Pressurised Air Injury in a Child

V POOVAZHAGI, S THANGAVELU AND S SHANTHI

From Pediatric Intensive care Unit, Institute of Child Health and Hospital for Children, Egmore, Chennai, India.

Correspondence to:
Dr V Poovazhagi,
8/11 Manjolai street, Kaliamagal Nagar Ekkaduthangal, Chennai 600 032, India. poomuthu@yahoo.com
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We report the case of a 7 year old girl, who sustained accidental injury following injection of pressurized air from a bicycle tyre air nozzle. She presented with generalized subcutaneous emphysema along with pneumomediastinum, pneumothorax, pneumoperitoneum, pneumoretroperitoneum and pneumorrachis. The child was recovered completely on conservative management.

Key words: *Pressurised air, Pneumomediastinum, Subcutaneous emphysema.*

A 7 year old girl traveling on the cross bar of a bicycle accidentally fell, resulting in penetration of her left heel by the air nozzle of the front tyre. Following the fall, her heel could be pulled free from the wheel only with difficulty after 3-4 minutes. A part of the valve remained attached which was removed later. Subsequently, the father noted swelling of the left lower limb which quickly extended to the face. The child started complaining of pain over the neck and chest .-She was taken to a medical facility within 30 minutes after sustaining the injury.

On arrival, examination revealed generalized subcutaneous emphysema (involving all four extremities, trunk, face and scalp). All peripheral pulses were equally palpable; the capillary refill time was less than two seconds. The respiratory rate was 62/min without the use of accessory muscles. The oxygen saturation was 98% in room air. A small puncture wound was present on her left heel with abrasions of the overlying skin. Crepitus was present all over the swollen areas. Breath sounds were not clearly appreciable due to the crepitus. Rest of the systemic examination was normal.

X-ray chest and abdomen revealed extensive subcutaneous emphysema, pneumomediastinum, pneumothorax on the left side, pneumoperitoneum and pneumoretroperitoneum. *X*-ray of the extremities and spine revealed extensive dissection of air in the subcutaneous plane and the muscle plane without any bony injury. These findings were confirmed by CT of the neck, chest and abdomen (***Fig*. 1**). In addition, air was detected in the epidural space (pneumorrachis) extending from L3 level upto cauda equina.

The child was managed in the pediatric intensive care unit. Complete blood counts, electrolytes, urea and creatinine were normal. She was administered tetanus toxoid, analgesics, oxygen and antibiotics.Tachypnea resolved in 24 hours and subcutaneous emphysema regressed in 48 hours. Auscultation of her chest thereafter revealed normal breath sounds. She was ambulant by the third day and discharged on the 7th day without any sequelae.

FIG. 1 *X-ray showing subcutaneous emphysema, pneumomediastinum, pneumothorax, pneumoperitoneum and pneumoretroperitoneum.*

DISCUSSION

Injection of pressurised air into the subcutaneous tissue in children is very rare, and usually follow a benign course [1]. In case of compressed air injury, air accumulates in the body cavities with minimal tissue inflammation [2]. The entry site may be deceptively small and painless [3]. The agent involved and the force of penetration influence the nature of injury.

The air pressure in an inflated bicycle tyre can vary from 30-60 psi depending on the size of the tyre and the surface on which it is used. When pressurized air is injected into the subcutaneous tissue, it can track along the fascial planes to communicate with the various body-cavities. Air from the legs and thighs track through the subcutaneous plane and along the psoas muscle and neurovascular sheaths to enter the peritoneum and retro peritoneum [4]. Air enters the mediastinum through the periaortic, periesophageal fascial planes and the sternocostal attachment of diaphragm. Further, air can dissect in to the submandibular and retropharyngeal spaces. Air can freely communicate from the posterior mediastinum or retropharyngeal space to the epidural space as there is no fascial barrier between them.

It is important to distinguish this condition from gas gangrene which may present similarly with swelling, crepitus and air in the subcutaneous tissue and muscular planes . However, gas tends to dissect into the muscles in gas gangrene in contrast to the intermuscular planes in air collection [5]. Gas chromatography may be used to demonstrate the composition of 78% nitrogen and 21% oxygen in air in comparison to predominantly nitrogen as seen in-gas gangrene

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