

# 超声可视化针刀联合康复训练 治疗膝骨关节炎疗效评价

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**摘要** **目的** 观察超声可视化针刀联合康复训练治疗膝骨关节炎的疗效。**方法** 选取2021年8月—2023年3月在福建中医药大学附属康复医院收治的膝骨关节炎患者70例,按照随机数字表法分为超声针刀组和常规治疗组,每组35例,其中超声针刀组4例、常规治疗组6例在中途退出,最终超声针刀组纳入31例,常规治疗组纳入29例。超声针刀组在超声引导下进行针刀治疗,同时联合股四头肌康复训练;常规治疗组行普通针刺治疗加股四头肌康复训练,比较2组治疗前后视觉模拟评分法(VAS)及西安大略和曼彻斯特大学骨关节炎指数(WOMAC)评分、股四头肌峰力矩值(PT)的变化情况,并比较疗效及安全性。**结果** 治疗后2组VAS评分均降低,与常规治疗组比较,超声针刀组VAS评分降低更明显( $P < 0.05$ )。治疗后2组骨关节炎指数(WOMAC)评分均有降低,超声针刀组WOMAC评分低于常规治疗组( $P < 0.001$ )。治疗后2组股四头肌PT均明显提高,与常规治疗组比较,超声针刀组提高更显著( $P < 0.001$ )。根据经筋辨证分型选取规律性经筋病灶点,选取频率较高的前4位主要为髌内下87.10%(27/31)、鹤顶次83.87%(26/31)、阴陵上77.42%(24/31)、髌外下74.19%(23/31)。髌内下在髌内侧支持带髌骨内下缘附着处回声增强,选取髌骨正下缘内侧旁开2 cm为进针点,针体向内侧偏45°,与皮肤垂直刺入,进针深度为(4.13±0.27)cm;鹤顶次在髌骨附着处股四头肌肌腱增厚,回声增强,髌上囊积液、滑膜增厚,选取髌骨正上缘1 cm处为进针点,髌上囊处针体向头侧偏45°进针,进针深度为(2.16±0.21)cm;阴陵上在鹅足腱胫骨内髌附着处回声增强,鹅足滑囊积液,选取髌骨正下缘内旁开3 cm、向下2 cm处为进针点,进针角度为鹅足滑囊处针体向头侧偏45°,进针深度为(1.97±0.18)cm;髌外下在髌外侧支持带髌骨外下缘附着处回声增强,选取髌骨下缘外侧正中旁开2 cm处为进针点,针体朝外偏45°,与皮肤垂直刺入,进针深度为(4.78±0.12)cm。常规治疗组临床有效率为86.21%(25/29),超声针刀组临床有效率为100.00%(31/31)( $P < 0.05$ )。常规治疗组有8例患者出现轻微不良反应,超声针刀组仅1例患者出现轻微不良反应,超声针刀组临床治疗安全性更高。**结论** 超声可视化针刀治疗联合股四头肌康复训练可精确松解经筋病灶点,稳定膝关节功能,提高治疗的安全性及有效性,值得推广。

**关键词** 膝骨关节炎; 经筋理论; 可视化针刀; 股四头肌训练; 疗效及安全

膝骨关节炎(knee osteoarthritis, KOA)发病率高、致残率高、社会危害大,积极开展KOA疾病防治

具有重要意义。KOA的临床治疗方法甚多,中医药特色疗法在防治KOA方面疗效显著,基于经筋理论

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对KOA“横络痹阻、气血失和,筋骨失衡”病机科学认识<sup>[1]</sup>,指导针刀“以痛为输”循经筋病灶点“解结”治疗KOA,取得确切的临床疗效<sup>[2-3]</sup>。肌骨超声技术应用用于针刀治疗骨关节疾病,能提高针刀治疗的安全性和有效性<sup>[4-5]</sup>。康复训练属于非药物疗法,可增强膝关节周围肌肉力量,维持关节稳定性和协调性<sup>[6]</sup>。本研究借助肌骨超声,采用可视化针刀松解KOA常见经筋病灶点,同时配合康复训练,取得满意效果,现报道如下。

## 1 临床资料

### 1.1 病例选择标准

**1.1.1 纳入标准** ①符合2018年中国中西医结合学会骨伤科专业委员会制定的《膝骨关节炎中西医结合诊疗指南》<sup>[7]</sup>诊断标准,影像学改变采用Kellgren-Lawrence分级(简写K-L分级)标准,K-L分级在I~III级;②年龄50~70岁,体质量指数 $\leq 30 \text{ kg/m}^2$ ;③近3个月内未使用病情改善药物或其他干预疗法;④签署知情同意书并自愿参与本研究。

**1.1.2 排除标准** ①有骨关节结核、肿瘤、风湿或类风湿关节炎病史;②惧怕针刀治疗者;③筛选前2个月内服用非甾体类抗炎药等止痛药或关节腔内有激素治疗史;④膝关节患有神经性疼痛或局部皮肤发红、破损等;⑤研究期间出现严重过敏、感染或精神紧张等要求中止研究者。

### 1.2 一般资料

选取2021年8月—2023年3月福建中医药大学附属康复医院符合纳入标准的膝骨关节炎单膝患者70例作为研究对象。采用随机数字表法分为超声针刀组和常规治疗组,每组35例。治疗期间,超声针刀组2例患者惧怕针刀治疗中途退出,1例患者失访,1例患者出现上呼吸道疾病,最终完成31例;常规治疗组3例患者治疗疗程不足,2例患者因内科疾病中途退出,1例患者因工作原因无法继续治疗,最终完成29例。2组一般资料比较,差异无统计学意义( $P>0.05$ ),具有可比性,见表1。研究方案提交福建中医药大学附属康复医院伦理委员会,经审批通过并备案(审批号:2021KY-009-02)。

表1 2组一般资料比较

Table 1 Comparison of the general data between the two groups

组别	例数	性别		年龄/ $(\bar{x}\pm s)$ ,岁	病程/ $(\bar{x}\pm s)$ ,年	患膝	
		男	女			左膝	右膝
常规治疗组	29	13	16	56.34 $\pm$ 4.17	5.24 $\pm$ 2.37	15	14
超声针刀组	31	14	17	56.35 $\pm$ 4.74	5.29 $\pm$ 2.82	17	14
<i>t</i> 值				0.009	0.073		
<i>P</i> 值				0.993	0.942		

## 2 方法

### 2.1 治疗方法

#### 2.1.1 超声针刀组

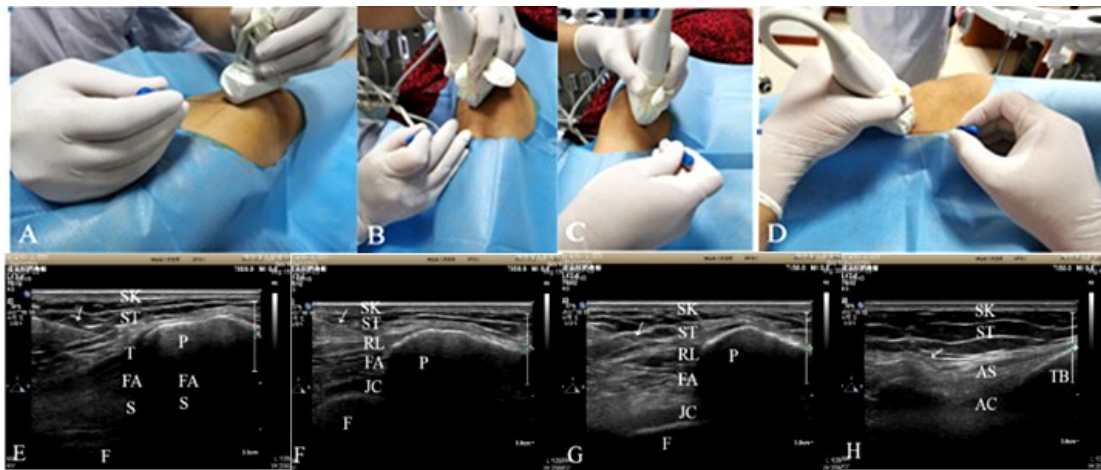
**2.1.1.1 定位** 根据《中国经筋学》<sup>[8]</sup>经筋查体方法,选取规律性经筋病灶点5~7点(鹤顶次、髌内下次、髌外下次、阴凌上次、委中次、阳陵泉次、足三里次等),做好标记,超声针刀组使用高频超声诊断仪(美国飞利浦公司EPIQ7),将患侧膝关节及超声探头进行常规消毒铺巾,术者戴无菌手套,超声探头置于标记点旁,先探测病灶点周围解剖,再探测病灶点病变情况,如肌纤维排列是否紊乱、肌纤维是否增生肥厚,肌腱骨面附着处是否毛糙、不连续,关节囊是否积液,积液厚度多少,精准定位评估病灶处针刀进针角度及深度。见图1。

**2.1.1.2 针刀操作** 选取汉章0.8 mm $\times$ 40 mm I型

针刀,超声针刀组针刀刀口线平行于探头方向与皮肤成45°进针<sup>[9]</sup>,在超声引导下抵达病灶点,在病变范围内行常规的纵切和横切,结束后按原路返回出刀,无菌干棉球按压1 min,无菌创口贴贴敷。每周1次,共治疗4周,若治疗1~2次后临床症状已缓解可提前结束治疗。

**2.1.1.3 康复训练** 利用仿真力量训练与评定系统<sup>[10]</sup>(Primus RS)进行股四头肌等速肌力训练,训练速度30°/s,15 min/次,5次/周,连续治疗4周。

**2.1.2 常规治疗组** 根据上述原则选取规律性经筋病灶点,做好标记,常规消毒铺巾,选用0.3 mm $\times$ 40.0 mm一次性华佗牌针灸针,按《针灸学》操作规范,左手固定穴位,右手持针进针,行提插捻转3~5次,得气后留针30 min,5次/周,共治疗4周。康复训练同超声针刀组。



注:A、B、C、D分别为超声引导针刀治疗“鹤顶次”“髌外下”“髌内下”“阴陵上”的进针刀图;E、F、G、H分别为超声引导针刀治疗“鹤顶次”“髌外下”“髌内下”“阴陵上”的针刀入路声像图。图中P为髌骨;F为股骨;SK为皮肤;ST为皮下组织;T为股四头肌肌腱;RL为髌外侧支持带;RM为髌内侧支持带;FA为脂肪组织;S为髌上囊;AC为鹅足囊;JC为关节囊。

Note: A, B, C, D represent for injection charts of ultrasound guided needle knife for "Hedingci", "Binwaixia", "Binneixia" and "Yinlingshang" respectively; E, F, G, H represent for audio charts of ultrasound guided needle knife for "Hedingci", "Binwaixia", "Binneixia" and "Yinlingshang" respectively. P is patella; F is femur; SK is skin; ST is subcutaneous tissue; T is quadriceps tendon; RL is lateral patellar support band; RM is medial patellar support band; FA is adipose tissue; S is superior patellar capsule; AC is goose foot capsule; JC is joint capsule.

图1 超声引导针刀治疗膝骨关节炎的常见经筋病灶点进针定位及超声声像图

Figure 1 Point injection needle positioning and ultrasonic sonogram of common ultrasound guided needle in the treatment of knee osteoarthritis

## 2.2 观察指标

**2.2.1 视觉模拟评分** 采用视觉模拟评分法(visual analogue scale, VAS)评估患者膝部疼痛程度,分值为0~10分,0分表示无痛,10分为最痛。让患者根据自身疼痛耐受程度于治疗前后进行评估。

**2.2.2 西安大略和曼彻斯特大学骨关节炎指数评分** 西安大略和曼彻斯特大学骨关节炎指数评分(Western Ontario and McMaster Universities Osteoarthritis Index, WOMAC)包含疼痛、僵硬和功能活动3大部分,共24个子项目,每个项目0~4分,总计96分;其中疼痛部分含5个子项目,共20分;僵硬部分含2个子项目,共8分;功能活动部分含17个子项目,共68分。评分越高则表示功能越差,病情越严重。于治疗前后分别评估。

**2.2.3 股四头肌生物力学指标** 采用仿真力量训练与评定系统(primus, RS)进行等速肌力测试,分别在治疗前后测试股四头肌的峰力矩值(peak torque, PT),测试角速度取60°/s。

**2.2.4 经筋病灶点发生频率及超声声像图解剖特**

征 根据经筋辨证分型选取经筋病灶点,分析常见经筋病灶点的发生频率,同时观察其病变好发解剖层面特征,测量进针角度及深度范围。

**2.2.5 疗效评价** ①治愈:正常活动,无疼痛,阳性体征消失;②显效:疼痛消退,功能活动如常,但不能久行,活动时关节有摩擦感或发出响声;③有效:功能活动明显好转,疼痛缓解;④无效:治疗后症状、阳性体征无明显变化,膝关节功能无改善<sup>[11]</sup>。

总有效率=[(总例数-无效例数)/总例数]×100%

**2.2.6 安全性评价** 根据患者治疗期间的体验感及疼痛、轻微出血、血肿、关节肿胀、局部轻度瘙痒等不良事件发生情况对比分析治疗前后2组患者不良反应发生的情况及例数。

## 2.3 统计学方法

采用SPSS 25.0软件进行数据统计分析。计量资料符合正态分布以( $\bar{x} \pm s$ )表示,组内比较采用配对样本t检验,组间比较采用两独立样本t检验;计数资料以(n, %)表示组间比较采用 $\chi^2$ 检验。 $P < 0.05$ 表示差异有统计学意义。

### 3 结果

#### 3.1 2组治疗前后VAS评分比较

治疗后2组VAS评分均降低,与常规治疗组比较,超声针刀组降低更明显( $P<0.05$ )。见表2。

表2 2组治疗前后VAS评分比较( $\bar{x}\pm s$ ) 分  
Table 2 Comparison of VAS scores between two groups before and after treatment ( $\bar{x}\pm s$ ) Scores

组别	例数	治疗前	治疗后
常规治疗组	29	7.10±0.90	2.35±2.04
超声针刀组	31	7.13±0.88	1.23±1.20
<i>t</i> 值		0.111	-2.566
<i>P</i> 值		0.912	0.014

#### 3.2 2组治疗前后WOMAC评分比较

治疗后2组WOMAC评分均有降低,与常规治疗组比较,超声针刀组WOMAC评分低于常规治疗组( $P<0.001$ )。见表3。

#### 3.3 2组治疗前后股四头肌PT比较

治疗后2组股四头肌PT均明显提高,与常规治疗组比较,超声针刀组提高更显著( $P<0.001$ )。见表4。

#### 3.4 常见经筋病灶点超声声像图解剖特征及进针入径分析

根据经筋辨证分型选取规律性经筋病灶点,选取频率较高的前4位主要为髌内下87.10%(27/31)、鹤顶次83.87%(26/31)、阴陵上77.42%(24/31)、髌

外下74.19%(23/31)。髌内下在髌内侧支持带髌骨内下缘附着处回声增强,选取髌骨正下缘内侧旁开2 cm为进针点,针体向内侧偏45°,与皮肤垂直刺入,进针深度为(4.13±0.27)cm,其余3个(鹤顶次、阴陵上、髌外下)病变解剖特征及进针点选择和进针角度及深度情况见表5和图2。

#### 3.5 2组疗效比较

常规治疗组治疗后临床有效率为86.21%(25/29),超声针刀组临床有效率为100.00%(31/31),差异有统计学意义( $P<0.05$ )。见表6。

表3 2组治疗前后WOMAC评分比较( $\bar{x}\pm s$ ) 分  
Table 3 Comparison of WOMAC scores between two groups before and after treatment ( $\bar{x}\pm s$ ) Scores

组别	例数	治疗前	治疗后
常规治疗组	29	76.97±2.85	46.31±12.66
超声针刀组	31	77.13±2.78	35.13±4.63
<i>t</i> 值		0.247	-3.277
<i>P</i> 值		0.805	<0.001

表4 2组治疗前后股四头肌PT比较( $\bar{x}\pm s$ )  
Table 4 Comparison of PT of quadriceps between two groups before and after treatment ( $\bar{x}\pm s$ )

组别	例数	治疗前	治疗后
常规治疗组	29	47.31±2.95	63.17±3.99
超声针刀组	31	47.23±6.71	70.58±2.74
<i>t</i> 值		-0.270	5.643
<i>P</i> 值		0.787	<0.001

表5 超声针刀组经筋病灶点超声声像图解剖及进针入路  
Table 5 Dissection and needle approach of ultrasonic needle knife group

经筋病灶点	病变解剖层面特征	进针点及进针角度	进针深度/( $\bar{x}\pm s$ , cm)
髌内下	髌内侧支持带髌骨内下缘附着处回声增强	髌骨正下缘内侧旁开2 cm,针体向内侧偏45°,垂直皮肤	4.13±0.27
鹤顶次	髌骨附着处股四头肌肌腱增厚,回声增强,髌上囊积液、滑膜增厚	髌骨正上缘1 cm,髌上囊处针体向头侧偏45°	2.16±0.21
阴陵上	鹅足腱胫骨内髌附着处回声增强,鹅足滑囊积液	髌骨正下缘内旁开3 cm,向下2 cm,鹅足滑囊处针体向头侧偏45°	1.97±0.18
髌外下	髌外侧支持带髌骨外下缘附着处回声增强	髌骨下缘外侧正中旁开2 cm,针体朝外偏45°,与皮肤垂直	4.78±0.12

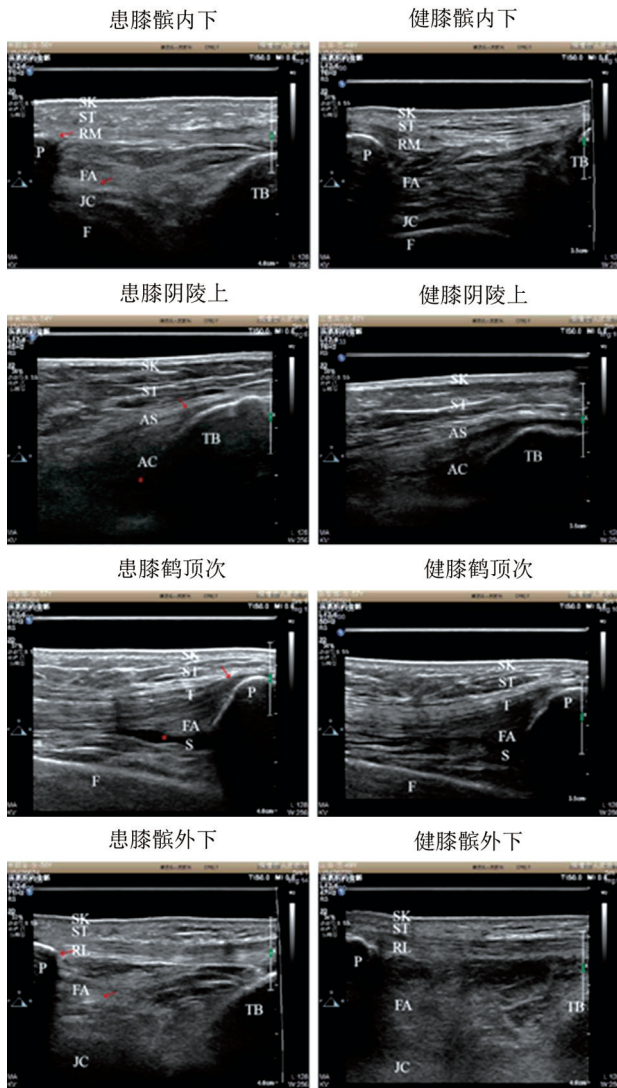


图2 超声针刀组经筋病灶点超声声像图  
Figure 2 Ultrasonic sonogram of ultrasonic needle knife group

表6 2组疗效比较

Table 6 Comparison of clinical efficacy between two groups

组别	例数	治愈	显效	有效	无效	总有效率/%
常规治疗组	29	6	11	8	4	86.21
超声针刀组	31	13	14	4	0	100.00
$\chi^2$ 值						8.215
P值						0.042

### 3.6 安全性评价

治疗过程中常规治疗组4例局部有轻微出血点,1例膝部血肿,予无菌棉球压迫止血,并消毒、贴敷处理后逐渐消退;2例有明显刺痛感,1例有神经刺激电灼感,予停止进针,待症状缓解后重新定位。

超声针刀组仅1例有刺痛感,余未述不适。说明超声可视化治疗的安全性高,可在超声引导下精准定位,可避免误伤局部血管神经。

## 4 讨论

### 4.1 经筋理论指导下行针刀松解治疗能有效缓解患者疼痛,改善膝关节功能

膝骨关节炎以膝关节软骨退行性变和骨质增生为病理特征,已成为全球第四大致残性疾病<sup>[12]</sup>,社会危害大,积极开展KOA疾病防治具有重要意义。医学对膝骨性关节炎治疗有独特作用,将其归属于“痹证”“痿证”范畴。《素问·痿论》言:“宗筋主束骨而利机关也。”足三阳经筋和足三阴经筋循行于膝关节,保持膝关节正常运动功能。经筋是十二经脉经气濡养筋肉骨节体系,经筋理论认为KOA主要发病机制是经筋力学失衡、气血失调,导致“筋伤”“筋结”,“解结”是治疗的关键。针刀可充分运用“针”和“刀”的优势,以经筋理论为辨治原则,通过针刺、切割、剥铲等操作松解常见筋结点粘连、瘢痕,疏通堵塞,达到止痛效果,恢复膝关节生物力学平衡,达到“结解则松,筋松则顺,筋顺则动,动则不痛”的治疗效果。徐文嵩和董宝强<sup>[13]</sup>运用DSA引导针刀治疗第三腰椎横突综合征,在经筋理论指导下选取规律性病灶点,获得显著疗效。伊传宗和陈南萍<sup>[2]</sup>研究表明,经筋理论指导下针刀治疗KOA能加快膝关节功能恢复,减轻痛苦,改善生活质量。本研究中超声针刀组在经筋理论指导下选取结筋病灶点,采用针刀治疗,治疗后患者VAS评分、WOMAC评分均降低,表明在经筋理论指导下行针刀松解治疗能有效缓解患者疼痛,改善膝关节功能。

### 4.2 可视化超声可明确经筋病灶点的解剖影像,提高针刀治疗的安全性和有效性

随着现代医学的发展,人们对膝骨性关节炎的治疗有了更高的要求,精准医学、可视化技术逐渐被推崇。肌骨超声技术作为一种方便且广泛使用的技术,对骨与软组织有较好的分辨力,能够清晰地显示膝关节肌腱、肌肉、滑囊等局部软组织解剖层次动态影像,了解局部病变情况,具有较好的敏感性和特异性、可对比性、无辐射等优点<sup>[14-17]</sup>,同时肌骨超声技术可明确经筋病灶点病变深度、范围和程度,能清晰显示局部软组织解剖层次和动态影像<sup>[18-19]</sup>,避免盲刺下对经筋病灶点诊断的随意性,治

疗安全性更优。根据课题组前期经验<sup>[18-19]</sup>,选取经筋辨证分型频率较高的髌内下 87.10%、鹤顶次 83.87%、阴陵上 77.42%、髌外下 74.19% 4 个经筋病灶点声像图进行研究,得出详细的进针点、进针角度和深度,如髌内下选取髌骨正下缘内侧旁开 2 cm 为进针点,针体向内侧偏 45°,与皮肤垂直刺入,进针深度为(4.13±0.27)cm,在髌内侧支持带髌骨内下缘附着处提示回声增强。

### 4.3 联合股四头肌康复训练可增强膝关节稳定性和协调性

研究显示膝骨关节炎病情演变与股四头肌萎缩关系密切,康复训练在提高股四头肌肌力、维持膝关节稳定性和协调性上起着举足轻重的作用,而改善股四头肌的肌力和肌耐力成为康复训练的重点<sup>[20-21]</sup>。仿真力量训练与评定系统既可进行股四头肌等速肌力训练,又可精确测量关节周围肌力,实时评估训练效果。本研究 2 组治疗后 PT 均提高,但超声针刀组提高更显著,说明可视化针刀联合股四头肌康复训练效果优于针刺配合股四头肌康复训练。

综上所述,运用经筋学辨证论治,指导针刀选穴定位,能明确膝骨性关节炎患者常见筋结病灶点;超声可视化引导能清晰显示常见筋结点的解剖结构,明确病变范围及深度,精准指导针刀进针松解,提高治疗的安全性及有效性;“解结的”同时联合股四头肌康复训练,可巩固针刀治疗效果,稳定膝关节功能,加速日常生活活动能力恢复,值得临床推广治疗。但本研究纳入的患者例数较少,观察的疗程较短,尚未进行远期疗效评估及治疗,今后将进一步加大样本量,开展随机对照研究,深入评估远期疗效,加强患者随访,为可视化针刀治疗提供临床依据。

### 参考文献

- [1] 赵卫锋,陆鹤,任媛媛,等.周志杰主任医师从经筋论治膝骨关节炎病及运用膝四针临证经验[J].陕西中医,2020,41(2):230-233.  
ZHAO W F, LU H, REN Y Y, et al. Academic thoughts of chief physician ZHOU Zhijie in treating knee osteoarthritis based on muscle region theory and the corresponding clinical experience of knee four needles [J]. Shaanxi J Tradit Chin Med, 2020, 41(2): 230-233.
- [2] 尹传宗,陈南萍.基于“经筋理论”针刀微创结合拔罐疗法治疗膝骨性关节炎的疗效[J].深圳中西医结合杂志,2022,

- 32(12):46-48.  
YIN C Z, CHEN N P. Therapeutic effect of minimally invasive needle knife combined with cupping therapy on knee osteoarthritis based on "meridian tendon theory" [J]. Shenzhen J Integr Tradit Chin West Med, 2022, 32(12):46-48.
- [3] 张良志,刘洪,修忠标.基于经筋理论针刀治疗膝骨性关节炎疗效的Meta分析[J].中国民族民间医药,2020,29(8):54-57.  
ZHANG L Z, LIU H, XIU Z B. Meta-analysis of therapeutic effect of acupotomy on knee osteoarthritis based on meridian tendon theory [J]. Chin J Ethnomed Ethnopharmacology, 2020, 29(8):54-57.
- [4] 张良志,张任攀,刘洪,等.基于CiteSpace的针刀治疗膝骨性关节炎知识图谱分析[J].中国医药导报,2022,19(10):9-13.  
ZHANG L Z, ZHANG R P, LIU H, et al. Analysis of knowledge graph of akupotomy in the treatment of knee osteoarthritis based on CiteSpace [J]. China Med Her, 2022, 19(10):9-13.
- [5] 朱晨霞,郑慧.《肌骨超声介入治疗图解》高频超声引导下在小针刀治疗膝关节中的应用[J].介入放射学杂志,2020,29(11):1181.  
ZHU C X, ZHENG H. Application of "Illustration of Myoskeletal Ultrasound Interventional Therapy" under the guidance of high-frequency ultrasound in the treatment of knee joint with small needle knife [J]. J Interv Radiol, 2020, 29(11):1181.
- [6] 黄梁江,史巍巍,陆敏.膝关节骨性关节炎的康复治疗新进展[J].中国康复,2022,37(4):252-256.  
HUANG L J, SHI W W, LU M. New progress in the rehabilitation and treatment of knee osteoarthritis [J]. Chin J Rehabil, 2022, 37(4):252-256.
- [7] 中国中西医结合学会骨伤科专业委员会.膝骨关节炎中西医结合诊疗指南[J].中华医学杂志,2018,98(45):3653-3658.  
Professional Committee of Orthopedics Department of Chinese Society of Integrated Traditional Chinese and Western Medicine. Guidelines for the diagnosis and treatment of integrated Traditional Chinese and Western medicine for knee osteoarthritis [J]. Natl Med J China, 2018, 98(45):3653-3658.
- [8] 薛立功.中国经筋学[M].北京:中医古籍出版社,2015:15-18.  
XUE L G. Chinese Jing jin School [M]. Beijing: Traditional Chinese Medicine Ancient Books Press, 2015:15-18.
- [9] 刘晶,林巧璇,宫玉榕,等.超声多模态联合技术评估膝骨性关节炎兔股直肌病变的应用探析[J].中国医药导报,2020,17(7):147-151.  
LIU J, LIN Q X, GONG Y R, et al. Discussion on application of ultrasonic multimodal combined technique in the evaluation of femoral rectus in rabbits with knee osteoarthritis [J]. China Med Her, 2020, 17(7):147-151.
- [10] 喻翔,廖燕铤,苏小燕,等.仿真力量训练系统对膝关节周围骨折术后障碍的疗效分析[J].中国卫生标准管理,2020,11(10):43-45.  
YU X, LIAO Y T, SU X Y, et al. Effect of BTE on joint dysfunction after peri-knee fracture [J]. China Health Stand Manag, 2020, 11(10):43-45.

- [11] 黄志强,刘宇,苏昭元,等.阿是穴刺络拔罐联合股四头肌功能锻炼治疗膝骨性关节炎[J].康复学报,2019,29(1):21-26.  
HUANG Z Q, LIU Y, SU Z Y, et al. Effect of Ashi point pricking and cupping combined with quadriceps femoris function exercise on the clinical curative effect of knee osteoarthritis [J]. Rehabil Med, 2019, 29(1): 21-26.
- [12] CROSS M, SMITH E, HOY D, et al. The global burden of hip and knee osteoarthritis: estimates from the global burden of disease 2010 study [J]. Ann Rheum Dis, 2014, 73(7): 1323-1330.
- [13] 徐文嵩,董宝强.经筋理论指导下DSA引导针刀“解结法”治疗第三腰椎横突综合征临床观察[J].辽宁中医药大学学报,2021, 23(8):97-101.  
XU W S, DONG B Q. Clinical observation on the treatment of the third lumbar transverse process syndrome with "unknotting method" guided by DSA under the guidance of meridian sinew theory [J]. J Liaoning Univ Tradit Chin Med, 2021, 23(8): 97-101.
- [14] 张艳华.超声、螺旋CT、腹部X线诊断肠梗阻临床对比观察[J].影像技术,2018,30(5):30-32,41.  
ZHANG Y H. Clinical contrast observation of ultrasound, spiral CT and abdominal X-ray diagnosis of intestinal obstruction [J]. Image Technol, 2018, 30(5): 30-32, 41.
- [15] 钟毓贤,刘峰,任贺,等.超声引导下针刀联合富血小板血浆注射治疗膝骨性关节炎的临床疗效观察[J].中国康复,2022,37(2):95-100.  
ZHONG Y X, LIU F, REN H, et al. Therapeutic effects of ultrasound-guided acupotomy combined with platelet-rich plasma on knee osteoarthritis [J]. Chin J Rehabil, 2022, 37(2): 95-100.
- [16] 李航,李月,何慧洋.探讨超声引导下针刀治疗对膝骨性关节炎患者关节功能、血清炎症因子的影响[J].现代诊断与治疗,2022,33(10):1442-1445.  
LI H, LI Y, HE H Y. To explore the effect of ultrasound-guided acupotomy on joint function and serum inflammatory factors in patients with knee osteoarthritis [J]. Mod Diagn Treat, 2022, 33(10): 1442-1445.
- [17] 雷志永,焦弗蔓,杨恺,等.探讨高频超声在膝关节骨性关节炎康复治疗效果评估中的价值[J].影像研究与医学应用,2021, 5(21):220-221.  
LEI Z Y, JIAO F M, YANG K, et al. To explore the value of high-frequency ultrasound in the evaluation of rehabilitation treatment effect of knee osteoarthritis [J]. J Imag Res Med Appl, 2021, 5(21): 220-221.
- [18] 刘晶,修忠标,林巧璇,等.基于经筋理论膝骨关节炎常见经筋病灶点的超声解剖学及针刀入路研究[J].中国针灸,2021, 41(8):892-896.  
LIU J, XIU Z B, LIN Q X, et al. Ultrasound anatomy and needle-knife insertion approach of common tendon lesions in knee osteoarthritis based on meridian sinew theory [J]. Chin Acupunct Moxibustion, 2021, 41(8): 892-896.
- [19] 刘晶,宫玉榕,修忠标.肌骨超声视角下膝痹病经筋辨治的再认识[J].环球中医药,2020,13(8):1384-1387.  
LIU J, GONG Y R, XIU Z B. Reunderstanding of the knee disease from the perspective of myosceous ultrasound [J]. Glob Tradit Chin Med, 2020, 13(8): 1384-1387.
- [20] 连晓文,陈秀明,刘金勇,等.股四头肌功能训练治疗膝骨性关节炎的临床观察[J].中国中医药现代远程教育,2018, 16(12):108-110.  
LIAN X W, CHEN X M, LIU J Y, et al. Clinical observation on quadriceps femoris function training in the treatment of knee osteoarthritis [J]. Chin Med Mod Distance Educ China, 2018, 16(12): 108-110.
- [21] 刘丽金,梁杰,苏婵娟,等.肌电生物反馈疗法对膝骨性关节炎股四头肌力量和功能的影响[J].吉林医学,2020,41(11): 2568-2573.  
LIU L J, LIANG J, SU C J, et al. Effects of electromyographic bio-feedback therapy on influence of quadriceps muscle strength and functional ability in patients with knee osteoarthritis [J]. Jilin Med J, 2020, 41(11): 2568-2573.

## Evaluation of the Efficacy of Ultrasound-Guided Visualized Acupotomy Combined with Rehabilitation Training in Treatment of Knee Osteoarthritis

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**ABSTRACT Objective** To observe the effect of ultrasound-guided visualized acupotomy combined with rehabilitation training for knee osteoarthritis. **Methods** A total of 70 patients with knee osteoarthritis, admitted to the Affiliated Rehabilitation of Fujian University of Traditional Chinese Medicine from August 2021 to March 2023 were selected. According to the random number table method, they were divided into ultrasonic needle knife group and conventional treatment group, with 35 cases in each group. Four patients in the ultrasound needle knife group and 6 patients in the conventional treatment group withdrew. Ultimately, 31 patients were included in the ultrasonic needle knife group and 29 in the conventional treatment group. The ultrasonic needle knife group underwent needle knife treatment under ultrasound guidance, combined with quadriceps rehabilitation training. The conventional treatment group underwent general acupuncture treatment plus quadriceps rehabilitation training. The visual analogue scale (VAS), the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores, peak torque values of the quadriceps femoris (PT), and efficacy and safety before and after treatment were compared. **Results** After treatment, the VAS scores decreased in both groups, with the ultrasound needle knife group showing a more significant decrease compared with the conventional treatment group ( $P<0.05$ ). WOMAC scores decreased in both groups after treatment, and the WOMAC scores of the ultrasound needle knife group were lower than those of the conventional treatment group ( $P<0.001$ ). The PT of the quadriceps increased significantly in both groups after treatment, and there was more significant in the ultrasound needle knife group compared with the conventional treatment group ( $P<0.001$ ). On the basis of the selection of regular meridian disease points according to meridian sinew theory, the top 4 frequently selected points were "Binneixia" 87.10% (27/31), "Hedingci" 83.87% (26/31), "Yinlingshang" 77.42% (24/31), and "Binwaixia" 74.19% (23/31). "Binneixia" showed echo enhancement at the attachment site of the medial inferior edge of the patella, and the needle point was selected 2 cm adjacent to the medial lower edge of the patella, the needle body was 45° inward, vertically thrust into the skin, with a depth of (4.13±0.27) cm. "Binneixia" enhanced the echo at the lower edge of the patella in the medial patella support belt, 2 cm of the medial lower edge of the patella is selected as the injection point, the needle body is medially 45°, vertically pierced with the skin, and the injection depth is (4.13±0.27) cm; "Hedingci" thickened the quadriceps tendon at the patellar attachment, enhanced echo, suprapatellar capsule fluid and synovial thickening, 1 cm at the upper edge of the patella is selected as the needle injection point, the patellar capsule is 45° to the head, and the needle injection depth is (2.16±0.21) cm; "Yinlingshang" echoes echo at the attachment of the tibial condyle of the goose foot tendon, selects 3 cm from the lower edge of the patella, 2 cm down for the injection point, the injection Angle is the head of the needle is 45°, and the injection depth is (1.97±0.18) cm; "Binwaixia" enhanced the echo at the attachment of the outer lower edge of the patella in the lateral patella. At 2 cm of the lateral lower edge of the patella was selected as the needle injection point, the needle body was tilted outward 45°, vertically pierced to the skin, and the needle injection depth was (4.78±0.12) cm. The clinical effective rate of the conventional treatment group was 86.21% (25/29), and the ultrasound needle knife group had a clinical effectiveness rate of 100.00% (31/31) ( $P<0.05$ ). Eight patients in the conventional treatment group had minor adverse reactions, and only one patient in the ultrasound needle knife group had minor adverse reactions, indicating a higher clinical treatment safety. **Conclusion** Ultrasound-guided visualization of needle knife treatment combined with quadriceps rehabilitation training can accurately release the focal points of the meridian tendons, stabilize the function of the knee joint, and improve the safety and effectiveness of the treatment, which is worthy of promotion.

**KEY WORDS** knee osteoarthritis; meridian sinew theory; visualized needle knife; quadriceps training; efficacy and safety

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