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微创改良双纽扣型金属接骨板结合高强度纤维修复喙锁韧带治疗 肩锁关节脱位合并喙锁韧带撕裂的临床研究*

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摘要 目的:探讨微创改良双纽扣型金属接骨板结合高强度纤维修复喙锁韧带治疗肩锁关节脱位合并喙锁韧带撕裂的临床疗效。**方法:**采用前瞻性随机病例对照的研究方法,选取2017年3月~2019年6月我院收治的肩锁关节脱位合并喙锁韧带撕裂患者64例,采用随机数字表法将患者分为两组:对照组(n=32)和观察组(n=32)。对照组的治疗方案为AO锁骨钩钢板内固定,观察组的治疗方案为微创改良双纽扣型金属接骨板结合高强度纤维修复喙锁韧带。比较两组手术相关指标、术后肩关节Constant评分、疼痛视觉模拟评分(VAS)及并发症发生情况。**结果:**观察组手术时间较对照组显著延长,疼痛消失时间及住院费用较对照组降低($P<0.05$),两组术后住院时间比较未见差异($P>0.05$)。观察组术后3个月肩关节VAS评分较对照组降低($P<0.05$),术后3个月及1年观察组肩关节Constant评分均显著高于对照组($P<0.05$)。两组术后3个月、术后1年并发症发生率比较无统计学意义($P>0.05$)。**结论:**微创改良双纽扣型金属接骨板结合高强度纤维修复喙锁韧带治疗肩锁关节脱位合并喙锁韧带撕裂更符合解剖学特点,可减轻肩关节疼痛,促进肩关节功能恢复。

关键词:改良双纽扣型金属接骨板;高强度纤维;肩锁关节脱位;喙锁韧带撕裂;疗效

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Clinical Study of Minimally Invasive Modified Double Button Metal Plate Combined with High-Strength Fiber to Repair Coracoclavicular Ligament in the Treatment of Acromioclavicular Joint Dislocation Combined with Coracoclavicular Ligament Tear*

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ABSTRACT Objective: To investigate the clinical effect of minimally invasive modified double button metal plate combined with high-strength fiber to repair coracoclavicular ligament in the treatment of acromioclavicular joint dislocation combined with coracoclavicular ligament tear. **Methods:** A prospective randomized case-control study was used to select 64 patients with acromioclavicular joint dislocation combined with coracoclavicular ligament tear who were admitted to our hospital from March 2017 to June 2019. Patients were divided into two groups by random number table method: control group (n=32) and observation group (n=32). The treatment plan of the control group was AO clavicular hook plate internal fixation, and the treatment plan of the observation group was minimally invasive modified double button metal plate combined with high strength fiber repair coracoclavicular ligament. Operation related indicators, postoperative shoulder Constant score, visual analogue scale (VAS) and complications were compared between the two groups. **Results:** Compared with the control group, the operation time in the observation group was significantly longer, the pain disappeared time and hospitalization cost were reduced ($P<0.05$), and there was no significant difference in postoperative hospitalization time between the two groups ($P>0.05$). VAS score of shoulder joint in the observation group at 3 months after operation was lower than that of the control group ($P<0.05$), and Constant score of shoulder joint in the observation group at 3 months and 1 year after operation was significantly higher than that in the control group ($P<0.05$). There was no statistical significance in the incidence of complications between the two groups at 3 months and 1 year after operation ($P>0.05$). **Conclusion:** The minimally invasive modified double button metal plate combined with high-strength fiber to repair coracoclavicular ligament in the treatment of acromioclavicular joint dislocation combined with coracoclavicular ligament tear is more consistent with anatomical characteristics, which can relieve shoulder pain, and promote the recovery of shoulder function.

Key words: Modified double button metal plate; High strength fiber; Acromioclavicular joint dislocation; Coracoclavicular ligament tear; Clinical effect

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前言

肩锁关节脱位是一种多发于中青年男性或运动员的骨科常见临床疾病^[1,2],手术治疗常见方法为解剖钢板固定、克氏针结合张力带固定及锁骨钩钢板固定等^[3-5],其中锁骨钩钢板内固定应用在肩关节脱位方面的疗效已得到既往较多学者肯定,但锁骨钩钢板内固定存在并发症发生率(主要有锁骨钩滑脱、肩关节慢性疼痛等)较高、肩峰撞击痛、肩部活动受限等不足^[6-8]。微创双纽扣型金属接骨板结合高强度纤维材料修复是近年来在运动医学领域新兴的仿生学内固定方式,对于韧带修复有着传统内固定方式无法比拟的优点,具有微创、强度高、弹性微动、机械稳定性好、避免二次取出等优势^[9],但也存在钢板规格有限,部分患者存在复位不佳或过度复位等情况。本研究中选取 64 例肩锁关节脱位合并喙锁韧带撕裂患者,探究微创改良双纽扣型金属接骨板结合高强度纤维修复喙锁韧带与传统 AO 锁骨钩钢板内固定方式的优劣,现报道如下。

1 资料与方法

1.1 一般资料

将 2017 年 3 月~2019 年 6 月我院收治的肩锁关节脱位合并喙锁韧带撕裂患者 64 例作为研究对象,纳入标准^[10]:① 年龄 18~60 岁;② 完全性肩锁关节脱位者,并经 X 线检查确诊;③ Rockwood 分型为 III~V 型;④ 受伤至手术时间<3 周;⑤ 无手术禁忌症;⑥ 首次、单侧、新鲜肩锁关节脱位;⑦ 患者及家属均签署知情同意书,并自愿参与本研究。排除标准:① 既往存在颈椎病、外侧肩关节手术史者;② 合并其他部位损伤如锁骨、肩胛骨;③ 合并血管、神经损伤,术后可能对功能恢复造成不良影响者;④ 陈旧性肩锁骨关节脱位者。采用前瞻性随机病例对照的研究方法,所有患者按随机数字表法分为对照组(n=32)和观察组(n=32)。两组患者一般资料见表 1,两组患者性别、年龄、受伤类型、Rockwood 分型、受伤至手术时间、损伤侧别比较无差异($P>0.05$),基线资料均衡可比。本研究经本院伦理委员会批准(编号:YL-KY-2019-027)。

表 1 两组一般资料的比较

Table 1 Comparison of two groups of general data

Groups	Gender (male/female)	Average age (years)	Injury type			Rockwood typing			Time from injury to operation	Injury side	
			Fall and hurt oneself	Sports injury	Traffic injury	Type III	Type IV	Type V		Left	Right
Observation group(n=32)	24/8	42.72± 8.71	14	10	8	13	10	9	9.35± 2.73	19	13
Control group(n=32)	22/10	43.14± 7.42	13	9	10	11	8	13	10.42± 2.81	20	12
χ^2/t	0.309	0.149	0.312			1.116			1.600		0.066
P	0.578	0.882	0.856			0.572			0.115		0.798

1.2 方法

对照组治疗方案为 AO 锁骨钩钢板内固定,麻醉方式为臂丛或颈丛神经阻滞麻醉,取沙滩椅位,患肩抬高,头部偏向健侧。施术者于患者肩锁关节及锁骨外侧作弧形切口约 5~8 cm,内侧在锁骨中点停止,充分暴露锁骨外侧端及肩锁骨关节,将肩锁关节利用手法复位,利用 C 臂 X 线机确认肩锁关节复位成功后,应用两根克氏针(直径为 1.5 mm)临时固定;然后沿锁骨远端后缘将 AO 锁骨钩钢板(3~6 孔)外侧钩从关节外插入肩峰下,采用透视确认锁骨钩钢板位置无误,则在锁骨钩钢板应用螺钉 4~6 枚固定至锁骨,斜方肌及三角肌联合腱膜缝合完成,逐层关闭切口,常规行硅胶引流管放置,术毕。观察组的治疗方案为微创改良双纽扣型金属接骨板结合高强度纤维修复喙锁韧带,麻醉方式及患者体位同上。于锁骨远端作长度约 2.0 cm 横切口,手法复位肩锁关节,利用 C 臂 X 线机确认肩锁关节复位成功后,行克氏针固定并连接关节镜器械,取肩关节后方及前上入路,使喙突根部充分暴露,行肩锁关节软骨盘清理,从锁骨上缘中部至喙突根部中点用前交叉定位器作直径垂直骨道约 2.5 mm,根据患者的情况选择带袢纽扣钢板,应用 2 根 2 号不可吸收线分别穿过纽扣钢板 1、4 孔;选择对折胸科钢

丝(直径 1.0 mm),将胸科钢丝对折端穿过喙突骨隧道,然后将已穿过纽扣钢板的 2 号不可吸收线在钢丝环上与胸科钢丝缠绕,并在喙突上端处抽取钢丝,从喙突上端将其拉出,在喙突骨孔下横向固定钢板,用同样方法将 2 根缝线穿过锁骨的骨隧道、喙突锁骨间的软组织隧道,在锁骨外侧上方将缝线穿出。再次取一块纽扣钢板,应用 2 根 2 号不可吸收线分别穿过纽扣钢板 1、4 孔在锁骨上端固定钢板;其外侧孔穿出 2 根 5 号爱惜邦聚酯纤维缝线,将其固定于锁骨表面,而后解剖重建斜方肌韧带和锥状韧带,拔除克氏针,行斜方肌、三角肌筋膜、肩锁关节囊修复,再次检查肩锁骨韧带是否缝合良好,透视确认建锁骨关节复位良好,常规行硅胶引流管放置,缝合切口,术毕。所有患者均由同一主刀医师进行手术,患者于术后 4 周应用前臂悬吊带悬吊保护,术后 2~4 周患者可进行非负重主动功能训练,4 周后患者可开始进行抗阻训练,以无痛为限进行活动。患者出院后定期门诊随访,并由同一康复指导人员予以患者同一康复方案的功能康复训练,由专人负责对患者术后观察指标及随访阶段的各评分进行评估记录。

1.3 观察指标

① 比较两组手术时间、术后住院时间、疼痛消失时间,比较

两组住院费用;② 比较两组术前、术后 3 个月及术后 1 年肩关节疼痛程度,采用疼痛视觉模拟评分(VAS)进行评价^[11],分数为 0 表示无痛,分数 ≤ 4 分但高于 0 分表示轻度疼痛,分数 5~6 分表示中度疼痛,分数 ≥ 7 分表示重度疼痛;③ 比较两组术前、术后 3 个月及术后 1 年肩关节 Constant 评分,采用 Constant 肩关节评分系统评价肩锁关节脱位合并喙锁韧带撕裂患者肩关节功能^[12],该系统总分为 100 分,包括两个主观评价指标:疼痛和日常活动,分值分别为 15 分和 20 分;两个客观指标:主动运动范围和力量,分值分别为 40 分和 25 分,总分分数越高表示患者肩关节功能恢复越好;④ 比较两组术后 1 年内并发症。

1.4 统计学方法

应用 SPSS 22.0 分析数据,以率(%)表示计数资料,使用 χ^2 检验;符合正态分布的计量资料以($\bar{x} \pm s$)表示,进行 t 检验,检验水准为 $\alpha=0.05$ 。

2 结果

2.1 比较手术相关指标

观察组手术时间较对照组显著延长($P<0.05$),疼痛消失时间、住院费用与对照组比较有显著性差异($P<0.05$),而术后住院时间两组未见显著性差异($P>0.05$)。见表 2。

表 2 两组手术相关指标的比较($\bar{x} \pm s$)

Table 2 Comparison of operation related indicators between the two groups($\bar{x} \pm s$)

Groups	Operation time(min)	Postoperative hospitalization time(d)	Pain disappeared time(d)	Hospitalization cost(yuan)
Observation group(n=32)	139.46 $\pm$ 29.63	5.23 $\pm$ 1.32	2.51 $\pm$ 1.23	19760.56 $\pm$ 1325.74
Control group(n=32)	90.17 $\pm$ 25.34	5.64 $\pm$ 1.58	4.26 $\pm$ 1.07	22630.55 $\pm$ 1995.23
t	7.162	0.173	6.156	6.780
P	0.000	0.864	0.000	0.000

2.2 比较肩关节 VAS 评分

两组患者均随访 1 年,无失访病例。两组患者术后肩关节 VAS 评分逐渐降低($P<0.05$),两组术前、术后 1 年肩关节

VAS 评分比较无统计学差异($P>0.05$),术后 3 个月观察组肩关节 VAS 评分低于对照组($P<0.05$)。见表 3。

表 3 两组肩关节 VAS 评分的比较($\bar{x} \pm s$, 分)

Table 3 Comparison of VAS score of shoulder joint between the two groups($\bar{x} \pm s$, score)

Groups	Before operation	3 months after operation	1 year after operation
Observation group(n=32)	4.74 $\pm$ 1.29	1.51 $\pm$ 0.62 [°]	1.31 $\pm$ 0.33 [°]
Control group(n=32)	4.83 $\pm$ 1.32	2.28 $\pm$ 0.65 [°]	1.40 $\pm$ 0.32 [°]
t	0.308	4.909	1.333
P	0.759	0.000	0.187

Note: compared with before operation, [°] $P<0.05$. Compared with 3 months after operation, [°] $P<0.05$.

2.3 两组肩关节 Constant 评分的比较

术前两组肩关节 Constant 评分比较无统计学差异($P>0.05$),两组患者术后肩关节 Constant 评分均较术前显著升高

($P<0.05$),术后 3 个月、术后 1 年观察组肩关节 Constant 评分均高于对照组($P<0.05$)。见表 4。

表 4 两组肩关节 Constant 评分的比较($\bar{x} \pm s$, 分)

Table 4 Comparison of Constant score of shoulder joint between the two groups($\bar{x} \pm s$, score)

Groups	Before operation	3 months after operation	1 year after operation
Observation group(n=32)	61.64 $\pm$ 7.42	79.84 $\pm$ 9.31 [°]	90.34 $\pm$ 9.05 [°]
Control group(n=32)	61.31 $\pm$ 7.80	68.46 $\pm$ 8.62 [°]	79.73 $\pm$ 9.42 [°]
t	0.158	5.046	4.583
P	0.875	0.000	0.000

Note: compared with before operation, [°] $P<0.05$. Compared with 3 months after operation, [°] $P<0.05$.

2.4 比较术后并发症

术后 3 个月观察组出现肩部持续性疼痛 2 例,复位丢失 1 例;对照组出现肩部持续性疼痛 6 例,未出现复位丢失病例;术

后 1 年复查 X 线,观察组出现内固定物松动但无移位 2 例;对照组出现钢板移位但无出现钢板断裂有 3 例。观察组和对照组术后 3 个月并发症发生率分别为 9.38%(3/32)、18.75%(6/32),

术后 1 年并发症发生率分别为 6.25%(2/32)、9.38%(3/32), 比较差异均无统计学意义($\chi^2=1.164, 0.217, P=0.281, 0.641$)。

2.5 典型病例

观察组: 44 岁男性左肩锁关节脱位(III度), 经微创改良双纽扣型金属接骨板结合高强度纤维修复喙锁韧带治疗, 术后 3

日患者即无明显疼痛, 肩关节活动范围基本正常。术前和术后 X 线片详见图 1A 和图 1B。对照组: 29 岁女性左肩锁关节脱位(III度), 经 AO 锁骨钩钢板内固定治疗, 患者术后 3 日仍疼痛明显, 左肩关节上举困难。术前和术后 X 线片详见图 2C 和图 2D。

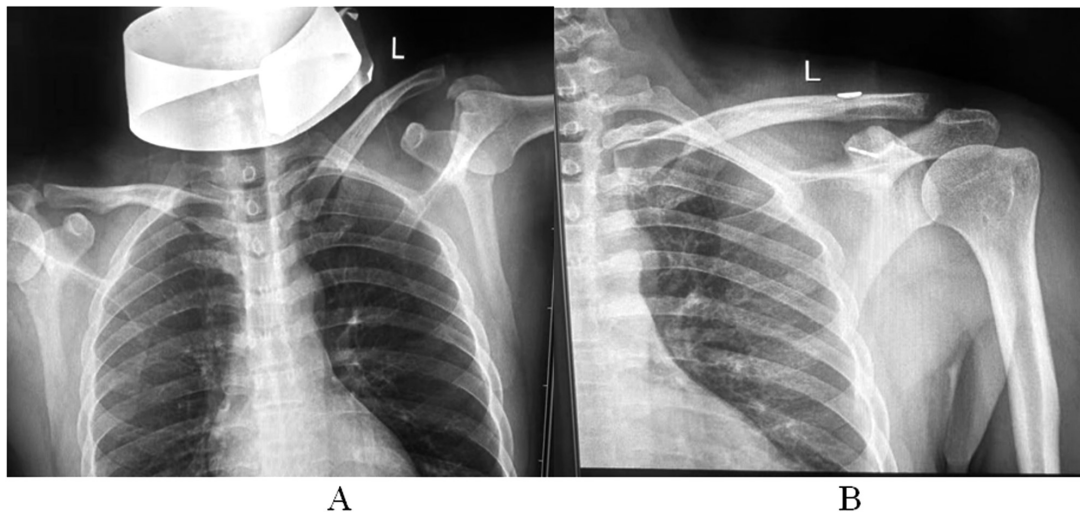


图 1 观察组术前后的 X 线片

Fig.1 X-ray film before and after operation in the observation group

Note: A: Preoperative X-ray showed dislocation of left acromioclavicular joint; B: The X-ray film showed that the reduction of acromioclavicular joint was good at 3 days after operation, and there was no space occupying under the acromion.

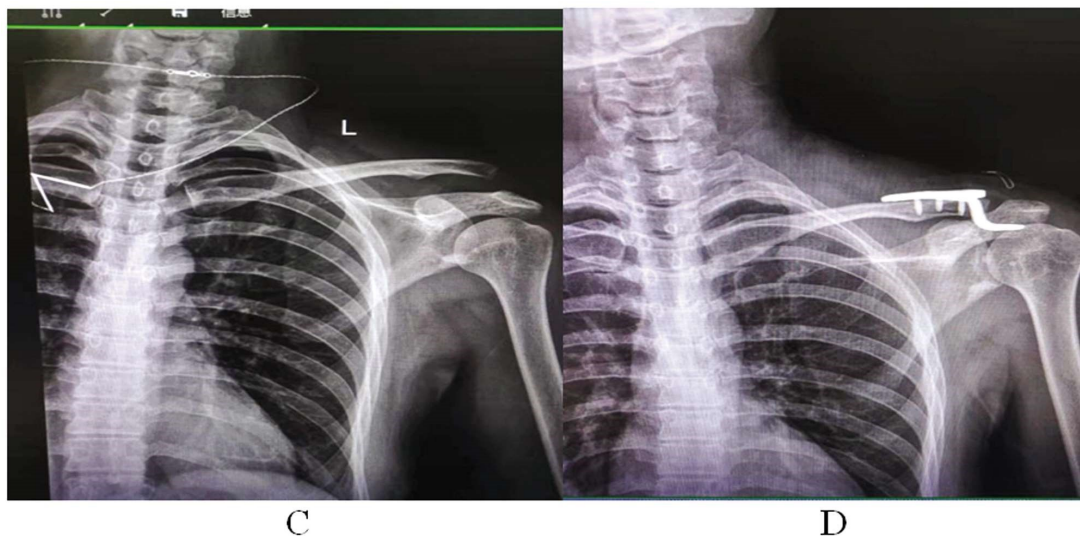


图 2 对照组术前后的 X 线片

Fig.2 X-ray film before and after operation in the control group

Note: C: Preoperative X-ray film showed dislocation of left acromioclavicular joint; D: X-ray film showed space occupying under the acromion and difficulty in lifting the left shoulder joint at 3 days after operation.

3 讨论

肩锁关节稳定性的维持主要通过以下组织:① 关节囊及其周围组织组成的韧带;② 由喙突延伸至锁骨形成的喙突锁骨韧带;③ 斜方肌及三角肌附着肌腱组织^[13-15]。在肩锁关节完全脱位尤其是在 Rockwood III~V 型肩锁关节脱位损伤中, 喙锁韧带断裂导致肩锁关节稳定性变差^[16,17], 在肩峰部位受重力下移, 受斜方肌等肌肉组织牵引导致锁骨上移, 形成了多种临床脱位症

状, 目前普遍认为恢复韧带连续性是恢复肩锁关节稳定性的关键之一。目前, 早期治疗手段主要选取克氏针结合张力带内固定, 多数学者指出克氏针具有价格及操作技术上的优势, 但随着研究的不断深入, 发现克氏针破坏了肩锁关节的纤维软骨盘, 限制肩锁关节微动效应等, 导致关节功能受限、创伤性关节炎^[18-20]。锁骨钩板的应用为肩锁关节的治疗开创了一条新的路径, 具有固定强度高、提高肩锁关节复位水平等优势, 但也存在肩峰撞击锁骨钩、肩峰溶解、肩关节内组织坏死等问题^[21-23]。

随着目前微创技术的不断发展,采用双纽扣型金属接骨板法治疗肩锁关节脱位已广泛在临床开展,纽扣型金属接骨板带袢内固定系统是近年来在运动医学领域新兴的仿生学内固定方式^[24,25],对于韧带修复有着传统内固定方式无法比拟的优点:首先能够动力性解剖重建损伤的韧带,为损伤韧带的瘢痕形成和愈合创造了充分的条件,并有足够的固定强度和弹性微动,再脱位的几率小;第二,疼痛轻微,粘连范围小,为术后早期进行关节功能康复训练提供了机械稳定性^[26-28];最后,依靠安全的组织相容性免除了二次取出手术。李钧等研究显示^[29],采用纽扣法对喙锁韧带进行修复后其强度高于原先的40%左右,同时纽扣法具有更小创伤及出血量少的优势,复位效果更好。本研究结果显示,观察组患者疼痛消失时间、术后3个月VAS评分及住院费用低于对照组,说明双纽扣型金属接骨板具有疼痛更轻、住院费用更低的优势。

与对照组比较,观察组术后并发症发生率降低,观察组术后3个月及1年肩关节Constant评分均高于对照组。本研究中采用微创改良双纽扣型金属接骨板结合高强度纤维修复喙锁韧带,较以往双纽扣型接骨板不同之处在于双纽扣型钢板与高强度纤维的连接方式采取双8字结合,双向定位通道一次成型,进一步增强固定强度,增加肩锁关节稳定性。本研究分析后认为改良双纽扣型金属接骨板结合高强度纤维方案具有以下优势:①以原韧带的解剖位置作为固定位置,具有更强的早期稳定性,患者进行关节外展或上举时肩锁关节具有一定的活动度;②韧带重建时采用钢板与高强度纤维的双8字缝合,能够最大程度分散关节应力,提高固定强度与关节稳定性^[30];③手术过程中对肩锁关节及其毗邻组织损伤较小,利于患者术后关节囊及韧带的恢复,同时对患者早期功能锻炼影响较小。

综上所述,采用微创改良双纽扣型金属接骨板结合高强度纤维修复喙锁韧带治疗肩锁关节脱位合并喙锁韧带撕裂更符合解剖学特点,可减轻肩关节疼痛、促进肩关节功能恢复,但本研究中亦存在随访时间过短、样本量过小等不足,对患者远期疗效及并发症发生情况有待更大样本、更长时间的多中心研究开展。

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