The effects of vitamin D treatment on liver degeneration and pyroptosis in rats fed with high-fat and high-fructose diet.

N. Bayramova[1], B Zorkaya[2], S. Rzayeva[1], T. Ozbilenler[1], A.S. Akdemir[3], E. Bayrak Kömürcü[4], M. Ozturk[1], F. Kaya Dagistanli[1]

[1] Department of Medical Biology, Cerrahpasa Faculty of Medicine, Istanbul University-Cerrahpasa, Istanbul, Turkey; [2] Department of Genetics, Aziz Sancar Institute of Experimental Medicine, Istanbul University, Istanbul, Turkey; [3] Department of Medical Biology, Faculty of Medicine, Karabuk University, Karabuk, Turkey; [4] Department of Medical Genetics, Istanbul Faculty of Medicine, Istanbul University, Istanbul, Turkey.

Abstract

Aim: High fat and high fructose diet cause metabolic abnormalities and serious degeneration in the liver. We aimed to examine the effects of Vitamin D (VitD), which has metabolic, anti-inflammatory and anti-fibrotic effects, on the liver.

Materials and Methods: In this study, 19 male Sprague Dawley rats were randomly divided into three groups as Control (C), Metabolic Syndrome (MetS) and Metabolic Syndrome+Vitamin D (MetS+VitD). For 15 weeks, MetS groups were fed with high fat (17%)-fructose (17%) chow and 20% fructose water, while the control group was fed with standard chow and water. VitD (170 IU/week) was administered to the MetS groups, once a week for 12 weeks starting from the 3rd week. At the end of the 15th week, the rats were sacrificed together with the control group and liver tissues were taken. The paraffin sections were stained using Hematoxylin-Eosin, Van Gieson and Periodic Acid Shiff staining for the determination of morphological changes and fibrosis. Immunohistochemical staining was performed to evaluate α-SMA, PCNA, NLRP3 and GSDM-D expressions in liver tissue.

Results: In the MetS group, vacuolization in hepatocytes, dense glycogen accumulations and an increase in binuclear cells were observed around the vena centralis. In addition, an increased number of NLRP3, GSDMD positive pyroptotic cells were detected in this region. An increase in α-SMA positive hepatic stellate cells, as well as fibrosis and mild inflammation in the central vein and portal area were observed. It was determined that VitD treatment improved the histopathology of hepatocytes, pyroptosis, inflammation and fibrosis, and decreased hepatic expression of α-SMA which is hepatic stellate cell activation marker.

Conclusion: This study indicates that feeding with a high-fat and high-fructose diet causes liver fibrosis, inflammation and pyroptosis in the rat liver. VitD has beneficial effects on these degenerative effects.