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术后疼痛对膝关节盘状半月板损伤患者膝关节功能、生活质量及心理状态的影响及其危险因素的 Logistic 回归分析*

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摘要 目的:探讨术后疼痛对膝关节盘状半月板损伤患者膝关节功能、生活质量及心理状态的影响及其危险因素的 Logistic 回归分析。**方法:**选取 2019 年 5 月~2022 年 1 月福建医科大学附属第一医院收治的膝关节盘状半月板损伤患者 120 例,均行关节镜手术治疗,观察并评价所有患者手术疗效;根据术后 6 个月膝关节是否疼痛分为疼痛组($n=16$)与无痛组($n=104$)。比较两组术前及术后 6 个月 Lysholm 膝关节功能评分、健康调查简表(SF-36)评分、焦虑自评量表(SAS)和抑郁自评量表(SDS)评分。单因素及多因素 Logistic 回归分析术后疼痛的危险因素。**结果:**120 例膝关节盘状半月板损伤患者术前、术后 3 个月、术后 6 个月 Lysholm 评分分别为(56.97 ± 8.62)分、(78.09 ± 10.53)分、(89.26 ± 8.14)分,术后 3 个月、术后 6 个月 Lysholm 评分均显著高于术前(均 $P<0.001$)。临床疗效显示行关节镜手术后优良率为 86.67%(104/120)。术后 6 个月两组 Lysholm 评分、SF-36 评分均高于手术前,但疼痛组低于无痛组($P<0.05$);术后 6 个月两组 SAS 评分、SDS 评分均低于手术前,但疼痛组高于无痛组($P<0.05$)。单因素分析发现,年龄、BMI、撕裂类型、滑膜切除、术后冷敷、开始负重时间与术后疼痛有关($P<0.05$);而性别、受教育程度、吸烟史、饮酒史、ASA 分级、患侧、病程、损伤部位、手术方式与术后疼痛无关($P>0.05$)。多因素 Logistic 回归分析显示,年龄、 $BMI\geq 24\text{ kg/m}^2$ 、纵裂或其他撕裂、滑膜切除、开始负重时间 <4 周及术后 6 个月 SAS 评分、SDS 评分是术后疼痛的独立危险因素,而术后冷敷是术后疼痛的保护因素($P<0.05$)。**结论:**术后疼痛对膝关节盘状半月板损伤患者膝关节功能、生活质量及心理状态产生明显负面影响。年龄、 $BMI\geq 24\text{ kg/m}^2$ 、混合性撕裂、滑膜切除、开始负重时间 <4 周以及术后 6 个月 SAS 评分、SDS 评分是术后疼痛危险因素,而术后冷敷是其保护因素,临床可据此施以针对性防治措施。

关键词:术后疼痛;膝关节;盘状半月板损伤;膝关节功能;生活质量;心理状态;危险因素

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Effect of Postoperative Pain on Knee Function, Quality of Life and Psychological Status of Patients with Discoid Meniscus Injury of Knee Joint and Logistic Regression Analysis of its Risk Factors*

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ABSTRACT Objective: To explore the effect of postoperative pain on knee function, quality of life and psychological state in patients with discoid meniscus injury of knee joint and Logistic regression analysis of its risk factors. **Methods:** A total of 120 patients with discoid meniscus injury of knee joint who were treated in The First Affiliated Hospital of Fujian Medical University from May 2019 to January 2022 were selected, all of them underwent arthroscopic surgery, and the surgical efficacy of all patients was observed and evaluated. The patients were divided into pain group ($n=16$) and painless group ($n=104$) according to whether the knee joint was painful 6 months after operation. The Lysholm knee function score, Short Form Health Survey (SF-36) score, Self-rating Anxiety Scale (SAS) and Self-rating Depression Scale (SDS) scores were compared between the two groups before and 6 months after surgery. The risk

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factors of postoperative pain were analyzed by univariate and multivariate logistic regression. **Results:** The Lysholm scores of 120 patients with discoid meniscus injury of knee joint were (56.97 ± 8.62) points, (78.09 ± 10.53) points and (89.26 ± 8.14) points before operation, 3 months and 6 months after operation, respectively. The Lysholm scores of 3 months and 6 months after operation were significantly higher than those before operation (all $P < 0.001$). The clinical efficacy showed that the excellent and good rate after arthroscopic surgery was 86.67% (104/120). Lysholm score and SF-36 score in 6 months after operation were higher than those before operation between two groups, but those in pain group were lower than those in painless group ($P < 0.05$); SAS score and SDS score 6 months after operation of the two groups were lower than those before operation, but those in pain group were higher than those in painless group ($P < 0.05$). Univariate analysis showed that age, BMI, tear type, synovial resection, postoperative cold compress and time to start weight-bearing were related to postoperative pain ($P < 0.05$). However, gender, education degree, smoking history, drinking history, ASA grade, injured side, course of disease, injury site, and operation method were not related to postoperative pain ($P > 0.05$). Multivariate Logistic regression analysis showed that age, $BMI \geq 24 \text{ kg/m}^2$, longitudinal tear or others, synovial resection, time to start weight-bearing < 4 weeks, and SAS score and SDS score 6 months after operation were independent risk factors for postoperative pain, while postoperative cold compress was a protective factor for postoperative pain ($P < 0.05$). **Conclusion:** Postoperative pain has a significant negative impact on knee function, quality of life and psychological status of patients with discoid meniscus injury of knee joint. Age, $BMI \geq 24 \text{ kg/m}^2$, mixed tear, synovial resection, time to start weight-bearing < 4 weeks, and SAS score and SDS score 6 months after operation are the risk factors of postoperative pain, while postoperative cold compress is the protective factor, and clinical prevention and treatment measures can be taken accordingly.

Key words: Postoperative pain; Knee joint; Discoid meniscus injury; Knee function; Quality of life; Psychological state; Risk factors

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前言

膝关节盘状半月板是较为少见的膝关节畸形形态,由于形态构架异常,易发生破损^[1]。现阶段,手术是膝关节盘状半月板损伤最常用且效果最好治疗手段。随关节镜的广泛应用,关节镜手术已逐步取代传统开放手术,成为盘状半月板损伤主要手术方式^[2,3]。目前,关节镜手术虽已获得广泛关注与重视,然而长期临床实践表明,盘状半月板损伤患者关节镜术后仍可能存在明显疼痛,影响患者膝关节功能及生活质量^[4]。另研究显示,疼痛并非仅是单纯神经生理过程,而是痛感觉与痛情绪的综合反应^[5]。焦虑、抑郁是术后疼痛患者最突出及最常见的心理应激反应,其与疼痛互为因果,相互交织^[6]。随生物-心理-社会医学模式的逐渐普及,探讨术后疼痛与焦虑、抑郁的关系的相关研究日益受到重视^[7]。另外,术后疼痛影响因素繁杂,现阶段尚无统一共识,而明确其影响因素是针对性预防的前提。基于此,本研究尝试探讨术后疼痛对膝关节盘状半月板损伤患者膝关节功能、生活质量及心理状态的影响,并探讨术后疼痛的影响因素,以期临床对症处理提供依据,报道如下。

1 资料和方法

1.1 临床资料

选取 2019 年 5 月~2022 年 1 月福建医科大学附属第一医院收治的膝关节盘状半月板损伤患者 120 例,均行关节镜手术治疗,其中男 64 例,女 56 例;年龄 25~71 岁,平均(49.45 ± 10.51)岁;体质指数(BMI) $< 24 \text{ kg/m}^2$ 22 例, $\geq 24 \text{ kg/m}^2$ 98 例;受教育程度:小学及以下 26 例,中学 71 例,大专及以上 23 例;吸烟史 48 例,饮酒史 44 例;美国麻醉师协会(ASA)分级 I 级 55 例,II 级 65 例;患侧:左侧 58 例,右侧 62 例;病程: ≤ 1 年 54 例, > 1 年 66 例;撕裂类型:水平撕裂 93 例,纵裂或其他 27

例;手术方式:成形术 15 例,修补缝合术 105 例;滑膜是否切除:是 107 例,否 13 例;术后是否冷敷:是 16 例,否 104 例;开始负重时间: < 4 周 19 例, ≥ 4 周 101 例。纳入标准:影像学及关节镜明确盘状半月板损伤;明确外伤史,关节功能损伤;认知正常,无语言交流障碍;患者知情同意。排除标准:半月板附近血供区急性撕裂,需保守治疗;膝关节手术史;下肢手术史;先天性骨性疾病;慢性骨性疾病;脏器功能严重障碍;恶性肿瘤;严重心理或精神疾病史。

1.2 研究方法

(1)治疗方法:所有患者均行关节镜下半月板修补缝合术或半月板成形术。(2)资料收集:包括:性别、年龄、BMI、受教育程度、吸烟史、饮酒史、ASA 分级、患侧、病程、损伤部位、撕裂类型、手术方式、滑膜是否切除、术后是否冷敷、开始负重时间等。(3)根据术后 6 个月膝关节是否疼痛分为疼痛组($n=16$)与无痛组($n=104$)。术后疼痛采用数字等级评定量表(NRS)^[8]评价:无痛(NRS 评分 0 分),轻度疼痛(NRS 评分 1-3 分,不影响睡眠),中度疼痛(NRS 评分 4~6 分); ≥ 7 分,重度疼痛(NRS 评分 7-9 分);剧烈疼痛(NRS 评分 10 分)。本研究以术后 6 个月 NRS 评分 ≥ 4 分作为有临床意义的术后疼痛。

1.3 观察指标

(1)手术疗效评价,术后 6 个月参照 Lysholm 分级标准评定临床疗效^[9]:优(≥ 95 分),良(85~94 分),可(65~84 分),差(< 65 分),优良率=(优+良)/总例数 $\times 100\%$ 。(2)术后并发症情况:包括血肿、神经损伤、韧带损伤、器械断裂、血栓栓塞、感染等。(3)评估术前及术后 6 个月患者膝关节功能,采用 Lysholm 膝关节功能量表^[10]评估患者膝关节功能,量表包括疼痛(25 分)、不稳(25 分)、交锁感(15 分)、肿胀度(10 分)、跛行(5 分)、楼梯攀爬(10 分)、蹲姿(5 分)、使用支撑物(5 分),满分 100 分,评分越高,膝关节功能越好。(4)评估术前及术后 6 个

月患者生活质量,采用简明健康问卷(SF-36)评价^[11]患者生活质量,总分0~100分,评分越高,生活质量越好。(5)评估术前及术后6个月患者心理状态,采用焦虑自评量表(SAS)^[12]、抑郁自评量表(SDS)^[13]评估患者心理状态,SAS量表以50分为分界值,<50分、50~59分、60~69分、>69分分别为正常、轻度焦虑、中度焦虑、重度焦虑;SDS量表以50分为分界值,<50分、50~59分、60~69分、>69分分别为正常、轻度抑郁、中度抑郁、重度抑郁。(6)单因素及多因素 Logistic 回归分析患者术后疼痛的危险因素。

1.4 统计学方法

采用统计学软件 SPSS 25.0 处理数据,计数资料以例数描述,采用 χ^2 检验,等级资料采用 Ridit 检验,计量资料以平均数 $\pm$ 标准差描述,两组间比较采用独立样本 t 检验,组内对比采用配对 t 检验;影响因素采用单因素及多因素 Logistic 回归分析。均采用双侧检验, $\alpha=0.05$, $P<0.05$ 为差异有统计学意义。

2 结果

2.1 手术疗效及并发症情况

120 例膝关节盘状半月板损伤患者术前、术后3个月、术后6个月 Lysholm 评分分别为(56.97 ± 8.62)分、(78.09 ± 10.53)分、(89.26 ± 8.14)分;术后3个月、术后6个月 Lysholm 评分均显著高于术前($t=17.001, 29.835$,均 $P<0.001$)。临床疗效:120 例患者中,优 69 例,良 35 例,可 13 例,差 3 例,优良率 86.67%(104/120)。术后并发症情况:120 例膝关节盘状半月板损伤患者术后发生 2 例明显血肿,穿刺抽液处理后好转,未发生神经损伤、韧带损伤、器械断裂、血栓栓塞、感染等严重并发症。

2.2 术后疼痛对患者膝关节功能的影响

术前两组 Lysholm 评分比较,差异无统计学意义($P>0.05$);术后6个月两组 Lysholm 评分均高于手术前,但疼痛组低于无痛组($P<0.05$),见表 1。

表 1 术后疼痛对患者膝关节功能的影响($\bar{x}\pm s$)

Table 1 Effect of postoperative pain on knee joint function($\bar{x}\pm s$)

Groups	Lysholm score	
	Before surgery	6 months after surgery
Pain group (n=16)	55.08 $\pm$ 7.94	82.55 $\pm$ 10.27 ^a
Painless group (n=104)	57.26 $\pm$ 8.27	90.29 $\pm$ 12.57 ^a
t value	0.987	2.343
P value	0.326	0.021

Note: Compared with the same group before surgery, ^a $P<0.05$.

2.3 术后疼痛对患者生活质量的影响

术前两组 SF-36 评分比较,差异无统计学意义($P>0.05$);

术后6个月两组 SF-36 评分均高于手术前,但疼痛组低于无痛组($P<0.05$),见表 2。

表 2 术后疼痛对患者生活质量的影响($\bar{x}\pm s$)

Table 2 Effect of postoperative pain on quality of life in patients($\bar{x}\pm s$)

Groups	SF-36 score	
	Before surgery	6 months after surgery
Pain group (n=16)	52.39 $\pm$ 8.54	79.58 $\pm$ 11.37 ^a
Painless group (n=104)	54.17 $\pm$ 10.13	87.06 $\pm$ 13.52 ^a
t value	0.667	2.100
P value	0.506	0.038

Note: Compared with the same group before surgery, ^a $P<0.05$.

2.4 术后疼痛对心理状态的影响

术前两组 SAS 评分、SDS 评分比较,差异无统计学意义($P>0.05$);术后6个月两组 SAS 评分、SDS 评分均低于手术前,但疼痛组高于无痛组($P<0.05$),见表 3。

2.5 术后疼痛的单因素分析

单因素分析发现,年龄、BMI、撕裂类型、滑膜切除、术后冷敷、开始负重时间与术后疼痛有关($P<0.05$);而性别、受教育程度、吸烟史、饮酒史、ASA 分级、患侧、病程、手术方式与术后疼痛无关($P>0.05$),见表 4。

2.6 术后疼痛的多因素 Logistic 回归分析

以术后疼痛为因变量,表 3 和表 4 中差异有统计学意义的项为自变量(赋值结果见表 5),纳入 Logistic 回归模型,结果显示,年龄、BMI ≥ 24 kg/m²、纵裂或其他撕裂、滑膜切除、开始负重时间 <4 周及术后6个月 SAS 评分、SDS 评分是术后疼痛的独立危险因素,而术后冷敷是术后疼痛的保护因素($P<0.05$),见表 6。

3 讨论

近年来,关节镜手术在膝关节盘状半月板损伤治疗中得到广泛应用,不仅具有创伤小、并发症少、恢复快等优势,还可最

大限度保留健康半月板组织,保存半月板载荷传导功能,同时, Lysholm 评分均显著高于术前,手术优良率达 86.67% 术者术中可清晰观察患者损伤类型及范围,选择合理手术和修 (104/120),与周超等^[16]报道一致。提示关节镜手术可有效改善 补方式,减少组织损伤^[14,15]。本研究对 120 例膝关节盘状半月板 患者各项临床症状,并确保膝关节功能逐渐恢复。 损伤行关节镜下手术治疗,结果显示,术后 3 个月、术后 6 个月

表 3 术后疼痛对心理状态的影响($\bar{x} \pm s$)
Table 3 Effect of postoperative pain on psychological state($\bar{x} \pm s$)

Groups	SAS score		SDS score	
	Before surgery	6 months after surgery	Before surgery	6 months after surgery
Pain group (n=16)	59.38± 8.61	51.28± 9.36 ^a	60.08± 7.61	49.86± 8.52 ^a
Painless group (n=104)	58.92± 7.95	43.59± 7.56 ^a	59.76± 8.29	42.37± 8.83 ^a
t value	0.213	3.666	0.145	3.173
P value	0.832	<0.001	0.885	<0.001

Note: Compared with the same group before surgery, ^a $P < 0.05$.

表 4 术后疼痛的单因素分析
Table 4 Single factor analysis of postoperative pain

Indexes	Pain group (n=16)	Painless group (n=104)	$t/\chi^2/u$	P
Gender				
Male	9(56.25)	55(52.88)	0.063	0.802
Female	7(43.75)	49(47.12)		
Age(years)	63.59± 12.54	47.28± 9.85	5.936	<0.001
BMI(kg/m ²)				
<24	3(18.75)	19(18.27)	5.781	0.016
≥24	13(81.25)	85(81.73)		
Education degree				
Primary school and below	3(18.75)	23(22.12)	0.516	0.606
Middle school	9(56.25)	62(59.62)		
College or higher	4(25.00)	19(18.27)		
Smoking history	6(37.50)	42(40.38)	0.048	0.826
Drinking history	5(31.25)	39(37.50)	0.233	0.629
ASA grade				
I	7(43.75)	48(46.15)	0.420	0.517
II	9(56.25)	56(53.85)		
Injured side				
Left side	8(50.00)	50(48.08)	0.104	0.747
Right side	8(50.00)	54(51.92)		
Course of disease (years)				
≤1	7(43.75)	47(45.19)	0.681	0.409
>1	9(56.25)	57(54.81)		
Tear type				
Horizontal tear	5(31.25)	88(84.62)	7.980	0.005
Longitudinal tear or others	11(68.75)	16(15.38)		
Operation method				
Plastic operation	7(43.75)	8(7.69)	0.000	1.000
Repair suture	9(56.25)	96(92.31)		

Synovial resection				
Yes	14(87.50)	93(89.42)	9.493	0.002
No	2(12.50)	11(10.58)		
Postoperative cold compress				
Yes	2(12.50)	14(13.46)	8.263	0.004
No	14(87.50)	90(86.54)		
Time to start weight-bearing				
< 4 weeks	12(75.00)	7(6.73)	11.682	<0.001
≥ 4 weeks	4(25.00)	97(93.27)		

表 5 赋值表
Table 5 Assignment table

Variable	Assignment
Dependent variable	Postoperative pain No=0, Yes=1
Independent variable	Age Actual value
	BMI <24 kg/m ² =0, ≥24 kg/m ² =1
	Tear type Horizontal tear=0, Longitudinal tear or others=1,
	Synovial resection No=0, Yes=1
	Postoperative cold compress No=0, Yes=1
	Time to start weight-bearing ≥ 4 weeks=0, <4 weeks=1
	SAS score 6 months after operation Actual value
	SDS score 6 months after operation Actual value

表 6 术后疼痛的多因素 Logistic 回归分析
Table 6 Multivariate Logistic regression analysis of postoperative pain

Factors	β	SE	Wald χ^2 value	P value	OR value	95%CI
Age	1.124	0.428	6.896	<0.001	3.077	1.496~6.329
BMI≥24 kg/m ²	1.186	0.441	7.235	<0.001	3.275	1.851~5.793
Longitudinal tear or others	1.247	0.320	15.188	<0.001	3.480	2.084~5.812
Synovial resection	1.312	0.426	9.489	<0.001	3.715	2.294~6.015
Postoperative cold compress	-0.699	0.259	7.278	<0.001	0.497	0.341~0.725
Time to start weight-bearing<4 weeks	1.020	0.346	8.683	<0.001	2.772	2.028~3.789
SAS score 6 months after operation	1.499	0.429	12.215	<0.001	4.479	2.854~7.029
SDS score 6 months after operation	1.448	0.445	10.595	<0.001	4.257	2.765~6.553

疼痛是半月板损伤关节镜术后常见并发症,也是患者最关切、最迫切解除的症状。近年来,学者关于半月板损伤关节镜术后疼痛开展了大量研究,但受疼痛定义、样本量、疼痛测量、研究方法、术后时间等的影响,目前尚无统一的确切定论^[17,18]。本研究 120 例膝关节盘状半月板损伤患者,关节镜术后 6 个月 16 例出现膝关节疼痛,发生率为 13.33%(16/120)。术后 6 个月疼痛组患者 Lysholm 评分、SF-36 评分均显著低于无痛组患者,可见术后疼痛可直接影响膝关节盘状半月板损伤患者关节功能及生活质量,需及时进行有效防治。随生物 - 心理 - 社会新医学模式的问世及逐渐普及,临床医学内涵已发生转变,由单一 "

病 " 转为以 " 人 " 为本^[19]。因此,本研究进一步分析术后疼痛对心理状态的影响。本研究发现,术后 6 个月两组 SAS 评分、SDS 评分均低于术前,但疼痛组高于无痛组($P<0.05$),提示膝关节盘状半月板损伤患者关节镜术后疼痛可增加患者焦虑、抑郁情绪。焦虑、抑郁是心理应激常见反应,其发病机制极其复杂,涉及生理生化、内分泌、心理及社会等多方面因素^[20,21]。疼痛是一种不愉快且复杂的主观感受,躯体疼痛不可避免地引起患者情感改变,二者相互交织产生大量病理情绪,其中焦虑、抑郁最具代表性^[22,23]。同时,疼痛与情绪变化共享生物通道、传导通路及神经递质系统,痛觉传导通路由丘脑投射到大脑边缘叶和第二

感觉区,而机体情绪调节中心位于大脑边缘区,因此,疼痛产生常伴有情绪反应^[24-26]。因此认为,术后疼痛对机体功能或生活质量产生严重影响时可诱发焦虑,而疼痛反复出现或长期存在,可逐渐表现为抑郁;同时,焦虑、抑郁使神经系统兴奋性增高,疼痛阈值降低,从而加重疼痛,形成恶性循环^[27-29]。因此,应从疼痛症状、心理状态(抑郁、焦虑、恐惧等)、精神状态、人际关系等多方面评价术后疼痛。本研究显示,多因素 Logistic 回归分析表明,术后 SAS 评分、SDS 评分是膝关节盘状半月板损伤患者关节镜术后疼痛的独立危险因素,也提示抑郁、焦虑、疼痛相互影响,相互作用,进而共同对患者生活质量产生影响。

临床中对术后疼痛高危因素者,应及时采取有效预防措施,而明确术后疼痛影响因素是预防的重要前提。本文进一步对关节镜术后疼痛进行单因素分析及 Logistic 回归分析,结果表明,年龄、BMI ≥ 24 kg/m²、纵裂或其他撕裂、滑膜切除、开始负重时间 < 4 周是膝关节盘状半月板损伤患者关节镜术后疼痛的独立危险因素,而术后冷敷是其保护因素。分析原因如下:(1)随年龄增长,患者自身机能衰退,体质较差,对疼痛敏感度增加,同时,患者认知与理解能力降低,对术后疼痛感往往表现为恐惧与紧张,导致痛阈进一步降低,另外,患者血液循环功能变差,损伤部位修复较慢,术后恢复延长。(2)BMI 可客观评价人体胖瘦程度,BMI 较高,膝关节遭受更大冲击,单位面积下软骨承载越高压强,软骨损伤几率显著提高,易继发疼痛。(3)水平撕裂白区组织累及较少,而纵裂或其他类型撕裂比如混合型撕裂等破损面积广,易导致血管分布稀疏白区损伤,患者病情更为严重,因此,纵裂或其他类型撕裂患者术后更易诱发疼痛体验^[30]。(4)滑膜切除患者多伴严重滑膜增生,存在更为严重的关节腔内炎症,易诱发术后疼痛。(5)组织修复是一个长期过程,术后过早负重行走,半月板易发生再次裂伤、移位,影响半月板承载能力及伤处愈合^[31]。(6)术后冷敷目的在于减轻关节内炎性渗出,缓解关节肿胀,促进关节功能恢复,对术后疼痛起到一定抑制作用^[32]。

综上所述,术后疼痛对膝关节盘状半月板损伤患者膝关节功能、生活质量及心理状态产生明显负面影响;年龄、BMI ≥ 24 kg/m²、纵裂或其他撕裂、滑膜切除、开始负重时间 < 6 周、术后 6 个月 SAS 评分、SDS 评分是术后疼痛危险因素,术后冷敷是保护因素,临床可据此施以针对性防治措施。本研究不足之处在于,收集到的术后 6 个月的膝关节疼痛患者的样本量小,可能存在数据偏倚,有待多中心、大样本研究进一步证实。

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