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## 肌间沟臂丛神经阻滞复合静脉全麻对肩关节镜手术患者麻醉效果、MAP、HR 以及血清 Cor、NE 的影响 \*

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**摘要 目的:** 分析 B 超指引下实施肌间沟臂丛神经阻滞复合静脉全麻对肩关节镜手术患者麻醉效果、心率 (HR)、平均动脉压 (MAP) 以及血清皮质醇 (Cor)、去甲肾上腺素 (NE) 水平的影响。**方法:** 选择本院 2016 年 3 月至 2019 年 12 月收治的 80 例肩关节镜手术患者, 以随机数字表法作为分组原则 (每组样本容量 40 例), 对照组实施单纯全凭静脉麻醉, 实验组实施 B 超指引下肌间沟臂丛神经阻滞复合静脉全麻, 对比两组不同时点 MAP、HR、血清 Cor、NE 水平以及瑞芬太尼、尼群地平 (NIT)、丙泊酚使用剂量, 并对比两组并发症发生情况。**结果:** 实验组 T1-4 时点 MAP、HR、血清 Cor、NE 水平均明显低于对照组 ( $P<0.05$ ), 瑞芬太尼、NIT 以及丙泊酚使用剂量实验组均明显较对照组减少 ( $P<0.05$ ); 两组并发症发生率比较未见统计学差异 ( $P>0.05$ )。**结论:** B 超指引下肌间沟臂丛神经阻滞复合静脉全麻应用于肩关节镜手术中可抑制患者体内应激物质释放, 将 MAP 及 HR 维持在稳定范围内, 极大地减少了麻醉药物、NIT 使用剂量, 麻醉效果理想、确切。

**关键词:** B 超指引; 肌间沟; 静脉全麻; 臂丛神经阻滞; 肩关节镜; 平均动脉压; 心率; 皮质醇; 去甲肾上腺素

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## Effects of Intermuscular Groove Brachial Plexus Block Combined with Intravenous General Anesthesia on Anesthesia Effect, MAP, HR and Serum Cor, NE in Patients Underwent Shoulder Arthroscopic Surgery\*

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**ABSTRACT Objective:** To analyze the effects of intermuscular groove brachial plexus block combined with intravenous general anesthesia under the guidance of B-ultrasound on anesthesia effect, heart rate (HR), mean arterial pressure (MAP) and serum cortisol (Cor), noradrenaline (NE) levels in patients underwent shoulder arthroscopic surgery. **Methods:** 80 patients who were underwent shoulder arthroscopic surgery in our hospital from March 2016 to December 2019 were selected, used random number table method as grouped principle (40 cases in each group), the control group was anesthetized by intravenous anesthesia alone, the experimental group was used intermuscular groove brachial plexus block combined with intravenous general anesthesia under the guidance of B-ultrasound. The levels of MAP, HR, serum Cor, NE and the dosages of remifentanyl, nitrendipine (NIT), propofol were compared between the two groups in different time points. The complications of the two groups were compared. **Results:** The levels of MAP, HR, serum Cor and NE in the experimental group at T1-4 time points were significantly lower than those in the control group ( $P<0.05$ ), the dosages of remifentanyl, NIT and propofol in the experimental group were significantly lower than those in the control group ( $P<0.05$ ). There was no statistical difference in the incidence of complications between the two groups ( $P>0.05$ ). **Conclusion:** Intravenous general anesthesia combine with intermuscular groove brachial plexus block under the guidance of B-ultrasound can inhibit the release of stress substances in the patients undergoing shoulder arthroscopic surgery, keep MAP and HR stable, reduce the dosages of narcotic drugs and NIT greatly, the anesthesia effect is ideal and accurate.

**Key words:** B-ultrasound guided; Intermuscular groove; Intravenous anesthesia; Brachial plexus block; Shoulder Arthroscopy; Mean arterial pressure; Heart rate; Cortisol; Noradrenaline

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## 前言

近年来,随着医疗科技的飞速发展,肩关节镜手术被广泛应用于临床,具有创伤性小、出血量少、恢复快等优点,现已得到广大医务工作者及患者的青睐<sup>[1-3]</sup>。肩关节镜手术中需要减少出血量,保持术野清晰,这就需要对关节腔进行持续加压冲洗,为防止冲洗液外渗对气管造成压迫,降低呼吸道梗阻发生率,往往需要采用气管插管全身麻醉,一定程度上增加了麻醉难度<sup>[4-6]</sup>。随着B超技术的发展,神经阻滞的安全性、准确性明显提高,给肩关节镜手术患者带来了福音。B超指引下实施肌间沟臂丛神经阻滞可获得更为精准的麻醉定位,麻醉效率更高,并可减轻手术操作带来的血管损伤<sup>[7-9]</sup>。基于此,本研究选择本院2016年3月至2019年12月收治的80例肩关节镜手术患者,分别给予B超指引下实施肌间沟臂丛神经阻滞复合静脉全麻和单纯全凭静脉麻醉,旨在为肩关节镜手术患者麻醉方式的选择提供参考,现报道如下。

## 1 资料与方法

### 1.1 一般资料

选择本院2016年3月至2019年12月收治的80例肩关节镜手术患者,纳入标准:①年龄在18周岁以上。②均为首次手术治疗。③ASA分级在I-II级。④意识清醒,临床资料完整。⑤患者及家属均已在有关本项研究的知情同意书上签字。排除标准:①存在血液、免疫疾病系统者。②合并恶性肿瘤者。③存在麻醉及手术禁忌症者。④处于哺乳期、妊娠期女性。⑤中途从本研究退出者。⑥存在酒精、药物滥用史者。⑦合并急慢性感染性疾病者。⑧合并支气管哮喘、肺结核等疾病者。⑨重大脏器功能障碍、衰竭者。⑩合并癫痫、帕金森等疾病者。以随机数字表法作为分组原则(每组样本容量40例)将其分为实验组和对照组。实验组:女性17例、男性23例;年龄38-80岁,平均(59.62±3.17)岁;美国麻醉医师协会(ASA)分级:16例I级、24例II级;体重49-86 kg,平均(67.52±3.44)kg;疾病类型:15例肩峰下撞击综合征、17例肩关节盂唇撕裂、8例肩袖损伤。对照组:女性13例、男性27例;年龄39-79岁,平均(59.58±3.15)岁;ASA分级:15例I级、25例II级;体重50-84 kg,平均(67.58±3.41)kg;疾病类型:12例肩峰下撞击综合征、18例肩关节盂唇撕裂、10例肩袖损伤。两组一般资料相比无明显差异

( $P>0.05$ ),可比较。医院伦理委员会已批准本研究。

### 1.2 方法

密切监测患者的生命体征,建立静脉通道,桡动脉穿刺并置管,给予氯化钠溶液持续输注,10 mL(kg·h)初始速率,30 min后速率调整为6 mL(kg·h)。对照组:静脉给予咪达唑仑0.05 mg/kg、丙泊酚2.5 mg/kg、舒芬太尼0.5 μg/kg、苯磺顺阿曲库铵0.15 mg/kg,气管插管,持续泵注0.2 μg/(kg·min)瑞芬太尼,6 mL(kg·h)丙泊酚麻醉维持,根据患者具体情况调整药物剂量,维持40-60麻醉深度指数,对于血压控制不理想的患者,则给予尼群地平(NIT),以20 μg/min的速率泵注,根据平均动脉压(MAP)及时调整泵注速率。实验组:在B超指引下仔细辨别患者臂丛神经所在位置,确定臂丛神经所在位置后穿刺进针,给予0.375%罗哌卡因20 mL,神经阻滞完全时,术肢针刺痛感、感觉以及温度均会消失,进而给予全麻诱导,其余操作与对照组一致。

### 1.3 观察指标

(1)记录两组患者 $T_0$ (入室时)、 $T_1$ (切皮时刻时)、 $T_2$ (开始手术30 min)、 $T_3$ (开始手术60 min)、 $T_4$ (拔管10 min后)的心率(HR)、MAP;(2)检测并对比两组患者 $T_{14}$ 时的血清皮质醇(Cor)、去甲肾上腺素(NE)水平,Cor、NE检测方法具体如下:抽取各个时间点患者3 mL动脉血,以10 cm离心半径、3500 r/min离心速率,离心处理10 min,分离血清,以酶联免疫吸附法(ELISA)检测Cor、NE,试剂均由厦门市波生生物技术有限公司提供,一切操作谨遵相关标准完成。(3)记录两组患者瑞芬太尼、NIT、丙泊酚的使用剂量。(4)记录两组并发症,如苏醒期躁动、恶心呕吐、苏醒延迟、声音嘶哑、呼吸困难等。

### 1.4 统计学方法

本次研究所有检验数据运用SPSS 23.0进行统计学分析,计量资料(MAP、HR、Cor、NE、瑞芬太尼、NIT、丙泊酚用量)以( $\bar{x} \pm s$ )表示,组间对比以独立样本t检验为主,组内对比采用配对t检验, $P<0.05$ 表明差异有统计学意义。

## 2 结果

### 2.1 两组各时点MAP、HR比较

$T_0$ 时点两组MAP、HR对比无统计学差异( $P>0.05$ ), $T_{14}$ 时点两组MAP、HR均较 $T_0$ 时点降低( $P<0.05$ ); $T_{14}$ 时点MAP、HR实验组均明显低于对照组( $P<0.05$ ),见表1。

表1 两组各时点MAP、HR比较( $\bar{x} \pm s$ )

Table 1 Comparison of MAP and HR at each time point between the two groups( $\bar{x} \pm s$ )

| Groups                       | MAP(mmHg)  |             |             |             |             | HR(beats/min) |            |            |            |            |
|------------------------------|------------|-------------|-------------|-------------|-------------|---------------|------------|------------|------------|------------|
|                              | $T_0$      | $T_1$       | $T_2$       | $T_3$       | $T_4$       | $T_0$         | $T_1$      | $T_2$      | $T_3$      | $T_4$      |
| Experimental group<br>(n=40) | 79.26±3.62 | 63.26±2.62* | 62.15±1.46* | 61.05±1.62* | 62.84±2.04* | 84.26±3.96    | 5.62±0.26* | 5.61±0.21* | 6.01±0.19* | 6.12±0.16* |
| Control group<br>(n=40)      | 79.29±3.52 | 69.26±3.66* | 72.26±1.55* | 65.28±1.44* | 73.85±1.74* | 84.29±3.91    | 6.28±0.33* | 6.29±0.34* | 6.69±0.28* | 6.99±0.46* |
| t                            | 0.038      | 8.431       | 30.029      | 12.343      | 32.578      | 0.034         | 9.936      | 10.762     | 12.710     | 11.298     |
| P                            | 0.970      | 0.000       | 0.000       | 0.000       | 0.000       | 0.973         | 0.000      | 0.000      | 0.000      | 0.000      |

Note: compared with  $T_0$ , \* $P<0.05$ .

## 2.2 两组各时点血清 Cor、NE 比较

T<sub>0</sub> 时点两组血清 Cor、NE 水平对比无明显差异 ( $P>0.05$ ), T<sub>1-4</sub> 时点实验组血清 Cor、NE 水平均较 T<sub>0</sub> 时点降低 ( $P<0.05$ ),

而对照组 T<sub>1</sub> 时点血清 Cor 较 T<sub>0</sub> 降低, T<sub>3-4</sub> 时点较 T<sub>0</sub> 升高, T<sub>1-4</sub> 时点 NE 水平均较 T<sub>0</sub> 时点升高 ( $P<0.05$ ); T<sub>1-4</sub> 时点血清 Cor、NE 水平实验组均明显比对照组更低 ( $P<0.05$ ), 见表 2。

表 2 两组各时点血清 Cor、NE 比较( $\bar{x} \pm s$ )

Table 2 Comparison of serum Cor and NE at each time point between the two groups( $\bar{x} \pm s$ )

| Groups                    | Cor(ng/mL)     |                |                |                |                | NE(pg/mL)      |                |                |                |                |
|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                           | T <sub>0</sub> | T <sub>1</sub> | T <sub>2</sub> | T <sub>3</sub> | T <sub>4</sub> | T <sub>0</sub> | T <sub>1</sub> | T <sub>2</sub> | T <sub>3</sub> | T <sub>4</sub> |
| Experimental group (n=40) | 285.28±6.62    | 238.26±1.62*   | 241.26±2.84*   | 239.46±2.11*   | 240.26±2.64*   | 152.62±6.47    | 142.16±3.62*   | 141.26±3.22*   | 134.26±2.54*   | 140.26±3.44*   |
| Control group (n=40)      | 286.31±6.59    | 279.26±5.62*   | 286.62±6.95*   | 298.26±7.14*   | 302.26±5.61*   | 153.59±6.52    | 169.62±4.52*   | 170.26±5.66*   | 168.26±4.32*   | 165.25±3.17*   |
| t                         | 0.697          | 44.335         | 38.211         | 49.949         | 63.244         | 0.668          | 29.990         | 28.166         | 42.909         | 33.787         |
| P                         | 0.488          | 0.000          | 0.000          | 0.000          | 0.000          | 0.506          | 0.000          | 0.000          | 0.000          | 0.000          |

Note: compared with T<sub>0</sub>, \* $P<0.05$ .

## 2.3 两组瑞芬太尼、丙泊酚、NIT 使用剂量比较

实验组瑞芬太尼、丙泊酚、NIT 使用剂量均显著比对照组

更低 ( $P<0.05$ ), 见表 3。

表 3 两组瑞芬太尼、丙泊酚、NIT 使用剂量比较( $\bar{x} \pm s$ , mg)

Table 3 Comparison of remifentanyl, propofol and NIT dosages in two groups( $\bar{x} \pm s$ , mg)

| Groups                    | Remifentanyl | NIT        | Propofol      |
|---------------------------|--------------|------------|---------------|
| Experimental group (n=40) | 1.42±0.16    | 7.36±0.16  | 892.26±15.62  |
| Control group (n=40)      | 2.28±0.21    | 21.82±1.49 | 1285.62±21.77 |
| t                         | 20.602       | 61.027     | 92.850        |
| P                         | 0.000        | 0.000      | 0.000         |

## 2.4 两组并发症比较

对照组患者出现 1 例苏醒期躁动、2 例恶心呕吐、1 例苏醒延迟、1 例声音嘶哑, 并发症发生率为 12.50%(5/40); 实验组患者出现 2 例苏醒期躁动、1 例恶心呕吐、1 例苏醒延迟, 并发症发生率为 10.0%(4/40); 两组并发症发生率比较未见统计学差异 ( $\chi^2=0.125$ ,  $P=0.723$ )。

## 3 讨论

近年来, 随着人们生活方式、环境的不断变化, 骨关节炎等疾病的发生率明显增高, 具体表现为关节畸形、活动受限、肿胀、僵硬以及疼痛等, 严重影响了患者正常的工作、生活<sup>[10-12]</sup>。随着我国微创技术的发展和普及以及肩关节解剖结构的特殊性, 肩关节镜手术成为当前临床治疗肩关节炎的主要手段<sup>[13,14]</sup>。肩关节镜手术与传统手术比较, 具有创伤性小、瘢痕少、易恢复等优点, 但由于肩关节部位血运丰富, 手术过程中难以使用止血带, 而手术的关键在于减少出血, 务必确保术野清晰, 这就需要实施控制性降压技术, 并且不会引发重要器官、组织缺氧、缺血性损害, 一定程度上增加了麻醉难度<sup>[15-17]</sup>。

既往有研究表明<sup>[18]</sup>: 肩关节镜手术患者术中 MAP 降低 20-25%, 可减少术中出血, 保证手术视野清晰。故对于肩关节镜

手术患者, 术中控制 MAP 稳定对于手术及患者机体健康影响极大。本研究显示实验组 T<sub>1-4</sub> 时点 MAP 以及 HR 均显著比对照组更低 ( $P<0.05$ ), 表明肩关节镜手术患者在手术实施过程中, 采用在 B 超指引下实施肌间沟臂丛神经阻滞复合静脉全麻, 可维持 MAP、HR 等生命体征平稳。其原因分析如下: B 超指引下肌间沟臂丛神经阻滞复合静脉全麻可以提前阻滞外周损伤冲动传递, 提前抑制中枢以及外周神经敏感化, 起到 " 预先镇痛 " 的作用, 可有效阻断疾病本身及手术创伤带来的伤害性刺激传导, 减轻对血流动力学指标的影响, 将 MAP 及 HR 等生命体征维持在稳定范围内<sup>[19-21]</sup>。

肩关节镜手术虽然创伤性较小, 但围术期患者仍旧存在不同程度应激反应, 导致免疫、体液、内分泌、神经功能均发生变化, 具体表现为心肌细胞缺氧、机体代谢增高、高血压危象、免疫抑制等, 极大的增加了手术风险<sup>[22-24]</sup>。另外, 严重的应激反应会增加术后并发症发生率, 不利于机体康复。人体在应激状态下, 下丘脑 - 垂体 - HPA(肾上腺皮质系统) 兴奋性增高, 释放大 量应激物质, 例如 Cor、NE 等<sup>[25,26]</sup>。本研究显示实验组 T<sub>1-4</sub> 时血清 Cor、NE 水平均显著比对照组更低 ( $P<0.05$ ), 表明在 B 超指引下实施肌间沟臂丛神经阻滞复合静脉全麻可有效降低肩关节镜手术患者术中应激物质释放。其原因分析如下: 单纯全

凭静脉麻醉中很难保证手术视野清晰,术中需要采用灌洗液对手术视野进行频繁的冲洗,同时还要调高灌注水压泵的压力,关节外间隙进入大量的灌洗液,加重了肩部水肿等症状及机体应激反应,往往会形成一个恶性循环<sup>[27]</sup>。B超指引下肌间沟臂丛神经阻滞复合静脉全麻在B超指引下展开麻醉,医生可以清楚的观察到臂丛神经的毗邻结构和神经走行,保证了手术视野的清晰度,避免神经阻滞过程中出现不必要的损伤,提高了阻滞精准性,肩关节基本不会出现水肿等症状,可维持血流动力学稳定,避免血压大幅度波动,极大地减轻了患者术中应激反应<sup>[28,29]</sup>。

控制性降压中代表药物以NIT为主,通过扩张血管平滑肌起到一定的降压作用,但在降压过程中容易引发血流动力学紊乱、反射性心动过速,增加心肌耗氧量及手术风险。故如何减少肩关节镜手术中NIT的使用量也是临床医师高度关注的内容。本研究显示实验组瑞芬太尼、丙泊酚、NIT使用剂量均显著低于对照组( $P<0.05$ ),表明B超指引下肌间沟臂丛神经阻滞复合静脉全麻相对于单纯全凭静脉麻醉,显著减少了肩关节镜手术患者术中瑞芬太尼、丙泊酚、NIT使用剂量。其原因分析如下:在B超指引下实施肌间沟臂丛神经阻滞复合静脉全麻,阻滞效果更加精准,效果更确切,明显减少了麻醉药物使用量,保证了麻醉安全性,有助于患者术后自主呼吸及早恢复,提高了麻醉阻滞质量<sup>[30]</sup>。另外本研究两组并发症发生率对比未见差异,可见肩关节镜手术患者给予B超指引下实施肌间沟臂丛神经阻滞复合静脉全麻安全性较高。

综上所述,肩关节镜手术患者给予B超指引下实施肌间沟臂丛神经阻滞复合静脉全麻,麻醉效果明显优于单纯全凭静脉麻醉,可维持术中MAP及HR等生命体征稳定,抑制Cor、NE等应激物质释放,减少麻醉药物和NIT用量,临床应用价值较高。

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