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硫酸氢氯吡格雷联合瑞舒伐他汀对冠心病患者心功能、凝血功能及血液流变学的影响*

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摘要 目的:探讨硫酸氢氯吡格雷联合瑞舒伐他汀对冠心病患者凝血功能、血液流变学的影响。方法:纳入我院 2018 年 2 月~2020 年 6 月期间收治的冠心病患者 100 例,根据信封抽签法分为对照组和观察组,各 50 例,对照组给予硫酸氢氯吡格雷联合阿托伐他汀治疗,观察组给予硫酸氢氯吡格雷联合瑞舒伐他汀治疗,疗程均为 2 个月。对比两组疗效、心功能、凝血功能、血液流变学、血脂,记录治疗期间两组不良反应发生情况。结果:观察组的临床总有效率高于对照组($P<0.05$)。两组不良反应发生率组间对比无差异($P>0.05$)。治疗 2 个月后,观察组左心室射血分数(LVEF)高于对照组,室壁运动评分指数(WMSI)低于对照组($P<0.05$)。治疗 2 个月后,观察组纤维蛋白原(FIB)低于对照组,活化的部分凝血酶时间(APTT)、凝血酶原时间(PT)高于对照组($P<0.05$)。治疗 2 个月后,观察组血小板聚集、全血黏度、血浆黏度低于对照组($P<0.05$)。治疗 2 个月后,观察组总胆固醇(TC)、甘油三酯(TG)、低密度脂蛋白胆固醇(LDL-C)水平低于对照组,高密度脂蛋白胆固醇(HDL-C)水平高于对照组($P<0.05$)。结论:硫酸氢氯吡格雷联合瑞舒伐他汀治疗冠心病患者,可有效改善患者凝血功能、血脂、心功能、血液流变学,安全有效。

关键词: 硫酸氢氯吡格雷;瑞舒伐他汀;冠心病;心功能;凝血功能;血液流变学;血脂

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Effects of Clopidogrel Bisulfate Combined with Rosuvastatin on Cardiac Function, Coagulation Function and Hemorheology in Patients with Coronary Heart Disease*

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ABSTRACT Objective: To investigate the effect of clopidogrel bisulfate combined with rosuvastatin on coagulation function and hemorheology in patients with coronary heart disease. **Methods:** 100 patients with coronary heart disease who were admitted to our hospital from February 2018 to June 2020 were selected, they were divided into control group and observation group according to envelope drawing method, 50 cases in each group. The control group was treated with clopidogrel bisulfate combined with atorvastatin, and the observation group was treated with rosuvastatin on the basis of the control group. The course of treatment was 2 months. The curative effect, cardiac function, coagulation function and hemorheology of the two groups were compared, and the incidence of adverse reactions during the treatment was recorded. **Results:** The total effective rate of the observation group was higher than that of the control group ($P<0.05$). There was no difference in the incidence of adverse reactions between the two groups ($P>0.05$). 2 months after treatment, the left ventricular ejection fraction (LVEF) of the observation group was higher than that of the control group, and the ventricular wall motion score index (WMSI) was lower than that of the control group ($P<0.05$). 2 months after treatment, fibrinogen (FIB) in the observation group was lower than that in the control group, and the activated partial thromboplastin time (APTT) and prothrombin time (PT) in the observation group were higher than those in the control group ($P<0.05$). 2 months after treatment, the levels of total cholesterol (TC), triglyceride (TG) and low density lipoprotein cholesterol (LDL-C) in the observation group were lower than those in the control group, and the level of high density lipoprotein cholesterol (HDL-C) in the observation group was higher than that in the control group ($P<0.05$). **Conclusion:** Clopidogrel bisulfate combined with rosuvastatin in the treatment of coronary heart disease patients, can effectively improve the coagulation function, cardiac function, hemorheology, safe and effective.

Key words: Clopidogrel bisulfate; Rosuvastatin; Coronary heart disease; Cardiac function; Coagulation function; Hemorheology; Blood lipid

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前言

冠心病是由多种因素共同作用引起的冠状动脉病变综合征,是发达国家成年人致残与死亡的主要原因之一^[1]。近年来,我国冠心病的发病率呈逐年升高的趋势,且发病年龄趋于年轻化,给我国居民的健康带来严重威胁^[2]。冠心病现今治疗的目的在于缓解症状、延缓冠状动脉粥样硬化进展、减少心绞痛发作等^[3,4]。血栓形成是造成冠心病发病的成因之一,而血小板聚集又在血栓形成中发挥重要作用^[5,6]。硫酸氢氯吡格雷属于并吡啶类药物,可稳定易损斑块,保护血管内皮^[7]。而瑞舒伐他汀为选择性 3- 羟基-3- 甲基戊二酰辅酶 A 还原酶抑制剂,可发挥抗动脉粥样硬化、抗炎、抗氧化的作用^[8,9]。本研究通过探讨瑞舒伐他汀联合硫酸氢氯吡格雷对冠心病患者心功能、凝血功能、血液流变学的影响,以期对冠心病临床治疗提供参考。

1 资料与方法

1.1 临床资料

纳入我院 2018 年 2 月~2020 年 6 月期间收治的 100 例冠心病患者。纳入标准:(1)符合冠心病的相关诊断标准^[10],经冠状动脉造影及心电图检查确诊;(2)临床资料完整且同意参加本研究;(3)心功能分级 II~IV 级;(4)认知功能良好,意识清醒;(5)近 1 个月内未进行过相关治疗。排除标准:(1)肺、肝、肾等脏器严重损害者;(2)对本研究所用药物过敏者;(3)合并血液系统病者;(4)急性心肌梗死、IV 级劳累性心绞痛、先天性心脏病者;(5)合并感染性疾病、免疫缺陷者。以上患者根据信封抽签法分为对照组 50 例和观察组 50 例,观察组女性 26 例,男性 24 例,年龄 47~77(62.91±5.28)岁;心功能分级:IV 级 6 例,III 级 21 例,II 级 23 例;病程 6~20(13.86±3.57)个月。对照组女性 28 例,男性 22 例,年龄 45~76(62.59±4.51)岁;心功能分级:IV 级 5 例,III 级 20 例,II 级 25 例;病程 5~18(13.29±2.31)个月。两组一般资料对比无差异($P>0.05$),均衡可比。本次研究经我院伦理学委员会批准进行。

1.2 方法

两组均给予抗血小板、抗缺血等基础治疗,随后对照组给予硫酸氢氯吡格雷[国药准字 H20056410,规格:75 mg,赛诺菲(杭州)制药有限公司]口服治疗,75 mg/次,1 次/d。阿托伐他汀钙片(福建东瑞制药有限公司,国药准字 H20193043,按 $C_{33}H_{35}FN_2O_5$ 计 10 mg),口服,20 mg/次,1 次/d。

观察组给予硫酸氢氯吡格雷联合瑞舒伐他汀(南京正大天晴制药有限公司,国药准字 H20080670,规格:10 mg)治疗,其中硫酸氢氯吡格雷治疗方案同对照组,瑞舒伐他汀口服,20

mg/次,1 次/d。两组均治疗 2 个月。

1.3 疗效判定标准

冠心病疗效判定标准参考《临床疾病诊断与疗效判断标准》^[10],分为治愈、好转和无效。治愈:症状消失,心力衰竭和心律失常得到抑制;好转:经治疗后心律失常得到缩小,心功能得到改善;无效:未能达到上述标准者。总有效率=治愈率+好转率。

1.4 观察指标

(1)采用美国 Diasonics 公司生产的彩色多普勒血流仪测定两组治疗前、治疗 2 个月后的心功能指标:左心室射血分数(LVEF)、室壁运动评分指数(WMSI)。其中 WMSI=室壁运动评分/节段数。检查时将左室壁分成 16 段,室壁运动评分为:形成室壁瘤为 5 分;矛盾运动为 4 分;向内运动消失为 3 分;运动减弱,即内膜移位 <5 mm 为 2 分;运动正常为 1 分。(2)于治疗前、治疗 2 个月后,采集 5 ml 外周静脉血,室温下静置 30 min,3100 r/min 离心 12 min,离心半径 10.5 cm,分离血清和血浆保存于冰箱中待测。采用 STA-R Evolution 全自动凝血分析仪(法国 STAGO 诊断技术有限公司生产)检测凝血酶原时间(PT)、活化的部分凝血酶时间(APTT)、纤维蛋白原(FIB)。采用 SA6000 血液流变仪(赛科西德公司生产)检测全血黏度、血小板聚集、血浆黏度。利用 TMS-1024 全自动生化分析仪(日本 Niigata 公司)测定血清总胆固醇(TC)、甘油三酯(TG)、低密度脂蛋白胆固醇(LDL-C)、高密度脂蛋白胆固醇(HDL-C)水平。(3)观察记录两组不良反应发生情况。

1.5 统计学处理

采用 SPSS21.0 软件行数据分析。计数资料用率(%)表示,行 χ^2 检验。计量资料用($\bar{x} \pm s$)表示,组内前后比较行配对 t 检验,组间比较行成组 t 检验。 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 两组临床疗效对比

治疗 2 个月后,对照组治愈 10 例,好转 21 例,无效 19 例,总有效率为 62.00%(31/50);观察组治愈 17 例,好转 25 例,无效 8 例,总有效率为 84.00%(42/50);观察组的临床总有效率高于对照组($\chi^2=6.353, P=0.012$)。

2.2 两组心功能指标对比

治疗前,两组 LVEF、WMSI 组间比较,差异无统计学意义($P>0.05$);治疗 2 个月后,两组 LVEF 升高,WMSI 降低($P<0.05$);治疗 2 个月后,观察组 WMSI 低于对照组,LVEF 高于对照组($P<0.05$),详见表 1。

表 1 两组心功能指标对比($\bar{x} \pm s$)
Table 1 Comparison of cardiac function indexes between the two groups($\bar{x} \pm s$)

Groups	LVEF(%)		WMSI	
	Before treatment	2 months after treatment	Before treatment	2 months after treatment
Control group(n=50)	44.89±7.65	47.49±6.95 [°]	1.76±0.24	1.38±0.26 [°]
Observation group(n=50)	44.96±5.57	51.01±7.83 [°]	1.72±0.25	1.04±0.19 [°]
t	0.063	4.962	0.846	7.466
P	0.942	0.001	0.416	0.000

Note: compared with before treatment, [°] $P<0.05$.

2.3 两组凝血功能指标对比

治疗 2 个月后,两组 FIB 降低,且观察组低于对照组($P<0.05$);治疗前,两组 PT、FIB、APTT 组间比较无明显差异($P>0.05$); PT、APTT 升高,且观察组高于对照组($P<0.05$),详见表 2。表 2 两组凝血功能指标对比($\bar{x} \pm s$)Table 2 Comparison of coagulation function indexes between the two groups($\bar{x} \pm s$)

Groups	PT(s)		FIB(g/L)		APTT(s)	
	Before treatment	2 months after treatment	Before treatment	2 months after treatment	Before treatment	2 months after treatment
Control group (n=50)	10.91± 2.24	12.78± 2.16 [°]	5.65± 0.38	3.91± 0.45 [°]	21.36± 3.35	25.19± 3.75 [°]
Observation group (n=50)	10.86± 2.31	15.39± 2.41 [°]	5.61± 0.43	2.75± 0.36 [°]	21.16± 4.39	28.67± 3.89 [°]
t	0.110	5.703	0.493	14.233	0.256	4.554
P	0.913	0.000	0.243	0.000	0.798	0.000

Note: compared with before treatment, [°] $P<0.05$.

2.4 两组血液流变学指标对比

明显差异($P>0.05$);治疗 2 个月后,两组血小板聚集、全血黏治疗前,两组血小板聚集、全血黏度、血浆黏度组间比较无 度、血浆黏度降低,且观察组低于对照组($P<0.05$),详见表 3。表 3 两组血液流变学指标对比($\bar{x} \pm s$)Table 3 Comparison of hemorheology indexes between the two groups($\bar{x} \pm s$)

Groups	Whole blood viscosity(mPa/s)		Platelet aggregation(%)		Plasma viscosity(mPa/s)	
	Before treatment	2 months after treatment	Before treatment	2 months after treatment	Before treatment	2 months after treatment
Control group (n=50)	7.37± 1.16	5.25± 0.99 [°]	73.23± 7.85	60.28± 8.46 [°]	1.81± 0.85	1.44± 0.67 [°]
Observation group (n=50)	7.29± 1.08	3.62± 0.83 [°]	73.29± 6.93	49.74± 7.51 [°]	1.79± 0.81	1.06± 0.59 [°]
t	0.357	8.922	0.041	6.588	0.120	3.010
P	0.722	0.000	0.968	0.000	0.904	0.003

Note: compared with before treatment, [°] $P<0.05$.

2.5 两组血脂指标对比

治疗前降低($P<0.05$),而 HDL-C 水平与治疗前升高($P<0.05$),治疗前,两组 TC、LDL-C、TG、HDL-C 水平比较无明显差异($P>0.05$);两组患者治疗 2 个月后 TG、TC、LDL-C 水平均较 观察组治疗 2 个月后 TG、TC、LDL-C 水平低于对照组, HDL-C 水平高于对照组($P<0.05$),详见表 4。表 4 两组血脂指标对比($\bar{x} \pm s$)Table 4 Comparison of blood lipid indexes between the two groups ($\bar{x} \pm s$)

Groups	TC(mmol/L)		TG(mmol/L)		LDL-C(mmol/L)		HDL-C(mmol/L)	
	Before treatment	2 months after treatment	Before treatment	2 months after treatment	Before treatment	2 months after treatment	Before treatment	2 months after treatment
Control group (n=50)	5.32± 0.61	3.56± 0.53 [°]	2.88± 0.42	2.11± 0.54 [°]	3.67± 0.45	2.18± 0.43 [°]	1.35± 0.29	1.62± 0.33 [°]
Observation group (n=50)	5.34± 0.59	2.11± 0.57 [°]	2.94± 0.53	1.35± 0.46 [°]	3.63± 0.58	1.23± 0.39 [°]	1.32± 0.31	1.94± 0.42 [°]
t	0.338	4.997	0.627	4.812	0.385	5.619	0.426	6.372
P	0.740	0.000	0.532	0.000	0.701	0.000	0.689	0.000

Note: compared with before treatment, [°] $P<0.05$.

2.6 两组不良反应发生率对比

不良反应发生率为 10.00%(5/50),包括胃肠道不适 2 例、恶心

治疗期间,对照组不良反应发生率为 6.00%(3/50),包括胃肠道不适 1 例、恶心呕吐 2 例,经停药处理后自行缓解。观察组 呕吐 3 例,经停药处理后自行缓解。两组不良反应发生率比较无明显差异($\chi^2=0.543$, $P=0.461$)。

3 讨论

目前临床上均认为冠心病的发病基础为冠脉内动脉粥样硬化斑块,当斑块破裂时,暴露血管下的内皮组织,导致血小板发生黏附和聚集,阻塞冠脉,引起心肌缺血性坏死,降低患者心功能^[11-13]。其中血栓形成的主要机制有血液流变学异常、血管内皮受损等^[14]。此外,也有研究证实^[15],凝血系统异常激活可以引起血栓的形成,引起冠心病。硫酸氢氯吡格雷可通过选择性的抑制二磷酸腺苷与血小板受体结合,从而起到阻止血小板生成及聚集的目的^[16,17]。但硫酸氢氯吡格雷仅可阻止和延缓已出现的冠状动脉粥样硬化斑块进展,无法从根本上进行改善,疗效具有局限性^[18]。瑞舒伐他汀是第三代他汀类药物,在所有他汀类药物中瑞舒伐他汀的终末半衰期最长,近年来在临床冠心病治疗中逐渐得到推广^[19,20]。然而国内外有关瑞舒伐他汀在改善心功能、血液流变学、凝血功能等方面的循证医学证据尚不多见,需进一步的相关研究以证实。

本次研究结果显示,硫酸氢氯吡格雷联合瑞舒伐他汀治疗冠心病的疗效较硫酸氢氯吡格雷联合阿托伐他汀治疗者的高,可有效促进患者心功能、血脂改善。近年来的研究表明^[21,22],瑞舒伐他汀可通过诱导巨噬细胞、单核细胞等进入血管壁,并通过抗炎、抗氧化等多种途径阻止和延缓冠状动脉粥样硬化斑块进展,稳定粥样斑块。联合硫酸氢氯吡格雷强效的抗血小板聚集作用,有效预防及抑制动脉粥样硬化斑块形成,进一步改善冠心病患者病情。他汀类药物调节血脂的机制主要为选择性地抑制单酰辅酶 A(HMG-CoA)还原酶活性,而瑞舒伐他汀具有亲油性低、肝选择性高等优点,与硫酸氢氯吡格雷协同使用可更为充分的发挥以上机制^[23]。相关研究表明^[24],血液流变学异常不仅可引起红细胞异常聚集,血液黏度增加,促进微血栓形成,同时还可损伤血管内皮细胞,促进动脉粥样硬化进展。本次研究中,两种治疗方案下的血液流变学指标均有所改善,硫酸氢氯吡格雷联合瑞舒伐他汀治疗者改善效果更佳。可能与瑞舒伐他汀可以通过竞争性抑制方式保障血管内皮细胞运转,避免血栓的形成,进而改善血液黏滞状态有关^[25]。以往研究还证实^[26],心血管疾病患者凝血系统往往发生一定程度的改变,表现为抗凝血活性和纤溶活性下降,凝血因子水平增加。其中 PT 是指在缺乏血小板的血浆中加入过量的组织因子后,凝血酶原转化为凝血酶,导致血浆凝固所需的时间,能反映患者凝血系统中组织因子质以及量的异常变化情况;APTT 是指在体外模拟体内内源性凝血的全部条件,测定血浆凝固所需的时间,能反映患者体内凝血酶原和 FIB 的缺乏状态;FIB 作为血凝块形成所必需的一种蛋白,能提示患者血液纤溶系统的激活^[27]。本研究中观察组的凝血功能指标改善效果更佳,表明硫酸氢氯吡格雷联合瑞舒伐他汀治疗有利于调节患者凝血系统状态的平衡。但有关其具体作用机制尚不清楚,有待进一步的基础实验验证。观察两组安全性可知,硫酸氢氯吡格雷联合瑞舒伐他汀治疗不会增加不良反应发生率,安全有效。值得注意的是,本研究尚存在纳入样本量偏少的局限,数据准确性仍有提升空间,在今后的研究中将通过开展多中心研究、扩大样本量加以验证。

综上所述,硫酸氢氯吡格雷联合瑞舒伐他汀治疗冠心病患者,可有效改善患者凝血功能、血脂、心功能、血液流变学,安全有效。

参考文献(References)

- [1] Wirtz PH, von Känel R. Psychological Stress, Inflammation, and Coronary Heart Disease[J]. *Curr Cardiol Rep*, 2017, 19(11): 111
- [2] 毕颖斐,王贤良,赵志强,等. 冠心病中医证候地域性特征的临床流行病学调查[J]. *中医杂志*, 2020, 61(5): 418-422
- [3] DiNicolantonio JJ, Lucan SC, O'Keefe JH. The Evidence for Saturated Fat and for Sugar Related to Coronary Heart Disease[J]. *Prog Cardiovasc Dis*, 2016, 58(5): 464-72
- [4] De Hert M, Detraux J, Vancampfort D. The intriguing relationship between coronary heart disease and mental disorders[J]. *Dialogues Clin Neurosci*, 2018, 20(1): 31-40
- [5] Satija A, Bhupathiraju SN, Spiegelman D, et al. Healthful and Unhealthful Plant-Based Diets and the Risk of Coronary Heart Disease in U.S. Adults[J]. *J Am Coll Cardiol*, 2017, 70(4): 411-422
- [6] Houston M. The role of noninvasive cardiovascular testing, applied clinical nutrition and nutritional supplements in the prevention and treatment of coronary heart disease [J]. *Ther Adv Cardiovasc Dis*, 2018, 12(3): 85-108
- [7] 周唯敏,万兵. 硫酸氢氯吡格雷对老年急性 ST 段抬高型心肌梗死急诊介入术后患者心功能、血管内皮功能和血脂的影响[J]. *中国老年学杂志*, 2020, 40(12): 2474-2477
- [8] Ma G, Bi S. Effect of rosuvastatin on vascular endothelial functions and inflammatory factors of patients with type 2 diabetes mellitus and coronary heart disease[J]. *Exp Ther Med*, 2019, 17(1): 332-336
- [9] 李平,何永铭,张源萍,等. 稳心颗粒与瑞舒伐他汀治疗老年冠心病的临床疗效及安全性 [J]. *现代生物医学进展*, 2017, 17(9): 1678-1681
- [10] 王蔚文. 临床疾病诊断与疗效判断标准[M]. 北京:科学技术文献出版社, 2010: 186-187
- [11] Roberts WC. Quantitative Extent of Atherosclerotic Plaque in the Major Epicardial Coronary Arteries in Patients with Fatal Coronary Heart Disease, in Coronary Endarterectomy Specimens, in Aorta-Coronary Saphenous Venous Conduits, and Means to Prevent the Plaques: A Review after Studying the Coronary Arteries for 50 Years [J]. *Am J Cardiol*, 2018, 121(11): 1413-1435
- [12] Ezhov M, Safarova M, Afanasieva O, et al. Matrix Metalloproteinase 9 as a Predictor of Coronary Atherosclerotic Plaque Instability in Stable Coronary Heart Disease Patients with Elevated Lipoprotein(a) Levels[J]. *Biomolecules*, 2019, 9(4): 129
- [13] Stewart RAH, Held C, Hadziosmanovic N, et al. Physical Activity and Mortality in Patients With Stable Coronary Heart Disease [J]. *J Am Coll Cardiol*, 2017, 70(14): 1689-1700
- [14] Li L, Qu C, Wu X, et al. Patterns and levels of platelet glycosylation in patients with coronary heart disease and type 2 diabetes mellitus[J]. *J Thromb Thrombolysis*, 2018, 45(1): 56-65
- [15] Zhu KF, Wang YM, Zhu JZ, et al. National prevalence of coronary heart disease and its relationship with human development index: A systematic review[J]. *Eur J Prev Cardiol*, 2016, 23(5): 530-543
- [16] Vranckx P, Valgimigli M, Juni P, et al. Ticagrelor plus aspirin for 1 month, followed by ticagrelor monotherapy for 23 months vs aspirin plus clopidogrel or ticagrelor for 12 months, followed by aspirin monotherapy for 12 months after implantation of a drug-eluting stent: a multicentre, open-label, randomised superiority trial [J]. *Lancet*, 2018, 392(10151): 940-949

- Ipsilateral Femoral Neck and Shaft Fractures: A New Imaging Protocol[J]. *J Bone Joint Surg Am*, 2020, 102(4): 309-314
- [15] Wu HH, Liu M, Challa ST, et al. Development of Squat-and-Smile Test as Proxy for Femoral Shaft Fracture-Healing in Patients in Dar es Salaam, Tanzania[J]. *J Bone Joint Surg Am*, 2019, 101(4): 353-359
- [16] Alam QS, Alam MT, Reza MS, et al. Evaluation of Outcome of Exchange Nailing with Autogenous Bone Graft for Treating Aseptic Nonunion of Femoral Shaft Fracture[J]. *Mymensingh Med J*, 2019, 28(2): 378-381
- [17] Tan L, Wang T, Li YH, et al. Patellar tendon ossification after retrograde intramedullary nailing for distal femoral shaft fracture: A case report and review of the literature[J]. *Medicine (Baltimore)*, 2017, 96(47): e8875
- [18] Jin YF, Xu HC, Shen ZH, et al. Comparing Augmentative Plating and Exchange Nailing for the Treatment of Nonunion of Femoral Shaft Fracture after Intramedullary Nailing: A Meta-analysis [J]. *Orthop Surg*, 2020, 12(1): 50-57
- [19] Koso RE, Terhoeve C, Steen RG, et al. Healing, nonunion, and re-operation after internal fixation of diaphyseal and distal femoral fractures: a systematic review and meta-analysis [J]. *Int Orthop*, 2018, 42(11): 2675-2683
- [20] Gautam VK, Ranade AS, Mone M, et al. A Novel Technique for the Removal of Elastic Intramedullary Nail in Pediatric Long Bones: A Technical Note[J]. *Cureus*, 2020, 12(8): e9717
- [21] Du M, Han J. Antegrade elastic stable intramedullary nail fixation for paediatric distal radius diaphyseal metaphyseal junction fractures: A new operative approach[J]. *Injury*, 2019, 50(2): 598-601
- [22] Li J, Ze R, Rai S, et al. Is elastic stable intramedullary nail a good choice for pathological fractures of the proximal femur due to simple bone cyst in pediatric population?[J]. *Medicine (Baltimore)*, 2020, 99(39): e22364
- [23] Corradi N, Caruso G, Martini I, et al. Rupture of an Intramedullary Elastic Bundle Nail Following Humeral Shaft Nonunion: A Case Report[J]. *J Long Term Eff Med Implants*, 2019, 29(1): 11-17
- [24] Wang W, Zheng X, Sun Z. Comparison of efficacy between internal fixation of minimally invasive elastic stable intramedullary nail and plate in the treatment of pediatric femoral shaft fracture[J]. *Pak J Med Sci*, 2019, 35(5): 1417-1421
- [25] Ramasubbu RA, Ramasubbu BM. Surgical stabilization for open tibial fractures in children: External fixation or elastic stable intramedullary nail - which method is optimal? [J]. *Indian J Orthop*, 2016, 50(5): 455-463
- [26] 姜海, 王磊, 李晓博, 等. 弹性髓内钉内固定治疗儿童股骨干骨折临床疗效观察[J]. *实用骨科杂志*, 2020, 26(3): 264-267
- [27] Li J, Rai S, Ze R, et al. The optimal choice for length unstable femoral shaft fracture in school-aged children: A comparative study of elastic stable intramedullary nail and submuscular plate[J]. *Medicine (Baltimore)*, 2020, 99(25): e20796
- [28] Griffin CM, Somerson JS. Elastic intramedullary nail treatment of adolescent perihardware radius and ulna refracture[J]. *BMJ Case Rep*, 2021, 14(1): e236098
- [29] Busch MT, Perkins CA, Nickel BT, et al. A Quartet of Elastic Stable Intramedullary Nails for More Challenging Pediatric Femur Fractures [J]. *J Pediatr Orthop*, 2019, 39(1): e12-e17
- [30] Frei B, Mayr J, de Bernardis G, et al. Elastic stabile intramedullary nailing (ESIN) of diaphyseal femur fractures in children and adolescents: A strobe-compliant study [J]. *Medicine (Baltimore)*, 2019, 98(14): e15085
- [31] Xu Y, Huang G, Niu C. Comparison of Elastic Intramedullary Nails and Locking Compression Plates on Oxidative Stress in Children with Distal Tibial Metaphyseal Fractures [J]. *J Coll Physicians Surg Pak*, 2019, 29(11): 1118-1120
- [32] 周岳来, 戴善和, 虞堂云, 等. 弹性髓内钉治疗儿童股骨干粉碎性骨折[J]. *实用骨科杂志*, 2014, 20(12): 1143-1144, 1145
- [33] 陈海龙, 周献伟, 郑九琴. 股骨干骨折锁定加压接骨板内固定失效3例原因分析[J]. *中国中医骨伤科杂志*, 2010, 18(4): 50-51
- (上接第 3514 页)
- [17] Zhang YJ, Li MP, Tang J, et al. Pharmacokinetic and Pharmacodynamic Responses to Clopidogrel: Evidences and Perspectives[J]. *Int J Environ Res Public Health*, 2017, 14(3): 301
- [18] Franchi F, Rollini F, Rivas Rios J, et al. Pharmacodynamic Effects of Switching From Ticagrelor to Clopidogrel in Patients With Coronary Artery Disease: Results of the SWAP-4 Study [J]. *Circulation*, 2018, 137(23): 2450-2462
- [19] Zhu J, Wu S, Hu S, et al. NLRP3 inflammasome expression in peripheral blood monocytes of coronary heart disease patients and its modulation by rosuvastatin[J]. *Mol Med Rep*, 2019, 20(2): 1826-1836
- [20] Yu P, Xiong T, Tenedero CB, et al. Rosuvastatin Reduces Aortic Sinus and Coronary Artery Atherosclerosis in SR-B1 (Scavenger Receptor Class B Type 1)/ApoE (Apolipoprotein E) Double Knockout Mice Independently of Plasma Cholesterol Lowering [J]. *Arterioscler Thromb Vasc Biol*, 2018, 38(1): 26-39
- [21] Perez-Calahorra S, Laclaustra M, Marco-Benedi V, et al. Comparative efficacy between atorvastatin and rosuvastatin in the prevention of cardiovascular disease recurrence [J]. *Lipids Health Dis*, 2019, 18(1): 216
- [22] Thondapu V, Kurihara O, Yonetsu T, et al. Comparison of Rosuvastatin Versus Atorvastatin for Coronary Plaque Stabilization [J]. *Am J Cardiol*, 2019, 123(10): 1565-1571
- [23] 张理科, 陈宇. 瑞舒伐他汀与阿托伐他汀治疗冠心病的疗效和安全性比较[J]. *中国药房*, 2016, 27(12): 1611-1613
- [24] 孙慧, 花继平. 美托洛尔联合心脉通胶囊对老年冠心病患者血脂、心功能及血液流变学的影响分析[J]. *中南医学科学杂志*, 2020, 48(1): 18-21
- [25] Liu D, Shen T, Ren C, et al. The effects of atorvastatin and rosuvastatin on exercise tolerance in patients with coronary heart disease[J]. *Expert Opin Drug Saf*, 2020, 19(9): 1203-1208
- [26] Lisyutenko NS, Morova NA, Tsekhanovich VN. Laboratory signs of activation of the hemostasis system in patients with coronary heart disease, who had coronary artery bypass surgery [J]. *Klin Lab Diagn*, 2018, 63(8): 500-505
- [27] Wu W, Liu R, Chen L, et al. Disequilibrium of Blood Coagulation and Fibrinolytic System in Patients With Coronary Artery Ectasia[J]. *Medicine (Baltimore)*, 2016, 95(8): e2779