Original Article
Accidental infusion leakage at subgalea in infants: report of 6 cases

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Abstract: Infiltration remains the commonest iatrogenic injury within infants care. We report a series of 6 infants affected by accidental infusion leakage occurring in subgalea. They were applied wet-hot compresses by sterile gauze, and topically administrated mucopolysaccharide polysulfate (MPS) cream following hot compress. There was no skin impairment in all cases. Early recognition and appropriate care for topical skin are essential to minimize the extent of accidental infusion leakage.

Keywords: Infants care, accidental infusion leakage, subgalea, wet-hot compress, mucopolysaccharide polysulfate cream

Introduction

The use of intravenous (IVs) access for provision of nutrition and medication is essential in modern neonatal intensive care. However, accidental leakage of an infusion into the surrounding tissues frequently occurs [1]. According to recent reports, up to 78% of IVs are estimated to become infiltrations, and extravasations occur in an estimated 11% of all NICU patients [2-5]. Although patients of all ages may suffer from the damage of infiltration or extravasation, infants have additional risk factors that may increase the severity of injury, such as poor venous integrity, capillary leakage, decreased peripheral circulation, and more flexible subcutaneous tissue [6, 7].

Percutaneous extravasations initially present as local swelling and pain [8-10]. Unfortunately, these local complications can frequently lead to severe and progressive destruction of the tissue, resulting in a series of life-altering outcomes like skin scar, limitation of functions and even amputation [11, 12]. Unlike adult patients, the inability of infants to quickly voice distress before damage becomes extensive may put them at increased risk of severe complications [13]. Therefore, it is crucially important to realize the early signs and symptoms of effusion to prevent the occurrence of complications and to implement optimal strategy to minimize its impacts [14].

Although a growing literature addressing the management of infiltration has been published in recent years, there remains no consensus on the ideal treatment for injuries that occur. Here we present six infants who experienced accidental infusion leakage during IV therapy in our department.

Case reports

Six infants were identified as having experienced accidental infusion leakage at subgalea between July and October 2013 in hospital, including 3 males and 3 females and with a mean age of 4 months. All patients were referred to our department for respiratory tract infection, with no evidence of other complications by clinical and biochemical examinations. They were conventionally commenced on intravenous (IV) Mezlocillin and sulbactam sodium via scalp vein, according to the treatment protocol of our hospital. The details of all patients are described in Table 1.

Two to three days after intravenous therapy, the IV site was swelling. On physical examination, a
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A palpable, hard, inelastic, 2×3 cm sized nodule was noted in both sides of temporal region or postauricular region, with no signs of body temperature rise and skin redness and hotness at the area around the insertion site. Ultrasonography (USG) showed a hypoechoic and heterogeneous mass in between epidural and subgalea, with well-defined margin and posterior echo enhancement. No flow signal was observed in the hypoechoic area. After ruling out the possibility of infection, the diagnosis of subgaleal fluid collection was proposed.

A multidisciplinary team consisting of clinical nurse specialists, clinical pharmacist and pediatric surgeons was established. After reviewing all details of infiltrated drug or fluid, clinical findings, treatment given, the diagnosis of infiltration was confirmed and treatment protocol was proposed. Given the absence of signs and symptoms of severe complications and consequences, surgical intervention was not considered. Alternatively, wet-hot compresses by small sterile gauze were performed 3-4 times per day for each patient, with temperature at 40-45 degrees and the duration of about 20-30 minutes per time. The attending nurse was required to pay close attention to the variation of temperature and the response of patients to avoid empyrosis. Moreover, mucopolysaccharide polysulfate (MPS) cream was applied topically at the infiltration site following hot compress. Tender massage by finger pulp was conducted for 3-5 minutes on each patient following MPS application.

Following the treatment, the attending nurses closely monitor the nodule size (length, width, and depth), skin color of infiltrated site and general conditions of each patient through routine clinical or ultrasound examination. After a median duration of 3 days' treatment, all patients had complete fluid absorption and were discharged without adverse outcomes at 3 months follow up.

Discussion

Infiltration is defined as the unintentional infusion of fluid into an extra-vascular space with the potential to cause damage [15, 16]. Its degree depends on the physiologic and chemical properties of the agents, particular type of agent and osmolarity [13, 17]. However, infants may be at additional risk as the small volume of infiltrated IV fluid has the potential to cause substantial tissue damage [18].

In the present cases, infiltration occurred in between epidural and subgalea. The subgaleal space of infants serves as a container when fluids leaks out of the vein, which can accommodate up to 260 ml of blood or fluids [20]. Moreover, the galea aponeurotica is poorly fixed to the underlying periosteum of the skull by the loose areolar tissue, so the pooled fluids can circulate to temporal region or postauricular region along the space, resulting in the presentation of swelling and pain, due to the thin skin in these regions.

Intravenous infiltration is classified by the Centers for Medicare & Medicaid Services (CMS) as an event that can be “reasonably prevented”, requiring hospitals to take responsibility for rectifying complications associated with procedures to repair infiltrated injuries [2]. In the present cases, the infusion is conducted via scalp vein, considering its good vision and convenience of fixation. However, given the delicate and fragile superficial vein of infants, repeated acupuncture frequently occurs, especially for those inexperienced nurses. This may increase the likelihood of infusion leakage [21], as an abundant communicating network of vessels exists in this area [19]. Therefore, it is essential for attending nurse to gain a better understanding of the anatomic structure and improve their skills of infiltration prevention and the awareness of the adverse effects.

When infiltration dose occur, timely recognizing the warning signs of an infiltration is most important for the prevention of a small but serious complication from progressing into a much larger problem [3]. In the present study, all

Table 1. Age, sex, underlying diseases of six patients

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Age (months)</th>
<th>Gender</th>
<th>Underlying disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>Female</td>
<td>Bronchopneumonia</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Female</td>
<td>Bronchopneumonia</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>Male</td>
<td>Acute bronchitis</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>Female</td>
<td>Bronchopneumonia</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>Male</td>
<td>Bronchopneumonia</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>Male</td>
<td>Acute pharyngitis</td>
</tr>
</tbody>
</table>
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cases have a history of fluid leakage, following by topical swelling and pain, indicating the possibility of the occurrence of infiltration. The attending nurses should be aware of these signs and further measurements should be implemented, including assessment of the catheter insertion site, estimation of the volume of infiltrated fluid and the potential adverse effects of drugs.

The extent of injury from infiltration is usually hard to predict. Some authorities recommend observation alone of infiltration in case of no obvious damage to overlying skin [13]. In the present cases, we use small sterile gauze as dressing for topical skin care. Different to previous studies [7, 22], the dressing was not medicinally impregnated but kept at a temperature of 40-45 degrees. The warm compresses cause vasodilation in the tissues, increasing fluids distribution and decreasing drug accumulation in the local tissue. All patients are self-limited and no further treatment is required.

Mucopolysaccharide polysulphate (MPS) cream is an anti-inflammatory and antithrombotic agent for the treatment of numerous conditions such as osteoarthritis and thrombophlebitis [23]. Topical administration of MPS has been demonstrated to have the potential to prevent peripheral vascular disorders, due to its good skin permeability [23]. In the present cases, the topical symptom is gradually alleviated following the MPS administration and massage, showing significant therapeutic effects.

Conclusions

Accidental infusion leakage remains the commonest iatrogenic injury within neonatal care. Nurses should take the responsibility for ensuring that optimal measures have been taken to prevent infiltration, like selecting appropriate IV site, close monitoring the pressure, ensuring the stabilization of IV cannulae. When prevention efforts fail, early recognition and appropriate treatment are essential to minimize the extent of the injury. Most injuries will heal spontaneously without complications.

Disclosure of conflict of interest

None.

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References


Figure 1. Ultrasonography examination.
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