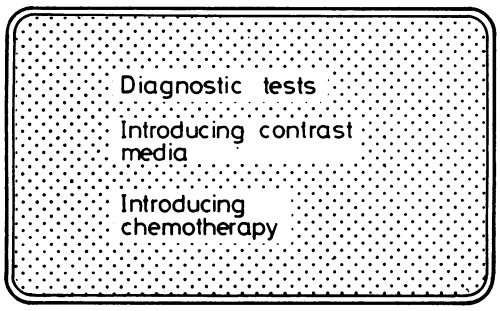
Procedures in Practice

C CLOUGH J M S PEARCE

LUMBAR PUNCTURE

Indications for performing lumbar puncture

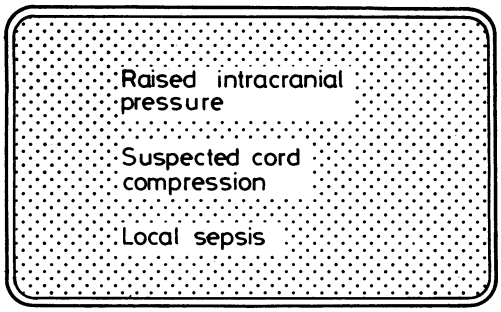


Lumbar puncture should not be indulged in idly as a result of diagnostic bankruptcy nor in place of a neurological opinion. Though it may be informative in certain patients with coma or stroke it should not be done blindly as an immediate procedure until other diagnostic tests have been performed.

There are three main indications: (*a*) for diagnostic purposes (see table); (*b*) for introducing contrast media; and (*c*) for introducing chemotherapeutic agents, for example, in meningitis or leukaemia.

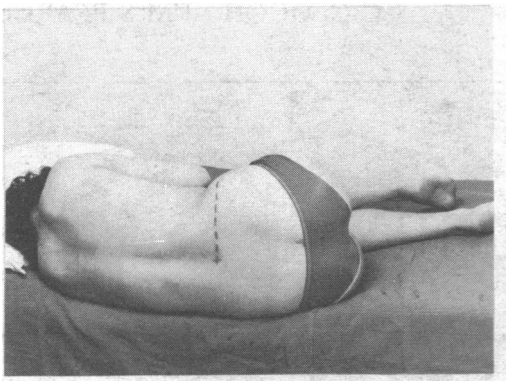
Indications for performing lumbar puncture for diagnosis	Tests
Suspected subarachnoid haemorrhage	Blood, xanthochromia
Selected strokes, but not routinely	Red blood cells, protein
Myelopathies and suspected multiple sclerosis (but not for suspected cord compression)	Protein, IgG, or gammaglobulin
Peripheral neuropathies—for example, Guillain-Barré syndrome	Cells, protein
Infections of central nervous system (bacterial meningitis; acute and subacute encephalitides; neurosyphilis; viral, fungal, and protozoal meningitis)	Cells, protein, treponemal haemagglutinating antibody (or other specific tests), glucose, culture, virology, special stains and antibodies

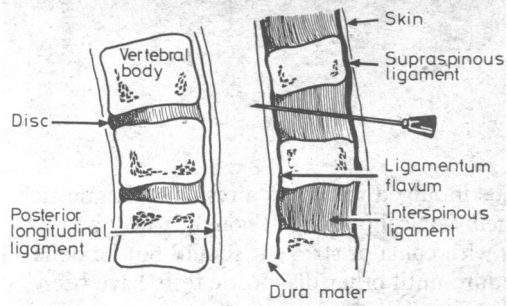
Contraindications

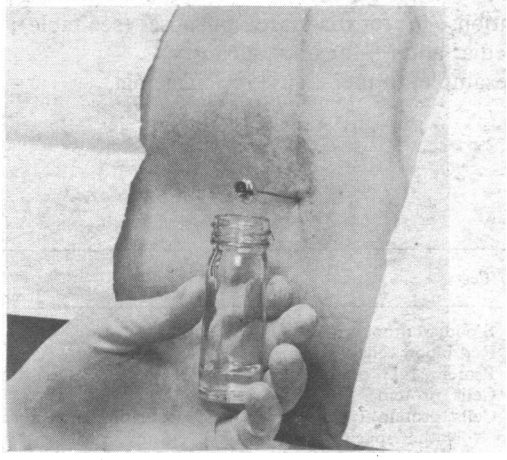


The contraindications to lumbar puncture must be kept in mind whenever the procedure is being considered. These are: (1) Raised intracranial pressure—papilloedema or a history suggesting raised intracranial pressure (even in the absence of signs) should lead to a neurological consultation and a computerised axial tomography scan or angiogram. To proceed with the puncture in the absence of these investigations could lead to fatal "coning." (2) Suspected cord compression—in many isolated spinal cord lesions it is impossible to distinguish an intrinsic lesion (for example, multiple sclerosis) from extrinsic compression. Myelography with simultaneous cerebrospinal fluid examination is then necessary, rather than a separate lumbar puncture. (3) Local sepsis—meningitis is a rare complication of lumbar puncture, but puncture should not be performed if there is skin sepsis.

Procedure







The most important factor in achieving an easy lumbar puncture is the correct positioning of the patient. The procedure should be explained to the patient and he should be comfortable and relaxed.

Place the patient on his left side with his back right up against the edge of the bed. Both legs are flexed towards the chest: place a pillow between the legs to ensure that the back is vertical. The neck should be slightly flexed.

Masks and gloves should be worn. Clean the skin with iodine (or other antiseptic) and spirit and then position sterile drapes. Use a gauge 18 lumbar puncture needle, and check that the stylet is flush with the end and that the manometer is intact and fits the needle hub.

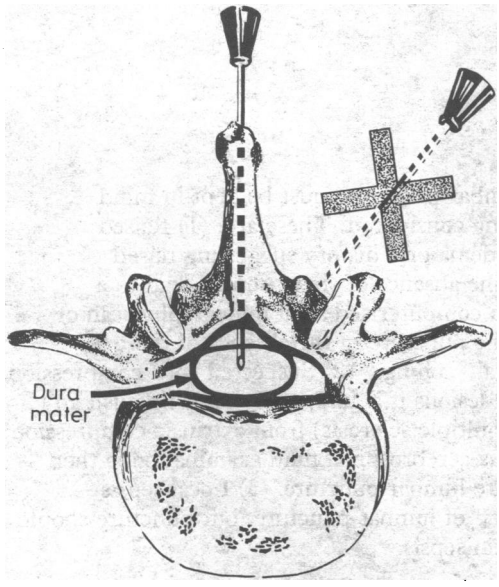
Palpate the anterior-superior iliac spine. The interspace perpendicularly beneath it is that at L3-4. Since the spinal cord ends at L1-2 the spaces above and below L3-4 are equally acceptable sites. Palpate the spinous processes superior to the chosen interspace: the needle will be inserted about 1 cm inferior to the tip of the process.

Draw up 5 ml of lignocaine 2% plain and, stretching the skin evenly over the interspace, infiltrate the skin and deeper tissues.

Allow at least one minute for the lignocaine to work then introduce the needle. Make sure that the needle is 90° to the back, with its bevel in the sagittal plane and pointing slightly to the head. Push the needle through the resistance of the superficial supraspinous ligament. The interspinous ligament is then easily negotiated. At about 4-7 cm the firmer resistance of the ligamentum flavum is felt, when an extra push will result in a popping sensation as the dura is breached.

The needle should now lie in the subarachnoid space, and when the stylet is withdrawn clear colourless fluid should drip out.

Dry tap: usually failure of technique

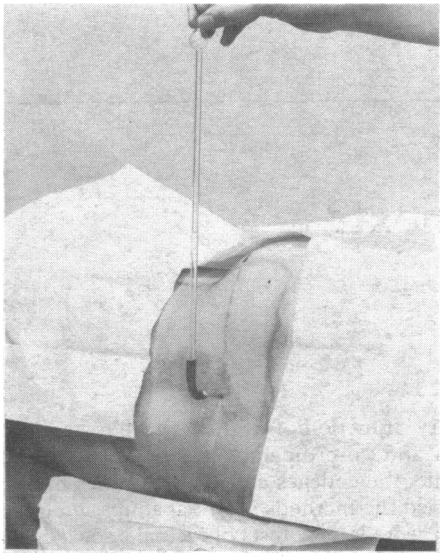


If no fluid emerges or it does not flow easily rotate the needle, because a flap of dura may be lying against the bevel. If there is still no fluid reinsert the stylet and cautiously advance, withdrawing the stylet after each movement. Pain radiating down either leg indicates that the needle is too lateral and has hit nerve roots. Withdraw the needle almost completely, check the patient's position, and reinsert in the midline.

If the needle meets total obstruction do not force it as the needle may be lying against an intervertebral disc and could damage it. Again, withdraw the needle, check its position, and reinsert. If there is complete failure move one space up or down depending on the original position.

A dry tap is usually due to a failure of technique. After two or three attempts a colleague should be invited to show his superior skill. Rare causes of a genuine dry tap are arachnoiditis and infiltrations of the meninges.

Manometry



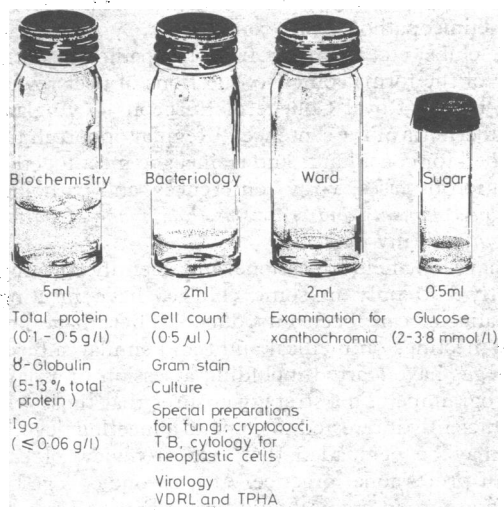
Once free flow of CSF is established the pressure should be measured. The manometer is connected to the end of the needle directly or via a two-way tap. An assistant holds the top end, and the resting pressure is recorded (normal 80-180 mm H_2O CSF). Queckenstedt's test is performed by asking the assistant to compress the jugular vein, which should cause a quick rise of at least 40 mm, which should be recorded.

Spinal block causes a failure of free rise and fall (positive Queckenstedt) and is usually accompanied by yellowish CSF with a high protein content (Froin's syndrome).

The commonest cause of low CSF pressure is bad needle placement, but if the low pressure is genuine no attempt should be made to aspirate as the cause may be obstruction of CSF flow caused by cerebellar tonsil herniation or spinal block. In either case a neurological opinion is needed.

A slightly raised CSF pressure in a very anxious or fat patient may be ignored. Pressures over 250 mm are abnormal and should be investigated. If a greatly raised pressure is discovered in a clear fluid the CSF should be collected from the manometer and the needle withdrawn. The patient should be nursed flat and a neurologist or neurosurgeon consulted.

Specimens for diagnosis



Eight to 10 ml of CSF is usually collected, depending on the particular investigation. The normal *basic* requirements are: pressure, cells, and total protein. There are no routine tests, and additional investigations should be requested as necessary with the guidance of the local laboratory. Lange curves and chloride estimations rarely give useful information.

A ward specimen is useful in suspected subarachnoid haemorrhage, where xanthochromia (a yellow discoloration) in the supernatant can be seen. It is also a useful spare for "mislaid specimens."

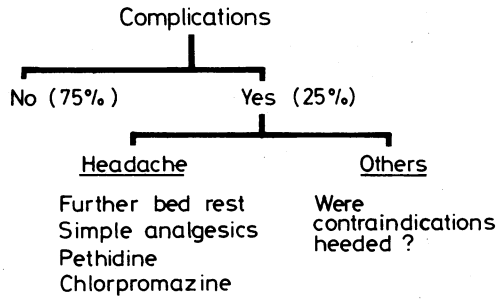
Even the most careful lumbar puncture can be bedevilled by bloodstaining. Bloody fluid should be collected in three tubes. A traumatic tap can be distinguished from subarachnoid haemorrhage in three ways.

Firstly, blood due to trauma forms streams in an otherwise clear CSF, while the CSF of subarachnoid bleeding is diffusely bloodstained.

Secondly, on centrifugation or standing the supernatant is colourless in a traumatic tap but xanthochromic in subarachnoid haemorrhage. The only exception is that a clear supernatant may rarely occur if the lumbar puncture is done within six hours of a subarachnoid haemorrhage occurring.

Thirdly, the first three consecutive specimens of CSF in a traumatic tap show clearing of the blood and usually become colourless, with a corresponding fall of the red cell count.

Aftercare and complications



Once the specimens have been collected the needle should be removed, a plaster applied, and the patients nursed flat for an arbitrary 24 hours. Three-quarters of patients have no symptoms. Headache occurs for 24-48 hours in the remainder but is severe in only half. Headache should be treated with further rest horizontally in bed, with simple analgesics, but with pethidine and chlorpromazine if necessary. If the contraindications are heeded there should be no other complications.

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