The Weekly Probe

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THIS WEEK

Diagnostic LP – minimising complications:

Refer Williams et al. Int Med J 38 (2008) 587-591

Emergent LP is usually performed to investigate CNS infection or possible SAH. Dural puncture for spinal anaesthesia is different to diagnostic LP as less CSF is removed and the needles used are often smaller. The authors looked at published evidence to address questions regarding complication rates in diagnostic LP (less frequently the subject of research than spinal anaesthetic dural puncture).

REDUCING COMPLICATIONS

Does routine CT brain prior to LP prevent cerebral herniation in adults with suspected meningitis?

Routine CT prior to LP may delay LP and thus antibiotics should be administered upon clinical suspicion of meningitis. Delay in initiation of antibiotics is assoc with an increased risk of adverse outcome and death. There are no published reports of serious deterioration in pts following LP who were NEUROLOGICALLY NORMAL prior to the procedure.

2 prospective studies of pts undergoing LP for suspected meningitis evaluated the need for prior CT & concluded clinical examination predicted the finding of abnormalities on CT.

The absence of immunocompromised status (HIV, malignancy, steroids etc), recent seizure, decreased consciousness & focal neurology made findings abnormalities on CT extremely unlikely (NPV 97%). The few pts whose abnormalities were missed by clinical examination underwent LP without complications. The American College for Emergency Medicine adds a class C recommendation on the need for imaging in those who have signs of raised ICP as indicated by papilloedema, loss of venous pulsations, altered mental status, focal neuro defecits, and signs of meningeal irritation) prior to LP.

Bestbets (www.bestbets.org) found 3 studies looking at this question (total 476 pts). They conclude similarly that "in cases of suspected meningitis it is very unlikely that patients without clinical risk factors (immunocompromise/ history of CNS disease/seizures) or positive neurological findings will have a contraindication to lumbar puncture on their CT scan. If CT scan is deemed to be necessary, administration of antibiotics should not be delayed"

HOW CAN WE REDUCE THE INCIDENCE OF POST-LP HEADACHE

The incidence of post-LP headache (PLPH) varied from 1 to 70%. PLPH is thought to result from chronic CSF leakage, leading to low CSF pressure and traction on the meninges and intracranial veins. Onset is usually within 48 h and resolves spontaneously within a few days. However, it may be disabling, necessitating hospital admission.

Does bed rest post-LP reduce the incidence of PLPH?

Systematic reviews have shown NO benefit in diagnostic LP or therapeutic LP for bed rest in reducing post LP headache.

Does the type of needle used affect the incidence of PLPH?
Prospective controlled trials have found the incidence of PLPH to be lower in pts where atraumatic 20G needles are used c/w pts undergoing LP with conventional cutting needles (20 or 22G).

Does the gauge of needle affect incidence of PLPH?
There are no controlled trials comparing needles of identical design but different gauges on the incidence of PLPH. Uncontrolled studies suggested larger diameter needles were associated with higher incidence of PLPH, and some feel that size is a more important factor with PLPH than the needle type.. However for diagnostic LP, needles smaller than 22-G may be impractical as CSF flow is slow and measuring CSF pressure and collecting adequate CSF volumes for diagnosis may be difficult.

Does bevel orientation affect the incidence of PLPH?
A meta-analysis of trials comparing insertion of a cutting needle with the bevel orientated parallel/ longitudinal with insertion in a perpendicular/transverse direction found that parallel/longitudinal insertion resulted in significantly lower incidence of PLPH.

Does replacing the stylet before withdrawing the needle reduce the incidence of PLPH?
A single prospective randomized trial addressed this question. Six hundred patients undergoing diagnostic LP with 21-G atraumatic needles were randomized to the stylet being replaced before removal of needle or the needle being removed without the stylet in place. Patients were blinded and were followed up for 7 days. Forty-nine of 300 patients (16%) without reinsertion developed PLPH versus 5% with stylet reinserted ($P < 0.005$).

HOW CAN WE MAXIMIZE THE CHANCE OF A SUCCESSFUL LP?
Is lateral recumbent or sitting position optimal for successful LP?
No controlled studies compared success of diagnostic LP with sitting or recumbent position. One small study found a significantly increased interspinous distance on ultrasound with patients sitting with feet supported compared with patients in the lateral recumbent position however the lateral recumbent position allows accurate measurement of CSF opening pressure which is an important diagnostic step in pts with suspected CNS infection and isolated elevated pressures may be seen in some atypical organisms (eg cryptococcal).

Does type of needle affect the chance of a failed attempt at LP?
Three prospective studies compare the incidence of PLPH with conventional or atraumatic needles that reported number of attempts needed as a secondary outcome and found no significant difference.

HOW CAN WE MINIMIZE THE INCIDENCE OF INFECTION POST-LP?
Iatrogenic meningitis is an uncommon complication of diagnostic LP. Incidence is unclear because cases may not be reported. Physicians may not be aware of the potential association between meningitis and a preceding LP. Potential routes of infection include from operators' hands, the patient's skin or through aerolization of organisms from the operator's mouth. In a review of 179 cases of postdural puncture meningitis, only 9% followed diagnostic LP; most followed either spinal or epidural anaesthesia.

Should operators wear masks when carrying out diagnostic LP?
We found no studies that looked at whether the use of masks reduced the incidence of postdural puncture headache. The incidence of postdural puncture headache is so low that studies to answer this question would need to enrol enormous numbers of participants and are therefore impractical. Identical Streptococci have been isolated from the CSF of a patient with post-LP meningitis and from the operator's oropharynx. Masks have been shown to reduce dispersal of methicillin-resistant *Staphylococcus aureus* (MRSA), but not other bacteria, from MRSA colonized staff. Masks are often not worn by those who frequently carry out LP.

Should LP be avoided in patients with suspected bacteraemia?
It is theoretically possible for LP to cause meningitis in a bacteraemic patient. A retrospective study of 1089 bacteraemic infants found no significant difference in the incidence of subsequent meningitis between infants undergoing LP and those that did not.

HOW CAN BLEEDING COMPLICATIONS BE MINIMIZED?
Although extremely rare, epidural, subdural haemorrhage or SAH is a potentially devastating complication of LP. Emergent LP may be indicated in patients receiving aspirin, clopidogrel, warfarin or heparin.

Is antiplatelet therapy a contraindication to LP?
One study found a significantly higher incidence of haemorrhage in patients anticoagulated after LP. A prospective study of 1000 orthopaedic procedures carried out under spinal or epidural anaesthesia

included 386 patients who were taking antiplatelet agents before surgery. Aspirin was the commonest agent taken by 193 patients. No spinal haematoma occurred. Bleeding was noted during catheter placement in 223 patients, but preoperative antiplatelet therapy was not found to be a risk factor. Stopping aspirin may be hazardous to patients although the magnitude of the increased risk is unclear. Up to 10.2% of myocardial infarction occurred after aspirin withdrawal.

Is anticoagulation with warfarin or heparin a contraindication to LP?
No randomized controlled trials evaluated stopping heparin or warfarin before diagnostic LP. One observational study evaluated 25 patients with normal pressure hydrocephalus who underwent therapeutic LP while taking warfarin. Warfarin was stopped 5–7 days before LP and no bleeding occurred. Guidelines suggest stopping low-dose low-molecular-weight heparin (LMWH) 12 h and high dose 24 h before spinal anaesthesia.

Recommendations
These are based on the studies discussed here. Grading follows the system described by the Infectious Diseases Society of America with 'I' indicating evidence from >1 RCT, 'II' indicating evidence from >1 well designed clinical trial and III indicating expert opinion. The strength of recommendation is indicated by 'A' to 'E' with 'A' indicating good evidence to support a recommendation, 'B' indicating moderate supporting evidence and 'C' indicating that the evidence in support of recommendations is poor. 'D' and 'E' indicates moderate and strong evidence against use, respectively.

* Routine CT brain before LP is not indicated (IA)- with the exception of those groups mentioned above
* Post-LP, patients may mobilize when ready (IA)
* Diagnostic LP should be carried out with 20-G or 22-G atraumatic (*pencil point)* needles (IA)
* If conventional needles *(cutting)* are used the bevel should be orientated parallelly/longitudinally (IA)
* The stylet should be replaced before withdrawing the needle (IA)
* Diagnostic LP should be carried out in the lateral recumbent position to enable measurement of opening pressure (IIIC)
* A mask should be worn for diagnostic LP if the procedure is expected to be prolonged or difficult or if the operator has an upper respiratory tract infection (IIIC)
* Suspected bacteraemia is not a contraindication to LP (IIIC)
* Aspirin is not a contraindication to emergent LP. For elective LP the low risk of serious bleeding if aspirin is continued must be balanced against the increased risk of cardiovascular or cerebrovascular events if aspirin is stopped (IIB)
* Clotting abnormalities should be corrected before emergent LP. LP appears safe if long-term warfarin is stopped 5–7 days before the procedure. If possible LMWH should be stopped 12–24hr before LP (IIB)

Please note:

The pencil tip point or atraumatic needles are by Sprotte or Whitacre.

All LP stock is kept in the storage demountable
We current carry two type of LP needles by BD:

The LP packs no longer carry a LP needle.
We also stock spares yet if you want a different gauge or length to those listed below , speak to theatres. We have:

- Quincke needles (cutting needle) 20G, 22G and short 25G 5cm paeds needles
- Whitacre needle (non-cutting needle) 25G, 26G and 27G .
- We do have introducers – you'll only need this if you use 25G or less. It's ok to use the 25G if you want, to get the CSF just expect a slower drop rate – if you want to measure pressures pull up a chair as you'll be there a long time.

In looking for info on whether the needle size affected opening pressure measures, Up-to-date brought up this point we'd never heard of before

- "Once CSF appears and begins to flow through the needle, the patient should be instructed to slowly straighten or extend the legs to allow free flow of CSF within the subarachnoid space. While the pressure measurement is affected by the position of the legs, the available evidence suggests that the effect is likely to be small. In one review, pressures were elevated by only 1 to 2 cm H_2O in four of five studies studying this effect; however, in one study, changing position from a straight to a fully flexed position resulted in an increase in pressure of 6.4 mm Hg (approximately 8.7 cm H_2O).

Delay to LP – you see a patient who presents one hour after sudden onset of headache ? SAH- CT normal. You are told that we should wait 12 hours to the LP. What is the reasoning for this practice?

Looking again at Bestbets who did the search for evidence in 2005. They only found one paper which looked at this - UK National External Quality Assessment Scheme for Immunochemistry Working Group. National guidelines for analysis of cerebrospinal fluid for bilirubin in suspected subarachnoid haemorrhage. *Ann Clin Biochem* 2003:40;481-8. They comment “Most patients in studies of bilirubin biokinetics had positive CT scans. As LP is normally reserved for those patients with a negative CT scan they are arguably a different group. Despite these limitations, current laboratory work suggests that bilirubin will remain undetectable until 12 hours after symptom onset…What is not shown from the literature is that any patient who had negative initial findings (on early LP) followed by positive findings (on late LP). Such cases would provide a convincing argument, but none were found.”

Blood may take up to 4 hours to reach the lumbar theca sac. However the main reason for delay in the LP is in case of a traumatic tap, which occurs in 10-15%- some are more predictable than others eg obese patients. If blood is seen on the tap after 12 hours then get the sample spun down & protected from light and examined by spectrophotometry for bilirubin. In this case the presence of xanthrochromia (bilirubin which is seen after 12 hours) on spectrophotometry may help discriminate from a bloody tap (which if processed appropriately , will be –ve for bili). Personally I don’t request spectrophotometry on those who present early who only have a none - couple of RBCs. However if the person has a delayed presentation (eg 2 days of constant headache which commenced suddenly) where there may have been RBC lysis, spectro has a role

Interested to hear from others re- cut off on the number of RBC which defines a positive tap from a –ve tap.

NOTE THAT A NORMAL CT AND A NORMAL LP DOES NOT RULE OUT OTHER POTENTIAL NASTIES WHICH PRESENT AS HEADACHES as mentioned couple of weeks ago (probe 2011 no. 15)

LUMBAR PUNCTURE NEEDLE LENGTH DETERMINATION

While we’re on the topic of LPs and needle selection it’s worth bringing up this article especially for those of you how remember ridiculous formulae.

You may recall that in February we discussed lumbar puncture needles. We mentioned that to reduce the post LP headaches, smaller is better, and the pencil points or other non-cutting needles are better. However we did not mention the length of the needle. However I saw this article and thought it worth a brief mention particularly for those of you with a head for figures / calculations who want a GUIDE to needle length.

Have you been in a situation when you’ve been doing a LP (especially in a adiposally generous patient) and used the LP needle provided only to get a dry tap? You pull out a new longer needle and are surprised on the length of the needle needed. The reasoning for noting this article is to avoid this issue (not so much as having a needle too long).

Numerous articles have tried to derive a formula to predict the skin to spinal canal depth. Some studies have largely focussed on children, less of an issue when discussing LP needles that were too short for those needles routinely provided.

An article by Abe in American Journal of Emergency Medicine October 2005 derived the formula of:

LP depth = 1 + 17 × (weight/height)

- **Eg 110kg man who is 166cm tall predicts a 12.3 cm needle to be required – thus a 9cm needle may be too short**
- **Eg 85 kg 180cm man – 9cm**

Note they included 175 paediatric and adult patients (105 pts >13 yo) and based their measurement on the distance from skin to spinal canal in patients receiving an abdominal CT - **note the patients were not flexed yet lying supine on a CT table.**
They found that when using the formula- 6% of needles were too short and 31% too long – However It is prudent to select a longer needle for an obese patient if the formula calculates a depth that is barely within the range of the needle at hand. In those with a BMI of > 30, in only 14% was the calculation too short (compared with 71-95% with other calculations).

Overall when compared to other studies they found that this formula resulted in significantly fewer estimates that were too short or too long for entry into the spinal canal of study subjects in comparison with other published formulas (18-71% too short and 0-37% too long). Note the more obese the patient the more frequent the needle was too short in the other formulas.

Take home point –comparing CT distances with skin to subarachnoid space in patients lying on their sde is not perfect, yet better to start with a long needle that you don’t need to insert completely than poking around with a needle that is too short to start with.

Ref Abe KK et al Lumbar puncture needle length determination *American Journal of Emergency Medicine* October 2005; 23 (6):p742–746

Editor: Peter Wyllie

BEER GOGGLES - DO THEY EXIST?

Tempted to keep this one for around the time of the Christmas party but the information is too important to withhold!! This info was recently reported in the MJA this month– in fact it's the only interesting article in months!

Researchers from the University of Bristol in the UK have found that there is no association between the amount of alcohol consumed in the perception of attractiveness, according to their study published in *Alcohol and Alcoholism*. The authors ran an "observational study conducted simultaneously across 3 public houses in Bristol". " Excessive alcohol consumption is linked to unsafe sexual behaviours. This relationship may, at least in part, be mediated by increased perceived attractiveness of others after alcohol consumption, a relationship colloquially termed the "beer goggles effect", the authors wrote. "Participants were required to rate the attractiveness of male and female face stimuli and landscape stimuli administered via an android tablet computer application, after which the expired breath alcohol concentration was measured. Linear regression revealed no clear evidence for the relationship between alcohol consumption and either overall perception of attractiveness for stimuli, for faces specifically, or for opposite sex faces. The naturalistic research methodology was feasible, with high levels of participant engagement and enjoyment".

So no excuses!

NEXT WEEK'S CASES

78yo man with a history of a recent aortic valve repair presents with exertional SOB. He is found to have a Hb 78 – macrocytic normochromic picture– Bilirubin 92 with otherwise normal LFTs. What is going on ?

65yo lady presents with LUQ pain post colonoscopy. O/E afebrile – mild tenderness yet distressed on lying on her back or left ++ - No free gas on CXR . What could be going on?

JOKE / QUOTE OF THE WEEK

Please forward any funny and litigious quotes you may hear on the floor (happy to publish names if you want)

THE WEEK AHEAD

Tuesdays - 12:00 – 13:45 Intern teaching -Thomas & Rachel Moore
Wednesday 0800-0900 Critical Care Journal Club. ICU Conf Room / 12.00-1.15 Resident MO in Thomas & Rachel Moore
Thursday 0730-0800 Trauma Audit. Education Centre / 0800-0830 MET Review Education centre / 1300-1400 Medical Grand Rounds. Auditorium.

Editor: Peter Wyllie