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## 克氏针内固定术与钢板内固定术治疗锁骨骨折的临床疗效比较 \*

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**摘要 目的:**比较克氏针内固定术与钢板内固定术在锁骨骨折患者中的临床疗效和安全性。**方法:**收集我院收治的 70 例锁骨骨折患者,随机分为克氏针内固定组和钢板内固定组,每组 35 例。克氏针内固定组患者给予克氏针内固定术,钢板内固定组患者采用钢板内固定术,观察并比较两组患者手术时间、住院时间、术中出血量、畸形愈合、延迟愈合、肩关节疼痛、切口感染、钢板断裂等并发症的发生率以及临床疗效。**结果:**与钢板内固定组相比,克氏针内固定组患者的手术时间以及住院时间较短,术中出血量较少,但并发症发生率较高,临床治疗优良率较低,差异具有统计学意义( $P<0.05$ )。**结论:**钢板内固定组患者的临床效果较好,并发症发生率较低,但克氏针内固定方法在手术时间、住院时间、术中出血量方面具有一定的优势。

**关键词:**克氏针内固定术;钢板内固定术;锁骨骨折;临床疗效;安全性

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## Comparison of the Clinical Therapeutic Effect of Internal Fixation and Plate Fixation for Patients with Clavicle Fracture\*

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**ABSTRACT Objective:** To compare the clinical effect and safety of internal fixation and plate fixation in the treatment of patients with clavicle fracture. **Methods:** 70 cases of clavicle fracture were collected from our hospital, all patients were randomly divided into two groups, 35 cases in each group. All patients were given corresponding treatment measures after admission. Kirschner wire internal fixation group were given internal fixation with Kirschner wire, plate fixation group was given plate internal fixation, the operation time, hospitalization time, amount of bleeding, malunion, and delayed healing, pain of shoulder joint, infection of incision, plate breakage complications occur rate and clinical efficacy were observed and compared between the two groups of patients. **Results:** Compared with plate fixation group, the operation time and hospital stay were significantly shorter in the Kirschner wire fixation group, the operative bleeding was less, but the incidence rate of complications was higher, and the excellent rate of clinical treatment was relatively lower, the difference were statistically significant ( $P<0.05$ ). **Conclusion:** Plate fixation had better clinical effect, lower incidence of complications in the treatment of patients with clavicle fracture, but Kirschner wire internal fixation methods had advantages of operation time, hospitalization time, intraoperative bleeding volume.

**Key words:** Internal fixation; Plate internal fixation; Clavicle fracture; Clinical efficacy; Safety

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### 前言

锁骨位于胸顶部的前方,是肩胛与躯干唯一骨性连接,解剖部位比较表浅,容易在暴力等的作用下发生骨折<sup>[1]</sup>,临床较为常见。据统计<sup>[2]</sup>,锁骨骨折的发生率约占全部骨折类型的 5.98%。临床对于较为稳定的锁骨骨折一般采用保守治疗,很少采用手术的方式进行固定。近年来的研究证实<sup>[3]</sup>保守治疗的疗效不理想,锁骨短缩、畸形、不愈合等情况的发生率较高,且影响患者的肩关节功能。采用手术治疗患者的临床疗效以及并发症的发生率均优于保守治疗<sup>[4]</sup>。目前,临床常用内固定的方法对锁骨骨

折进行治疗,常规的钢板内固定能够促进锁骨骨折患者的早期愈合。克氏针内固定的方法具有创伤小,瘢痕不明显的特点,且患者住院时间短,费用少,在临床应用较为广泛,但与钢板内固定的方法相比,克氏针内固定的稳定性较差,可能会导致术后的骨折发生移位<sup>[5]</sup>。本研究主要比较了克氏针内固定术与钢板内固定术治疗锁骨骨折的临床疗效,现报道如下。

### 1 资料与方法

#### 1.1 临床资料

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70 例锁骨骨折患者,其中远段骨折 33 例,中段骨折 22 例,横形骨折 15 例,所有患者随机分为两组,分别为克氏针内固定组和钢板内固定组,组内患者各 35 例。克氏针内固定组患者平均年龄( $33.03 \pm 0.78$ )岁,男性 19 例,女性 16 例;钢板内固定组患者平均年龄( $31.32 \pm 1.01$ )岁,男性 18 例,女性 17 例。所有患者均符合《临床骨科学》中关于锁骨骨折的诊断标准,并经 X 线、CT 等影像学检查确诊。患者年龄在 18~47 岁之间,性别不限,患者平素身体状况良好,无骨肿瘤,所有患者无心脑血管疾病以及其他重要脏器重大疾病,无局部皮肤破溃以及皮肤病,患者无感染性疾病,所有患者签署知情同意书同意实验。两组患者一般资料相比无明显差异( $P>0.05$ )。

## 1.2 方法

**1.2.1 治疗方法** 所有患者采用颈丛阻滞麻醉,取仰卧位,头向健侧偏移,在骨折处做切口,以骨折端为中心,切开皮肤、皮下组织,剥离骨膜,过程中彻底止血,避免损伤血管和神经,克氏针内固定组患者给予克氏针内固定术,选择大小合适的克氏针,自骨折远段 1~2 cm 髓腔穿入,肩峰后穿出,复位骨折处,再穿入近骨折段。针尾弯折,埋于皮下,敷料包扎,检查其稳定性。钢板内固定组患者采用钢板内固定术,复位后,选用合适的钢板,塑形后与骨弧度一致,置于锁骨上方,固定后,选择合适的螺钉,固定骨折两端。活动肩关节,检查其稳定性。复位后,克氏

针固定组带悬吊制动,时间根据年龄和骨折严重程度而定,解除锁骨带后进行康复训练,定期复查。钢板固定组不需特殊外固定,术后第二天即进行康复锻炼,定期复查。

**1.2.2 观察指标** 对两组患者手术时间、住院时间,术中出血量,畸形愈合、延迟愈合、肩关节疼痛、切口感染以及钢板断裂等并发症的发生率进行检测。

**1.2.3 疗效评价** 治疗后评价患者的临床疗效进行评价:患者骨折愈合情况正常,无畸形,经 X 线检查显示对位对线良好,肩关节活动正常为优;患者骨折愈合正常,有轻微移位,肩关节活动正常为良;骨折愈合不良畸形明显,甚至骨不连,肩关节活动受限为差。

## 1.3 统计学分析

采用 SPSS 19.0 统计软件进行分析,计量数据以均数 $\pm$ 标准差( $\bar{x} \pm s$ )表示,采用 t 检验;计数资料采用%表示,采用卡方检验,以  $P<0.05$  认为差异有统计学意义。

## 2 结果

### 2.1 两组患者手术时间以及住院时间的比较

与钢板内固定组相比,克氏针内固定组患者的术时间以及住院时间较短( $P<0.05$ )。

表 1 两组患者手术时间以及住院时间的比较( $\bar{x} \pm s$ )

Table 1 Comparison of the operation time and hospital stay between two groups( $\bar{x} \pm s$ )

| Groups                        | n  | Operation time (min) | Length of stay (days) |
|-------------------------------|----|----------------------|-----------------------|
| Kirschner wire fixation group | 35 | 40.28 $\pm$ 7.81*    | 17.38 $\pm$ 6.56*     |
| Plate fixation group          | 35 | 59.11 $\pm$ 5.11     | 34.27 $\pm$ 5.33      |

注:与钢板内固定组相比,\* $P<0.05$ 。

Note: Compared with the plate fixation group, \* $P<0.05$ .

### 2.2 两组患者术中出血量的比较

与钢板内固定组相比,克氏针内固定组患者的术中出血量

较少( $P<0.05$ )。

表 2 两组患者术中出血量比较( $\bar{x} \pm s$ )

Table 2 Comparison of the amount of bleeding during operation between two groups( $\bar{x} \pm s$ )

| Groups                        | n  | Amount of bleeding during operation |
|-------------------------------|----|-------------------------------------|
| Kirschner wire fixation group | 35 | 48.92 $\pm$ 13.19*                  |
| Plate fixation group          | 35 | 84.28 $\pm$ 12.28                   |

注:与钢板内固定组相比,\* $P<0.05$ 。

Note: Compared with the plate fixation group, \* $P<0.05$ .

### 2.3 两组患者并发症发生率的比较

与钢板内固定组相比,克氏针内固定组患者的并发症发生

率较高( $P<0.05$ )。

表 3 两组患者并发症发生率比较【例(%)】

Table 3 Comparison of the occurrence rate between two groups[n(%)]

| Groups                        | Abnormal healing | Delayed healing | Shoulder pain | Incision infection | Steel plate fracture | Complication rate |
|-------------------------------|------------------|-----------------|---------------|--------------------|----------------------|-------------------|
| Kirschner wire fixation group | 2(5.71)          | 2(5.71)         | 5(14.26)      | 0                  | 0                    | 9(25.71)*         |
| plate fixation group          | 0                | 1(2.86)         | 0             | 0                  | 1(2.86)              | 2(5.71)           |

注:与钢板内固定组相比,\* $P<0.05$ 。

Note: Compared with the plate fixation group, \* $P<0.05$ .

## 2.4 两组患者临床疗效的比较

与钢板内固定组相比,克氏针内固定组患者的临床治疗优

良率较低( $P<0.05$ )。

表 4 两组患者临床疗效比较( $\%, \bar{x} \pm s$ )

Table 4 Comparison of the Clinical curative effect between two groups( $\%, \bar{x} \pm s$ )

| Groups                        | Excellent | Good      | Poor      | Excellent and good rate |
|-------------------------------|-----------|-----------|-----------|-------------------------|
| Kirschner wire fixation group | 9(25.71)  | 15(42.86) | 11(31.43) | 24(68.57)*              |
| Plate fixation group          | 19(54.29) | 12(34.26) | 4(11.43)  | 31(88.57)               |

注:与钢板内固定组相比,\* $P<0.05$ 。

Note: Compared with the plate fixation group, \* $P<0.05$ .

## 3 讨论

锁骨的解剖形态为 S 形的管状骨, 其外侧半向后呈凹形, 内侧半突出成弓形<sup>[6]</sup>, 外三分之一为扁平状, 内三分之一为棱柱状, 其特殊的形态使锁骨的耐受力较低, 锁骨中无韧带、肌肉等的附着, 暴力传导至锁骨, 因此容易造成骨折<sup>[7]</sup>。以往的研究认为<sup>[8]</sup>锁骨骨折的开放复位可能会造成骨的不愈合, 但随着锁骨骨折种类的增加, 传统的保守治疗的疗效较差。对于锁骨骨折患者的临床治疗, 临床传统主要采用克氏钢针内固定, 由于其具有具有创伤小, 住院费用低等优点, 因此在临床得到了广泛应用<sup>[9]</sup>。但克氏钢针内固定术的临床并发症发生率较高, 临床治疗效果不理想。据统计<sup>[10]</sup>, 克氏针内固定的方式的临床治疗有效率在 55%~93%。我们的研究结果表明克氏针内固定组患者的临床治疗优良率低于钢板内固定组。近年来临床多采用钢板内固定的手术方式对锁骨骨折患者进行固定<sup>[11]</sup>。因此, 本实验对以上两种固定方式进行比较, 实验结果显示克氏针内固定组患者的手术时间、住院时间较短, 术中出血量较少, 可能是由于克氏针内固定的方式在成的创伤较小, 且克氏针的弹性固定方式利于骨折的愈合, 因此减少了患者的住院时间以及出血量<sup>[12-14]</sup>。而钢板内固定的钢板费用高, 手术切口长, 且在钻孔和放置螺钉时可能造成锁骨下的血管以及神经的损伤, 造成住院时间以及出血量水平较高<sup>[15]</sup>。

钢板内固定术在临床最先应用于骨盆骨折, 依靠钢板和螺钉的自身的强度纠正骨折的移位, 且与克氏针相比, 钢板内固定术组织相容性较好, 可根据锁骨的形状塑形, 有利于固定的优点, 钢板内固定能在早期缓解患者的疼痛, 促进患者的功能锻炼<sup>[16-18]</sup>。克氏针由于难以达到良好的内固定, 影响术后的肩关节功能, 克氏针的滑脱等也可以造成愈合延迟等不良反应, 另外, 克氏针的针尾可能造成感染, 而钢板内固定贴附较好利于骨折愈合<sup>[19,20]</sup>。因此, 克氏针内固定组患者的并发症发生率高于钢板内固定组。

本研究结果显示: 钢板内固定组患者的临床效果较好, 并发症发生率较低, 但克氏针内固定方法在手术时间、住院时间, 术中出血量方面具有一定的优势, 在应用克氏针内固定术时, 应注意选择直径合适的克氏针以满足术后的稳定, 在置入克氏针的过程中避免造成血管以及神经损伤, 避免其游走及退针, 固定后将针尾弯折, 置于皮下, 保证患者的疗效。

### 参考文献(References)

[1] Smith S D, Wijdicks C A, Jansson K S, et al. Stability of mid-shaft

clavicle fractures after plate fixation versus intramedullary repair and after hardware removal [J]. Knee Surgery, Sports Traumatology, Arthroscopy, 2014, 22(2): 448-455

[2] Leroux T, Wasserstein D, Henry P, et al. Rate of and risk factors for re-operations after open reduction and internal fixation of midshaft clavicle fractures[J]. J Bone Joint Surg Am, 2014, 96(13): 1119-1125

[3] Rehn C H, Kirkegaard M, Viberg B, et al. Operative versus nonoperative treatment of displaced midshaft clavicle fractures in adults: a systematic review [J]. European Journal of Orthopaedic Surgery & Traumatology, 2014, 24(7): 1047-1053

[4] Jørgensen A, Troelsen A, Ban I. Predictors associated with nonunion and symptomatic malunion following non-operative treatment of displaced midshaft clavicle fractures-a systematic review of the literature [J]. International orthopaedics, 2014, 38(12): 2543-2549

[5] Wall L B, Mills J K, Leveno K, et al. Incidence and prognosis of neonatal brachial plexus palsy with and without clavicle fractures[J]. Obstetrics & Gynecology, 2014, 123(6): 1288-1293

[6] Jones L D, Grammatopoulos G, Kambouroglou G. Titanium elastic nails, open reduction internal fixation and non-operative management for middle third clavicle fractures: a comparative study [J]. European Journal of Orthopaedic Surgery & Traumatology, 2014, 24 (3): 323-329

[7] Loriaut P, Moreau P E, Dallaudiere B, et al. Outcome of arthroscopic treatment for displaced lateral clavicle fractures using a double button device[J]. Knee Surgery, Sports Traumatology, Arthroscopy, 2015, 23 (5): 1429-1433

[8] Tassel D, Owens B D, Pointer L, et al. Incidence of clavicle fractures in sports: analysis of the NEISS Database [J]. International journal of sports medicine, 2014, 35(01): 83-86

[9] Yang S, Werner B C, Gwathmey Jr F W. Treatment trends in adolescent clavicle fractures[J]. Journal of Pediatric Orthopaedics, 2015, 35 (3): 229-233

[10] Ashman B D, Slobogean G P, Stone T B, et al. Reoperation following open reduction and plate fixation of displaced mid-shaft clavicle fractures[J]. Injury, 2014, 45(10): 1549-1553

[11] Solooki S, Azad A. Simultaneous of Mid Third Clavicle Fracture and Type 3 Acromioclavicular Joint Dislocation; A Case Report [J]. The Archives of Bone and Joint Surgery, 2014, 2(1): 69-71

[12] Zhang C, Huang J, Luo Y, et al. Comparison of the efficacy of a distal clavicular locking plate versus a clavicular hook plate in the treatment of unstable distal clavicle fractures and a systematic literature review [J]. International orthopaedics, 2014, 38(7): 1461-1468(下转第 1706 页)

不足,还是胰岛素抵抗<sup>[18-20]</sup>。本研究证实,血清 Irisin 水平和 BMI、腰围、低密度脂蛋白、糖化血红蛋白、胰岛素抵抗指数、糖尿病病程呈负相关 ( $r=-0.73, -0.68, -0.56, -0.79, -0.65, -0.73$ , 均  $P<0.05$ )。血清 Irisin 水平和 C 肽成正相关( $r=0.62, P<0.05$ )。胰岛素抵抗指数、糖尿病病程是影响血清 Irisin 水平的独立负影响因素。研究结果证实,血清 Irisin 和 C 肽呈正相关,说明胰岛素分泌越少,血清 Irisin 水平越低,胰岛素和 Irisin 分泌存在密切相关性;同时和胰岛素抵抗密切相关。

#### 参考文献(References)

- [1] Cho N H, Ahn C H, Moon J H, et al. Metabolic syndrome independently predicts future diabetes in women with a history of gestational diabetes mellitus[J]. *Medicine (Baltimore)*, 2016, 95(35): e4582
- [2] Tang Q, Li X, Song P, et al. Optimal cut-off values for the homeostasis model assessment of insulin resistance (HOMA-IR) and pre-diabetes screening: Developments in research and prospects for the future[J]. *Drug Discov Ther*, 2015, 9(6): 380-385
- [3] Chen X, Su M, Wang C, et al. Role of insulin resistance and beta cell function in the development of newly diagnosed type 2 diabetes[J]. *Institute of health*, 2015, 44(6): 881-886
- [4] Jha S, Panda M, Kumar S, et al. Psychological Insulin Resistance in Patients with Type 2 Diabetes [J]. *J Assoc Physicians India*, 2015, 63 (7): 33-39
- [5] Castillo-Quan J I. From white to brown fat through the PGC-1 $\alpha$ -dependent myokine irisin: implications for diabetes and obesity [J]. *Dis Model Mech*, 2012, 5(3): 293-295
- [6] Liu J J, Wong M D, Toy W C, et al. Lower circulating irisin is associated with type 2 diabetes mellitus[J]. *J Diabetes Complications*, 2013, 27(4): 365-369
- [7] Aydin S, Kuloglu T, Aydin S. Copeptin, adropin and irisin concentrations in breast milk and plasma of healthy women and those with gestational diabetes mellitus[J]. *Peptides*, 2013, 47(6): 66-70
- [8] Elsen M, Raschke S, Sommerfeld M, et al. Comment on Wu and Spiegelman. Irisin ERKs the fat[J]. *Diabetes*, 2014, 63: 381-383
- [9] Piya M K, Harte A L, Sivakumar K, et al. The identification of irisin in human cerebrospinal fluid: influence of adiposity, metabolic markers, and gestational diabetes [J]. *Am J Physiol Endocrinol Metab*, 2014, 306(5): E512-E518
- [10] Kurdiova T, Balaz M, Vician M, et al. Effects of obesity, diabetes and exercise on Fndc5 gene expression and irisin release in human skeletal muscle and adipose tissue: in vivo and in vitro studies [J]. *J Physiol*, 2014, 592(5): 1091-1107
- [11] Liu J J, Liu S, Wong M D, et al. Relationship between circulating irisin, renal function and body composition in type 2 diabetes[J]. *J Diabetes Complications*, 2014, 28(2): 208-213
- [12] Yuksel M A, Oncul M, Tuten A, et al. Maternal serum and fetal cord blood irisin levels in gestational diabetes mellitus [J]. *Diabetes Res Clin Pract*, 2014, 104(1): 171-175
- [13] Kuzmicki M, Telejko B, Lipinska D, et al. Serum irisin concentration in women with gestational diabetes [J]. *Gynecol Endocrinol*, 2014, 30(9): 636-639
- [14] Wang H H, Zhang X W, Chen W K, et al. Relationship between serum irisin levels and urinary albumin excretion in patients with type 2 diabetes[J]. *J Diabetes Complications*, 2015, 29(3): 384-389
- [15] Espes D, Lau J, Carlsson P O. Increased levels of irisin in people with long-standing Type 1 diabetes[J]. *Diabet Med*, 2015, 32(9): 1172-1176
- [16] Zhu D, Wang H, Zhang J, et al. Irisin improves endothelial function in type 2 diabetes through reducing oxidative/nitrative stresses [J]. *J Mol Cell Cardiol*, 2015, 87: 138-147
- [17] Effect of canagliflozin, a sodium glucose co-transporter 2 inhibitor, on C-peptide kinetics[J]. *Clinical pharmacology in drug development*, 2015, 4(1): 12-17
- [18] Al-Daghri N M, Alokail M S, Rahman S, et al. Habitual physical activity is associated with circulating irisin in healthy controls but not in subjects with diabetes mellitus type 2 [J]. *Eur J Clin Invest*, 2015, 45 (8): 775-781
- [19] Graham M L, Gresch SC, Hardy SK, et al. Evaluation of commercial ELISA and RIA for measuring porcine C-peptide: implications for research[J]. *Xenotransplantation*, 2015, 22(1): 62-69
- [20] Jolival C G, Rodriguez M, Wahren J, et al. Efficacy of a long-acting C-peptide analogue against peripheral neuropathy in streptozotocin-diabetic mice [J]. *Diabetes, obesity & metabolism*, 2015, 17(8): 781-788
- (上接第 1728 页)
- [13] Khorami M, Arti H R, Fakour M, et al. The comparison of results of treatment of midshaft clavicle fracture between operative treatment with plate and non-operative treatment [J]. *The Archives of Bone and Joint Surgery*, 2014, 2(3): 210-214
- [14] Christensen T J, Horwitz D S, Kubiak E N. Natural history of anterior chest wall numbness after plating of clavicle fractures: educating patients[J]. *Journal of orthopaedic trauma*, 2014, 28(11): 642-647
- [15] Sun J, Zheng G, Zhao K. Minimally invasive treatment of clavicular fractures with cannulated screw [J]. *Orthopaedic surgery*, 2014, 6(2): 121-127
- [16] Compston J E, Flahive J, Hosmer D W, et al. Relationship of weight, height, and body mass index with fracture risk at different sites in postmenopausal women: the Global Longitudinal study of Osteoporosis in Women (GLOW)[J]. *Journal of Bone and Mineral Research*, 2014, 29(2): 487-493
- [17] Alves K, Jupiter J. Clavicle fractures: plate versus intramedullary fixation [J]. *Techniques in Shoulder & Elbow Surgery*, 2014, 15 (2): 55-59
- [18] Wong D J, Holm T M, Dyer G S M, et al. Late onset venous thoracic outlet syndrome following clavicle non-union fracture: A case report [J]. *Vascular*, 2015, 23(2): 183-187
- [19] Wang X H, Guo W J, Li A, et al. Operative versus nonoperative treatment for displaced midshaft clavicle fractures: a meta-analysis based on current evidence[J]. *Clinics*, 2015, 70(8): 584-592
- [20] Olden G D J. VA-LCP anterior clavicle plate: The anatomically pre-contoured fixation system with angular stability for clavicle shaft[J]. *Musculoskeletal surgery*, 2014, 98(3): 217-223