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Case Report

Pneumocephalus after lumbar epidural

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injection of air/saline appreciated easily as a sudden forward movement of the plunger of the syringe. Although accidental dural puncture following identification of the dural space should ideally be evident with drainage of Cerebrospinal Fluid (CSF) it may not at times be detected, as happened in the case being described. Post dural puncture headache may rarely be owing to pneumocephalus and this should be kept in the mind when treating these patients. We present the case of a 65 years old female patient who had an undetected accidental puncture of dural while placing an epidural catheter followed by pneumocephalus.

Case report

Introduction

Epidural techniques are widely used for anaesthesia and pain management. Various complications have been reported after lumbar puncture. Rarely after an epidural block, pneumocephalus may also occur.¹ There are numerous causes of pneumocephalus. However, following epidural block it is usually as a result of dural puncture during the application of the loss of resistance technique using air. It is customary, while assessing the position of the tip of the epidural needle, to enter the tissues under the skin using an air/saline filled syringe attached to the needle. While entering, the resistance to pushing in air/saline is judged by applying gentle pressure to the plunger of the syringe. As the needle tip traverses the soft tissues and reaches the ligamentum flavum there is a mild resistance to insertion of the needle. Once the tip of the needle enters the epidural space, there is a loss of resistance to

Our patient is a 60 years old female patient, a known case of diabetes mellitus under treatment for 6 years and hypertension for 4 years. She had undergone tubectomy, cataract surgery, insertion of a Dynamic Hip Screw (DHS) for an intertrochanteric fracture right side femur (operated 6 months back) and bilateral Total Knee Replacement (2 months back) in the past. The patient had been taking metformin, gliclazide, and a combination of losartan and furosemide tablet. She now presented for revision of implant (as a result of implant failure). Cemented bipolar hemiarthroplasty was planned.

On examination, the patient was conscious cooperative and well oriented to time place and person. She was averagely built, weighed 65 kg, and a height of – 158 cm. She had a pulse rate of 100/min, B.P. – 130/84 mm of hg. Systemic examination was unremarkable. The Electrocardiography (ECG) revealed a sinus tachycardia, she had an adequate glycaemic control and the blood pressure was normal. Her biochemical investigations were within normal limits.

On the day of the surgery she was made to sit up and the part prepared for combined spinal epidural anaesthesia. While

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Fig. 1 – Non contrast CT scan head showing air in the frontal horn.

inserting an 18 gauge Tuohy needle in the lumbar 3–4 epidural space, there was an accidental dural puncture and cerebrospinal fluid came out in the syringe air was used for loss of resistance technique to identify the epidural space. The needle was removed and reinserted in L4–5 lumbar space. The epidural catheter was placed successfully. The surgery was performed once surgical anaesthesia of the area to be operated was established. The surgery was uneventful. However, the patient developed post dural puncture headache within a few hours of being shifted from the Operation theatre this subsided with adequate hydration and analgesia. Pulse rate was 90–120/min, rest of the vitals were normal. The postoperative period was uneventful and pain free with an epidural infusion of 0.125% bupivacaine at the rate of 5 ml/h.

After 2 days the patient developed a slurring of speech, however, was conscious cooperative and well oriented to time place and person. No other neurological deficit was noticed and biochemical investigations were normal. She was reviewed by the medical specialist and NCCT head was done which revealed air in both frontal horns of the lateral ventricles (Fig. 1). Low molecular weight heparin was started and a conservative approach was adopted with her being placed under observation. She made an uneventful recovery.

Discussion

The presence of air within the cranial cavity is defined as pneumocephalus. For the diagnosis and occurrence of pneumocephalus, the following conditions are necessary, a connection must exist between the Central Nervous System (CNS) and the external environment, it is necessary that air traverses through this connection and adequate quantity of air must be present for detection by radiologic studies and for the patient to be symptomatic.¹

Pneumocephalus has been associated mainly with the use of the technique of loss of resistance to air² for the

identification of the dural space though the frequency of intracranial air after lumbar epidural placement is very less with one case report per year³ it can be fatal.⁴ Pneumorrhaxis has also been reported following multiple attempts⁵ although the mechanism has been contested⁵ the hanging drop technique avoids the active injection of air, and therefore, the complication of pneumocephalus should be rare.⁴ Placement of the needle into a blood vessel may cause false-positive results. The column of saline inside the needle may also be aspirated into the subarachnoid space. In the sitting position, the pressures in the ventricles and basal cisterns are sub atmospheric. Moreover a dural puncture being a blind procedure is a known complication even in the hands of experienced anaesthesiologists.⁴

The hanging drop technique relies on building up of an initial negative pressure as a result of bulging of the flavum followed by recoil.⁶ A smaller margin of error, in a more mobile region of the spine, can allow the needle to advance ever so slightly just before or during injection.⁷ Air that is present in the needle after proper identification of the epidural space by using the hanging drop technique may be pushed intrathecally when the syringe is connected.

Another method of minimising the possibility of pneumocephalus during the performance of an epidural block with the loss of resistance technique is to use normal saline instead of air, although air is commonly used. When air is used, the volume should be minimised.

During epidural placement, therefore, the patient must remain immobile with the needle being stabilised when the epidural is being placed. Subarachnoid air injection may be minimised by prior aspiration and the attachment of extension tubing for injection.

Both pneumocephalus and dural puncture can cause a headache after spinal or epidural anaesthesia. The onset is often immediate with pneumocephalus.⁸ On the contrary, headaches as a result of a dural puncture typically manifest 1–3 days after the procedure. Unlike a post dural puncture headache, a headache caused by a Pneumo cephalus is not relieved with lying down.⁹ However may be relieved by a head low position As small a volume as 2 ml if injected into the sub arachnoid space can cause a severe headache. The reabsorption of the air takes about two days and the headache takes approximately five days to resolve.¹⁰

Recovery after the occurrence of pneumocephalus is mostly uneventful, it can be shortened by increasing the FiO₂ and cutting off Nitrous oxide in an attempt to minimise the size of the air bubbles under general anaesthesia.¹¹ On occasion there may be a persistence of the headache, confusion, lethargy, drowsiness, hemiparesis or hemiplegia. Rarely, tension pneumocephalus can result in neurologic symptoms from the mass effect of a large volume of air for which surgical evacuation may be required emergently. It is therefore necessary to evaluate a patient in detail when pneumocephalus is a possibility. Also patients in whom a dural puncture has been detected should be monitored closely.

Conflicts of interest

The authors have none to declare.

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