不同治法方药对激素性股骨头坏死鸡血脂、血黏度、凝血及纤溶功能的影响

王荣田[1]，林诗富[1]，万蓉[2]，殷小杰[2]，王智耀[1]，刘道兵[1]，林娜[2]，陈卫衡[1]

（1. 中国中医科学院望京医院，北京 100102；2. 中国中医科学院中药研究所，北京 100700）

摘 要 **目的**：观察健脾化痰、活血通络与补肾壮骨、活血通络两种不同治法对激素性股骨头坏死鸡血脂、血黏度、凝血及纤溶功能的影响，探讨二者防治股骨头坏死的作用机制和效果。**方法**：将 80 只来航鸡随机分为正常组、模型组、洛伐他汀组、健脾组和补肾组，除正常组外其余各组动物均胸肌注射甲基氢化泼尼松琥珀酸钠，洛伐他汀组、健脾组和补肾组同时给予相应的药物，并于给药后 8 周和 16 周分批静脉采血，测定全血黏度、血浆黏度、红细胞压积、纤维蛋白原、高密度脂蛋白、低密度脂蛋白、总胆固醇、甘油三脂、血浆纤溶酶原、抗凝血酶Ⅲ、组织型纤溶酶原激活物、活化部分凝血酶时间、凝血酶时间及凝血酶原时间。采血后处死动物，取出双侧股骨头，切片后进行组织学观察。**结果**：①光镜下组织学观察结果。正常组软骨细胞排列整齐，骨小梁排列规则、致密、饱满，周边可见成骨细胞和少量破骨细胞，未见脂肪细胞增生及肥大；模型组软骨细胞呈簇状肥大，排列不规则，骨小梁变细，部分软骨下骨小梁断裂、分离，骨髓腔内脂肪细胞肥大、增生，可见空骨陷窝；洛伐他汀组骨小梁稀疏，可见空骨陷窝及髓腔内变大的脂肪细胞；健脾组软骨细胞排列整齐，骨小梁排列尚规则、致密，周边可见大量成骨细胞及少量破骨细胞；补肾组骨陷窝较少，髓腔内脂肪细胞零散分布，髓腔内造血细胞较丰富。②空骨陷窝率。8 周时各组动物空骨陷窝率比较，差异有统计学意义（$F=6.081$，$P=0.010$）。模型组空骨陷窝率高于正常组、洛伐他汀组和健脾组（$q=2.273$，$P=0.029$；$q=2.550$，$P=0.015$；$q=2.830$，$P=0.007$），模型组与补肾组比较，差异无统计学意义。16 周时各组动物空骨陷窝率比较，差异有统计学意义（$F=27.910$，$P=0.000$）。模型组高于正常组、健脾组和补肾组（$q=6.330$，$P=0.000$；$q=3.730$，$P=0.000$；$q=4.440$，$P=0.000$），模型组与洛伐他汀组比较，差异无统计学意义。③骨髓内脂肪面积。8 周时各组动物骨髓内脂肪面积比较，差异有统计学意义（$F=11.230$，$P=0.000$）。模型组高于正常组、洛伐他汀组、健脾组和补肾组（$q=2.470$，$P=0.019$；$q=2.470$，$P=0.018$；$q=7.890$，$P=0.000$；$q=7.710$，$P=0.000$）。16 周时各组动物骨髓内脂肪面积比较，差异有统计学意义（$F=57.140$，$P=0.000$）。模型组高于正常组、洛伐他汀组、健脾组和补肾组（$q=12.240$，$P=0.000$；$q=3.148$，$P=0.003$；$q=3.910$，$P=0.000$；$q=3.690$，$P=0.000$）。④血脂。8 周时各组实验动物总胆固醇、甘油三脂、高密度脂蛋白及低密度脂蛋白比较，差异均有统计学意义（$F=17.630$，$P=0.000$；$F=27.450$，$P=0.000$；$F=6.820$，$P=0.000$；$F=6.670$，$P=0.000$）。正常组总胆固醇和甘油三脂均低于模型组（$q=5.740$，$P=0.000$；$q=8.180$，$P=0.000$），高密度脂蛋白高于模型组（$q=3.030$，$P=0.005$）；洛伐他汀组总胆固醇和甘油三脂均低于模型组（$q=7.050$，$P=0.000$；$q=8.480$，$P=0.000$），高密度脂蛋白高于模型组（$q=2.800$，$P=0.008$）；健脾组总胆固醇、甘油三脂、低密度脂蛋白均低于模型组（$q=7.127$，$P=0.000$；$q=8.900$，$P=0.000$；$q=4.110$，$P=0.000$），高密度脂蛋白高于模型组（$q=2.860$，$P=0.007$）；补肾组总胆固醇、甘油三脂、低密度脂蛋白均低于模型组（$q=5.970$，$P=0.000$；$q=7.220$，$P=0.000$；$q=4.170$，$P=0.000$），高密度脂蛋白高于模型组（$q=5.190$，$P=0.000$）；健脾组总胆固醇、甘油三脂、高密度脂蛋白均低于补肾组（$q=2.090$，$P=0.042$；$q=2.216$，$P=0.037$；$q=2.335$，$P=0.025$）；其余各项指标组间比较，差异无统计学意义。16 周时各组实验动物总胆固醇、甘油三脂、高密度脂蛋白及低密度脂蛋白比较，差异均有统计学意义（$F=17.160$，$P=0.000$；$F=10.650$，$P=0.000$；$F=9.260$，$P=0.000$；$F=3.312$，$P=0.021$）。正常组总胆固醇、甘油三脂、低密度脂蛋白均低于模型组（$q=6.900$，$P=0.000$；$q=4.640$，$P=0.000$；$q=5.690$，$P=0.000$）；洛伐他汀组总胆固醇、甘油三脂、高密度脂蛋白均低于模型组（$q=5.420$，$P=0.000$；$q=5.590$，$P=0.000$；$q=3.980$，$P=0.000$）；健脾组总胆固醇、甘油三脂、高密度脂蛋白、低密度脂蛋白均低于模型组（$q=-5.751$，$P=0.000$；$q=2.215$，$P=0.040$；$q=5.594$，$P=0.000$）；补肾组总胆固醇、甘油三脂、低密度脂蛋白低于模型组（$q=7.230$，$P=0.000$；$q=4.690$，$P=0.000$；$q=4.550$，$P=0.000$）；补肾组甘油三脂低于健脾组和洛伐他汀组（$q=2.230$，$P=0.029$；$q=2.080$，$P=0.039$）；其余各项指标组间比较，差异均无统计学意义。⑤血黏度。8 周时各实验组全血黏度（10/s）、全血黏度（50/s）、全血黏度（200/s）、血浆黏度、红细胞压积、纤维蛋白原比较，差异均有统计学意义（$F=4.860$，$P=0.030$；$F=2.650$，$P=0.040$；$F=2.630$，$P=0.050$；$F=2.680$，$P=0.048$；$F=3.130$，$P=0.027$；$F=7.920$，$P=0.000$）。模型组全血黏度（10/s）、全血黏度（50/s）、红细胞压积、血浆黏度、

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通讯作者：陈卫衡 E-mail：drchenweiheng@163.com

纤维蛋白原均高于正常组($q=3.230$,$P=0.003$;$q=2.060$,$P=0.046$;$q=2.990$,$P=0.005$;$q=3.050$,$P=0.004$;$q=5.420$,$P=0.000$);健脾组全血黏度(10/s)、全血黏度(50/s)、全血黏度(200/s)、红细胞压积、血浆黏度、纤维蛋白原均低于模型组($q=3.370$,$P=0.002$;$q=2.060$,$P=0.047$;$q=2.640$,$P=0.012$;$q=2.480$,$P=0.018$;$q=2.170$,$P=0.041$;$q=3.080$,$P=0.004$);补肾组血浆黏度低于模型组($q=2.030$,$P=0.048$),纤维蛋白原高于健脾组($q=2.830$,$P=0.007$);其余各指标组间比较,差异均无统计学意义。16 周时各实验组全血黏度(10/s)、全血黏度(50/s)、全血黏度(200/s)、血浆黏度、红细胞压积、纤维蛋白原比较,差异均有统计学意义($F=6.089$,$P=0.001$;$F=3.220$,$P=0.024$;$F=2.281$,$P=0.020$;$F=9.268$,$P=0.000$;$F=8.569$,$P=0.000$;$F=9.532$,$P=0.000$)。模型组全血黏度(10/s)、全血黏度(50/s)、全血黏度(200/s)、红细胞压积、血浆黏度、纤维蛋白原均高于正常组($q=3.912$,$P=0.000$;$q=2.857$,$P=0.007$;$q=2.645$,$P=0.012$;$q=4.330$,$P=0.000$;$q=4.920$,$P=0.000$;$q=5.829$,$P=0.000$);健脾组全血黏度(10/s)、全血黏度(50/s)、全血黏度(200/s)、红细胞压积、血浆黏度均低于模型组($q=4.070$,$P=0.000$;$q=3.920$,$P=0.000$;$q=2.990$,$P=0.005$;$q=4.980$,$P=0.000$;$q=2.170$,$P=0.041$);补肾组全血黏度(10/s)、全血黏度(50/s)、全血黏度(200/s)、血浆黏度低于模型组($q=2.740$,$P=0.010$;$q=2.840$,$P=0.008$;$q=3.770$,$P=0.000$;$q=2.220$,$P=0.032$);其余各指标组间比较,差异均无统计学意义。⑥凝血功能。8 周时各组实验动物血浆活化部分凝血酶时间、凝血酶原时间及凝血酶时间比较,差异均有统计学意义($F=6.400$,$P=0.001$;$F=8.700$,$P=0.000$;$F=7.300$,$P=0.000$)。模型组活化部分凝血酶时间、凝血酶原时间、凝血酶时间均短于正常组($q=4.320$,$P=0.000$;$q=4.250$,$P=0.000$;$q=3.490$,$P=0.001$);健脾组凝血酶原时间、凝血酶时间均长于模型组($q=4.990$,$P=0.000$;$q=4.337$,$P=0.000$);补肾组凝血酶原时间、凝血酶时间均长于模型组($q=4.080$,$P=0.000$;$q=4.970$,$P=0.000$);其余各项指标组间比较,差异均无统计学意义。16 周时各组实验动物血浆活化部分凝血酶时间和凝血酶时间比较,差异均有统计学意义($F=19.120$,$P=0.000$;$F=3.470$,$P=0.017$);各组凝血酶原时间比较,差异无统计学意义。模型组活化部分凝血酶时间、凝血酶时间均短于正常组($q=5.302$,$P=0.000$;$q=2.410$,$P=0.210$);健脾组活化部分凝血酶时间长于模型组($q=3.290$,$P=0.002$);补肾组活化部分凝血酶时间和凝血酶时间均长于模型组($q=6.890$,$P=0.000$;$q=3.470$,$P=0.001$);其余各项指标组间比较,差异无统计学意义。⑦纤溶功能。8 周时各组实验动物血浆抗凝血酶Ⅲ、组织型纤溶酶原激活物比较,差异均有统计学意义($F=8.300$,$P=0.000$;$F=16.590$,$P=0.000$);各组血浆纤溶酶原比较,差异无统计学意义。模型组组织型纤溶酶原激活物低于正常组($q=6.800$,$P=0.000$);健脾组组织型纤溶酶原激活物高于模型组和补肾组($q=4.160$,$P=0.000$;$q=3.770$,$P=0.001$);其余各项指标组间比较,差异均无统计学意义。16 周时各组实验动物血浆抗凝血酶Ⅲ、组织型纤溶酶原激活物比较,差异均有统计学意义($F=10.980$,$P=0.000$;$F=43.950$,$P=0.000$);各组血浆纤溶酶原比较,差异无统计学意义。模型组抗凝血酶Ⅲ、组织型纤溶酶原激活物均低于正常组($q=5.810$,$P=0.000$;$q=9.030$,$P=0.000$);健脾组组织型纤溶酶原激活物高于模型组($q=4.080$,$P=0.000$);其余各项指标组间比较,差异均无统计学意义。**结论**:健脾和补肾两种治法方药均具有一定程度的改善激素性股骨头坏死鸡血脂、血黏度及凝血功能的作用,但二者发挥作用的强度和时间不同,健脾法更具优势。

关键词　股骨头坏死　血脂　血液黏度　血液凝固　动物实验

Effects of different therapeutic methods and prescriptions on blood fat, blood viscosity, blood coagulation and fibrinolysis of chickens with steroid-induced necrosis of femoral head

*WANG Rong-tian**, *LIN Shi-fu*, *WAN Rong*, *YIN Xiao-jie*, *WANG Zhi-yao*, *LIU Dao-bing*, *LIN Na*, *CHEN Wei-heng*. * *Wangjing Hospital of China Academy Of Chinese Medical Sciences*, *Beijing* 100102, *China*

ABSTRACT　**Objective**: To compare the effects between STRENGTHENING SPLEEN RESOLV PHLEGM combined with ACTIVAT BLOOD DREDGING COLLATERALS and REINFORCING KIDNEY SUPPERS BONE combined with ACTIVAT BLOOD DREDGING COLLATERALS on blood fat, blood viscosity, blood coagulation and fibrinolysis of chickens with steroid-induced necrosis of femoral head (SNFH), and to explore the mechanism of action and the role of the two methods in the prevention of SNFH. **Methods**: Eighty leghorn chickens were randomly divided into normal group, model group, lovastatin group, STRENGTHENING SPLEEN(SS) group and REINFORCING KIDNEY(RK) group. Chickens were administrated with pectoral intramuscular injection of methylprednisolone sodium succinate except those in the normal group, and chickens in lovastatin group, SS group and RK group were simultaneously administrated with respective medicine. After 8 and 16 weeks of medication, venous blood was respectively collected from the chickens in batches for detecting the following parameters as whole blood viscosity(ηb), plasma viscosity(ηp), hematocrit(HCT), fibrinogen(FIB), high density lipoprotein(HDL), low density lipoprotein(LDL), cholesterol total(CHOL), triglyceride(TG), plasma plasminogen(PLG), antithrombin Ⅲ(AT-Ⅲ), tissue-type

plasminogen activator(t-PA), activated partial thromboplastin time(APTT), thrombin time(TT) and prothrombin time(PT). After blood collection, the chickens were executed for fetching out their bilateral femoral heads, which were sectioned for histological observation. **Results**: 1) The results of histological observation under a light microscope: In normal group cartilage cells lined up in order; bone trabeculae were in regular, close and well-stacked arrangement, surrounded by some osteoblasts and a small number of osteoclasts; and no hypertrophic fat cells were found. The following situations were found in model group as tufted hypertrophic cartilage cells arranged irregularly, thin bone trabeculae, fracture and separation of partial bone trabeculae under the cartilage, hypertrophic fat cells in marrow cavity and empty bone lacuna. Sparse bone trabeculae, empty bone lacuna and larger fat cells in marrow cavity were found in lovastatin group. In SS group the cartilage cells lined up in order and the bone trabeculae lined up regularly and closely, surrounded by a large number of osteoblasts and a small number of osteoclasts. A small number of bone lacuna, sparse fat cells and plenty of hematopoietic cells in marrow cavity were found in RK group. 2) Empty bone lacuna rate: There were statistical differences in empty bone lacuna rate among the groups at 8 weeks ($F = 6.081$, $P = 0.010$). The empty bone lacuna rate of the model group was higher than that of normal group, lovastatin group and SS group respectively ($q = 2.273$, $P = 0.029$; $q = 2.550$, $P = 0.015$; $q = 2.830$, $P = 0.007$), and there was no statistical difference between model group and RK group. There were statistical differences in empty bone lacuna rate among the groups at 16 weeks ($F = 27.910$, $P = 0.000$). The empty bone lacuna rate was higher in the model group compared to normal group, SS group and RK group respectively ($q = 6.330$, $P = 0.000$; $q = 3.730$, $P = 0.000$; $q = 4.440$, $P = 0.000$), and there was no statistical difference between model group and lovastatin group. 3) Area of fat in bone marrow cavity: There were statistical differences in the area of fat in bone marrow cavity among the groups at 8 weeks ($F = 11.230$, $P = 0.000$). The area of fat in bone marrow cavity was greater in the model group compared to normal group, lovastatin group, SS group and RK group respectively ($q = 2.470$, $P = 0.019$; $q = 2.470$, $P = 0.018$; $q = 7.890$, $P = 0.000$; $q = 7.710$, $P = 0.000$). There were statistical differences in the area of fat in bone marrow cavity among the groups at 16 weeks ($F = 57.140$, $P = 0.000$). The model group surpassed normal group, lovastatin group, SS group and RK group respectively ($q = 12.240$, $P = 0.000$; $q = 3.148$, $P = 0.003$; $q = 3.910$, $P = 0.000$; $q = 3.690$, $P = 0.000$). 4) Blood fat levels: There were statistical differences in the levels of CHOL, TG, HDL and LDL among the groups at 8 weeks ($F = 17.630$, $P = 0.000$; $F = 27.450$, $P = 0.000$; $F = 6.820$, $P = 0.000$; $F = 6.670$, $P = 0.000$). CHOL and TG levels were all lower in the normal group compared to the model group ($q = 5.740$, $P = 0.000$; $q = 8.180$, $P = 0.000$), while HDL levels were higher in the normal group compared to the model group ($q = 3.030$, $P = 0.005$). CHOL and TG levels were lower in the lovastatin group compared to the model group ($q = 7.050$, $P = 0.000$; $q = 8.480$, $P = 0.000$), while HDL levels were higher in the lovastatin group compared to the model group ($q = 2.800$, $P = 0.008$). CHOL, TG and LDL levels were lower in the SS group compared to the model group ($q = 7.127$, $P = 0.000$; $q = 8.900$, $P = 0.000$; $q = 4.110$, $P = 0.000$), while HDL levels were higher in the SS group compared to the model group ($q = 2.860$, $P = 0.007$). CHOL, TG and LDL levels were lower in the RK group compared to the model group ($q = 5.970$, $P = 0.000$; $q = 7.220$, $P = 0.000$; $q = 4.170$, $P = 0.000$), while HDL levels were higher in the RK group compared to the model group ($q = 5.190$, $P = 0.000$). CHOL, TG and HDL levels were lower in the SS group compared to the RK group ($q = 2.090$, $P = 0.042$; $q = 2.216$, $P = 0.037$; $q = 2.335$, $P = 0.025$). There were no statistical differences in the levels of rest indexes among the groups. There were statistical differences in CHOL, TG, HDL and LDL levels among the groups at 16 weeks ($F = 17.160$, $P = 0.000$; $F = 10.650$, $P = 0.000$; $F = 9.260$, $P = 0.000$; $F = 3.312$, $P = 0.021$). CHOL, TG and LDL levels were lower in the normal group compared to the model group ($q = 6.900$, $P = 0.000$; $q = 4.640$, $P = 0.000$; $q = 5.690$, $P = 0.000$). CHOL, TG and HDL levels were lower in the lovastatin group compared to the model group ($q = 5.420$, $P = 0.000$; $q = 5.590$, $P = 0.000$; $q = 3.980$, $P = 0.000$). CHOL, TG, HDL and LDL levels were lower in the SS group compared to the model group ($q = -5.751$, $P = 0.000$; $q = 2.215$, $P = 0.040$; $q = 5.594$, $P = 0.000$). CHOL, TG and LDL levels were lower in the RK group compared to the model group ($q = 7.230$, $P = 0.000$; $q = 4.690$, $P = 0.000$; $q = 4.550$, $P = 0.000$). TG levels were lower in the RK group compared to the SS group and the lovastatin group respectively ($q = 2.230$, $P = 0.029$; $q = 2.080$, $P = 0.039$). There were no statistical differences in the levels of rest indexes among the groups. 5) Blood viscosity levels: There were statistical differences in the levels of ηb(10/s, 50/s and 200/s), ηp, HCT and FIB among the groups at 8 weeks ($F = 4.860$, $P = 0.030$; $F = 2.650$, $P = 0.040$; $F = 2.630$, $P = 0.050$; $F = 2.680$, $P = 0.048$; $F = 3.130$, $P = 0.027$; $F = 7.920$, $P = 0.000$). The levels of ηb(10/s and 50/s), HCT, ηp and FIB were higher in the model group compared to the normal group ($q = 3.230$, $P = 0.003$; $q = 2.060$, $P = 0.046$; $q = 2.990$, $P = 0.005$; $q = 3.050$, $P = 0.004$; $q = 5.420$, $P = 0.000$). The levels of ηb(10/s, 50/s and 200/s), HCT, ηp and FIB were lower in the SS group compared to the model group ($q = 3.370$, $P = 0.002$; $q = 2.060$, $P = 0.047$; $q = 2.640$, $P = 0.012$; $q = 2.480$, $P = 0.018$; $q = 2.170$, $P = 0.041$; $q = 3.080$, $P = 0.004$). The levels of ηp was lower in the RK group compared to the model group ($q = 2.030$, $P = 0.048$), while the levels of FIB was

higher in the RK group compared to the SS group($q=2.830$, $P=0.007$). There were no statistical differences in the levels of the rest indexes among the groups. There were statistical differences in the levels of ηb(10/s,50/s and 200/s), ηp, HCT and FIB among the groups at 16 weeks($F=6.089$, $P=0.001$; $F=3.220$, $P=0.024$; $F=2.281$, $P=0.020$; $F=9.268$, $P=0.000$; $F=8.569$, $P=0.000$; $F=9.532$, $P=0.000$). The levels of ηb(10/s,50/s and 200/s), HCT, ηp and FIB were higher in the model group compared to the normal group($q=3.912$, $P=0.000$; $q=2.857$, $P=0.007$; $q=2.645$, $P=0.012$; $q=4.330$, $P=0.000$; $q=4.920$, $P=0.000$; $q=5.829$, $P=0.000$). The level of ηb(10/s,50/s and 200/s), HCT and ηp were lower in the SS group compared to the model group($q=4.070$, $P=0.000$; $q=3.920$, $P=0.000$; $q=2.990$, $P=0.005$; $q=4.980$, $P=0.000$; $q=2.170$, $P=0.041$). The levels of ηb(10/s,50/s and 200/s) and ηp were lower in the RK group compared to the model group($q=2.740$, $P=0.010$; $q=2.840$, $P=0.008$; $q=3.770$, $P=0.000$; $q=2.220$, $P=0.032$). There were no statistical differences in the levels of the rest indexes among the groups. 6) Blood coagulation function: There were statistical differences in APTT, PT and TT of the plasma among the groups at 8 weeks($F=6.400$, $P=0.001$; $F=8.700$, $P=0.000$; $F=7.300$, $P=0.000$). APTT, PT and TT of model group were all shorter than those of normal group($q=4.320$, $P=0.000$; $q=4.250$, $P=0.000$; $q=3.490$, $P=0.001$); PT and TT of SS group were all longer than those of model group($q=4.990$, $P=0.000$; $q=4.337$, $P=0.000$); PT and TT of RK group were all longer than those of model group($q=4.080$, $P=0.000$; $q=4.970$, $P=0.000$); while there were no statistical differences in the rest indexes among the groups. There were statistical differences in APTT and TT of plasma among the groups at 16 weeks($F=19.120$, $P=0.000$; $F=3.470$, $P=0.017$); while there was no statistical difference in PT among the groups. APTT and TT of model group were all shorter than those of normal group($q=5.302$, $P=0.000$; $q=2.410$, $P=0.210$); APTT of SS group was longer than that of model group($q=3.290$, $P=0.002$); APTT and TT of RK group were all longer than those of model group($q=6.890$, $P=0.000$; $q=3.470$, $P=0.001$); while there were no statistical differences in the rest indexes among the groups. 7) Fibrinolysis: There were statistical differences in the plasma concentrations of AT-Ⅲ and t-PA among the groups at 8 weeks($F=8.300$, $P=0.000$; $F=16.590$, $P=0.000$); while there were no statistical differences in plasma PLG concentrations among the groups. The concentrations of t-PA in plasma of model group were lower than those of normal group($q=6.800$, $P=0.000$); the plasma concentrations of t-PA of SS group were higher than those of model group and RK group respectively($q=4.160$, $P=0.000$; $q=3.770$, $P=0.001$); while there were no statistical differences in the plasma concentrations of rest indexes among the groups. There were statistical differences in the plasma concentrations of AT-Ⅲ and t-PA among the groups at 16 weeks($F=10.980$, $P=0.000$; $F=43.950$, $P=0.000$); while there were no statistical differences in plasma PLG concentrations among the groups. The concentrations of AT-Ⅲ and t-PA in plasma of model group were lower than those of normal group($q=5.810$, $P=0.000$; $q=9.030$, $P=0.000$); the concentrations of t-PA in plasma of SS group were higher than those of model group($q=4.080$, $P=0.000$); while there were no statistical differences in the plasma concentrations of rest indexes among the groups. **Conclusion**: Although both the therapy of STRENGTHING SPLEEN and the therapy of REINFORCING KIDNEY can improve blood fat, blood viscosity and blood coagulation of SNFH chickens to some extent, they have different intensity of action and different effective date, and the former has more advantages.

Key words　Femur head necrosis; Blood fat; Blood viscosity; Blood coagulation; Animal experimentation

随着糖皮质激素的广泛应用,激素性股骨头坏死的发病率呈上升趋势,已居于非创伤性股骨头坏死的首位[1]。激素所致的血脂代谢紊乱、血流变学异常及凝血-纤溶系统失衡,是导致股骨头坏死的重要因素[2]。我们在前期临床实践中,曾分别采用健脾化痰、活血通络和补肾壮骨、活血通络的方药治疗激素性股骨头坏死患者,均取得了较满意的疗效[3-4]。为进一步明确相关作用机制,本研究从血脂、血液黏度、凝血及纤溶功能方面对 2 种不同的治法方药进行比较。

1　材料与仪器

1.1　实验动物　健康 16 月龄 SPF 级雌性来航鸡 80 只,体质量 1.80 ~ 2.30 kg,由北京梅里来维通实验动物技术有限公司提供,实验动物合格证号:SYXK1100-0022。

1.2　实验药物及试剂　自拟健脾方,药物组成:茯苓 15 g、白术 12 g、党参 20 g、法半夏 10 g、赤芍 10 g、桂枝 10 g、当归 10 g、川芎 10 g 等;自拟补肾方,药物组成:独活 15 g、桑寄生 20 g、补骨脂 15 g、肉桂 10 g、杜仲 15 g、菟丝子 15 g、当归 10 g、川芎 8 g 等。以上 2 方均制备成水煎粗提液(含生药 1 g · mL^{-1}),中药饮片由中国中医科学院中药研究所提供。洛伐他汀片(北京万生药业有限责任公司);甲基氢化泼尼松琥珀酸钠(比利时法玛西亚普强公司);注射用青霉素钠、

注射用硫酸链霉素（华北制药股份有限公司）；纤溶酶试剂盒、抗凝血酶试剂盒、组织型纤溶酶原激活物试剂盒（上海太阳生物技术有限公司）。

1.3 实验仪器 OLYMPUS AU400 型全自动生化仪；LXJ-Ⅱ型离心沉淀机；普利生 LBY-N6A 自清洗旋转式黏度计；普利生 LBY-NW1 型毛细管黏度计；普利生 C2000-4 血凝仪；STAcompact 全自动血栓与止血分析仪；Humalyzer 2000 半自动生化分析仪及 BIO-RAD 酶标仪；SPOTMIS 图像处理分析系统。

2 方 法

2.1 动物分组及造模 将 80 只来航鸡随机分为正常组、模型组、洛伐他汀组、健脾组和补肾组，每组 16 只。参照王新生等[5]的造模方法，并结合前期实验研究结果进行改良，选用甲基氢化泼尼松琥珀酸钠肌注的方法造模。模型组、洛伐他汀组、健脾组和补肾组按 5.2 mg·kg^{-1}胸肌注射甲基氢化泼尼松琥珀酸钠，正常组注射等量生理盐水，每周 1 次。

2.2 药物干预 洛伐他汀组、健脾组、补肾组动物在造模的同时，分别给予洛伐他汀、健脾方水煎液、补肾方水煎液灌胃，剂量分别为 5 mg·kg^{-1}、6 g·kg^{-1}、9 g·kg^{-1}，正常组和模型组以等量生理盐水灌胃，每天 1 次。所有动物均预防性注射青霉素 2 万单位·kg^{-1}、链霉素 50 mg·kg^{-1}，每周 2 次。

2.3 血液学指标测定及组织学观察

2.3.1 血液学指标测定 分别于给药 8 周、16 周后，分别从各组中随机选取 8 只动物，禁食 12 h 后，于翼下静脉取血，测定全血黏度（blood viscosity，ηb）、血浆黏度（plasma viscosity，ηp）、红细胞压积（hematocrit，HCT）、纤维蛋白原（fibrinogen，FIB）、高密度脂蛋白（high density lipoprotein，HDL）、低密度脂蛋白（low density lipoprotein，LDL）、总胆固醇（cholesterol total，CHOL）、甘油三脂（triglyceride，TG）、血浆纤溶酶原（plasminogen，PLG）、抗凝血酶Ⅲ（antithrombin Ⅲ，AT-Ⅲ）、组织型纤溶酶原激活物（tissue-type plasminogen activator，t-PA）、活化部分凝血酶时间（activated partial thromboplastin time，APTT）、凝血酶时间（thrombin time，TT）及凝血酶原时间（prothrombin time，PT）。

2.3.2 组织学观察 采血后处死动物，取出双侧股骨头，置于4%多聚甲醛溶液中固定 48～72 h，然后用 12.5% EDTA-2Na 溶液脱钙，梯度乙醇脱水，常规石蜡包埋、切片（厚度 5～7 μm）后进行 HE 染色。光镜下观察股骨头内软骨细胞、骨细胞、骨小梁、髓腔脂肪细胞形态。高倍镜下任选 5 个视野，每个视野内计数 50 个骨陷窝，计算空骨陷窝的百分比。采用 SPOTMIS 图像处理分析系统计算骨髓内脂肪面积。

2.4 统计学方法 采用 SAS9.0 统计软件对所得数据进行统计分析，各组空骨陷窝率、骨髓内脂肪面积、ηb、ηp、HCT、FIB、HDL、LDL、CHOL、TG、PLG、AT-Ⅲ、t-PA、APTT、TT 及 PT 的组间比较采用单因素方差分析，组间两两比较采用 q 检验，检验水准 $\alpha=0.05$。

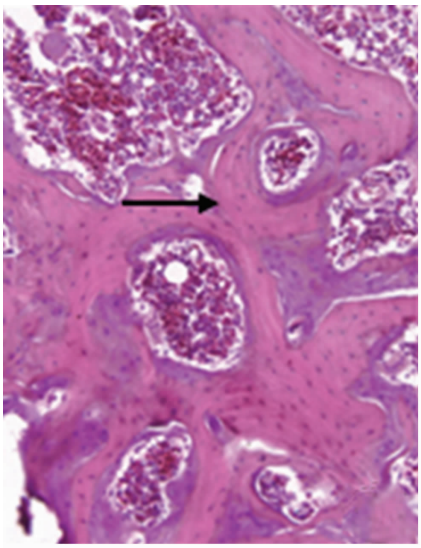
3 结 果

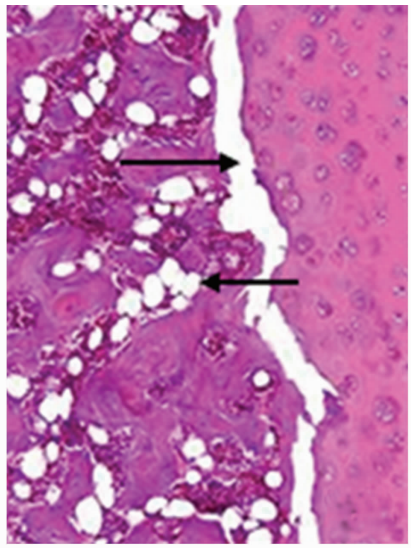
3.1 组织学观察结果

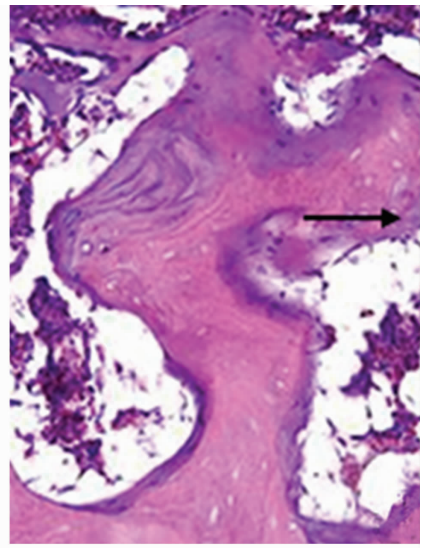
3.1.1 光镜下观察结果 正常组软骨细胞排列整齐，骨小梁排列规则、致密、饱满，周边可见成骨细胞和少量破骨细胞，未见脂肪细胞增生及肥大［图 1(1)］；模型组软骨细胞呈簇状肥大，排列不规则，骨小梁变细，部分软骨下骨小梁断裂、分离，骨髓腔内脂肪细胞肥大、增生［图 1(2)］，可见空骨陷窝［图 1(3)］；洛伐他汀组骨小梁稀疏，可见空骨陷窝及髓腔内变大的脂肪细胞［图 1(4)］；健脾组软骨细胞排列整齐，骨小梁排列尚规则、致密，周边可见大量成骨细胞及少量破骨细胞［图 1(5)］；补肾组骨陷窝较少，髓腔内脂肪细胞零散分布，髓腔内造血细胞较丰富［图 1(6)］。

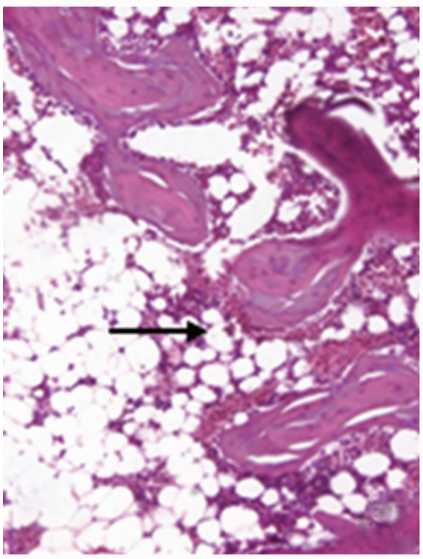
3.1.2 空骨陷窝率 8 周时各组动物空骨陷窝率比较，差异有统计学意义。模型组空骨陷窝率高于正常组、洛伐他汀组和健脾组（$q=2.273$，$P=0.029$；$q=2.550$，$P=0.015$；$q=2.830$，$P=0.007$），模型组与补肾组比较，差异无统计学意义。16 周时各组动物空骨陷窝率比较，差异有统计学意义。模型组高于正常组、健脾组和补肾组（$q=6.330$，$P=0.000$；$q=3.730$，$P=0.000$；$q=4.440$，$P=0.000$），模型组与洛伐他汀组比较，差异无统计学意义（表 1）。

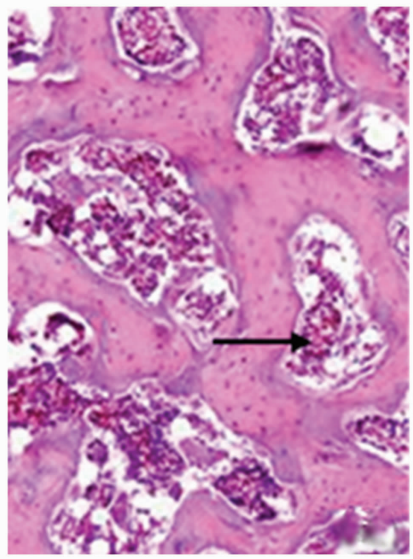
3.1.3 骨髓内脂肪面积 8 周时各组动物骨髓内脂肪面积比较，差异有统计学意义。模型组高于正常组、洛伐他汀组、健脾组和补肾组（$q=2.470$，$P=0.019$；$q=2.470$，$P=0.018$；$q=7.890$，$P=0.000$；$q=7.710$，$P=0.000$）。16 周时各组动物骨髓内脂肪面积比较，差异有统计学意义。模型组高于正常组、洛伐他汀组、健脾组和补肾组（$q=12.240$，$P=0.000$；$q=3.148$，$P=0.003$；$q=3.910$，$P=0.000$；$q=3.690$，$P=0.000$）。（表 2）


(1)正常组(×200)


(2)模型组(×200)


(3)模型组(×400)


(4)洛伐他汀组(×200)


(5)健脾组(×200)

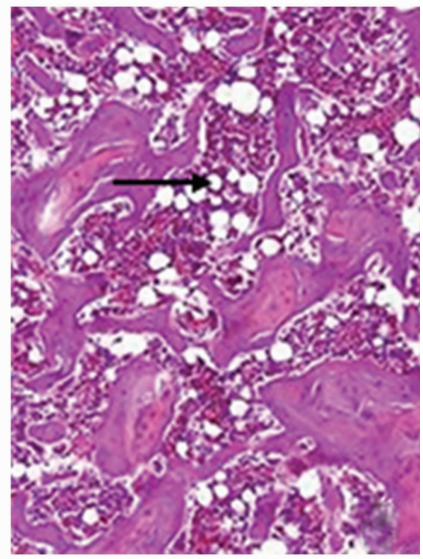

(6)补肾组(×200)

图 1　各组实验动物给药后 16 周时股骨头组织形态学改变(HE 染色)

表 1　各组实验动物空骨陷窝率比较　%

组别	空骨陷窝率	
	8 周	16 周
正常组	13.80 ± 6.60	9.00 ± 8.80
模型组	23.30 ± 7.70	27.70 ± 12.60
洛伐他汀组	16.00 ± 1.88	21.00 ± 1.89
健脾组	15.20 ± 5.60	17.00 ± 6.00
补肾组	20.00 ± 9.60	15.00 ± 6.80
F 值	6.081	27.910
P 值	0.010	0.000

表 2　各组实验动物骨髓内脂肪面积比较　μm^2

组别	骨髓内脂肪面积	
	8 周	16 周
正常组	121.04 ± 42.40	116.40 ± 29.20
模型组	738.86 ± 119.90	1 043.10 ± 225.50
洛伐他汀组	625.00 ± 162.78	686.93 ± 39.48
健脾组	324.40 ± 161.10	302.00 ± 91.00
补肾组	311.60 ± 92.60	352.50 ± 127.90
F 值	1.230	57.140
P 值	0.000	0.000

3.2　血液学指标测定结果

3.2.1　血脂　①8 周时各组实验动物 CHOL、TG、HDL 及 LDL 比较,差异均有统计学意义。正常组 CHOL 和 TG 均低于模型组($q = 5.740$,$P = 0.000$;$q = 8.180$,$P = 0.000$),HDL 高于模型组($q = 3.030$,$P = 0.005$);洛伐他汀组 CHOL 和 TG 均低于模型组($q = 7.050$,$P = 0.000$;$q = 8.480$,$P = 0.000$),HDL 高于模型组($q = 2.800$,$P = 0.008$);健脾组 CHOL、TG、LDL 均低于模型组($q = 7.127$,$P = 0.000$;$q = 8.900$,$P = 0.000$;$q = 4.110$,$P = 0.000$),HDL 高于模型组($q = 2.860$,$P = 0.007$);补肾组 CHOL、TG、LDL 均低于模型组($q = 5.970$,$P = 0.000$;$q = 7.220$,$P = 0.000$;$q =$

4.170，$P=0.000$），HDL 高于模型组（$q=5.190$，$P=0.000$）；健脾组 CHOL、TG、HDL 均低于补肾组（$q=2.090$，$P=0.042$；$q=2.216$，$P=0.037$；$q=2.335$，$P=0.025$）；其余各项指标组间比较，差异均无统计学意义。②16 周时各组实验动物 CHOL、TG、HDL 及 LDL 比较，差异均有统计学意义。正常组 CHOL、TG、LDL 均低于模型组（$q=6.900$，$P=0.000$；$q=4.640$，$P=0.000$；$q=5.690$，$P=0.000$）；洛伐他汀组 CHOL、TG、HDL 均低于模型组（$q=5.420$，$P=0.000$；$q=5.590$，$P=0.000$；$q=3.980$，$P=0.000$）；健脾组 CHOL、TG、HDL、LDL 均低于模型组（$q=-5.751$，$P=0.000$；$q=2.215$，$P=0.040$；$q=5.594$，$P=0.000$）；补肾组 CHOL、TG、LDL 均低于模型组（$q=7.230$，$P=0.000$；$q=4.690$，$P=0.000$；$q=4.550$，$P=0.000$）；补肾组 TG 低于健脾组和洛伐他汀组（$q=2.230$，$P=0.029$；$q=2.080$，$P=0.039$）；其余各项指标组间比较，差异均无统计学意义（表 3）。

表 3　各组实验动物血脂指标比较　mmol · L^{-1}

组别	8 周				16 周			
	CHOL	TG	HDL	LDL	CHOL	TG	HDL	LDL
正常组	4.20 ± 0.80	4.20 ± 0.60	1.80 ± 0.30	1.90 ± 0.50	3.70 ± 0.90	4.90 ± 1.90	1.80 ± 0.110	1.10 ± 0.21
模型组	5.60 ± 0.50	7.60 ± 1.30	1.20 ± 0.10	2.30 ± 0.40	6.00 ± 1.10	9.10 ± 0.80	1.70 ± 0.30	2.10 ± 0.50
洛伐他汀组	3.60 ± 0.90	4.10 ± 0.80	1.80 ± 0.50	2.00 ± 0.70	3.60 ± 0.70	5.80 ± 1.50	1.50 ± 0.25	1.40 ± 0.33
健脾组	3.50 ± 0.40	3.90 ± 0.50	1.80 ± 0.60	1.50 ± 0.50	3.50 ± 0.70	5.60 ± 0.50	1.40 ± 0.25	1.40 ± 0.22
补肾组	4.20 ± 0.80	4.60 ± 1.00	2.30 ± 0.70	1.40 ± 0.20	3.90 ± 0.50	4.70 ± 0.70	1.80 ± 0.33	1.30 ± 0.39
F 值	17.630	27.450	6.820	6.670	17.160	10.650	9.260	3.312
P 值	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.021

3.2.2　血黏度　①8 周时各实验组 ηb、ηp、HCT、FIB 比较，差异均有统计学意义。模型组 ηb（10/s）、ηb（50/s）、HCT、ηp、FIB 均高于正常组（$q=3.230$，$P=0.003$；$q=2.060$，$P=0.046$；$q=2.990$，$P=0.005$；$q=3.050$，$P=0.004$；$q=5.420$，$P=0.000$）；健脾组 ηb（10/s）、ηb（50/s）、ηb（200/s）、HCT、ηp、FIB 均低于模型组（$q=3.370$，$P=0.002$；$q=2.060$，$P=0.047$；$q=2.640$，$P=0.012$；$q=2.480$，$P=0.018$；$q=2.170$，$P=0.041$；$q=3.080$，$P=0.004$）；补肾组 ηp 低于模型组（$q=2.030$，$P=0.048$），FIB 高于健脾组（$q=2.830$，$P=0.007$）；其余各指标组间比较，差异均无统计学意义（表 4）。②16 周时各实验组 ηb、ηp、HCT、FIB 比较，差异均有统计学意义。模型组 ηb（10/s）、ηb（50/s）、ηb（200/s）、HCT、ηp、FIB 均高于正常组（$q=3.912$，$P=0.000$；$q=2.857$，$P=0.007$；$q=2.645$，$P=0.012$；$q=4.330$，$P=0.000$；$q=4.920$，$P=0.000$；$q=5.829$，$P=0.000$）；健脾组 ηb（10/s）、ηb（50/s）、ηb（200/s）、HCT、ηp 均低于模型组（$q=4.070$，$P=0.000$；$q=3.920$，$P=0.000$；$q=2.990$，$P=0.005$；$q=4.980$，$P=0.000$；$q=2.170$，$P=0.041$）；补肾组 ηb（10/s）、ηb（50/s）、ηb（200/s）、ηp 均低于模型组（$q=2.740$，$P=0.010$；$q=2.840$，$P=0.008$；$q=3.770$，$P=0.000$；$q=2.220$，$P=0.032$）；其余各指标组间比较，差异均无统计学意义（表 5）。

3.2.3　凝血功能　①8 周时各组实验动物血浆 APTT、PT 及 TT 比较，差异均有统计学意义。模型组 APTT、PT、TT 均短于正常组（$q=4.320$，$P=0.000$；$q=4.250$，$P=0.000$；$q=3.490$，$P=0.001$）；健脾组 PT、TT 均长于模型组（$q=4.990$，$P=0.000$；$q=4.337$，$P=0.000$）；补肾组 PT、TT 均长于模型组（$q=4.080$，$P=0.000$；$q=4.970$，$P=0.000$）；其余各项指标组间比较，差异均无统计学意义。②16 周时各组实验动物血浆 APTT 和 TT 比较，差异均有统计学意义；各组 PT 比较，差异无统计学意义。模型组 APTT、TT 均短于正常组（$q=5.302$，$P=0.000$；$q=2.410$，$P=0.210$）；健脾组 APTT 长于模型组（$q=3.290$，$P=0.002$）；补肾组 APTT 和 TT 均长于模型组（$q=6.890$，$P=0.000$；$q=3.470$，$P=0.001$）；其余各项指标组间比较，差异均无统计学意义（表 6）。

3.2.4　纤溶功能　①8 周时各组实验动物血浆 AT-Ⅲ、t-PA 比较，差异均有统计学意义；各组 PLG 比较，差异无统计学意义。模型组 t-PA 低于正常组（$q=6.800$，$P=0.000$）；健脾组 t-PA 高于模型组和补肾组（$q=4.160$，$P=0.000$；$q=3.770$，$P=0.001$）；其余各项指标组间比较，差异均无统计学意义。②16 周时各组实验动物血浆 AT-Ⅲ、t-PA 比较，差异均有

统计学意义;各组 PLG 比较,差异无统计学意义。模型组 AT－Ⅲ、t-PA 均低于正常组($q = 5.810$, $P = 0.000$;$q = 9.030$, $P = 0.000$);健脾组 t-PA 高于模型组($q = 4.080$, $P = 0.000$);其余各项指标组间比较,差异均无统计学意义(表 7)。

表 4　各组实验动物 8 周时血黏度指标比较

组别	ηb (mpa. s)			HCT(%)	ηp(mpa. s)	FIB(g · L^{-1})
	10/s	50/s	200/s			
正常组	1.92 ± 0.01	2.02 ± 0.00	2.12 ± 0.02	25.55 ± 2.06	1.10 ± 0.05	0.79 ± 0.11
模型组	2.16 ± 0.15	2.23 ± 0.16	2.38 ± 0.04	28.32 ± 1.72	1.23 ± 0.09	1.07 ± 0.09
洛伐他汀组	2.13 ± 0.15	2.17 ± 0.20	2.20 ± 0.24	26.54 ± 1.45	1.21 ± 0.07	1.05 ± 0.11
健脾组	1.96 ± 0.16	2.03 ± 0.19	2.05 ± 0.21	26.02 ± 2.33	1.14 ± 0.09	0.87 ± 0.07
补肾组	2.02 ± 0.2	2.12 ± 0.32	2.19 ± 0.48	27.08 ± 2.16	1.15 ± 0.09	1.01 ± 0.07
F 值	4.860	2.650	2.630	2.680	3.130	7.920
P 值	0.030	0.040	0.050	0.048	0.027	0.000

表 5　各组实验动物 16 周时血黏度指标比较

组别	ηb (mpa. s)			HCT(%)	ηp(mpa. s)	FIB(g · L^{-1})
	10/s	50/s	200/s			
正常组	1.93 ± 0.01	2.06 ± 0.17	2.09 ± 0.04	23.92 ± 2.06	1.11 ± 0.04	0.80 ± 0.11
模型组	2.19 ± 0.16	2.29 ± 0.11	2.39 ± 0.03	29.07 ± 1.72	1.27 ± 0.09	1.09 ± 0.12
洛伐他汀组	2.12 ± 0.15	2.18 ± 0.22	2.19 ± 0.25	26.91 ± 1.47	1.24 ± 0.08	1.02 ± 0.11
健脾组	1.91 ± 0.16	1.96 ± 0.13	2.03 ± 0.19	23.85 ± 2.33	1.15 ± 0.09	1.00 ± 0.06
补肾组	2.03 ± 0.17	2.10 ± 0.30	2.18 ± 0.29	24.76 ± 2.16	1.12 ± 0.04	0.98 ± 0.06
F 值	6.089	3.220	2.281	9.268	8.569	9.532
P 值	0.001	0.024	0.020	0.000	0.000	0.000

表 6　各组实验动物凝血指标比较　s

组别	8 周			16 周		
	APTT	PT	TT	APTT	PT	TT
正常组	205.00 ± 42.00	77.00 ± 7.00	71.00 ± 9.00	199.00 ± 21.00	65.00 ± 11.00	71.00 ± 14.00
模型组	130.00 ± 28.00	54.00 ± 5.00	59.00 ± 8.00	124.00 ± 22.00	57.00 ± 12.00	60.00 ± 10.00
洛伐他汀组	132.00 ± 27.00	71.00 ± 15.00	69.00 ± 9.00	122.00 ± 27.00	58.00 ± 14.00	76.00 ± 13.00
健脾组	141.00 ± 36.00	81.00 ± 9.00	74.00 ± 9.00	168.00 ± 21.00	61.00 ± 16.00	78.00 ± 13.00
补肾组	158.00 ± 36.00	82.00 ± 15.00	76.00 ± 5.00	216.00 ± 34.00	66.00 ± 11.00	83.00 ± 12.00
F 值	6.400	8.700	7.300	19.120	0.600	3.470
P 值	0.001	0.000	0.000	0.000	0.660	0.017

表 7　各组实验动物纤溶指标比较　mmol · L^{-1}

组别	8 周			16 周		
	AT－Ⅲ	PLG	t-PA	AT－Ⅲ	PLG	t-PA
正常组	962.00 ± 149.00	0.28 ± 0.09	0.82 ± 0.2	1 018.00 ± 126.00	0.33 ± 0.01	0.74 ± 0.05
模型组	633.00 ± 121.00	0.21 ± 0.06	0.40 ± 0.08	596.00 ± 126.00	0.34 ± 0.07	0.43 ± 0.04
洛伐他汀组	781.00 ± 126.00	0.19 ± 0.07	0.49 ± 0.06	629.00 ± 157.00	0.36 ± 0.08	0.31 ± 0.09
健脾组	699.00 ± 153.00	0.23 ± 0.05	0.65 ± 0.07	686.00 ± 121.00	0.36 ± 0.01	0.57 ± 0.07
补肾组	639.00 ± 101.00	0.22 ± 0.01	0.42 ± 0.08	626.00 ± 187.00	0.37 ± 0.06	0.54 ± 0.06
F 值	8.300	2.010	16.590	10.980	0.620	43.950
P 值	0.000	0.140	0.000	0.000	0.650	0.000

4　讨　论

糖皮质激素可引起股骨头坏死已被临床和动物实验证实[6],激素性股骨头坏死的发生是多种病理因素协同作用的结果。糖皮质激素不但可引起血脂代谢紊乱导致骨髓内脂肪细胞堆积、压力增高、血液循环障碍而致成骨障碍,而且长期大剂量服用糖皮质激素可导致基因突变使血液处于高凝低纤溶状态,从而介导股骨头静脉内血栓形成,造成骨细胞缺血坏死,

导致骨组织结构和功能受损[7]。另一方面，大剂量应用糖皮质激素可使血液黏度增加，高黏度的血在股骨头内容易瘀滞，在局部形成微小血栓，导致微循环灌注量下降[8]。因此，寻求多途径改善股骨头血液循环障碍的措施，如降脂、抗凝及改善血液流变学状态等，是防治激素性股骨头坏死的重要方法。

现代研究认为血脂及血液流变学指标的异常与“痰瘀”密切相关，血清 CHOL、TG、LDL 及血黏度的升高，可作为痰瘀证的微观辨证依据[9]。我们前期根据非创伤性股骨头坏死“脾虚生痰，由痰致瘀，因瘀致痹”的病机特点[10]，采用健脾化痰、活血通络的方药防治激素性股骨头坏死取得了较好的疗效[3-4]。为了进一步明确相关作用机制，本实验将这一治法与补肾壮骨、活血通络治法进行了比较。

Pritchett[11]的研究显示，服用大剂量糖皮质激素的同时应用他汀类药物，骨坏死发生率仅为 1%，远低于单纯服用大剂量糖皮质激素的 3% ~20%。在本实验中我们发现洛伐他汀给药 8 周时便能降低激素性股骨头坏死模型动物的股骨头内空骨陷窝率、髓腔内脂肪细胞面积，在降低血清 CHOL、TG 的同时升高 HDL 含量，提示了他汀类降脂药可能通过降低血脂而起到防治股骨头坏死的作用。

本研究的结果显示，激素除能诱导股骨头坏死模型动物发生血脂代谢紊乱外，还导致血液高黏、高凝和低纤溶等病理状态，然而洛伐他汀对实验动物出现的血液高黏、高凝和低纤溶改变没有作用。健脾方无论是在降低激素性股骨头坏死动物股骨头内空骨陷窝率、髓腔内脂肪细胞面积，还是在调节血脂代谢紊乱、抗黏、抗凝和提高血管纤溶酶原激活物方面，均具有很好的作用，且在用药 8 周时就已观察到明显的药效，这可能与这一治法具有健脾化痰、活血通络的功效有关。方中桂枝、赤芍活血化瘀，通络止痛；法半夏、茯苓健脾化痰；党参、白术、茯苓补脾益气；当归、赤芍滋养心肝；加川芎入血分理气，补而不滞。现代药理研究也表明，川芎具有改善微循环、降低血液黏稠度的作用[12]；白术、当归、法半夏等可以明显改善微循环、降低血液黏稠度、纠正脂肪代谢紊乱状态，防止脂质在髓腔内堆积[13-14]。结合我们前期在动物实验[15-16]中所观察到的健脾方药在给药 8 周时能上调激素性股骨头坏死动物股骨头内血管内皮生长因子、骨形态发生蛋白 2、转化生长因子 β1、Smads4 及 Smads7 蛋白表达的现象，我们认为纠正脂代谢紊乱、促进血管再生和刺激成骨细胞活性可能是健脾方防治激素性股骨头坏死的部分分子机制。而补肾方虽也具有调节脂代谢紊乱、抗凝血和一定程度的抗黏作用，但发挥作用的时间较晚，在本实验中 16 周时才观察到，且对激素性股骨头坏死模型动物的纤溶功能没有影响。

本实验结果提示健脾和补肾两种不同的治法方药均具有一定程度的改善激素性股骨头坏死鸡血脂、血黏度及凝血功能的作用，但二者发挥作用的强度和时间不同，健脾法更具优势。

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