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血浆 D-二聚体、纤维蛋白原水平与骨创伤患者创伤程度的相关性

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摘要 目的:分析骨创伤患者的血浆 D-二聚体、纤维蛋白原水平及其与创伤程度的相关性。**方法:**收集 2015 年 1 月至 2016 年 1 月我院收治的骨创伤患者 180 例作为观察组,选择同期接受体检的健康者 100 例作为对照组。动态监测两组受检者入院后第 1、3、6、10 d 的血浆 D-二聚(DD)和纤维蛋白原(FIB)的水平,并分析 DD 和 FIB 水平与骨创伤程度的相关性。**结果:**入院后第 1、3、6、10 d,观察组的 FIB 和 DD 水平均出现下降趋势,但均显著高于对照组,差异具有统计学意义($P<0.05$)。重度创伤组和中度创伤组患者的 FIB 水平显著高于轻度创伤组,且重度创伤组 FIB 水平显著高于中度创伤组,组间比较差异均具有统计学差异($P<0.05$)。从入院第 1 d 至 10 d,3 组患者的 FIB 水平均出现显著降低($P<0.05$)。轻度创伤组患者的 DD 水平最低,其次是中度创伤组,重度创伤组最高,组间比较差异均具有统计学差异($P<0.05$)。从入院第 1 d 至 10 d,3 组患者的 DD 水平均出现显著降低($P<0.05$)。此骨创伤患者创伤严重程度与 FIB 和 DD 的水平均呈现出显著正相关关系($r=0.64, P=0.003; r=0.71, P=0.002$)。**结论:**骨创伤患者的血浆 FIB 和 DD 水平显著高于健康人,与创伤程度呈显著正相关,可能作为骨创伤患者病情程度和预后评估的生物指标。

关键词:骨创伤;纤维蛋白原;血浆 D-二聚体;创伤程度

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Correlation of the Plasma D-dimer, Fibrinogen Levels with the Traumatic Degree of Patients with Orthopedic Trauma

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ABSTRACT Objective: To investigate the correlation of plasma D-dimer, fibrinogen levels with the traumatic degree of patients with orthopedic trauma. **Methods:** One hundred and eighty patients with orthopedic trauma in our hospital from January 2015 to January 2016 were selected as the observation group, and one hundred healthy people in the same period were chosen as the control group. The plasma D-dimer and fibrinogen levels from 1st to 10th day after admission were compared, and the correlation of plasma D-dimer (DD), fibrinogen (FIB) levels with the traumatic degree were analyzed. **Results:** The DD and FIB levels in observation group were obviously lowered, which were significantly higher than those of the control group ($P<0.05$). The DD and FIB levels in serious injury group and moderated injury group were much higher than those of the slight injury group, and those in serious injury group was the highest ($P<0.05$). And DD and FIB levels in the three groups had a remarkable decrease from 1st to 10th day ($P<0.05$). Additionally, plasma D-dimer and fibrinogen levels were significantly and positively correlated with the orthopedic traumatic degree ($r=0.64, P=0.003; r=0.71, P=0.002$). **Conclusion:** The levels of plasma DD and FIB in patients with orthopedic trauma were markedly higher than those of the healthy people, which were significantly and positively correlated with the orthopedic traumatic degree and could be served as a biomarker on assessment of traumatic degree and prognosis.

Key words: Orthopedic trauma; Fibrinogen levels; Plasma D-dimer; Traumatic degree

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前言

近年来,随着我国交通运输、建筑等行业的快速发展,骨创伤的发生率也随之上升^[1]。患者创伤后活动长期受限或需长时间卧床极易诱发血栓性疾病的发生,如深静脉血栓、弥散性血管内凝血以及肺栓塞等,严重时甚至导致死亡^[2]。血浆 D-二聚体(D-dimer, DD)作为纤溶酶降解交联纤维蛋白的特异性产物,

可有效指示肝脏疾病的受损程度,同时可作为判断骨创伤患者病情发展的重要生物标志物^[3,4]。纤维蛋白原(fibrinogen, FIB)是一种由肝脏合成的急性时相蛋白,具有较好的凝血功能,与骨创伤患者血栓形成及溶解关系密切^[5]。因此,DD 和 FIB 在骨创伤患者中的检测对于病情的判断有着重要的临床意义。本研究探讨了骨创伤患者纤维蛋白原、血浆 D-二聚体水平与创伤程度的相关性。现报道如下。

1 资料与方法

1.1 病例资料

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收集 2015 年 1 月至 2016 年 1 月攀钢集团总医院收治的骨创伤患者 180 例作为观察组,均为闭合性骨损伤,接受手术治疗,包括多发性骨折、上下肢骨折等,并排除合并有凝血功能障碍及既往静脉血栓史患者。其中,男性患者 100 例,女性患者 80 例,年龄 20~65 岁,平均(46.1±11.3)岁。根据损伤定级标准(AIS-ISS)^[6]将 180 例骨创伤患者分成轻度损伤组 63 例(AIS<2 或 ISS≤16)、中度创伤组 59 例(AIS=3 或 16<ISS<25)、重度创伤组 58 例(AIS>3 或 ISS≥25)。选择同期健康体检者 100 例作为对照组,男性患者 60 例,女性患者 40 例,年龄 20~67 岁,平均(46.8±11.7)岁。

1.2 检测方法

于患者入院后第 1、3、6、10 d 的晨间收集静脉血 3~5 mL,置入抗凝管,3000 r/min 离心 10 min,保存于 -80 ℃待测。采用日本 Sysmex 公司生产的 CA-7000 型全自动凝血仪以及相应

配套的试剂盒动态监测纤维蛋白原(FIB)和 D-二聚体(DD),同时对对照组受检者进行测定。

1.3 统计学分析

采用 SPSS18.0 统计学软件进行数据处理,计量资料用均数±标准差($\bar{x} \pm s$)表示,组间比较采用 t 检验,多组间比较采用单因素方差分析,相关性分析采用 Spearman 秩相关系数分析法,以 P<0.05 表示差异具有统计学意义。

2 结果

2.1 两组血浆 FIB 和 DD 水平比较

入院后第 1、3、6、10 d,观察组的 FIB 和 DD 水平均出现下降趋势,但均显著高于对照组,差异具有统计学意义(P<0.05)。详见表 1。

表 1 两组血浆 FIB 和 DD 水平比较($\bar{x} \pm s$)

Table 1 Comparison of the plasma FIB and DD levels between the two groups($\bar{x} \pm s$)

Indexes	Control group (n=100)	Observation group (n=180)			
		1 d	3 d	6 d	10 d
FIB (g/L)	2.56±0.34	3.92±0.48 [°]	3.61±0.43 [°]	3.36±0.38 [°]	3.02±0.35 [°]
DD (μg/L)	182.13±38.65	1503.24±287.41 [°]	1036.72±291.87 [°]	815.97±212.04 [°]	603.57±167.92 [°]

Note: Compared with that in control group, [°] P<0.05.

2.2 不同创伤程度患者的 FIB 水平比较

重度创伤组和中度创伤组患者的 FIB 水平显著高于轻度创伤组,且重度创伤组显著高于中度创伤组,组间比较差异均

具有统计学意义(P<0.05)。从入院第 1 d 至 10 d,3 组患者的 FIB 水平均出现显著降低(P<0.05)。见表 2。

表 2 不同创伤程度患者的血浆 FIB 水平比较($\bar{x} \pm s$)

Table 2 Comparison of the plasma FIB levels in Patients with different degree of bone trauma($\bar{x} \pm s$)

Indexes	n	FIB (g/L)			
		1 d	3 d	6 d	10 d
Slight injury group	63	3.42±0.46	3.21±0.33	3.04±0.28	2.86±0.25
Moderate injury group	59	3.87±0.43 [°]	3.62±0.40 [°]	3.37±0.41 [°]	3.10±0.32 [°]
Serious injury group	58	4.41±0.52 [°]	4.11±0.51 [°]	3.72±0.44 [°]	3.48±0.39 [°]

Note: Compared with slight injury group, [°] P<0.05; Compared with moderate injury group, [°] P<0.05

2.3 不同创伤程度患者的 DD 水平比较

轻度创伤组患者的 DD 水平最低,其次是中度创伤组,重度创伤组最高,组间比较差异均具有统计学意义(P<0.05)。随着

入院时间的推移,3 组患者的 DD 水平均出现显著降低(P<0.05)。见表 3。

表 3 不同创伤程度患者的血浆 DD 水平比较($\bar{x} \pm s$)

Table 3 Comparison of the plasma DD levels in Patients with different degree of bone trauma ($\bar{x} \pm s$)

Indexes	n	DD (μg/L)			
		1 d	3 d	6 d	10 d
Slight injury group	63	712.26±182.41	623.45±170.82	493.55±142.18	476.39±138.07
Moderate injury group	59	1520.32±262.12 [°]	1003.52±251.84 [°]	728.68±180.96 [°]	593.82±155.43 [°]
Serious injury group	58	2136.07±304.67 [°]	1489.30±286.34 [°]	1088.95±266.73 [°]	892.71±192.51 [°]

Note: Compared with slight injury group, [°] P<0.05; Compared with moderate injury group, [°] P<0.05.

2.4 血浆 FIB 和 DD 水平与骨创伤程度的相关性

相关性分析结果显示,骨创伤患者创伤严重程度与 FIB 和 DD 的水平均呈现显著正相关关系(r=0.64, P=0.003; r=0.71, P=0.002)。

3 讨论

骨创伤患者在受到应激原刺激后机体会发生应激反应,而引起各项生理功能发生变化,带来一系列并发症^[7]。骨创伤

后,患者的血管内膜受到损害,内膜下的组织暴露,组织凝血活酶释放,从而促进了血小板的黏附作用,并促使血浆中的凝血系统被激活,最终引起血液的高凝状态^[8]。此外,骨折患者往往需要长时间活动限制或长期卧床,极易造成静脉血液回流缓慢,甚至出现淤积,而导致深静脉血栓、弥散性血管内凝血以及肺栓塞等静脉血栓性疾病的发生^[9]。当发生严重创伤时,高凝状态的继发纤维蛋白溶解系统被迅速激活,促使纤溶酶原转变为纤溶酶,从而加速了纤维蛋白的降解,严重时可能导致凝血系统紊乱^[10]。DD 是血液凝固过程中纤溶酶降解交联纤维蛋白时所产生的特异性产物,可有效指示高凝状态血液的黏度^[11]。DD 在健康人群中的水平较低,而当机体受到创伤后,其含量会大大增加^[12]。FIB 是在肝脏中合成的一种具有凝血功能的蛋白质,参与血液凝固的关键过程,可促使血小板黏附和聚集而达到一期止血作用,而在二期止血过程中可被凝血酶转变成纤维蛋白单体,最终变成纤维蛋白凝块^[13]。因此,DD 和 FIB 的检测将对骨创伤患者病情程度的评估和预后具有重要的临床意义。

本研究结果显示入院后第 1、3、6、10 d, 观察组的 FIB 和 DD 水平均出现下降趋势,但均显著高于对照组,指示骨创伤患者的血浆 FIB 和 DD 水平明显高于健康人群,可能具有较高的静脉血栓性疾病的发病风险,但随着患者病情的恢复,会出现逐步降低,该结果与多篇文献报道一致^[14-16],并可能解释为在机体受到损伤后,肝脏受到暴露的组织因子刺激后会增加 FIB 的分泌,而分泌的 FIB 会被凝血酶催化为纤维蛋白单体,而随即形成的纤维蛋白凝块被纤溶酶水解产生 DD,从而引起 FIB 和 DD 水平的上升^[17,18]。此外,本研究根据 AIS-ISS 评分将 180 例骨创伤患者分为轻度、中度及重度创伤组。通过动态监测不同程度骨创伤患者的 DD 和 FIB 水平和 Pearson 相关性分析结果显示,当损伤程度增加时,患者的血浆 DD 和 FIB 水平也随机出现大幅度增加,骨创伤患者创伤严重程度与 FIB 和 DD 的水平均呈现出显著正相关关系($r=0.64, P=0.003; r=0.71, P=0.002$)。该结果可能是由于愈加严重的骨创伤也可造成血管内皮的直接和间接性损伤加大,而促使内皮下组织暴露剧烈,组织因子的大量释放,而促使凝血反应的加剧^[19]。同时,重度骨损伤患者极易出现休克症状,而引起溶酶体酶的分泌量增加而增加了血管内皮的损害^[20]。因此,临床上对于不同骨损伤患者的治疗方案也应有所区分,对症治疗。

综上所述,骨创伤患者的 FIB 和 DD 水平明显高于健康人群,且随着病情的康复呈现出降低趋势。此外,FIB 和 DD 水平与骨创伤患者在病情程度呈显著正相关关系,可能作为骨创伤患者病情程度和预后评估的参考指标。

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