

# 加速康复外科综合治疗在三角纤维软骨复合体损伤患者围术期中的应用

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**摘要:**目的 观察加速康复外科(enhanced recovery after surgery, ERAS)综合治疗对三角纤维软骨复合体(triangular fibrocartilage complex, TFCC)损伤经腕关节镜修复术后患者围术期的效果。方法 回顾性收集山东大学齐鲁医院2023年1月至12月行腕关节镜下修复TFCC损伤患者46例,行ERAS综合康复患者为观察组,常规康复患者为对照组,每组23例。观察组和对照组术后均采用同一种支具外固定方式,前3周采用过肘关节支具,3周根据复查情况更换前臂外固定支具,6周后根据复查情况去除外固定支具逐渐恢复康复训练,其中对照组根据术前谈话及复查医嘱自行康复锻炼。观察组术前即开始通过预康复运动、营养、心理治疗,综合评估,制定患者个性化综合护理计划,术后采用早期渐进式康复治疗,进行肌肉训练、关节活动、理疗、日常生活训练等,过程中由护理人员监督指导完成。术后6周和12周分别对患者疼痛视觉模拟量表(visual analogue scale, VAS)进行评分,术后12周评估关节活动度及改良的MAYO腕关节评分。结果 观察组术后6、12周疼痛VAS评分均较对照组低,术后12周腕关节背伸、掌屈、桡偏、尺偏活动度、MAYO腕关节评分均较对照组高,差异有统计学意义( $P<0.05$ )。结论 ERAS理念应用于TFCC损伤患者能够缩短康复治疗时间,提高康复效果,对手术的疗效起到强化作用,助力患者尽快回归社会生活。

**关键词:**加速康复外科;三角纤维软骨复合体损伤;预康复;早期康复;腕关节镜

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## Application of enhanced recovery after surgery comprehensive treatment in the perioperative period of patients with triangular fibrocartilage complex injuries

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**Abstract: Objective** To observe the perioperative efficacy of the comprehensive treatment of enhanced recovery after surgery (ERAS) in patients with triangular fibrocartilage complex (TFCC) injury after undergoing transcarpal arthroscopic repair. **Methods** A retrospective collection was carried out on 46 patients with TFCC injuries who underwent transcarpal arthroscopic repair in Qilu Hospital of Shandong University from January to December 2023. The patients who underwent ERAS comprehensive rehabilitation were assigned to the observation group, and those who received conventional rehabilitation were designated as the control group, with 23 cases in each group. Both the observation group and the control group were treated with the same modality of external orthotic fixation postoperatively. In the initial three-week period, an above-elbow orthosis was applied. Subsequently, at the three-week mark, a review was conducted and, based on the assessment, the forearm external fixation orthosis was substituted. After six weeks, in accordance with the reevaluation findings, the external fixation orthosis was removed and a progressive resumption of rehabilitation training was initiated. Among them, the control group carried out rehabilitation exercises on their own according to the

preoperative conversation and the doctor's advice during the review. In the observation group, pre-rehabilitation exercises, nutritional support, and psychological counseling were initiated prior to surgery, followed by a comprehensive evaluation. Subsequently, a comprehensive assessment was conducted to develop an individualized comprehensive nursing plan for the patients. After the operation, an early progressive rehabilitation treatment was adopted, which comprised muscle training, joint mobilization, physiotherapy, and activities of daily living training. The entire process was supervised and directed by nursing staff until completion. The visual analogue scale (VAS) for pain was scored at 6 and 12 weeks postoperatively, and the range of joint motion and the modified MAYO wrist score were evaluated at 12 weeks after the operation. **Results** The pain VAS scores of the observation group at 6 and 12 weeks after surgery were both lower than those of the control group. At 12 weeks after surgery, the wrist joint dorsiflexion, palmar flexion, radial deviation, ulnar deviation range of motion and MAYO wrist score of the observation group were all higher than those of the control group, and the differences were statistically significant ( $P < 0.05$ ). **Conclusion** The application of the ERAS concept in patients with TFCC injuries can shorten the rehabilitation treatment time, enhance the rehabilitation effect, strengthen the curative effect of the surgery, and help patients return to social life as soon as possible.

**Key words:** Enhanced recovery after surgery; Triangular fibrocartilage complex injury; Prehabilitation; Early rehabilitation; Wrist arthroscopy

加速康复外科(enhanced recovery after surgery, ERAS)目前已广泛应用于骨科领域,对于骨科疾病患者术后的康复发挥重要作用,尤其在术后康复方面,不仅可以缩短患者的住院时间、减少医疗费用、降低并发症的发生率等,而且在患者康复速度和康复效果等方面也有明显的促进作用<sup>[1]</sup>, ERAS理念在整个围术期护理对改善患者的预后尤为重要,它贯穿整个恢复期,同时需要多个科室协同、医护团队和患者相互信任、多方面共同努力去完成<sup>[2-3]</sup>。

预康复是基于ERAS理念之上的快速康复理念,是对ERAS理念的补充和扩展<sup>[4]</sup>。将预康复理念和加速康复相结合,将会使患者术后的康复计划更加完善,得到更好的临床效果<sup>[5]</sup>。

三角纤维软骨复合体(triangular fibrocartilage complex, TFCC)在腕部尺侧起缓冲垫的作用,在生物力学上又是连接和稳定尺桡骨的重要结构,它的损伤是腕关节疼痛和腕关节不稳的常见原因之一<sup>[6]</sup>。严重的TFCC损伤或经保守治疗无效者通常需要进行手术治疗,目前最常用的手术方式是在腕关节镜辅助下行TFCC缝合修复术<sup>[7-8]</sup>,通过直接修复损伤的TFCC,症状得到明显改善,随着医疗水平和患者健康意识的提高,术后康复也越来越受到重视。将ERAS和预康复理念应用于TFCC损伤的患者,在整个恢复期对患者进行加速康复综合治疗,能够提升患者的恢复效果,加快患者的恢复进程<sup>[9-11]</sup>。本研究旨在探讨基于ERAS理念下综合治疗在TFCC损伤患者康复中的应用,提出科学、安全快速的康复模式,建立完善的康复周期体系。

## 1 资料与方法

### 1.1 一般资料

#### 1.1.1 研究对象

回顾性收集2023年1月至2023年12月山东大学齐鲁医院手足外科行腕关节镜下TFCC修复术并实施ERAS综合康复患者23例(观察组)临床资料,其中男7例,女16例,16~59岁,平均(41.1±2.5)岁,病程1个月~5年不等,平均病程3(2,12)个月,其中左侧患病13例,右侧患病10例;在同一条件下找出与观察组患者相同时间进行腕关节镜下TFCC修复术且接受常规康复的患者23例(对照组),以此构建1:1的对照关系,其中男9例,女14例,15~67岁,平均(40.2±2.8)岁,病程10d~4年不等,平均病程6(5,24)个月,其中左侧患病15例,右侧患病8例。本研究所有患者均签署知情同意书。

#### 1.1.2 纳入标准与排除标准

纳入标准:①在手足外科行TFCC损伤修复术的患者;②18~70岁,能积极配合并获得随访的患者;③无其他影响血管及组织愈合等基础疾病的患者。

排除标准:①认知有欠缺,有心理疾病或精神病患者;②采用目前技术水平与患者不能进行沟通者;③存在失访可能的患者。

### 1.2 方法

#### 1.2.1 治疗方法

两组患者均采用相同的手术方式、手术用药,并由同一名高年资主任医师完成,同一组医生协助完成。所有患者采用静吸复合全身麻醉,均由同一护理组人员完成,术后均采用同一种支具固定方式。

### 1.2.2 对照组康复计划

对照组按照术前谈话讲解手术过程、手术风险、术后并发症和术后康复计划,前3周采用过肘关节支具,3周后根据复查情况解放肘关节,更换前臂外固定支具至6周,6周后根据复查情况去除外固定支具逐渐恢复康复训练,自行学习我科针对TFCC损伤康复锻炼视频,12周再次复查患者功能恢复情况。

### 1.2.3 观察组康复计划

#### 1.2.3.1 术前综合评估及腕关节活动、功能评定

患者入院后由护理人员进行疼痛、生活自理能力、心理状况、营养等生理心理方面的综合评估;对腕关节活动度及功能障碍情况由医生进行全面观察和评定。根据评估、评定结果,提出详细的康复及护理计划并制定相应的康复措施。

#### 1.2.3.2 术前预康复策略

在术前对患者进行预康复内容练习:①营养预康复:在患者入院前即开始根据患者营养状况制定均衡饮食计划,嘱患者加强高质量蛋白质及其他营养物质的摄入,增强体质,以耐受手术创伤及术后康复训练;同时,初步设定术后营养计划,让患者提前做好身心准备,配合术后具体营养评估结果做计划微调,保证围术期营养供给。②康复预训练:术前每日由专门护理人员指导观察组患者进行肢体肌肉力量训练,根据制定的康复计划进行训练及康复锻炼预练习,学习我科针对TFCC损伤术后的康复锻炼操(图1A、B)。③心理预康复:针对患者对手术、术

后康复等所存在的顾虑和担忧进行耐心的解答,分享成功案例及典型案例,术前做好针对性宣教、鼓励患者并积极疏导患者,降低患者对于疾病的心理担忧及恐惧感,增加患者术后恢复的信心和目标。

#### 1.2.3.3 康复锻炼方式

根据术前的预康复宣教内容,以降低患者心理紧张度和增加信心为主,从手术当天开始按照如下计划行康复训练。①手术当日,患肢制动,观察血运,支具或石膏固定。②术后1周内,患侧锻炼方式为手指屈伸、手指分指并指和肩关节内收外展、前屈后伸、上举、旋转;每个动作各10次,整个锻炼过程为1组,2次/d,1组/次。且局部使用光子治疗仪,2次/d,15 min/次(图1C)。③术后2~3周:重复上述锻炼方式,2次/d,2组/次。同时每天间断解除肘关节固定,进行肘关节屈伸训练,时间频次不限,发生不适,需暂停锻炼。④术后3周,需行第1次复诊,将过肘的长臂支具更换为腕关节支具,彻底解除肘关节制动(图1D、E)。⑤术后3~6周行肘关节屈伸训练,间断解除腕关节支具固定,做双手夹指牵拉动作,腕关节做掌屈、背伸、旋前、旋后训练,其中训练以患者疼痛耐受为宜。⑥术后6周,行第2次复诊,去除支具,复查X线。评估手腕关节活动度及功能。⑦术后6周~3个月,逐渐增加上肢各关节活动度及强度。⑧术后3个月,行第3次复诊,复查X线、MRI。再次评估手腕关节活动度及功能。

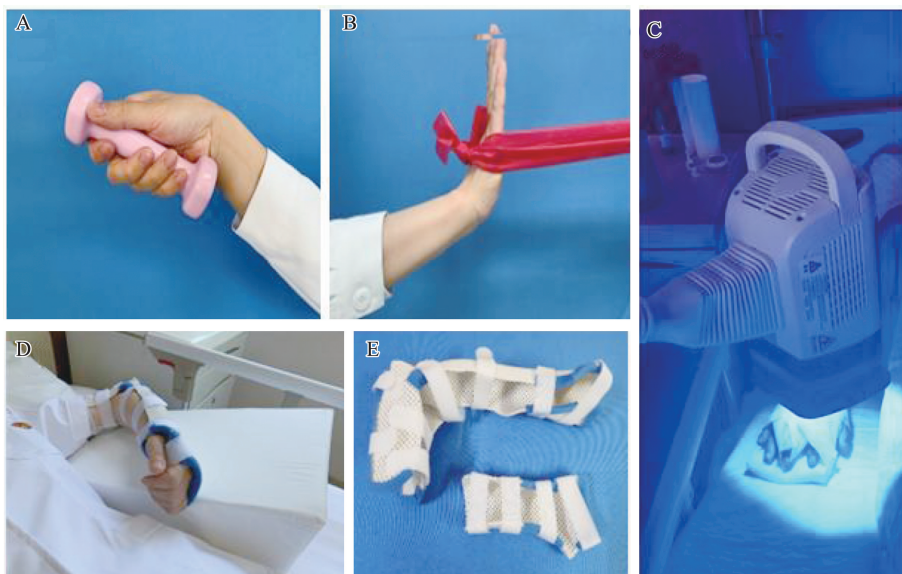


图1 康复训练项目及腕关节护具

A、B:腕关节运动预康复、术后功能训练;C:术后采用蓝光、红外线理疗方式;D:术后采用上肢垫抬高患肢,肘关节屈曲90°,腕关节护具采用中立位或旋后位;E:术后3周过肘关节长支具、术后3~6周前臂腕关节短支具。

Figure 1 Rehabilitation programmes and wrist braces

A, B: Partial photographs of motor prehabilitation and postoperative functional training of the wrist joint; C: Postoperative use of blue-light and infrared physiotherapy modalities; D: Postoperative use of upper limb pads to elevate the affected limb, with the elbow joint flexed at 90°, and the wrist brace in a neutral or rotated position; E: Over elbow joint long brace 3 weeks postoperatively, forearm wrist joint short brace 3-6 weeks postoperatively.

### 1.2.3.4 术后整体指导

①体位要求:制动中要求肘关节屈曲 $90^{\circ}$ ,腕关节中立位或旋后位;肢体位要求抬高患肢,高于心脏水平。②预防并发症:预防继发性功能障碍的策略,由康复组成员亲自示范并督促患者进行功能锻炼;日常生活中通过评估患者的术后自理等级,通过促进、代偿训练,由替代护理转变为自我护理,帮助、指导或训练患者逐步独立完成自理。③康复辅助护理:正确佩戴外固定支具及使用前臂吊带,期间严格按照预康复计划循序渐监督进行康复锻炼。④心理、环境护理:住院期间对患者采用安慰、启发、疏导、暗示和支持等方式;在病区开展集体座谈和健康科普等方式进行心理护理;病区内调整患者就诊的环境,夜间休息、阳光、温度、房间及病房设施等进一步改善。出院后,加强随访,定期检测患者心理状况,继续给予患者鼓励、支持等。

### 1.2.4 评定标准

比较两组患者术后6周和12周疼痛量表VAS评分,比较术后12周患者腕关节背伸、掌屈、桡偏、

尺偏活动度以及腕关节MAYO评分<sup>[12]</sup>。

### 1.3 统计学处理

采用SPSS 26.0统计学软件。Shapiro-Wilk检验用于评估数据的正态性,符合正态分布的计量资料以 $\bar{x}\pm s$ 表示,并采用两独立样本 $t$ 检验,计数资料通过频数和百分比表示,并采用皮尔逊卡方检验,不符合正态分布的计量资料以 $M(P_{25}, P_{75})$ 表示,并采用Mann-Whitney  $U$ 检验。 $P<0.05$ 为差异有统计学意义。

## 2 结果

### 2.1 两组基线资料比较

两组患者年龄、性别、体质指数、病程时长、既往高血压、吸烟史等均差异无统计学意义( $P>0.05$ ),在术前血液学检查中观察组白细胞、中性粒细胞计数均低于对照组( $P<0.05$ ),观察组平均血小板体积高于对照组( $P<0.05$ )。见表1。

表1 患者基线特征

Table 1 Baseline characteristics of the participants

指标	观察组	对照组	$P$
年龄/岁	41.10±2.50	40.20±2.80	0.811
性别/ $n(\%)$			
男	7(30.43)	9(39.13)	0.536
女	16(69.57)	14(60.87)	
病程时长/月	3(2,12)	6(5,24)	0.052
高血压/ $n(\%)$	2(8.7)	1(4.3)	0.550
吸烟史/ $n(\%)$	1(4.3)	3(13.0)	0.295
身高/m	1.66±0.16	1.67±0.15	0.612
体质量/kg	68(63,75)	70(60,75)	0.904
体质量指数	25.50±0.78	24.38±0.56	0.250
白细胞/ $(\times 10^9/L)$	5.36±0.22	6.26±0.31	0.021
中性粒细胞计数/ $(\times 10^9/L)$	2.91±0.14	3.59±0.24	0.019
红细胞计数/ $(\times 10^{12}/L)$	4.53±0.09	4.55±0.14	0.875
血红蛋白/(g/L)	134.74±3.15	135.09±3.05	0.937
红细胞压积/%	40.10(38.60,42.30)	40.50(38.20,44.10)	0.869
平均红细胞体积/fL	89.50(87.60,92.00)	89.70(84.90,94.60)	0.775
血小板计数/ $(\times 10^9/L)$	235.30±9.57	249.39±10.90	0.337
平均血小板体积/fL	10.47±0.15	9.75±0.17	0.002

### 2.2 两组术后并发症比较

两组患者术后均得到随访,平均随访12周以上。所有患者术后未出现感染、二次手术等并发症。

### 2.3 两组术后疗效比较

观察组术后6、12周疼痛VAS评分均较对照组低,差异有统计学意义( $P<0.05$ )。观察组术后12

周腕关节背伸、掌屈、桡偏、尺偏活动度、MAYO评分均较对照组高,差异有统计学意义( $P<0.05$ )。观察组与对照组术后1年以上MAYO评分相当,差异无统计学意义( $P>0.05$ )。见表2。观察组部分患者术后12周腕关节尺偏、背伸、桡偏、背侧观、旋后、旋前、掌屈、掌侧观等情况,见图2。

表2 两组术后疼痛量表VAS评分、腕关节活动度及MAYO评分  
Table 2 Postoperative pain scale VAS score, wrist mobility and MAYO score in both groups

指标	随访时间	观察组	对照组	P
疼痛量表VAS评分	6周	2(1,3)	3(2,4)	0.015
	12周	1(1,1)	1(1,3)	0.047
背伸活动度/°	12周	55.96±0.48	53.91±0.38	0.002
掌屈活动度/°	12周	56.26±0.27	54.74±0.36	0.001
桡偏活动度/°	12周	35.70±0.23	34.60±0.20	0.005
尺偏活动度/°	12周	26.39±0.27	24.83±0.23	<0.001
MAYO评分	12周	85(80,85)	80(80,85)	0.003
MAYO评分	1年以上	90(90,95)	90(90,95)	0.392

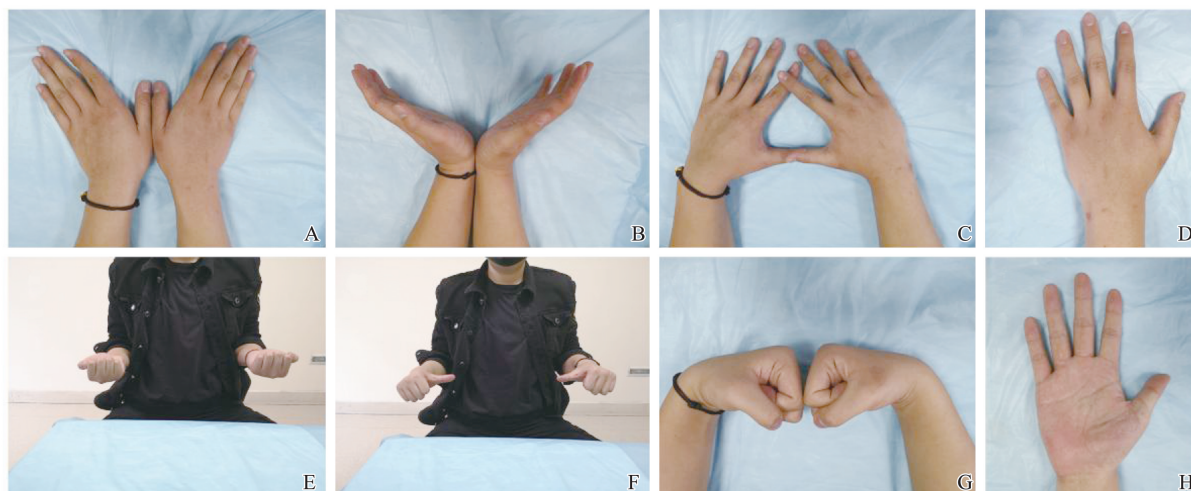


图2 观察组患者术后12周腕关节尺偏(A)、背伸(B)、桡偏(C)、背侧(D)、旋后(E)、旋前(F)、掌屈(G)、掌侧观(H)功能图  
Figure 2 At 12 weeks postoperatively, functional photographs of the patient's wrist joint were taken, including ulnar deviation (A), dorsal extension (B), radial deviation (C), dorsal (D), posterior rotation (E), anterior rotation (F), palmar flexion (G), and palmer (H)

### 3 讨论

TFCC 损伤患者多为青壮年,初次损伤,一部分患者通过佩戴腕关节护具、减少活动行保守治疗可以达到治愈,而另一部分经过保守治疗无效或损伤较为严重的患者,需要手术治疗才能治愈。手术方式从最开始的开放治疗到现在微创技术的不断发展及成功应用,腕关节镜下辅助治疗 TFCC 损伤已成为目前常用且可靠的手术方式,在减轻患者疼痛及改善腕关节活动功能方面成效显著<sup>[13-14]</sup>,大部分患者可恢复至既往的工作或运动状态,恢复比率较高,其中不乏从事高强度腕关节活动职业或运动项目的患者<sup>[15-16]</sup>。在运动医学损伤恢复的理念中,除了重视损伤组织解剖结构和生物力学的恢复,对组织功能的恢复也有较高要求<sup>[17]</sup>。康复治疗对患者功能恢复至关重要,术后康复因人而异,需要贯穿始终的康复理念与计划、多学科协同、医护团队监督指导以及患者对健康理念的理解并循序渐进康复锻

炼,这些是将 ERAS 理念应用于 TFCC 损伤患者康复的深刻体现。

在 TFCC 损伤患者康复治疗中,对于何时开始进行患肢的功能训练,外固定支具固定多久时间为最佳,不同学者及临床医生存在不同的看法,对于不同时间进行前臂和腕关节的康复训练,在不良事件的发生率上无明显不同<sup>[18]</sup>,但大多数还是建议术后行 4~6 周固定后开始关节活动<sup>[19]</sup>。本研究整合普遍认可的康复策略、ERAS 理念与预康复理念,借助医护团队协作督导患者康复计划,早期依循序渐进模式开展有规划、策略性与指导性的腕关节功能康复训练,进而显著缩短患者恢复时长,减少术后并发症。观察组在预康复阶段对患者实施了系统的预康复方案。运动预康复采用抬高患肢、加强患肢肌肉组织训练,有效的肌肉组织训练能够促进关节液、血液和淋巴液流动,增加肌肉组织延展性,减少组织黏连、关节僵硬等<sup>[20]</sup>;营养预康复,良好的营养方式能够增加肌肉和脂肪量群、体质量指数和蛋白浓度等,对组织的恢复具有促进作用<sup>[21]</sup>;心理预康复,运

用心理暗示方法转移患者对疾病的注意力,并对患者手术前后的恐惧与担忧情绪予以疏导,同时借助成功案例激励患者<sup>[22]</sup>。这些预康复措施直接或间接地促进患者的恢复。有研究表明,预康复护理模式在骨科手术前的干预中,能够稳定患者的情绪,提高术后患者压力应对能力,改善营养状况,减少并发症的发生<sup>[23]</sup>。观察组患者术后行早期渐进式加速康复治疗,结合预康复阶段学习内容,按照计划依次从指间关节活动,到肩、肘关节活动,最后到腕关节活动,逐渐加强训练和肌肉组织的力量,医护团队继续对患者营养物质摄入和心理状况监督指导,贯穿整个恢复期。观察组患者术后6周和12周VAS评分较对照组低,疼痛感觉明显降低,术后12周腕关节活动度及MAYO评分较对照组高。由此所见,预康复同加速康复外科综合治疗对患者恢复有促进作用。然而,长期随访结果显示两组患者MAYO评分无统计学差异,这可能与样本量有限或远期康复措施的个体化差异及功能代偿等因素有关,该现象提示不同康复策略在远期疗效方面可能存在等效性,有待进一步深入研究。

多项研究表明,快速康复理念对促进患者术后恢复显著,可缓解疼痛、提升生活质量、加速康复进程<sup>[24-26]</sup>。有研究对TFCC损伤患者术后固定6周后进行一个计划性综合康复训练,相较于没有明确康复计划的对照组具有明显的临床效果<sup>[27]</sup>,可见理疗、日常生活训练等都是快速康复治疗有效的康复手段<sup>[28]</sup>。本研究从术前的预康复开始,对观察组患者进行康复计划的制定,加速康复综合治疗贯穿患者整个恢复期。对照组患者在出院后被告知康复及复查计划,按3周解放肘关节、6周解放腕关节的方案开展康复锻炼与复查,未施行预康复治疗,亦未制定综合性康复计划,该组因缺乏医护人员的具体监督、患者自身健康观念不足以及健康教育不完善<sup>[29]</sup>,加之预康复预期计划相关知识学习缺失、康复计划实施不规范等诸多不可控因素,致使其术后恢复效果不如接受加速康复综合性治疗的患者。长时间固定肘关节,限制肩关节活动,易导致关节僵硬,肌肉萎缩<sup>[30-31]</sup>等并发症,不仅降低患者的恢复进度,还会对临床效果产生影响。

综上所述,ERAS理念在TFCC损伤患者中能有效缩减康复治疗时长,提升康复疗效,促使患者尽快回归原有的工作生活。本研究将预康复、加速康复综合性结合,并成功应用于TFCC损伤患者,是TFCC损伤患者康复治疗的新尝试,有助于ERAS理念在TFCC损伤患者中的康复策略更加完善。但

同样,对于ERAS理念在TFCC损伤患者当中的应用缺乏统一的标准,尽管在结果上都是有益于康复,但对于何时开始康复、何种康复方式最优以及各种方法与发生不良事件及并发症之间的关系尚需深入研究。

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