BRACHIAL PLEXUS BLOCK IN 
MAHARAJ NAKORN CHIANG MAI HOSPITAL: 
A RETROSPECTIVE STUDY OF 794 CASES 

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Abstract 

Objective  To study the success rate and complication of brachial plexus block in Maharaj Nakorn Chiang Mai Hospital, Thailand. 

Methods  The anesthetic data of brachial plexus block performed for operations on the upper extremity in the Department of Anesthesiology, Faculty of Medicine, Chiang Mai University, from January 2004 to December 2005, were reviewed and analyzed for success rate and complication. 

Results  The number of supraclavicular brachial plexus blocks performed in this study was 767 from 794 of all cases between 2004 and 2005. The age ranged from 13 to 86 years and hypertension was the most common underlying disease found. Of the 767 patients, 666 (86.83%) were classified as successful, while 101 were failures (13.17%) requiring unplanned general anesthesia. The supraclavicular approach with a nerve stimulator guide, and interscalene and axillary approaches were used in only 27 patients, and the success rate was 77.8 percent (21/27). Supplementary blocks were needed in 74 patients (9.32%); 41 ulnar, 2 median, 4 radial, 13 digital, 9 surgical field and 5 ulnar and median nerve blocks were performed. There was no significant difference of success rate among the groups of different local anesthetics used. The most serious complication was found in only one pneumothorax case (0.13%). 

Conclusion  Classic supraclavicular plexus block has usually been the anesthesia of choice in Maharaj Nakorn Chiang Mai Hospital for operations on the upper limb. Although the success rate was higher, there was no significant difference to that among different brachial plexus block techniques. The data from anesthetic records were incomplete and did not conclude the factors of success in brachial plexus block. Chiang Mai Medical Journal 2007;46(4):135-140. 

Keywords: brachial plexus block, supraclavicular block, success rate, complication
General anesthesia and brachial plexus block have been used successfully for surgery on the upper extremities. The brachial plexus block was first performed with cocaine solution in 1884 by Halstead at St. Luke’s Roosevelt Hospital in New York. It is accepted that the use of regional anesthesia can minimize the stress response, and the avoidance of opiate-related complication is an added bonus.

The supraclavicular approach to local anesthetic blockade of the brachial plexus offers several advantages over other approaches, e.g. interscalene, infraclavicular and axillary blocks. Supraclavicular nerve blocks are technically easy to perform, with a high success rate and rapid onset of action, but they may be associated with pneumothorax. In comparison, the axillary approach provides more complete anesthesia of the plexus, particularly in the axillary and musculocutaneous nerves. The interscalene approach is complicated by a higher incidence of injections into the epidural or subarachnoid spaces or into the vertebral artery. The infraclavicular approach is not widely used, since most anesthetists believe it requires the use of a nerve stimulator and a long needle able to penetrate both the major and minor pectoralis muscles. It has been our practice to use supraclavicular block (a classic approach regarded as a combination of earlier published techniques) as the main anesthesia for any surgery on the upper limb, which does not involve the shoulder.

Objective

The aim of this study was to define the success rate and complication of brachial plexus block in Maharaj Nakorn Chiang Mai Hospital between 2004 and 2005.

Methods

The authors reviewed all 794 cases who received brachial plexus block for elective and emergency upper extremity surgery between January 2004 and December 2005. Data were obtained from the anesthetic records and then transferred to the computer program. The information reviewed included patient characteristics, types of operation, operative sites, tourniquet use, techniques of brachial plexus block, types of local anesthetic and supplementary nerve block.

Discrete categorical data were presented as number (percent); continuous data were presented as mean±SD. Differences in demographics, surgery and anesthetic were tested by the unpaired t-test (continuous data) or Chi-square test (categorical data and Fisher exact test when appropriate). AP value of less than 0.05 was considered significant. All analyses were conducted using the Statistical Package for Social Science (SPSS for Windows, version 14.0).

Results

Successful block was defined as anesthesia of sufficient quality in the area of surgery. If general anesthesia was required to complete surgery, the nerve block was considered a failure, even if a supplementary block had been already used. Table 1 shows that patients in both groups (successful block group and failed block group) were statistically similar in terms of age, sex ratio, weight, elective to emergency ratio and underlying diseases. The youngest patient was 13 years old and the oldest 86. Hypertension was the most underlying disease found in both groups.

The incidences of failed nerve block shown in Table 2 were not significantly different among
the type of operation groups, with a value of approximately 12.64 percent. Operative duration was significantly longer in the failed block group, although they had already been under general anesthesia. There was no significant difference between the successful and failed block groups in the operative site ($p = 0.062$) or tourniquet use ($p = 0.512$).

Of a 767 total of supraclavicular brachial blocks, 666 (86.83%) were classified as successful block and 101 failures (13.17%) requiring unplanned general anesthesia. Other approach techniques (supraclavicular with a peripheral nerve stimulator, axillary and interscalene blocks) are summarized in Table 3. The axillary approach was used in 4 patients and the success rate was 75 percent (3/4 patients), whereas the interscalene approach was used in 16 patients and the success rate was 87.5 percent (14/16 patients). In the supraclavicular block, with a nerve stimulator guide, the success rate was only 57.1 percent (4/7 patients).

The success rate with use of 1.5% lidocaine with epinephrine 1:200,000, 2% lidocaine with epinephrine 1:200,000 and lidocaine with bupivacaine mixture was 85.14, 89.11 and 87.84 percent, respectively. Supplementary block was needed in 74 patients (9.32%) after supraclavicular block; 41 ulnar, 2 median, 4 radial, 13 digital, 9 surgical field, and 5 ulnar and median nerve blocks were performed. Nine patients, who needed general anesthesia after supplementary block, were considered failed brachial plexus block.

The most serious complication found was pneumothorax in a 21 year old male from a supraclavicular block for emergency debridement, ORIF with tubular plate and K-wire tension band.
There are significant advantages in terms of patient safety and satisfaction when using regional techniques. The authors favor the use of a supraclavicular block as the main anesthesia for any surgery on the upper extremity that does not involve the shoulder.(6-7) The Department of Anesthesiology had never collected a success and failure rate of the regional technique for the upper limb in Maharaj Nakorn Chiang Mai Hospital before this study. Thus, the authors cannot conclude whether the incidence of success increased or not.

Most of the blocks reported in this series were performed by anesthetic residents in their second or third year of training. No significant results were found between different approach technique. However, when comparing the percentage number, the success rate in the supraclavicular approach was 86.83 percent and that in other methods (supraclavicular block with a nerve stimulator, axillary and interscalene approaches) was 77.78 percent. Due to incomplete retrospective data on the time and number of attempts and experience of the performers, the authors could not conclude the factors of success rate of brachial plexus block.

There was only 1 pneumothorax case in 767 patients, who had received brachial plexus block with the supraclavicular approach over 2 years(0.13%). Pneumothorax has a reported incidence of 0.6-5.0 percent with the classic supraclavicular technique.(6) A research showed that diaphragmatic paralysis occurs less often with the supraclavicular approach and is not associated with respiratory difficulties in healthy subjects.(8) However, there was no record of hemidiaphragmatic paresis in this study.

The use of a peripheral nerve stimulator to assist in the performance of the supraclavicular approach is well described, and its use has been advocated in view of the possible risk of neurological damage associated with paresthesia.(9) However, a study by Mulroy MF(10) supported the concern of others(11-13) in that reliance on a nerve stimulator for performance

<table>
<thead>
<tr>
<th>Technique (N)</th>
<th>Successful block</th>
<th>Failed block</th>
<th>P&lt; 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supraclavicular with paresthesia</td>
<td>666</td>
<td>101</td>
<td></td>
</tr>
<tr>
<td>Other(supraclavicular with a PNS*, axillary, interscalene)</td>
<td>21</td>
<td>6</td>
<td>0.143</td>
</tr>
<tr>
<td>1.5%lidocaine with adrenaline 1: 200,000</td>
<td>430</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>2%lidocaine with adrenaline 1: 200,000</td>
<td>221</td>
<td>27</td>
<td>0.317</td>
</tr>
<tr>
<td>Bupivacaine+lidocaine</td>
<td>36</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Supplement block (N)</td>
<td>Yes</td>
<td>63</td>
<td>9</td>
</tr>
<tr>
<td>No</td>
<td>624</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>

* PNS = peripheral nerve stimulator
of a peripheral nerve block does not eliminate the potential for nerve injury. The authors explained that the low incidence of a peripheral nerve stimulator to perform the classic supraclavicular approach was due to anesthetic residents having lack of experience in using the equipment.

The data from anesthetic records had several limitations as follows: 1) all possible immediate complications (hematoma, Horner’s syndrome, accidental intravascular injection and respiratory difficulty), 2) long term follow-up of neurologic complications (persistent numbness, pain or weakness in the extremity), 3) patient satisfaction, and 4) tourniquet time and complaint of tourniquet discomfort.

Conclusion

Brachial plexus anesthesia in combination with a supplementary block can provide an adequate condition for surgery. The present findings conclude that the supraclavicular nerve block in Maharaj Nakorn Chiang Mai Hospital was usually performed without the aid of a nerve stimulator, and the practice of other techniques was very low. Although there was no significant difference in success rate, this study would encourage the authors and their colleagues to practice axillary and interscalene approaches more often (either alone or with a peripheral nerve stimulator guide). Whereas, brachial plexus block and the anesthesiologist’s experience are the key to success, with practicing skill also a requirement.

References

การระงับความรู้สึกด้วยวิธี brachial plexus block
ในโรงพยาบาลมหาราชนครเชียงใหม่: การศึกษาปัจจุบันในผู้ป่วย 794 คน

อานันท์ชนก, คงจรริยานุเคราะห์, พ.บ. และเบญจพรรณ บุญมา, พ.บ.

ภาควิชาวิสัญญี คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่

บทคัดย่อ
วัตถุประสงค์ เพื่อศึกษาอัตราความสำเร็จและภาวะแทรกซ้อนของการใช้วิธีระงับความรู้สึกด้วยวิธี brachial plexus block ในโรงพยาบาลมหาราชนครเชียงใหม่

วิธีการศึกษา ควบคุมเก็บข้อมูลผู้ป่วยที่ใช้ในการระงับความรู้สึกด้วยวิธี brachial plexus block สำหรับการผ่าตัดแขนในโรงพยาบาลมหาราชนครเชียงใหม่ ตั้งแต่เดือนมกราคม พ.ศ. 2547 ถึงเดือนธันวาคม พ.ศ. 2548 ถูกลงบันทึกและวิเคราะห์เพื่อหาอัตราความสำเร็จและภาวะแทรกซ้อน

ผลการศึกษา ผู้ป่วยทั้งหมด 767 ราย ได้รับการระงับความรู้สึกด้วยเทคนิค supraclavicular block จากผู้ป่วยทั้งหมด 794 ราย ที่ได้รับการระงับความรู้สึกด้วยวิธี brachial plexus block ระหว่างปี พ.ศ. 2547-2548 อายุระหว่าง 13-86 ปี ความสำเร็จถูกคัดแยกเป็น 2 ระดับ ที่มีความสูงสุด คุณสมบัติเกณฑ์ คือ 666 ราย จาก 767 ราย หรือร้อยละ 86.83 ที่ไม่สำเร็จต้องได้รับการระงับความรู้สึกด้วยเทคนิค supraclavicular approach รวมถึงการใช้ยาระงับการสูญเสียส่วนต่าง ๆ เทคนิค interscalene และ axillary approach รวมทั้ง 27 ราย จดหมายในกลุ่มที่ไม่สำเร็จสูงสุดคิดเป็นร้อยละ 77.8 (21 จาก 27 ราย) การ block เซ็นรูปร่างในผู้ป่วย 74 ราย (ร้อยละ 9.32) ประกอบด้วย เซ็นรูป ulnar 41 ราย median 2 ราย radial 4 ราย digital 13 ราย ที่มีการผ่าตัดเสริม 9 ราย และมี 5 รายที่ได้รับการ block เซ็นรูป ulnar และ median ในภาพความสัมพันธ์ อย่างมีนัยสำคัญทางสถิติ ในความสัมพันธ์ระหว่างกลุ่มนัยสำคัญทางสถิติผ่านการรับ block เซ็นรูป ulnar และ median ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติ ผู้ป่วยที่มีภาวะแทรกซ้อนเป็นภาวะปอดที่มีการมีปริมาณน้ำอยู่ในช่องปอด (pneumothorax) 1 ราย

สรุป เทคนิคการระงับความรู้สึกด้วยวิธี supraclavicular block เป็นวิธีการทางวิสัญญีที่ใช้เป็นหลักสำหรับการตัดเย็บในโรงพยาบาลมหาราชนครเชียงใหม่ และแม้ว่าอัตราความสำเร็จจะสูงกว่า แต่ไม่พบความแตกต่างอย่างมีนัยสำคัญทางสถิติทางสถิติ ที่เห็นถึงการใช้ brachial plexus block ตัวย่อยเดียวกัน ซึ่งอาจมีผลต่อการใช้วิธีอย่างที่จะส่งผลต่อการผลิตความสำเร็จในการใช้ brachial plexus block ได้ ซึ่งตามข้อมูลการ 2550;46(4):135-140.

คำสำคัญ: brachial plexus block supraclavicular block อัตราความสำเร็จ ภาวะแทรกซ้อน