

EFFECT OF OMEGA-3 FATTY ACIDS IN A RAT MODEL OF ATHEROSCLEROSIS-INDUCED CHRONIC BLADDER ISCHEMIA

Hypothesis / aims of study

Aging-related bladder dysfunction and associated lower urinary tract symptoms (LUTS) have been well documented and seem to be multifactorial. One of the factors is chronic ischemia of the bladder detrusor, resulting from atherosclerotic changes in blood vessels. A rat model of atherosclerosis-induced chronic bladder ischemia (CBI) had been developed, which has been a useful tool for further research.

Very-long chain omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), have well-described effects on cardiovascular disease with suggested potential mechanisms as promoting secretion of anti-inflammatory cytokines, attenuation of atherosclerotic plaques, and antioxidant activity.

The aim of this study was to evaluate the potential protective effects of omega-3 fatty acids in a rat model of atherosclerosis-induced CBI.

Study design, materials and methods

Total 18 of 16-week old male rats were divided into three groups. The CBI group underwent endothelial injury of the iliac arteries and received 2% cholesterol diet. The omega-3 fatty acids group underwent endothelial injury also and received 2% cholesterol diet, with 2 weeks of DHA + EPA (200mg/kg/day) administration. The control group underwent sham operation and received a regular diet. After 8 weeks, in vivo cystometry and in vitro detrusor muscle strip study were performed. The plasma and bladder tissue were processed for immunohistochemical staining of oxidative stress markers. Histological examination of the bladder and iliac arteries was also done.

Results

In cystometry, omega-3 fatty acids group showed decreased micturition frequency with prolonged intercontraction interval, increased bladder capacity compared to untreated CBI group. In the muscle strip study, omega-3 fatty acids group showed increased contractile responses compared to untreated CBI group. Plasma and bladder tissue of CBI group showed higher malondialdehyde (MDA) than in other groups. In histological examination, omega-3 fatty acids group showed lesser submucosal fibrosis of the bladder wall and also lesser degenerative change of blood vessel wall than in CBI group.

Interpretation of results

Atherosclerosis-induced CBI is associated with detrusor overactivity in cystometric study, impaired smooth muscle contractility in muscle strip study, and oxidative stress in MDA assay.

Concluding message

Our study suggests that omega-3 fatty acids supplementation provides bladder protection against CBI on rat urinary bladder and reduces the MDA accumulation in bladder tissue caused by chronic ischemia and reperfusion.

Table 1. Comparative results of cystometric parameters

group	BP (mmHg)	TP (mmHg)	MP (mmHg)	TP-BP (mmHg)	MF (voiding/hr)	Bcap (ml) (infusion rate/MF)	Bcom (ml/mmHg) (Bcap/(TP- BP))	ICI (min)
CBI + DHA, EPA	7.4±1.4	19.8±1.8	29.3±2.6	12.5±2.8	13.6±2.8*	0.9±0.04* ⁺	0.07±0.02 ⁺	4.9±0.6* ⁺
CBI	8.3±1.6	16.9±1.8	25.6±1.9	8.7±1.6	27.2±4.7	0.4±0.03	0.05±0.01	2.2±0.5
control	6.0±1.7	16.6±2.2	35.6±3.9	10.6±1.3	8.1±1.6*	1.5±0.16*	0.14±0.04*	8.1±1.3*

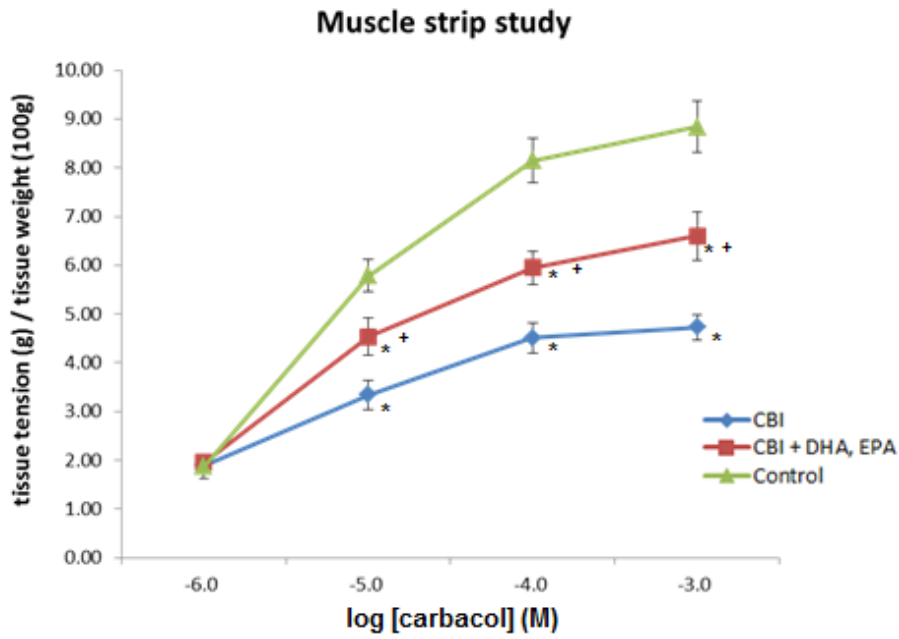


Figure 1. Carbachol-induced contraction in the detrusor muscle strip from each groups.

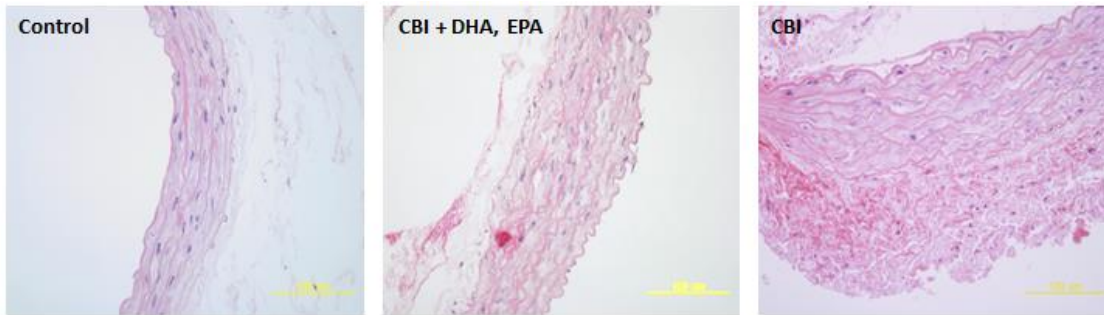


Figure 2. Microscopic features of common iliac artery section(x400).

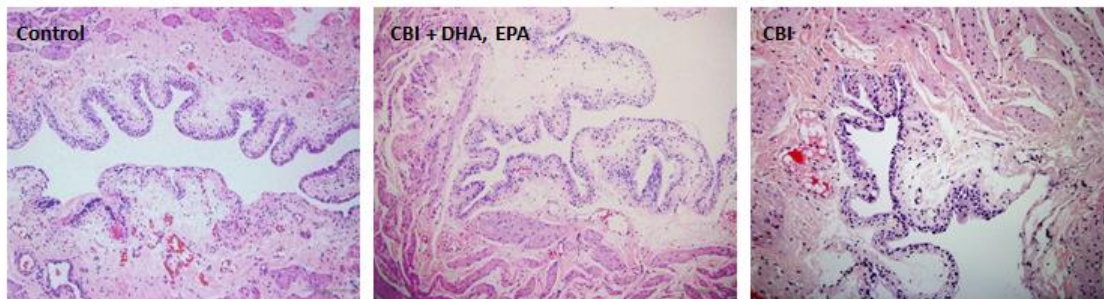


Figure 3. Microscopic features of the bladder wall section(x200).

Disclosures

Funding: NONE **Clinical Trial:** No **Subjects:** ANIMAL **Species:** Rat **Ethics Committee:** Korea University Institutional Animal Care and Use Committee