Perioperative Stroke and Coma in Thai Anesthesia Incidents Study (THAI Study)

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Objectives: *To analyze perioperative stroke and coma using database of Thai Anesthesia Incidents Study (THAI Study) with regard to frequency, contributing factors, preventive and corrective strategies.*
Material and Method: *Details of perioperative neurological complications comprising stroke and coma in one year were recorded prospectively by attending anesthesiologists or nurse anesthetists in standardized record forms. All data were analyzed to identify contributing factors and preventive strategies.*
Results: *Among 172,592 anesthetics, there were 24 cases of coma, and 28 cases of stroke. Most cases of coma that eventually died (12/16 cases, 75%) had ASA physical status (ASA PS) ranging from 2E to 5E. Perioperative stroke was found mainly in patients with ASA PS 3 and most of the incidence (74%) occurred in patients who had no previous history of stroke. These patients already had pre-existing cardiovascular diseases and underwent high risk procedures. There were 54% of perioperative stroke cases that could be due to improper cardiovascular management and 42% due to improper emergency neurological management.*
Conclusion: *The incidence of perioperative stroke and coma in this study was approximately 0.03%. The majority of cases had no prior stroke or coma, which suggested that a problem during perioperative period itself might predispose patients to these complications. Preventive strategies included quality assurance activity, improved communication, and practice guideline.*

Keywords: *Perioperative stroke, Coma, Anesthesia*

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Despite improvements in the overall safety of anesthetized patients at present, brain injury remains a major and growing problem. The on-going American Society of Anesthesiologists closed-claims analysis revealed brain injury (including brain damage, stroke and awareness) as the single largest fraction (17%) of malpractice claims[1]. In Thailand, until now there was no national database of incidence of perioperative stroke and coma. The reported incidence of perioperative stroke varied from 0.02 to 0.7%[2-10]. Most reported series were collected retrospectively, thus the true incidence might be higher[11].

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The incidence of perioperative coma was 0.5 per 10,000 anesthetics (0.005%)[12]. Although these complications are infrequent; they have great impact on the patient and their family. This study aimed to analyze perioperative stroke and coma using database of Thai Anesthesia Incidents Study (THAI Study) with regard to frequency, contributing factors and preventive strategies. Evaluation of these serious complications may provide knowledge of the quality of our anesthetic management and help provide preventive measures in the future.

Material and Method

Thai Anesthesia Incidents Study (THAI Study) is the multi-centered study including 7 university hospitals, 5 tertiary care hospitals, 4 secondary

care hospitals and 4 primary care hospitals. This study aimed to monitor the incidence of adverse events from March 1, 2003 to February 28, 2004. THAI Study was approved by Institutional Ethical Review Board. Details of preanesthetic condition, anesthetic management, intraoperative events and perioperative complications within 24 hours of consecutive patients had been recorded in standardized record forms. The patient was followed up for one week for long term outcome.

Details of perioperative stroke and coma were recorded by attending anesthesiologists or nurse anesthetists and site managers. Then the recorded form was reviewed by three peer reviewers to identify clinical risk factors, contributing factors and corrective strategies. Controversial issues were discussed to yield consensus.

Definition

Stroke is defined by the World Health Organization as the rapidly developing signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than vascular origin [13]. Perioperative stroke is one which occurs in the perioperative period, usually defined as intraoperative or within 3 to 30 days following surgery[2].

Coma refers to a sleeplike state of unarousability in which consciousness is completely absent and the eyes remains closed despite stimulation[14]. Data were analyzed by using descriptive statistics. The Intercooled Stata 6 was used.

Results

Among 172,592 anesthetics, there were 24 cases of coma, and 28 cases of stroke. Patient characteristics were summarized in table 1. Most cases of coma that eventually died (12/16 cases, 75%) had ASA physical status (ASA PS) ranging from 2E to 5E. The remaining four dead cases of coma had ASA PS of 2 or 3. Perioperative stroke was found mainly in patients with ASA PS 3 and most of the incidence (74%) occurred in patients who had no previous history of stroke. These patients already had pre-existing cardiovascular diseases (71%) and underwent high risk procedures such as neurological (32%) and cardiovascular surgery(43%). Table 2 revealed outcome of perioperative coma and stroke. Most comatose patients had high mortality rate except two cases that had complete recovery before discharge. These two patients had ASA PS 2. One of them had general anesthesia for thyroidectomy and was found to be coma at ward which was response well to intravenous glucose push. Another coma patient had spinal anesthesia for

Table 1. Patient characteristics

		Coma	Stroke
Sex			
	M	13 (54%)	17 (61%)
	F	11 (46%)	11 (39%)
Age group			
	< 12 yrs old	2 (8%)	2 (7%)
	12-65 yrs old	16 (67%)	20 (71%)
	> 65 yrs old	6 (25%)	6 (22%)
ASA PS	1	-	-
	2	5 (20%)	9 (32%)
	3	9 (38%)	17 (61%)
	4	6 (25%)	2 (7%)
	5	4 (17%)	-
Elective		10 (42%)	25 (89%)
Emergency		14 (58%)	3 (11%)

Table 2. Outcome of Incidence

	Coma	Stroke
Death	16 (67%)	6 (21%)
Ventilator dependent	6 (25%)	10 (36%)
Hemiparesis/hemiplegia	-	12 (43%)
Complete recovery	2 (8%)	-

Table 3. Time of Occurrence

	Coma	Stroke
Intraoperative	4 (17%)	-
Postanesthetic care unit	-	2 (7%)
Postoperative in 24 hrs	20 (83%)	26 (93%)

Table 4. Category of perioperative stroke

Category	Cases (%)
Ischemic	10 (37%)
Thrombotic	8 (30%)
Hemorrhagic	4 (15%)
Undetermined	3 (11%)
Inadequate data	2 (7%)

total hip replacement, she had abnormal preoperative electrocardiogram which showed sinus bradycardia. She was found apneic and unresponsive at ward and recovered well with artificial ventilation by face mask and deep pain stimuli within five minutes.

Table 3 shows time of occurrence, which majority of both perioperative coma and stroke occurred at ward within 24 hours. Table 4 describes the category of perioperative stroke. The major causes were ischemia (37%) and thrombotic events (30%).

The incidents occurred mostly in university hospitals and tertiary care hospitals. No perioperative coma and stroke was reported in secondary and primary care hospitals.

Perioperative stroke was evidenced to be preventable or partially preventable in 15 cases (56%). There were 55% of cases that were surgical related and 15% were both anesthesia and surgical related. It was considered that 54% of perioperative stroke cases could due to improper emergency cardiovascular management and 42% due to improper emergency neurological management. Of perioperative comatose cases, 12% were related to anesthesia and patient condition while approximately 80% were related to surgery and patient preoperative conditions.

Preventive strategies included quality assurance activity (18%), improved supervision (15%), and guideline practice (10%). Unfortunately, there were almost 50% of missing data regarding preventive strategies.

Discussion

The incidence of perioperative coma and stroke in this study was approximately 0.03% which was consistent with the incidence in the general surgical population of previous studies[2-10]. The majority of cases had no previous stroke or coma which suggested that a problem during perioperative period might predispose patients to these complications.

Most patients who developed perioperative coma were emergency cases while perioperative stroke occurred mostly in elective cases. This finding was different from the previous study in general surgery that found an increased risk in emergency surgery[8]. The different finding could be from types of surgery which in our study mostly were neurological (32%) and cardiovascular surgery (43%). Both types of surgery were well documented as major factors of perioperative stroke[11].

The main contributing factors for these two adverse outcomes included patient-related factors (poor physical condition) and surgical factors. Therefore, preventive strategies included identifying patients at risk such as hypertension, diabetes mellitus, smoking, dyslipidemia, atrial fibrillation, and previous stroke [11,15]; and altering risk factors to limit their impact on patient outcome. In our study, most of the incidence (74%) of perioperative stroke occurred in patients at risk who had no prior history of stroke. This data suggested that better preventative measures needed to be applied particularly for modifiable stroke risk factors such as hypertension and diabetes. However; there was also some area that anesthetic management could be improved as evident by the fact that about 54% of these adverse events resulted from improper cardiovascular management. This finding also found in the previous study of mortality associated anesthesia[12]. Thus, corrective strategies might include good anesthetic technique and careful monitorings. Patients at risk should be well hydrated throughout the perioperative period; as evidenced in our study that patients who had perioperative stroke had episodes of intraoperative hypotension and/or high dose of vasopressor use. It was worthwhile to remember that routine physical assessment alone, including blood pressure, heart rate, and urine output, often failed to show the true hemodynamic status of the compromised patients[16]. Invasive monitorings might benefit these critical patients for early treatment of hypotensive episodes.

For perioperative stroke, there were 42% due to improper emergency neurological management. This finding could reflect inadequate communication among patient care team although this contributing factor was not reported in this study.

The fact that most of perioperative coma and stroke occurred during postoperative period in 24 hours might suggest that the area of postoperative care would need major improvement in Thailand in terms of prompt hemodynamic management and medical consultation.

The mortality of perioperative stroke in this study was 21% which was close to the previous studies[5-6].

The main drawback of this study was missing data in the area of preventive or corrective strategies despite an extensive introductory phase and emphasis on completeness of records throughout the study period.

Conclusion

Perioperative coma and stroke are uncommon

but can have devastating consequences for the patient, family and healthcare providers. The knowledge of contributing factors, preventive and corrective strategies will certainly help to reduce the impact of these crucial complications.

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References

1. Caplan RA. The ASA closed claims project: lessons learned. ASA Annual Refresher Course, 2004:118.
2. Hindman BJ. Perioperative stroke: the noncardiac patient. Int Anesthesiol Clin 1986 24:101-34.
3. Culley DJ, Crosby G. Impaired central nervous system function. In : Benumof JL, Lawrence JS, editors. Anesthesia & perioperative complications. Second edition. St. Louis: Mosby, 1999:357-76.
4. Kam PC, Calcroft RM. Peri-operative stroke in general surgical patients. Anaesthesia 1997; 52:879-83.
5. Kim J, Gelb AW. Predicting perioperative stroke. J Neurosurg Anesthesiol 1995; 7:211-5.
6. Wong GY, Warner DO, Schroeder DR, Offord KP, Warner MA, Maxson PM, et al. Risk of surgery and anesthesia for ischemic stroke. Anesthesiology 2000; 92:425-32.
7. Forrest JB, Rehder K, Goldsmith CH, Cahalan MK, Levy WJ, Strunin L, et al. Multicenter study of general anesthesia: I. Design and patient demography. Anesthesiology 1990; 72:252-61.
8. Larsen SF, Zaric D, Boysen G. Postoperative cerebrovascular accidents in general surgery. Acta Anaesthesiol Scand 1988; 32: 698-701.
9. Hart R, Hindman B. Mechanisms of perioperative cerebral infarction. Stroke 1982; 13:766-73.
10. Warner MA, Shields SE, Chute CG. Major morbidity and mortality within 1 month of ambulatory surgery and anesthesia. JAMA 1993; 270:1437-41.
11. Gelb AW, Cowie DA. Perioperative stroke prevention. IARS 2001 Review Course Lectures: 46-53.
12. Arbous MS, Grobbee DE, Van Kleef JW. Mortality associated with anaesthesia: a qualitative analysis to identify risk factors. Anaesthesia 2001; 56:1141-53.
13. Bonita R. Epidemiology of stroke. Lancet 1992; 339:342-7.
14. Bassetti C, Aldrich MS. Consciousness, delirium, and coma. In : Albin MS, editor. Textbook of Neuroanesthesia with Neurosurgical and Neuroscience Perspectives. New York: McGraw-Hill Companies Inc, 1997:369-70.
15. McFarlane SI, Sica DA, Sowers JR. Stroke in patients with diabetes and hypertension. J Clin Hypertens 2005;7:286-92.
16. Al-Khafaji A, Webb AR. Fluid resuscitation. Continuing Education in Anesthesia. Critical Care Pain 2004;4:127-31.

อุบัติการณ์การเกิด perioperative stroke และcoma ในการศึกษาภาวะแทรกซ้อนทางวิสัญญีในประเทศไทย

วรินี เล็กประเสริฐ, ภูพิงค์ เอกะวิภาต, โฉมชบา สิรินันท์, สุรีรัตน์ ศรีสวัสดิ์

วัตถุประสงค์: *เพื่อศึกษาภาวะแทรกซ้อนเรื่อง perioperative stroke และ coma จากโครงการศึกษาอุบัติการณ์การเกิดภาวะแทรกซ้อนทางวิสัญญีในประเทศไทย ในด้านอุบัติการณ์ ปัจจัยที่เกี่ยวข้อง และแนวทางการป้องกันแก้ไข*

วัสดุและวิธีการ: *ศึกษาแบบพรรณนาชนิดไปข้างหน้า ในผู้ป่วยผ่าตัดทุกรายที่รับการระงับความรู้สึกจากโรงพยาบาล 20 แห่ง ทุกภูมิภาคของประเทศไทย ในระยะเวลาหนึ่งปี ตั้งแต่ 1 มีนาคม พ.ศ. 2546 ถึง 28 กุมภาพันธ์ พ.ศ. 2547 ที่เกิด perioperative strokeและcoma โดยทำการบันทึกข้อมูลที่เกี่ยวข้องกับผู้ป่วย ชนิดของการผ่าตัด และการบริการทางวิสัญญี*

ผลการศึกษา: *ผู้ป่วยผ่าตัดที่ได้รับการระงับความรู้สึกจำนวน 172,592 ราย เกิดภาวะแทรกซ้อน coma 24 ราย และ stroke 28 ราย คิดเป็นอุบัติการณ์โดยรวมร้อยละ 0.03 ผู้ป่วย coma ส่วนใหญ่มารับการผ่าตัดฉุกเฉิน แต่ผู้ป่วย stroke ส่วนใหญ่มารับการผ่าตัดตามนัด และไม่เคยมีประวัติ stroke มาก่อน ผู้ป่วยทั้งสองกลุ่มส่วนใหญ่มีโรคทางระบบหัวใจและหลอดเลือดซึ่งเป็นอยู่เดิมและได้รับการผ่าตัดใหญ่ที่มีความเสี่ยงสูง ผู้ป่วยที่เกิด stroke กว่าครึ่งหนึ่ง (ร้อยละ 54) พบว่าน่าจะได้รับการดูแลรักษาด้านระบบหัวใจและหลอดเลือดไม่เหมาะสม และร้อยละ 42 พบว่าได้รับการส่งปรึกษาแบบฉุกเฉินทางด้านระบบประสาทไม่เหมาะสม*

สรุป: *อุบัติการณ์โดยรวมของ perioperative stroke และ coma พบประมาณร้อยละ 0.03 ผู้ป่วยส่วนใหญ่ไม่มีประวัติของ stroke และ coma มาก่อน ซึ่งสนับสนุนว่าช่วงที่มีการผ่าตัดมีความเสี่ยงสูงที่จะเกิดภาวะแทรกซ้อนนี้ แนวทางป้องกันและแก้ไขคือการวางแนวปฏิบัติในการประเมินก่อนให้ยาระงับความรู้สึกเพื่อค้นหากลุ่มเสี่ยง การเตรียมผู้ป่วยให้พร้อม การดูแลผู้ป่วยหลังผ่าตัดที่หอผู้ป่วยตลอดจนการสื่อสารที่มีประสิทธิภาพ ระหว่างบุคลากรต่างสาขาที่ร่วมกันดูแลผู้ป่วย*