

· 经验交流 ·

跗跖关节复合体损伤的诊治探讨

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【摘要】 目的: 探讨跗跖关节复合体(TJC)损伤的诊治方法。方法: 2007年1月至2009年12月采用切开复位内固定治疗16例跗跖关节复合体损伤, 男12例, 女4例; 年龄21~45岁, 平均34.1岁, 均为闭合性损伤。左侧7例, 右侧9例, 均为直接暴力所伤, 其中交通伤4例, 高处坠落伤5例, 挤压伤7例。楔骨间脱位11例, 舟楔关节脱位3例, 骰骨骨折2例。跗跖关节损伤均为三柱损伤。根据手术探查和稳定性破坏情况, 通常跗骨间关节, 内侧、中间柱跗跖关节用螺钉固定, 外侧柱用克氏针固定, 对跗骨基底部分碎性骨折和骰骨压缩性骨折等用跨关节微型钢板固定以达到解剖复位、有效固定。采用美国足踝外科协会(AOFAS)中足评分标准从疼痛、功能、对线方面进行临床评估。结果: 所有患者均获得随访, 时间6~18个月, 平均12.6个月。按AOFAS评分: 疼痛为(29.3±5.9)分, 功能为(32.4±5.6)分, 对线为(12.9±2.6)分, 总分为(74.6±10.4)分。所有切口均I期愈合, 未见皮肤坏死, 感染, 钢板螺钉松动、断裂等并发症。3例患者因后期出现骨性关节炎, 疼痛明显, 行走困难, II期行关节融合术。4例患者影像学表现为骨性关节炎, 但临床症状(疼痛)较轻, 继续观察随访。结论: 解剖复位有效稳定内固定是治疗跗跖关节复合体损伤的关键要素, I期切开复位内固定有利于II期融合手术。

【关键词】 跗骨; 跗关节; 创伤和损伤; 骨折; 关节融合术; 骨折固定术, 内

DOI: 10.3969/j.issn.1003-0034.2011.10.020

Diagnosis and treatment of tarsometatarsal joint complex injury CHEN Jian-liang, ZHANG Long-jun, YE Feng, ZHENG Xiao-dong, WANG Xiao, XU Yong. Shangyu Hospital of Traditional Chinese Medicine, Shangyu 312300, Zhejiang, China

ABSTRACT Objective: To explore the diagnosis and treatment of tarsometatarsal joint complex injury (TJC). **Methods:** From January 2007 to January 2009, 16 patients with tarsometatarsal joint complex injury were treated with open reduction and internal fixation. There were 12 males and 4 females, ranging in age from 21 to 45 years with an average of 34.1 years. Seven cases were left and 9 cases were right and all injuries caused by direct violence. Four cases caused by traffic accident 5 by fall from high and 7 by crush injury. Intercuneiform dislocation were in 11 cases, naviculocuneiform joint dislocation in 3 cases and cuboid fracture in 2 cases. All the cases were three column injuries. According to the situation of exploring and the stability, screw fixation was used for intertarsal joint, internal and middle column tarsometatarsal joint, the Kirschner wire fixation for external column and miniature plate fixation for comminuted fracture of metatarsal bones and compressible fracture of cuboid. The criteria of the AOFAS Foot and Ankle Surgery by the United States Association of ankle-rear foot functional scale was used to evaluate the clinical effect. **Results:** All the patients were followed up, the duration ranged from 6 to 18 months (averaged 12.6 months). According to the score system of AOFAS, the total score was (74.6±10.4) points, including pain items of (29.3±5.9), the score of functional items of (32.4±5.6) points, and power lines of (12.9±2.6). All the incisions were primarily healed without infection, skin necrosis, fixture broken or loosen. Three cases received arthrodesis due to osteoarthritis. Four cases were followed up continually because they only had the radiologic osteoarthritis without pain. **Conclusion:** Anatomical reduction and stable fixation is the key point of the treatment of tarsometatarsal joint complex injury. Open reduction and internal fixation at the first stage is good for secondary arthrodesis.

KEYWORDS Metatarsal bones; Tarsal joints; Wounds and injuries; Fractures; Arthrodesis; Fracture fixation, internal

Zhongguo Gu Shang/China J Orthop Trauma, 2011, 24(10): 869-872 www.zggszz.com

跗跖关节损伤是指发生在坚固中足和负重前足之间的损伤, 以往文献报道其发生率较低, 约占全身骨折的0.02%^[1]。近年来随着交通伤等高能量损伤的增多, 发病率呈上升趋势。且这些高能量损伤在造

成跗跖关节损伤的同时, 常累及骰骨、楔骨间关节或舟楔关节, 即所谓跗跖关节复合体损伤。由于不能及时有效治疗, 且其预后远比单纯的跗跖关节损伤差, 所以致残率更高^[2]。目前对于跗跖关节骨折脱位的治疗已由切开复位内固定取代传统的手法复位石膏外固定, 且由于对跗跖关节损伤认识的增加, 漏诊率

明显减少,但对跗骨间骨折脱位(中足)的损伤尚没有完全认识。我们自 2007 年 1 月至 2009 年 12 月收治此类损伤 16 例,取得了较好的疗效,现报告如下。

1 临床资料

本组 16 例,男 12 例,女 4 例;年龄 21~45 岁,平均 34.1 岁,均为闭合性损伤。左侧 7 例,右侧 9 例,均为直接暴力所伤。致伤原因:交通伤 4 例,高处坠落伤 5 例,挤压伤 7 例。楔骨间脱位 11 例,舟楔关节脱位 3 例,骰骨骨折 2 例,跗跗关节损伤均为三柱损伤。临床表现:中足肿胀、畸形、疼痛及活动受限,第 2 天均有足底皮肤青紫瘀斑,术前均常规消肿,外敷中药,待软组织肿胀基本消退后行切开复位内固定术。

2 治疗方法

2.1 手术方法 分别取第 1、2 跗骨间及第 4、5 跗骨间在足背做纵行切口,两切口之间尽量保留足够间距。因需探查中足结构,较单纯跗跗关节损伤切口长,常规切开先探查清除跗跗关节间隙软组织和碎小骨块,再探查跗骨间关节(楔骨间、舟楔关节)间隙,确定是否有损伤。牵出嵌在骨折端和关节间隙的胫前肌腱,清除嵌在间隙内软组织和小骨块,先整复脱位,跗骨间关节克氏针临时固定,再行跗跗关节骨折脱位、跗骨基底部骨折整复克氏针临时固定,对骰骨压缩性骨折,先将压缩的骰骨撑开填塞植骨,恢复其基本形态。术中 C 形臂 X 线机透视见前中足部骨折脱位基本复位,根据术中探查和稳定性破坏情况,通常跗骨间关节,内侧、中间柱跗跗关节用螺钉固定,外侧柱用克氏针固定,跗骨基底部粉碎性骨折和骰骨压缩性骨折等用跨关节微型钢板固定以达到解剖复位、有效固定。

2.2 术后处理 术后患足加压包扎,抬高患肢,局部冰敷以减轻肿胀,患肢制动避免负重 3 个月,尽早开始功能锻炼,定期复查 X 线片,骨折愈合后及时拆除内固定物后完全负重行走。

3 结果

3.1 疗效评价标准 末次随访时足部功能评估采用美国足踝外科协会(AOFAS)中足评分标准进行临床评估^[3]。满分 100 分,疼痛 40 分;功能 45 分,其中活动受限需要辅助支撑 10 分,对鞋子要求 5 分,最大步行距离 10 分,行走地面 10 分,步态 10 分;对线 15 分。

3.2 治疗结果 本组患者切口均

I 期愈合,未见皮肤坏死,感染,钢板螺钉松动、断裂等并发症。本组均获得平均 12.6 个月(6~18 个月)随访。采用 AOFAS 中足评分标准进行临床评估,疼痛 20~40 分,平均(29.3±5.9)分,功能 30~45 分,平均(32.4±5.6)分,对线 5~15 分,平均(12.9±2.6)分,总分 58~94 分,平均(74.6±10.4)分。患者平均术后 6.3 个月恢复正常生活,9 例患者能穿平常鞋子在各种地面上行走,步态基本正常;3 例因后期出现骨性关节炎,疼痛明显,行走困难,II 期行关节融合术;4 例影像学表现为骨性关节炎,但临床症状(疼痛)较轻,继续观察随访。典型病例见图 1-3。

4 讨论

跗跗关节有 5 根跗骨,3 块楔骨和骰骨组成,功能上分成 3 个柱结构,各柱之间有独立的关节囊。内侧柱和中间柱同时和舟楔关节相连,因而衍生出跗跗关节复合体的概念^[4]。在跗跗关节损伤时,特别是高能量损伤时要注意舟楔关节和楔骨间关节的损伤,在治疗跗跗关节损伤时将相应的楔骨间及舟楔关节乃至整个中足作为一个整体进行复位固定。Vuori 等^[5]报道跗跗关节损伤合并跗中关节骨折脱位高达 39%,笔者在治疗跗跗关节损伤后期加深认识了跗跗关节复合体损伤概念,术前注意对跗中关节 CT 检查及三维重建,术中对跗中关节探查,发现实际合并跗中关节损伤可能更高。因跗跗关节复合体损伤远比单纯跗跗关节损伤程度更重,常为高能量损伤,因而跗跗关节复合体损伤除骨折脱位外,还伴有维持中足稳定的韧带系统损伤,即使骨折脱位得到解剖复位和坚强内固定,术后因韧带的瘢痕修复,远期内固定拆除后因韧带的松弛而再脱位、创伤性关节炎发生率相对较高,术前必须告知患者以提



图 1 男,41 岁。楔骨间脱位、舟楔关节脱位和跗跗关节三柱损伤 1a,1b.术前左足正斜位 X 线片 1c,1d.术后左足正斜位 X 线片,跗跗关节复合体复位良好,第 5 跗骨基底部用克氏针弹性固定

Fig.1 Man, 41 years old, dislocation of cuneiform bone joint, dislocation of scaphoideum and cuneiform joint and three-column injury of tarsometatarsal joint 1a, 1b. Preoperative X-ray films of left foot 1c, 1d. Postoperative X-ray films of left foot showed excellent fixation, and Kirschner wire fixed well the fifth metatarsal bone elasti



图2 男,36岁。楔骨间脱位和跖跗关节三柱损伤 2a,2b.术前左足正斜位 X 线片 2c,2d.术后左足正斜位 X 线片,第1、2楔骨间用1空心螺钉固定,Lisfranc 韧带方向用1空心螺钉固定,第5跖骨底部用克氏针弹性固定

Fig.2 Man,36-year-old,dislocation of cuneiform bone joint and three-column injury of tarsometatarsal joint 2a,2b.Preoperative X-ray films of left foot 2c,2d.Postoperative X-ray films of left foot showed cannulated screws fixed well the first and second cuneiform bone,cannulated screw on Lisfranc ligament direction,and Kirschner wire to fix the basilar part of the fifth metatarsal bone elastic



图3 男,42岁。楔骨间骨折脱位和跖跗关节三柱损伤 3a,3b.术前左足正斜位 X 线片 3c,3d.术后左足正斜位 X 线片示克氏针内固定后基本复位 3e,3f.术后1个月左足正斜位 X 线片提示第2跖骨局部移位 3g,3h.术后2个月左足正斜位 X 线片提示第2跖骨移位更明显(本例为早期笔者选择克氏针固定病例,不能提供有效固定作用,术后骨折有移位趋势)

Fig.3 Man,42-year-old,dislocation of cuneiform bone joint and three-column injury of tarsometatarsal joint 3a,3b.Preoperative X-ray films of left foot 3c,3d.Postoperative X-ray films at 3 days showed Kirschner wire fixation well 3e,3f.Postoperative X-ray films at 1 months showed

displacement of the second metatarsal bone 3g,3h.Postoperative X-ray films at 2 months showed the second metatarsal bone displaced more obvious

高患者对治疗效果的理解。

跖跗关节的骨折脱位目前临床得到重视,而且影像学检查技术的提高,往往显而易见,不容易漏诊;而合并的舟楔关节、楔骨间关节损伤往往以韧带损伤所致的关节脱位为主,且常受伤后自动复位,真实伤情被掩盖,容易忽视,给诊断带来困难。本组病例术中发现舟楔关节和楔骨间关节以韧带损伤为主,部分伴有较小的撕脱骨块,术前 X 线片因骨折块较小,影像重叠不容易发现而漏诊。我们发现高能量中足损伤,足背肿胀明显的患者,术前应 CT 平扫及三维重建,这样有助于跖跗关节复合体损伤的诊

断,但笔者认为术中直视下检查舟楔关节、楔骨间关节的稳定性和术中探查韧带损伤更为重要,常可明确诊断。

获得稳定的解剖复位是跖跗关节复合体损伤治疗成功的关键^[6]。闭合复位从 C 形臂 X 线透视尚不能有效判断解剖复位,关节间隙内常有软组织嵌入而不能有效复位,且不能探查和检查舟楔关节、楔骨间关节稳定性和损伤程度。我们认为应该切开复位才能达到解剖复位,微小的移位都会改变足弓部的生物力学环境,继而发生创伤性关节炎。具体手术操作应全面评价损伤情况,尽量减少跨关节进钉次数,

做到精确缓慢一次完成,减少对关节面的损伤。

从解剖结构上看,第 2 跖骨基底部分与中间楔骨的关节面位于第 1 跖楔关节面近侧约 8 mm,第 3 跖楔关节面近侧约 4 mm,这样第 2 跖骨基底部分同时与第 1、3 跖骨和 3 块楔骨相关节成为跖跗关节“罗马拱形门”结构的“拱顶石”,与整个跖跗关节的稳定性息息相关。故而对内侧柱、中间柱固定给予螺钉等坚强固定。特别是第 1 楔骨和第 2 跖骨基底部分之间的固定。对于跖骨基底部分粉碎性骨折脱位的固定,钢板跨关节(楔骨和跖骨)间的固定,可有效恢复跖骨的长度从而达到稳定有效的解剖复位。已有学者^[6-7]对第 4、5 跖跗关节活动度的实验研究证实:其外侧柱具有相当的活动度,故目前多数学者支持克氏针弹性固定,但对伴有骰骨骨折的患者我们采用复位填充植骨用钢板跨关节固定,从而有效恢复解剖结构。跖骨间关节骨折脱位,考虑关节均为微动关节,常采用螺钉固定。固定顺序从近端向远端逐一固定。

对于融合问题,目前常指对于内侧、中间柱的融合,对于外侧柱常不融合。有学者认为 I 期融合以缓解疼痛并尽可能保留足的功能^[8-11]。Ly 等^[12]对 I 期融合与切开复位内固定的治疗效果进行比较,结果发现 I 期融合术的患者功能可恢复到术前的 92%,而切开复位内固定组只能恢复到术前的 65%。另一项研究^[13]也发现 I 期融合组 II 期手术率远低于切开复位内固定组。Coetzee 提出 I 期行关节融合的手术指征^[8]:①主要韧带断裂,跖跗关节多向性不稳或完全脱位;②第 1、2 跖骨基底部分内粉碎性骨折;③中足挤压伤致关节内骨折脱位患者。笔者在这方面也做了有益探索,但对第 1、2 跖骨基底部分粉碎性骨折累及关节面的患者应用微型钢板跨关节固定以恢复跖骨长度和足弓解剖复位。假如后期出现关节疼痛,创伤性关节炎需行融合术时,操作相对简单方便,不需要考虑解剖位置,因此笔者认为 I 期尽量恢复解剖结构,使足部各点受到正常应力分布,后期出现疼痛等功能障碍再 II 期行关节融合术。

跖跗关节损伤要注意同时伴有舟楔关节,楔骨间关节损伤可能,术中检查是必要的,解剖复位有效稳定内固定是治疗关键。切开复位是骨折脱位解剖复位的基础,内固定的选择应是有效稳定固定。I 期切开复位内固定有利于 II 期融合手术。

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(收稿日期:2011-04-12 本文编辑:王宏)