

EFFECTS OF BLADDER OUTLET OBSTRUCTION ON INTRACELLULAR ANTIOXIDANTS AND ANTIOXIDANT ENZYMES

Aims of Study

Studies have suggested the involvement of reactive oxygen species (ROS) in bladder injury secondary to bladder outlet obstruction. However, there is little information on the responses of in vivo antioxidant system to outlet obstruction. This study investigated the effects of bladder outlet obstruction on detrusor content of antioxidants and activities of antioxidant enzymes.

Methods

Bladder outlet obstruction was induced on male New Zealand rabbits (N=12) by placing a Teflon ring around the bladder neck. The bladders were removed 14 days later. Sham operated animals (N=6) served as the controls. We isolated mitochondria from the detrusor and determined mitochondrial content of antioxidants, including reduced glutathione(GSH) and alpha-tocopherol(vitamin E), and activities of antioxidant enzymes, including superoxide dismutase(SOD),glutathione peroxidase(GPx) and catalase. Contractile response of detrusor strips to bethanechol was determined in tissue bath. Detrusor content of adenine nucleotides (ATP, ADP, AMP) was assayed and energy charge (EC) calculated.

Results

(1) Detrusor contractility was significantly impaired by outlet obstruction. (2) Outlet obstruction damaged detrusor energy production with a decrease in energy charge from 0.72(mean) down to 0.54. (3) Mitochondrial SOD activity was significantly increased in obstruction group, comparing to the control group, indicating an enhanced release of superoxide radicals. (4) However, other antioxidant enzymes, including GPx and catalase, and antioxidants, including reduced glutathione and alpha-tocopherol were significantly reduced in the obstruction group.(see table)

	Control(mean±SEM)	Obstruction(mean±SEM)
Energe charge	0.72±0.02	0.54±0.03
Mitochondrial SOD(unit/mg protein)	3.6±0.5	7.4±0.6
Mitochondrial GPx(unit/mg protein)	0.065±0.014	0.032±0.001
Mitochondrial Catalase (µmol/minute/mg protein)	0.925±0.190	0.175±0.030
Mitochondrial GSH(µmol/mg protein)	0.175±0.030	0.0393±0.003
Alpha-tocopherol(mmol/gm tissue)	0.89±0.11	0.19±0.03

Conclusions

Bladder outlet obstruction enhances a release of superoxide radicals, as evidenced by the increased SOD activity. However, the content /activity of “downstream” antioxidants/antioxidant enzymes are significantly reduced in the obstructed detrusor. Supplementation of these decreased antioxidants or antioxidant enzymes may be helpful in minimizing bladder injury caused by bladder outlet obstruction.