Intracellular Ca^{2+} modulation by Angiotensin II in cerebral artery during cardiac hypertrophy

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Background : Cardiac hypertrophy is an independent risk factor for cerebrovascular event. However, the cellular mechanisms involved in cerebrovascular impairment during cardiac hypertrophy are unknown. Of the many vasoactive agonists that have been implicated in vascular hyperresponsiveness in cardiac hypertrophy, angiotensin II (Ang II) appears to play one of the important roles.

Methods and results : To clarify the correlation between intracellular Ca^{2+} dynamics by Ang II and level of related proteins, we monitored cytoplasmic Ca^{2+} concentration ($[Ca^{2+}]i$)by fura-2 AM, flou-4 AM ratio and analyzed expression of Ang II by real-time RT-PCR, western blotting in cerebral artery during cardiac hypertrophy. Basal $[Ca^{2+}]i$ were higher in cardiac hypertrophy compared with control. Ang II stimulation significantly increased $[Ca^{2+}]i$ in both groups. The net change in $[Ca^{2+}]i$ induced by Ang II was significantly lower in cardiac hypertrophy compared with control. Ang II-mediated $[Ca^{2+}]i$ increase was inhibited by 1 μM verapamil but 20 μM ryanodine. However, net change in $[Ca^{2+}]i$ was different between control and cardiac hypertrophy. Interestingly, the expression of Ang II receptor mRNA was increased in cardiac hypertrophy compared with control.

Conclusion: The decreased Ang II-stimulated $[Ca^{2+}]i$ may not be associated with the expression of Ang II receptor in cerebral artery during cardiac hypertrophy, but the alteration of Ang II-mediated signaling pathway was involved.

Key words : Angiotensin II(Ang II), Cardiac hypertrophy, Cerebral artery, Ca^{2+} concentration($[Ca^{2+}]i$)