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Case Report

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Iatrogenic Esophageal Perforation in Extremely Preterm Infants: A Report of Three Cases

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Abstract Iatrogenic esophageal perforation in neonates is a rare but serious complication that can occur during medical interventions. Early diagnosis and intervention are of vital importance. In recent years, surgical treatment has been replaced by conservative approaches. In this article, three cases of esophageal perforation that developed during the insertion of an orogastric (O/G) tube are presented.

Keywords Esophagus · neonate · perforation

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INTRODUCTION

Iatrogenic esophageal perforation in neonates is a rare but potentially fatal complication that can occur during medical interventions such as orogastric tube (O/G) or nasogastric (N/G) tube insertion and endotracheal intubation and has an incidence of 0.4-0.5%[1–3]. This rate is approximately 10 times higher in extremely low birth weight babies[1,2] . Iatrogenic esophageal perforation may lead to mediastinitis, sepsis, respiratory failure, hemodynamic instability, and even death. Clinical outcome is directly related to the time between perforation and treatment[4]. Mortality rates of up to %20-30 have been reported in esophageal perforation in neonates, but death is mostly associated with comorbidities of prematurity rather than esophageal perforation[5–7]. Although conservative treatment methods such as discontinuation of enteral feeding, antibiotics, and total parenteral nutrition (TPN) are successful in selected patients, surgical procedures are rarely required in cases of clinical deterioration despite conservative treatment[8].

In this report, we present three cases of iatrogenic esophageal perforation, one of which was referred from an external center and the other two developed iatrogenic esophageal perforation during hospitalization in our hospital.

CASE 1

The baby girl, who was born at 27 gestational weeks (GW) by emergency cesarean section at an outside center with a weight of 775 g due to preeclampsia as the 3rd living baby from the 5th pregnancy of a 29-year-old mother, was transferred to our hospital on the 8th day of her life intubated with a diagnosis of pneumothorax in the right lung and suspicion of esophageal perforation. She was followed up in the HFOV mode. The right-sided course of O/G was observed on X-ray radiography, and esophageal perforation was considered (Figure 1). The patient was referred to the pediatric surgery department, and the N/G tube was inserted under scopic guidance. Enteral feeding was discontinued, and TPN and broad-spectrum antibiotic (vancomycin, meropenem, fluconazole) treatment were started. In the follow-up, minimal enteral nutrition with the N/G tube was started on the 21st day of hospitalization and the thoracic tube was removed on the 48th day of hospitalization. During the follow-up of the patient who was followed up with the pediatric surgery department, feeding was gradually increased and full enteral feeding was started on the 90th day of hospitalization. The patient who received invasive mechanical ventilation support for 84 days and noninvasive mechanical ventilation support for 88 days in total received systemic steroid treatment in accordance with the DART protocol due to bronchopulmonary dysplasia. The patient, who was in good general condition, breathing room air and fed completely orally, was discharged with healing on the 194th postnatal day after the completion of follow-up and treatment.

Figure 1. Right-sided course of the orogastric tube (indicated by arrow)

CASE 2

A male infant born via cesarean section at 26 GW, weighing 1016 g, as the second living twin from a 21-year-old mother's first pregnancy, was admitted to the NICU with nasal CPAP applied in the delivery room. Ampicillin, gentamicin therapies, and fluconazole prophylaxis were initiated. The patient, who had a high oxygen requirement, received surfactant via the minimally invasive surfactant treatment (MIST) method due to respiratory distress syndrome and was monitored on non-invasive positive pressure ventilation (NIPPV). On the third day of his life, a chest tube was inserted due to right pneumothorax, a liquid fluid was obtained from the pleural cavity suggestive of nutritional content and the course of the O/G tube was seen to be toward the right lung instead of the stomach on the X-ray, and esophageal perforation was considered (Figure 2). The patient was consulted with the pediatric surgery department, enteral feeding was discontinued, an N/G tube was placed under fluoroscopy guidance on the postnatal 3rd day, and TPN along with broad-spectrum antibiotic therapy was initiated. The patient, who experienced increased oxygen needs and developed carbon dioxide retention, was intubated and monitored in the SIMV + VG + PSV (Synchronized Intermittent Mandatory Ventilation + Volume-Guaranteed Ventilation + Pressure Support Ventilation) mode. On the 19th day of life, enteral feeding was continued under the supervision of pediatric surgery, but septic shock developed on the 25th day of life before complete enteral feeding could be started during

follow-up, and the patient died on the 27th postnatal day due to late-onset neonatal sepsis.

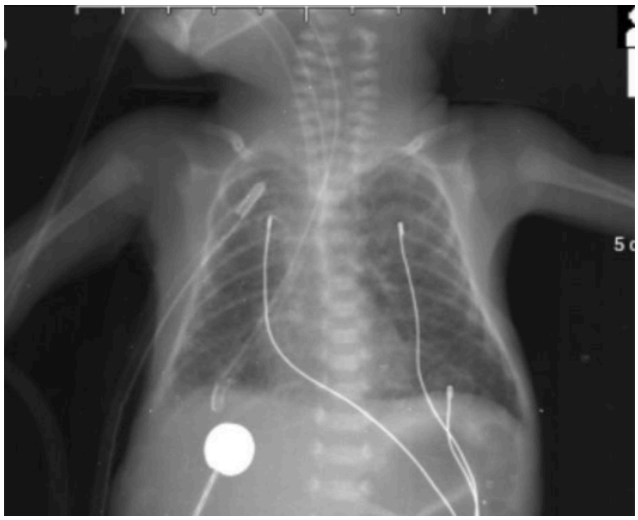

Figure 2. The orogastic tube was seen to be toward the right lung instead of the stomach (indicated by arrow)

CASE 3

A female infant born at 27 GW, weighing 1050 g, as the first living twin from a 29-year-old mother's first pregnancy, was admitted to the NICU with nasal CPAP applied in the delivery room due to preterm labor. Ampicillin, gentamicin therapies, and fluconazole prophylaxis were initiated. The patient, who had a high oxygen requirement, received surfactant via the MIST method because of respiratory distress syndrome and was monitored on non-invasive positive pressure ventilation (NIPPV). On the second day of life, the patient who continued to have respiratory distress and developed carbon dioxide retention was intubated and followed up with respiratory support in the HFOV mode. On the fourth day of life, posteroanterior and lateral chest X-rays revealed a radiolucent area in the posterior cardiac region (Figure 3 and 4). The patient was consulted with the pediatric surgery department because of the suspicion of Morgagni hernia or esophageal perforation. Thoracic computed tomography showed a limited focal air density in the mediastinum, and it was observed that there was an esophageal perforation limited to the mediastinum (Figure 5). With a conservative approach, enteral feeding was discontinued, and TPN along with broad-spectrum antibiotic therapy was initiated. During follow-up, the patient, whose ventilator parameters were minimal in the HFOV mode and blood gas monitoring was normal, was switched to the conventional mode (SIMV + VG + PSV). The patient was followed up in collaboration with the pediatric surgery department, and minimal enteral nutrition was started on the 16th day and gradually increased, and full enteral nutrition was started on the 34th day. The patient, who received 38 days of invasive and 27 days of non-invasive mechanical ventilation support, was treated with systemic steroids for bronchopulmonary dysplasia. After completing the follow-up and treatment, the patient, who was in good general condition, breathing room air, and fully orally fed, was discharged with full recovery.

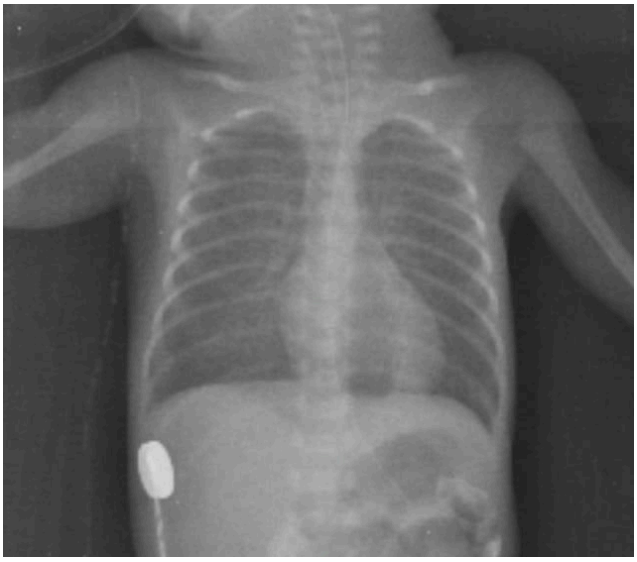

Figure 3. A radiolucent area in the posterior cardiac region (indicated by arrow)

Figure 4. A radiolucent area in the posterior cardiac (indicated by arrow)

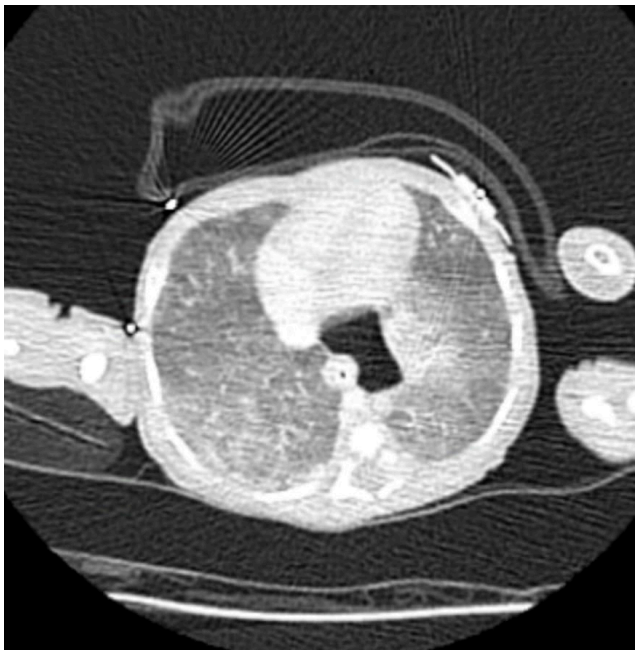

Figure 5. A limited focal air density in the mediastinum (indicated by arrow)

DISCUSSION

Iatrogenic esophageal perforation can be a rare complication of procedures frequently performed in neonatal intensive care units, such as endotracheal intubation, O/G, or N/G tube placement[9]. The most common anatomical site of perforation is the thoracic esophagus, followed by the cervical esophagus[10]. Iatrogenic cervical esophageal perforations can occur, particularly when multiple attempts are required during difficult intubation. This is due to factors such as neck hyperextension during the procedure, stretching of the cricopharyngeal muscle, and the esophageal wall being stretched toward the cervical vertebrae, making the esophagus more susceptible to damage[11]. Thoracic esophageal perforations are mostly caused by the insertion of O/G or N/G tubes, and their occurrence can be related to the characteristics of the tube, with a higher frequency noted in polyvinyl tubes[10]. This complication is more common in extremely preterm and very low birth weight infants[12–14]. Esophageal perforation can present in three forms: as a pseudodiverticulum, as a mucosal perforation with limited extravasation extending posteriorly into a blind-ending submucosal area, and as a full-thickness esophageal perforation with air or esophageal contents freely leaking into the intrapleural space[13,14]. Although the usual routes of perforation are into the mediastinal, pleural, and peritoneal spaces, there are reports in the literature, albeit rarer, of N/G or O/G tubes penetrating into other organs, including the pericardial sac[15], renal pelvis[16], and bladder[17]. Proximal esophageal perforation typically presents findings and radiological abnormalities on the left side of the lung radiograph, whereas distal perforation manifests findings and abnormalities on the right side[1,18,19]. In all three of our cases, a right-sided distal esophageal perforation occurred, believed to have occurred during the placement of the N/G tube, resulting in two cases of complicated perforation causing pleural injury and one case of isolated full-thickness perforation confined to the mediastinum. In the past, iatrogenic esophageal perforation in neonates was mostly treated surgically, similar to that in older children and adults. However, in recent years, conservative treatment has gained importance[4,5,12,13,20]. Although it is a complication with high mortality and morbidity, these rates are associated with the time interval between the occurrence of the perforation and the diagnosis[12,19]. In all three of our cases, a retrospective review of the direct radiographs confirmed the diagnosis of esophageal perforation within hours. The conservative treatment option was chosen, and enteral feeding was discontinued, while total parenteral nutrition and broad-spectrum antibiotics were initiated. Two of our cases were discharged in good health, while the third, despite the perforation healing and enteral feeding being resumed, succumbed to respiratory failure and late-onset neonatal sepsis due to the presence of additional comorbidities. As in our cases, in a multicenter study involving eight premature infants in Europe, eight premature infants with esophageal perforation were treated conservatively and one of them died, but the cause of death was not perforation; it was attributed to complications related to prematurity[9].

CONCLUCION

Early diagnosis and intervention are crucial in iatrogenic esophageal perforation, a rare complication that can develop during medical procedures performed in neonatal intensive care units. Even a 24-h delay in diagnosis can nearly double the mortality rate[3]. Therefore, it is essential for healthcare professionals to be aware of the signs associated with iatrogenic esophageal perforation and the management strategies to either prevent this condition or address it promptly.

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