

# 畚药活血通经方外敷在旋后外旋型Ⅲ度、Ⅳ度踝关节骨折术后治疗中的应用及作用机制研究

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**摘要 目的:**探讨畚药活血通经方外敷在旋后外旋型Ⅲ度、Ⅳ度踝关节骨折术后治疗中的应用价值,并探讨其作用机制。**方法:**将 80 例行切开复位钢板内固定术的旋后外旋型Ⅲ度、Ⅳ度踝关节骨折患者随机分为 2 组,每组 40 例。常规治疗组术后用支具固定并抬高患肢,给予常规抗感染治疗;术后第 1 天在手术切口周围持续冰敷,每天 4 次,每次 1 h;并于术后第 1 天开始足趾屈伸功能锻炼及踝关节功能锻炼,每次 15 min,每天 4 次,共 4 周。畚药外敷组在常规治疗的基础上于术后第 1 天开始采用畚药活血通经方外敷患处,每日换药 1 次,共 4 周。分别于术后第 1 天、第 7 天和第 14 天记录并比较 2 组患者的足踝部疼痛视觉模拟量表 (visual analogue scale, VAS) 评分和足踝部周径,分别于术后第 1 天、第 90 天和第 180 天记录并比较 2 组患者的美国足与踝关节协会 (American Orthopaedic Foot and Ankle Society, AOFAS) 踝与后足功能评分,并分别于术后第 1 天、第 7 天和第 14 天记录并比较 2 组患者的白细胞介素 (interleukin, IL) -6、IL-10 的血清含量。**结果:**①足踝部疼痛 VAS 评分。时间因素和分组因素存在交互效应 ( $F=1.430, P=0.000$ ); 2 组患者足踝部疼痛 VAS 评分总体比较,组间差异有统计学意义,即存在分组效应 ( $F=2.144, P=0.033$ ); 术后不同时间点足踝部疼痛 VAS 评分的差异有统计学意义,即存在时间效应 ( $F=215.900, P=0.000$ ); 2 组患者术后的足踝部疼痛 VAS 评分均呈降低趋势[畚药外敷组:  $(7.53 \pm 1.58)$  分,  $(4.78 \pm 1.17)$  分,  $(2.70 \pm 1.24)$  分,  $F=129.700, P=0.000$ ; 常规治疗组:  $(7.45 \pm 1.55)$  分,  $(5.65 \pm 0.89)$  分,  $(3.70 \pm 0.91)$  分,  $F=104.600, P=0.000$ ], 但 2 组的变化趋势不完全一致; 术后第 1 天 2 组患者足踝部疼痛 VAS 评分的差异无统计学意义 ( $t=0.214, P=0.831$ ); 术后第 7 天、第 14 天畚药外敷组足踝部疼痛 VAS 评分均低于常规治疗组 ( $t=3.769, P=0.000$ ;  $t=4.100, P=0.000$ )。②足踝部周径。时间因素和分组因素存在交互效应 ( $F=107.200, P=0.000$ ); 2 组患者足踝部周径总体比较,组间差异有统计学意义,即存在分组效应 ( $F=3.105, P=0.002$ ); 术后不同时间点足踝部周径的差异有统计学意义,即存在时间效应 ( $F=1.496, P=0.029$ ); 2 组患者术后的足踝部周径均呈降低趋势[畚药外敷组:  $(28.39 \pm 0.83)$  cm,  $(27.07 \pm 0.81)$  cm,  $(25.78 \pm 0.57)$  cm,  $F=108.800, P=0.000$ ; 常规治疗组:  $(28.31 \pm 0.85)$  cm,  $(27.53 \pm 0.90)$  cm,  $(26.84 \pm 0.91)$  cm,  $F=27.520, P=0.000$ ], 但 2 组的变化趋势不完全一致; 术后第 1 天 2 组患者足踝部周径的差异无统计学意义 ( $t=0.439, P=0.662$ ); 术后第 7 天、第 14 天畚药外敷组足踝部周径均小于常规治疗组 ( $t=2.368, P=0.020$ ;  $t=6.240, P=0.000$ )。③AOFAS 踝与后足功能评分。时间因素和分组因素存在交互效应 ( $F=1.430, P=0.000$ ); 2 组患者 AOFAS 踝与后足功能评分总体比较,组间差异有统计学意义,即存在分组效应 ( $F=4.913, P=0.000$ ); 术后不同时间点 AOFAS 踝与后足功能评分的差异有统计学意义,即存在时间效应 ( $F=1.668, P=0.000$ ); 2 组患者术后的 AOFAS 踝与后足功能评分均呈上升趋势[畚药外敷组:  $(34.50 \pm 3.24)$  分,  $(80.83 \pm 3.61)$  分,  $(85.78 \pm 3.53)$  分,  $F=2669.000, P=0.000$ ; 常规治疗组:  $(34.48 \pm 3.14)$  分,  $(74.13 \pm 4.33)$  分,  $(83.88 \pm 4.31)$  分,  $F=1741.000, P=0.000$ ], 但 2 组的变化趋势不完全一致; 术后第 1 天 2 组患者 AOFAS 踝与后足功能评分的差异无统计学意义 ( $t=0.035, P=0.972$ ); 术后第 90 天、第 180 天畚药外敷组 AOFAS 踝与后足功能评分均高于常规治疗组 ( $t=7.514, P=0.000$ ;  $t=4.100, P=0.034$ )。④IL-10 血清含量。时间因素和分组因素存在交互效应 ( $F=1.373, P=0.006$ ); 2 组患者 IL-10 血清含量总体比较,组间差异有统计学意义,即存在分组效应 ( $F=3.092, P=0.003$ ); 术后不同时间点 IL-10 血清含量的差异有统计学意义,即存在时间效应 ( $F=22.080, P=0.000$ ); 2 组患者术后的 IL-10 血清含量均呈下降趋势[畚药外敷组:  $(73.07 \pm 17.65)$  pg · mL<sup>-1</sup>,  $(54.60 \pm 7.43)$  pg · mL<sup>-1</sup>,  $(46.68 \pm 4.92)$  pg · mL<sup>-1</sup>,  $F=18.310, P=0.000$ ; 常规治疗组:  $(74.25 \pm 13.41)$  pg · mL<sup>-1</sup>,  $(64.31 \pm 13.08)$  pg · mL<sup>-1</sup>,  $(55.16 \pm 11.79)$  pg · mL<sup>-1</sup>,  $F=7.260, P=0.002$ ], 但 2 组的变化趋势不完全一致; 术后第 1 天 2 组患者 IL-10 血清含量的差异无统计学意义 ( $t=0.192, P=0.849$ ); 术后第 7 天、第 14 天畚药外敷组 IL-10 血清含量均低于常规治疗组 ( $t=2.328, P=0.029$ ;  $t=2.395, P=0.025$ )。⑤IL-6 血清含量。时间因素和分组因素存在交互效应 ( $F=1.207, P=0.005$ ); 2 组患者 IL-6 血清含量总体比较,组间差异有统计学意义,即存在分组效应 ( $F=2.797, P=$

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0.007); 术后不同时间点 IL-6 血清含量的差异有统计学意义, 即存在时间效应 ( $F = 18.680, P = 0.000$ ); 2 组患者术后的 IL-6 血清含量均呈下降趋势[ 畚药外敷组:  $(13.05 \pm 3.50) \text{ pg} \cdot \text{mL}^{-1}$ ,  $(10.04 \pm 2.24) \text{ pg} \cdot \text{mL}^{-1}$ ,  $(8.25 \pm 1.91) \text{ pg} \cdot \text{mL}^{-1}$ ,  $F = 10.960$ ,  $P = 0.000$ ; 常规治疗组:  $(13.83 \pm 2.62) \text{ pg} \cdot \text{mL}^{-1}$ ,  $(11.90 \pm 2.23) \text{ pg} \cdot \text{mL}^{-1}$ ,  $(9.96 \pm 2.15) \text{ pg} \cdot \text{mL}^{-1}$ ,  $F = 8.898$ ,  $P = 0.001$  ], 但 2 组的变化趋势不完全一致; 术后第 1 天患者 IL-6 血清含量的差异无统计学意义 ( $t = 0.644, P = 0.526$ ); 术后第 7 天、第 14 天畚药外敷组 IL-6 血清含量均低于常规治疗组 ( $t = 2.124, P = 0.044$ ;  $t = 2.138, P = 0.043$ )。结论: 对于旋后外旋型 III 度、IV 度踝关节骨折患者, 术后应用畚药活血通经方外敷治疗, 与单纯常规治疗相比, 能更好地缓解足踝部疼痛, 减轻足踝部肿胀, 促进踝关节功能的恢复; 其作用机制可能是通过降低 IL-10 和 IL-6 血清含量, 从而减轻了炎症反应。

**关键词** 踝关节; 骨折; 中药外敷; 白细胞介素-6; 白细胞介素-10; 临床试验

### A clinical study of external application of Huoxue Tongjing Fang(活血通经方) to postoperative treatment of supination – extorsion – type grade III and IV ankle fractures and its mechanism of action

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**ABSTRACT** **Objective:** To explore the applied values of external application of Huoxue Tongjing Fang(活血通经方, HXTJF) to postoperative treatment of supination – extorsion – type grade III and IV ankle fractures and to explore its mechanism of action. **Methods:** Eighty patients who received open reduction and plate internal fixation for treatment of supination – extorsion – type grade III and IV ankle fractures were selected and randomly divided into conventional therapy group and HXTJF external application group, 40 cases in each group. All patients in the 2 groups were treated with orthosis fixation, raising the injured limbs and anti-infection after the surgery, and the continuous ice compress was performed around the surgical incision on the postoperative day 1, four times a day, 1 hour at a time. Meanwhile, all patients were instructed to perform toes flexion and extension functional exercises and ankle functional exercises since the postoperative day 1, four times a day, 15 minutes at a time for consecutive 4 weeks. Moreover, the patients in HXTJF external application group were treated with external application of HXTJF at the fractured parts since the postoperative day 1, and the dressings change were performed once a day for 4 weeks. The ankle pain visual analogue scale(VAS) scores, ankle circumferences and the serum contents of interleukin(IL) – 6 and IL – 10 were recorded and compared between the 2 groups on postoperative day 1, 7 and 14 respectively. The American Orthopaedic Foot and Ankle Society(AOFAS) ankle – hindfoot function scores were recorded and compared between the 2 groups on postoperative day 1, 90 and 180 respectively. **Results:** There was interaction between time factor and group factor in ankle pain VAS scores ( $F = 1.430, P = 0.000$ ). There was statistical difference in ankle pain VAS scores between the 2 groups in general, in other words, there was group effect ( $F = 2.144, P = 0.033$ ). There was statistical difference in ankle pain VAS scores between different timepoints after the surgery, in other words, there was time effect ( $F = 215.900, P = 0.000$ ). The postoperative ankle pain VAS scores presented a time – dependent decreasing trend in the 2 groups(HXTJF external application group:  $7.53 \pm 1.58, 4.78 \pm 1.17, 2.70 \pm 1.24$  points,  $F = 129.700, P = 0.000$ ; conventional therapy group:  $7.45 \pm 1.55, 5.65 \pm 0.89, 3.70 \pm 0.91$  points,  $F = 104.600, P = 0.000$ ), while the 2 groups were inconsistent with each other in the variation tendency. There was no statistical difference in ankle pain VAS scores between the 2 groups on postoperative day 1 ( $t = 0.214, P = 0.831$ ). The ankle pain VAS scores were lower in HXTJF external application group compared to conventional therapy group on postoperative day 7 and 14 ( $t = 3.769, P = 0.000$ ;  $t = 4.100, P = 0.000$ ). There was interaction between time factor and group factor in ankle circumferences ( $F = 107.200, P = 0.000$ ). There was statistical difference in ankle circumferences between the 2 groups in general, in other words, there was group effect ( $F = 3.105, P = 0.002$ ). There was statistical difference in ankle circumferences between different timepoints after the surgery, in other words, there was time effect ( $F = 1.496, P = 0.029$ ). The postoperative ankle circumferences presented a time – dependent decreasing trend in the 2 groups(HXTJF external application group:  $28.39 \pm 0.83, 27.07 \pm 0.81, 25.78 \pm 0.57$  cm,  $F = 108.800, P = 0.000$ ; conventional therapy group:  $28.31 \pm 0.85, 27.53 \pm 0.90, 26.84 \pm 0.91$  cm,  $F = 27.520, P = 0.000$ ), while the 2 groups were inconsistent with each other in the variation tendency. There was no statistical difference in ankle circumferences between the 2 groups on postoperative day 1 ( $t = 0.439, P = 0.662$ ). The ankle circumferences were smaller in HXTJF external ap-

plication group compared to conventional therapy group on postoperative day 7 and 14 ( $t = 2.368, P = 0.020; t = 6.240, P = 0.000$ ). There was interaction between time factor and group factor in AOFAS ankle – hindfoot function scores ( $F = 1.430, P = 0.000$ ). There was statistical difference in AOFAS ankle – hindfoot function scores between the 2 groups in general, in other words, there was group effect ( $F = 4.913, P = 0.000$ ). There was statistical difference in AOFAS ankle – hindfoot function scores between different timepoints after the surgery, in other words, there was time effect ( $F = 1.668, P = 0.000$ ). The postoperative AOFAS ankle – hindfoot function scores presented a time – dependent increasing trend in the 2 groups (HXTJF external application group:  $34.50 \pm 3.24, 80.83 \pm 3.61, 85.78 \pm 3.53$  points,  $F = 2.669, P = 0.000$ ; conventional therapy group:  $34.48 \pm 3.14, 74.13 \pm 4.33, 83.88 \pm 4.31$  points,  $F = 1.741, P = 0.000$ ), while the 2 groups were inconsistent with each other in the variation tendency. There was no statistical difference in AOFAS ankle – hindfoot function scores between the 2 groups on postoperative day 1 ( $t = 0.035, P = 0.972$ ). The AOFAS ankle – hindfoot function scores were higher in HXTJF external application group compared to conventional therapy group on postoperative day 90 and 180 ( $t = 7.514, P = 0.000; t = 4.100, P = 0.034$ ). There was interaction between time factor and group factor in serum content of IL – 10 ( $F = 1.373, P = 0.006$ ). There was statistical difference in serum content of IL – 10 between the 2 groups in general, in other words, there was group effect ( $F = 3.092, P = 0.003$ ). There was statistical difference in serum content of IL – 10 between different timepoints after the surgery, in other words, there was time effect ( $F = 22.080, P = 0.000$ ). The postoperative serum content of IL – 10 presented a time – dependent decreasing trend in the 2 groups (HXTJF external application group:  $73.07 \pm 17.65, 54.60 \pm 7.43, 46.68 \pm 4.92$  pg/mL,  $F = 18.310, P = 0.000$ ; conventional therapy group:  $74.25 \pm 13.41, 64.31 \pm 13.08, 55.16 \pm 11.79$  pg/mL,  $F = 7.260, P = 0.002$ ), while the 2 groups were inconsistent with each other in the variation tendency. There was no statistical difference in serum content of IL – 10 between the 2 groups on postoperative day 1 ( $t = 0.192, P = 0.849$ ). The serum content of IL – 10 was lower in HXTJF external application group compared to conventional therapy group on postoperative day 7 and 14 ( $t = 2.328, P = 0.029; t = 2.395, P = 0.025$ ). There was interaction between time factor and group factor in serum content of IL – 6 ( $F = 1.207, P = 0.005$ ). There was statistical difference in serum content of IL – 6 between the 2 groups in general, in other words, there was group effect ( $F = 2.797, P = 0.007$ ). There was statistical difference in serum content of IL – 6 between different timepoints after the surgery, in other words, there was time effect ( $F = 18.680, P = 0.000$ ). The postoperative serum content of IL – 6 presented a time – dependent decreasing trend in the 2 groups (HXTJF external application group:  $13.05 \pm 3.50, 10.04 \pm 2.24, 8.25 \pm 1.91$  pg/mL,  $F = 10.960, P = 0.000$ ; conventional therapy group:  $13.83 \pm 2.62, 11.90 \pm 2.23, 9.96 \pm 2.15$  pg/mL,  $F = 8.898, P = 0.001$ ), while the 2 groups were inconsistent with each other in the variation tendency. There was no statistical difference in serum content of IL – 6 between the 2 groups on postoperative day 1 ( $t = 0.644, P = 0.526$ ). The serum content of IL – 6 was lower in HXTJF external application group compared to conventional therapy group on postoperative day 7 and 14 ( $t = 2.124, P = 0.044; t = 2.138, P = 0.043$ ). **Conclusion:** External application of HXTJF can better relieve ankle pain, alleviate ankle swelling and promote ankle function recovery compared to conventional therapy in postoperative treatment of supination – extorsion – type grade III and IV ankle fractures, and its mechanisms of action may be that it can reduce the inflammatory reaction through reducing the serum contents of IL – 10 and IL – 6.

**Keywords** ankle joint; fractures, bone; external applications (TCD); interleukin – 6; interleukin – 10; clinical trial

踝关节骨折是骨科常见病,多由暴力损伤所致<sup>[1-3]</sup>。临床上多采用手术治疗,但治疗不当容易引起踝关节慢性疼痛及创伤性关节炎。而对于 Lauge – Hansen 分型<sup>[4]</sup>中的旋后外旋 III 度、IV 度踝关节骨折,因其损伤机制复杂,治疗更为棘手。此类骨折手术后,因踝部置入较多的内固定物,加上手术治疗的二次损伤,足踝部疼痛和肿胀较为明显,甚至难以一期缝合手术切口,易出现皮肤坏死、感染、内固定物外露等并发症,从而影响踝关节功能恢复<sup>[5-6]</sup>。可见,正确及时地处理踝关节骨折术后足踝部疼痛和肿胀,对手术预后尤为重要。目前临床上踝关节骨折术后常给予患肢支具制动、抬高患肢、切口周围持续冰敷、足

趾屈伸功能锻炼等常规处理;但是,术后出现并发症的概率仍较高,远期踝关节功能恢复也欠佳。2015 年 1 月至 2019 年 12 月,我们对行切开复位钢板内固定术的旋后外旋型 III 度、IV 度踝关节骨折患者,分别于术后给予雷药活血通经方外敷联合常规治疗与单纯常规治疗,对其疗效进行了比较,同时为探讨作用机制,测定了患者血清中的白细胞介素 (interleukin, IL) – 6、IL – 10 含量,现报告如下。

## 1 临床资料

**1.1 一般资料** 选择因踝关节骨折在浙江省丽水市人民医院接受手术治疗的患者为研究对象。试验方案经医院医学伦理委员会审查通过。

**1.2 纳入标准** ①符合《实用骨科学》中踝关节骨折的诊断标准<sup>[7]</sup>;②年龄 18~65 岁;③均为 Lauge-Hansen 分型中旋后外旋型Ⅲ度、Ⅳ度踝关节骨折;④单侧新鲜闭合性骨折;⑤行切开复位钢板内固定术;⑥对研究方案知情同意并签署知情同意书。

**1.3 排除标准** ①合并 Pilon 骨折者;②对本研究所用药物过敏者;③合并较严重的心脑血管系统疾病者;④妊娠或哺乳期妇女;⑤精神病患者。

**1.4 退出标准** ①治疗依从性差者;②对中药发生过敏反应或出现严重不良反应者;③主动退出试验者;④失访者。

## 2 方 法

**2.1 分组方法** 采用随机数字表将符合要求的 80 例行切开复位钢板内固定术的踝关节骨折患者随机分为常规治疗组和畚药外敷组。

### 2.2 治疗方法

**2.2.1 常规治疗组** 术后用支具固定并抬高患肢,给予常规抗感染治疗;术后第 1 天在手术切口周围持续冰敷,每天 4 次,每次 1 h;并于术后第 1 天开始足趾屈伸功能锻炼及踝关节功能锻炼,注意踝关节背伸、跖屈、内收、外展均至最大程度(以患者感到疼痛或有抵抗感为止),并在此位置维持 1 min,每次锻炼 15 min,每天 4 次,共 4 周。

**2.2.2 畚药外敷组** 畚药外敷组在常规治疗组的基础上,于术后第 1 天开始采用畚药活血通经方外敷患处。其药物组成:枫藤 15 g,茎穗木 15 g,九节茶 12 g,凌霄花根 9 g,龙泉矮茶 12 g,血藤 10 g,雷毒柴 9 g,五加皮 12 g,牛尾菜根 15 g,石菖蒲 9 g,条叶榕 9 g。将上述药物用冷水浸泡 1 h 后,煎煮 1 h,过滤,将药渣再用冷水煎煮 45 min,过滤。最后将 2 次药液合并浓缩,调整含量至规定标准(含乙醇 15%~20%,防腐作用),贮存于密闭容器中待用。将制作好的药膏外敷于手术切口近端皮肤周围,避免浸湿手术切口周围敷料,持续外敷 6 h 后,用生理盐水清洁局部皮肤。每日换药 1 次,共治疗 4 周。

**2.3 疗效及炎症指标对比方法** 分别于术后第 1 天、第 7 天和第 14 天记录并比较 2 组患者的足踝部疼痛视觉模拟量表(visual analogue scale, VAS)评分和足踝部周径(足踝部周径即每日上午 8 时用皮尺经过内、外踝和跟骨结节绕足踝部 1 周所测的长度),分别于术后第 1 天、第 90 天和第 180 天记录并比较 2 组

患者的美国足与踝关节协会(American Orthopaedic Foot and Ankle Society, AOFAS)踝与后足功能评分<sup>[8]</sup>,并分别于术后第 1 天、第 7 天和第 14 天记录并比较 2 组患者的 IL-6、IL-10 的血清含量。

**2.4 数据统计方法** 采用 SPSS17.0 统计软件对所得数据进行统计学分析,2 组患者性别、踝关节骨折分型的组间比较采用  $\chi^2$  检验,年龄、受伤至就诊时间的组间比较采用  $t$  检验,足踝部疼痛 VAS 评分、足踝部周径、AOFAS 踝与后足功能评分以及 IL-6、IL-10 血清含量的比较均采用重复测量资料的方差分析。检验水准  $\alpha=0.05$ 。

## 3 结 果

**3.1 分组结果** 2 组患者基线资料的比较,差异无统计学意义,有可比性(表 1)。

**3.2 足踝部疼痛 VAS 评分** 时间因素和分组因素存在交互效应;2 组患者足踝部疼痛 VAS 评分总体比较,组间差异有统计学意义,即存在分组效应;术后不同时间点足踝部疼痛 VAS 评分的差异有统计学意义,即存在时间效应;2 组患者术后的足踝部疼痛 VAS 评分均呈降低趋势,但 2 组的变化趋势不完全一致;术后第 1 天 2 组患者足踝部疼痛 VAS 评分的差异无统计学意义;术后第 7 天、第 14 天畚药外敷组足踝部疼痛 VAS 评分均低于常规治疗组(表 2)。

**3.3 足踝部周径** 时间因素和分组因素存在交互效应;2 组患者足踝部周径总体比较,组间差异有统计学意义,即存在分组效应;术后不同时间点足踝部周径的差异有统计学意义,即存在时间效应;2 组患者术后的足踝部周径均呈降低趋势,但 2 组的变化趋势不完全一致;术后第 1 天 2 组患者足踝部周径的差异无统计学意义;术后第 7 天、第 14 天畚药外敷组足踝部周径均小于常规治疗组(表 3)。

**3.4 AOFAS 踝与后足功能评分** 时间因素和分组因素存在交互效应;2 组患者 AOFAS 踝与后足功能评分总体比较,组间差异有统计学意义,即存在分组效应;术后不同时间点 AOFAS 踝与后足功能评分的差异有统计学意义,即存在时间效应;2 组患者术后的 AOFAS 踝与后足功能评分均呈上升趋势,但 2 组的变化趋势不完全一致;术后第 1 天 2 组患者 AOFAS 踝与后足功能评分的差异无统计学意义;术后第 90 天、第 180 天畚药外敷组 AOFAS 踝与后足功能评分均高于常规治疗组(表 4)。

### 3.5 炎症指标

**3.5.1 IL-10 血清含量** 时间因素和分组因素存在交互效应;2 组患者 IL-10 血清含量总体比较,组间差异有统计学意义,即存在分组效应;术后不同时间点 IL-10 血清含量的差异有统计学意义,即存在时间效应;2 组患者术后的 IL-10 血清含量均呈下降趋势,但 2 组的变化趋势不完全一致;术后第 1 天 2 组患者 IL-10 血清含量的差异无统计学意义;术后第 7 天、第 14 天敷药外敷组 IL-10 血清含量均低于常规治疗组(表 5)。

**3.5.2 IL-6 血清含量** 时间因素和分组因素存在交互效应;2 组患者 IL-6 血清含量总体比较,组间差

异有统计学意义,即存在分组效应;术后不同时间点 IL-6 血清含量的差异有统计学意义,即存在时间效应;2 组患者术后的 IL-6 血清含量均呈下降趋势,但 2 组的变化趋势不完全一致;术后第 1 天 2 组患者 IL-6 血清含量的差异无统计学意义;术后第 7 天、第 14 天敷药外敷组 IL-6 血清含量均低于常规治疗组(表 6)。

## 4 讨论

目前国际上通用的踝关节骨折分型主要有 Lauge-Hansen 分型、Danis-Weber 分型等,其中 Lauge-Hansen 分型被临床骨科医生广泛应用<sup>[9-10]</sup>。该分型可以帮助医生明确踝关节骨折时的具体受伤机制、指

表 1 2 组旋后外旋型Ⅲ度、Ⅳ度踝关节骨折患者的基线资料

组别	样本量(例)	性别(例)		年龄 ( $\bar{x} \pm s$ , 岁)	踝关节骨折分型(例)		受伤至就诊时间 ( $\bar{x} \pm s$ , h)
		男	女		Ⅲ度	Ⅳ度	
敷药外敷组	40	23	17	43.5 ± 11.6	9	31	31.1 ± 37.1
常规治疗组	40	21	19	42.7 ± 9.5	12	28	30.1 ± 35.7
检验统计量		$\chi^2 = 0.202$		$t = 0.338$	$\chi^2 = 0.581$		$t = 0.115$
P 值		0.653		0.737	0.446		0.909

表 2 2 组旋后外旋型Ⅲ度、Ⅳ度踝关节骨折患者的术后足踝部疼痛视觉模拟量表评分

组别	样本量 (例)	足踝部疼痛视觉模拟量表评分( $\bar{x} \pm s$ , 分)				F 值	P 值
		术后第 1 天	术后第 7 天	术后第 14 天	合计		
敷药外敷组	40	7.53 ± 1.58	4.78 ± 1.17	2.70 ± 1.24	5.00 ± 1.33	129.700	0.000
常规治疗组	40	7.45 ± 1.55	5.65 ± 0.89	3.70 ± 0.91	5.60 ± 1.12	104.600	0.000
合计	80	7.49 ± 1.57	5.22 ± 1.03	3.20 ± 1.08	5.30 ± 1.23	215.900 <sup>1)</sup>	0.000 <sup>1)</sup>
检验统计量		$t = 0.214$	$t = 3.769$	$t = 4.100$	2.144 <sup>1)</sup>	$F = 1.430^{2)}$ ,	
P 值		0.831	0.000	0.000	0.033 <sup>1)</sup>	$P = 0.000^{2)}$	

1) 主效应的 F 值和 P 值; 2) 交互效应的 F 值和 P 值

表 3 2 组旋后外旋型Ⅲ度、Ⅳ度踝关节骨折患者的术后足踝部周径

组别	样本量 (例)	足踝部周径( $\bar{x} \pm s$ , cm)				F 值	P 值
		术后第 1 天	术后第 7 天	术后第 14 天	合计		
敷药外敷组	40	28.39 ± 0.83	27.07 ± 0.81	25.78 ± 0.57	27.08 ± 0.74	108.800	0.000
常规治疗组	40	28.31 ± 0.85	27.53 ± 0.90	26.84 ± 0.91	27.56 ± 0.89	27.520	0.000
合计	80	28.35 ± 0.84	27.30 ± 0.86	26.31 ± 0.74	27.32 ± 0.82	1.496 <sup>1)</sup>	0.029 <sup>1)</sup>
检验统计量		$t = 0.439$	$t = 2.368$	$t = 6.240$	3.105 <sup>1)</sup>	$F = 107.200^{2)}$ ,	
P 值		0.662	0.020	0.000	0.002 <sup>1)</sup>	$P = 0.000^{2)}$	

1) 主效应的 F 值和 P 值; 2) 交互效应的 F 值和 P 值

表 4 2 组旋后外旋型Ⅲ度、Ⅳ度踝关节骨折患者的术后美国足与踝关节协会踝与后足功能评分

组别	样本量 (例)	美国足与踝关节协会踝与后足功能评分( $\bar{x} \pm s$ , 分)				F 值	P 值
		术后第 1 天	术后第 90 天	术后第 180 天	合计		
敷药外敷组	40	34.50 ± 3.24	80.83 ± 3.61	85.78 ± 3.53	67.04 ± 3.46	2 669.000	0.000
常规治疗组	40	34.48 ± 3.14	74.13 ± 4.33	83.88 ± 4.31	64.16 ± 3.93	1 741.000	0.000
合计	80	34.49 ± 3.19	77.48 ± 3.97	84.83 ± 3.92	65.60 ± 3.69	1.668 <sup>1)</sup>	0.000 <sup>1)</sup>
检验统计量		$t = 0.035$	$t = 7.514$	$t = 4.100$	4.913 <sup>1)</sup>	$F = 1.430^{2)}$ ,	
P 值		0.972	0.000	0.034	0.000 <sup>1)</sup>	$P = 0.000^{2)}$	

1) 主效应的 F 值和 P 值; 2) 交互效应的 F 值和 P 值

表 5 2 组旋后外旋型Ⅲ度、Ⅳ度踝关节骨折患者的术后白细胞介素-10 血清含量

组别	样本量 (例)	白细胞介素-10 血清含量( $\bar{x} \pm s, \text{pg} \cdot \text{mL}^{-1}$ )				F 值	P 值
		术后第 1 天	术后第 7 天	术后第 14 天	合计		
畚药外敷组	40	73.07 ± 17.65	54.60 ± 7.43	46.68 ± 4.92	58.12 ± 10.00	18.310	0.000
常规治疗组	40	74.25 ± 13.41	64.31 ± 13.08	55.16 ± 11.79	64.57 ± 12.76	7.260	0.002
合计	80	73.66 ± 15.53	59.46 ± 10.26	50.92 ± 8.36	61.35 ± 11.38	22.080 <sup>1)</sup>	0.000 <sup>1)</sup>
检验统计量		$t = 0.192$	$t = 2.328$	$t = 2.395$	3.092 <sup>1)</sup>	$F = 1.373^{2)}$ ,	
P 值		0.849	0.029	0.025	0.003 <sup>1)</sup>	$P = 0.006^{2)}$	

1) 主效应的 F 值和 P 值; 2) 交互效应的 F 值和 P 值

表 6 2 组旋后外旋型Ⅲ度、Ⅳ度踝关节骨折患者的术后白细胞介素-6 血清含量

组别	样本量 (例)	白细胞介素-6 血清含量( $\bar{x} \pm s, \text{pg} \cdot \text{mL}^{-1}$ )				F 值	P 值
		术后第 1 天	术后第 7 天	术后第 14 天	合计		
畚药外敷组	40	13.05 ± 3.50	10.04 ± 2.24	8.25 ± 1.91	10.45 ± 2.55	10.960	0.000
常规治疗组	40	13.83 ± 2.62	11.90 ± 2.23	9.96 ± 2.15	11.90 ± 2.33	8.898	0.001
合计	80	13.44 ± 3.06	10.97 ± 2.24	9.11 ± 2.03	11.18 ± 2.44	18.680 <sup>1)</sup>	0.000 <sup>1)</sup>
检验统计量		$t = 0.644$	$t = 2.124$	$t = 2.138$	2.797 <sup>1)</sup>	$F = 1.207^{2)}$ ,	
P 值		0.526	0.044	0.043	0.007 <sup>1)</sup>	$P = 0.005^{2)}$	

1) 主效应的 F 值和 P 值; 2) 交互效应的 F 值和 P 值

导医生制定治疗方案和判断骨折预后。Lauge-Hansen 分型前半部分代表患足受伤时所处的位置(旋后、旋前), 后半部分代表患足受伤时距骨的移动方向(外旋、外展、内收)。Lauge-Hansen 分型具体分为旋后内收型骨折、旋后外旋型骨折、旋后外展型骨折、旋前外旋型骨折, 每型又根据韧带和骨骼损伤程度进行分度。其中旋后外旋型Ⅲ度、Ⅳ度踝关节骨折是临床上最常见的踝关节严重损伤之一。对于此类骨折, 常采用切开复位钢板内固定术治疗。但是, 术后常因为软组织损伤严重, 疼痛和肿胀持续时间较长, 皮肤张力较大, 甚至出现皮肤变黑或坏死以及踝关节僵硬, 严重影响患者生活质量和正常工作。为了解决上述问题, 临床上我们对行切开复位钢板内固定术后的旋后外旋型Ⅲ度、Ⅳ度踝关节骨折患者在常规治疗的基础上给予畚药活血通经方外敷治疗, 并取得了满意的疗效。

畚族是我国东南地区一个历史悠久的少数民族, 该族人民在长期与疾病的斗争中, 逐渐形成了具有本民族特色的畚族医药学, 如畚医经筋诊疗体系<sup>[11]</sup>。畚医应用畚药在治疗骨折、筋伤等疾病上积累了丰富的经验, 善于将新鲜畚药清洗晒干后变成青草药, 以外敷、外洗、内服等方式治疗骨伤科疾病<sup>[12]</sup>。本研究所用活血通经外敷方是根据畚医前辈治疗该病的经验, 并结合大量临床实践而创立的。该方以枫藤、茎穗木为君药, 枫藤具有祛风除湿、活血消肿的功效, 茎穗木具有活血化瘀、祛风行气、消肿止痛的功效; 九节

茶形如关节, 具有祛风除湿、活血止痛的功效, 对治疗骨关节病效果较好; 凌霄花根具有祛风化痰、通经行血的作用; 龙泉矮茶具有祛风湿、活血调经、消肿止痛的功效; 血藤具有补血活血、通筋络、祛风的功效; 雷毒柴祛风化痰; 牛尾茶根通筋络、补筋络; 石菖蒲豁痰开窍、化湿行气, 具有祛水湿的作用; 五加皮祛风湿、补肝肾、强筋骨、活血化瘀; 诸药合用, 共奏活血化痰、通经活络、消肿止痛、祛风除湿的功效。中药外敷可以治疗骨折<sup>[13-16]</sup>、筋伤<sup>[17-18]</sup>等, 具有缓解疼痛、消除肿胀等作用。畚药外敷治疗骨折、筋伤, 也具有消肿止痛的功效。

踝关节骨折后易导致创伤性关节炎的发生, 其发生机制可能与血清中 IL-6、IL-10 等炎症因子含量发生改变有关<sup>[19]</sup>。Furman 等<sup>[20]</sup>研究发现, 踝关节骨折患者的关节腔滑液中所有细胞因子和趋化因子的含量均有所升高, 且与正常人的血清相比, 踝关节骨折患者的 IL-6 血清含量显著增加。Adams 等<sup>[19]</sup>研究结果显示, 踝关节骨折后, 关节腔滑液中 IL-6、IL-10 等炎症因子含量升高。血清中 IL-6 含量明显升高, 可能在创伤性关节炎的发生中起重要作用<sup>[20]</sup>。Godoy-Santos 等<sup>[21]</sup>研究发现, 踝关节骨折后软骨、软骨下骨、滑膜组织和滑液均发生了炎性变化, 这可能导致创伤后性关节炎的发生。本研究结果显示, 术后第 7 天、第 14 天 2 组踝关节骨折术后患者 IL-6、IL-10 血清含量均低于术后第 1 天, 且畚药外敷组低于常规治疗组, 说明畚药活血通经方能明显减

轻炎症反应。

本研究结果显示,对于旋后外旋型Ⅲ度、Ⅳ度踝关节骨折患者,术后应用畚药活血通经方外敷治疗,与单纯常规治疗相比,能更好地缓解足踝部疼痛,减轻足踝部肿胀,促进踝关节功能的恢复;其作用机制可能是通过降低 IL-10 和 IL-6 血清含量,从而减轻了炎症反应。但仍需后续进一步研究证实。

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