Turkish Journal of Medical Sciences

Turkish Journal

of

Medical Sciences

The Relation Between Low-Density Lipoprotein (LDL) Oxidation and Hemodialysis with Respect to Membrane Types Protective Effects of Vitamin E-bonded membrane

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Keywords
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Abstract: Plasma total antioxidant (TAO) levels, LDL (low density lipoprotein), antioxidant defense potential (AOP) and the resistance to oxidation of LDL fractions were studied in chronic hemodialysis patients. The differences with respect to dialyzer membrane types before and after hemodialysis were also assessed. After isolation of LDL from plasma by precipitation, AOP was measured based on the determination of TBARS (thiobarbituric acid reactive substance), and resistance to oxidation was assessed by the metal-catalyzed peroxidation of LDL followed by the determination of the values of the peroxidation product malondialdehide (MDA) before and after peroxidation. The assay principle of TAO was based on the suppression of ABTS+ radical cation (2,2'-Azino-di- [3-ethylbenzthiazoline sulfonate]) by the sample. AOP and the resistance to oxidation of LDL were expressed as 1/nmol/ ml.h. Plasma TAO levels of patients (n=22) were significantly lower than those of the control group (n=20). In the patient group, the decrease in TAO levels was also significant and continued to the end of the single dialysis session. The rate of decrease was similar in the two types of conventional membranes used (polysulfone and hemophan). The antioxidant defense potential of LDL significantly decreased after hemodialysis with the polysulfone type dialyzer but resistance to oxidation values of LDL showed no difference. When the same group of patients were hemodialyzed with a vitamin E bonded membrane no difference was observed in the AOP of LDL, but resistance to oxidation of the LDL fraction significantly increased during the hemodialysis session. The results suggest that the vitamin E-bonded dialysis membrane strengthens the LDL antioxidant defense potential and protects the LDL from oxidation. In conclusion, the decreased antioxidant capacity in these patients may be attributed to several factors such as elimination via the dialyzer of enzymatic or nonenzymatic antioxidants or deformation of these compounds by the increased oxidant stress. Improving LDL resistance to oxidation by using a vitamin E-bonded membrane appears to be an attractive alternative to prevent accelerated oxidative processes in hemodialysis patients.

Key Words: Oxidative stress, hemodialysis, antioxidants, LDL oxidation

Turk J Med Sci 2002; **32**(2): 93-100.
Full text: pdf
Other articles published in the same issue: Turk J Med Sci,vol.32,iss.2.