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前交叉韧带保留残端重建对患者术后膝关节本体感觉功能恢复的影响 *

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摘要 目的：研究前交叉韧带保留残端重建对患者术后膝关节本体感觉功能恢复的影响。**方法**：选取 2014 年 3 月 -2016 年 3 月于我院行膝关节镜下前交叉韧带重建手术患者 108 例，采用随机数字表法将所有患者分为对照组（n=54）和研究组（n=54）。对照组给予非保留残端重建治疗，研究组给予保留残端重建治疗，两组患者均进行为期 12 个月的随访观察。分别比较两组患者术前、术后 3 个月、术后 6 个月、术后 12 个月膝关节功能以及本体感觉功能恢复情况。**结果**：术前、术后 12 个月两组患者膝关节 Lysholm 评分对比均无统计学差异（*P>0.05*），术后 3 个月、术后 6 个月研究组膝关节 Lysholm 评分明显高于对照组，差异有统计学意义（*P<0.05*）。术后各个时间两组患者膝关节 Lysholm 评分均高于术前，且随着时间的推移呈上升的趋势，差异有统计学意义（*P<0.05*）。术前、术后 12 个月两组膝关节被动活动察觉阈值、被动角度再生试验结果对比无统计学差异（*P>0.05*），术后 3 个月、术后 6 个月研究组的膝关节被动活动察觉阈值、被动角度再生试验结果明显低于对照组，差异有统计学意义（*P<0.05*），术后各个时间两组患者膝关节被动活动察觉阈值、被动角度再生试验结果均低于术前，且随着时间的推移呈下降的趋势，差异有统计学意义（*P<0.05*）。两组患者不良反应发生率均为 1.85%，无统计学差异（*P>0.05*）。**结论**：前交叉韧带保留残端重建有利于患者术后膝关节功能以及本体感觉功能早期恢复，安全性好，值得临床推广。

关键词：前交叉韧带重建；保留残端重建；膝关节功能；本体感觉功能；关节镜

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Effect of Reconstruction of Anterior Cruciate Ligament Stump on Recovery of Proprioceptive Function of Knee Joint after Operation*

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ABSTRACT Objective: To study the effect of reconstruction of anterior cruciate ligament stump on the recovery of proprioceptive function of knee joint after operation. **Methods:** A total of 108 patients,who underwent arthroscopic reconstruction of anterior cruciate ligament stump in Cangzhou Hospital of Integrated TCM and Western Medicine of Hebei Province from March 2014 to March 2016, were selected and were randomly divided into study group (n=54) and control group (n=54). The control group was given non reserved stump reconstruction treatment, and the study group was given retained stump reconstruction treatment. The patients of the two groups were followed-up for 12 months. The function of knee joint and the recovery of proprioceptive function were compared between the two groups before operation, 3 months, 6 months and 12 months after operation. **Results:** There was no significant difference in Lysholm score between the two groups before operation and 12 months after operation (*P>0.05*). The Lysholm score of the knee joint of the study group was significantly higher than that of the control group 3 months and 6 months after operation, and the difference was statistically significant (*P<0.05*). The Lysholm score of knee joint in the two groups was higher than that before operation and after operation, and the trend increased with the time, the difference was statistically significant (*P<0.05*). There weres no statistical difference in the motion detection threshold and passive angle regeneration test before operation and 12 months after operation between the two groups (*P>0.05*). The passive motion detection threshold and passive angle regeneration test in the study group 3 months and 6 months after operation were significantly lower than those in the control group, the difference was statistically significant (*P<0.05*). After operation, the passive motion detection threshold and passive angle regeneration test results of the two groups were all lower than those before operation, decreasing with the time, the difference was statistically significant (*P<0.05*). The incidence of adverse reactions in the two groups was 1.85%, with no statistical difference (*P>0.05*). **Conclusion:** The reconstruction of the anterior cruciate ligament with retained residual end is beneficial to the postoperative recovery of the function of the knee joint and the function of proprioception, with good safety, which is worthy of clinical promotion.

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前言

前交叉韧带属于膝关节最重要的稳定结构之一,对胫骨的内旋以及前移具有一定的限制作用[1,2]。当前交叉韧带发生断裂时,膝关节稳定性便会遭受损害,从而将对患者的运动功能造成严重影响[3,4]。目前,临床上对于前交叉韧带断裂主要采用膝关节前交叉韧带重建术给予治疗,该治疗术式疗效明显,已成为公认的最有效治疗手段之一[5,6]。然而,随着医疗水平的不断进步,不同类型的膝关节前交叉韧带重建术逐渐被开展,并应用于临床治疗中。非保留残端重建治疗和保留残端重建治疗是目前治疗前交叉韧带断裂的两种主要方法,迄今为止,其临床效果尚且存在一定的争议。鉴于此,本文通过研究前交叉韧带保留残端重建对患者术后膝关节本体感觉功能恢复的影响,旨在为临床治疗前交叉韧带损伤提供一种合适的手术方式,现作以下报道。

1 资料与方法

1.1 一般资料

选取 2014 年 3 月 -2016 年 3 月于我院行膝关节镜下前交叉韧带重建手术患者 108 例作为本次研究对象。纳入标准[7]:(1)所有研究对象均经影像学检查确诊为前交叉韧带损伤;(2)由运动或交通事故等外伤引发的膝关节功能障碍;(3) 关节镜下可见前交叉韧带胫骨止点完整,且残端滑膜包裹较佳,残端直径与长度 > 原韧带直径与长度的 50%;(4) 临床病历资料完整;(5)均为单膝受伤。排除标准:(1)合并膝关节感染、骨关节炎以及肿瘤疾病者;(2) 伴有多发韧带损伤以及骨折者;(3)术后未遵医嘱进行康复锻炼者;(4) 伴有侧副韧带或后交叉韧带损伤且需同时给予手术重建者;(5)合并心、肝、肾等脏器功能严重损伤者。采用随机数字表法将所有患者分为对照组(n=54)和研究组(n=54)。研究组男 33 例,女 21 例,年龄 19-52 岁,平均(30.28± 5.68)岁;受伤至就诊时间为 3d-9 年,平均(5.14± 1.71)个月;致伤原因:交通意外伤 23 例,运动损伤 18 例,其他损伤 13 例。对照组男 31 例, 女 23 例, 年龄 18-54 岁, 平均(31.32± 5.71) 岁; 受伤至就诊时间为 3d-8 年, 平均 (5.12± 1.68)个月;致伤原因:交通意外伤 22 例,运动损伤 19 例,其他损伤 13 例。两组患者一般资料比较差异无统计学意义 (*P*> *0.05*),具有可比性。本研究经医院伦理委员会审核通过,且所有患者或家属均自愿签署知情同意书。

1.2 研究方法

两组患者术前均给予蛛网膜下腔阻滞麻醉联合持续硬膜外麻醉。对照组给予非保留残端重建治疗,具体方式如下:采用单束重建, 手术过程中对前交叉韧带止点残迹不予以保留,对前交叉韧带于胫骨以及股骨的残端进行完全清理。选择外侧半月板前角内侧缘的延长线与后交叉韧带胫骨中央附丽部前缘 6 mm 处作为胫骨隧道内口,进行胫骨隧道的制备,屈膝 90° 位经胫骨隧道定位股骨隧道于股骨外髁内侧壁过顶位处,将导针钻入,制备股骨隧道。研究组给予保留残端重建治疗,具体方式如下:同样采用单束重建,手术过程中对前交叉韧带于胫骨上的残端不进行清理,仅对股骨残端的残余纤维进行处理。胫骨隧道出口选择于胫骨残端足印范围内,以足印中心作为导针的出针点,出针方向为顺着残端纤维,采用直径为 4.5 mm 的小钻头将骨质以及残余纤维钻通, 随后对胫骨隧道进行扩大处理。常规制备股骨隧道,将移植物经由胫骨残端形成的圆筒状结构以及股骨隧道,保证胫骨端的残余纤维将前交叉韧带移植物彻底包裹。两组固定方式相同。

1.3 观察指标

对两组患者均进行为期 12 个月的电话随访观察。分别比较两组患者术前、术后 3 个月、术后 6 个月、术后 12 个月膝关节功能以及本体感觉功能恢复情况。其中膝关节功能采用膝关节 Lysholm 评分进行评估,主要包括跛行、交锁、疼痛、肿胀、上下楼、不稳定、需要支持、下蹲 8 个项目,总分 100 分,得分越高表示患者膝关节功能越好。膝关节本体感觉功能情况通过被动活动察觉阈值以及被动角度再生试验进行评估:(1) 被动活动察觉阈值:采用 ISOMED200 等速测试仪(由德国 D&R 公司提供)进行,检查前向患者讲解检测目的、方式以及注意事项,检查过程中将患者的视觉和听觉完全阻隔。以 15° 为起始角度,以 2° /s 的速度使得膝关节伸直, 当患者感受到膝关节角度变化时停止计时,重复测量 3 次,计算平均时间,并乘以 0.5/s 即为测试结果,数值越低,表示治疗效果越好。(2)被动角度再生试验:采用 ISOMED200 等速测试仪进行,检测前准备工作同上。以 0° 为起始角度,以 2° /s 的角速度进行屈膝运动。当屈曲角度至设定角度后停止 10 s, 由患者感受该屈曲角度的位置,随后复位仪器再次进行被动屈曲运动,在患者认为关节屈曲位置到达上述屈曲角度时暂停,计算两次角度的误差。分别选择 0-20° 、40-60° 、80-100° 进行测试, 每段内随机选取两个角度进行。6 次误差取平均值即为结果,数值越低,表示治疗效果越好。

1.4 统计学方法

本研究数据均采用 SPSS20.0 统计学软件进行统计分析,计量资料以($\bar{x}\pm s$)表示,采用 t 检验,计数资料以率表示,采用 x^2 检验,*P<0.05* 为差异有统计学意义。

2 结果

2.1 手术前后两组膝关节 Lysholm 评分对比

术前、术后 12 个月两组患者膝关节 Lysholm 评分对比均无统计学差异(*P>0.05*),术后 3 个月、术后 6 个月研究组膝关节 Lysholm 评分明显高于对照组, 差异有统计学意义 (*P< 0.05*)。术后各个时间两组患者膝关节 Lysholm 评分均高于术前,且随着时间的推移呈上升的趋势,差异有统计学意义(*P< 0.05*)。见表 1。

表 1 手术前后两组膝关节 Lysholm 评分对比(分,$\bar{x}\pm s$)

Table 1 Comparison of Lysholm scores of knee joint before and after operation in two groups(scores, $\bar{x}\pm s$)

Groups	n	Preoperative	3 months after operation	6 months after operation	12 months after operation
Study group	54	47.60± 6.51	79.01± 5.50*	87.15± 4.21*	92.72± 3.40*
Control group	54	47.69± 6.47	70.12± 5.63*	83.87± 3.99*	91.68± 3.48*
t	-	0.072	8.300	4.155	1.571
P	-	0.943	0.000	0.000	0.119

Note: compared with preoperative, *$P<0.05$.

2.2 手术前后两组膝关节被动活动察觉阈值对比

术前、术后 12 个月两组膝关节被动活动察觉阈值对比无统计学差异($P>0.05$),术后 3 个月、术后 6 个月研究组的膝关节被动活动察觉阈值明显低于对照组,差异有统计学意义($P<0.05$)。术后各个时间两组患者膝关节被动活动察觉阈值均低于术前,且随着时间的推移呈下降的趋势,差异有统计学意义($P<0.05$)。见表 2。

表 2 手术前后两组膝关节被动活动察觉阈值对比($\bar{x}\pm s$)

Table 2 Comparison of detection threshold recovery of knee joint passive activities before and after operation in two groups($\bar{x}\pm s$)

Groups	n	Preoperative	3 months after operation	6 months after operation	12 months after operation
Study group	54	2.48± 0.47	1.47± 0.59*	1.39± 0.46*	1.34± 0.19*
Control group	54	2.49± 0.48	2.13± 0.34*	1.75± 0.48*	1.33± 0.21*
t	-	0.109	7.122	3.979	0.259
P	-	0.913	0.000	0.000	0.796

Note: compared with preoperative, *$P<0.05$.

2.3 手术前后两组膝关节被动角度再生试验对比

术前、术后 12 个月两组膝关节被动角度再生试验结果对比无统计学差异($P>0.05$),术后 3 个月、术后 6 个月研究组的膝关节被动角度再生试验结果明显低于对照组,差异有统计学意义($P<0.05$)。术后各个时间两组患者膝关节被动角度再生试验结果均低于术前,且随着时间的推移呈下降的趋势,差异有统计学意义($P<0.05$),见表 3。

表 3 手术前后两组膝关节被动角度再生试验对比($\bar{x}\pm s$)

Table 3 Comparison of knee joint passive angle regeneration test before and after operation in two groups ($\bar{x}\pm s$)

Groups	n	Preoperative	3 months after operation	6 months after operation	12 months after operation
Study group	54	4.71± 1.20	3.15± 0.84*	2.95± 0.56*	2.90± 0.31*
Control group	54	4.70± 1.21	4.21± 1.01*	3.56± 0.77*	3.01± 0.35*
t	-	0.043	5.930	4.708	1.729
P	-	0.966	0.000	0.000	0.087

Note: compared with preoperative, *$P<0.05$.

2.4 两组患者不良反应发生情况对比

围术期,两组患者的手术切口无感染,并且重要的血管神经无损伤,同时未发生独眼畸形,两组均有 1 例患者出现胫骨骨道偏移,不良反应发生率为 1.85%,两组比较无统计学差异($P>0.05$)。

3 讨论

本体感觉是指由大脑接受来源于躯体深部肌肉、肌腱、关节以及骨膜等对躯体空间位置、姿势、运动状态和运动方向的感觉[8-10]。其中关节本体感觉功能主要包括关节位置的静态感知功能、动态感知功能、反射回应及肌张力调节回路的传出活动功能[11-13]。而前交叉韧带富含本体感觉传入装置,因此前交叉韧带损伤会导致患者的膝关节机械力学稳定性被破坏,同时会导致膝关节本体感觉出现异常[14-16]。如不能得到及时有效的治疗,易引发半月板或关节软骨损伤,病情严重时会加重膝关节软骨的蜕变,进一步对膝关节功能造成严重影响[17,18]。目前,关节镜下前交叉韧带重建术已成为临床上治疗前交叉韧带损伤的首选方案。而为了获取更佳的临床治疗效果,近年来越来越多的学者开始探究保留残端重建的方式应用于前交叉韧带重建中的疗效,希望通过对残端的血运以及本体感受器进行保留,从而促进血运的重建以及本体感觉恢复[19,20]。但关于保留残端重建方式是否能达到预期效果,目前临床上尚且存在争议。

本研究结果发现,术前、术后 12 个月两组患者膝关节 Lysholm 评分对比均无统计学差异($P>0.05$),术后 3 个月、术后 6 个月研究组膝关节 Lysholm 评分明显高于对照组($P<0.05$),术后各个时间两组患者膝关节 Lysholm 评分均高于术前,且随

着时间的推移呈上升的趋势，($P<0.05$)。这符合张太良等人的研究报道[21]，提示了前交叉韧带保留残端重建术有利于前交叉韧带损伤患者膝关节功能的早期恢复。分析原因，可能是由于前交叉韧带保留残端重建术有利于帮助术者明确定位隧道，与此同时，残端保留后，韧带残端将重建的移植物完全包裹，可有效封闭死腔，从而对骨隧道内口发挥封闭作用，进一步减少了关节滑液渗进骨隧道中，避免了关节内液体对隧道的冲刷，为腱-骨愈合创造了有利条件，有利于患者进行早期功能锻炼，最终达到早期恢复膝关节功能的目的[22-24]。此外，术前、术后 12 个月两组膝关节被动活动察觉阈值、被动角度再生试验结果对比无统计学差异($P>0.05$)，术后 3 个月、术后 6 个月研究组的膝关节被动活动察觉阈值、被动角度再生试验结果明显低于对照组($P<0.05$)，术后各个时间两组患者膝关节被动活动察觉阈值、被动角度再生试验结果均低于术前，且随着时间的推移呈下降的趋势($P<0.05$)。这表明保留残端重建治疗与非保留残端重建治疗均能达到康复的效果，但是前交叉韧带保留残端重建术有利于患者膝关节本体感觉功能的早期康复。究其原因，可能是由于前交叉韧带主要由胫神经关节支支配，韧带内存大量的机械感受器，而机械感受器的数量和膝关节本体感觉功能存在一定相关性，如前交叉韧带重建过程中韧带残端保留越多，机械感受器数量也越多，从而有利于膝关节本体感觉功能的恢复[25-27]。另外，前交叉韧带保留残端重建术有利于机械感受器长入肌腱移植物，同时在一定程度上保证了滑膜于移植物表面的良好覆盖，从而为术后膝关节功能以及本体感觉的迅速恢复提供了有利条件[28-30]。两组患者未出现严重的不良反应，说明两种治疗方式均安全有效，不会给患者带来其他不良影响。然而，本研究样本量较少，可能使得研究结果发生一定的偏倚，因此，在今后的研究中还应增大样本量，进行深入研究，以获取更为准确、可靠的数据。

综上所述，对于前交叉韧带损伤患者采用前交叉韧带保留残端重建效果明显，可有效促进患者术后膝关节功能以及本体感觉功能早期恢复，无严重不良反应，可在临床上加以推广应用。

参 考 文 献(References)

[1] Ranuccio F, Familiari F, Tedesco G, et al. Effects of Notchplasty on Anterior Cruciate Ligament Reconstruction: A Systematic Review[J]. Joints, 2017, 5(3): 173-179

[2] Almazán-Díaz A, Sierra-Suárez L, Cruz-López F, et al. Intraarticular lesions associated with tibial fixation during anterior cruciate ligament reconstruction[J]. Acta Ortop Mex, 2017, 31(3): 145-147

[3] Ho SW, Lee KT. A Rare Case of Intra-Articular Displacement of EndoButton Following Anterior Cruciate Ligament Reconstruction [J].Clin Orthop Surg, 2017, 9(4): 534-536

[4] Satora W, Królikowska A, Czamara A, et al. Synthetic grafts in the treatment of ruptured anterior cruciate ligament of the knee joint[J]. Polim Med, 2017, 47(1): 55-59

[5] Pinczewski LA, Salmon LJ. Editorial Commentary: The Acrid Bioscrew in Anterior Cruciate Ligament Reconstruction of the Knee [J]. Arthroscopy, 2017, 33(12): 2195-2197

[6] DePhillipo NN, Cinque ME, Chahla J, et al. Incidence and Detection of Meniscal Ramp Lesions on Magnetic Resonance Imaging in Patients With Anterior Cruciate Ligament Reconstruction [J]. Am J Sports Med, 2017, 45(10): 2233-2237

[7] 孔颖,王雷,张元民,等.关节镜下保留残端自体胭绳肌腱同期单束重建前后交叉韧带疗效观察 [J]. 中国矫形外科杂志, 2015, 23(2): 113-118
Kong Ying, Wang Lei, Zhang Yuan-min, et al. Arthroscopic anterior and posterior cruciate ligament single-bundle reconstruction using hamstring tendon auto-grafts with remnant preservation [J]. Orthopedic Journal of China, 2015, 23(2): 113-118

[8] Kim HJ, Lee JH, Lee DH. Proprioception in Patients With Anterior Cruciate Ligament Tears: A Meta-analysis Comparing Injured and Uninjured Limbs[J]. Am J Sports Med, 2017, 45(12): 2916-2922

[9] Li J, Kong F, Gao X, et al. Prospective Randomized Comparison of Knee Stability and Proprioception for Posterior Cruciate Ligament Reconstruction With Autograft, Hybrid Graft, and γ -Irradiated Allograft[J].Arthroscopy, 2016, 32(12): 2548-2555

[10] Wei M, Liu Y, Li Z, et al. Short-term effects of radiofrequency shrinkage treatment for anterior cruciate ligament relaxation on proprioception[J]. J Int Med Res, 2013, 41(5): 1586-1593

[11] Lee DH, Lee JH, Ahn SE, et al. Effect of Time after Anterior Cruciate Ligament Tears on Proprioception and Postural Stability [J]. PLoS One, 2015, 10(9): e0139038

[12] Mir SM, Talebian S, Naseri N, et al. Assessment of Knee Proprioception in the Anterior Cruciate Ligament Injury Risk Position in Healthy Subjects: A Cross-sectional Study [J]. J Phys Ther Sci, 2014, 26(10): 1515-1518

[13] Nagai T, Heebner NR, Sell TC, et al. Restoration of sagittal and transverse plane proprioception following anatomic double-bundle ACL reconstruction [J]. Knee Surg Sports Traumatol Arthrosc, 2013, 21(9): 2048-2056

[14] Dingenen B, Janssens L, Luyckx T, et al. Postural stability during the transition from double-leg stance to single-leg stance in anterior cruciate ligament injured subjects[J]. Clin Biomech (Bristol, Avon), 2015, 30(3): 283-289

[15] 胡喜春,黄长明,范华强,等.关节镜下前交叉韧带重建中保留残端对膝关节功能及本体感觉恢复的影响研究[J].现代生物医学进展, 2017, 17(26): 5062-5065, 5095
Hu Xi-chun, Huang Chang-ming, Fan Hua-qiang, et al. Effect of Remnant Preservation on Knee Joint Function and Proprioception Recovery in Anterior Cruciate Ligament Reconstruction under Arthroscope [J]. Progress in Modern Biomedicine, 2017, 17 (26): 5062-5065, 5095

[16] Cho HJ, Kim TK, Kang SB, et al. Variations in sagittal locations of anterior cruciate ligament tibial footprints and their association with radiographic landmarks: a human cadaveric study [J]. BMC Musculoskelet Disord, 2017, 18(1): 448-449

[17] Soejima T, Kanazawa T, Tabuchi K, et al. Regeneration of ring-shaped lateral meniscus after partial resection of discoid meniscus with anterior cruciate ligament reconstruction[J]. Int J Surg Case Rep, 2013, 4(12): 1093-1096

[18] Makhni EC, Crump EK, Steinhaus ME, et al. Quality and Variability of Online Available Physical Therapy Protocols From Academic Orthopaedic Surgery Programs for Anterior Cruciate Ligament

Reconstruction[J]. Arthroscopy, 2016, 32(8): 1612-1621

[19] 张磊,孙荣鑫,王少军,等.保留残端重建兔前交叉韧带术对其胫骨骨道扩大的预防作用[J].山东医药, 2016, 56(37): 25-27
Zhang Lei, Sun Rong-xin, Wang Shao-jun, et al. The preventive effect of reconstruction of rabbit anterior cruciate ligament with retained stump on the enlargement of the bone canal of the tibia [J]. Shandong Medical Journal, 2016, 56(37): 25-27

[20] Gupta R, Bahadur R, Malhotra A, et al. Anterior Cruciate Ligament Reconstruction Using Hamstring Tendon Autograft With Preserved Insertions[J]. Arthrosc Tech, 2016, 5(2): e269-e274

[21] 张太良,张磊,康志明,等.关节镜下前交叉韧带重建保留残端与否干预膝关节本体感觉功能恢复的 Meta 分析 [J]. 中国组织工程研究, 2017, 21(03): 471-477
Zhang Tai-liang, Zhang Lei, Lian Zhi-ming, et al. Effect of remnant preservation on recovery of knee proprioception in arthroscopic anterior cruciate ligament reconstruction:a meta-analysis [J]. Chinese Journal of Tissue Engineering Research, 2017, 21(03): 471-477

[22] Andonovski A, Topuzovska S, Samardziski M, et al. The Influence of Anterior Cruciate Ligament Remnant on Postoperative Clinical Results in Patients with Remnant Preserving Anterior Cruciate Ligament Reconstruction [J]. Open Access Maced J Med Sci, 2017, 5(5): 624-629

[23] Nag HL, Gupta H. Anterior cruciate ligament reconstruction with preservation of femoral anterior cruciate ligament stump[J]. Arthrosc Tech, 2014, 3(5): e575-e577

[24] Plotkin BE,Agarwal VK,Varma R.Stump Entrapment of the Torn Anterior Cruciate Ligament[J]. Radiol Case Rep, 2016, 4(1): 268

[25] Fältström A, Hägglund M, Kvist J. Functional Performance Among Active Female Soccer Players After Unilateral Primary Anterior Cruciate Ligament Reconstruction Compared With Knee-Healthy Controls[J]. Am J Sports Med, 2017, 45(2): 377-385

[26] Hajizadeh M, Hashemi Oskouei A, Ghalichi F, et al. Knee Kinematics and Joint Moments During Stair Negotiation in Participants with Anterior Cruciate Ligament Deficiency and Reconstruction: A Systematic Review and Meta-Analysis [J]. PM R, 2016, 8(6): 563-579.e1

[27] Noh JH, Yoon KH, Song SJ, et al. Re-tensioning technique to cover the graft with remnant in anterior cruciate ligament reconstruction[J]. Arthrosc Tech, 2014, 3(6): e679-e682

[28] 王刚,杨自权,曹万全,等.保留残端重建对膝关节本体感觉恢复的影响[J].中华临床医师杂志(电子版), 2017, 11(03): 475-478
Wang Gang, Yang Zi-quan, Cao Wan-quan, et al. Effects of remnants preservation on proprioception recovery after anterior cruciate ligament reconstruction [J]. Chinese Journal of Clinicians(Electronic Edition), 2017, 11(03): 475-478

[29] Cho SH, Bae CH, Gak HB. Effects of closed kinetic chain exercises on proprioception and functional scores of the knee after anterior cruciate ligament reconstruction [J]. J Phys Ther Sci, 2013, 25(10): 1239-1241

[30] Hu J, Qu J, Xu D, et al. Clinical outcomes of remnant preserving augmentation in anterior cruciate ligament reconstruction: a systematic review[J]. Knee Surg Sports Traumatol Arthrosc, 2014, 22(9): 1976-1985

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[19] Güneysu E, Koçman AE, Özatik O, et al. The effects of iloprost and alprostadil on ischemia-reperfusion injury in preventing inflammation, tissue degeneration, and apoptosis in rat skeletal muscle [J]. Turk J Med Sci, 2017, 47(3): 1028-1036

[20] Sun F, Yin Z, Shi Q, et al. Effect of short-term high-dose atorvastatin on systemic inflammatory response and myocardial ischemic injury in patients with unstable angina pectoris undergoing percutaneous coronary intervention[J]. Chin Med J (Engl), 2014, 127(21): 3732-3737

[21] Ragino YI, Chernyavskiy AM, Tsimbal SY, et al. Relationship of blood levels of inflammatory and destructive biomarkers in coronary atherosclerosis with long-term results of surgical revascularization[J]. Bull Exp Biol Med, 2013, 155(3): 314-317

[22] Chen SL, Liu Y, Lin L, et al. Interleukin-6, but not C-reactive protein, predicts the occurrence of cardiovascular events after drug-eluting stent for unstable angina [J]. J Interv Cardiol, 2014, 27(2): 142-154

[23] Ma QQ, Yang XJ, Yang NQ, et al. Study on the levels of uric acid and high-sensitivity C-reactive protein in ACS patients and their relationships with the extent of the coronary artery lesion[J]. Eur Rev Med Pharmacol Sci, 2016, 20(20): 4294-4298

[24] Karabela G, Karavolias G, Chaidaroglou A, et al. Is IL-10 a predictor of in-stent restenosis in stable and unstable angina patients undergoing coronary interventions?[J]. Int J Cardiol, 2014, 176(3): 1156-1157

[25] Tabrez S, Ali M, Jabir NR, et al. A putative association of interleukin-10 promoter polymorphisms with cardiovascular disease [J]. IUBMB Life, 2017, 69(7): 522-527

[26] 陈红娟,殷泉忠.丹参川芎嗪联合前列地尔对老年不稳定性心绞痛患者内皮功能的影响[J].中国老年学杂志, 2015, 35(15): 4210-4211
Chen Hong-juan, Yin Quan-zhong. Effect of Salvia miltiorrhiza Ligustrazine Combined with prostadil on endothelial function in elderly patients with unstable angina pectoris [J]. Chinese Journal of Gerontology, 2015, 35(15): 4210-4211

[27] Lawall H, Pokrovsky A, Checinski P, et al. Efficacy and Safety of Alprostadil in Patients with Peripheral Arterial Occlusive Disease Fontaine Stage IV: Results of a Placebo Controlled Randomised Multicentre Trial (ESPECIAL)[J]. Eur J Vasc Endovasc Surg, 2017, 53(4): 559-566

[28] Chambord J, Attivi D, Thuus V, et al. The effect of intravenous isosorbide dinitrate in acute decompensated heart failure in hospital [J]. Int J Clin Pharm, 2017, 39(3): 536-541