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Impact of Allyl Disulfide on Oxidative Damage and Liver Regeneration in an Experimental Hepatectomy Model

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Abstract
Backgraund: We investigated the effects of allyl disulfide (a garlic extract) on tissue damage, regeneration, proliferation and oxidative damage in an experimental liver resection model.
Materials and Methods: In the study, 24 female Wistar albino rats weighing approximately 200-250 g were used. Group 1: The rats in the experimental group all received a 70% hepatectomy and were fed an Allyl disulfide (30 µg/kg/day, Allyl disulfide, Sigma-Aldrich, formula: C6H10S2, CAS Number: 2179-57-9, formula weight: 146.27 g/mol) in supplement to a regular diet for 1 week both preoperatively and postoperatively. Group 2: The rats in the control group also underwent a 70% hepatectomy and were given regular food and water for 1 week both preop and postop. Group 3: In the sham group, all rats were sacrificed 7 days after surgery. For biochemical evaluation, SGOT, SGPT, bilirubin, CRP and MDA were studied. In a histopathological examination, the fattening of the liver tissue, existence of (macro-micro vesicular), fibrosis, pleomorphism at hepatocyte nuclei, portal inflammation, existence of intralobular inflammatory cells, dilation at sinusoids, congestion, congestion at the central vein, regeneration, existence of Kupffer cells in the sinusoidal lumen and ki-67 proliferation index at hepatocytes were examined.
Results: A significant difference between group 1 and group 2 was observed regarding the existence of regeneration, (p:0.06), the occurrence of nuclear pleomorphisms (p:0,001) and the fibroblast activity status (p:0.001). Significant differences were found between the experimental groups in regard to Kupffer cell increase and dilation and the hyperemia status in the sinusoid lumens (p:0.013 and p:0.001, respectively). In the Allyl disulfide group, the proliferation index was significantly higher than that of the other groups (p:0,001), while the average plasma MDA value was lower than that of the other groups (p: 0,042). No significant differences were found among the groups with respect to tissue MDA values (p:0,720). No significant difference was found for SGPT (ALT) and SGOT (AST) levels between Group 1 and the other groups (p:0.247 and p:0.539, respectively). The average total bilirubin (T. Bili) values were 0,12, 0,08 and 0,04 in the allyl disulfide group, control group and Sham group, respectively. This difference among the groups is statistically significant (p:0.001). The average direct bilirubin (D. Bili) values were 0,06, 0,02 and 0,02 in the allyl disulfide group, control group and Sham group, respectively. This variation among the groups is also statistically significant (0.001).
Conclusion: We observed that the use of Allyl disulfide supplementation after major hepatectomy has a positive impact on liver regeneration, proliferation and oxidative damage.
Abbreviations: Postop: post-operative, Preop: pre-operative, SGOT(AST): serum glutamic oxaloacetic transaminase, SGPT(ALT): serum glutamate-pyruvate transaminase, CRP: C- Reactive protein, MDA: Malondialdehyde, DAS: Garlic extract diallyl sulfide, AGE: aged garlic extract
Key words: Allium sativum, major hepatectomy, oxidative damage, Allyl disulfide

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