

论著

黄芪提取物与红花总黄酮配伍对急性血瘀大鼠血液流变学的改善作用

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摘要 目的 观察黄芪提取物 (EAM) 与红花总黄酮 (ECT) 配伍对急性血瘀模型大鼠血液流变学指标的影响。方法 大鼠随机分为正常对照、急性血瘀模型、阳性对照阿司匹林 $100\text{ mg}\cdot\text{kg}^{-1}$, EAM $400\text{ mg}\cdot\text{kg}^{-1}$, ECT $200\text{ mg}\cdot\text{kg}^{-1}$, EAM $400\text{ mg}\cdot\text{kg}^{-1}$ +ECT $200\text{ mg}\cdot\text{kg}^{-1}$ 组。每天早晚各给药1次, 共7次。第5次给药后, 大鼠sc给予肾上腺素加冰浴制备急性血瘀模型。锥板法测定全血黏度和血浆黏度; 微量毛细管法测定红细胞比容 (Hct); 光电比浊法测定二磷酸腺苷 (ADP) 诱导的血小板聚集; 光电电磁法测定凝血参数。结果 与正常对照组相比, 模型组大鼠全血黏度和血浆黏度升高, 红细胞聚集指数和血小板最大聚集率显著增加, Hct显著升高, 纤维蛋白原 (Fib) 含量显著增加, 凝血酶时间 (TT)、活化部分凝血活酶时间 (APTT) 和凝血酶原时间 (PT) 均显著缩短 ($P<0.01$)。与模型组相比, 单独应用EAM和ECT均能显著降低全血黏度及血浆黏度, 明显降低Hct、红细胞聚集指数和血小板最大聚集率, 其中EAM还能显著降低Fib含量, 延长APTT和TT; ECT还能显著延长PT。与单独应用EAM或ECT相比, EAM与ECT配伍能进一步改善血液流变学指标, 在延长TT上优于单用ECT ($P<0.05$), 对血小板最大聚集率的抑制作用优于单用EAM或ECT ($P<0.05$)。与阿司匹林相比, 单用EAM或ECT抑制血小板聚集的作用不及阿司匹林, 但EAM降低Fib的作用较好, ECT延长PT的作用较好; EAM与ECT配伍对血液流变学的改善作用与阿司匹林相似。结论 EAM和ECT单用能显著改善血瘀模型大鼠血液流变学指数, 且二者配伍后能增强对血瘀模型大鼠血液流变学的改善作用。

关键词 黄芪提取物 红花总黄酮 血液流变学 血瘀 血小板聚集 全血凝固时间 纤维蛋白原

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Ameliorative effect of extract of *Astragalus membranaceus* combined with flavonoids of *Carthamus tinctorius* on hemorheology in rats with acute blood stasis

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Abstract

OBJECTIVE To evaluate the effect of extract of *Astragalus membranaceus* (EAM) combined with extract (flavonoids) of *Carthamus tinctorius* (ECT) on the hemorheological abnormality in rats with acute blood stasis. **METHODS** The rats were ig given EAM $400\text{ mg}\cdot\text{kg}^{-1}$, ECT $200\text{ mg}\cdot\text{kg}^{-1}$, EAM $400\text{ mg}\cdot\text{kg}^{-1}$ +ECT $200\text{ mg}\cdot\text{kg}^{-1}$ and aspirin $100\text{ mg}\cdot\text{kg}^{-1}$, twice a day, for seven consecutive times. After the 5th administration, the rats were given adrenaline and ice water soaking to set up the acute blood stasis model. Whole blood viscosity and plasma viscosity were evaluated by cone-plate viscometer, hematocrit (Hct) determined by micro-capillary method, platelet aggregation measured by photoelectric turbidimetry and coagulation parameters evaluated by optical electromagnetic method. **RESULTS** Compared with normal control group, the whole blood viscosity and plasma viscosity of rats significantly increased, erythrocyte aggregation index (EAI) and the maximum platelet aggregation rate were also remarkably elevated in blood stasis model group. Simultaneously, Hct and fibrinogen (Fib) contents were also increased while prothrombin time (PT), activated partial thrombin time (APTT) and thrombin time (TT) were shortened ($P<0.01$). Compared with model group, EAM $400\text{ mg}\cdot\text{kg}^{-1}$ or ECT $200\text{ mg}\cdot\text{kg}^{-1}$ alone could obviously decrease whole blood viscosity and plasma viscosity, reduce EAI and Hct, and inhibit the ADP-induced platelet maximum aggregation rate ($P<0.05$, $P<0.01$). Meanwhile, EAM $400\text{ mg}\cdot\text{kg}^{-1}$ significantly decreased Fib content but delayed the APTT and TT; ECT $200\text{ mg}\cdot\text{kg}^{-1}$ significantly delayed the PT. Compared with EAM or ECT group, EAM $400\text{ mg}\cdot\text{kg}^{-1}$ +ECT $200\text{ mg}\cdot\text{kg}^{-1}$ ameliorated abnormal hemorheology in rats with acute blood stasis, as revealed by the more delayed TT ($P<0.05$) and greater platelet maximum aggregation inhibition ($P<0.05$). Compared with

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aspirin group, EAM and ECT showed less inhibition of platelet aggregation while EAM had a little better effect on Fib content reduction, ECT could more effectively delay PT. EAM+ECT could improve hemorheology as much as aspirin. CONCLUSION EAM $400 \text{ mg} \cdot \text{kg}^{-1}$ +ECT $200 \text{ mg} \cdot \text{kg}^{-1}$ improves abnormal hemorheology in rats with acute blood stasis more effectively in combination than used alone.

Key words [extract of *Astragalus membranaceus*](#) [flavonoids of *Carthamus tinctorius*](#) [hemorheology](#) [blood stasis](#) [platelet aggregation](#) [whole blood coagulation time](#) [fibrinogen](#)

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