

· 临床研究 ·

应用经髌上入路交锁髓内钉技术治疗胫骨骨折

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【摘要】 目的:探讨应用经髌上入路交锁髓内钉技术治疗胫骨骨折的短期疗效。方法:2016 年 1 月至 2018 年 6 月采用交锁髓内钉手术治疗 80 例胫骨骨折患者,根据手术入路不同分为观察组(经髌上入路)和对照组(经髌韧带入路)。其中观察组 40 例,男 28 例,女 12 例,年龄 28~67(46.70±10.34)岁;对照组 40 例,男 30 例,女 10 例,年龄 31~69(49.38±10.74)岁。记录并比较分析两组患者手术时间,切口长度,术中 X 线机透视次数,术中失血量,骨折愈合时间,术后主动直腿抬高(straight leg raise, SLR)时间,住院时间,膝痛视觉模拟评分(visual analogue scale, VAS),膝关节疼痛率,术后美国特种外科医院(Hospital for Special Surgery, HSS)膝关节评分等指标。结果:全部病例获得随访,时间 19~38(24.60±4.52)个月。观察组手术时间(53.83±7.01) min,切口长度(3.98±0.83) cm,术中 X 线机透视次数(18.90±1.75)次,骨折愈合时间(10.03±0.89)周,术后 SLR 时间(1.19±0.25) d,住院时间(6.73±1.06) d 均优于对照组($P<0.05$)。末次随访,根据 HSS 评分评估疗效,观察组优 34 例,良 5 例,可 1 例,差 0 例;对照组优 25 例,良 9 例,可 6 例,差 0 例;观察组疗效优于对照组($P<0.05$)。结论:采用经髌上入路交锁髓内钉内固定治疗胫骨骨折,具有创伤小、膝关节功能恢复更好等优点,可获得更加满意的临床效果,可进一步广泛应用。

【关键词】 胫骨骨折; 骨折固定术,髓内; 外科手术

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A follow up study on the treatment of tibial fractures with intramedullary interlocking nail through the suprapatellar approach TANG Hui-bin, SUN Zhen-guo, WENG Wei, XU Xu-chun, and MIN Ji-kang. Department of Orthopaedics, the First People's Hospital of Huzhou, Osteoporotic Osteopathy Prevention and Treatment Center in Northern Zhejiang, Huzhou 313000, Zhejiang, China

ABSTRACT Objective: To investigate the short-term effect of suprapatellar interlocking intramedullary nail in the treatment of tibial fractures. **Methods:** Eighty patients with tibial fractures treated from January 2016 to June 2018 were treated with interlocking intramedullary nail, who were divided into observation group (suprapatellar approach) and control group (patellar ligament approach) according to different surgical approaches. There were 40 cases in the observation group, including 28 males and 12 females, aged 28 to 67 years with a mean of (46.70±10.34) years. There were 40 cases in the control group, including 30 males and 10 females, aged 31 to 69 years with a mean of (49.38±10.74) years. The operation time, incision length, intraoperative C-arm X-ray fluoroscopy times, intraoperative blood loss, fracture healing time, postoperative active straight leg raise (SLR) time, hospital stay, visual analogue scale (VAS), knee pain rate and postoperative Hospital for Special Surgery (HSS) score were recorded and compared between two groups. **Results:** All the patients were followed up, and the duration ranged from 19 to 38 months, with an average of (24.60±4.52) months. In the observation group, the operation time was (53.83±7.01) min; the incision length was (3.98±0.83) cm; the number of intraoperative C-arm X-ray fluoroscopy was (18.90±1.75) times; the fracture healing time was (10.03±0.89) weeks; the postoperative active SLR time was (1.19±0.25) days; and the hospital stay was (6.73±1.06) days. The above indexes were better than those in the control group ($P<0.05$). In the latest follow-up, 34 cases got an excellent result, 5 good, 1 fair and 0 poor in the observation group. In the control group, 25 cases got an excellent result, 9 good, 6 fair and 0 poor. The curative effect of the observation group was better than that of the control group ($P<0.05$). **Conclusion:** The treatment of tibial fractures with suprapatellar interlocking intramedullary nail has the advantages of less trauma and better recovery of knee function. It can obtain more satisfactory clinical results and can be further widely used.

KEYWORDS Tibial fractures; Fracture fixation, intramedullary; Surgical procedures, operative

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交锁髓内钉内固定是目前治疗胫骨干骨折的金标准,其主要优势是闭合复位,中心固定,对骨折端的软组织损伤小,利于骨折愈合。目前临床多采用经髌韧带入路切口,术中进针需在膝关节极度屈曲位

下操作,骨折端维持复位较困难,术后膝前疼痛发生率高而逐渐为诟病^[1-3]。针对这一问题,Tornetta 等^[4]率先提出经髌上入路行交锁髓内钉治疗胫骨干骨折,半伸膝位下易于维持骨折端复位,保护髌韧带完整,还能减低术后膝前疼痛发生及缩短手术时间,有利于患者术后膝关节功能快速恢复,可有效避免经髌韧带入路的不足,是符合微创与快速康复治疗理念的一种微创手术入路。查阅文献资料发现,对于经髌上入路行交锁髓内钉治疗胫骨干骨折的临床效果显著^[5-7],但作为一种新兴的微创手术技术,尚缺乏较长时间的随访观察研究论证。鉴于此,笔者自 2016 年 1 月至 2018 年 6 月对收治的 80 例胫骨干骨折的患者,分别采用经髌上入路与传统经髌韧带入路行交锁髓内钉内固定手术治疗,分析两种治疗方式的临床应用价值,旨在为微创胫骨干骨折治疗的发展提供数据参考,现报告如下。

1 资料与方法

1.1 病例选择

纳入标准:(1)DR 检查明确单侧胫骨骨折诊断,有髓内钉固定指征。(2)受伤前膝关节功能良好。(3)患者及家属对治疗方案知情同意。排除标准:(1)骨折累及关节面者。(2)术前膝关节疼痛、功能不良者。(3)开放性骨折患者。(4)不能配合完成随访者。

1.2 临床资料

对 2016 年 1 月至 2018 年 6 月在浙江省湖州市第一人民医院住院并接受交锁髓内钉治疗的 80 例胫骨干骨折患者进行回顾性研究,男 52 例,女 28 例,年龄 28~69 岁。根据手术入路不同分为观察组(经髌上入路)和对照组(经髌韧带入路),其中经髌上入路组 40 例,男 28 例,女 12 例;年龄 28~67 (46.70±10.34)岁;左侧 24 例,右侧 16 例;骨折 AO 分型,A1 型 18 例,A2 型 12 例,A3 型 3 例,B1 型 5 例,C2 型 2 例。经髌韧带入路组 40 例,男 30 例,女 10 例;年龄 31~69(49.38±10.74)岁;左侧 19 例,右侧 21 例;骨折 AO 分型,A1 型 16 例,A2 型 7 例,A3 型 2 例,B1 型 9 例,B2 型 6 例。本研究经浙江省湖州市第一

人民医院伦理委员会批准(编号:20160001),患者知情同意后实施。两组患者临床资料比较差异均无统计学意义,具有可比性($P>0.05$),见表 1。

1.3 治疗方法

本组患者手术均由同一位主刀医师完成,均使用施乐辉(美国 Smith &Nephew 公司)医疗公司提供的髓内钉内固定器械,在全身麻醉、止血带下完成。

1.3.1 髌上入路组 患者平卧位,膝关节屈曲 15°~30°,于髌骨上极约 2 横指处做一长约 3 cm 纵行切口,分离股四头肌至髌上囊,切关节囊,经髌骨下方沿股骨滑车沟插入操作保护套筒进入胫骨平台“安全区域”。经套筒穿入导针行胫骨近端开口定位,正侧位 C 形臂 X 线机透视确认进针点良好准确,沿导针对胫骨近端行开口扩髓。复位骨折后,经套筒插入球形导丝,让导丝通过骨折端进入胫骨远端软骨下骨部位。经套筒沿导丝扩髓至比髓内钉直径大 1.0 mm,测定髓内钉长度,插入髓内钉。安装远端瞄准器辅助下置入 2~3 枚远端锁钉,回敲髓内钉加压骨折端,在近端瞄准装置引导下置入 2~3 枚近端锁钉,拧入钉尾螺帽,用生理盐水溶液冲洗后,缝合切口,适当加压包扎。典型病例见图 1-3。

1.3.2 经髌韧带入路组 患者平卧位,屈曲膝关节 120°~130°,由髌骨下极至胫骨结节处做一长 5~6 cm 的纵行切口,锐性分离髌韧带,用开口器于胫骨近端开口后,复位骨折端,将导针经髓腔通过骨折端至胫骨远端软骨下骨部位。沿导丝依次扩髓后,根据患者情况置入合适长度与直径的髓内钉,分别打入远端、近端锁钉,透视满意后仔细冲洗伤口,彻底止血,逐层缝合、包扎。

1.4 观察项目与方法

记录手术时间,髌上及髌下切口长度,术中 C 形臂 X 线机透视次数,术中失血量,骨折愈合时间,术后主动直腿抬高(straight leg raise,SLR)时间,住院时间,膝痛视觉模拟评分(visual analogue scale,VAS),膝关节疼痛率,术后美国特种外科医院(Hospital for Special Surgery,HSS)膝关节评分^[8]等数据。

表 1 交锁髓内钉两种手术入路治疗胫骨骨折患者的术前临床资料比较

Tab.1 Comparison of clinical data in patients with tibial fractures treated with interlocking intramedullary nailing using two surgical approaches

组别	例数	性别(例)		年龄 ($\bar{x}\pm s$,岁)	侧别(例)		致伤原因(例)			骨折 AO 分型(例)						
		男	女		左	右	车祸伤	坠落伤	跌倒伤	压砸伤	A1	A2	A3	B1	B2	C2
观察组	40	28	12	46.70±10.34	24	16	15	13	5	7	18	12	3	5	0	2
对照组	40	30	10	49.38±10.74	19	21	16	15	4	5	16	7	2	9	6	0
检验值		$\chi^2=0.063$		$t=-1.135$	$\chi^2=0.805$			$\chi^2=0.620$			$\chi^2=10.776$					
P 值		0.802		0.260	0.370			0.892			0.056					

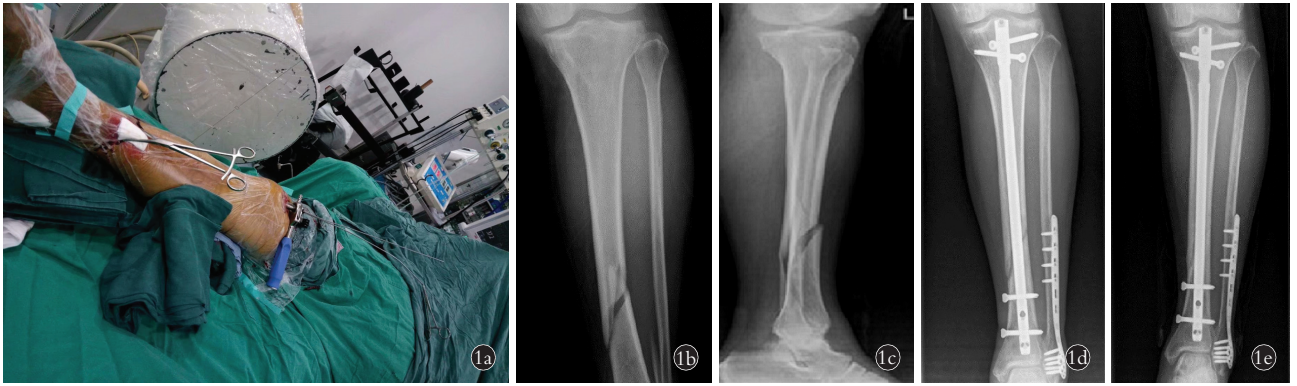


图 1 患者,男,51 岁,左胫腓骨骨折 **1a**. 经髌上入路行髓内钉内固定手术治疗术中照片 **1b,1c**. 术前左胫腓骨正侧位 X 线片 **1d**. 术后 2 周时复查左胫腓骨 X 线片 **1e**. 术后 6 周复查左胫腓骨 X 线片,可见骨折端连续性骨痂通过,骨折线模糊 **1f,1g**. 术后 10 周复查左胫腓骨 X 线正侧位,可见骨折完全愈合

Fig.1 An 51-year-old male, fracture of the left tibia and fibula **1a**. Intraoperative photos of intramedullary nail fixation via suprapatellar approach **1b,1c**. Preoperative AP and lateral X-ray films of left tibia and fibula **1d**. Radiographic examination of left tibia and fibula was performed 2 weeks after surgery **1e**. Six weeks after surgery, the left tibia-fibula X-ray was reexamined, showing continuous callus passing through the fracture end and blurred fracture line **1f,1g**. Anteroposterior and lateral X-ray films of the left tibia and fibula 10 weeks after surgery revealed complete healing of the fracture

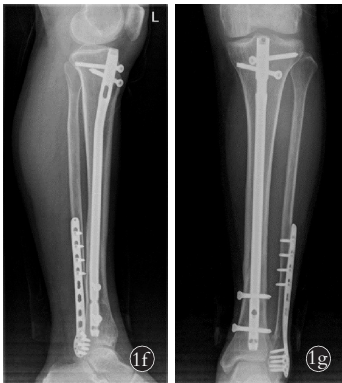


图 2 患者,女,49 岁,右胫骨多段粉碎性骨折 **2a**. 经髌上入路行髓内钉内固定手术治疗术中照片 **2b,2c**. 术前右胫腓骨上段及下段 X 线片 **2d**. 术后 2 周时复查右胫腓骨 X 线片 **2e**. 术后 6 周复查右胫腓骨 X 线片,可见骨折端连续性骨痂通过,骨折线模糊 **2f,2g**. 术后 10 周复查右胫腓骨正侧位 X 线片,可见骨折基本愈合

Fig.2 An 49-year-old female patient with multiple comminuted fractures of the right tibia **2a**. Intraoperative photos of a suprapatellar approach with intramedullary nail fixation **2b,2c**. Preoperative X-ray of the upper and lower segments of the right tibia and fibula **2d**. Radiographic examination of right tibia and fibula was performed 2 weeks after surgery **2e**. Radiographic examination of right tibiofibula 6 weeks after surgery showed continuous callus passing through the fracture end and blurred fracture line **2f,2g**. Retrospective examination of right tibia and fibula 10 weeks after surgery showed that the fracture was basically healed

1.5 疗效评价方法

采用 HSS 膝关节评分^[8],从术后膝关节疼痛、活动度、功能、肌力、屈曲畸形、稳定性等项目来评分膝关节,分值越高代表膝关节恢复越好。HSS 评价标准分为 4 个等级:优为 90~100 分,良为 80~89 分,可为 70~79 分,差为 <70 分。

1.6 统计学处理

采用 SPSS 17.0 软件对所得数据进行统计学处理,两组患者性别、侧边、致伤原因、骨折 AO 分型及术后 1 年疼痛率及 HSS 评分优良率采用 χ^2 检验;年龄、切口长度、透视次数、手术时间、失血量、住院时间、骨折愈合时间及术后 SLR 时间等采用 t 检验;膝



图 3 患者,女,54 岁,左胫骨上段骨折 **3a**. 经髌上入路行髓内钉内固定手术治疗术中照片 **3b**. 术前左胫腓骨正位 X 线片 **3c**. 术后 4 周时复查左胫腓骨 X 线片 **3d**. 术后 6 周复查左胫腓骨 X 线片,可见骨折端连续性骨痂通过 **3e**. 术后 8 周复查可见大量连续性骨痂,骨折线模糊 **3f,3g**. 术后 12 周复查左胫腓骨正侧位 X 线片,可见骨折完全愈合

Fig.3 An 54-year-old female patient with a fracture of the upper left tibia **3a**. Intraoperative photos of the treatment with intramedullary nail fixation via the suprapatellar approach **3b**. Preoperative orthotopic X-ray of the left tibia and fibula **3c**. Radiographic examination of left tibia and fibula was performed 4 weeks after surgery **3d**. X-rays of the left tibia and fibula were reexamined 6 weeks after surgery, showing continuous callus passing through the fracture end **3e**. A large number of continuous callus and blurred fracture line were observed 8 weeks after surgery **3f,3g**. Anteroposterior and lateral X-ray examination of the left tibia and fibula 12 weeks after surgery revealed complete fracture healing

关节 VAS 评分及 HSS 评分组间比较采用重复测量资料的方差分析。以 $P < 0.05$ 为差异有统计学意义。

2 结果

本组患者均获得有效随访,时间 19~38(24.60±4.52)个月。术中观察指标比较:观察组手术时间、切口长度、术中 X 线透视次数均优于对照组($P < 0.05$);两组患者术中失血量比较,差异无统计学意义($P > 0.05$),见表 2。术后观察指标比较:观察组患者骨折愈合时间、术后 SLR 时间,住院时间等均优于对照组($P < 0.05$),见表 3。观察组患者术后 2 周、1 个月时的 VAS 优于对照组($P < 0.05$);术后 6 个月、1 年时的 VAS 及术后膝关节疼痛发生率差异无统计学意义($P > 0.05$),见表 4。观察组患者术后 2 周、1 个月、6 个月及 1 年时的 HSS 评分均优于对照组 ($P < 0.05$),见表 5;末次随访时根据膝关节 HSS 评分评定疗效,观察组优于对照组($P < 0.05$),见表 6。

3 讨论

3.1 经髌上入路手术的应用现状及优势

应用经髌上入路行髓内钉内固定手术治疗胫骨骨折已经进行较深刻的研究,与传统经髌韧带入路手术相比展现出较多优势。传统经髌韧带入路技术的弊端主要在于两个方面:第一,术中需极度屈曲膝关节,这种状态下骨折端维持复位困难,往往需多次复位,对骨折端软组织损伤大,增加了骨折不愈合及延迟愈合的风险,且术中透视相对困难,透视次数也较多^[9-10]。第二,术后膝关节疼痛发生率较高,原因在

表 2 两种手术入路交锁髓内钉治疗胫骨骨折患者术中观察指标比较($\bar{x} \pm s$)

Tab.2 Comparison of intraoperative observation indexes of interlocking intramedullary nail in the treatment of tibial fracture using two surgical approaches($\bar{x} \pm s$)

组别	例数	手术时间 (min)	切口长度 (cm)	失血量 (ml)	X 线透视次数(次)
观察组	40	53.83±7.01	3.98±0.83	85.50±6.39	18.90±1.75
对照组	40	62.75±6.26	5.40±0.59	87.75±6.30	20.48±1.88
t 值		-6.007	-8.836	-1.587	-3.876
P 值		0	0	0.117	0

表 3 两种手术入路交锁髓内钉治疗胫骨骨折患者术后观察指标比较($\bar{x} \pm s$)

Tab.3 Comparison of postoperative indexes of patients with tibial fracture treated with interlocking intramedullary nailing using two surgical approaches($\bar{x} \pm s$)

组别	例数	骨折愈合时间(周)	SLR 时间(d)	住院时间(d)
观察组	40	10.03±0.89	1.19±0.25	6.73±1.06
对照组	40	11.05±1.04	1.59±0.41	7.58±1.55
t 值		-4.742	-5.33	-2.86
P 值		0	0	0.005

于极度屈曲膝关节使伸膝复合体承受过度的牵拉力而受伤^[11-12]。鉴于此,髌上入路却避免了此类问题,因此在临床得到了广泛应用。经髌上入路手术不损

表 4 两种手术入路交锁髓内钉治疗胫骨骨折患者术后不同时间 VAS 及术后 1 年时膝关节疼痛率比较

Tab.4 Comparison of postoperative VAS and knee pain rate at 1 year after operation in patients with tibial fracture treated by interlocking intramedullary nail with two surgical approaches

组别	例数	VAS 评分($\bar{x}\pm s$, 分)					膝关节疼痛(例)
		术前	术后 2 周	术后 1 个月	术后 6 个月	术后 1 年	
观察组	40	6.84±1.06	4.90±0.84 ^{a1}	2.93±0.62 ^{b1}	2.23±0.42 ^{c1}	1.38±0.49 ^{d1}	2
对照组	40	6.79±1.12	5.60±1.01 ^{a2}	3.63±0.77 ^{b2}	2.30±0.46 ^{c2}	1.45±0.50 ^{d2}	7
检验值		$t=0.087$	$t=-3.373$	$t=-4.476$	$t=-0.755$	$t=-0.675$	$\chi^2=2.003$
P 值		0.824	0.001	0	0.452	0.502	0.157

注：与术前比较，^{a1} $t=20.147, P<0.05$ ；^{a2} $t=17.900, P>0.05$ ；^{b1} $t=21.770, P<0.05$ ；^{b2} $t=27.100, P<0.05$ ；^{c1} $t=30.500, P<0.05$ ；^{c2} $t=29.700, P<0.05$ ；^{d1} $t=35.800, P<0.05$ ；^{d2} $t=36.410, P<0.05$ 。观察组手术前后不同时间点间 VAS 比较， $F=289.001, P<0.01$ ；对照组手术前后不同时间点间 VAS 比较， $F=191.645, P<0.01$

Note: Compared with preoperation data, ^{a1} $t=20.147, P<0.05$; ^{a2} $t=17.900, P>0.05$; ^{b1} $t=21.770, P<0.05$; ^{b2} $t=27.100, P<0.05$; ^{c1} $t=30.500, P<0.05$; ^{c2} $t=29.700, P<0.05$; ^{d1} $t=35.800, P<0.05$; ^{d2} $t=36.410, P<0.05$. Comparison of VAS among different time points in the observation group, $F=289.001, P<0.01$; Comparison of VAS among different time points in the control group, $F=191.645, P<0.01$

表 5 两种手术入路交锁髓内钉治疗胫骨骨折患者术后 HSS 膝关节评分比较($\bar{x}\pm s$, 分)

Tab.5 Comparison of HSS scores of the knee joint in patients with tibial fracture treated with interlocking intramedullary nailing of two surgical approaches($\bar{x}\pm s$, score)

组别	例数	术前	术后 2 周	术后 1 个月	术后 6 个月	术后 1 年
观察组	40	24.78±4.11	67.38±1.67 ^{e1}	72.23±6.25 ^{f1}	93.75±2.19 ^{g1}	95.13±2.10 ^{h1}
对照组	40	25.69±4.09	65.18±1.69 ^{e2}	68.58±6.15 ^{f2}	71.75±2.98 ^{g2}	93.40±2.45 ^{h2}
t 值		0.095	5.843	2.633	3.422	3.381
P 值		0.746	0	0.01	0.001	0.001

注：与术前比较，^{e1} $t=29.800, P<0.05$ ；^{e2} $t=34.750, P<0.05$ ；^{f1} $t=36.910, P<0.05$ ；^{f2} $t=38.500, P<0.05$ ；^{g1} $t=37.410, P<0.05$ ；^{g2} $t=39.600, P<0.05$ ；^{h1} $t=41.980, P<0.05$ ；^{h2} $t=39.740, P<0.05$ 。观察组手术前后不同时间点间 HSS 评分比较， $F=174.011, P<0.01$ ；对照组手术前后不同时间点间 HSS 评分比较， $F=315.211, P<0.01$

Note: Compared with preoperation data, ^{e1} $t=29.800, P<0.05$; ^{e2} $t=34.750, P<0.05$; ^{f1} $t=36.910, P<0.05$; ^{f2} $t=38.500, P<0.05$; ^{g1} $t=37.410, P<0.05$; ^{g2} $t=39.600, P<0.05$; ^{h1} $t=41.980, P<0.05$; ^{h2} $t=39.740, P<0.05$. Comparison of HSS score among different time points in the observation group, $F=174.011, P<0.01$; Comparison of HSS score among different time points in the control group, $F=315.211, P<0.01$

表 6 两种手术入路交锁髓内钉治疗胫骨骨折患者末次随访时疗效比较(例)

Tab.6 Comparison of excellent and good rates of knee HSS scores in patients with tibial fracture treated with interlocking intramedullary nailing of two surgical approaches at the last follow-up(case)

组别	例数	优	良	可	差
观察组	40	34	5	1	0
对照组	40	25	9	6	0
Z 值		6.087			
P 值		0.048			

伤髌韧带,在术中操作时,将膝关节屈曲 15°~30°,置于斜“T”形垫上操作,患肢予以牵引、旋转等操作即可复位骨折端,对伸膝装置承受的牵拉力较小,对骨折端软组织损伤较小,利于患者术后膝关节功能恢

复及骨折愈合,符合当前快速康复及微创手术的治疗理念。

Sutphen 等^[13]研究认为经髌上入路髓内钉手术方案对胫骨骨折端周围软组织损伤更小,可有效避免肢体肿胀、并发感染等不良反应。Wang 等^[14]认为经髌上入路操作将膝关节处伸直状态时,髌韧带和近端骨块处于放松的状态,易于维持骨折复位稳定和内固定的操作,减少髓内钉在置入过程中从侧皮质穿出的危险,提高了手术安全性,缩短了手术时间。Schiapparelli 等^[15]研究认为经髌上入路闭合复位髓内钉内固定术,对半月板或前交叉韧带等重要膝关节结构损害程度较低,损伤概率低,且其他感染、膝关节疼痛等并发症发生率更低。

3.2 经髌上入路手术的随访疗效分析及笔者经验

本研究结果显示,经髌上入路患者手术时间、切口长度、术中 X 线机透视次数均优于经髌韧带组

($P<0.05$),说明经髌上入路术中操作步骤简单,手术创伤较小,手术安全性高。术后观察指标比较:经髌韧带入路组患者骨折愈合时间、SLR 时间、住院时间等均优于对照组,术后 2 周、1 个月时的 VAS 优于对照组,术后末次随访时膝关节 HSS 评分优良率情况优于对照组($P<0.05$),说明手术操作对于伸膝装置及骨折端软组织损伤较小,患者术后恢复速度更快。

笔者综合评估术中及术后观察指标,并结合自身手术操作经验认为,尽管髌上入路手术治疗效果显著优于经髌韧带入路,但仍有以下几个方面需要注意:第一,对于拟行经髌上入路手术的患者,需严格选择合适的患者,关键在于评估髌股间隙,对于髌股间隙显著狭窄的患者不建议行经髌上入路,术中可能操作套筒置入困难,勉强置入操作套管可能造成髌股关节软骨损伤,不利于术后康复,还会造成手术时间延长。第二,重视术前病情谈话交代,尤其是对于骨折愈合后必须行髓内钉取出的患者,经原髌上入路手术切口行髓内钉取出术相对较困难,且胫骨髓腔内容物有造成关节腔内感染的风险,故多采用髌旁入路进行取出髓内钉,与通常内固定取出术采用原切口有所不同需交代清楚,避免不必要的纠纷。第三,建议具有一定髓内钉技术操作经验的医师主刀,可严格把控术中操作步骤,避免不必要的手术步骤及可能造成损伤的动作。

综上所述,采用经髌上入路行髓内钉内固定治疗胫骨骨折,较经髌韧带入路可获得更加满意的临床治疗效果,建议临床医师在掌握一定操作技术的基础上,向微创及快速康复的方向进一步发展。

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