

Osteoblast Activity is Diminished in Young Spontaneously Hypertensive Rats

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ABSTRACT

Spontaneously Hypertensive Rats (SHR) are used as a genetic model of essential hypertension. Reductions in cortical and cancellous bone mass and increased bone turnover have been observed in aged SHR vs. Wistar-Kyoto (WKY) rats, normotensive genetics controls. In addition, antihypertensive aids have been effective in improving bone parameters in hypertensive rats. Thus, the relation between hypertension and bone remodeling warrants further attention. The *purpose* of this study was to determine how acute (i.e., 9 weeks) hypertension effects bone remodeling parameters (i.e., osteoclast and osteoblast activity). **Methods:** Right femora from 14-week-old SHR (n=5) and WKY (n=4) rats were dissected, fixed in 10% formalin and processed for bone histomorphometry for the examination of bone microarchitectural (bone volume/total volume ratio [BV/TV, %], trabecular thickness [Tb.Th, μ m], trabecular number [Tb.N /mm] and trabecular separation [Tb. Sp, μ m]) and bone static (osteoid surface/bone surface [OS/BS, %], osteoblast surface/bone surface [Ob.S/BS, %], number of osteoblast per total area [N.Ob/T.Ar], osteoclast surface/bone surface [Oc.S/BS, %]), and number of osteoclast per total area [N.Oc/T.Ar]) properties. **Results:** Body mass did not differ between SHR and WKY rats (i.e., 357 \pm 6g vs. 351 \pm 8g). No significant differences in bone microarchitectural properties (i.e., BV/TV, Tb.Th, Tb.N and Tb.Sp) were observed after acute hypertension. However, OS/BS, which represents newly formed yet unmineralized bone tissue, was significantly ($p < 0.05$) reduced in SHR vs. WKY rats. In addition, osteoblast activity (Ob.S/BS) was significantly ($p < 0.05$) diminished with hypertension. Further, there was a tendency ($p = 0.08$) for higher N.Oc/T.Ar in SHR vs. WKY rats. **Conclusions:** Results from this study indicate that hypertension alters bone remodeling parameters by decreasing osteoblast and increasing osteoclast activity. Differences in bone microarchitectural properties (i.e., BV/TV, Tb.Th, Tb.N and Tb.Sp) were not observed at this age; however, the alterations in bone cellular activity (i.e., OS/BS, Ob.S/BS and N.Oc/T.Ar) imply that reductions in bone mass are inevitable as the duration of hypertension increases.