Effects of Intra-articular Injection of Tranexamic Acid on Joint Swelling, Pain and Recovery of Joint Function in Patients with Simple Meniscus Injury

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ABSTRACT OBJECTIVE: To investigate the effects of intra-articular injection of tranexamic acid on joint swelling, pain and recovery of joint function in patients with simple meniscus injury. METHODS: A total of 62 patients with simple meniscus injury receiving arthroscopic surgery of the knee in orthopedics department of Chongqing people's hospital during Oct. 2016-Apr. 2017 were selected and divided into control group and observation group according to random table, with 31 cases in each group. Both groups received meniscus excision or trimming under knee arthroscopy. Control group was given intra-articular injection of 0.9% Sodium chloride injection 10 mL after wound suture. Observation group was given intra-articular injection of Tranexamic acid for injection 2.0 g added into 0.9% Sodium chloride injection 10 mL after wound suture. The drainage tube was not placed in all the patients, The tourniquet was loosened after the pressurized dressing of wound. Circumferential diameter of the knee and VAS scores of 2 groups were observed before surgery, 1, 3, 5 and 7 d after surgery. Lysholm scores were observed before and one month after surgery. The occurrence of ADR was recorded. RESULTS: There was no statistical significance in circumferential diameter of the knee, VAS score or Lysholm score between 2 groups before surgery ($P>0.05$). 1, 3, 5 and 7 d after surgery, circumferential diameter of the knee in 2 groups was significantly bigger than before surgery, but the observation group was significantly smaller than the control group 1, 3 d after surgery, with statistical significance ($P<0.05$). There was no statistical significance in circumferential diameter of the knee between 2 groups 5 and 7 d after surgery ($P>0.05$). VAS score of observation group 1, 3 d after surgery and control group 1, 3 and 5 d after surgery were significantly higher than before surgery, but the observation group was significantly lower than the control group 1, 3, 5 d after surgery, with statistical significance ($P<0.05$). There was no statistical significance in observation group 5, 7 d after surgery and control group 7 d after surgery, compared to before surgery and 7 d after surgery ($P>0.05$). One month after surgery, Lysholm scores of 2 groups were significantly higher than before surgery, and the observation group was significantly higher than the control group, with statistical significance ($P<0.05$). No severe ADR was found in 2 groups during medication, and there also was not deep venous thrombosis after surgery. CONCLUSIONS: Intra-articular injection of tranexamic acid can effectively reduce the degree of early knee swelling after knee arthroplasty, relieve postoperative early pain. It promotes the recovery of knee function with good safety.

KEYWORDS Tranexamic acid; Intra-articular injection; Simple meniscus injury; Knee arthroscopy; Swelling; Pain; Joint function

膝关节镜术后关节腔积血是影响膝关节损伤患者术后康复的主要并发症[1]，关节腔积血不仅对关节软骨无益，还可增加术后关节感染的发生率[2]。关节腔积血、疼痛可影响术后康复进程，导致术后关节粘连，而术后3个月内有效的功能锻炼对整个康复进程至关重要[2]。止血带用于膝关节镜中具有减少术中出血、视野清晰以及更易外科操作等特点[3]，但解除止血带后易出现下肢静脉血液回流，可促使血管内皮细胞释放组织纤维蛋白溶酶原激活物，而引发纤溶反应，导致关节出血量增加，造成术后关节腔积血[4]。有研究发现，膝关节镜术后通过安置引流管可减少关节腔积血，但目前对膝关节镜术中是否采用引流管存在争议，认为膝关节镜术后无关节腔引流必要，安置引流管可影响术后关节功能的恢复[5-7]。氨甲环酸在骨科手术中应用广泛，其既可减少出血，又可降低术后同种异体输血比例[8]。有研究认为，在髋膝关节置换术中静脉应用氨甲环酸可安全有效地减少出血及输血，且不会增加深静脉栓塞发生率[8-10]，但该药在膝关节镜手术治疗中的应用，国内外尚未见报道。为此，在本研究中笔者探讨了膝关节腔注射氨甲环酸对单纯半月板损伤患者关节肿胀、疼痛以及关节功能恢复的影响，旨在为临床提供参考。

1 资料与方法

1.1 纳入与排除标准

纳入标准：(1)初次接受膝关节镜手术；(2)术前双下肢静脉血管彩色多普勒超声检查未见异常；(3)经核磁共振成像(MRI)确诊为单纯半月板损伤。

排除标准：(1)既往发生过深静脉血栓、肺栓塞者；(2)术前*D*-二聚体水平升高者；(3)对氨甲环酸过敏者；(4)严重心、肺、肝、肾功能不全者。

1.2 研究对象

选择2016年10月－2017年4月重庆市人民医院骨科收治的62例拟行膝关节镜手术的单纯半月板损伤患者，其中男性33例，女性29例；年龄28～56岁，平均(38.31±4.52)岁。按随机数字表法将所有患者分为对照组和观察组，各31例。对照组男性16例，女性15例；年龄(38.74±3.81)岁。观察组男性17例，女性14例；年龄(37.50±4.13)岁。两组患者性别、年龄等一般资料比较，差异均无统计学意义($P>0.05$)，具有可比性。本研

究方案经医院医学伦理委员会审核通过，所有患者均签署了知情同意书。

1.3 治疗方法

两组患者均于膝关节镜下行半月板切除或修整术。对照组患者术中伤口缝合后给予0.9%氯化钠注射液（四川科伦药业股份有限公司，批准文号：国药准字H20056626，规格：100 mL∶5 g）10 mL，膝关节腔注射。观察组患者术中伤口缝合后给予注射用氨甲环酸（瑞阳制药有限公司，批准文号：国药准字H20040695，规格：0.5 g）2.0 g加入0.9%氯化钠注射液10 mL中，膝关节腔注射。所有患者均未安置引流管，加压包扎伤口后松止血带。

1.4 观察指标

观察两组患者术前及术后1、3、5、7 d膝关节周径、视觉模拟评分法（VAS）评分，术前及术后1个月Lysholm评分，并记录不良反应发生情况。所有患者于膝关节髌骨上方及上方10 cm处测量膝关节周径，膝关节周径越大说明膝关节肿胀程度越大。VAS评分范围为0～10分，分数越高表示疼痛越严重。以Lysholm评分评价患者的关节功能，Lysholm评分≥95分为优秀，85～94分为良好，65～84分为尚可，＜65分为差。

1.5 统计学方法

采用SPSS 20.0软件对数据进行统计分析。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χ^2检验。$P<0.05$为差异有统计学意义。

2 结果

2.1 两组患者手术前后膝关节周径比较

术前，两组患者膝关节周径比较，差异无统计学意义（$P>0.05$）。术后，两组患者1、3、5、7 d膝关节周径均显著大于同组术前，但观察组术后1、3 d显著小于同期对照组，差异均有统计学意义（$P<0.05$）；术后5、7 d，两组间膝关节周径比较，差异均无统计学意义（$P>0.05$），详见表1。

表1 两组患者手术前后膝关节周径比较（$\bar{x}\pm s$，cm）

Tab 1 Comparison of knee circumferential diameter between 2 groups before and after surgery（$\bar{x}\pm s$，cm）

组别	n	术前	术后1 d	术后3 d	术后5 d	术后7 d
对照组	31	40.6±3.16	46.92±3.32*	48.52±3.30*	43.12±3.31*	42.68±3.32*
观察组	31	41.2±4.21	44.52±4.21*#	46.42±4.44*#	44.17±4.38*	43.18±4.40*

注：与术前比较，*$P<0.05$；与对照组比较，#$P<0.05$

Note：vs. before operation，*$P<0.05$；vs. control group，#$P<0.05$

2.2 两组患者手术前后VAS评分比较

术前，两组患者VAS评分比较，差异无统计学意义（$P>0.05$）。术后，观察组患者1、3 d及对照组患者1、3、5 d的VAS评分均显著高于同组术前，但观察组术后1、3、5 d显著低于同期对照组，差异均有统计学意义（$P<0.05$）；观察组术后5、7 d及对照组术后7 d与同组术前比较，两组间术后7 d比较，差异均无统计学意义（$P>0.05$），详见表2。

表2 两组患者手术前后VAS评分比较（$\bar{x}\pm s$，分）

Tab 2 Comparison of VAS scores between 2 groups before and after surgery（$\bar{x}\pm s$，score）

组别	n	术前	术后1 d	术后3 d	术后5 d	术后7 d
对照组	31	2.03±0.33	6.28±0.11*	5.32±0.18*	3.82±0.28*	2.09±0.16
观察组	31	2.12±0.24	4.12±0.17*#	3.37±0.22*#	1.98±0.14#	1.91±0.21

注：与术前比较，*$P<0.05$；与对照组比较，#$P<0.05$

Note：vs. before operation，*$P<0.05$；vs. control group，#$P<0.05$

2.3 两组患者手术前后Lysholm评分比较

术前，两组患者Lysholm评分比较，差异无统计学意义（$P>0.05$）。术后1个月，两组患者Lysholm评分均显著高于同组术前，且观察组显著高于对照组，差异均有统计学意义（$P<0.05$），详见表3。

表3 两组患者手术前后Lysholm评分（$\bar{x}\pm s$，分）

Tab 3 Comparison of Lysholm scores between 2 groups before and after surgery（$\bar{x}\pm s$，score）

组别	n	术前	术后1个月
对照组	31	70.83±6.43	77.83±5.71
观察组	31	69.81±5.21*	86.83±6.63*#

注：与术前比较，*$P<0.05$；与对照组比较，#$P<0.05$

Note：vs. before operation，*$P<0.05$；vs. control group，#$P<0.05$

2.4 不良反应

两组患者用药期间均未见严重不良反应发生，术后两组患者均无深静脉血栓发生。

3 讨论

关节腔积血作为膝关节镜术后主要并发症，其对关节软骨存在明显毒副作用的同时还可增加关节感染的可能性[4]。尽管关节腔积血在术后即刻发生，但其可严重影响术后关节功能恢复[11]。因此，如何有效减轻膝关节镜术后关节腔积血及关节肿胀、缓解疼痛是患者能否达到术后快速康复的关键。以往有研究采用关节腔安置引流管来减轻术后关节肿胀，但引流管易被关节腔血凝块堵塞，且拔除引流管后关节腔积血、肿胀现象仍存在[8]。因此，使用药物防止关节腔积血比安置引流管更加合理、实用。亦有学者采用术后反复关节腔穿刺抽取积液来缓解术后早期膝关节肿胀、疼痛以加快关节功能的恢复，但相比安置引流管更加痛苦[5]。

氨甲环酸为赖氨酸的合成衍生物，通过抑制纤溶酶、纤溶酶原和纤维蛋白的结合，而抑制纤溶酶所致的纤维蛋白的分解，降低纤溶系统活性，具有抗纤维蛋白溶解作用，从而实现局部止血与减少出血的目的。研究证实，氨甲环酸对于外科止血是安全有效的[12]，目前，氨甲环酸已被广泛用于减少骨科手术术中以及术后失血。一项Meta分析研究结果显示，氨甲环酸可有效减少骨科手术出血，降低异体输血率[13]；《中国骨科大手术静脉血栓栓塞症预防指南》也指出氨甲环酸用于髋膝关节置换术效果较好[14]。氨甲环酸不仅可减少髋膝关节置换术后引流量等显性出血，还可有效减少关节腔及组织间隙中的隐性出血。有研究认为，无论是采用静脉注射

还是关节腔局部用药，氨甲环酸在有效减少失血和输血的同时，并不会增加深静脉血栓的发生[15]。氨甲环酸局部应用可直接作用于关节滑液及滑膜组织，局部药物浓集，可最大程度地减少静脉注射氨甲环酸可能带来的潜在并发症，且关节腔内给药剂量＞30 mg/kg或2 g氨甲环酸为最安全、有效的剂量[16]。

本研究结果显示，术后，两组患者1、3、5、7 d膝关节周径均显著大于同组术前，但观察组术后1、3 d显著小于同期对照组，差异均有统计学意义；术后5、7 d，两组患者膝关节周径比较，差异均无统计学意义。术后，观察组患者1、3 d及对照组患者1、3、5 d的VAS评分均显著高于同组术前，但观察组术后1、3、5 d显著低于同期对照组，差异均有统计学意义；观察组术后5、7 d及对照组术后7 d与同组术前比较，两组间术后7 d比较，差异均无统计学意义。这说明，膝关节镜术后膝关节腔注射氨甲环酸可有效减轻关节腔积血肿胀程度、缓解疼痛。本研究结果还显示，术后1个月，两组患者Lysholm评分均显著高于同组术前，且观察组显著高于对照组，差异均有统计学意义。这说明，膝关节镜术后膝关节腔注射氨甲环酸可有效促进患者术后早期关节功能恢复。但目前对于氨甲环酸给药方式、剂量以及序贯给药能否进一步缓解肿胀、疼痛等相关问题仍需进一步研究。安全性方面，两组患者用药期间均未见严重不良反应发生，术后也未见深静脉血栓发生。这提示，膝关节腔注射氨甲环酸的安全性较高。

综上所述，膝关节镜术后膝关节腔注射氨甲环酸可有效减轻单纯半月板损伤患者的早期关节肿胀程度，术后早期疼痛，促进术后关节功能恢复，且安全性较高。由于本研究纳入的样本量较小，所得结论还需更多高质量、大样本的随机对照研究进一步证实。

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