Inadvertent Injection of Piperacillin - Tazobactum into Epidural Space

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CASE REPORT

A 66yr old, 60 kg male presented with bilateral osteoarthritis knee. Left sided high tibial osteotomy was performed under Combined spinal epidural anesthesia. In the postoperative period patient received regular epidural top-ups of 0.125% bupivacaine with tramadol for postoperative pain relief until 2nd postoperative day when a nursing staff mistakenly administered inj. piperacillin - tazobactum (4.5g diluted to 10ml with 0.9%NS) through epidural catheter. The error was realised after 3 hrs when patient continued to have pain even after top-up dose and developed fever. Immediately, bupivacaine 0.125% with 8 mg dexamethasone, diluted to 10ml, were injected into the epidural space and then epidural catheter was removed and thereafter pain relief was maintained on injectable and oral analgesics. The patient did not show any change in heart rate or blood pressure during or after the injection. After 15 min of top-up, patient became comfortable, with relief of pain and with no evidence of neurological dysfunction. Fever subsided with a dose of antipyretic with no recurrence. The patient remained in the hospital for further two days under observation. One week later, the patient was examined; he reported no back ache and there was no neurological deficit or local tenderness. Thereafter, patient was followed up fortnightly for nearly one year with no evidence of neurological deficit.

DISCUSSION

Inadvertent administration of non-epidural medications into the epidural space has the potential for serious morbidity and mortality.1,2

Neither piperacillin - tazobactum powder nor the 0.9% normal saline used as solvent had preservatives.

Most of our knowledge of inadvertent drug injections in the epidural space comes from case reports. With regard to antibiotics, inadvertent epidural administration of gentamicin has been reported in an adult, with minor sequelae (back pain).3

As far as we know, piperacillin-tazobactum has not been reported in this context. In this case, after the inadvertent epidural injection of piperacillin-tazobactum, we proceeded with epidural bupivacaine and dexamethasone mixture to dilute the concentration of piperacillin-tazobactum and to have anti-inflammatory effects in the epidural space. By doing that we hoped to lessen any potential chemical irritation or damage to nerve tissues, a decision we admit was speculative.

Types of error: The recurrent errors include syringe swap4,5,6 wrong ampoule for drug dilution7,8 and performance of loss of resistance13 technique for epidural insertion. Syringe swaps most commonly involve injection of intravenous induction agents, antibiotics and ephedrine from similar sized syringes, which may or may not be labelled. Potassium chloride is frequently mistaken for normal saline, because the two solutions are presented in similar ampoules with different coloured writing.1,7,10 Gentamicin has also been mistaken for fentanyl.3

Effects of inadvertent epidural injection: Inadvertent injection of the wrong drug into the epidural space can have immediate and/or delayed effects. Pain and neurological symptoms immediately following injection are usually due to a direct drug or drug additive neurotoxic, pH or osmolality effect.1,2,5 The rate of application, the total dose7,8 and the concentration2 also play a role. Systemic effects of drugs, such as intravenous induction agents3 occur over time as vascular uptake occurs into the epidural veins. Patients under general anaesthesia4 or infants6 are unable to complain.

Management of inadvertent epidural injection: Once the error has occurred, there is no definitive or effective treatment. Some practitioners choose to just observe the patient and provide symptomatic and supportive treatment as required6, while others attempt to reduce the amount or concentration of the drug in the epidural space. Measures taken include aspiration of the epidural catheter, flushing with distilled water or saline3,4,10 and insertion of a second epidural catheter for lavage of the epidural space. Epidural local anaesthetic has been used for symptomatic treatment3,5, epidural or intravenous corticosteroids2,5 to reduce the inflammatory response and epidural hyaluronidase4 to aid the dispersion of the solution and reduce local concentration. None of these attempts to minimize the risk of an adverse outcome are of proven benefit and some can potentially worsen the situation, resulting in upward spread of drug and further symptoms.16 Local anaesthetic can also confuse
the diagnosis of neurological injury. Resuscitative measures include intubation to support the airway. Symptomatic relief includes diazepam, midazolam or opioids for muscle spasm, and reversal of systemic effects with antagonists, for example flumazenil and naloxone. Medication error is the single most preventable cause of patient injury. This includes wrong patient, wrong time and wrong drug, dose or route of administration.

PREVENTIVE STRATEGIES

Various strategies have been suggested to prevent the occurrence of such errors.

Drug preparation: Drugs should be drawn up separately, after reading the ampoule, with the syringe or bag labelled. This is especially important when there is no one person directly responsible for drug administration (for example when two anaesthetists are attending the same patient). Only drugs that are required should be drawn up or kept in the vicinity, to avoid errors such as potassium chloride being mistaken for normal saline. A separate tray has been recommended for regional drugs, to avoid confusion with intravenous agents. Any doubtful drugs or syringes should be discarded.

Epidural drug administration strategies: It has been standard nursing practice for many years to double check with another person prior to administering any drug, but this may not be practical for the theatre anaesthetist and alternative measures are required. A computer system using barcode reader has also been used in an attempt to reduce parenteral drug administration error. Slow incremental injection while maintaining verbal contact may allow earlier detection of problems.

Labelling: Packaging and labelling of ampoules with appropriate size writing and colour for easy reading helps to avoid the problem of drawing up solution from the wrong ampoule. Clear labelling of epidural infusion bags, syringes, pumps, infusion sets, ports for injection and epidural catheters may improve safety. However there have been many cases where intravenous infusions have been inadvertently attached to epidural lines with access ports available.

Epidural lines and Injection ports: Epidural lines with injection ports should preferably be avoided altogether, because labels can accidentally fall off.

Physical separation of intravenous and epidural access points: Epidural and intravenous catheters should be placed physically separate from one another, to reduce the risk of confusion between the two systems.

In conclusion, inadvertent administration of non-epidural medications into the epidural space has the potential for serious morbidity and mortality. "Syringe swap", "ampoule error", and epidural/intravenous line confusion are the main sources of error. As there is no effective treatment for such errors, prevention should be the main defence strategy.

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