

The Thai Anesthesia Incidents Study (THAI Study) on Nerve Injury Associated with Anesthesia

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Objectives : *The Thai Anesthesia Incidents Study (THAI Study) database was used to identify the incidence, outcome and contributing factors of nerve injuries associated with anesthesia in Thai people.*

Material and Method : *A prospective multicenter study was conducted in 20 hospital in Thailand from February 1, 2003 to January 31, 2004. All patients underwent anaesthesia were monitored for nerve injuries during the first 24 hours. The details of nerve injuries were recorded and analysed.*

Results : *The overall incidence of nerve injuries associated with anesthesia was 1.6 per 10,000 patients. Considering on spinal and regional anesthesia, the incidence was 5.2 per 10,000 patients. Lumbosacral roots comprised 65.4% of the injuries, the brachial plexus nerve 11.5%, and femoral nerve 7.7%. Contributing factors included type and duration of surgery and regional anesthesia.*

Conclusion : *The incidence of nerve injuries associated with anesthesia in Thailand was 1.5 per 10,000 patients. The spinal anesthesia was predominantly associated with injury of lumbosacral root.*

Keywords : *Nerve injury, Anesthesia, Complication, Surgery*

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Nerve injuries have been recognized as a consequence of general anesthesia, central nervous system blockade, regional anesthesia and peripheral nerve block.

There are many possible ways in which nerve can be damaged in the peri-operative period such as direct injury by needle^(1,2) direct neurotoxic effect of local anesthetic agents, prolonged hypotension and malpositioning. The incidence of nerve injuries from previous studies was approximately 1 per 10,000 cases⁽¹⁾.

In Thailand, the incidence, etiology and management of nerve injuries associated with anesthesia are not well known. The Thai Anesthesia Incidents

Study (THAI Study) aimed to assess the incidence, outcome and contributing factors of nerve injuries related to anesthesia that may lead to proper way for preventive and corrective strategies.

Material and Method

The Thai Anesthesia Incidents Study (THAI Study) is a multi-centered study including 7 university hospitals, 5 tertiary care hospitals, 4 secondary care hospitals and 4 district hospitals. The study aimed to monitor the incidence of adverse events from February 1, 2003 to January 31, 2004. THAI Study was approved by the institutional ethical review board. Details of preanesthetic conditions, anesthetic technique and agents, intraoperative and perioperative complications of consecutive patients within 24 hours were recorded on a standardized form (form 1).

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Nerve injury was considered in patient presented with clinical features included anesthesia, paresthesia, hypoesthesia, hyperesthesia and pain in the area supplied by the affected nerve. Paralysis or paresis of affected muscles and disabling autonomic dysfunction was also included. The detail of nerve injuries was recorded by the attending anesthetist or nurse anesthetist and verified by the site manager. The forms were then reviewed by three peer reviewers to identify the clinical risk factors, contributing factors and suggested corrective strategies. Data were analyzed using descriptive statistics.

Results

According to the operational definition, the study shows an overview of 26 cases of nerve injuries contained within the total of 163,403 recorded cases. The most common reported events were lumbosacral injury (17; 65.4%). Following this category of injury were brachial plexus injury (3; 11.5%), femoral nerve

Table 1. Nerve injury events

| | N | % |
|------------------|----|------|
| Lumbosacral root | 17 | 65.4 |
| Cranial nerve | 4 | 15.4 |
| Brachial plexus | 3 | 11.5 |
| Femoral nerve | 2 | 7.7 |

Table 2. Patient s characteristics and anesthetic techniques

| | N | % |
|-------------------------------|----|------|
| ASA | | |
| I | 18 | 69.2 |
| II | 8 | 30.8 |
| SEX | | |
| Female | 14 | 53.8 |
| Male | 12 | 46.2 |
| Techniques | | |
| GA | 3 | 11.5 |
| GA + Epidural block | 2 | 7.7 |
| GA + Brachial plexus block | 1 | 3.8 |
| GA + Ilioinguinal nerve block | 1 | 3.8 |
| Epidural block | 2 | 7.7 |
| Spinal block | 14 | 53.8 |
| Brachial plexus block | 3 | 11.5 |

injury (2; 7.7 %) cranial nerve injury (4; 15.4%). (Table 1)

Most of patients with lumbosacral injury were recovered within one week except two cases of paraplegia related to tumor metastasis. Two patients had transient hoarseness after receiving brachial plexus block and resolved within 3 hours. A 9 years old child who suffered from femoral nerve injury after ilioinguinal nerve block was recovered in one day.

Regarding the anesthetic techniques, 18 cases or 69% received regional anesthesia, 3 cases or 11.5% received general anesthesia, 4 cases or 15.4% received brachial plexus block and one case received ilioinguinal nerve block (Table 2).

More than half of patients were ASA class I (18 or 69.2%). Others were ASA class II (8 or 30.8%). The mean age was 36.6 – 14.4 years ranged from 9 to 61 years. The mean operation time was 120.4 – 84.9 minutes ranged from 25 to 360 minutes.

There were 6 cases of caesarean section under regional anesthesia who developed lumbosacral injury.

Discussion

The overall incidence of nerve injury in THAI Study was approximately 1.6 in 10,000 cases of anesthesia. The incidence in our study seemed to be less than 1 in 1,000 reviewed by Sawyer et al⁽¹⁾. More than half of nerve injuries found in this study were regional block related. Considering on regional anesthesia the incidence of nerve injury was 5.2 in 10,000 cases. Lumbrosacral injury was the most common injury which differed from other studies that was brachial plexus injury.^(1,2)

The nerve injury in our study may be under reported because of the large number of persons involved in the study. Other limitations include the short follow up period and the data provided by only direct participants instead of expert opinion such as neurologist. The database does not have any denominator data on some important factors such as positioning and type of peripheral nerve block.

Seddon s classified nerve injuries into three groups: neurapraxia, axonotmesis and neurotmesis. The majority of perioperative nerve injury resulted in axonal degeneration axonotmesis⁽¹⁾.

Diagnosis of the site of the lesion depends on the abnormal findings interpreted by clinical signs rather than electrophysiological abnormalities. Nerve damaged may show immediately after recovery from anesthesia or only several days later. Clinical signs

include anesthesia, paresthesia, hyperesthesia, hypoesthesia and pain in the area supplied by the affected nerve and there may be paresis or even paralyzed of affected muscle. In some cases, autonomic dysfunction may occur⁽¹⁻⁵⁾.

There are many factors that may contribute to perioperative nerve injury including preexisting condition, surgical and anesthetic factors. Nerve injuries are more common in diabetic patients than in the general population. Cardiac surgery, patient positioning and length of procedure are examples of surgical factors associated with nerve injury.^(1,5-6) In our study, there were 3 cases of nerve injury that may be related to surgical factors and positioning. They were a case of craniotomy with left facial palsy, a modified radical neck resection with cranial nerve XI injury and a case of brachial plexus injury related to lateral position.

Peripheral nerve injury and central neural damage may be associated with regional anesthesia. Hypoxia, hypovolemia and hypotension are systemic factors that may involve in the pathogenesis of perioperative nerve damage.^(1,5)

In this study, we had inadequate data to identify actual mechanism and risk factors of injury. However, the corrective strategies should include guideline practice, additional training and quality assurance activity. We should thoroughly conduct and document all aspect of the perioperative evaluation and aware of factors that may influence the development of nerve injury.

Conclusion

Nerve injury is a complication following both general and regional anesthesia. The nerve damage can occur at anytime during the perioperative period. The incidence of anesthesia associated nerve injury can be reduced if we are aware of their cause and mechanism.

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อุบัติการณ์การเกิดบาดเจ็บของเส้นประสาทที่สัมพันธ์กับการระงับความรู้สึกในประเทศไทย

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วัตถุประสงค์: โครงการศึกษาอุบัติการณ์การเกิดภาวะแทรกซ้อนทางวิสัญญีในประเทศไทย ได้ศึกษาอุบัติการณ์การเกิดบาดเจ็บของเส้นประสาทที่สัมพันธ์กับการระงับความรู้สึก ปัจจัยที่เกี่ยวข้องและแนวทางการป้องกันการเกิดภาวะแทรกซ้อนนี้ในประเทศไทย

วัสดุและวิธีการ: ศึกษาแบบพรรณนาชนิดไปข้างหน้า ในผู้ป่วยทุกรายที่ได้ยาระงับความรู้สึกในโรงพยาบาล 20 แห่ง จากทุกภูมิภาคของประเทศไทย ในช่วงระยะเวลาตั้งแต่ 1 กุมภาพันธ์ พ.ศ. 2546 ถึง 31 มกราคม พ.ศ. 2547 เพื่อคัดกรองผู้ป่วย ที่มีการบาดเจ็บของเส้นประสาทภายหลังการได้รับการระงับความรู้สึก โดยจะทำการกรอกข้อมูลที่เกี่ยวข้องกับผู้ป่วย ทั้งการศัลยกรรม วิสัญญี และภาวะแทรกซ้อนที่เกิดขึ้นระหว่างผ่าตัด

ผลการศึกษา: พบอุบัติการณ์โดยรวมการเกิดบาดเจ็บของเส้นประสาท ภายหลังการระงับความรู้สึก 1.6 ต่อ 10,000 แต่ในรายที่ได้รับ การระงับความรู้สึกเฉพาะส่วนอุบัติการณ์จะเพิ่มเป็น 5.2 ต่อ 10,000 โดยพบว่าเป็นกลุ่มของเส้นประสาท ส่วน Lumbosacral root มากที่สุด ร้อยละ 65.4 รองลงมาได้แก่ brachial plexus ร้อยละ 11.5, femoral ร้อยละ 7.7 ส่วนปัจจัยที่เกื้อหนุนให้เกิดได้แก่ ชนิดและระยะเวลาของการผ่าตัด และการระงับความรู้สึกเฉพาะส่วน

สรุป: อุบัติการณ์โดยรวมของการเกิดบาดเจ็บของเส้นประสาท ภายหลังการระงับความรู้สึก พบประมาณ 1.5 ต่อ 10,000 และพบในกลุ่มเส้นประสาท Lumbosacral root มากที่สุด
