

doi: 10.13241/j.cnki.pmb.2022.03.016

腓肠神经营养血管皮瓣修复跟骨骨折术后皮肤软组织缺损的临床研究 *

刘 华¹ 许春涛² 颜丙祥¹ 张 雷² 邹 林² 韩 康² 赵 燕^{3Δ}

(1 山东第一医科大学第一附属医院 山东省千佛山医院 骨创伤外科 山东 济南 250000;

2 解放军第九六〇医院骨科 山东 济南 250000; 3 济南市疾病预防控制中心 山东 济南 250021)

摘要 目的:探讨负压引流技术结合腓肠神经营养皮瓣在跟骨骨折钢板内固定术后皮肤软组织缺损的临床效果。方法:回顾性分析我院骨科2012年5月-2020年5月共31例跟骨骨折术后钢板外露,皮肤软组织缺损住院病人。纳入患者均使用负压引流技术结合腓肠神经营养皮瓣修复技术。创面给予彻底清创后行封闭负压吸引引流术,待创面新鲜后以腓肠神经营养皮瓣修复创面。对术后皮瓣成活情况;Maryland功能评分以及BMRC感觉功能评分进行综合评估。结果:术后2周时,28例皮瓣顺利成活,供区与受区伤口愈合良好,干燥、无渗出。3例术后出现皮瓣肿胀,皮瓣颜色发暗,伤口渗出较多,皮瓣边缘坏死,窦道形成等,给予切开引流、加强换药、敏感抗生素控制感染等治疗后,皮瓣成活。术后随访6-24个月皮瓣外观及功能恢复良好,无创面再坏死,裂开,感染等情况出现。其中2例再次入院行皮瓣整形术。术后6个月时,Maryland功能评分:优:17例;良:11例;优良率为90.3%。BMRC感觉功能评分:S3-S4:20例;S2:8例;S1:3例。结论:腓肠神经营养皮瓣联合封闭负压吸引技术在跟骨骨折钢板内固定术后皮肤软组织缺损的治疗中能够缩短治疗时间,操作简单,疗效确切,可获得良好的修复效果。

关键词:跟骨骨折;软组织缺损;腓肠神经营养血管皮瓣

中图分类号:R683 **文献标识码:**A **文章编号:**1673-6273(2022)03-477-05

Clinical Application of Sural Neurofasciocutaneous Flap in the Treatment of Repairing Soft Tissue Defect of Foot after the Operation of Calcaneal Fracture*

LIU Hua¹, XU Chun-tao², YAN Bing-xiang¹, ZHANG Le², ZOU Lin², HAN Kang², ZHAO Yan^{3Δ}

(1 Department of orthopedic, The First Hospital Affiliated with SHANDONG First Medical University, SHANDONG Provincial Qian-foshan Hosipital, Jinan, Shandong, 250000, China; 2 Department of orthopedic, The 960th Hospital of the PLA Joint Logistics Support Force, Jinan, Shandong, 250000, China; 3 Jinan municipal center for disease control and prevention, Jinan, Shandong, 250000, China)

ABSTRACT Objective: To explore the clinical effect of the VSD combined sural neurovascular flap in the treatment of soft-tissue defect of postoperative calcaneal fracture. **Methods:** A retrospective analysis was performed of 31 cases of oft-tissue defect and plate exposure after the surgery for calcaneal fractures from 2012.05 to 2020.05. All the patients underwent surgery using the VSD combined sural neurovascular flap. The wounds shall be given to thoroughly debrided and then be covered with VSD. After the wounds have become fresh, they would be used the sural nerve flaps for repair. while 54 patients underwent surgery with conventional balloon dilatation vertebroplasty (PKP group). The VAS and ODI scores in 3days, 3 months after operations were analyzed. Standard thoracolumbar radiography was performed before and after operation. The imaging was compared before and after operation, including anterior edge height, posterior edge height, midline height and cobb angle. The bone cement distribution and the rate of bone cement leakage were evaluated of both groups. **Results:** After 2 weeks, 28 flaps survived completely without vascular problems. The donor site and wound were healed by first intention. 3 cases of the flaps have become swelling, dark color, edge necrosis, and sinus formation. These flaps would be give incision, drainage, more dressing, and sensitive antibiotics to control infection, at last, all the flaps have become survival and all the patients were followed up for 6 to 24 months. The flap appearance and function were satisfactory, and the wound have no longer present necrosis, dehiscence, and infection. 2 cases were admitted to hospital for the second time having flap plastic surgery, and the effect was satisfactory. According to Maryland foot score, the skip flaps in 17 cases were excellent, 11 cases good; the excel good rate was 90.3%. The BMRC sensory function scores of the flaps were S3-S4 in 20 cases, S2 in 8 cases and S1 in 3 cases. **Conclusions:** The sural neurovascular flap combined VSD in the treatment of soft-tissue defect of postoperative calcaneal fracture wound save time, be sample for operation, and have good repairing effect.

Key words: Calcaneal fracture; Soft-tissue defect; Sural neurovascular flap

Chinese Library Classification (CLC): R683 **Document code:** A

Article ID:1673-6273(2022)03-477-05

* 基金项目:国家自然科学基金项目(81702935)

作者简介:刘华(1981-),硕士,主治医师,主要从事四肢骨折创伤及显微外科修复,电话:15275172420, E-mail: 81288328@163.com

Δ 通讯作者:赵燕(1969-),本科,副主任药师,主要从事药品试剂、设备管理及医学统计等工作,

电话:13505313358, E-mail: gan_7758525@163.com

(收稿日期:2021-06-04 接受日期:2021-06-27)

前言

跟骨骨折在临床上比较常见,约占附骨骨折的60%^[1]。跟骨骨折通常由于高能量损伤,如高处坠落或者车祸所致。由于相关手术技巧及内植物的发展,患者对解剖复位,牢固的内固定及早期下床功能锻炼的日益增加^[2]。严重的粉碎性跟骨骨折,特别是涉及跟距关节面的跟骨骨折,临床上现大多主导手术治疗^[3]。但是由于严重的粉碎性跟骨骨折后周围特殊的软组织损伤情况;手术对软组织的二次损害;吸烟、糖尿病、开放骨折、体重指数过大、手术距离受伤时间过长及切口单层缝合等常见危险因素的存在,常常导致切口皮缘坏死^[4],甚至导致整个局部皮肤的坏死,从而造成较大的皮肤及软组织损伤^[5]。相关的报道称跟骨骨折术后软组织感染和缺血以及深部感染的概率高达13.5%-21%^[6]。这无疑给患者的身心造成巨大的伤害,同时也会增加患者的医疗负担^[7]。而对这类问题的解决,临床上没有明确的统一的治疗方案^[8]。在治疗过程中需要较长的周期,处理起来也非常棘手^[9]。我院从2012年开始对此类病人给予创面彻底清创后行封闭负压吸引引流术,待创面新鲜后以腓肠神经营养皮瓣修复创面,获得了非常满意的效果。现将处理方法和结果报道如下。

1 资料和方法

1.1 研究对象

本次回顾性分析的时间截点为2012年5月-2020年5月。所有患者均接收了至少6个月的术后随访。按照本次研究的纳入及排除标准,共有31名患者纳入本次研究。其中男性患者为19例,女性患者为12例;年龄分布为25-63岁,平均年龄(34.7±6.5)岁。受伤至手术时间为5-8天(6.3±1.2天)。所有患者均采用经典的外侧入路"L"型切口,解剖钢板内固定。术后7-14天(9.2±2.3天),切口周围皮肤软组织发生坏死,逐渐出现钢板及骨质外露,其中左足跟部14例,右足跟部17例。所有病例伤口经细菌培养+药敏试验均发现有细菌感染,其中8例伤口为金黄色葡萄球菌感染,23例为绿脓杆菌感染。所有患者同意并愿意配合医生的调查,有完整的随访资料。本次研究上报我院医学伦理委员会批准通过。患者跟骨骨折经内固定术后再次接受皮肤软组织缺损钢板外露治疗的时间为4-8周,创面面积大小4.0 cm×2.0 cm-6.5 cm×3.5 cm,均有骨质和钢板的外露。行皮瓣手术之前X线片示:所有患者跟骨骨折均未愈合。本次研究经查阅文献并结合临床经验后,制定相关纳入及排除标准如下^[10,11]。

纳入标准^[10,11]:①患者均明确诊断为跟骨骨折并行切开复位内固定手术;②患者均全程接收了本次手术及治疗方法;③患者均为初次骨折。排除标准:①患者为双侧损伤;②患者术前有皮肤损伤或坏死情况;③患者随访资料不全或不详细。

1.2 方法

1.2.1 手术方法 本研究纳入的手术患者均由本文第一作者团队实施手术。患者根据情况采用全身麻醉或者硬膜外麻醉的方法。待麻醉满意后,给予常规消毒铺巾。首先彻底清创,去除炎性坏死组织(术前、术后创面分泌物培养+药敏),大量双氧水、新洁尔灭稀释液、生理盐水反复冲洗创面,应用一次性

VSD负压吸引材料覆盖创面,持续吸引,术后5-7天观察创面新鲜情况给予不同的处理。创面不新鲜患者可再次清创后更换VSD吸引,待感染基本控制,创面新鲜后,采用腓肠神经营养皮瓣修复皮肤软组织缺损区。

皮瓣手术步骤:受区彻底清创后,按照受区软组织缺损的面积设计皮瓣,以腓窝中点至跟腱与外踝的中点的连线为轴心线,血管蒂的旋转点选在外踝后上方5 cm腓动脉最低的一个肌间隔穿支(术前使用超声多普勒协助确定),按设计线先切开腓窝侧达深筋膜下,将腓肠神经和小隐静脉切断,包含在皮瓣内,间断将皮肤与深筋膜缝合固定,防止二者脱离,在深筋膜下由近端向远端蒂部解剖游离,电凝遇到的一些穿支血管,用缝线结扎小隐静脉,旋转点蒂部保留2-3 cm宽的筋膜蒂,从跟腱一侧切开深筋膜,将其向前掀起,观察腓动脉最远侧肌间隔穿支血管的位置,再对皮瓣切取范围做适当调整,放松止血带,观察皮瓣血循环,皮瓣末端有鲜红的渗血,将皮瓣试行转移,如有张力,可将蒂部筋膜组织作显微分离,切断紧张的纤维带,切开创面皮肤明道转移,将皮瓣无张力转移至受区,寻找受区皮神经,同时将腓肠神经同受区的皮神经进行吻合,所有供区均能直接缝合,不必行断层植皮覆盖。皮瓣转移修复注意事项:1、适当增加皮瓣筋膜蒂的宽度,以保护神经及其血管网,保证皮瓣的血供;2、保证皮瓣蒂部无压力转移,避免蒂部受压;3、术中创面彻底止血,避免因血肿导致皮瓣张力过高,引起皮瓣缺血坏死。

1.2.2 术后护理 术后抬高患肢20-30°,以利于静脉回流;根据药敏情况常规给予抗生素;严密观察皮瓣血运变化,皮温情况,发现问题及时处理;术后保持引流通畅,观察引流管引流量,48小时后,引流量小于40 mL,拔出引流管;必要时支具外固定保护,防止皮瓣受压影响皮瓣血运情况。

1.2.3 评价方法 主要观察患者局部皮瓣的成活情况(成活率;愈合率;并发症);足部术后6个月的运动功能评分(Maryland评分^[12]评分,满分为100分,分数越大表示功能越好);足部术后的感觉功能评分(British Medical Research Council, BMRC评分^[13],共分为5级,完全没感觉为S0级,感觉完全恢复正常为S4级)。

1.3 统计学分析

使用SPSS 19.0根据不同的样本类型采用不同的检验方法,计数资料采用卡方检验,计量资料采用t检验,以 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 患者的围手术期情况

所有手术患者(31例)手术时间为2.5-5.3 h(3.1±1.4)。28例患者在术后并且稳定,皮瓣血运及颜色正常,毛细血管充盈时间无明显异常。2例患者在手术之后24 h内出现血管危象。给予对症药物处理及拆除部分缝线后,症状明显改善,皮瓣最终成活。1例患者出现局部皮瓣远端周围坏死,渗出增多。给予切开引流,加强换药,控制感染后皮瓣成活。

2.2 患者的足部功能评分

在术后1个月及6个月时,我们对所有纳入患者进行了足部的功能评分(见表1-2)。在术后1月时, Maryland 功能评分:

优:17例;良:11例;优良率为:90.3%。BMRC 感觉功能评分: 评分:优:17例;良:11例;优良率为:90.3%。BMRC 感觉功能 S3-S4:20例;S2:8例;S1:3例。在术后6月时, Maryland 功能 评分:S3-S4:20例;S2:8例;S1:3例。

表1 患者 Maryland 功能评分的随访(例数)

Table 1 The Maryland scores of the patients after the operation (NO.)

Times	Excellent	Good	Fair	Poor
1 month after the operation	12	14	4	1
6 months after the operation	17	11	2	1

表2 患者 BMRC 皮肤感觉功能指标的随访($\bar{x} \pm s$)Table 2 The BMRC scores of the patients after the operation($\bar{x} \pm s$)

Groups	S4-S3	S2	S1
1 month after the operation	13	13	5
6 months after the operation	20	8	3

2.3 典型病例

患者男性,58岁。因“左足跟疼痛、肿胀、功能障碍3小时”入院。入院后,给予对症消肿,待情况稳定后,给予左足跟骨切开复位内固定术。术后2周左右,见切口处明显坏死。给予局部

清创,VSD负压吸引,局部稳定后,给予腓肠神经血管皮瓣软组织修复。现局部皮瓣外观良好,血运正常,Maryland 功能评分为90分,BMRC 皮肤感觉功能评分为S3。见图1。

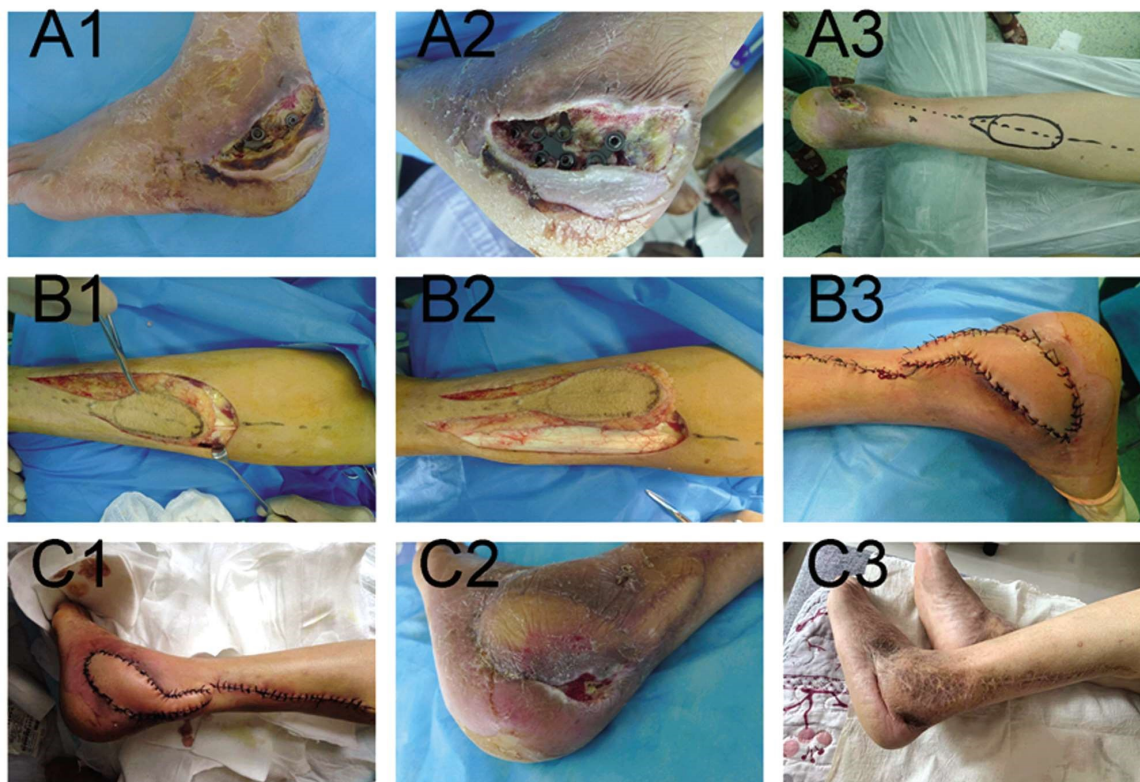


图1 典型病例 男 58岁

A1 术前外观片;A2 VSD吸引后外观片;A3 术前皮瓣规划;B1-B3 术中情况;C1 术后1周外观片;

C2 术后3月外观片;C3 术后6月外观片

Fig.1 Typical cases of male, 58 years old

A1 Preoperative appearance; A2: Appearance after the VSD A3: Preoperative flap planning; B1-B3: Intraoperative picture;

C1: Postoperative 1 week appearance; C2: Postoperative 3 months appearance; C3: Postoperative 6 months appearance

3 讨论

跟骨骨折通常为高能量损伤,例如高处坠落伤及车祸伤所

致,常伴有严重的软组织损伤及肿胀^[4]。在明显移位的舌形骨折中,跟骨结节被跟腱拉向近端,由于跟骨结节的压迫,可致后方皮肤严重受损^[5]。同样,在移位的关节面压缩骨折,骨折的移

位可致内侧皮肤的张力增高而产生水泡,影响骨折处软组织条件^[16]。在手术时机的选择上,由于软组织损伤程度直接影响着跟骨骨折处软组织的血液供应,同时此类闭合性骨折损伤时,肉眼又很难直接观察到皮下组织损伤的程度,临床上通常将伤后 7-14 天足跟外侧切口部位出现皮肤褶皱作为可以进行手术的标志^[17]。相关文献报道手术时机每增加一个等级,手术并发症的发生风险减少了 0.513 倍^[18]。不恰当的手术时机常常会导致手术后切口灾难性的后果^[19]。切开复位内固定是目前治疗累及跟距、跟骰关节面等严重骨折最佳的治疗方案,而经典的外侧“L”形切口是跟骨骨折最常使用的手术入路^[20]。但是此处皮肤张力高、软组织皮瓣薄,血液供应不稳定,特别是外侧入路时拐角处皮瓣的血供大部分来自外侧跟动脉,损伤后极易导致出现切口愈合方面的并发症,加上术后由于手术本身的创伤所导致的组织损伤引起伤口周围组织水肿等炎症反应。术后切口容易发生浅表感染,如缝合的皮瓣边缘发生坏死率达 0-21.4%,发生深部感染,如跟骨骨髓炎的发生率达 0-14.3%^[21]。常常引起局部软组织坏死缺损,引起跟骨骨质及钢板内固定物外露,临床处理相当困难。

跟骨骨折术后皮肤软组织坏死、感染及缺损在临床治疗上十分棘手,一期植皮或者皮瓣转移修复死亡率又较高,传统的换药处理,周期长,临床工作量大,对患者身体和心理创伤也较大,效果也不明显,而负压引流技术因其独特的优势在治疗这些病例时越来越受到临床外科大夫的青睐^[21]。该技术能为组织创面提供一个持续稳定的负压吸引环境,有利于创面周围组织渗出液的引流^[22]。对于骨筋膜室综合症的治疗有其独特的疗效,同时坏死组织能够及时排出,减轻组织水肿,刺激肉芽组织生长,减小创面组织缺损的面积,为二期创面植皮及组织皮瓣移植创造良好的条件,并且缩短了患者治疗疗程,在一定程度上减轻患者住院费用^[23]。VSD 负压引流技术适于皮肤软组织缺损的临床广泛应用,对于跟骨骨折术后皮肤软组织感染、坏死及缺损的病人,同样有较好的疗效,值得临床推广应用^[24]。

以肢体的皮神经营养血管为供血基础的新型皮瓣,自 Bertelli^[25]和 Masquelet^[26]首先报道后,已经经历了多年的发展和创新。腓肠神经营养皮瓣以其在治疗足踝部软组织感染、坏死及缺损中的独特优势,越来越受到临床医生的欢迎^[27]。过去无论是游离皮瓣还是岛状皮瓣会牺牲肢体的主要血管,对周围组织血供影响较大,对供区周围组织损伤也较大,同时由于足踝部软组织少,皮肤弹性差^[28]。对于足踝部软组织的修复,既要考虑手术风险程度,良好的术后外观效果,同时更要考虑到足踝部运动及负重功能的恢复。腓肠神经营养皮瓣的血供主要来源于腓肠神经伴行的腓肠浅动脉、腓动脉肌间隙穿支、小隐静脉及其周围的毛细血管网。同时由于腓肠神经营养皮瓣的供区隐蔽,皮瓣厚薄适宜,外观、色泽及质地也俱佳,能在一定程度上克服上述游离皮瓣以及岛状皮瓣在修复足踝部软组织感染、坏死及缺损中的不足^[29,30]。

腓肠神经皮瓣也有其自身不足之处,诸如足底外侧感觉减退,对于肥胖患者皮瓣的设计应该较大一些,否则不易覆盖创面,皮瓣吻合处张力高,延长了伤口愈合的时间,甚至影响皮瓣的存活,同时由于血管较细,对于血管蒂长于 15 cm 的皮瓣供血可能不足。这些问题有待于临床工作者及相关专家对腓肠神

经营养皮瓣的进一步研究。综上所述,腓肠神经营养皮瓣联合封闭负压吸引技术在跟骨骨折钢板内固定术后皮肤软组织缺损治疗中能够缩短治疗时间,操作简单,疗效确切,能获得良好的修复效果,值得临床推广应用。

参考文献(References)

- [1] Frank AL, Charette RS, Groen K. Ankle Dislocation[A]. In: StatPearls. Treasure Island FL: © 2021, StatPearls Publishing LLC., 2021
- [2] Wire J, Slane VH. Ankle Fractures [A]. In: StatPearls. Treasure Island FL: © 2021, StatPearls Publishing LLC., 2021
- [3] Tian H, Guo W, Zhou J, et al. Bone graft versus non-bone graft for treatment of calcaneal fractures: A protocol for meta-analysis [J]. Medicine (Baltimore), 2021, 100(2): e24261
- [4] Subramanian S, Kemp AK, Viswanathan VK. Bone Cyst [A]. In: StatPearls. Treasure Island FL: © 2021, StatPearls Publishing LLC., 2021
- [5] Shi F, Wu S, Cai W, et al. Comparison of 5 Treatment Approaches for Displaced Intra-articular Calcaneal Fractures: A Systematic Review and Bayesian Network Meta-Analysis[J]. J Foot Ankle Surg, 2020, 59 (6): 1254-1264
- [6] Schepers T. Fixation by Open Reduction and Internal Fixation or Primary Arthrodesis of Calcaneus Fractures: Indications and Technique [J]. Foot Ankle Clin, 2020, 25(4): 683-695
- [7] Bui PV, Rizzo DA. Lower Limb Muscle Flaps: The Reverse Peroneus Brevis Flap[J]. Clin Podiatr Med Surg, 2020, 37(4): 649-670
- [8] Zhang P, Liang Y, He J, et al. A systematic review of suture-button versus syndesmotom screw in the treatment of distal tibiofibular syndesmosis injury[J]. BMC Musculoskelet Disord, 2017, 18(1): 286
- [9] Nosewicz TL, Dingemans SA, Backes M, et al. A systematic review and meta-analysis of the sinus tarsi and extended lateral approach in the operative treatment of displaced intra-articular calcaneal fractures [J]. Foot Ankle Surg, 2019, 25(5): 580-588
- [10] Shimozono Y, Hurley ET, Myerson CL, et al. Suture Button Versus Syndesmotom Screw for Syndesmosis Injuries: A Meta-analysis of Randomized Controlled Trials [J]. Am J Sports Med, 2019, 47(11): 2764-2771
- [11] Onggo JR, Nambiar M, Phan K, et al. Suture button versus syndesmosis screw constructs for acute ankle diastasis injuries: A meta-analysis and systematic review of randomised controlled trials [J]. Foot Ankle Surg, 2020, 26(1): 54-60
- [12] Dingemans SA, Birnie MFN, Sanders FRK, et al. Routine versus on demand removal of the syndesmotom screw; a protocol for an international randomised controlled trial (RODEO-trial) [J]. BMC Musculoskelet Disord, 2018, 19(1): 35
- [13] Jain SK, Dar MY, Kumar S, et al. Role of anti-oxidant (vitamin-C) in post-operative pain relief in foot and ankle trauma surgery: A prospective randomized trial [J]. Foot Ankle Surg, 2019, 25 (4): 542-545
- [14] Ræder BW, Stake IK, Madsen JE, et al. Randomized trial comparing suture button with single 3.5 mm syndesmotom screw for ankle syndesmosis injury: similar results at 2 years [J]. Acta Orthop, 2020, 91 (6): 770-775
- [15] Al-Ashhab ME. Primary Ankle Arthrodesis for Severely Comminuted Tibial Pilon Fractures[J]. Orthopedics, 2017, 40(2): e378-e381
- [16] Rammelt S, Marx C. Managing Severely Malunited Calcaneal Frac-

- tures and Fracture-Dislocations [J]. *Foot Ankle Clin*, 2020, 25 (2): 239-256
- [17] Wilkinson BG, Marsh JL. Minimally Invasive Treatment of Displaced Intra-Articular Calcaneal Fractures[J]. *Orthop Clin North Am*, 2020, 51(3): 325-338
- [18] Najefi AA, Najefy A, Vemulapalli K. Paediatric calcaneal fractures: A guide to management based on a review of the literature [J]. *Injury*, 2020, 51(7): 1432-1438
- [19] Park CH, Yan H, Park J. Randomized comparative study between extensile lateral and sinus tarsi approaches for the treatment of Sanders type 2 calcaneal fracture[J]. *Bone Joint J*, 2021, 103-B(2): 286-293
- [20] Choo YJ, Park CH, Chang MC. Rearfoot disorders and conservative treatment: a narrative review [J]. *Ann Palliat Med*, 2020, 9 (5): 3546-3552
- [21] Blanton CM, Clougherty CO. The Role of Bone Marrow Aspirate in Osseous and Soft Tissue Pathology [J]. *Clin Podiatr Med Surg*, 2021, 38(1): 1-16
- [22] Finkemeier CG, Neiman R. Reverse Sural Artery Pedicle Flap [J]. *J Orthop Trauma*, 2016, 30 Suppl 2S41-42
- [23] Li H, Song Y, Li H, et al. Outcomes After Anatomic Lateral Ankle Ligament Reconstruction Using Allograft Tendon for Chronic Ankle Instability: A Systematic Review and Meta-analysis [J]. *J Foot Ankle Surg*, 2020, 59(1): 117-124
- [24] Colcuc C, Blank M, Stein T, et al. Lower complication rate and faster return to sports in patients with acute syndesmotic rupture treated with a new knotless suture button device [J]. *Knee Surg Sports Traumatol Arthrosc*, 2018, 26(10): 3156-3164
- [25] Tchanque-Fossuo CN, Wishy AM, West KIM, et al. Reclaiming Autologous Amputated Tissue for Limb Salvage of a Diabetic Foot Burn with Underlying Critical Limb Ischemia [J]. *Adv Skin Wound Care*, 2018, 31(1): 596-600
- [26] Liles J, Adams SB, Jr. Management of Complications of Achilles Tendon Surgery[J]. *Foot Ankle Clin*, 2019, 24(3): 447-457
- [27] Bui PV, Rizzo DA. Lower Limb Muscle Flaps: The Reverse Peroneus Brevis Flap[J]. *Clin Podiatr Med Surg*, 2020, 37(4): 649-670
- [28] Chen C, Hao L, Sun W, et al. Glabrous Flow-Through Flaps for Simultaneous Resurfacing, Revascularization, and Reinnervation of Digits[J]. *Ann Plast Surg*, 2016, 77(5): 547-554
- [29] Battiston B, Ciclamini D, Tang JB. Compound or Specially Designed Flaps in the Lower Extremities [J]. *Clin Plast Surg*, 2020, 47 (4): 535-546
- [30] Weng X, Li X, Ning J, et al. Experience of 56 patients using a retrograde sural neurovascular flap to repair lower limb tissue defects[J]. *J Plast Surg Hand Surg*, 2012, 46(6): 434-437

(上接第 556 页)

- [23] 张佳男. 明目羊肝丸联合自体血清治疗白内障超声乳化术后干眼症疗效研究[J]. *陕西中医*, 2017, 38(1): 93-94
- [24] 史薇, 王小元, 张涛, 等. 0.3%玻璃酸钠滴眼液对轻中度干眼症患者的疗效及 BUT、SIt、球结膜充血程度的影响[J]. *河北医药*, 2021, 43(5): 757-759
- [25] 陶娜, 李亚兰, 项奕. 杞菊地黄丸对白内障术后干眼症患者疗效, BUT, SIT 及 FL 的影响 [J]. *中国实验方剂学杂志*, 2017, 23(23): 166-170
- [26] Yang L, Zhang L, Jian Hu R, et al. The influence of overnight orthokeratology on ocular surface and dry eye-related cytokines IL-17A, IL-6, and PGE2 in children [J]. *Cont Lens Anterior Eye*, 2021, 44(1): 81-88
- [27] Wu X, Chen X, Ma Y, et al. Analysis of tear inflammatory molecules and clinical correlations in evaporative dry eye disease caused by meibomian gland dysfunction [J]. *Int Ophthalmol*, 2020, 40 (11): 3049-3058
- [28] 曾永宜. TNF- α 和 TSLP 在干眼症患者结膜上皮细胞和泪液中的表达水平及意义[J]. *临床眼科杂志*, 2016, 24(6): 496-498
- [29] 赵亚东, 徐夏冰, 张少波, 等. 肿瘤坏死因子 - α (TNF- α)和白细胞介素 1 β (IL-1 β)在干眼症患者结膜上皮细胞和泪液中的表达及意义[J]. *现代生物医学进展*, 2017, 17(34): 6713-6716
- [30] 马贵灿, 司玮, 杨潇远. 普拉洛芬滴眼液治疗睑板腺功能障碍的效果观察[J]. *中华眼外伤职业眼病杂志*, 2020, 42(2): 138-142
- [31] 黄长盛, 邢婷婷, 周汝云, 等. 菟丝子及菟丝子多糖对妊娠期糖尿病大鼠 Th1/Th2 炎症因子及妊娠结局的影响 [J]. *江西中医药*, 2016, 47(6): 37-39