doi: 10.13241/j.cnki.pmb.2020.05.025

右美托咪定联合七氟烷对心脑血管介入患者血液动力学及苏醒影响 *

李德平[1] 薛 韬[2△] 王悦喜[1] 张迎军[1] 李 鹏[1]

（1 内蒙古医科大学附属医院心内科 B 区 内蒙古 呼和浩特 010050；
2 内蒙古医科大学附属医院神经内科 内蒙古 呼和浩特 010050）

摘要 目的：探究右美托咪定联合七氟烷对心脑血管介入治疗患者血液动力学影响，并分析药物对患者苏醒干预效果。**方法：**选择 2015 年 3 月至 2019 年 3 月于我院均接受介入治疗的心脑血管系统疾病 92 例，按照随机数字表法将其均分为研究组与对照组（各 46 例），对照组采用七氟烷麻醉并以生理盐水进行连续泵注，研究组采用七氟烷联合右美托咪定的方式实施麻醉，对比两组 T_0（麻醉诱导前）、T_1（气管插管后）、T_2（手术结束时）、S_1（苏醒即刻）、S_2（指令配合）、S_3（气管拔除）时的心率（Heart rate，HR）、平均动脉压（Mean arterial pressure，MAP），对比两组苏醒时 Riker 镇静和躁动评分（Riker sedation and agitation score，SAS）及拔管时间。**结果：**（1）对比显示，T_0 时，两组患者 HR 与 MAP 对比差异不具有统计学意义（P>0.05），T_1 及 T_2 时刻研究组 HR 及 MAP 均明显低于对照组（P<0.05）；（2）S_1 时刻两组 HR 及 MAP 对比差异不具有统计学意义（P>0.05），S_2 及 S_3 时刻研究组 HR 及 MAP 均明显低于对照组（P<0.05）；（3）研究组苏醒时其 SAS 评分低于对照组，拔管时间短于对照组（P<0.05）；（4）观察组随访期间心脑血管事件的发生率为 10.87%，显著低于对照组的 28.26%（P<0.05）。同时，两组随访期间各死亡 1 例。**结论：**心脑血管疾病行介入治疗患者应用右美托咪定联合七氟烷干预能够显著稳定患者血液动力学，同时还能够改善患者苏醒状态，缓解患者随麻醉作用减弱而出现的应激反应，减少心脑血管事件的发生，改善预后。

关键词：右美托咪定；七氟烷；心脑血管介入治疗；血液动力学

中图分类号：R541；R743 **文献标识码：**A **文章编号：**1673-6273（2020）05-914-05

Effects of Dexmedetomidine Combined with Sevoflurane on Hemodynamics and Recovery in Patients with Cardiovascular and Cerebrovascular Intervention*

LI De-ping[1], XUE Tao[2△], WANG Yue-xi[1], ZHANG Ying-jun[1], LI Peng[1]

(1 B District of Cardiology Department, the Affiliated Hospital of Inner Mongolia Medical University, Huhhot, Inner Mongolia, 010050, China; 2 Department of Neurology, the Affiliated Hospital of Inner Mongolia Medical University, Huhhot Municipality, Huhhot, Inner Mongolia, 010050, China)

ABSTRACT Objective: To investigate the effects of dexmedetomidine combined with sevoflurane on hemodynamics in patients undergoing cardiovascular and cerebrovascular intervention, and to analyze the effect of drugs on patients' wake-up intervention. **Methods:** 92 patients who with cardiovascular and cerebrovascular diseases underwent interventional therapy in our hospital from March 2015 to March 2019 were randomly divided into study group and control group (46 cases in each group), ccording to the random number table method. Patients in the control group were anesthetized with sevoflurane and continuously pumped with normal saline. Patients in the study group were treated with sevoflurane combined with dexmedetomidine. The heart rate Heart rate (HR) and Mean arterial pressure (MAP) of T_0, T_1, T_2, S_1, S_2, and S_3 were compared between the two groups. Riker sedation and agitation score (SAS) and extubation time were compared between the two groups. **Results:** (1) The comparison showed that there was no significant difference in HR and MAP between the two groups at T_0 (P>0.05). The HR and MAP of the study group at T_1 and T_2 were significantly lower than those of the control group (P<0.05).(2) There was no significant difference in HR and MAP between the two groups at S_1 (P>0.05). The HR and MAP of the study group at S_2 and S_3 were significantly lower than those of the control group (P<0.05). (3) The SAS score of the study group was lower than that of the control group when the patient was awakened, and the extubation time was shorter than that of the control group (P<0.05). (4) The incidence of cardiovascular events during the follow-up of the observation group was 10.87%, which was significantly lower than 28.26% of the control group (P<0.05). At the same time, 1 patient died during the two follow-up periods. **Conclusion:** Interventional therapy for patients with cardiovascular and cerebrovascular diseases can significantly stabilize the

* 基金项目：内蒙古自治区自然科学基金项目（2016MS0853）

作者简介：李德平(1978-)，男，硕士，住院医师，研究方向：心衰、高血压、冠心病的介入治疗，
电话：13848198271，E-mail：m13848198271ldp@163.com

△ 通讯作者：薛韬(1978-)，男，博士，副主任医师，研究方向：癫痫，电话：13948125212，E-mail：rant2009@126.com

（收稿日期：2019-10-10 接受日期：2019-10-30）

hemodynamics of patients with dexmedetomidine combined with sevoflurane. It can also improve the patient's recovery state and relieve the stress response of patients with the weakening of anesthesia, and reduce the occurrence of cardiovascular and cerebrovascular events and improve the prognosis.

Key words: Dexmedetomidine; Sevoflurane; Cardiovascular and cerebrovascular interventional therapy; Hemodynamics

Chinese Library Classification(CLC): R541; R743 Document code: A

Article ID:1673-6273(2020)05-914-05

前言

介入治疗学又名介入放射学，是近些年随着影像诊断技术和临床治疗飞速发展后相融合而产生的一门新兴学科，该疗法的原理为在血管造影机、CT、核磁共振等影像设备的辅助和观察下，利用穿刺针、导管或其他介入器材，通过人体自然孔道或微小创口将器械导入被施术者病变部位，进而实施一系列微创治疗技术的总称，临床实践指出，目前该治疗方式已在恶性肿瘤、肝脓肿、心肌梗死等多种疾病的治疗中发挥重要作用[1-3]。麻醉是介入治疗的必要环节，以往对介入治疗患者所应用的麻醉药物多为瑞芬太尼复合七氟烷静吸全麻，瑞芬太尼具有镇痛效果好、起效快、疼痛消失快等优点，但术后麻醉效果消退后患者易出现疼痛和躁动状态，七氟烷有助于维持患者术中血流动力学平稳，还能够减少患者麻醉中肌松药的应用剂量，但应用该药的患者苏醒后躁动发生率较高，而躁动易增加患者术后心血管意外事件的发生率，因而寻找一种有效且安全性较高的麻醉方案就显得尤为重要[4-6]。右美托咪定属于新型的麻醉辅助药，有较高的选择性，现阶段常被用于全麻、椎管麻醉[7]。本文作者研究发现，心脑血管疾病行介入治疗患者应用右美托咪定联合七氟烷干预能够显著稳定患者血液动力学，同时还能够改善患者苏醒状态，缓解患者随麻醉作用减弱而出现的应激反应，现报告如下。

1 资料与方法

1.1 一般资料

选择 2015 年 3 月至 2019 年 3 月于我院均接受介入治疗的心脑血管系统疾病 92 例，按照随机数字表法将其均分为两组（各 46 例），对照组：男性 26 例，女性 20 例，年龄 36-69 岁，平均年龄（53.01± 3.26）岁，研究组：男性 25 例，女性 21 例，年龄 35-68 岁，平均年龄（52.91± 3.36）岁，两组一般资料对比差异无统计学意义（P>0.05），有可比性。

纳入标准：（1）均经脑血管介入治疗；（2）采用美国麻醉师协会（American society of anesthesiologists，ASA）分级为 I-II 级；（3）调研经医院伦理学会同意；（4）患者或其家属签署知情同意书；（5）病历资料齐全。

排除标准：（1）合并严重肝肾功能障碍者；（2）合并精神异常患者；（3）施术前已存在意识障碍、嗜睡、昏迷等影响后续指标评价症状者；（4）酒精或精神类药品依赖者；（5）合并严重休克、脱水或电解质紊乱者。

1.2 方法

两组术前均接受相同的常规护理，包括生命体征监护、术前禁食水等，进入手术室后，开通患者左上肢静脉通路，使用心电监护仪监测患者心率（Heart rate，HR）、平均动脉压（Mean arterial pressure，MAP）、血氧饱和度等指标，两组均使用丙泊酚（Fresenius Kabi AB，药品规格 20 mL/0.2 g，国药准字 J20080023）、舒芬太尼（宜昌人福药业有限责任公司，规格 1 mL/50 μg，国药准字 H20054172）实施诱导麻醉，观察患者失去意识后，应用注射用顺苯磺酸阿曲库铵（江苏恒瑞医药股份有限公司，规格 10 mg/ 瓶，国药准字 H20060869），而后进行插管，术中维持泵注维库溴铵 0.1 mg/（kg·h），对照组患者术中应用七氟烷（上海恒瑞医药有限公司，国药准字 H20070172）维持吸入麻醉，手术结束后拔鞘时停止七氟烷的应用并泵注生理盐水，研究组患者术中选择与对照组相同的七氟烷进行维持麻醉，同时加用右美托咪定（辰欣药业股份有限公司，规格 0.2 mg/ 支，药品批号 20161014）和盐水以 0.4 μg/（kg·h）的速率持续泵入。

1.3 观察指标及评测标准

1.3.1 麻醉期血流动力学指标观测 分别于 T_0（麻醉诱导前）、T_1（气管插管后）、T_2（手术结束时）三个时间点记录两组患者 HR 及 MAP，并进行组间和组内比较。

1.3.2 苏醒期血流动力学指标观测 分别于 S_1（苏醒即刻）、S_2（指令配合）、S_3（气管拔除）三个时间点记录两组患者 HR 及 MAP，并进行组间和组内比较。

1.3.3 不同药物对患者苏醒影响分析 使用 Riker 镇静和躁动评分（Riker sedation and agitation score，SAS）记录两组患者苏醒时的躁动情况，该量表共分为 7 个等级，对应 1-7 分，分值越高代表躁动越明显[8]；此外记录两组患者拔管时间，拔管时间定义为自停止应用麻醉药物至拔管之间的时间。

1.3.4 心脑血管事件的发生情况 治疗后随访 6 个月，比较两组心脑血管事件的发生情况。

1.4 统计学方法

使用 SPSS22.0，计数资料以%表示，采用卡方检验，计量资料以（$\bar{x}\pm s$）表示，采用 t 检验，P<0.05 为差异有统计学意义。

2 结果

2.1 麻醉期血流动力学指标观测

经记录对比发现，T_0 时，两组患者 HR 与 MAP 对比差异不具有统计学意义（P>0.05），T_1 及 T_2 时刻两组患者 HR 及 MAP 较 T_0 时刻均有了明显的下降（P<0.05），同时组间对比显示，研究组患者两个时刻 HR 及 MAP 均低于对照组（P<0.05），具体数据如表 1 所示。

2.2 苏醒期血流动力学指标观测

经对比分析发现，S_1 时刻两组患者 HR 及 MAP 对比差异不具有统计学意义（P>0.05），S_2 及 S_3 时刻两组患者的 HR 及 MAP 较 S_1 时刻有了明显提升（P<0.05），同时组间对比显示研究组患者 HR 及 MAP 均明显低于对照组（P<0.05），具体数据

如表 2 所示。

表 1 麻醉期血流动力学指标观测

Table 1 Observation of hemodynamics during anesthesia

Groups	Case	T_0		T_1		T_2	
		HR (Times/minute)	MAP (mmHg)	HR (Times/minute)	MAP (mmHg)	HR (Times/minute)	MAP (mmHg)
Study group	46	91.06± 5.65	111.06± 6.89	65.26± 5.26*#	73.95± 6.33*#	67.92± 4.19*#	76.95± 5.23*#
Control group	46	90.69± 6.26	110.56± 7.21	73.59± 8.11*	79.51± 5.29*	78.98± 2.65*	86.29± 3.66*

Note: Compared with T_0, *P<0.05, compared with the control group, #P<0.05.

表 2 两组患者苏醒期血流动力学指标观测

Table 2 Observation of hemodynamics in the recovery period of two groups of patients

Groups	Case	S_1		S_2		S_3	
		HR (Times/minute)	MAP (mmHg)	HR (Times/minute)	MAP (mmHg)	HR (Times/minute)	MAP (mmHg)
Study group	46	72.01± 5.11	90.12± 5.62	78.65± 3.66*#	95.69± 6.33*#	83.95± 4.11*#	98.11± 2.68*#
Control group	46	72.06± 4.98	91.07± 4.98	86.39± 3.69*	99.26± 5.36*	96.38± 3.65*	102.26± 3.65*

Note: Compared with the time of S_1,*P < 0.05, and #P < 0.05, compared with the control group.

2.3 不同药物对患者苏醒影响分析

经记录发现，研究组患者苏醒时 SAS 评分优于对照组患者(P<0.05)，拔管时间短于对照组患者(P<0.05)，具体数据如表 3 所示。

表 3 不同药物对患者苏醒影响分析

Table 3 Effect of different drugs on recovery of patients

Groups	Case	SAS(score)	Extubation time(min)
Study group	46	3.21± 0.32*	13.02± 3.06*
Control group	46	5.06± 0.26	18.21± 2.55

Note: Compared with the control group,*P < 0.05.

2.4 心脑血管事件的发生情况

观察组随访期间心脑血管事件的发生率为 10.87%，显著低于对照组的 28.26%(P<0.05)。同时，两组随访期间各死亡 1 例。

表 4 两组随访期间心脑血管事件的发生情况(例，%)

Table 4 The incidence of cardiovascular events during the two groups of follow-up (n, %)

Groups	Case	脑出血	脑缺血	心力衰竭	再发梗死	发生率	死亡
Study group	46	1	2	1	1	5 (10.87)*	1
Control group	46	2	4	3	2	13(28.26)	1

Note: Compared with the control group,*P < 0.05.

3 讨论

介入治疗是近些年一门将影像诊断与临床治疗相融合的新兴学科，相比于传统治疗方式，该技术具有创伤小、治疗针对性强、适应症广泛、并发症少等优点，目前已成为一些疾病的首选治疗手段[9]。介入治疗可大体分为血管性介入治疗和非血管性介入治疗，能够采用介入治疗的疾病种类极为广泛，基本包含全身各个器官，该技术在血管性和实体肿瘤的微创治疗中优势尤为明显。临床实践指出，介入疗法在各类心脑血管疾病的治疗中具有较好的应用效果，如心肌梗死患者血管造影、颅内肿瘤患者介入治疗等，均发挥了较理想的干预作用[10,11]。但也有临床研究指出，介入治疗多需在麻醉条件下实施，对心脑血管疾病患者来说，围手术期血流动力学的稳定会对手术进程及术后患者恢复产生较明显的影响，如出现血流动力学指标的过度波动，甚至会诱发不良心血管事件，危及患者生命，因而对介入治疗中麻醉药物的选择就显得尤为重要[12,13]。

七氟烷是目前临床上常用的全麻药物，该药物具有镇痛效果明显、能够减少肌松药应用量等优点，但临床实践发现，应用该药物麻醉患者苏醒时躁动情绪明显，血流动力学波动较大，这显然会增加心脑血管介入治疗患者风险事件的发生率，不利于其预后[14,15]。右美托咪定是 α2- 肾上腺素受体激动剂[16]，现阶段常被用于麻醉中，该药的镇静机理较为特殊，是通过对大脑

蓝斑受体的刺激来达到镇静、抗焦虑的作用,故而其具有弱化机体应激反应、降低呼吸抑制等不良反应的发生[17,18]。有研究发现加用右美托咪定能够显著稳定患者血流动力学,使其 HR 及 MAP 维持于较小的波动范围[19];学者 Chen W[20]等就术前应用右美托咪定对术后患儿苏醒期躁动的影响进行了探究,结果显示,术前使用右美托咪定滴鼻的患儿术后躁动发生率低,同时其麻醉唤醒时间短,分析认为右美托咪定能够稳定术中患儿血流动力学,且不会引发呼吸抑制,其安全性较强[21]。

我们通过设立研究组与对照组的方式,就右美托咪定及七氟烷对心脑血管介入治疗患者血液动力学及苏醒期影响进行了分析,结果显示,联合应用右美托咪定及七氟烷的研究组干预后其麻醉期和苏醒期不同时刻的 HR 及 MAP 均低于单纯应用七氟烷的对照组。本文作者分析认为,对行介入治疗的心脑血管疾病患者来说,维持其术中血流动力学的稳定性意义较为重大,以颅脑肿瘤患者为例,此类患者在施术时,常常因为血液不稳或心动过速,进而导致动脉瘤的破裂,甚至危及患者生命,因而平稳的血流动力学能够一方面保证患者术中平稳安全[22],另一方面还有助于加速患者苏醒。右美托咪定属于新型的具有高选择性的 α- 受体激动剂,该药具有起效快、药效平稳等特点,同时在镇痛、镇静、降低心率血压方面效果也较为明显[23,24]。本文中研究组加用右美托咪定后,与对照组相比,在 T_1、T_2、S_2、S_3 时刻明显 HR 及 MAP 更低且变化幅度更小,这说明在麻醉期右美托咪定起到了较好的稳定血流动力学指标的效果。此外还有研究指出,右美托咪定能够与其他药物配合,起到协同镇静镇痛作用,减少全麻药的应用量,同时还能够降低患者 BIS 值,减少术中知晓的发生率 [25]。此外文中还就两组苏醒时的 SAS 评分及拔管时间进行了对比,结果显示研究组 SAS 评分及拔管时间均低于对照组,分析其原因为七氟烷虽然具有镇痛作用强、起效快等优点,但其缺点为药效消退快、疼痛发生早,术后患者易躁动,文中对照组拔管时 HR 即 MAP 骤升也证实了该观点,而右美托咪定具有较明显的抗交感神经兴奋作用,能够改善麻醉恢复过程,减少应激反应的发生率[26,27]。观察组随访期间心脑血管事件的发生率为 10.87%,显著低于对照组的 28.26%。两组随访期间各死亡 1 例,说明右美托咪定联合七氟烷干预能够减轻患者的心脑血管事件的发生情况,改善患者的预后。同时也有研究指出,右美托咪定能够使患者处于类似自然睡眠状态,保持易唤醒、合作良好,对患者呼吸影响较小[28],文中研究组患者术后 SAS 评分低于对照组也佐证了上述论据的真实性。

总而言之,心脑血管疾病行介入治疗患者应用右美托咪定联合七氟烷干预能够显著稳定患者血液动力学,同时还能够改善患者苏醒状态,缓解患者随麻醉作用减弱而出现的应激反应,减少心脑血管事件的发生,改善预后,值得进行临床推广。

参 考 文 献(References)

[1] Larsen SH, Olsen M, Emmertsen K, et al. Interventional Treatment of Patients With Congenital Heart Disease [J]. J Am Coll Cardiol, 2017, 69(22): 2725-2732

[2] Zhiyuan Z, Long J, Guang C, et al. Endovascular interventional therapy of portal vein stenosis after pediatric liver transplantation[J]. Chinese Journal of Interventional Imaging and Therapy, 2017, 14(4): 210-213

[3] Anjum N, Tabish H, Debdas S, et al. Effects of dexmedetomidine and clonidine as propofol adjuvants on intra-operative hemodynamics and recovery profiles in patients undergoing laparoscopic cholecystectomy: A prospective randomized comparative study [J]. Avicenna J Med, 2015, 5(3): 67-73

[4] Wang X, Jiang T, Zhao B. Effects of different maintain doses of dexmedetomidine on plasma cortisol and glucose during anesthesia recovery period in patients undergoing uvulopalatopharyngoplasty under sevoflurane inhalation anesthesia[J]. Lin Chung Er Bi Yan Hou Tou Jing Wai Ke Za Zhi, 2014, 28(15): 1154-1157

[5] He L, Wang X, Zheng S, et al. Effects of dexmedetomidine infusion on laryngeal mask airway removal and postoperative recovery in children anaesthetised with sevoflurane [J]. Anaesth Intensive Care, 2013, 41 (3): 328-338

[6] Khare A, Sharma SP, Deganwa ML, et al. Effects of Dexmedetomidine on Intraoperative Hemodynamics and Propofol Requirement in Patients Undergoing Laparoscopic Cholecystectomy [J]. Anesth Essays Res, 2017, 11(4): 1040-1045

[7] Cheng X, Huang Y, Zhao Q, et al. Comparison of the effects of dexmedetomidine-ketamine and sevoflurane-sufentanil anesthesia in children with obstructive sleep apnea after uvulopalatopharyngoplasty: An observational study[J]. J Anaesthesiol Clin Pharmacol, 2014, 30(1): 31-35

[8] Bilgi KV, Vasudevan A, Bidkar PU. Comparison of dexmedetomidine with fentanyl for maintenance of intraoperative hemodynamics in hypertensive patients undergoing major surgery: A randomized controlled trial[J]. Anesth Essays Res, 2016, 10(2): 332-337

[9] Ishibashi C, Hayashida M, Sugasawa Y, et al. Effects of dexmedetomidine on hemodynamics and respiration in intubated, spontaneously breathing patients after endoscopic submucosal dissection for cervical esophageal or pharyngeal cancer [J]. J Anesth, 2016, 30(4): 626-636

[10] Günes, Yasemin, Türktan, et al. Comparison of Dexmedetomidine, Remifentanil, and Esmolol for the Control of Hypertension During Tracheal Extubation and Emergence From Anesthesia After a Craniotomy[J]. Neur Qua, 2013, 23(4): 294-298

[11] Wang SS, Zhang MZ, Sun Y, et al. The sedative effects and the attenuation of cardiovascular and arousal responses during anesthesia induction and intubation in pediatric patients: a randomized comparison between two different doses of preoperative intranasal dexmedetomidine[J]. Paediatr Anaesth, 2014, 24(3): 275-281

[12] Rashwan DA, Rashwan SA, Talaat NN. Intravenous dexmedetomidine infusion in adult patients undergoing open nephrolithotomy: Effects on intraoperative hemodynamics and blood loss; a randomized controlled trial[J]. Egy J Ana, 2015, 31(4): 321-325

[13] Singh GD, Kinjavdekar P, Amarpal, et al. Clinicophysiological and haemodynamic effects of fentanyl with xylazine, medetomidine and dexmedetomidine in isoflurane-anaesthetised water buffaloes (Bubalus bubalis)[J]. J S Afr Vet Assoc, 2013, 84(1): E1

[14] Chavan SG, Shinde GP, Adivarekar SP, et al. Effects of dexmedetomidine on perioperative monitoring parameters and recovery in patients undergoing laparoscopic cholecystectomy [J].

Anesth Essays Res, 2016, 10(2): 278-283

[15] Na YK, Kim SY, Yoon HJ, et al. Effect of Dexmedetomidine on Sevoflurane Requirements and Emergence Agitation in Children Undergoing Ambulatory Surgery [J]. Yonsei Med J, 2014, 55(1): 209-215

[16] Cheng X, Zuo Y, Zhao Q, et al. Comparison of the Effects of Dexmedetomidine and Propofol on Hemodynamics and Oxygen Balance in Children with Complex Congenital Heart Disease Undergoing Cardiac Surgery [J]. Congenit Heart Dis, 2015, 10(3) E123-E130

[17] K ılıç ET, Aydın G. Effects of dexmedetomidine infusion during spinal anesthesia on hemodynamics and sedation [J]. Libyan J Med, 2018, 13(1): 1-16

[18] Zhu M, Wang H, Zhu A, et al. Meta-analysis of dexmedetomidine on emergence agitation and recovery profiles in children after sevoflurane anesthesia: different administration and different dosage [J]. Plos One, 2015, 10(4): e0123728

[19] Kavalci G, Ethemoglu FB, Durukan P, et al. Comparison of the effects of dexmedetomidine and remiphentanyl on emergence agitation after sevoflurane anesthesia in adults undergoing septoplasty operation: a randomized double-blind trial [J]. Eur Rev Med Pharmacol Sci, 2013, 17(22): 3019-2023

[20] Chen W, Liu B, Zhang F, et al. The effects of dexmedetomidine on post-operative cognitive dysfunction and inflammatory factors in senile patients[J]. Int J Clin Exp Med, 2014, 8(3): 4601-4605

[21] Bedirli N, Akçabay M, Emik U. Tramadol vs dexmedetomidine for emergence agitation control in pediatric patients undergoing adenotonsillectomy with sevoflurane anesthesia: prospective randomized controlled clinical study [J]. Bmc Anesthesiology, 2017, 17(1): 41

[22] Shariffuddin II, Teoh WH, Wahab S, et al. Effect of single-dose dexmedetomidine on postoperative recovery after ambulatory ureteroscopy and ureteric stenting: a double blind randomized controlled study[J]. BMC Anesthesiol, 2018, 18(1): 3-18

[23] Ali WA, Mohammed AK, Elshorbagy HM. Dexmedetomidine versus ketofol effect on the incidence of emergence agitation associated with sevoflurane-based anesthesia in children undergoing orthopedic surgery[J]. Egy J Anaes, 2016, 32(3): 277-284

[24] Harsoor SS, Rani DD, Lathashree S, et al. Effect of intraoperative Dexmedetomidine infusion on Sevoflurane requirement and blood glucose levels during entropy-guided general anesthesia [J]. J Anaesthesiol Clin Pharmacol, 2014, 30(1): 25-30

[25] Lépiz ML, Sayre R, Sawant O, et al. Maternal and fetal effects of dexmedetomidine infusion in pregnant ewes anesthetized with sevoflurane[J]. Am J Vet Res, 2017, 78(11): 1255-1263

[26] Mizrak A, Ganidagli S, Cengiz MT, et al. The effects of DEX premedication on volatile induction of mask anesthesia (VIMA) and sevoflurane requirements [J]. J Clin Monit Comput, 2013, 27(3): 329-334

[27] Kar P, Durga P, Gopinath R. The effect of epidural dexmedetomidine on oxygenation and shunt fraction in patients undergoing thoracotomy and one lung ventilation: A randomized controlled study [J]. J Anaesthesiol Clin Pharmacol, 2016, 32(4): 458-464

[28] Luo K, Xu JM, Cao L, et al. Effect of dexmedetomidine combined with sufentanil on preventing emergence agitation in children receiving sevoflurane anesthesia for cleft palate repair surgery[J]. Exp Ther Med, 2017, 14(2): 1775-1782

（上接第 856 页）

[21] Li L, Lian X, Wang Z, et al. The dipeptidyl peptidase-4 inhibitor sitagliptin ameliorates renal injury in type 1 diabetic mice via inhibiting the TGF-β/Smad signal pathway [J]. Pharmazie, 2019, 74(4): 239-242

[22] Wang Y, Liu L, Peng W, et al. Ski-related novel protein suppresses the development of diabetic nephropathy by modulating transforming growth factor-β signaling and microRNA-21 expression [J]. J Cell Physiol, 2019, 234(10): 17925-17936

[23] Kang Z, Zeng J, Zhang T, et al. Hyperglycemia induces NF-κB activation and MCP-1 expression via downregulating GLP-1R expression in rat mesangial cells: inhibition by metformin [J]. Cell Biol Int, 2019, 43(8): 940-953

[24] Liang D, Song Z, Liang W, et al. Metformin inhibits TGF-beta 1-induced MCP-1 expression through BAMBI-mediated suppression of MEK/ERK1/2 signalling [J]. Nephrology (Carlton), 2019, 24(4): 481-488

[25] 李莎, 胡明亮. 人参皂苷 Rg1 对糖尿病肾病大鼠肾保护作用的分子机制探讨[J].中国中医药科技, 2018, 25(2): 208-211

[26] 李敬华, 王素莉, 沈继春, 等. 三七总皂苷对糖尿病肾病大鼠肾功能的作用研究 [J]. 中华实用诊断与治疗杂志, 2015, 29(11): 1075-1077

[27] Sun F, Yu PF, Wang D, et al. MicroRNA-488 regulates diabetic nephropathy via TGF-β1 pathway [J]. Eur Rev Med Pharmacol Sci, 2019, 23(10): 4333-4340

[28] Zhu QJ, Zhu M, Xu XX, et al. Exosomes from high glucose-treated macrophages activate glomerular mesangial cells via TGF-β1/Smad3 pathway in vivo and in vitro[J]. FASEB J, 2019, 33(8): 9279-9290

[29] Zhou D, Mou X, Liu K, et al. Association Between Transforming Growth Factor-β1 T869C Gene Polymorphism and Diabetic Nephropathy: A Meta-Analysis in the Chinese Population [J]. Clin Lab, 2019, 65(7): 181238-181239

[30] Liu W, Yu J, Tian T, et al. Meta-analysis of the efficacy of liraglutide in patients with type 2 diabetes accompanied by incipient nephropathy[J]. Exp Ther Med, 2019, 18(1): 342-351