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跗骨窦入路切开复位内固定与外侧 "L" 形入路切开复位 内固定治疗跟骨骨折的疗效比较研究*

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摘要 目的:比较跗骨窦入路切开复位内固定与外侧 "L" 形入路切开复位内固定治疗跟骨骨折的疗效。**方法:**选取 2016 年 10 月到 2017 年 6 月期间川北医学院附属医院收治的 86 例跟骨骨折患者,根据随机数字表法分为对照组和观察组,两组均为 43 例。对照组采用外侧 "L" 形入路切开复位内固定进行治疗,观察组采用跗骨窦入路切开复位内固定进行治疗。比较两组患者的手术时间、住院时间、骨折愈合时间、踝-后足功能优良率、视觉模拟评分法(VAS)、Böhler 角、Gissane 角和术后并发症发生率。**结果:**两组患者的手术时间和骨折愈合时间比较无统计学差异($P>0.05$),而观察组患者的住院时间短于对照组($P<0.05$)。观察组患者术后踝-后足功能优良率高于对照组($P<0.05$)。在术前和术后 12 个月时,两组患者的 VAS 评分、Gissane 角、Böhler 角比较无统计学差异($P>0.05$),术后 12 个月时两组患者的 VAS 评分均明显低于术前,Böhler 角及 Gissane 角明显高于术前($P<0.05$)。观察组患者术后并发症发生率低于对照组($P<0.05$)。**结论:**跗骨窦入路和外侧 "L" 形入路切开复位内固定均可有效治疗跟骨骨折,但跗骨窦入路可更有效地改善踝-后足功能,且住院时间短、术后并发症发生率更低。

关键词:跟骨骨折;跗骨窦入路;外侧 "L" 形入路;疗效;比较研究

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Comparative Study of the Curative Effect of Tarsal Sinus Approach with Open Reduction and Internal Fixation and Lateral "L"-shaped Approach with Open Reduction and Internal Fixation for the Treatment of Calcaneal Fractures*

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ABSTRACT Objective: To compare the curative effect of tarsal sinus approach with open reduction and internal fixation and lateral "L"-shaped approach with open reduction and internal fixation for the treatment of calcaneal fractures. **Methods:** 86 patients with calcaneal fractures who were treated at the Affiliated Hospital of North Sichuan Medical College from October 2016 to June 2017 were enrolled. The patients were divided into the control group and the observation group according to the random number table method, and 43 patients in both groups. The control group was treated with lateral "L"-shaped approach with open reduction and internal fixation. The observation group was treated with tarsal sinus approach with open reduction and internal fixation. The operation time, hospitalization time, fracture healing time, sputum-hind foot function, VAS score, Böhler angle, Gissane angle and postoperative complication rate were compared between the two groups. **Results:** There was no difference in the operation time and fracture healing time between the two groups ($P>0.05$). The hospitalization time of the observation group was shorter than that of the control group ($P<0.05$). The talus- hind foot function excellent rate in the observation group was higher than that in the control group ($P<0.05$). There were no significant differences in VAS score, Böhler angle and Gissane angle between the two groups before and 12 months after operation ($P>0.05$). At 12 months after operation, the VAS scores of both groups were significantly lower than those before operation, and the Böhler angle and Gissane angle were significantly higher than those before operation ($P<0.05$). The incidence rate of postoperative complications in the observation group was lower than that in the control group ($P<0.05$). **Conclusion:** The sacral sinus approach and the lateral "L" approach with open reduction and internal fixation can effectively treat calcaneal fractures. However, tarsal sinus approach can improve ankle-hind foot function more effectively, with shorter hospitalization time and lower incidence of postoperative complications.

Key words: Calcaneal fracture; Tarsal sinus approach; Lateral "L" shaped approach; Efficacy; Comparative study

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前言

跟骨骨折是足部常见的骨折类型,致伤原因多为高处坠落,患者足部着地,导致足跟遭受到巨大的垂直撞击力,进而出现跟骨骨折^[1,2]。跟骨骨折多为关节内骨折,复位难度较大、并发症较多,若未得到有效的治疗将会有很高的致残率^[3],因此探究跟骨骨折的有效治疗方案具有重要的临床意义。手术治疗是临床治疗跟骨骨折的主要方式,尤其是 SandersII 型以上的跟骨骨折。外侧 "L" 形入路切开复位内固定是治疗跟骨骨折的经典术式,"L" 形切口可较好地显露跟骨骨折块和距下关节,利于成功复位,但该手术方式的术后并发症发生率较高^[4,5]。随着近年来微创技术的普及和应用,临床上逐渐开始使用跗骨窦入路切开复位内固定来治疗跟骨骨折,跗骨窦切口对外侧皮瓣的血运干扰较小,术后并发症发生率较低^[6,7],然而相较于 "L" 形切口入路其存在操作更加困难、骨折暴露情况更差等缺点^[8]。目前对于 SandersII 型以上的跟骨骨折更宜选用外侧 "L" 形入路还是跗骨窦入路的术式尚且存在争议,鉴于此,本研究旨在比较这两种入路方式治疗跟骨骨折的疗效,以期为临床治疗 SandersII 型以上的跟骨骨折提供参考,现将结果整理如下。

1 对象与方法

1.1 研究对象

选取 2016 年 10 月到 2017 年 6 月期间川北医学院附属医院收治的 86 例跟骨骨折患者,纳入标准:(1)所有患者均经影像学资料确诊,且均为单侧跟骨骨折;(2)Sanders 分型为 II-III 型;(3)年龄在 18-70 岁之间;(4)随访资料完整;(5)所有患者均签署知情同意书。排除标准:(1)开放性骨折;(2)妊娠或哺乳期妇女;(3)合并糖尿病或下肢血管性疾病;(4)合并同侧足踝部其他骨折;(5)合并有软组织感染或皮肤疾病;(6)随访时间小于 12 个月者。本项研究获得川北医学院附属医院伦理委员会批准。根据随机数字表法分为对照组 (n=43) 和观察组 (n=43),其中对照组男 27 例,女 16 例;年龄 25-61 岁,平均 (43.57±8.26) 岁;Sanders 分型:SandersII 型 31 例,SandersIII 型 12 例;受伤侧别:左侧 24 例,右侧 19 例;致伤原因:高处坠落 33 例,交通伤 10 例;受伤至手术时间 1-8d,平均 (3.22±1.27)d。观察组男 24 例,女 19 例;年龄 22-63 岁,平均 (44.51±8.07) 岁;Sanders 分型:SandersII 型 30 例,SandersIII 型 13 例;受伤侧别:左侧 25 例,右侧 18 例;致伤原因:高处坠落 32 例,交通伤 11 例;受伤至手术时间 1-9d,平均 (3.47±1.32)d。两组患者一般资料比较无统计学差异 ($P>0.05$),均衡可比。

1.2 手术方法

在患者软组织条件改善后进行手术,软组织改善的表现为

水泡消退,出现皱皮征。对照组采用外侧 "L" 形入路切开复位内固定进行治疗,采用全麻或椎管内麻醉,取健侧卧位,切口从外踝上方 4 cm 左右的位置纵形向下,直至外侧与距侧皮肤的交界处,后转 120° 向前切至第五跖骨基底部,完成 "L" 形切口,掀起皮瓣,显露距下关节和跟骰关节。撬拨恢复距下关节面的平整性,克氏针固定,C 臂机透视复位良好后根据骨折的具体情况选择合适的钢板进行固定,缝合切口,留置负压引流管。观察组采用跗骨窦入路切开复位内固定进行治疗,采用全麻或椎管内麻醉,取健侧卧位,患肢采用气囊止血带止血,切口从外踝尖下方 5 mm 经跗骨窦间隙向第四跖骨基底部延伸 4-5 cm 左右,沿跟骨外侧壁浅面间隙锐性分离腓骨长短肌,显露后关节面并清理血肿,根据三维 CT 结果显示后关节面的主骨折线情况,撬拨恢复后关节面的平整性,使用克氏针临时固定,同时采用斯氏针牵引,纠正内翻畸形,C 臂机透视复位良好后选用合适微型钢板进行固定,术后仅加压包扎不留置引流管。所有手术均由本研究组成员共同完成。两组患者术后常规使用抗生素 3d,待影像学证实骨折愈合后开始负重。

1.3 评价指标

记录两组患者的手术时间、住院时间和骨折愈合时间。在术后 12 个月时对所有患者进行门诊随访,采用美国足踝外科协会(American Orthopaedic Foot and Ankle Society, AOFAS)踝-后足评分评价术后 12 个月时两组患者的恢复情况^[9],该评分主要包括 9 个考察项目,总分为 100 分,得分越高代表踝-后足功能越好,总分 90-100 分为优,75-89 分为良,50-74 分为可,50 分以下为差,优良率=(优例数+良例数)/总例数×100%。拍摄 X 线片,在医学影像信息系统上测量患者术前、术后 12 个月时的 Böhler 角及 Gissane 角,采用视觉模拟评分法(Visual analogue scale, VAS)评估术前、术后 12 个月时患者的主观疼痛^[10],VAS 满分为 10 分,得分越高代表疼痛感越明显。记录两组患者术后出现的并发症。

1.4 统计学方法

应用 IBM SPSS Statistics 23 统计软件分析数据,其中计数资料采用率的形式表示,进行卡方检验;计量资料经检验均符合正态分布,采用均值±标准差表示,采用 t 检验。检验水准 α 值取双侧 0.05。

2 结果

2.1 两组患者的手术时间、住院时间和骨折愈合时间比较

两组患者的手术时间和骨折愈合时间比较无统计学差异 ($P>0.05$),观察组患者的住院时间短于对照组 ($P<0.05$),如表 1 所示。

表 1 两组患者的手术时间、住院时间和骨折愈合时间比较($\bar{x}\pm s$)

Table 1 Comparison of operative time, hospitalization time and fracture healing time between two groups of patients($\bar{x}\pm s$)

Groups	n	Operation time(min)	Hospitalization time(d)	Fracture healing time(w)
Control group	43	81.39± 7.26	13.57± 2.18	12.46± 1.24
Observation group	43	83.48± 6.92	12.08± 2.09	11.97± 1.13
t		1.366	3.235	1.915
P		0.175	0.002	0.059

2.2 两组患者术后踝 - 后足功能优良率比较

如表 2 所示。

观察组患者术后踝 - 后足功能优良率高于对照组($P<0.05$),

表 2 两组患者术后踝 - 后足功能优良率比较 [例(%)]

Table 2 Comparison of excellent and good rate of sputum-hind foot function in two groups of patients after operation [n(%)]

Groups	n	Excellent	Good	Passable	Bad	Excellent and good rate
Control group	43	12(27.91)	20(46.51)	10(23.26)	1(2.33)	32(74.42)
Observation group	43	18(41.86)	21(48.84)	4(9.30)	0(0.00)	39(90.70)
χ^2						3.957
P						0.047

2.3 两组患者术前、术后 12 个月时的 VAS 评分、Böhler 角及 Gissane 角比较

角及 Gissane 角比较无差异($P>0.05$), 术后 12 个月时两组患者的 VAS 评分均明显低于术前, Böhler 角及 Gissane 角明显高于术前($P<0.05$), 如表 3 所示。

在术前和术后 12 个月时, 两组患者的 VAS 评分、Böhler

表 3 两组患者术前、术后 12 个月时的 VAS 评分、Böhler 角及 Gissane 角比较($\bar{x}\pm s$)Table 3 Comparison of VAS score, Böhler angle and Gissane angle between two groups before operation and 12 months after operation($\bar{x}\pm s$)

Groups	n	VAS score(scores)		Böhler angle(°)		Gissane angle(°)	
		Before operation	12 months after operation	Before operation	12 months after operation	Before operation	12 months after operation
Control group	43	7.42± 1.14	1.82± 0.48*	13.48± 3.06	32.49± 3.53*	102.53± 6.08	114.98± 6.72*
Observation group	43	7.31± 1.03	1.61± 0.52*	14.12± 3.17	32.93± 3.12*	101.24± 5.89	115.86± 6.57*
t		0.469	1.946	0.953	0.612	0.999	0.614
P		0.640	0.055	0.344	0.542	0.321	0.541

Note: compared with before operation, * $P<0.05$.

2.4 两组患者的术后并发症比较

18.60%(8/43)($P<0.05$), 如表 4 所示。

观察组患者术后并发症发生率 2.33%(1/43) 低于对照组

表 4 两组患者的术后并发症比较 [例(%)]

Table 4 Comparison of postoperative complications between the two groups of patients [n(%)]

Groups	n	Incisional infection	Incision dehiscence after suture removal	Sural nerve injury	Traumatic arthritis	Incidence rate of postoperative complications
Control group	43	2(4.65)	1(2.33)	2(4.65)	3(6.98)	8(18.60)
Observation group	43	1(2.33)	0(0.00)	0(0.00)	0(0.00)	1(2.33)
χ^2						6.081
P						0.014

3 讨论

跟骨骨折占跗骨骨折的 60%左右, 通常会累及距下关节面, 周围的软组织也会有不同程度的损伤, 临床上的治疗原则是最大限度地复位距下关节面, 矫正跟骨内翻畸形, 恢复患者的跟骨长、宽、高度, 改善患者的踝 - 后足功能^[11-13]。传统的切开复位内固定是临床治疗跟骨骨折的主要手术方法, 过往此类手术多采用外侧 "L" 形入路, 虽然采用该入路进行切开复位内固定可取得较好的临床疗效, 但也存在明显的弊端^[14, 15]。同时, 尽管在外侧 "L" 形入路中会全用厚皮瓣及无接触技术保护软组织, 但术后并发症发生率仍然较高。Çolak 等的研究发现^[16], 外

侧 "L" 形入路治疗跟骨骨折的深部组织感染的发生率为 5.6%, 浅层组织感染的发生率为 19.7%, 术后伤口裂开的发生率为 27.0%。跗骨窦入路是切开复位内固定治疗的另一种常用入路方式, 其手术切口较小, 符合微创的理念, 且临床疗效显著^[17, 18]。目前在采用切开复位内固定治疗跟骨骨折时选用何种入路方式依然存在争议, 张元松等人认为^[19], 跗骨窦入路与外侧 "L" 形入路切开复位内固定治疗跟骨骨折的疗效相当, 但前者可减少并发症发生率, 而 Veltman ES 等的研究认为^[20], 跗骨窦入路无法充分暴露跟骨后外侧面, 会在一定程度上增加术中恢复跟骨高度和宽度的难度。

本研究结果显示, 两组患者的手术时间和骨折愈合时间比

较无统计学差异,但观察组患者的住院时间短于对照组,Basile A 等人的研究显示^[21],跗骨窦入路切开复位内固定治疗跟骨骨折的手术时间短于外侧 "L" 形入路,与本研究结果不一致。分析造成此差异的原因可能是因为手术时间受到手术医师对手术技巧的掌握程度和临床经验的影响,因此不同的手术医师在行同一手术时手术时间会存在一定的差异。观察组患者的住院时间更短,这可能和跗骨窦入路切开复位内固定治疗跟骨骨折手术切口较小,手术给患者造成的创伤更小有关,此外外侧 "L" 形入路需大范围剥离软组织,导致患者术后疼痛明显,会在一定程度上延长住院时间。另外,本研究结果还显示,观察组患者术后踝 - 后足功能优良率高于对照组,而两者患者的 VAS 评分、Böhler 角及 Gissane 角比较无明显差异,这说明两种入路方式治疗跟骨骨折矫正 Böhler 角及 Gissane 角、术后疼痛方面无明显差异,但跗骨窦入路能更有效地改善患者的踝 - 后足功能。这可能是由于跗骨窦入路对软组织损伤小,患者的术后引流量少,有利于患者尽早进行功能锻炼,进而利于患者的关节功能恢复。庞渊等人的研究也显示^[22],与外侧 "L" 形入路相比,跗骨窦入路可更有效地改善患者的踝 - 后足功能,与本研究结果一致。在术后并发症方面,观察组患者术后并发症发生率低于对照组,可见与外侧 "L" 形入路比较,跗骨窦入路可更有效的降低跟骨骨折患者术后并发症发生率。跗骨窦入路与外侧 "L" 形入路在治疗跟骨骨折时,存在以下几点优势:(1)跗骨窦入路可以避免足跟外侧血管,能有效地降低对外侧皮肤软组织血供的损伤^[23];(2)跗骨窦入路切口行走于腓骨长、短肌腱的上缘,可避开下方腓肠神经的分支^[24];(3)跗骨窦入路骨膜剥离少,对骨折块血运影响小^[25];(4)跗骨窦入路软组织损伤少,对软组织要求不高,可有效避免大面积软组织剥离和牵拉所导致的软组织并发症^[26];(5)跗骨窦入路切口小,出血少,可达到微创的效果^[27]。从跗骨窦入路的以上特点可知,该入路对软组织损伤小,对外侧皮瓣的血运干扰小,因此其可有效减少术后并发症^[28]。Wang Z 等人的研究显示^[29],跗骨窦入路切开复位内固定治疗跟骨骨折未发生切口并发症,而李培源等人的研究显示^[30],外侧 "L" 形入路治疗跟骨骨折的术后并发症发生率为 18.2%,且 Sanders 分型越高其术后并发症的发生率也越高,可见跗骨窦入路可以更有效地减少术后并发症的发生。

综上所述,跗骨窦入路切开复位内固定与外侧 "L" 形入路切开复位内固定均可有效治疗跟骨骨折,但跗骨窦入路的住院时间短、术后并发症少,且可更有效地改善踝 - 后足功能,另外跗骨窦入路手术切口小,符合微创的理念,因此在治疗跟骨骨折上存在一定的优势。

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