

# 利多卡因对脑肿瘤患者麻醉诱导时脑氧供需平衡和血液动力学的影响

李申一<sup>1</sup>袁世元<sup>1</sup>袁小平<sup>1</sup>袁睿<sup>1</sup>袁余楠<sup>2</sup>袁平<sup>1</sup>袁景利<sup>1</sup>第一军医大学珠江医院<sup>1</sup>麻醉科袁临床检验科袁广东广州 510282

**摘要** 目的 研究全麻诱导中利多卡因对幕上肿瘤患者气管插管时脑氧供需平衡和能量代谢及血液动力学的影响。方法 将 24 例幕上肿瘤患者随机分为利多卡因组(袁=12)和空白对照组(袁=12)。在麻醉诱导前和气管插管即刻采取颈内静脉球部静脉血和桡动脉血进行血气分析、乳酸和血糖测定。结果 A 组两组气管插管时较插管前脑氧摄取率、静动脉乳酸含量差下降。颈内静脉球部氧饱和度、桡动脉氧饱和度、桡动脉氧分压、颈内静脉球部氧分压、颈内静脉球部氧含量升高。两组间比较血气指标在插管时，诱导前的变化仅颈内静脉球部氧分压有统计学意义。诱导期间 A 组血液动力学变化小于 B 组。结论 利多卡因对幕上肿瘤患者麻醉诱导时脑氧供需平衡的变化无明显影响，但可能有效抑制脑肿瘤患者诱导时气管插管时血液动力学反应。

**关键词** 利多卡因；脑肿瘤；全身麻醉；代谢；氧消耗；血气分析；血液动力学

中图分类号：R614.1 文献标识码：A 文章编号：1000-2588(2004)02-0223-03

## Effects of lidocaine on cerebral oxygen supply-consumption balance and hemodynamics during anesthesia induction in patients with supratentorial tumor

LI Shen-yi<sup>1</sup>, XU Shi-yuan<sup>1</sup>, YE Xiao-ping<sup>1</sup>, XU Rui<sup>1</sup>, YU Nan<sup>2</sup>, XU Ping<sup>1</sup>, HOU Jing-li<sup>1</sup>

<sup>1</sup>Department of Anesthesia, <sup>2</sup>Department of Clinical Laboratory, Zhujiang Hospital, First Military Medical University, Guangzhou 510282, China

**Abstract:** Objective To study the effects of lidocaine on the balance between cerebral oxygen supply-consumption and on the hemodynamics during anesthesia induction in patients with supratentorial tumor. Methods Twenty-four patients with supratentorial tumor were randomly divided into lidocaine group ( $n=12$ ) and control group ( $n=12$ ). Blood gas analysis and determinations of plasma lactic acid and glucose in the radial artery and internal jugular venous bulb were performed. Oxygen extraction ratio (OER) and blood oxygen content in the artery and internal jugular venous bulb were calculated during anesthesia induction. Results OER and difference declined in plasma lactic acid level between the internal jugular venous bulb and the artery, and blood oxygen saturation as well as blood oxygen pressure in the internal jugular venous bulb and the artery increased along with blood oxygen content in the internal jugular venous bulb in both groups during anesthesia induction. Comparison between the groups showed that only the changes in blood oxygen pressure in the internal jugular venous bulb were statistically significant. Changes in the hemodynamics in lidocaine group were less obvious than those in the control group during anesthesia induction. Conclusion Lidocaine does not significantly influence cerebral oxygen balance and may effectively inhibit hemodynamic response during anesthesia induction in patients with supratentorial tumor.

**Key words:** lidocaine; brain neoplasms; anesthesia, general; brain/metabolism; oxygen consumption; blood gas analysis; hemodynamics

脑肿瘤患者静息脑血流及脑血流自身调节均有异常改变。全麻诱导插管时脑血流及脑摄氧变化可能更大。<sup>1,2</sup>这方面的文献报道较少。<sup>3,4</sup>本研究利用颈内静脉逆行置管技术和血气分析技术对颈内静脉球部血样进行检测，探讨全麻插管时脑氧供需平衡及能量代谢的变化。

## 1 对象和方法

### 1.1 研究对象

幕上肿瘤手术患者 24 例。年龄 20~60 岁。ASA 级别：Ⅰ~Ⅲ 级。

收稿日期：2003-11-23

作者简介：李申一，男，第一军医大学在读硕士研究生，主治医师。Email: lishenyi@126.com

通讯作者：袁世元，电话：20-61643298

Corresponding author: XU Shi-yuan, Tel: +86-20-61643298

将 24 例幕上肿瘤患者随机分为利多卡因组(袁=12)和空白对照组(袁=12)。

### 1.2 麻醉方法

入手术室后静脉注射东莨菪碱 0.3 mg、咪唑安定 0.02 mg/kg·b.w.、芬太尼 0.03 ml/kg·b.w.，左侧颈内静脉逆行置管 15~17 cm 至颈骨静脉球部，而后桡动脉穿刺置管。组静脉注射利多卡因 1.5 mg/kg·b.w.、派库溴铵 0.15 mg/kg·b.w.、芬太尼 0.04 ml/kg·b.w.、异丙酚 2 mg/kg·b.w.，袁去氮给氧 3 min 后气管插管。B 组除不用利多卡因外，诱导同 A 组。在诱导前，分别同时采取颈内静脉球部和桡动脉血样，采血后立即测定血气，所有动脉血标本使用草酸钠-氟化钠抗凝，立即离心分离血浆，于 1 h 内完成乳酸、血糖含量测定。氧含量、摄氧率由以下公式

得出院  $aO_2 = 1.34 \text{PaO}_2 + 0.0031 \text{IjvO}_2$  且  $CjvO_2 = 1.34 \text{PaO}_2 + 0.0031 \text{IjvO}_2$  且  $OER = ajvDO_2 - CaO_2$  其中  $CaO_2$  血氧含量  $\text{PaO}_2$  且  $\text{Hb}$  红蛋白  $\text{SaO}_2$  血氧饱和度  $\text{PaO}_2$  血氧分压  $\text{IjvO}_2$  颈内静脉球部血氧含量  $IjvO_2$  颈内静脉球部血氧饱和度  $IjvO_2$  颈内静脉球部血氧分压  $IjvDO_2$  颈动脉 - 颈内静脉球部血氧含量差。

### 1.3 统计学处理

数据用 SPSS11.0 统计软件分析袁组内前后比较用配对 t 检验袁组间比较用两独立样本 t 检验。

## 2 结果

### 2.1 两组气管插管即时与麻醉诱导前比较

表 1 麻醉诱导前气管插管时血气指标的变化

Tab.1 Changes of blood gases before anesthesia induction and at the moment of endotracheal intubation (Mean  $\pm$  SD)

Item	Before induction	Endotracheal intubation	Difference
SpO <sub>2</sub> (%)			
A	99.25 $\pm$ 0.01	99.92 $\pm$ 0.29**	3.67 $\pm$ 0.10
B	97.01 $\pm$ 0.34	99.83 $\pm$ 0.39**	2.75 $\pm$ 0.36
SaO <sub>2</sub> (%)			
A	96.00 $\pm$ 0.13	100 $\pm$ 0.00**	4.00 $\pm$ 0.13
B	96.08 $\pm$ 0.90	100 $\pm$ 0.00**	3.92 $\pm$ 0.90
SjvO <sub>2</sub> (%)			
A	62.83 $\pm$ 0.16	74.83 $\pm$ 0.58**	12.00 $\pm$ 1.01
B	64.58 $\pm$ 0.87	83.25 $\pm$ 0.22**	18.67 $\pm$ 0.88
PaO <sub>2</sub> (mmHg)			
A	85.25 $\pm$ 0.70	449.00 $\pm$ 0.274**	363.75 $\pm$ 9.81
B	86.83 $\pm$ 0.06	504.25 $\pm$ 18.14**	417.42 $\pm$ 15.36
PjvO <sub>2</sub> (mmHg)			
A	36.42 $\pm$ 0.80	45.25 $\pm$ 0.75**	8.83 $\pm$ 1.07
B	36.42 $\pm$ 0.57	61.75 $\pm$ 3.54**	25.33 $\pm$ 2.54*
CaO <sub>2</sub> (ml/dl)			
A	1749.19 $\pm$ 39.93	1821.56 $\pm$ 64.60	72.37 $\pm$ 31.42
B	1739.03 $\pm$ 48.59	1810.56 $\pm$ 45.71	71.53 $\pm$ 73.76
CjvO <sub>2</sub> (ml/dl)			
A	1157.54 $\pm$ 20.84	1370.29 $\pm$ 0.44*	212.75 $\pm$ 66.23
B	1171.16 $\pm$ 46.24	1508.03 $\pm$ 19.77**	336.86 $\pm$ 51.24
OER (%)			
A	0.35 $\pm$ 0.08	0.25 $\pm$ 0.11*	-0.09 $\pm$ 0.11
B	0.33 $\pm$ 0.39	0.17 $\pm$ 0.09**	-0.16 $\pm$ 0.08
ajvDGlucose (mmol/L)			
A	0.38 $\pm$ 0.33	0.45 $\pm$ 0.41	0.07 $\pm$ 0.45
B	0.43 $\pm$ 0.28	0.27 $\pm$ 0.29	-0.16 $\pm$ 0.32
jvaDLac (mmol/L)			
A	0.16 $\pm$ 0.28	-0.18 $\pm$ 0.31*	-0.33 $\pm$ 0.39
B	0.43 $\pm$ 0.62	-0.05 $\pm$ 0.16**	-0.48 $\pm$ 0.50

\*P<0.05, \*\*P<0.01 vs before induction; #P<0.05 vs group A. SpO<sub>2</sub>:

Saturation of pulse blood oxygen; SaO<sub>2</sub>: Saturation of arterial blood oxygen; SjvO<sub>2</sub>: Blood oxygen saturation of internal jugular venous bulb; PaO<sub>2</sub>: Pressure of artery blood oxygen; PjvO<sub>2</sub>: Blood oxygen pressure in the internal jugular venous bulb; CaO<sub>2</sub>: Content of arterial blood oxygen; CjvO<sub>2</sub>: Blood oxygen content of internal jugular venous bulb; OER:

Oxygen extraction ratio; ajvDGlucose: Difference of plasma glucose between the artery and internal jugular venous bulb; jvaDLac: Difference of plasma lactic acid between the internal jugular venous bulb and artery

两组 SpO<sub>2</sub>、脉搏血氧饱和度、SaO<sub>2</sub>、jvO<sub>2</sub>、CaO<sub>2</sub>、PjvO<sub>2</sub>、颈内静脉球部血氧分压、CjvO<sub>2</sub>、ajvDGlucose、jvaDLac 水平内静脉球部与桡动脉血乳酸含量的差值变化均有统计学意义。两组间比较，诱导前各观察指标均无显著差异。插管时 - 诱导前差值 PjvO<sub>2</sub> 有统计学差异，其他无统计学意义。

### 2.2 血液动力学变化

组内比较：组气管插管时与麻醉诱导前比较仅心率增加快；组气管插管时与麻醉诱导前比较 MABP 和 DABP 均有显著性差异。两组间比较，诱导前各观察指标均无显著差异。插管时 - 诱导前差值 HR 和 MABP 有统计学差异。

表 2 麻醉诱导前气管插管时血液动力学的变化

Tab.2 Changes of hemodynamics before anesthesia induction and at the moment of endotracheal intubation (Mean  $\pm$  SD)

Item	Before induction	Endotracheal intubation	Difference
Heart rate			
A	77.92 $\pm$ 4.63	88.25 $\pm$ 4.43*	13.33 $\pm$ 3.80
B	68.58 $\pm$ 7.66	94.00 $\pm$ 6.25**	25.42 $\pm$ 3.17#
SABP (mmHg)			
A	106.00 $\pm$ 3.73	101.17 $\pm$ 6.03	-4.83 $\pm$ 6.17
B	111.33 $\pm$ 3.17	121.50 $\pm$ 2.44	10.17 $\pm$ 8.62
MABP (mmHg)			
A	78.17 $\pm$ 0.24	79.08 $\pm$ 1.00	0.92 $\pm$ 1.05
B	80.08 $\pm$ 7.20	97.00 $\pm$ 7.68*	16.92 $\pm$ 9.70#
DABP (mmHg)			
A	63.58 $\pm$ 1.84	65.75 $\pm$ 2.55	2.17 $\pm$ 2.31
B	62.92 $\pm$ 4.30	79.75 $\pm$ 2.82**	16.83 $\pm$ 5.55#

\*P<0.05, \*\*P<0.01 vs before induction; #P<0.05, ##P<0.01 vs group A. SABP: Systolic arterial blood pressure; MABP: Mean arterial blood pressure; DABP: Diastolic arterial blood pressure

## 3 讨论

有研究发现异丙酚能引起脑血管收缩，脑血流量减少和脑氧耗降低。异丙酚能使脑代谢底物的消耗量减少。在异丙酚麻醉下，脑血管仍然保留着对张力的反应性。反应曲线的斜度降低。采用异丙酚静脉麻醉可明显降低颅脑手术患者的颅内压。降低脑需氧量。在动物实验中，即使应用大剂量异丙酚，脑循环的自身调节机制仍然存在。本研究表明，诱导时使用异丙酚芬氟合剂，库溴铵不能很好地平抑插管反应使 PjvO<sub>2</sub> 和 IjvO<sub>2</sub> 明显升高和 OER 明显降低。而且外周血液循环变化明显。多卡因是常用的局部麻醉药，并有脑保护作用。有研究表明，静脉内 1.5 mg/kg 的利多卡因可有效地预防气管插管和开颅术切皮引起的颅内压升高。预防气管内吸痰诱发的颅内压升高。颅内肿瘤患者的颅内血管顺应性差，脆性增大。若血压波动较大，易导致脑出血。通过动

物实验发现利多卡因能减轻脑缺血引起的脑组织病理学损害。本研究结果显示袁插管时 - 诱导前差值 HR<sub>BP</sub> M - HR<sub>BP</sub> D 有统计学差异袁说明利多卡因能有效平抑气管插管时血液动力学反应。本研究结果还显示袁在气管插管时动脉平均氧含量高于静脉遥比袁无论诱导前和气管插管时均有动脉乳酸含量高于颈内静脉球部的现象。遥内静脉血乳酸在理论上可以作为脑缺氧的监测指标。遥实际上对颈内静脉血乳酸的解释比较困难袁因为脑可以释放和摄取乳酸遥。

卢振和等<sup>10</sup>临床研究表明袁脑手术应用利多卡因 - 异氟醚静吸复合麻醉气管插管时颅内压不升高袁静脉注射利多卡因 1.5 mg/kg<sup>b.w.</sup>后显示颅内大动脉收缩和脑氧耗量降低。袁长兴安等<sup>11</sup>研究表明利多卡因能减少异丙酚用量袁抑制气管插管血液动力学反应。遥本试验对脑肿瘤患者专门进行了研究袁结果显示是否伍用利多卡因插管时 - 诱导前差值 P<sub>jvO<sub>2</sub></sub> 有统计学差异袁其他无统计学变化。遥利多卡因能收缩脑血管袁降低脑血流袁平抑插管反应时的脑血流增加袁降低脑肿瘤患者气管插管时脑血管意外的风险。遥但两组间诱导前和气管插管时 S<sub>jvO<sub>2</sub></sub> - S<sub>aO<sub>2</sub></sub> - DER 差值无统计学差异袁不足以说明利多卡因影响脑氧供需平衡。遥。

本研究结果显示袁伍用利多卡因和非伍用利多卡因气管插管时 S<sub>pO<sub>2</sub></sub> - S<sub>aO<sub>2</sub></sub> - S<sub>jvO<sub>2</sub></sub> - S<sub>aO<sub>2</sub></sub> - S<sub>jvO<sub>2</sub></sub> - C<sub>jvO<sub>2</sub></sub> - DER - vaDLac 变化均有统计学意义。袁利多卡因对幕上肿瘤患者麻醉诱导时脑氧供需平衡的变化无明显影响。袁利多卡因能有效抑制脑肿瘤患者诱导时气管插管时血液动力学反应。总之袁利多卡因对脑肿瘤患者气管插管有保护作用。遥。

## 参考文献院

- 1 咨世元, 唐先南, 许平, 等. 罗库溴铵与琥珀胆碱对脑血管血流动力学的影响及比较. 咨临床麻醉学杂志, 2000, 16(6): 280-2.  
Xu SY, Tang XN, Xu P, et al. Comparison of the effects of rocuronium and succinylcholine on cerebrovascular hemodynamics. 咨 Chin J Anesthesiol, 2000, 16(6): 280-2.
- 2 咨卢振和, 高崇荣, 关合女, 等. 脑肿瘤患者气管插管时脑氧供需平衡的变化. 咨中华麻醉学杂志, 2002, 22(1): 37-8.  
Hou J, Xu T, Ma Y, et al. Effects of the different induction anesthetic drugs on cerebral oxygen metabolism at brain tumor operations. 咨 Chin J Neuromed, 2002, 1(1): 37-8.
- 3 咨Cavazzuti M, Porro CA, Barbieri A, et al. Brain and spinal cord metabolic activity during propofol anaesthesia [J]. Br J Anaesth, 1991, 66(4): 405-9.
- 4 咨Fox J, Gelb AW, Enns J, et al. The responsiveness of cerebral blood flow to changes in arterial carbon dioxide is maintained during propofol-nitrous oxide anesthesia in humans. 咨 Chin J Anesthesiol, 1992, 39: A43.
- 5 咨唐先南, 徐世元, 萧广均, 等. 气管插管时脑血流动力学变化及艾司洛尔的平抑作用. 咨中华麻醉学杂志, 1999, 19(4): 200-2.  
Tang XN, Xu SY, Xiao GJ, et al. Cerebrovascular hemodynamics and the effects of esmolol during endotracheal intubation[J]. Chin J Anesthesiol, 1999, 19(4): 200-2.
- 6 咨Mitchell SJ, Pellett O, Gorman DF. Cerebral protection by lidocaine during cardiac operations. 咨 Ann Thorac Surg, 1999, 67(4): 1117-24.
- 7 咨Bedford RF, Persing JA, Pobereskin L, et al. Lidocaine or thiopental for rapid control of intracranial hypertension. 咨 Chin J Anest Analg, 1980, 59(6): 435.
- 8 咨Wang D, Wu X, Zhong Y. Effect of lidocaine on improving cerebral protection provided by retrograde cerebral perfusion: a neuropathologic study. 咨 Chin J Cardiothorac Vasc Anesth, 1999, 13(2): 176-80.
- 9 咨卢振和, 高崇荣, 关合女, 等. 脑肿瘤患者气管插管时脑氧供需平衡的变化. 咨中华麻醉学杂志, 1993, 9(3): 140-1.  
Lu ZH, Gao CR, Guan HN, et al. General anesthesia by isoflurane-lidocaine in operation for 87 neurosurgical patients [J]. J Clin Anesthesiol, 1993, 9(3): 140-1.
- 10 咨卢振和, 高崇荣, 何雁冰. 利多卡因对脑氧耗和脑血管功能的影响. 咨中华麻醉学杂志, 1999, 19(6): 335-6.  
Lu ZH, Gao CR, He YB. Effect of lidocaine on oxygen consumption and cerebrovascular function. 咨 Chin J Anesthesiol, 1999, 19(6): 335-6.
- 11 咨张兴安, 吴群林, 聂煌. 芬太尼和利多卡因对异丙酚静脉麻醉作用的比较. 咨中华麻醉学杂志, 2001, 21(10): 617-20.  
Zhang XA, Wu QL, Nie H. Effects of fentanyl and lidocaine on the hypnotic effect of propofol in total intravenous anesthesia. 咨 Chin J Anesthesiol, 2001, 21(10): 617-20.
- 12 咨营养, 2002, 9(1): 50-2.  
Cai J, Xu J, Ni GQ, et al. Intestinal bacteria and dietary fibre. 咨 Chin J Parenter Enteral Nutr, 2002, 9(1): 50-2.
- 13 咨曹亚平, 张秀荣, 严浩, 等. 广东地区健康人肠道菌群调查分析. 咨中国微生态学杂志, 1999, 11(6): 357, 360.  
Cao YP, Zhang XR, Yan H, et al. A survey on intestinal flora of healthy people in Guang Dong province[J]. Chin J Microcol, 1999, 11(6): 357, 360.
- 14 咨陈清, 俞守义, 王雅贤, 等. 冻干口服霍乱 rBS-WC 菌苗安全性及免疫原性的人群试验. 咨中华预防医学杂志, 1996, 30(6): 330-3.  
Chen Q, Yu SY, Wang YX, et al. Community trial for safety and immunogenicity of oral-administered lyophilized rBS-WC cholera vaccine. 咨 Chin J Prev Med, 1996, 30(6): 330-3.

## 渊上接 222 页冤

- cholera vaccine of capsule [J]. J First Mil Med Univ/Di Yi Jun Yi Da Xue Xue Bao, 1998, 18(4): 329.
- 2 咨Viret J F, Favre D, Wegmuller B, et al. Mucosal and systemic immune responses in humans after primary and booster immunizations with orally administered invasive and noninvasive live attenuated bacteria. 咨 Infect Immun, 1999, 67(7): 3680-5.
- 3 咨张秀荣. 肠道菌群粪便涂片检查图谱. 咨北京院民军医出版社, 2000. 1-15.
- 4 咨张秀荣, 陈穗, 杨海涛, 等. 广州地区健康青老年人肠道菌群的调查. 咨 第一军医大学学报, 1998, 8(4): 356.
- 5 咨康白. 微生态学. 咨大连出版社, 1988. 64-81.
- 6 咨蔡炯, 许进, 倪国强, 等. 肠道菌群与膳食纤维. 咨肠外与肠内

- 营养, 2002, 9(1): 50-2.
- Cai J, Xu J, Ni GQ, et al. Intestinal bacteria and dietary fibre. 咨 Chin J Parenter Enteral Nutr, 2002, 9(1): 50-2.
- 7 咨曹亚平, 张秀荣, 严浩, 等. 广东地区健康人肠道菌群调查分析. 咨中国微生态学杂志, 1999, 11(6): 357, 360.  
Cao YP, Zhang XR, Yan H, et al. A survey on intestinal flora of healthy people in Guang Dong province[J]. Chin J Microcol, 1999, 11(6): 357, 360.
- 8 咨陈清, 俞守义, 王雅贤, 等. 冻干口服霍乱 rBS-WC 菌苗安全性及免疫原性的人群试验. 咨中华预防医学杂志, 1996, 30(6): 330-3.  
Chen Q, Yu SY, Wang YX, et al. Community trial for safety and immunogenicity of oral-administered lyophilized rBS-WC cholera vaccine. 咨 Chin J Prev Med, 1996, 30(6): 330-3.