

# 肌肉能量技术联合常规康复治疗对慢性非特异性颈痛患者的影响

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**摘要 目的** 观察肌肉能量技术(MET)联合常规康复治疗对慢性非特异性颈痛(CNSNP)患者的影响。**方法** 选取2022年5月—2023年3月在四川大学华西医院康复医学中心门诊诊治的CNSNP患者54例,采用随机数字软件分为对照组和观察组,每组27例。治疗过程中共有3例患者因依从性不强而退出研究,其中对照组脱落2例,观察组脱落1例,最终对照组、观察组分别纳入25例、26例。对照组接受常规康复治疗(物理因子治疗和运动训练)联合拉伸训练,物理因子治疗主要包括磁热理疗和中频脉冲电理疗,每项20 min/次,1次/d,连续治疗,3次/周,共治疗1周;运动训练包括等长收缩训练和颈部深层屈肌群训练,3次/d,连续治疗,3次/周,共治疗1周;拉伸训练,1次/d,连续治疗,3次/周,共治疗1周。观察组在对照组常规康复治疗基础上接受MET治疗,治疗师将目标肌肉牵伸至引发疼痛或能够感觉到软组织阻力点的位置,双手分别固定肌肉起止点处并施加中等的阻力,让患者的目标肌肉进行等长收缩(强度为最大力的20%)并持续10 s后放松,然后继续拉伸该目标肌肉并到达下一个阻力点的位置,以该阻力点作为开始位置,重复3~5次,1次/d,连续治疗,3次/周,共治疗1周。分别于治疗前、治疗后采用视觉模拟疼痛评分法(VAS)评估患者疼痛程度;采用颈椎功能障碍指数调查问卷(NDI)评估患者颈椎功能障碍情况;采用田中靖久颈椎病症量表20分法(CSR20)评估患者颈椎功能;采用《非特异性颈痛的物理治疗指南》评价临床疗效;观察治疗过程中出现的不良反应(颈部疼痛加重、恶心、呕吐、头晕、心率加快等)。**结果** 与治疗前比较,2组治疗后VAS评分、NDI指数均明显降低( $P<0.05$ ),CSR20评分明显升高,差异均具有统计学意义( $P<0.05$ )。与对照组比较,观察组治疗后VAS评分明显更低,CSR20评分明显更高,差异均具有统计学意义( $P<0.05$ );观察组有效率(92.31%)高于对照组(28.00%),差异具有统计学意义( $P<0.05$ )。在治疗过程中,2组均未发生不良反应。**结论** MET联合常规康复治疗可有效改善CNSNP患者疼痛、颈椎功能,值得临床应用。

**关键词** 慢性非特异性颈痛;肌肉能量技术;拉伸训练;等长收缩训练;颈椎功能

非特异性颈痛(non-specific neck pain, NNP)是指无特异原因和病理损伤所造成的颈痛,可能伴有神经肌肉和生物力学变化,包括颈部活动范围减小<sup>[1]</sup>、颈部肌肉活动的方向特异性降低<sup>[2-3]</sup>、颈深屈肌和颈浅屈肌之间的协调性改变以及本体感觉和

运动控制能力变差等<sup>[4]</sup>。临床上常表现为颈部疼痛,活动受限,颈部周围肌肉存在压痛、无力、损伤以及伴或不伴有放射性的手臂疼痛。若NNP症状持续时间 $>90$  d则为慢性非特异性颈痛(chronic non-specific neck pain, CNSNP)。长期患有CNSNP

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会使患者的生活质量和工作效率下降<sup>[5]</sup>。肌肉拉伸技术联合常规康复治疗常用于治疗 CNSNP 患者<sup>[6-7]</sup>,肌肉拉伸技术主要是改善肌肉的被动张力,而对主动张力改善不明显<sup>[8]</sup>。在 CNSNP 急性期,患者会因为疼痛而激发肌肉保护机制,若使用肌肉拉伸技术可能会加重相关症状。肌肉能量技术(muscle energy techniques, MET)是物理治疗师经常用于改善肌肉骨骼功能和减轻疼痛的一种手法治疗方式,包括主动肌肉收缩和放松后的肌肉伸展动作。MET 可通过反射抑制机制减轻主动张力,缓解肌肉疼痛保护,减轻疼痛和改善肌肉骨骼的功能<sup>[9-10]</sup>。另外,常规康复治疗虽然对肌肉软组织疼痛具有一定的作用,但是对颈部功能障碍恢复的效果欠佳,而 MET 可以降低肌肉张力,加强薄弱的肌肉组织和改善关节功能,对 NNP 和 CNSNP 患者疼痛和颈部功能具有改善作用<sup>[11]</sup>。然而,在 CNSNP 的康复治疗过程中,对 MET 和肌肉拉伸分别联合常规康复治疗对其作用情况的对比研究较少。因此,本研究旨在观察 MET 联合常规康复治疗用于 CNSNP 的治疗效果,并比较其与拉伸技术联合常规康复治疗对 CNSNP 的治疗疗效差异,从而为 CNSNP 的康复治疗提供更好的干预方法。

## 1 临床资料

### 1.1 病例选择标准

**1.1.1 诊断标准** 参考 2018 年荷兰皇家物理治疗学会《非特异性颈痛的物理治疗指南》<sup>[12]</sup>有关 CNSNP 的诊断标准。

**1.1.2 纳入标准** ① 年龄 20~60 岁;② 可配合完成相关评估和治疗;③ 本人或家属对研究方案知情同意,并自愿签署知情同意书。

**1.1.3 排除标准** ① 颈椎创伤史者,有手术指征及颈椎外科手术史;② 痉挛性斜颈、频繁偏头痛、周围神经卡压、纤维肌痛、肩部疾病、炎症性风湿性疾病;③ 妊娠、精神疾病、感染或有重要脏器疾病、恶性肿瘤等影响治疗或因颈部治疗可能加重疾病。

**1.1.4 中止和脱落标准** ① 发生严重不良事件;② 试验过程中病情出现恶化;③ 治疗依从性较差,不能配合完成全程治疗和随访;④ 主动要求退出试验研究。

### 1.2 一般资料

根据预试验,按照双侧检验水平  $\alpha=0.05$ ,检验效能  $1-\beta=0.8$  进行检验分析,每组需要 21 例受试者,按照 20% 脱落比例计算,共至少需要 53 例受试

者。本研究选取 2022 年 5 月—2023 年 3 月在四川大学华西医院康复医学中心门诊诊治的 CNSNP 患者共 54 例,采用随机数字软件将其分为对照组和观察组,每组 27 例。治疗过程中共有 3 例患者因依从性不强而退出研究,其中对照组脱落 2 例,观察组脱落 1 例,最终对照组、观察组分别纳入 25 例、26 例。2 组年龄、性别、病程等比较,差异无统计学意义 ( $P>0.05$ ),具有可比性。见表 1。本研究方案经四川大学华西医院伦理委员会审批通过[审批号:2019 年审(794)号]。

表 1 2 组一般资料比较

Table 1 Comparison of general data between two groups

组别	例数	性别		年龄/ ( $\bar{x}\pm s$ ,岁)	病程/ ( $\bar{x}\pm s$ ,月)
		男	女		
对照组	25	10	15	42.48 $\pm$ 10.22	8.56 $\pm$ 2.08
观察组	26	9	17	42.85 $\pm$ 11.30	8.58 $\pm$ 2.47

## 2 方法

### 2.1 治疗方法

**2.1.1 对照组** 接受常规康复治疗(物理因子治疗和运动训练)联合拉伸训练。

**2.1.1.1 物理因子治疗** 主要包括磁热理疗和中频脉冲电理疗,每项 20 min/次,1 次/d,连续治疗,3 次/周,共治疗 1 周。

(1)磁热理疗 采用磁振热治疗仪(广州龙之杰科技有限公司,型号:LGT-2600B 型)进行磁热理疗。患者取仰卧位,将颈肩磁热垫置于患者颈肩部,频率为 50 Hz,磁场 30 mT,温度 50 °C。

(2)中频脉冲电理疗 采用电脑多功能电疗仪(北京祥云电子设备厂有限公司,型号:K8832-T 型)进行中频脉冲电理疗。患者采取坐位或俯卧位,将 2 片电极置贴于颈背部,强度大小为患者舒适的耐受剂量。

**2.1.1.2 运动训练** 每天进行运动训练(等长收缩训练和颈部深层屈肌群训练),3 次/d,3 次/周,共治疗 1 周。

(1)等长收缩训练 患者采取坐位或站立位,放松颈部,通过手施加向前、向后、向左、向右的阻力,颈部保持中立位不动,维持 5 s 后放松,每个动作重复 5 次。

(2)颈部深层屈肌群训练 患者采取坐位或站立位,向后收下颌,感觉头后部的肌肉被拉伸,维持 5 s,每个动作重复 5 次。

**2.1.1.3 拉伸训练** 患者采取坐位,治疗师将目标

肌肉(斜方肌、肩胛提肌、胸大肌、胸锁乳突肌)牵伸至引发疼痛或能够感觉到软组织阻力的位置,然后进行静态拉伸30 s,每个动作重复3~5次,1次/d,连续治疗,3次/周,共治疗1周。

**2.1.2 观察组** 在对照组常规康复治疗基础上接受MET治疗。

**2.1.2.1 常规康复治疗** 常规康复治疗同对照组。

**2.1.2.2 MET治疗** 患者采取卧位,治疗师将目标肌肉(斜方肌、肩胛提肌、胸大肌、胸锁乳突肌)牵伸至引发疼痛或能够感觉到软组织阻力点的位置,一手固定目标肌肉起点处,另一手固定肌肉止点处并施加中等的阻力,治疗师语言告知患者:“不要让我推动你,保持这个力度大小”让患者的目标肌肉进行等长收缩(强度为最大力的20%)并持续10 s,随后让患者放松并呼气。之后治疗师继续拉伸该目标肌肉并到达下一个阻力点的位置,以该阻力点作为开始,重复3~5次,1次/d,连续治疗,3次/周,共治疗1周。

**2.2 观察指标**

分别于治疗前、治疗后评估CNSNP患者疼痛程度、颈椎功能障碍。

**2.2.1 疼痛评估** 采用视觉模拟疼痛评分量表(visual analogue scale, VAS)评估患者疼痛程度。VAS评分总分10分,分值越高,表示疼痛程度越高。

**2.2.2 颈椎功能** 采用颈椎功能障碍指数调查问卷(neck disability index, NDI)<sup>[13]</sup>评估患者颈椎功能障碍情况;采用田中靖久颈椎病症状量表20分法(cervical spondylotic radiculopathy 20, CSR20)<sup>[14]</sup>评估患者颈椎功能。

**2.2.2.1 NDI指数** 主要包括颈痛及相关症状以及日常生活活动能力2个部分,共10个题目。每个题

目为0~5分,总分50分,得分越高表示功能障碍程度越严重。

NDI指数(%)=(每个项目总得分/完成项目数×5)×100%

**2.2.2.2 CSR20评分** 主要包括颈椎症状、生活和工作能力、手功能和体征等内容,总分20分。得分越高表示颈椎功能越好。

**2.2.3 临床疗效** 根据荷兰皇家物理治疗学会《非特异性颈痛的物理治疗指南》<sup>[12]</sup>评价临床疗效。

①有效:治疗前VAS评分-治疗后VAS评分≥2分;

②无效:治疗前VAS评分-治疗后VAS评分<2分。

**2.2.4 不良反应** 观察治疗过程中出现的不良反应,包括颈部疼痛加重、恶心、呕吐、头晕、心率加快等。

**2.3 统计学方法**

采用SPSS 26.0统计软件进行数据分析。计量资料服从正态分布,采用( $\bar{x} \pm s$ )表示,组内比较采用配对t检验,组间比较采用独立样本t检验;不服从正态分布的计量资料采用M( $P_{25}, P_{75}$ )表示,组内比较用Wilcoxon符号秩检验,组间比较用Mann-Whitney U检验。计数资料用(n,%)表示,组间比较采用 $\chi^2$ 检验。P<0.05表示差异具有统计学意义。

**3 结果**

**3.1 2组治疗前后VAS评分、NDI指数、CSR20评分比较**

与治疗前比较,2组治疗后VAS评分、NDI指数均明显降低(P<0.05),CSR20评分明显升高,差异均具有统计学意义(P<0.05)。与对照组比较,观察组治疗后VAS评分明显更低,CSR20评分明显更高,差异均具有统计学意义(P<0.05)。见表2。

表2 2组治疗前后VAS评分、NDI指数、CSR20评分比较[( $\bar{x} \pm s$ )/M( $P_{25}, P_{75}$ )]

Table 2 Comparison of VAS score, NDI index, and CSR20 score between two groups before and after treatment [( $\bar{x} \pm s$ )/M( $P_{25}, P_{75}$ )]

组别	例数	时间	VAS评分/分	NDI指数/%	CSR20评分/分
对照组	25	治疗前	5.04±1.43	0.20(0.14,0.22)	14.00(12.00,15.00)
		治疗后	4.00(3.00,4.50) <sup>1)</sup>	0.12(0.08,0.16) <sup>1)</sup>	15.72±1.49 <sup>1)</sup>
观察组	26	治疗前	4.50(4.00,6.00)	0.14(0.1,0.21)	14.15±2.05
		治疗后	0.50(0,1.25) <sup>1)2)</sup>	0.07(0.04,0.12) <sup>1)</sup>	17.00(16.00,18.00) <sup>1)2)</sup>

注:与治疗前比较,1) P<0.05;与对照组比较,2) P<0.05。

Note: Compared with that before treatment, 1) P<0.05; compared with the control group, 2) P<0.05.

**3.2 2组临床疗效比较**

观察组有效率(92.31%)明显高于对照组

(28.00%),差异具有统计学意义(P<0.05)。见表3。

表3 2组临床疗效比较(n,%)

Table 3 Comparison of therapeutic effects between two groups (n,%)

组别	例数	有效	无效
对照组	25	7(28.00)	18(72.00)
观察组	26	24(92.31) <sup>1)</sup>	2(7.69)

注:与对照组比较,1)  $P < 0.05$ 。

Note: Compared with the control group, 1)  $P < 0.05$ .

### 3.3 2组不良反应发生率比较

在治疗过程中,2组均未发生疼痛加重、恶心、呕吐、头晕、心率加快等不良反应。

## 4 讨论

### 4.1 MET联合常规康复治疗可有效改善CNSNP患者疼痛

与对照组比较,观察组治疗后VAS评分明显更低,提示MET联合常规康复可有效改善CNSNP患者疼痛。这与JALAL等<sup>[15]</sup>研究结果一致。可能与以下因素有关:①对CNSNP患者的目标肌肉进行MET治疗时,目标肌肉(主动肌)会产生等长收缩来抑制高尔基肌腱反射,导致拮抗肌的反射性松弛;同时还激活了颈椎周围肌肉上的机械感受器,通过体细胞传入激发交感神经系统并激活中脑导水管周围灰质,调节疼痛的下行,从而减轻疼痛<sup>[16]</sup>。②MET治疗时,目标肌群的节律性肌肉收缩会影响淋巴和血流速率,改变细胞间质压力,改善经过毛细血管的血流,使促炎细胞因子减少,使外周伤害性感受器脱敏,降低疼痛<sup>[17]</sup>。③MET治疗可以通过筋膜刺激和舒张局部血管降低交感神经张力,通过有节奏的肌肉运动减少局部水肿,有效缓解肌肉痉挛和疼痛程度。这与FRANKE等<sup>[18]</sup>和MANZOOR等<sup>[19]</sup>研究结果一致。

### 4.2 MET联合常规康复治疗可有效改善CNSNP患者颈椎功能

与对照组比较,观察组治疗后CSR20评分明显更高,提示MET联合常规康复治疗可有效改善CNSNP患者颈椎功能。可能与以下因素有关:①CNSNP患者进行斜方肌、肩胛提肌、斜角肌、胸锁乳突肌的拉伸训练后,高尔基肌腱器官会产生抑制作用以减少运动神经元放电,改善肌肉、肌腱的长度及松弛程度,缓解疼痛和改善颈椎功能障碍<sup>[20]</sup>。肌肉拉伸主要是对CNSNP患者肌肉的平行纤维进行拉长,但对“串联”的纤维影响不大,因而对肌肉僵硬等的改善具有局限性<sup>[16]</sup>。②肌肉主动的收缩具有神经生理作用,包括抑制疼痛和促进肌肉伸展。MET作为一

种“更高级的拉伸技术”,包含了肌肉的等长收缩和肌肉的被动拉长<sup>[10]</sup>,在肌肉拉伸的同时,进行等长的主动肌肉收缩,会让肌肉纤维受到更多的力和负荷,产生超过单独被动拉伸所实现的粘弹性或塑性变化<sup>[16]</sup>。MET可能比被动拉伸更有效地使肌肉长度及松弛程度增加,从而进一步改善肌群疼痛阈值和颈椎功能<sup>[21-22]</sup>。③CNSNP患者因为疼痛会导致肌肉痉挛和产生疼痛保护,肌肉的静息张力会增加。MET可以对肌肉进行激活,通过有节律性收缩和舒张使更多的肌小节参与收缩,增加肌肉软组织的供血量,促进肌肉软组织序列重排和微环境的物质交换,加快新陈代谢率,从而使静息活动的肌张力下降、减轻疼痛和改善肌肉功能。这与MAHA-JAN<sup>[23]</sup>和OSAMA等<sup>[24]</sup>研究结果一致。但也有研究认为采用等长收缩后放松和拉伸技术治疗慢性颈痛的作用效果一样<sup>[25]</sup>,与本研究结果不一致,可能是因为该研究未进行运动训练,仅采用等长收缩后放松和理疗进行干预。

## 5 小结

MET联合常规康复治疗可有效改善CNSNP患者疼痛、颈部功能障碍和颈椎功能,值得临床应用。但本研究仍存在一些不足之处:纳入病例数较少;观察时间较短;未单独研究MET不同治疗技术的疗效差异;未进行随访等。下一步研究将开展大样本临床随机对照研究;延长观察时间;强化出院后随访,细分不同MET治疗对CNSNP患者的影响;以期MET联合常规康复治疗提供更可靠的临床证据。

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## Clinical Efficacy of Muscle Energy Technology Combined with Conventional Rehabilitation Therapy on Patients with Chronic Non-Specific Neck Pain

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**ABSTRACT Objective** To observe the effects of muscle energy technology (MET) combined with conventional rehabilitation therapy on patients with chronic non-specific neck pain (CNSNP). **Methods** A total of 54 patients with CNSNP in the outpatient department of rehabilitation medical center of West China Hospital, Sichuan University from May 2022 to March 2023 were randomly divided into control group and observation group, with 27 cases in each group. During the course of treatment, three cases withdrew from the study due to poor compliance, including two cases in the control group and one case in the observation group. Finally 25 and 26 cases were included in the control group and the observation group, respectively. The control group received conventional rehabilitation therapy (physical modality therapy and exercise training) combined with stretching training. Physical modality therapy mainly included magnetothermal therapy and medium frequency pulsed electrotherapy, with a duration of 20 minutes a time for each treatment, once a day, continuous treatment, and three times a week; exercise training included isometric contraction training and

deep neck flexor muscle group training, with three times a day, continuous treatment, and three times a week; stretching training were performed once a day, continuous treatment, and three times a week. The observation group received MET therapy in addition to the conventional rehabilitation therapy in the control group. The therapist stretched the target muscle to the position where pain was triggered or the resistance point of soft tissue could be felt, fixed the starting and ending points of the muscle with both hands, applied moderate resistance, and allowed the patient's target muscle to perform isometric contraction (an intensity of 20% of the maximum force) and relax after 10 seconds, and then continued to stretch the target muscle and reached the position of the next resistance point, taking the resistance point as the starting position, repeated the procedure 3 to 5 times, once a day, three times a week, lasting for one week. Before treatment and one week after treatment, visual analog scale (VAS) was used to assess the pain level; neck disability index (NDI) was used to evaluate cervical spine dysfunction; Yasuhisa Tanaka cervical spondylotic radiculopathy 20 (CSR20) was used to evaluate cervical spine function; "Clinical practice guideline for physical therapy assessment and treatment in patients with nonspecific neck pain" were used to evaluate the clinical efficacy; the adverse reaction such as aggravation of neck pain, nausea, vomiting, dizziness, increased heart rate, etc. that occurred during treatment were observed. **Results** Compared with that before treatment, VAS scores and NDI index decreased significantly of both groups after treatment ( $P<0.05$ ), CSR20 score increased significantly, and the differences were statistically significant ( $P<0.05$ ). Compared with the control group, VAS score was significantly lower in the observation group after treatment, CSR20 score was significantly higher, and the differences were statistically significant ( $P<0.05$ ). The effective rate in the observation group (92.31%) was higher than that of the control group (28.00%), and the difference was statistically significant ( $P<0.05$ ). During the course of treatment, there were no adverse reactions in both groups. **Conclusion** MET combined with conventional rehabilitation therapy can effectively improve the pain and cervical spine function of patients with CNSNP, which is recommended for clinical promotion and application.

**KEY WORDS** chronic non-specific neck pain; muscle energy technology; stretching training; isometric contraction training; cervical spine function

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## Therapeutic Effect of Huayu Tongluo Moxibustion Combined with Low-Frequency Repetitive Transcranial Magnetic Stimulation on Patients with Mild to Moderate Post-Stroke Depression

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**ABSTRACT Objective** To observe the effect of Huayu Tongluo moxibustion combined with low-frequency repetitive transcranial magnetic stimulation (rTMS) on depressive symptoms, neurological deficits and sleep efficiency in patients with mild to moderate post-stroke depression (PSD). **Methods** A total of 40 patients with mild to moderate PSD in the First Affiliated Hospital of Anhui University of Chinese Medicine from January 2022 to October 2023 were randomly divided into control group and observation group, with 20 cases in each group. Both groups received routine treatment and rehabilitation training. The control group received low-frequency rTMS treatment in addition to the routine treatment and rehabilitation training, with a stimulation frequency of 1 Hz, a stimulation intensity of 80% motor threshold (MT), a stimulation duration of 10 s, an interval time of 2 s, and a total of 1 000 pulses. The observation group received Huayu Tongluo moxibustion therapy [pressure moxibustion at Baihui acupoint (GV 20), suspension moxibustion at Shenting (GV 24) acupoint and Dazhui acupoint (GV 14)] in addition to the treatment of the control group. Both groups were treated once a day, five times a week for three weeks. Before and after treatment, the Hamilton depression scale (HAMD), patient health questionnaire-9 (PHQ-9), and latency and amplitude of event related potential P300 were used to evaluate the symptoms and severity of depression; the National Institutes of Health Stroke Scale (NIHSS) was used to evaluate the degree of neurological deficits; the Pittsburgh sleep quality index (PSQI) was used to evaluate patient sleep efficiency; and the differences in adverse reactions between the two groups were compared. **Results** (1) Symptoms and severity of depression: compared with that before treatment, the HAMD and PHQ-9 scores decreased significantly in both groups after treatment, the latency of event related potential P300 decreased significantly and the amplitude of event related potential P300 increased significantly, and the differences were statistically significant ( $P<0.05$ ). Compared with the control group, HAMD and PHQ-9 scores were lower in the observation group after treatment, the latency of event related potential P300 was shorter and the amplitude of event related potential P300 was higher, and the differences were statistically significant ( $P<0.05$ ). (2) Degree of neurological deficits: compared with that before treatment, NIHSS score decreased significantly in both groups after treatment ( $P<0.05$ ). Compared with the control group, NIHSS score were lower in the observation group after treatment, and the differences were statistically significant ( $P<0.05$ ). (3) Sleep efficiency: compared with that before treatment, sleep efficiency improved significantly in both groups after treatment, and the differences were statistically significant ( $P<0.05$ ). There was no statistically significant difference in sleep efficiency between the control group and the observation group after treatment ( $P>0.05$ ). (4) Adverse reactions: No adverse reactions occurred in both group. **Conclusion** Huayu Tongluo moxibustion combined with low-frequency rTMS can effectively improve depression symptoms, neurological deficits, and sleep efficiency of patients with mild to moderate PSD, which is recommended for clinical promotion and application.

**KEY WORDS** stroke; depression; Huayu Tongluo moxibustion; low-frequency repetitive transcranial magnetic stimulation; neurological function; sleep efficiency

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