Epidural fibrin clot for the prevention of post-lumbar puncture headache: A new method with risks

Sir: Since the introduction of lumbar puncture in 1891 by Quincke a multitude of methods have been reported for the prevention of postlumbar puncture syndrome, of which headache is the outstanding feature. Tourtellotte lists no fewer than 49, which range from the application of an abdominal binder to roentgen-radiation of the skull. According to current opinion, the syndrome is caused by continuous leakage of CSF through the dural puncture defect with resulting downward displacement of the brain leading to tension on pain sensitive structures. With that hypothesis in mind, Gormley introduced the epidural injection of autologous blood with the aim of sealing the dural leak by the resulting blood clot. The method was initially described as effective for treatment of post lumbar headache. Since then, its prophylactic usefulness has been shown. A disadvantage of the procedure, in our own experience, is the frequent appearance of back pain at the level of injection, which sometimes persists for days. It is probably caused by the pressure exerted on the spinal and radicular dura by the relatively large (2–10 ml) volumes injected. Another possible complication is iatrogenic subarachnoid haemorrhage caused by the accidental intradural injection of blood.

We tried a modification of Gormley's method, namely the epidural injection of a fibrinogen/thrombin compound commercially available as a tissue glue for surgical use. An advantage seemed to be the opportunity to accomplish closure of the dural leak with less injected volume, since the compound coagulates more rapidly and is "stickier" than whole blood. Furthermore, accidental intradural injection seemed to be less dangerous, since fibrin clots quickly dissolve in CSF, which is hyperfibrinolytic.

We used a two-component fibrinous tissue glue (Tissucol®, Immuno GmbH, Heidelberg). The first component contained 80–120 mg/ml human plasma protein with 70–110 mg/ml fibrinogen, 2–9 mg/ml fibrinectin, 10–50 IU/ml coagulation factor XIII, and 0.02–0.08 mg/ml plasminogen. The second component contained 500 IU/ml thrombin and 3000 KIU/ml kallidinogenase inactivator-units) of the antifibrinolytic agent aprotinin. Both components were applied simultaneously in equal amounts using a two-component injection set (Duploject system), which must be assembled manually before use. The different components of the tissue glue must be stored deep frozen or refrigerated. Due to the chosen concentrations of the coagulatory and antifibrinolytic components fibrin clot formation was expected to occur within seconds and lysis within a few days.

Epidural injection was performed during the withdrawal of the lumbar needle immediately after the dural tap. Twenty G needles were used. The epidural space was identified as the depth of the needle tip, where CSF flow had, after slow and careful removal of the needle, just stopped, while on the other hand the typical loss of resistance after withdrawal out of the ligamentum flavum had not yet occurred. In this position 1 ml of saline was injected, low resistance was considered to be proof of the correct epidural position of the needle tip. High resistance signalled its position within the ligamentum flavum; the needle was then slowly moved 1–2 mm ventrally. Renewed flow of CSF was carefully looked for and avoided. After epidural placement of the needle tip 1.0–1.8 ml of Tissucol were injected. The injection was terminated as soon as a noticeable increase in resistance to injection appeared in order not to exert painful pressure on the spinal or radicular dura.

Our plan was to do a controlled study with 30 patients in the treated group (after obtaining informed consent) and 30 patients in the placebo group. The study was discontinued after the occurrence of the complication described below in the seventh patient of the treated group. The first six treated patients had no post-punctureal complaints, during the first week, while of the six patients of the control group three complained of mild to severe post-puncture syndrome.

Our seventh treated patient was a female, 58 years old, with suspected neuritis of the brachial plexus. One ml of Tissucol was injected epidurally after withdrawal of CSF. The CSF contained 1 lymphocyte/microlitre, 0.176 g/l protein and 3.5 mmol/l glucose. Several hours later headache, meningismus, and a fever of 38.5°C appeared. CSF was again taken, this time by suboccipital puncture. It now contained 5600 cells/µl (80% granulocytes, 20% lymphocytes and macrophages), 1.24 g/l protein and 4.1 mmol/l glucose. A septic meningitis was suspected and high dose antibiotic treatment was immediately begun and continued for one week. After 1 day the fever resolved; neck stiffness and headache disappeared within 4 days. A bacterial agent could not be identified microscopically nor by cultures. Viral titres were not elevated. Eupicataneous allergy tests for the different components of Tissucol were negative. An examination of the remainder of the glue components gave no evidence of bacterial, pyrogenic, or particular contamination.

We presume that accidental intradural injection occurred in this patient, leading to iatrogenic meningitis. The prompt relief of symptoms following antibiotic therapy suggests septic meningitis. However, a bacterial agent could not be identified. In our opinion, aseptic meningitis due to chemical irritation caused by one or several of the components of the tissue glue cannot be completely excluded, despite the fact that, to our knowledge, acute aseptic reactions to fibrinous tissue glue have not been reported, even though it is frequently used in neurosurgery.

Obviously, when doing a lumbar tap with the epidural injection of fibrinogen/thrombin compound, one runs a higher risk of doing a "septic puncture" than with the normal procedure because of the several manual steps involved in preparing the two component-injection set, each carrying the theoretical risk of bacterial contamination. If the procedure is to be tested further, it would be advisable to develop a sterile 2-component injection set, which can be taken in toto from its package. Even then, lumbar puncture with epidural injection of tissue glue, by which foreign material is brought into the immediate neighbourhood of the lumbar dura (with the risk of accidental intradural injection) has, in principle, a higher infection risk than the usual procedure as well as, in our opinion, the risk of chemical irritation leading to aseptic meningitis.

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