The Protective Effect Of Prophylactic Ozone Administration Against Retinal Ischemia Reperfusion Injury

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Introduction: Many retinal diseases are associated with vascular dysfunction accompanied by neuroinflammation. Retinal ischemia/reperfusion (IR) injury is associated with many ocular diseases, including acute glaucoma, diabetic retinopathy, and retinal vascular occlusion. Retinal ischemia/reperfusion injury leads to the death of retinal ganglion cells (RGCs), morphological degeneration of the retina, the loss of retinal function, and ultimately, vision loss. The intraocular pressure-induced retinal ischemia reperfusion (IR) model is a useful tool for studying the neuronal response to a transient ischemic injury. Ozone (O3) has been used as a therapeutical agent for the treatment of different diseases. Moreover, ozone could prepare the host to face physiopathological events mediated by reactive oxygen species. Additionally its triggering the formation of new capillary, increasing the number of defensive cells in immune response, and cellular energy release, and anti-oxidant efficacy may be mentioned. The aim of the present study was to show the protective effect of prophylactic ozone administration against retinal ischemia reperfusion injury.

Material and Method: Control group (n:6) was administered SF intraperitoneally seven days without creating ischemia reperfusion injury and at eight day the rats were sacrificed. Ozone group (n:7) was administered 1 mg/kg ozone intraperitoneally for seven days without creating ischemia reperfusion injury and at eight day the rats were sacrificed. Ischemia Reperfusion (IR) group (I/R) (n:7) were subjected to retinal ischemia by cannulating the anterior chamber of the right eye with a 27-gauge infusion needle connected to a reservoir containing normal saline and by raising the intraocular pressure (IOP) to 130 mmHg for 1 hour by elevating the saline reservoir and then reperfusion for two hours. In Ozone + IR group, 1 mg/kg ozone was administered intraperitoneally for seven days before the ischemia/reperfusion procedure and at eight day the ischemia reperfusion injury was created (as in group 3) and rats were sacrificed at the same day. Subsequently, ischemia was terminated after 1 hour and 2nd hour of reperfusion rats were anesthetized with 80 mg/kg ketamin and their intracardiac blood was drawn completely and they were sacrificed. Blood samples were sent to laboratory for superoxide dismutase (SOD), glutation peroxidase (GSH-Px), malondyaldehide (MDA) total oxidant score (TOS) and total antioxidant capacity (TAC) analysis. The degree of retinal injury was evaluated according to changes in retinal cells (ganglion cell layer, inner plexiform layer, inner nuclear layer, outer plexiform layer and outer nuclear layer) and necrotic and apoptotic cells by Tunel method. Data were evaluated statistically by Kruskal Wallis test.

Results: The number of retinal ganglion cells and the inner retinal thickness were significantly decreased at 7 days after ischemia, treatment with ozone significantly inhibited retinal ischemic injury even increased compared to all groups. In ischemia-reperfusion group, the degree of retinal injury was found highest and statically significantly compared to the other groups (p<0.05). In the group administered ozone before ischemia reperfusion procedure, retinal injury was found to be decreased in comparison to IR group (p<0.05). In ozone group administered only SF without creating retinal ischemia/reperfusion injury, retinal injury score was the lowest in comparison to the other groups (p<0.05). The difference according to the antioxidant parameters SOD, GPX TAC values were found to be increased in ozone group and lowest in IR group (p<0.05). The difference according to the oxidant parameters MDA and TOS were found to be highest in IR group and decreased in ozone group (p<0.05).