Pharyngoesophageal perforation from an exploding bottle is an extremely rare injury. To date, twenty-four cases have been documented in English literature. In this study, we reported two additional cases of pharyngoesophageal perforation by a bottle exploding in the mouth. Explosion of the bottle occurred when the patients removed the cap of a home-made wine bottle with their teeth, which resulted in pharyngoesophageal perforation. The patients were managed by conservative treatment and operative repair, respectively. Both patients had an uneventful recovery. Possible mechanisms and preventive measures are discussed in this study, along with a review of the literature.

**Key Words:** Explosion, bottle, pharynx, esophagus, perforation

**INTRODUCTION**

The explosion of a drink bottle is a very rare cause of traumatic pharyngoesophageal perforation. Pharyngoesophageal perforation may occur when one removes a bottle cap with their teeth. The rapid pressure increase in the closed oral cavity not only causes laceration of the oral and pharyngoesophageal soft tissues, but also cervical emphysema, pneumothorax, and pneumomediastinum. Pharyngoesophageal perforation by an exploding bottle was first reported by Bowsher et al. in 1982. Subsequently, twenty-three cases have been documented in English literature. This study reports two additional cases of pharyngoesophageal perforation by an exploding bottle, and a review of the literature pertaining to this condition.

**CASE REPORT**

**Case 1**

An 83 year-old male was admitted because of bleeding from the mouth and dyspnea. He tried to remove the cap of a 1.8-liter plastic bottle of home-made wine with his teeth. The plastic screw cap had blown off and a gas stream burst into his mouth. Neck swelling and dyspnea were observed, even though laceration of the soft palate was repaired before he was transferred to our hospital.

On examination, he was not anemic or shocked. His respiratory rate was 28/min, blood pressure 160/110 mmHg, and pulse rate 128 beats/min. He was not febrile. A flexible larynopharyngoscopy showed laceration and hematoma obstructing oropharyngeal airway (Fig. 1). He developed acute bleeding from his pharynx and was in respiratory distress. He was intubated immediately and taken to an operating room. A pharyngoscopy showed a perforation in the left side of the posterior pharyngeal wall starting from the inferior part of the nasopharynx and extending to the cricopharyngeus (Fig. 2). The
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Pharyngeal perforation was repaired, but upper esophageal tearing was left unrepaired because of constraints under the pharyngoscopy. Supportive therapy with broad spectrum antibiotics, fluids, oxygen, and a nasogastric tube-feeding was given. Subcutaneous emphysema of the neck gradually improved and pharyngoesophagogram with Gastrograffin showed no leakage 9 days after the operation, so oral feeding was started. He was discharged 14 days after injury, and felt fine at the 1-year follow-up.

Case 2

A 65-year old female presented with bleeding from the mouth and throat pain. She had been trying to remove the cork of a 750-mL glass bottle of home-made wine with her teeth when it exploded and the cork shot into her mouth. After the explosion she noticed pain in her throat. The glass bottle was not broken and the cork was retrieved from her mouth.

The patient was nervous upon examination, with a temperature of 36.3°C, a respiratory rate of 20/min, a pulse rate of 92 beats/min, and a blood pressure of 170/90 mmHg. Her airway was intact. The posterior pharyngeal wall was lacerated about 2 cm in length and blood clots were seen in the larynx and hypopharynx. Cervical emphysema was noted, but there was no pneumomediastinum or pneumothorax. A lateral neck radiograph and CT showed emphysema in both sides of the neck. Nasogastric tube feeding and prophylactic antibiotics were given because of deep neck infection or mediastinitis. She was feeling well at the 2-year follow-up.

DISCUSSION

Barotrauma in the aerodigestive tract causes mucosal perforation. Once an abnormally high air pressure is introduced into the potential space of the head and neck, it may extend to deeper structures and to the mediastinum. Through the perforation, normal floras in the aerodigestive tract contaminate the deep space of the head and neck, which may result in deep neck infection or mediastinitis.

Etiologic agents of barotrauma have been reported as follows: bicycle inner tube, tractor tire, fire extinguisher, and exploding bottle. Pharyngoesophageal injury by bottle explosion can develop when patients remove the cap of a bottle with their teeth. Commercially made soft drinks, wine, or beer are safe unless they have been stored under adverse conditions, but home-produced wine and beer are often manufactured in less than ideal circumstances, with considerable build-up of carbon dioxide. To date, 24 cases of barotraumatic pharyngoesophageal perforation by an exploding bottle have been reported in English literature and are summarized in Table 1.

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The patients were aged 5 to 75 years and consisted of 17 males and 7 females. Most of the cases (22/24)
were less than 15 years old, which suggests that educating children and adolescents is essential for prevention.

The pathogenesis of injuries caused by compressed air has been clearly described: the escaping gas enters the mouth and forcibly distends the pharynx and esophagus, causing them to rupture. The hurled cap and broken bottle are also involved in pharyngoesophageal injuries. Because of its anatomy, the exceedingly friable

Table 1. Summary of Reported Cases of Barotraumatic Pharyngoesophageal Injuries by Exploding Bottle in the Literature

| Year | Authors | Age (years) /Sex | Respiratory compromise on admission | Site of injury | Major morbidity | Repair & drainage | Outcome |
|------|---------|------------------|-------------------------------------|----------------|-----------------|-------------------|---------|
| 1982 | Bowsher WG and Kenyon GS1 | 15/F | None | T, OT, SP, ICA | None | Repair | Alive |
| 1982 | Irwin BC2 | 10/M | None | TP | PPA, M | Unknown | Unknown |
| 1983 | Du Plessis HJ and Becker JH3 | 10/F | Intubation | TP | None | Conservative | Alive |
| 1983 | 7/M | None | Pneumothorax | P, T | None | Repair & tonsillectomy | Alive |
| 1984 | Conlan AA, et al.4 | 12/M | Intubation | P | None | Repair | Alive |
| 1986 | Wood DJ and Milford D5 | 14/M | Pneumothorax | P | M | MD | Alive |
| 1986 | Forer M, et al.6 | 36/F | None | PPW | RPA | Repair & CD | Alive |
| 1986 | Vallis MP and Gibbin KP7 | 14/F | None | T, PPW | None | Tonsillectomy | Alive |
| 1988 | Meyerovitch J, et al.8 | 9/F | None | T, PPW | None | Conservative | Alive |
| 1988 | 9/M | None | Hydropneumothorax | CE, TE | MA, TF, S | MD | Died |
| 1992 | Bar-Maor JA and Hayari L9 | 13/M | Unknown | OP, CE | MA | MD | Alive |
| 1993 | Efrati Y, et al.10 | 11/M | None | P | None | Repair | Alive |
| 1995 | 10/M | None | P | T | None | Repair | Alive |
| 1995 | Kraus M, et al.11 | 8/F | None | SP, BOT, T | None | Conservative | Alive |
| 1995 | 75/M | None | TP | None | Conservative | Alive |
| 1995 | Tostevin PM, et al.12 | 30/F | Tracheostomy | PPW, CE | None | Repair | Alive |
| 1995 | 6/M | None | PPW | MA | Repair & tonsillectomy | Alive |

T, tonsil; OT, oral tongue; SP, soft palate; ICA, internal carotid artery; TP, tonsillar pilla; PPA, parapharyngeal abscess; M, mediastinitis; P, pharynx; UE, Upper esophagus; LE, lower esophagus; CD, cervical drainage; PPW, posteriot pharyngeal wall; MD, mediastinal drainage; RPA, retropharyngeal abscess; CE, cervical esophagus; TE, thoracic esophagus; MA, mediastinal abscess; TF, truncal fasciitis; S, sepsis; OP, oropharynx; BOT, base of tongue.
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oxygen. Based on a review of literature, most of the patients have a good prognosis if they are properly managed for airway compromise and complications such as mediastinitis. Suggested measures to prevent injuries from a bottle explosion include the storage of bottles in a cool place, avoidance of jostling or hitting bottles together, directing the cap away from the body or face when opening, storage of bottles on the floor or lowest shelves to reduce the hazards in case the bottle falls or explodes, and avoidance of shaking carbonated drinks. School campaigns should be waged because children are the most susceptible. Conspicuous warning labels should be placed on all carbonated drink bottles, and the use of plastic bottles and caps is helpful in reducing incidence of this injury.

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