Traumatic vs. atraumatic 22 G needle for therapeutic and diagnostic lumbar puncture in the hematologic patient: a prospective clinical trial

We investigated the impact of needle type on post lumbar puncture headache (PLPH) in hematologic patients undergoing LP. We prospectively compared traumatic (TN) *vs.* atraumatic 22G needles. Twenty-seven patients underwent 48 LPs, 22 with chemotherapy injection. PLPH occurred almost exclusively with TN (4% *vs.* 30% p=0.02), irrespective of chemotherapy injection.

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Diagnostic lumbar puncture with or without intrathecal chemotherapy injection is often required in hematologic patients, particularly in patients diagnosed with high or intermediate grade lymphoma and acute lymphoblastic leukemia who are at high risk of CNS disease. These patients often have between 4-8 *intrathecal* methotraxte (MTX) injections from 8 days to a few weeks apart. Unfortunately, they often develop post lumbar puncture headache (PLPH), causing a delay, or even withdrawal of scheduled intrathecal MTX therapy.

PLPH is defined as a headache appearing within 12 days after LP (usually within 24-48 hours). It is exacerbated by standing and passes when the patient lies down. Treatment includes bed rest, analgesics, increased fluid intake (especially caffeine-containing beverages) and epidural blood patch.[1,2,3] PLPH is more frequent in younger women with a low body mass index and in patients who have previously experienced PLPH.[4] Technical factors affecting PLPH include patient's position during procedure, bevel insertion of the needle in parallel to the patient's axis, and reinsertion of a stylet before needle withdrawal.[5,6] An atraumatic needle (ATN) has a blunt tip that separates the dural fibers instead of tearing them thus enabling their rapid closure. This potentially results in a lower incidence of PLPH compared with that observed with a traumatic needle (TN).[5-8]

We conducted a prospective randomized trial, comparing the incidence and severity of PLPH following diagnostic or therapeutic LP, using a TN versus an ATN 22G needle. The study was approved by the local IRB and informed consent was obtained from all patients. All hematologic patients, 18 years or older, that were scheduled for a diagnostic or therapeutic LP between July and December 2004 as part of their clinical management were included. Exclusion criteria were platelet count <80×10^9/L, evidence of increased intracranial pressure in fundoscopy and/or brain CT scan, and a previous LP, performed during the preceding week. Patients were randomly assigned according to identification number to undergo LP with a standard TN (Quincke, traumatic, 22 Gauge, 90 mm; TSK, JAPAN) versus an ATN (Whitacre, 22 Gauge, 0.70 mm, 103 mm, Polymedic, E.C, JAPAN). The same physician performed all LPs using the same technique with patients lying on their side and receiving local anesthesia. Introducer needle or traumatic needle bevel were directed parallel to the patient's axis with stylets reinserted before needle withdrawal. Patients were required to lie down for an hour after LP. Patients were not aware of the needle type being used. Data collection included demographics, past medical history, indication for LP, procedure-related parameters and complications was obtained from questionnaires carried out by a blinded physician on days 2 and 7 post LP. PLPH was defined according to standard criteria.[9] Twenty-seven patients (lymphoma 14; leukemia 13) underwent 48 LPs; 25 with an ATN and 23 with a TN. Patient characteristics, technique parameters and complications are presented in Table 1. Seventeen patients (63%) had a single LP, whereas 10 required repeated LPs (2-4), performed from a week to several weeks apart. All LPs, irrespective of the needle type being used, provided a sufficient amount of CSF for all tests required and allowed an intrathecal injection of chemotherapy to be given.

The incidence of PLPH following all LPs was higher with TN compared with an ATN: 7/23 *vs.* 1/25, (p=0.02). After adjustment to other covariates (age, and positive CSF results) that showed a trend in the univariate analysis (p<0.2), needle type remained an important predictor of PLPH (p=0.01). Only one episode resulted in a significant limitation of daily activities (VAS scale=4.8 range 2-10) and resolved within 12-48 hours (median 36 hours) after being treated with analgesics and increased fluid intake. Ten patients required 22 therapeutic LPs with intrathecal MTX alone (n=8) or in combination with cytarabine and steroids (n=14). Twelve of these LPs were performed with a TN and 10 with an ATN. All PLPH episodes occurred following a therapeutic LP with a TN (5/12, *vs.* none following a therapeutic LP with an ATN) (Figure 1). A therapeutic and diagnostic LP through a TN was associated with a higher risk of PLPH (5/12 and 2/11) whereas *intrathecal* chemotherapy through an ATN had the

Table 1. Characteristics and technique parameters of therapeutic LPs.

	p value	*Atraumatic needle (n=10)*	*Traumatic needle (n=12)*
Age	0.3	45±15	52±15
Gender (women%)	0.04	3(33%)	9 (75%)
BMI Kg/m^2	0.5	25±4	23±5
Years of education	0.9	14.6±4	15±7
Caffeine consumption cups/d	0.5	2.9±1.6	2.3±1.6
Number of attempts	0.2	1.1	1.5
CSF volume mL	0.2	8.2±1.8	9.3±2.2
PLPH	0.02	0	5
Back pain	0.02	0	5
Pathological CSF	0.6	3	4

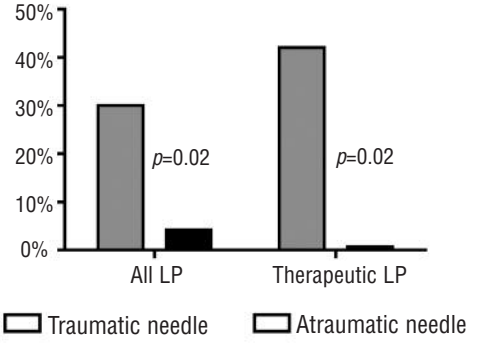

Figure 1. PLPH incidence following diagnostic and therapeutic LP. PLPH is markedly reduced when ATN is used in both diagnostic and therapeutic LPs.

same low impact on PLPH risk as observed following a diagnostic LP through an ATN (0/10 *vs.* 1/15).

The use of ATN for diagnostic and therapeutic LPs in hematologic patients is safe and feasible. Furthermore, the results strongly support its superiority over the TN, providing a significant reduction in the incidence of PLPH and allowing the application of repeated therapeutic LPs according to treatment schedule.

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References

1. Serpell MG, Rawal N. Headaches after diagnostic dural punctures. Br Med J 2000;321:973-4.
2. Williams EJ, Beaulieu P, Jenkins WJ. Efficacy of epidural blood patch in the obstetric population. Int J Obstet Anest 1999;8:105-9.
3. Harrington BE. Postdural Puncture Headache and the Development of the Epidural Blood Patch. Reg Anesthesia Pain Med 2004;29:136-63.
4. Vilming ST, Schrader H, Monstad I. The significance of age, sex, and cerebrospinal fluid pressure in post-lumbar-puncture headache. Cephalalgia 1989;9:99-106.
5. Turnbull DK, Shepherd DB. Post-dural puncture headache: pathogenesis, prevention and treatment. Br J Anaesth 2003;91:718-29.
6. Armon C, Evans RW, Therapeutics, Technology Assessment Subcommittee of the American Academy of N. Addendum to assessment: prevention of post-lumbar puncture headaches: report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. Neurology 2005;65:510-2.
7. Kannan K, Koh LP, Linn YC. Subdural hematoma in two hematopoietic stem cell transplant patients with post-dural puncture headache and initially normal CT brain scan. Ann Hemat 2002;81:540-2.
8. Strupp M, Schueler O, Straube A, Von Stuckrad-Barre S, Brandt T. "Atraumatic" Sprotte needle reduces the incidence of post-lumbar puncture headaches. Neurology 2001;57:2310-2.
9. Vilming S, Kloster R. Post-lumbar puncture headache: clinical features and suggestions for diagnostic criteria. Cephalalgia 1997;17:778-84.