Comparison of Prevalence of Post-Dural Puncture Headache between Six hour- Supine Recumbence and Early Ambulation after Lumbar Puncture in Thai Patients: A Randomized Controlled Study

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Objective: *To compare the prevalence of Post Dural Puncture Headache (PDPH) between 6 hour- supine recumbence and early ambulation in Thai patients.*
Material and Method: *The present study was a prospective controlled study and enrolled the patients who underwent Lumbar Puncture (LP) from Phramongkutklao Hospital, Thailand. The background characteristics were recorded. Standard LP method was done. The patients were randomized to 6 hour-supine recumbence and ≤ 1hour- (early ambulation) groups. Prevalence and characteristics of PDPH were compared.*
Results: *Of 65 patients, there were 33 patients (50.8%) in the 6 hour-recumbent group and 32 patients (49.2%) in the early ambulation group. The background characteristics and CerebroSpinal Fluid (CSF) findings were not different between the groups. Prevalence of PDPH was 16.9% (overall), 18.2% (6 hours) and 15.6% (early ambulation). There was no statistically significant difference in prevalence, pattern and severity of PDPH between the groups.*
Conclusion: *The prevalence and characteristics of PDPH were not different between the 6 hour- recumbence and early ambulation groups.*

Keywords: *Post-dural puncture headache, PDPH, Recumbence, Early ambulation, Prevalence, Risk factor, Lumbar puncture*

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Lumbar Puncture (LP) for cerebrospinal fluid examination is an important diagnostic tool in neurology[1,2]. Post-Dural Puncture Headache (PDPH) is a common sequelae to LP[3-6]. The pathophysiology of this headache is related with ongoing leakage of CerebroSpinal Fluid CSF through the dural rent made by the LP needle that exceeds the rate of CSF production and stimulates or stretches the pain sensitive structures of the brain[7,8]. PDPH can occur in 1-70% but common frequency after diagnostic LP is about 30%[3-6,9]. PDPH is a common type of low CSF pressure headache. The International Headache Society classified it as one that occurs or worsens less than 15 minutes after assuming the upright position and disappears or improves less than 30 minutes after resuming the recumbent position[7]. PDPH occurs twice as often in women as in men and the highest frequency is in the 18- to 30-year-old age group[10-14]. The incidence is greater in patients with a small Body Mass Index (BMI)[10]. Patients with headache before or during the LP or a history of prior PDPH are at greater risk for PDPH including prevalence and severity[10,15-17]. Smaller needle size is associated with lesser risk of headache according to a smaller tear in the dura and less potential for leakage[18]. Incidence of PDPH decreases about 50%[18-22] if the bevel of the Quincke is inserted parallel

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to the dural fibers, rather than perpendicular. The amount of removed spinal fluid is not a risk factor for PDPH[10]. There is no evidence for the use of increased fluids intake in the prevention of PDPH[7,23]. In 1899, Bier[24] reported the PDPH of himself and his associate and his recommendation for prevention were strict bed rest. This is still advised by many physicians today. Class I evidence shows no benefit for prevention of PDPH by bed rest for up to 24 hours in the supine, prone, or head down position[7,25-31]. Two studies showed a mildly increased frequency of PDPH in recumbent patients compared with patients immediately mobilized[10,32]. However, these are the data from different countries that may differ from the Thai population. There are no reports from Thailand in Medline database about PDPH. In Thailand, the supine recumbent duration varies from 1 to 24 hours. Longer recumbence may generate unnecessary hospitalization thus cause some sequelae such as aspiration in the patients who eats during recumbence. Six hours is the routine recumbence duration used in Phramongkutklao Hospital. The authors plan to compare the prevalence of PDPH between 6 hour-supine recumbence and early ambulation ($\leq$ 1 hour) after LP in Thai patients.

Material and Method

The present study was a prospective, randomized controlled study. The authors enrolled the consecutive patients who underwent LP in the Department of Medicine, Phramongkutklao Hospital, Thailand from April 1st, 2004 to April 30th, 2005. The inclusion criteria were age of more than 14 years, who had indications for diagnostic LP, good cooperation and good consciousness. Exclusion criteria were volume of CSF examination more than 15 ml, difficult LP (apply needle > 1 time), repeated LP within 1 month, pregnancy or lactation, respirator dependent, unstable vital signs, HIV infection, severe dementia, very severe headache, low pressure headache pattern prior LP, contraindications for LP and non-ambulate or bed ridden.

Standard LP method was done in fully flexed decubitus position then injection of local anesthetic agent at L3-4 intervertebral space and spinal needle [Quincke (conventional) needle] number (No.) 20 or 22 bevel-up (parallel to the dural fibers) was inserted through the skin and advanced through the deep tissue until CSF flowed. CSF Opening Pressure (OP) and Closing Pressure (CP) were measured in mm H_2O after relaxation and stable with minimal fluctuation of CSF level by glass cylindrical manometer. CSF was drawn and volume was recorded. After LP, the patients were randomized to the standard group (6 hour-supine recumbence) and early ambulation ($\leq$ 1 hour-supine recumbence) by block randomization. Vital signs and neurological signs were recorded at 30 minutes, 1, 2, 4 and 6 hours. The research doctors monitored and stimulated the patients for accuracy timing of recumbence as protocol.

Demographic characteristics, clinical and indications for LP were recorded. CSF profiles were analyzed: White Blood Cell (WBC) count, differentiation, protein, sugar, cytology and various infectious parameters. Final diagnosis of each patient after LP was recorded. PDPH defined as bilateral headache that related with position especially improvement during recumbent and worsening during upright position of the body. In the patients who had headache before LP, PDPH was defined as position related or low CSF pressure pattern that should be different from previous headache. The authors recorded associated symptoms of PDPH such as nausea, vomiting. Severity, pain scale and treatment were assessed. Disability grading were 0: no disability (if no headache occurred), 1: mild disability (if mild headache, minimally involved activity, not required daytime bed rest), 2: moderate disability (if moderate headache, moderately involved activity, required partial daytime bed rest), 3: severe disability (if severe headache, mostly involved activity, required all of daytime bed rest and vomiting). Patients estimated the Visual Analog Scale (VAS) that ranged between 0 through 10 (0: if no pain and 10 if the most severe pain in their life). In the patients who developed PDPH, the authors treated them individually by supine bed rest, forced oral fluid, simple analgesic, intravenous fluid and epidural blood patch. The mode of treatment depended on severity. Severe PDPH was defined by duration of PDPH > 3 days or severe disability grading = 3 or average VAS > 5 or treatment requiring more than bed rest and forced oral fluid (analgesic, intravenous fluid or epidural blood patch). The authors visited and recorded the symptoms and treatment of each in-hospital patient every day for at least 7 days. Out patients were assessed daily by telephone and questionnaire until follow up time (day 7th) at out-patients clinic. After that the authors advised the patients to contact them if they developed headache within 1 month after LP. If PDPH occurred, the authors assessed the patients until headache had disappeared. In mild to moderate disability PDPH, the authors advised conservative (bed rest and force oral fluid) first, whereas in severe disability, the authors

advised the patient to take additional analgesic drug or intravenous fluids with or without hospitalization. In patient who did not improve after intravenous fluid and analgesic administration with ongoing disability, the authors considered performing the epidural blood patch.

The present study was approved by the Army Medical department ethical committee. Written consent was obtained from all eligible patients.

Statistical analysis

The continuous data was assessed by means, range and Standard Deviation (SD). The discrete data was assessed in number and percent. The authors used Mann-Whitney U test, chi-square test and Fisher's Exact test for determining the difference between groups. P value < 0.05 represented statistically significant. Statistical analysis was assessed by statistic program, SPSS version 11.5.

Results

From the 96 eligible patients, the authors enrolled 65 patients during the one year study at Phramongkutklao Hospital that as shown in the study diagram (Fig. 1). There were 32 males (49.2%) and 33 females patients (50.8%). The mean age was 44.8 years, the SD was 17.5 years and range was 18-81 years. Indications for LP were suspected infectious meningitis 41.8%, malignant meningitis 9.1%, immune mediated disease (optic neuritis, multiple sclerosis, CNS vasculitis, SLE and neuropathy) 27.3%, neurosyphilis 16.4%, venous sinus thrombosis 1.8%, non-severe dementia 1.8% and subarachnoid hemorrhage 1.8%. There were 12 patients (20%) who had headache (not severe headache and not low-pressure headache pattern) before or during LP. Needle size No 20 was used in 21 cases (81%) and No. 22 in 4 cases (19%). Mean BMI was 22.5. After randomization, there were 33 patients (50.8%) in the 6 hour- supine recumbent group and 32 patients (49.2%) in $\leq$ 1 hour-recumbence or early ambulation group. Demographic variables, CSF profiles and diagnosis after LP were not different between the groups as shown in Table 1. The duration of supine recumbence after LP in both groups were not found different in prevalence, characteristics and severity among PDPH.

Eleven patients (16.9%) developed PDPH. The onset of PDPH started at 6 hours through the 4th days after LP (mean 1.5 days and SD 3.7). The duration of PDPH ranged between 12 hours and 7 days. Mean duration of PDPH was 4 days. The most common peak

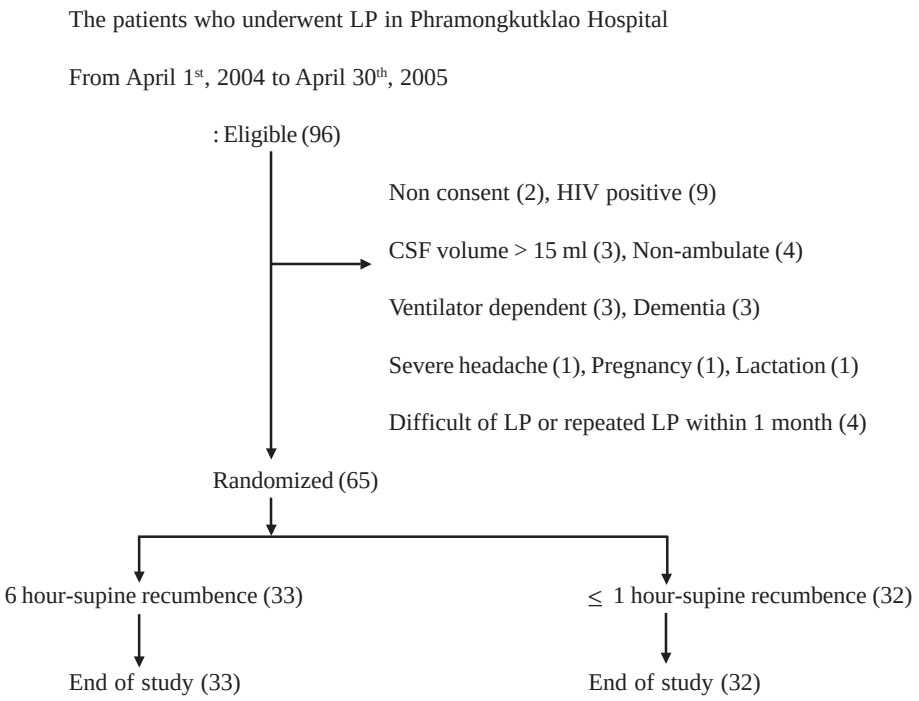

Fig. 1 Study diagram

Table 1. Demographic, CSF findings and frequency of postdural punture headache

Profile	6 hour-supine after LP (n =33) Mean ± SD (range)	1 hour-supine after LP (n = 32) Mean ± SD (range)	p value
Demographic:			
- Age (yr)	45.0 ± 18.0 (range 21-81)	44.7 ± 17.3 (range 18-77)	0.949
- Sex: male [N (%)]	17 (51.5 %)	15 (46.9 %)	0.708
: female [N (%)]	16 (48.5 %)	17 (53.1 %)	
- Body weight (Kg)	58.5 ± 11.2 (35-80)	59.0 ± 14.6 (44-82)	0.911
- Height (cm)	160.7 ± 9.0 (140-180)	163.6 ± 9.2 (152-178)	0.434
- BMI (Kg/m^2)	22.5 ± 3.1 (17.8-31.3)	22.5 ± 4.0 (17.3-30.1)	0.986
- Headache before LP [N (%)]	11 (33.3 %)	10 (31.3 %)	0.914
CSF pressure & profiles:			
- Opening pressure (mmH_2O)	147.4 ± 57.5 (30-280)	150.4 ± 34.9 (100-205)	0.808
- Closing pressure (mmH_2O)	117.3 ± 40.2 (20-210)	115.2 ± 33.6 (60-180)	0.580
- Volume of CSF examination (ml)	10.4 ± 2.3 (4-15)	10.7 ± 1.2 (10-12)	0.689
- WBC count (/cu.mm)	36.8 ± 170.7 (0-856)	40.6 ± 154.8 (0-660)	0.697
- Protein (mg/dL)	91.2 ± 104.8 (25-498)	62.0 ± 81.3 (14-368)	0.065
- Sugar (mmol/L)	7.6 ± 15.2 (2.7-72)	3.6 ± 0.9 (2-5.7)	0.354
PDPH occurring:			
- Frequency [N (%)]	6 (18.2 %)	5 (15.6 %)	0.783

SD = standard deviation, BMI = body mass index, LP = lumbar puncture, CSF = cerebrospinal fluid, WBC = white blood cell, PDPH = post-dural puncture headache, N = number

severity was on the 2nd day after LP. The mean of average VAS and peak VAS were 4.9 and 7.6 respectively. Disability from PDPH occurred in 45.5% as they developed nausea or vomiting. The patients who needed analgesic or intravenous fluid were 36.4% while 63.6% needed only forced oral fluid and no patient needed epidural blood patch.

In comparison between the two groups, the prevalence of PDPH was 18.2% and 15.6%. This result was not different among the groups. The pattern and severity of PDPH in both groups were not different. The clinical profiles of PDPH are shown in Table 2. Nine patients (81.8%) had 'severe' PDPH.

Discussion

The clinical characteristics of PDPH in the present study were similar to other studies. The duration of recumbence after LP was not related to PDPH pathophysiology (dural tearing and further CSF leakage), so different duration might not influence prevalence and severity of PDPH. Several previous studies confirmed that duration and posture of recumbence after LP did not influence PDPH[25-32], however, there was no data among Thai population. After analysis, the authors found a similar result of Thai patients to other countries that early ambulation didn't increase the prevalence of PDPH. The duration of recumbence also did not relate to 'severe' PDPH. So, for patients without the risk of brain herniation, the authors could safely advise the patients to early ambulation after LP, which could reduce the cost of un-necessary hospitalization. The early ambulation might reduce some

Table 2. Clinical profile of post-dural puncture headache

PDPH	6 hour-supine after LP (n = 6) Mean ± SD (range)	1 hour-supine after LP (n = 5) Mean ± SD (range)	p value
Characteristics:			
- Starting (day)	1.5 ± 0.8 (12h-2d)	1.6 ± 1.5 (6h-4d)	0.945
- Duration (day)	3.8 ± 2.4 (12h-6d)	4.2 ± 2.2 (2-7d)	0.757
- Peak severity (day)	2.2 ± 1.5 (1-5)	2.0 ± 1.5 (1-4)	0.845
- Mean VAS	5.2 ± 1.7 (2-7)	4.6 ± 0.5 (4-5)	0.547
- Maximum VAS	7.6 ± 2.9 (2-10)	7.3 ± 2.2 (5-10)	0.776
- Nausea, vomiting, dizzy [N (%)]	3 (50%)	3 (60%)	0.608
Disability:			0.676
1) Mild [N (%)]	1 (16.7%)	2 (40%)	
2) Moderate [N (%)]	2 (33.3%)	1 (20%)	
3) Severe [N (%)]	3 (50%)	2 (40%)	
Treatment:			0.819
1) Supine bed rest, hydration [N (%)]	4 (66.6%)	3 (60%)	
2) IV fluid or analgesic [N (%)]	2 (33.3%)	2 (40%)	
3) Epidural blood patch [N (%)]	0	0	

PDPH = post-dural puncture headache, VAS = visual analog scale, SD = standard deviation, h = hour, d = day, N = number

complications that were related to prolonged supine bed rest such as bed sores, aspiration, psychological stress and deep vein thrombosis, etc. In the patients who had a history of frequent vasovagal syncope or fear of any procedures, the physician should individually advise for an appropriate time of recumbence to reduce clinical syncope.

Conclusion

The prevalence and characteristics of PDPH are not different between 6 hour-recumbence and early ambulation in Thai patients.

References

1. Roos KL. Lumbar puncture. Semin Neurol 2003; 23: 105-14.
2. Disturbances of cerebrospinal fluid and its circulation including hydrocephalus, pseudotumor cerebri and low-pressure syndromes. In: Victor M, Ropper AH, editors. Principles of neurology. 7th ed. New York: McGraw-Hill; 2001: 655-75.
3. Examination of the cerebrospinal fluid: techniques and complications. In: Fishman RA, editor. Cerebrospinal fluid in disease of the nervous system. 2nd ed. Philadelphia: W.B. Saunders; 1992: 157-82.
4. Halpern S, Preston R. Postdural puncture headache and spinal needle design. Metaanalyses. Anesthesiology 1994; 81: 1376-83.
5. Dieterich M, Perkin GD. Postlumbar puncture headache syndrome. In: Brandt T, Caplan LR, Dichland J, Diener HC, Kennard C, editors. Neurologic disorders: course and treatment. San Diego, CA: Academic Press; 1996: 59-63.
6. Evans RW. Complications of lumbar puncture. Neurol Clin 1998; 16: 83-105.
7. Lay CM. Low cerebrospinal fluid pressure headache. Curr Treat Options Neurol 2002; 4: 357-63.
8. Levine DN, Rapalino O. The pathophysiology of lumbar puncture headache. J Neurol Sci 2001; 192: 1-8.
9. Sudlow C, Warlow C. Posture and fluids for preventing post-dural puncture headache. Cochrane Database Syst Rev 2002; CD001790.
10. Kuntz KM, Kokmen E, Stevens JC, Miller P, Offord KP, Ho MM. Post-lumbar puncture headaches: experience in 501 consecutive procedures. Neuro-

logy 1992; 42: 1884-7.
11. Dripps RD, Vandam LD. Hazards of lumbar puncture. J Am Med Assoc 1951; 147: 1118-21.
12. Tourtellotte WW, Henderson WG, Tucker RP, Gilland O, Walker JE, Kokman E. A randomized, double-blind clinical trial comparing the 22 versus 26 gauge needle in the production of the post-lumbar puncture syndrome in normal individuals. Headache 1972; 12: 73-8.
13. Leibold RA, Yealy DM, Coppola M, Cantees KK. Post-dural-puncture headache: characteristics, management, and prevention. Ann Emerg Med 1993; 22: 1863-70.
14. Solomon GD, Clark JW, deSenanayake P, Kunkel RS. Hypersensitivity to substance P in the etiology of postlumbar puncture headache. Headache 1995; 35: 25-8.
15. Peterman SB. Postmyelography headache: a review. Radiology 1996; 200: 765-70.
16. Clark JW, Solomon GD, Senanayake PD, Gallagher C. Substance P concentration and history of headache in relation to postlumbar puncture headache: towards prevention. J Neurol Neurosurg Psychiatry 1996; 60: 681-3.
17. Lybecker H, Moller JT, May O, Nielsen HK. Incidence and prediction of postdural puncture headache. A prospective study of 1021 spinal anesthesias. Anesth Analg 1990; 70: 389-94.
18. Dittmann M, Schafer HG, Ulrich J, Bond-Taylor W. Anatomical re-evaluation of lumbar dura mater with regard to postspinal headache. Effect of dural puncture. Anaesthesia 1988; 43: 635-7.
19. Mihic DN. Postspinal headache and relationship of needle bevel to longitudinal dural fibers. Reg Anesth 1985; 10: 76-81.
20. Norris MC, Leighton BL, DeSimone CA. Needle bevel direction and headache after inadvertent dural puncture. Anesthesiology 1989; 70: 729-31.
21. Tarkkila PJ, Miralles JA, Palomaki EA. The subjective complications and efficiency of the epidural blood patch in the treatment of postdural puncture headache. Reg Anesth 1989; 14: 247-50.
22. Flaatten H, Thorsen T, Askeland B, Finne M, Rosland J, Hansen T, et al. Puncture technique and postural postdural puncture headache. A randomised, double-blind study comparing transverse and parallel puncture. Acta Anaesthesiol Scand 1998; 42: 1209-14.
23. Dieterich M, Brandt T. Incidence of post-lumbar puncture headache is independent of daily fluid intake. Eur Arch Psychiatry Neurol Sci 1988; 237: 194-6.
24. Bier A. Versuche uber cocainisirung des ruckenmarkes [abstract]. Deutsche Zeitschrift fur Chirurgie 1899; 51: 361-9.
25. Cook PT, Davies MJ, Beavis RE. Bed rest and postlumbar puncture headache. The effectiveness of 24 hours' recumbency in reducing the incidence of postlumbar puncture headache. Anaesthesia 1989; 44: 389-91.
26. Carbaat PA, van Crevel H. Lumbar puncture headache: controlled study on the preventive effect of 24 hours' bed rest. Lancet 1981; 2: 1133-5.
27. Spriggs DA, Burn DJ, French J, Cartlidge NE, Bates D. Is bed rest useful after diagnostic lumbar puncture? Postgrad Med J 1992; 68: 581-3.
28. Dieterich M, Brandt T. Is obligatory bed rest after lumbar puncture obsolete? Eur Arch Psychiatry Neurol Sci 1985; 235: 71-5.
29. Handler CE, Smith FR, Perkin GD, Rose FC. Posture and lumbar puncture headache: a controlled trial in 50 patients. J R Soc Med 1982; 75: 404-7.
30. Hilton-Jones D, Harrad RA, Gill MW, Warlow CP. Failure of postural manoeuvres to prevent lumbar puncture headache. J Neurol Neurosurg Psychiatry 1982; 45: 743-6.
31. Hafer J, Rupp D, Wollbruck M, Engel J, Hempelmann G. The effect of needle type and immobilization on postspinal headache. Anaesthesist 1997; 46: 860-6.
32. Vilming ST, Schrader H, Monstad I. Post-lumbar-puncture headache: the significance of body posture. A controlled study of 300 patients. Cephalalgia 1988; 8: 75-8.

การเปรียบเทียบภาวะปวดศีรษะหลังการเจาะน้ำไขสันหลังระหว่างกลุ่มนอนราบ 6 ชั่วโมง เทียบกับกลุ่มลุกเร็วหลังเจาะน้ำไขสันหลังในผู้ป่วยไทย: การศึกษาควบคุมแบบสุ่ม

สิรกานต์ เตชะวณิช, พาสิริ สิทธินามสุวรรณ, ณกรณ์ สิทธินามสุวรรณ, สามารถ นิธินันทน์, จิตถนอม สุวรรณเตมีย์

วัตถุประสงค์: *เพื่อเปรียบเทียบภาวะปวดศีรษะหลังการเจาะน้ำไขสันหลัง [Post-dural puncture headache (PDPH)] ในการนอนราบแบบหงายระยะเวลา 6 ชั่วโมง และการลุกเร็ว ในผู้ป่วยไทย*

วัสดุและวิธีการ: *การศึกษานี้เป็นการศึกษาไปข้างหน้าควบคุมแบบสุ่มจากผู้ป่วยไทยที่ได้รับการเจาะน้ำไขสันหลังในโรงพยาบาลพระมงกุฎเกล้า บันทึกลักษณะพื้นฐาน ทำการเจาะน้ำไขสันหลังตามวิธีมาตรฐาน สุ่มแยกเป็นกลุ่มนอนราบ 6 ชั่วโมงและนอนราบไม่เกิน 1 ชั่วโมง (ลุกเร็ว) ทำการเปรียบเทียบการเกิดอาการปวดศีรษะและลักษณะของอาการปวดศีรษะแบบ PDPH*

ผลการศึกษา: *จากผู้ป่วยทั้งสิ้น 65 คน, กลุ่มนอนราบ 6 ชั่วโมงมี 33 คน (ร้อยละ 50.8) และกลุ่มลุกเร็วมี 32 คน (ร้อยละ 49.2) ทั้งสองกลุ่มไม่มีความแตกต่างในลักษณะพื้นฐานและผลตรวจน้ำไขสันหลัง พบการเกิดอาการปวดศีรษะแบบ PDPH โดยรวมร้อยละ 16.9, กลุ่ม 6 ชั่วโมงร้อยละ 18.2 และกลุ่มลุกเร็วร้อยละ 15.6 ไม่พบความแตกต่างอย่างมีนัยสำคัญของความชุก, ลักษณะและความรุนแรงของ PDPH ระหว่าง 2 กลุ่ม*

สรุป: *ไม่พบความแตกต่างของภาวะปวดศีรษะแบบ PDPH ในผู้ป่วยไทยที่มารับการตรวจโดยการเจาะน้ำไขสันหลังระหว่างกลุ่มนอนราบ 6 ชั่วโมงเทียบกับกลุ่มลุกเร็วภายหลังเจาะหลัง*