Albumin at the intersection between antioxidant and pro-oxidant in patients on peritoneal dialysis

Abstract

Albumin (HSA) is a multifunctional protein and due to its free Cys34 thiol group, represents a main source of free thiols in the circulation. This property of HSA, combined with its ability to sequester redox active Cu(II) ions, makes HSA a dominant circulatory antioxidant. End stage kidney disease (ESRD) is a condition accompanied by elevated oxidative stress. The aim of the present study was to examine changes in the antioxidative capacity of HSA and Cu(II) binding affinity in patients on peritoneal dialysis (PD), and relate it to the Cys34 thiol group content and other structural changes of this molecule.

HSA molecules are modified in ESRD patients subjected to PD, having significantly lower thiol group and bound Cu(II) content, reduced antioxidant capacity, an increased content of advanced glycation end-products and altered conformation. Also, Cu(II) binding capacity of HSA in these patients is impaired, since a significant portion of the high-affinity metal-binding site is unable to interact with Cu(II).

Taking into account that the concentration of Cu(II) in the circulation of ESRD patients is much higher than in healthy persons and that Cu(II) binding capacity of HSA in these patients is significantly impaired, HSA may be considered as a novel circulatory pro-oxidant, thus exacerbating oxidative stress.

Graphical abstract