Update in
Anaesthesia

Barium bronchogram following hydrostatic reduction of intussusception: presentation of a rare complication and brief review of literature

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Abstract

Intussusception is one of the most common paediatric emergencies. Frequently occurs in males under the age of two years. Majority of cases are idiopathic. The accepted initial treatment of uncomplicated intussusception is non-surgical enema reduction using pneumatic or hydrostatic techniques (HR) under fluoroscopic or ultrasound guidance. For HR Barium (Ba) or saline can be used. Complications of HR are rare even though failure to reduce and perforation has been reported. Barium aspiration following HR is hitherto unreported. Ba aspiration in adults and children has been reported following various upper GI contrast studies[1]. We report a case of Ba aspiration following HR of intussusception in a 9 month old child under general anaesthesia. Ba as such is inert, but can remain in lungs for longer period of time and can confuse future imaging studies of respiratory tract.

Key words: intussusception; hydrostatic reduction; barium aspiration; barium bronchogram.

INTRODUCTION

Intussusception refers to the invagination of a part of the intestine into itself. In uncomplicated cases the accepted initial treatment of intussusception is non-surgical enema reduction using pneumatic or hydrostatic techniques under fluoroscopic or USG guidance with or without anaesthesia. For HR barium or saline can be used. Even though ultrasound-guided saline reduction is currently favoured[2] in our institution we still use Ba for HR under fluoroscopy. Complications are rare with HR but rarely failure to reduce. or perforation has been reporte[3]. Xie Xiaolong, in a recent study retrospectively reported 637 patients with intussusception[4]. A total of 621 episodes of intussusception were collected for final analysis out of which 62 (9.98%) patients suffered failed reduction. We present a hitherto unreported complication in an infant following HR, and review the literature briefly.

Case presentation

Intussusception is one of the most common paediatric emergencies. We report a rare complication of hydrostatic reduction under general anaesthesia and review the limited available literature. A 9 month otherwise healthy child weighing 10kg presented with classical signs of intussusception. He was posted for hydrostatic reduction under fluoroscopy/Ga. The baby presented with a history of vomiting, incessant crying and failure to feed. Constipated for one day, pre-rectal examination revealed blood stained gloved finger. Hydrostatic reduction was attempted using Ba after induction of Ga. As per our anaesthetic protocol, we gave IV Ketamine 2mg.kg anaesthesia was maintained holding mask with sevoflurane in oxygen and nitrous oxide mixture. Reduction was achieved within 10 minutes. Throughout the procedure, the child remained hemodynamically stable with SaO_2 100%. Sevofluare and N_2O were stopped and maintained on 100% O_2 while holding the face mask. Suddenly it became increasingly difficult to ventilate with mask and child started to desaturate, simultaneously white coloured thick secretions were noticed while attempting to insert an airway. Immediate oral suction was done. Intubated and kept on 100% Oxygen. Auscultation revealed bilateral crepitations and wheezes. Baby was put on steroids and inhaled bronchodilators. Postoperative chest X-ray showed extensive opacities suggestive of Ba aspiration. Several attempts were made to suck out Ba through the endotracheal tube but little could be retrieved. A feeding tube was passed to empty the stomach. Bronchoscopy or BAL was not performed. He was shifted to Paediatric ICU for further management. Extubated after 48 hrs un-eventfully. Remained stable after extubation. Baby was discharged on 5th day.

Post aspiration

X-ray showed well-defined radio-opaque opacities

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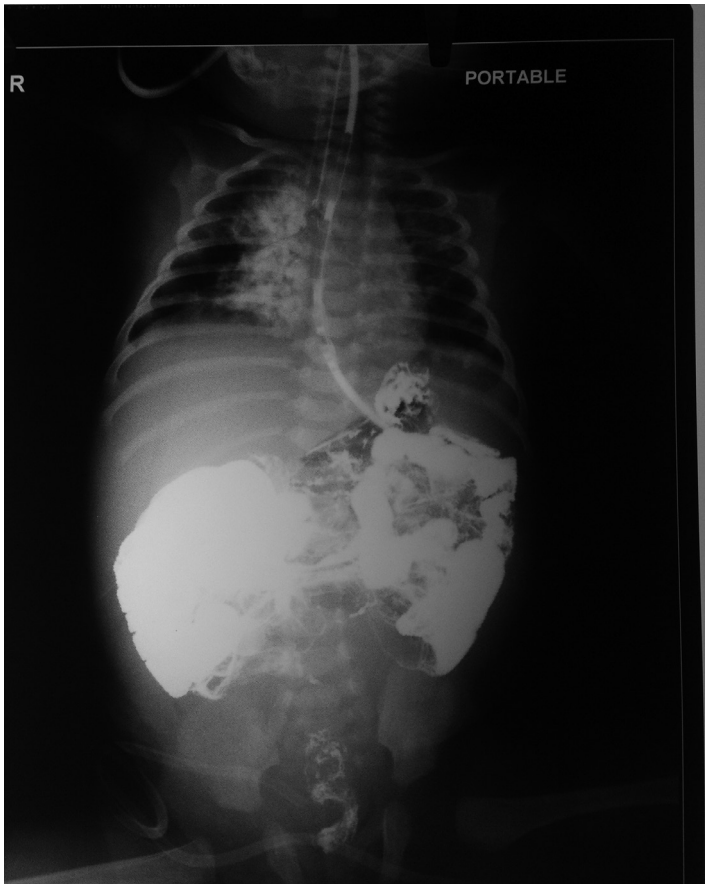

Figure 1: Barium in lungs X-ray

through all zones of the right lung and but less extensive changes on the left side. Also residual Ba in bowel loops was clearly seen. Feeding tube partially filled with Ba also visible. Ba had accumulated mainly in the Rt lung may be due to the supine position.

Discussion

In our institution over a period of 10 years we have performed approximately 240 cases of HR using Ba. This was the only case of Ba aspiration following HR during this period. Intussusception typically presents with the sudden onset of colicky but worsening abdominal pain, sometimes with vomiting and bloody stools, alternating with relatively pain-free periods. If left untreated, the bowel can perforate.

Management choices

For stable patients with evidence of intussusception non-operative reduction is recommended (HR). This procedure involves introducing a substance (air or liquid) into the bowel, via the rectum, with a set pressure that reduces the 'telescoped' bowel into its normal position. The standard method of reduction is to place a reservoir of contrast 100cm above the patient to ensure sustained and constant hydrostatic pressure. Ba (50% dilution of 125w/v Ba.) is used as the contrast agent. Successful reduction is indicated by the free flow of contrast into the small intestine. Very few complications are associated with HR with or without GA. Perforation and failure of reduction has been reported[3,4] Ba regurgitation and aspiration following HR has never been reported in literature.

In our case the standard protocol for Ba reduction was followed regarding the height of Ba container. Here Ba enema successfully reduced the intussusception and may be through an incompetent ilieocecal valve entered the large intestine from there to the small intestine and filled the stomach leading to regurgitation and aspiration. We did not anticipate this event and were caught unaware. Several cases of Ba aspiration has been described following upper GI contrast studies. Most of them are usually associated with congenital malformations of gut and airway, like tracheo-oesophageal cleft, tracheo-oesophageal fistula.[5] Ba is inert as such but since it went through the stomach chances of chemical broncho pneumonia was there. In modern era Ba aspiration is typically accidental.[7] Aspiration of significant amounts of Ba in infants is rare and there is no consensus in the literature on how to manage such aspiration. The sequalae of Ba aspiration depends largely on various factors including patient's age, pre-existing lung conditions , the strength of the Ba used[6,7], the volume aspirated, and the presence of gastric contents[10] the subject's posture at the time of aspiration and respiratory clearance mechanisms such as cough can affect the eventual presence of Ba in the tracheobronchial tree and lungs. Few reports are there in infants. Acute respiratory distress, pneumonitis, sepsis, and even death has been reported in adults[6]. Aspiration of Ba along with gastric contents can give a conflicting picture. Lopez-Castilla et al. reports ARDS like picture and the resultant desaturation in a 2-month-old child with gastro-oesophageal reflux after aspirating Ba following a contrast study[1]. In an attempt to clear the Ba, fibreoptic bronchoalveolar lavages (BAL) were tried. A CT scan of the chest taken 4 months later still showed Ba and micro-nodular densities.

BAL is not routinely recommended as suggested by Wani and Yeola[10], because of the possibility of further spread of Ba down the lungs. Long-term effects of Ba aspiration provide varying information. Small amounts of Ba are well-tolerated. Residual particles that are not expectorated or removed by mucociliary clearance accumulate in alveolar spaces, using high-resolution CT scans Voloudaki et al, inferred that the Ba particles are likely to be phagocytosed by alveolar macrophages and can potentially cause interstitial fibrosis by crossing into the alveolar or peribronchial interstitial tissue[11] Marchiori et al. differs in this matter in their description of Baritosis in which inhaled particulate matter lies in the lungs for years without producing symptoms or significant respiratory impairment[12]. A study in dogs by Wilson et al. only a mild transient inflammatory reaction following Ba brocnhography, which was quickly replaced by a harmless foreign body reaction[13]. The same investigators did not find any ill-effects, either acute or chronic. They concluded that Ba sulfate in the lung behaves as a relatively inert foreign body. Various studies by different investigators involving Ba bronchography has not resulted in short or long term ill effects[14]. The innocent nature of Ba in lungs is provided by Doig who described nine cases of Baritosis in factory workers exposed to Ba dust[15]. He described it as a benign pneumoconiosis. He followed up these subjects for 9 years and reported partial clearing of radiographic changes.

Before the advent of computed tomography and bronchoscopy Ba had been used as a contrast medium for bronchography. Although historically found to be safe in this context, aspiration of Ba may also produce a chemical pneumonitis in some cases.

Limited data exist characterizing the long-term prognoses of patients after isolated Ba aspiration events. Most patients appear to have complete recovery given the inert nature of Ba; however, high-resolution chest imaging has detected subtle evidence of early fibrosis even 1 year after aspiration[11], Wani and Yeola took the contrary view and recommended against bronchoalveolar lavage arguing that it may disseminate the Ba further within the bronchoalveolar system[10].

In paediatrics, imaging techniques may not differentiate primary from secondary aspiration. Factors that are likely to influence outcomes post-aspiration are the child's pre-existing clinical state, the volume, and concentration of the Ba sulfate used as well as the immediate post-aspiration clinical status. If Ba is aspirated, immediate management of Ba aspiration involves an attempt to suck out Ba as much as possible from the tracheobronchial tree and supportive care. Antibiotics and steroids are not indicated routinely Ba aspiration is rare and often produces dramatic radiographic findings, but is generally associated with a favourable prognosis. Evidence favours supportive care in most cases, with therapeutic bronchoalveolar lavage to be considered only in cases with significant respiratory symptomatology[5]. The evidence suggests that the Ba will remain in the lung for an extended time, be relatively inert and that the risk of fibrosis or other complications remains low.

Conclusion

Ba aspiration has been reported following several Ba studies. Since Ba can remain in lungs for an indefinite period of time and can interfere with future radiological studies parents were warned about this. Literature review did not reveal Ba aspiration following hydrostatic reduction of intussusception in a child. In the above case after iv induction, anaesthesia was maintained holding mask. We still continue the same technique. However, endotracheal intubaton and protection of airway should be seriously considered we hereby report this rare complication and alert the concerned physicians about this potentially fatal complication.

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