گرلین متعاقب ایسکمی-رپرفیوژن تجربی در تخمدان موش صحرایی

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چکیده

زمینه مطالعه: تورشن تخمدان، یک اورژانس حیاتی زنان، سبب انسداد شریان و ورید تخمدان و در نهایت باعث ایسکمی در تخمدان میشود.

هدف: این مطالعه با هدف بررسی اثرات آنتیاکسیدانی بالقوه گرلین در آسیب ایسکمی-رپرفیوژن تخمدان موش صحرایی انجام شد.

روش کار: ۲۱ موش صحرایی ماده بالغ نژاد ویستار (گرم ۳۰۰-۲۵۰) به سه گروه (۷ تایی) تقسیم شدند: ۱- گروه شم. ۲- گروه ایسکمی-سالین: ۱۰۰ میکرولیتر سالین ۳۰ دقیقه قبل از ۲ ساعت ایسکمی و همزمان با شروع رپرفیوژن ۲ ساعته به صورت داخل صفاقی تجویز شد. ۳- گروه ایسکمی-گرلین: ۱۰ نانومول گرلین ۳۰ دقیقه قبل از ۲ ساعت ایسکمی و همزمان با شروع رپرفیوژن ۲ ساعته به صورت داخل صفاقی تجویز شد. تخمدان های سمت راست در هر گروه برداشته و تحت آنالیز بیوشیمیایی قرار گرفتند. مالون دی آلدهید (MDA)، سوپراکسید دیسموتاز (SOD)، گلوتاتیون پراکسیداز (GPx)، ظرفیت آنتی اکسیدان تام (TAS)، و کاتالاز (CAT) به عنوان پارامترهای بیوشیمیایی مورد بررسی قرار گرفتند.

نتایج: فعالیت SOD و GPx بین گروههای مختلف تفاوت معنیداری نداشت (P>۰/۰۵). سطح MDA در گروه ایسکمی-سالین نسبت به گروه کنترل بالاتر و در گروه ایسکمی-گرلین نسبت به گروه ایسکمی-سالین به طور معنی داری کمتر بود (P<۰/۰۵). فعالیت های CAT و TAC در گروه سالین در مقایسه با گروه شم به طور معنیداری کاهش یافت و در گروه تحت درمان با گرلین نسبت به گروه سالین به طور معنی داری افزایش یافت (P<۰/۰۵).

نتیجه گیری نهایی: به طور کلی، گرلین با دوز ۱۰ نانومول، تخمدانهای موش را از آسیب ناشی از ایسکمی-رپرفیوژن محافظت کرد.

کلیدواژهها: گرلین، ایسکمی-رپرفیوژن، تخمدان موش صحرایی، تورشن، تورشن/دتورشن

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