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Hypopharyngeal Perforation Leading to Neck Emphysema and Pneumomediastinum: Case Report

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Abstract

Hypopharyngeal perforation due to blunt trauma in the neck is a very rare but potentially life-threatening condition. We present the imaging findings of a 16-year-old male who presented with dysphagia after blunt neck trauma from a baseball helmet. Less than twenty such cases have been reported in the world literature. No prior case has been published with associated pneumomediastinum.

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Background

Hypopharyngeal perforation due to blunt trauma to the neck is very rare. Less than twenty such cases have been reported in the world literature and none with associated pneumomediastinum [1][2][3][4][5]. The mechanism of injury was being hit by a helmet-wearing teammate during a baseball game. After the collision, the patient soon developed neck pain, dysphagia, and a change in voice and went to the emergency department. Radiographs showed air in the neck region. An emergent CT scan was performed that revealed the results of a hypopharyngeal injury, causing air to dissect into the retropharyngeal and prevertebral soft tissue and upper mediastinum. A swallow using water-soluble contrast proved a hypopharyngeal leak. A flexible upper endoscopy examination showed hemorrhage from both false vocal cords. The hypopharyngeal tear could not be localized. Conservative management including inpatient observation, nil per oral status,

pain killer, and proton pump inhibitors were successfully implemented. This case report aims to present the imaging findings of this rare case to aid future diagnosis.

Case Report

A 16-year-old boy presented to the emergency department with severe neck pain, dysphagia, and dysphonia after getting hit in the neck by a teammate wearing a helmet during a baseball game. Complete history revealed no associated fever, emesis, breathlessness, palpitation, or chest pain. Physical examination showed stable vital signs. His core temperature was 37.9 degrees, his blood pressure was 122/80 mm of Hg, and his heart rate was 88 beats per minute. His oxygen saturation was 100 % on room air. Neck motion was limited on his right side. Mild swelling of the right base of the neck was visualized. No crepitus was felt along the neck, clavicles, or chest. On further clinical examination of his cardiovascular, respiratory, abdominal, musculoskeletal, and vascular systems no abnormality was found. No tenderness was elicited along the spinous processes of the cervical and thoracolumbar spine. All lab tests were normal, including hematocrit, white blood cell count, C-reactive protein, and coagulation profile. A Chest radiograph (Fig.1) demonstrated upper pneumomediastinum as well as soft tissue emphysema within the lower neck. Heart size and pulmonary vascularity were normal. Lungs were normally aerated with no pneumothorax. A chest CT exam was performed for further evaluation. The CT scan (Fig.2) confirmed soft tissue emphysema involving the retropharyngeal space and prevertebral soft tissues anterior to the cervical and upper thoracic spine. A large defect (Fig.3) involving the posterior wall of the hypopharynx below the base of the epiglottis at the level of C3 was visualized. It measured 2 cm craniocaudally and 1 cm in transverse dimension. Air was seen surrounding the trachea, within the carotid spaces, and extending into the superior mediastinum. The trachea was intact. The laryngeal structures were within normal limits. An esophagogram was performed to evaluate for perforation and leakage from the esophagus. 100 ML of Isovue water-soluble contrast was used. At the level of the C3 vertebra, extravasation of contrast was noted along the poster aspect of the hypopharynx tracking inferiorly into the prevertebral soft tissues and upper mediastinum (Fig.4). Esophageal motility was within normal limits. A flexible upper endoscopy examination was performed which showed hemorrhage from the false vocal cord. No tear could be visualized. The patient was hospitalized and kept NPO. The patient was given intravenous fluids and intravenous clindamycin. He was also given prn acetaminophen, morphine, ondansetron, and oxymetazoline. A repeat esophagogram on day 3 showed decreased contrast leakage and improved hypopharyngeal tear. The patient was discharged on day 4 with instruction to have clear liquids for one day, followed by full liquids on the following day, and to resume a regular diet after that as tolerated. Clinical follow-up was uneventful with the progressive resolution of his pain and dysphasia. No fever was present. Blood tests showed a stable coagulation profile, hemoglobin levels, white blood cell count, and C-reactive protein levels. Progressive oral intake was then reintroduced with good tolerance. The patient was asked to follow up after 2 weeks, provided no new symptoms arise in the interim.

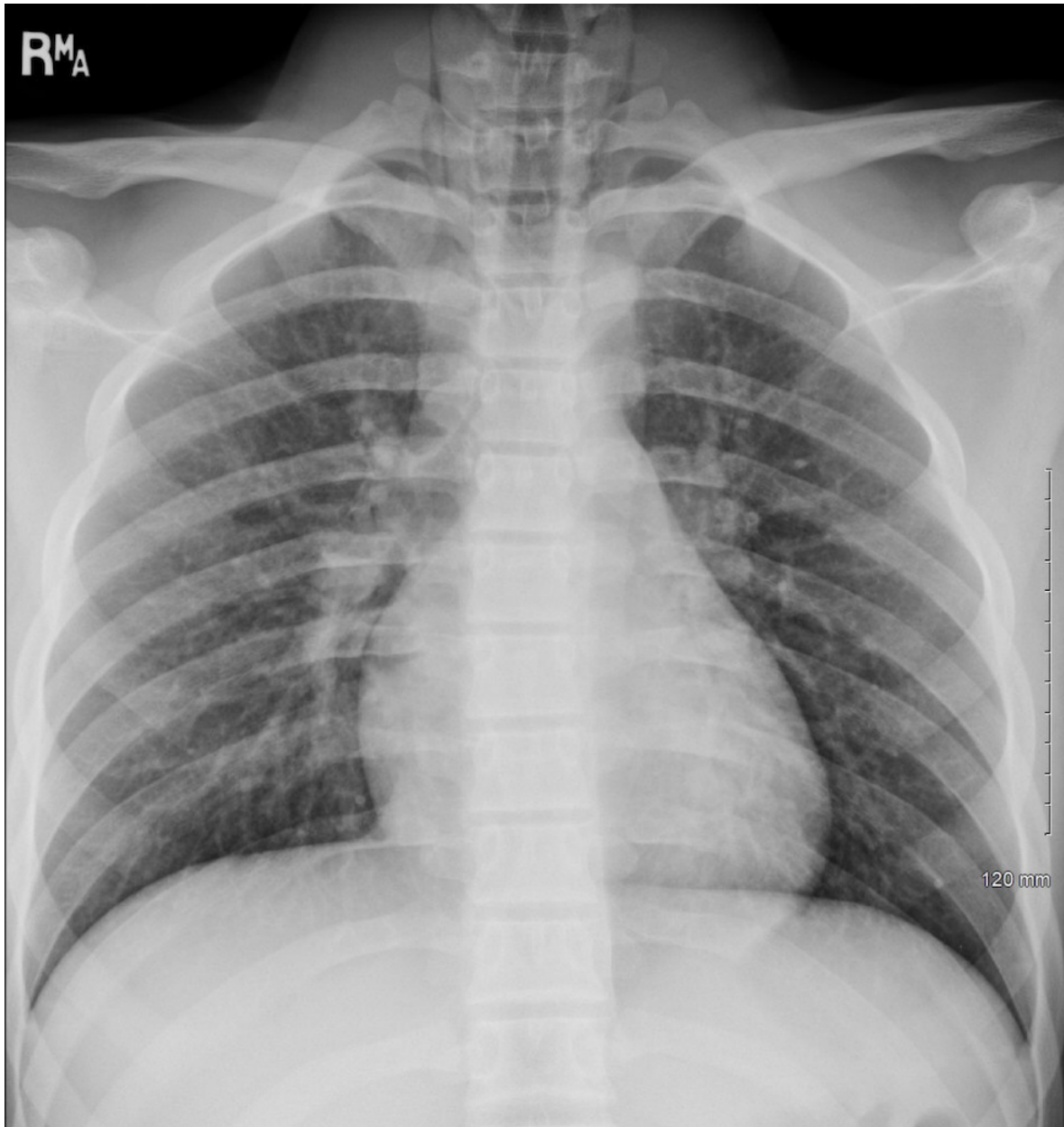


Fig.1. Chest radiograph demonstrates upper pneumomediastinum as well as soft tissue emphysema within the lower neck.

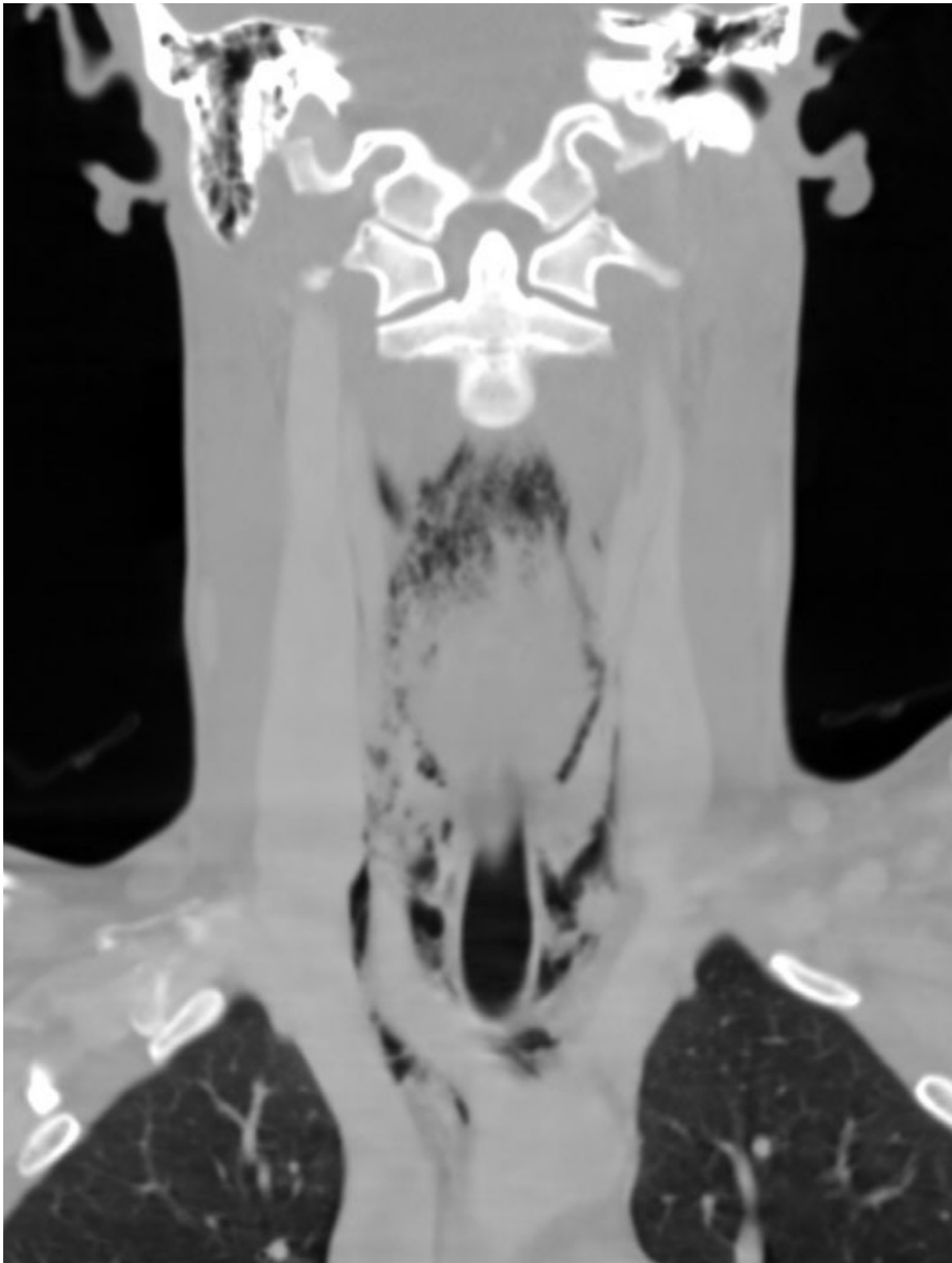


Fig.2. CT scan reveals extensive soft tissue emphysema and pneumomediastinum.



Fig.3. Defect involving the poster wall of the hypopharynx below the base of the epiglottis at the level of C3 was visualized.

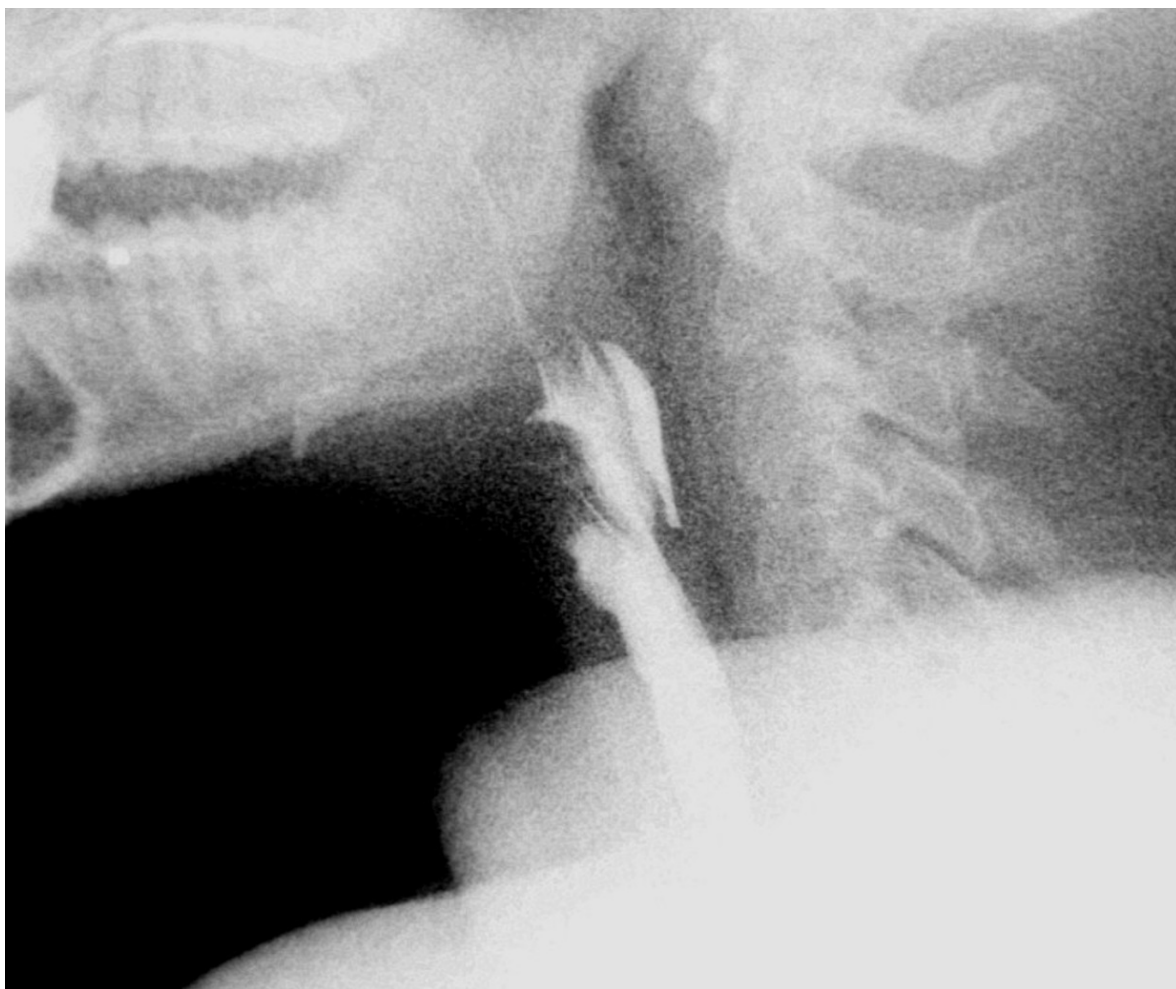


Fig.4 Gastrograffin upper gastrointestinal study reveals extravasation of contrast along the poster aspect of the hypopharynx at C3 level tracking inferiorly into the prevertebral soft tissues and upper mediastinum.

Discussion

Blunt neck trauma causes less than 2% of pharyngoesophageal perforations, as the majority of them are iatrogenic due to instrumentation like esophagoscopy [2]. However, when it occurs it can be disastrous if not treated immediately. Usually, this perforation occurs at the level of the Killian's dehiscence which is an area of weakness of the hypopharynx [3]. The proposed mechanism of the injury is an upper airway closure due to compression at the level of the hyoid bone, concurrently with expiration leading to high pressure and thus the perforation [3][4]. Some of the commonly associated findings with pharyngoesophageal perforations are subcutaneous emphysema, chest pain, dysphagia, odynophagia, stridor, hoarseness, and hemoptysis [5].

Imaging of pharyngoesophageal perforations usually includes plain films of the lateral cervical spine and the chest which may reveal prevertebral and retropharyngeal air or mediastinal emphysema [5][6]. The most accurate diagnostic tool is the Gastrograffin swallow-enhanced CT scan, which can help demonstrate the location and the extension of a tear. Its sensitivity and specificity rates reach 75% and 100% [7][8]. The management is either nonoperative or operative depending on the size and location of the pharyngeal tear as well as the clinical symptoms and signs [1]. Surgery is mandatory if there

is hemodynamic instability, sepsis, a tear larger than 2 cm in diameter, or when the esophagus is involved. It consists of debridement, surgical closure of the tear, and drainage as required [9][10]. If the tear is small and the patient is stable then conservative management can be done which includes fasting, nasogastric tube decompression, analgesics, total parental nutrition, and broad-spectrum antibiotics (penicillin, metronidazole, or third-generation cephalosporin). Close follow-up in the hospital with clinical, biological, and radiological surveillance is mandatory. The most dangerous risk of nonoperative management is the development of acute mediastinitis. A mediastinal abscess can also develop which requires surgical drainage. Other complications include hematoma and vascular rupture [6].

Conclusion

Hypopharyngeal tear as a consequence of blunt neck trauma is uncommon. Imaging is very important for the diagnosis of this rare condition. Radiographs, CT, and Gastrografin upper gastrointestinal study are mandatory for confirmation and are superior to upper endoscopy in many cases, as in this case. The radiologists need to be aware of a hypopharyngeal tear as a possible cause of pneumomediastinum and the need to confirm this by a contrast swallow. He also needs to know the imaging findings to make the correct diagnosis, as presented in this case report.

Teaching Points

1. Radiographs, CT, and Gastrografin upper gastrointestinal study are mandatory for confirmation of hypopharyngeal tear and are superior to upper endoscopy in many cases, as in this case.
2. The radiologists need to confirm hypopharyngeal tear as a possible cause of pneumomediastinum by a contrast swallow.

Table listing the differential diagnoses of hypopharyngeal tear:

| Condition | Description |
|--|--|
| Peritonsillar abscess | Collection of pus near the tonsils presenting with pain with swallowing and sore throat |
| Gastroesophageal reflux disease (GERD) | Backflow of stomach acid into the esophagus presenting with difficulty and pain while swallowing |
| Esophageal perforation | A tear in the esophagus presenting with similar symptoms to hypopharyngeal tear |
| Laryngitis | Inflammation of the larynx presenting with hoarseness, difficulty speaking and sore throat |
| Pharyngitis | Inflammation of the pharynx presenting with sore throat and difficulty swallowing |

Three multiple-choice questions (MCQs) on imaging for hypopharyngeal tear:

1. Which imaging modality is most commonly used to diagnose hypopharyngeal tear?
 1. CT scan

2. MRI
3. X-ray
4. Ultrasound

- Answer: a) CT scan is the most commonly used imaging modality to diagnose hypopharyngeal tear. It provides detailed images of the neck and pharynx and can help identify the location and extent of the tear.

2. Which of the following imaging findings is indicative of hypopharyngeal tear?

1. Air in the pharynx
2. Soft tissue swelling
3. Bone fractures
4. Increased blood flow to the area

- Answer: a) Air in the pharynx is a common imaging finding in hypopharyngeal tear, which occurs due to the escape of air into the soft tissues of the neck. This finding is often seen on CT scans or X-rays.

3. What is the role of contrast-enhanced imaging in diagnosing hypopharyngeal tear?

1. It helps identify the location and extent of the tear.
2. It differentiates between different types of tissues in the neck.
3. It can help identify underlying medical conditions.
4. It is not useful in the diagnosis of hypopharyngeal tear.

- Answer: a) Contrast-enhanced imaging can help identify the location and extent of the tear by highlighting areas of contrast leakage. It is often used in conjunction with CT or MRI scans to enhance the accuracy of the diagnosis.

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