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微创后入路治疗肩胛骨骨折的临床研究 *

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摘要 目的:探讨微创后入路手术治疗肩胛骨骨折的临床疗效。**方法:**选取 2009 年 6 月~2014 年 1 月在我院接受后路内固定手术治疗的 40 例肩胛骨骨折,治疗组 20 例,行微创后入路内固定术,对照组 20 例,行 Judet 入路内固定术。比较两组间手术时间、术中出血量、切口总长度及术后肩关节功能 Constant 评分。**结果:**40 例患者均获随访,随访时间 12~36 个月,平均 16.5 个月。治疗组手术时间、术中出血量、切口总长度均优于对照组(均 $P<0.05$),术后 6 个月肩关节功能:治疗组优 15 例,良 3 例,可 1 例,差 1 例,优良率 90%,对照组优 14 例,良 2 例,可 3 例,差 1 例,优良率 80%。两组优良率比较,差异有统计学意义($P<0.05$)。两组均无感染、骨折延迟愈合或不愈合。对照组 1 例发生肩胛上神经卡压。**结论:**微创后入路手术操作简单,创伤小,恢复快,是一种安全有效的肩胛骨骨折手术入路。

关键词:肩胛骨骨折;微创后入路;内固定术

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Clinical Research of the Posterior Minimally Invasive Approach for Scapula Fracture*

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ABSTRACT Objective: To investigate the effect of operative treatment of scapular fractures through the posterior minimally invasive approach. **Methods:** From June 2009 to January 2014, 40 patients of scapular fractures were treated by open reduction and internal fixation through the posterior approach. 20 cases were performed the posterior minimally invasive approach, the other 20 cases were performed the Judet approach as control. Such indexes as the incisional length, the total operative time, intraoperative bleeding volume were compared between the two groups. Using a Constant scores of the shoulder function, the postoperative function recovery of shoulder joint was elevated. **Results:** Forty patients were followed up with an average of 16.5 months (range 12 months~36 months). The incisional length, the total operative time, intraoperative bleeding volume in treatment group were less than control ($P<0.05$). According to Constant scores 6 months postoperatively, the excellent and good rate was 90 % in treatment group, and in control group, the excellent and good rate was 80 %, and there was significant difference between two groups ($P<0.05$). There was no delayed union, nonunion, infection in either group. In control group, there was 1 patient that recurred suprascapular nerve entrapment syndrome. **Conclusions:** Compared with Judet approach, the posterior minimally invasive approach has the advantage of less trauma, simple procedure, rapid recovery. Therefore, it is an effective and safe method of scapular fracture.

Key words: Scapular fracture; Minimally invasive surgery; Interfixation

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前言

肩胛骨骨折仅占全身骨折的 1%, 上肢骨折的 3%~5%^[1]。肩胛骨骨折常为高能量损伤,多合并有锁骨骨折、肋骨骨折等

其他部位损伤,早期复位并固定肩胛骨骨折有助于肩关节功能及其他合并伤的恢复,成为近年研究的热点。由于肩胛骨形状不规则,面积大,厚薄不一致,手术显露与固定均有一定难度。既往用 Judet 入路^[2]、改良 Judet 入路等手术方式治疗肩胛骨骨

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折,显露充分,便于复位内固定而被广泛接受。但 Judet 入路存在皮肤切口大,肌肉剥离广,手术创伤大等缺点,一定程度影响其疗效。随着人们对肩胛区解剖研究的深入^[9],以及骨折微创治疗技术与内固定技术的进一步成熟,肩胛骨的微创治疗逐渐用于临床。本研究自 2009 年 6 月至 2014 年 1 月经微创后入路内固定术治疗肩胛骨骨折 20 例,同期 20 例采用 Judet 入路行对照研究,疗效满意,报告如下。

1 材料与方法

1.1 一般资料

自 2009 年 6 月至 2014 年 1 月按入院时间先后将 40 例肩胛骨骨折患者随机分为治疗组和对照组。治疗组 20 例,均为男性,年龄 21~48 岁,平均年龄 31.2 ± 2.33 岁。致伤原因:车祸伤 9 例,坠落 8 例,撞击伤 3 例。对照组 20 例,均为男性,年龄 19~50 岁,平均年龄 33.2 ± 1.62 岁。致伤原因:车祸伤 12 例,坠落伤 6 例,撞击伤 2 例。骨折类型:参照 X 线及三维 CT 检查结果,根据 Hardegger 分型^[4],肩胛骨体骨折 22 例,肩胛颈骨折 16 例,肩胛盂窝骨折 3 例,肩胛盂边缘骨折 3 例,无喙突骨折、肩峰骨折,2 处或以上骨折 21 例。合并伤:合并锁骨骨折 3 例,肋骨骨折 2 例,血气胸 2 例,肱骨干骨折 1 例。比较两组年龄、性别、致伤原因等资料,差异无统计学意义($P>0.05$)。

1.2 手术方法

1.2.1 术前准备 伤后至手术时间 3 d~10 d,平均 7.2 d。术前拍摄肩关节前后位、Y 位 X 线片及 CT 三维重建。

1.2.2 治疗组手术方法 患者均取俯卧位,全麻下消毒铺无菌巾。以骨折为中心设计微创切口。肩胛骨外侧缘切口一般为 1 个,内侧缘切口 1~2 个,视骨折位置组合运用。肩胛骨外侧缘骨折线一般位于或接近肩胛盂颈部,以骨折为中心切开外侧缘 5 cm~7 cm,找到并分离冈下肌与小圆肌间隙,将二者分别拉向

内、外侧,用手指触摸小圆肌止点附近有无动脉搏动,注意勿损伤三边孔发出的旋肩胛动脉,对于旋肩胛动脉上升支可予以结扎。找到骨折端,剥离器于骨膜下向周围推开约 1 cm,以免软组织嵌入。骨折可通过点式复位钳把持复位,或用克氏针辅助提拉复位,骨折复位后用克氏针临时固定。对于肩胛盂骨折,必要时切开一部分后下方关节囊,尽量解剖复位关节内骨折。以内侧骨折线为中心,切开肩胛骨内侧缘,顺冈下肌肌纤维走行钝性分离部分冈下肌,显露并复位骨折。对于复位困难的病例,可同时检视外侧切口内骨折复位情况,以调整骨折位置,克氏针临时固定骨折。C 臂透视骨折复位满意,关节内骨折无台阶、分离,用 3.5 mm 重建接骨板或 2.7 mm 锁定接骨板先固定外侧骨折,再固定内侧骨折,其中外侧骨折线先固定近端的肩胛盂、肩胛颈,再固定远端肩胛体。固定肩胛冈与肩胛体内侧交界处骨折时,需根据模板塑形接骨板,避免反复折弯接骨板导致疲劳断裂。术中 C 臂透视肩关节前后位、Y 位,确认骨折复位及固定情况。

1.2.4 对照组手术方法 体位同治疗组。切口自肩峰沿肩胛冈折向肩胛骨内侧缘,并沿肩胛骨内缘切开至肩胛下角,由内向外骨膜下剥离冈下肌、三角肌至肩胛颈处,将两肌向外侧牵开,注意勿损伤冈孟切迹处的肩胛上神经,显露骨折,直视下复位骨折后用与治疗组相同的接骨板行内固定。其余复位与固定技巧同治疗组。

1.2.5 术后处理 颈腕带悬吊 1 周,1 周内行同侧腕、肘关节功能锻炼,1 周后开始行肩关节被动功能锻炼,4 周后开始主动功能锻炼,锻炼间隙用外展支架固定肩关节于外展 60° 位。

1.3 检测指标及疗效标准

比较两组患者的手术时间、术中出血量、切口长度及术后 6 个月肩关节功能 Constant 评分^[5,6](见表 1)。综合评定疗效。优:90~100 分;良:80~89 分;可:60~79 分;差:0~59 分。

表 1 肩关节功能 Constant 评价标准(分)

Table 1 Constant evaluation of the shoulder functions (scores)

Pain 15	Activities of Daily Living 10	Positioning of Hand 10	Range of motion 40	Power 25
None 15	Full work 4	Up to waist 2	Forward flexion(900)10	V 25
Mild 10	Full recreation/sport 4	Up to xiphoid 4	Lateral flexion(900)10	IV 20
Moderate 5	Unaffected sleep 2	Up to neck 6	External rotation(800)10	III 15
Severe 0		Up to top of head 8	Internal rotation(300)10	II 10
		Above head 10		

Note: Using a Constant scores of the shoulder function, the postoperative function recovery of shoulder joint was elevated: Excellent (90~100 scores), Good (80~89 scores), Fair (60~79 scores), Poor (0~59 scores).

1.4 统计学分析

SPSS 20.0 统计软件进行统计分析,计量资料用均数 $\pm$ 标准差($\bar{x} \pm s$)表示,采用 t 检验,计数资料采用 χ^2 检验。 $P<0.05$ 认为差异有统计学意义。

2 结果

40 例患者均获随访,随访时间 12~36 个月,平均 16.5 个月。治疗组手术时间、术中出血量及切口长度均优于对照组,差异均有统计学意义(均 $P<0.05$),见表 2。术后 6 个月肩关节功能 Constant 评分:治疗组优 15 例,良 3 例,可 1 例,差 1 例,优

良率 90%;对照组优 14 例,良 2 例,可 3 例,差 1 例,优良率 80%。两组优良率比较,差异有统计学意义($P<0.05$),见表 3。

两组均无感染、骨折延迟愈合或不愈合。对照组 1 例发生肩胛上神经卡压,表现为肩周钝痛,向上臂后侧放射,肩外展、外旋乏力,保守治疗后缓解。

3 讨论

目前对于肩胛骨骨折,尤其是肩胛骨体部骨折仍存在保守与手术治疗的争议^[2,7]。随着微创理念与内固定技术的发展,及患者对功能的高要求,手术内固定逐渐被重视^[8]。

表 2 手术时间、术中出血量、切口长度比较($\bar{x} \pm s$)Table 2 Comparison of the incisional length, the total operative time, intraoperative bleeding volume between the two groups($\bar{x} \pm s$)

Group	n	Operative time(min)	Bleeding volume(mL)	Incisional length(cm)
Treatment group	20	50.31 $\pm$ 33.01	105.68 $\pm$ 28.22	12.68 $\pm$ 4.29
Control group	20	80.11 $\pm$ 26.58	257.73 $\pm$ 58.04	26.01 $\pm$ 5.31
t		3.14	2.09*	8.73
P		<0.05	<0.05	<0.05

Note: * The t'-test was used under eterogeneity of variance. There was significant difference between two groups (P<0.05).

表 3 术后 6 个月肩关节功能比较

Table 3 Comparison of the function recovery of shoulder joint at 6 months after the operation

Group	n	Excellent	Good	Fair	Poor	The excellent and good rate (%)
Treatment group	20	15	3	1	1	90*
Control group	20	14	2	3	1	80

Note: There was significant difference between the treatment group and control group, *P<0.05.

肩胛骨分为肩峰、喙突、肩胛盂、肩胛颈及肩胛体,常根据骨折部位进行具体分类。Hardegger 分型[4]临床运用较多,将骨折分为:体部骨折,孟缘骨折,孟窝骨折,解剖颈骨折,外科颈骨折,肩峰骨折,肩胛冈骨折及喙突骨折,Hardegger 分型简单明了,临床运用较多。Ideberg 分型^[9]以肩胛盂为标准,将骨折分为 5 型,其中 I 型为肩胛盂前缘骨折,需经三角肌胸大肌入路手术。而其它四型均可经后路手术。Ideberg 分型中没有对应肩胛突起部位骨折的类型。AO 分型较 Ideberg 分型全面,依据肩胛颈与肩胛体骨折部位与程度进行分型。改进后的 OTA/AO 分型^[10-12]则进一步考虑了骨折的严重程度,在这种分型系统中将肩胛骨骨折分为突起部骨折,肩胛盂骨折和肩胛体骨折,再根据骨折粉碎程度进一步将骨折分为亚型。由于本研究病例涉及肩胛颈、肩胛盂及体部等多处骨折,因此本研究采用 Hardegger 分型。

Judet 入路是肩胛骨骨折的经典手术入路^[13]。其优点是显露广,便于对粉碎性骨折、关节孟后方骨折直视下复位并固定^[14]。Judet 入路的缺点同它的优点一样明显,切口大,出血多,将冈上肌、三角肌全部行骨膜下剥离,组织创伤大,肌肉与切口瘢痕在术后常引起牵掣痛,且影响美观,肩胛上神经易受卡压。本研究中对照组出现 1 例肩胛上神经卡压,分析可能为重新缝合的冈上肌牵拉导致,经理疗、神经营养治疗后好转。改良 Judet 入路虽然缩小了切口,术中为了显露充分,仍需将三角肌自肩胛冈处部分剥离。Gauger 等^[15]首先报道了微创后入路治疗肩胛骨骨折,该入路充分利用了肩胛后区的解剖间隙进行手术设计。微创后入路治疗肩胛骨骨折的主要原理在于:(1)根据骨折部位分别采用小切口,多个小切口组合完成手术;(2)肩胛颈及肩胛盂处骨折在冈下肌与小圆肌间隙内完成,无需剥离三角肌、冈下肌。本研究中治疗组在手术时间、术中出血量及切口长度方面均优于对照组,也说明微创后入路在治疗大多数肩胛骨骨折方面优于传统 Judet 入路。

微创后入路手术治疗肩胛骨骨折要注意以下几点:(1)术前熟悉解剖结构,术中注意保护血管、神经。肩胛后区外侧四边孔、三边孔内有腋神经、旋肱后动脉及旋肩胛动脉等重要结构,在肩胛外侧后入路时,小圆肌应向外侧牵拉保护四边孔内结

构,但避免过度牵拉,以免将旋肩胛动脉暴露于术野后损伤。(2)手术的关键在于肩胛盂、肩胛颈骨折的固定,找到冈下肌与小圆肌间隙,在该间隙内进行复位固定。(3)由于肩胛骨呈扁平状,骨量少,复位后难以维持,在用复位钳把持时需力度适中,避免导致新的骨折^[16]。螺钉应固定于肩胛颈、肩胛骨两侧缘等有足够骨量的区域,同时避免反复钻孔引起钉道松动导致固定失效。接骨板固定肩胛颈、肩胛冈内侧与肩胛体部交界处等弧度较大的部位时应避免反复折弯导致疲劳断裂。(4)术前 X 线检查应包括前后位、Y 位与腋位,CT 三维重建对规划手术具有重要作用^[17-20]。术中 C 臂检查肩关节前后位、Y 位,排除关节内复位不佳、钉头突入关节等情况。

本研究中的微创后入路操作简单,创伤小,恢复快,是一种安全有效的肩胛骨骨折手术入路。

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