

World Journal of *Orthopedics*

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WJO covers topics concerning arthroscopy, evidence-based medicine, epidemiology, nursing, sports medicine, therapy of bone and spinal diseases, bone trauma, osteoarthropathy, bone tumors and osteoporosis, minimally invasive therapy, diagnostic imaging. Priority publication will be given to articles concerning diagnosis and treatment of orthopedic diseases. The following aspects are covered: Clinical diagnosis, laboratory diagnosis, differential diagnosis, imaging tests, pathological diagnosis, molecular biological diagnosis, immunological diagnosis, genetic diagnosis, functional diagnostics, and physical diagnosis; and comprehensive therapy, drug therapy, surgical therapy, interventional treatment, minimally invasive therapy, and robot-assisted therapy.

We encourage authors to submit their manuscripts to *WJO*. We will give priority to manuscripts that are supported by major national and international foundations and those that are of great basic and clinical significance.

INDEXING/ABSTRACTING

World Journal of Orthopedics is now indexed in Emerging Sources Citation Index (Web of Science), PubMed, PubMed Central and Scopus.

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I-III Editorial Board

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NAME OF JOURNAL
World Journal of Orthopedics

ISSN
 ISSN 2218-5836 (online)

LAUNCH DATE
 November 18, 2010

FREQUENCY
 Monthly

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World Journal of Orthopedics
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PUBLICATION DATE
 August 18, 2017

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Open wound management of esophagocutaneous fistula in unstable cervical spine after corpectomy and multilevel laminectomy: A case report and review of the literature

Hossein Elgafy, Mustafa Khan, Jacob Azurdia, Nicholas Peters

Hossein Elgafy, Mustafa Khan, Jacob Azurdia, Nicholas Peters, Department of Orthopedics, University of Toledo Medical Center, Toledo, OH 43614-5807, United States

Author contributions: All the authors contributed in outlining the manuscript, gathering the data, and writing the manuscript.

Institutional review board statement: This case report was exempt from the Institutional Review Board standards at University of Alabama in Birmingham.

Informed consent statement: The patient involved in this study gave her written informed consent authorizing use and disclosure of her protected health information.

Conflict-of-interest statement: None of the authors have any financial or other conflicts of interest that may bias the current study.

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Manuscript source: Invited manuscript

Correspondence to: Hossein Elgafy, MD, MCh, FRCSed, FRCSc, Department of Orthopaedics, University of Toledo Medical Centre, 3065 Arlington Avenue, Toledo, OH 43614-5807, United States. hossein.elgafy@utoledo.edu
Telephone: +1-419-3833515
Fax: +1-419-3833526

Received: November 28, 2016

Peer-review started: December 3, 2016

First decision: December 19, 2016

Revised: May 24, 2017

Accepted: June 6, 2017

Article in press: June 7, 2017

Published online: August 18, 2017

Abstract

A 67-year-old female patient developed an esophagocutaneous fistula 4 mo after C4 and C5 partial corpectomy. Plain radiograph and computed tomography (CT) scan of cervical spine showed inferior screws pullout with plate migration that caused the esophageal perforation. Management included removal of anterior hardware, revision C4-5 corpectomy, iliac crest strut autograft and halo orthosis immobilization. The fistula was treated using antibiotics and a 10-french gauge rubber tube for daily irrigation and Penrose drain. At 3 mo, the esophagocutaneous fistula healed and the patient resumed oral feeding. Six months follow-up CT scan showed sound fusion with graft incorporation. At two-year follow-up, patient denied any neck pain or dysphagia. This case report presents a successful outcome of a conservative open wound management without attempted repair. The importance of this case report is to highlight this treatment method that may be considered in such a rare complication particularly if surgical repair failed.

Key words: Wound management; Esophagocutaneous fistula

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Core tip: Esophageal perforation and subsequent fistulization is a known complication following anterior cervical spine surgery. As part of the treatment of this complication, hardware removal is commonly required. The majority of the literature advises against conservative treatment of esophageal injury due to the associated morbidity and mortality.

Elgafy H, Khan M, Azurdia J, Peters N. Open wound management of esophagocutaneous fistula in unstable cervical spine after corpectomy and multilevel laminectomy: A case report and review of the literature. *World J Orthop* 2017; 8(8): 651-655 Available from: URL: <http://www.wjgnet.com/2218-5836/full/v8/i8/651.htm> DOI: <http://dx.doi.org/10.5312/wjo.v8.i8.651>

INTRODUCTION

Anterior cervical spine discectomy and corpectomy are reliable with good outcomes for the treatment of neck pain with radiculopathy or myelopathy. The incidence of esophageal perforation in anterior cervical spine surgery is 0.2% to 0.4%. High mortality rates up to 20% have been reported with injury even when the patient is treated within the first 24 h. This increases to 50% when treatment is further delayed. In rare circumstances with delayed diagnosis, esophagocutaneous fistulous tract may form and presents with discharge of food particles from the surgical wound. As with most infections involving orthopedic implants, management involves hardware removal, debridement of soft tissues and culture specific antibiotic^[1-4]. The objective of this case report is to present a successful open wound management without attempted repair of a patient with an esophagocutaneous fistula.

CASE REPORT

A 67-year-old female patient was hospitalized at the authors' institution for left distal femur fracture that was treated with open reduction and internal fixation. During her postoperative stay, it was noted that food particles were draining from an anterior cervical wound. Patient had a history of two previous cervical spine surgeries, both performed at other institutions. The first was a C4-6 posterior laminectomy without fusion, performed eight years prior to this hospitalization. The second surgery was performed 4 mo prior to her admission to the authors' institution. It consisted of C4 and C5 partial corpectomy with insertion of a polyetheretherketone (PEEK) cage and C3-6 anterior cervical instrumentation.

The spine service was consulted and plain radiograph demonstrated inferior screws pullout with plate migration (Figure 1). Computed tomography (CT) scan showed subcutaneous air tracking along the neck soft tissues. General surgery and otolaryngology were consulted and an esophagram (Figure 2) revealed ingested oral contrast tracking along the right subcutaneous tissues of the neck confirming perforation of the esophagus at the level of the inferior screws with fistulization through the anterior surgical wound. Blood work showed normal white cell count 8000 (normal 4500-10000), decreased prealbumin 6.1 mg/dL (normal 17-34) and serum iron level 15 mg/dL (normal 50-212) that confirmed malnutrition.

The patient's oral intake was suspended and a



Figure 1 Lateral plain radiograph showed inferior screws pullout and anterior displacement of the plate.

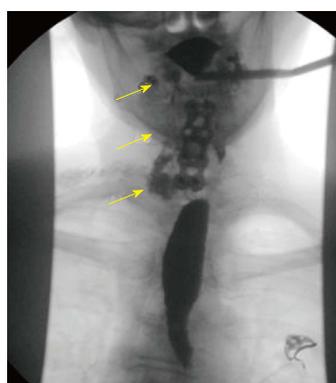


Figure 2 Anteroposterior fluoroscopic image of esophogram showed extravasated contrast material tracking along the right side of the neck (arrows).

nasogastric tube placed to facilitate feeding. The patient was taken to the operating room and underwent removal of the anterior hardware, drainage of cervical abscess, revision C4-5 corpectomy, C3-C6 fusion using tricortical iliac crest strut autograft and halo vest immobilization. The wound was left open and managed by the general surgery and otolaryngology services. One week after the revision cervical fusion, the patient was taken to the operating room by general surgery for irrigation and debridement, insertion of a 10 French gauge rubber tube for irrigation and Penrose drain. The wound was irrigated *via* the rubber tube two times daily with a dilute hydrogen peroxide solution. The patient was placed on ceftriaxone and flagyl for 6 wk as cultures grew polymicrobial mouth flora.

The halo vest removed at 3 mo. The fistulous tract healed at 3 mo and patient resumed oral feeding. Six months follow-up CT scan showed graft incorporation (Figure 3). At two years follow up, patient denied any neck pain or dysphagia and plain radiograph showed maintenance of the cervical spine alignment (Figure 4).

DISCUSSION

The incidence of esophageal perforation after anterior cervical spine surgery is 0.2% to 0.4% and may present

Table 1 Cases reported in the literature

| Ref. | No of patients with perforation | Time of diagnosis | Management | Outcome |
|--|---------------------------------|--|--|--|
| Zhong <i>et al</i> ^[11] | 6 | Early postoperative | Wound debrided in 3 patients, implant removed and primary suture of perforation in 2 patients | 5 healed 1 died due to pneumonia |
| Ardon <i>et al</i> ^[3] | 4 | Early postoperative in 3 patients | Hardware removed with primary suture of the perforation in 2 patients and in one of these an additional sternocleidomastoid myoplasty was done | 3 healed 1 patient died due to systemic complication, indirectly related to the perforation |
| Yin <i>et al</i> ^[4] | 1 | 3 yr after surgery | Emergency tracheostomy, hardware removal, abscess drainage and infected tissue debridement | Healed |
| Jamjoom <i>et al</i> ^[27] | 1 | Early postoperative | No definite perforation detected at reoperation, pharyngocutaneous fistula formed subsequently No attempted repair | Fistula recurred twice soon after resumption of oral feeding |
| Orlando <i>et al</i> ^[9] | 5 | 2 during surgery 2 early postoperative 6 mo postoperative in 1 | Hardware removal in 2 Hardware retained in 1 No hardware inserted in 2 | All healed |
| Sun <i>et al</i> ^[10] | 5 | 1 during surgery 4 early postoperative | Esophagus repaired in 4 Hardware removal in 2 Esophagus repaired in 4 reinforcement with a sternocleidomastoid muscle flap in 1 patient | All healed |
| Balmaseda <i>et al</i> ^[20] | 1 | Early postoperative | Hardware retained No repair | Healed |
| Ji <i>et al</i> ^[21] | 1 | Early postoperative | Hardware retained repaired and reinforced with sternocleidomastoid flap Recurrent esophageal leakage 2 d after the repair Wound reopened and a continuous irrigation and drainage system used | Healed |



Figure 3 Computed tomography scan sagittal reformat showed incorporation of the iliac crest strut graft.



Figure 4 Lateral cervical spine plain radiograph at 2-year follow-up showed incorporation of the iliac crest strut graft with maintenance of the cervical spine alignment.

intraoperatively or in the postoperative period^[1-5]. Graft dislodgment, prominent hardware or migration can result in chronic pressure on the esophagus, which leads to ischemic tissue breakdown^[4,6,7]. It has been reported that 50% of esophageal fistulas occur at C5-6 level instrumentation. At this anatomic landmark, known as Lannier’s triangle, the pharynx transitions to the esophagus and the posterior esophageal mucosa is extremely thin and covered only by fascia^[8-11].

Patients with delayed esophageal injury commonly present with surgical wound infection, odynophagia (pain

on swallowing) and dysphagia^[1,4,12,13]. When esophageal injury is suspected, contrast swallow studies may reveal extravasation of the contrast material and CT scan may demonstrate subcutaneous air. The patient in the current report had loose hardware, prior corpectomy and presented with food particles draining from an anterior cervical wound, which is pathognomonic for esophageal fistula.

Treatment strategies for esophageal perforation and fistula are debated (Table 1). The majority of

publications recommended surgical repair of esophageal injury due to the associated morbidity and mortality^[1,3,4,7,9,10,14-19]. However, some have reported successful conservative management^[20,21]. The key aspects of the treatment strategy include: Anterior hardware removal, posterior fusion for patients in whom primary fusion has not yet occurred, primary closure of the esophageal perforation, and intravenous antibiotics. The patient in the current report was treated with anterior hardware removal and revision interbody fusion with iliac crest tricortical autograft. Patient's prior multilevel laminectomy rendered the cervical spine unstable after anterior hardware removal. In the setting of esophageal perforation and active infection re-instrumentation of the anterior cervical spine was not possible. Commonly a posterior cervical instrumentation and fusion would be the approach considered. The patient presented in the current study had an increased risk of postoperative posterior cervical spine surgical wound infection related to the existing anterior wound infection and malnutrition. Furthermore, the previous multilevel wide posterior laminectomy would have made the posterior cervical approach challenging with increased risk of dural tear and spinal cord injury. Given those risks associated with a posterior approach in this patient, the authors opted to use a halo vest immobilization postoperatively for cervical stabilization in place of posterior instrumentation. The esophageal perforation and fistulous tract in this patient successfully resolved without attempted repair by two times daily wound irrigation through a rubber tubing and Penrose drain.

In conclusion, the current report shows that this complication can be successfully treated with open wound management. This highlights the value of wound management for such a rare complication that could be considered after failed surgical repair of esophageal injury.

COMMENTS

Case characteristics

A 67-year-old female patient presented with food particles draining from an anterior cervical wound. Patient had a history of two previous cervical spine surgeries; the first was a C4-6 posterior laminectomy without fusion, performed eight years prior current presentation. The second surgery was performed 4 mo prior to her admission to the authors' institution. It consisted of C4 and C5 partial corpectomy with insertion of a PEEK cage and C3-6 anterior cervical instrumentation.

Clinical diagnosis

Esophagus perforation with fistulization through the anterior surgical wound.

Laboratory diagnosis

Blood work showed normal white cell count 8000 (normal 4500-10000), decreased prealbumin 6.1 mg/dL (normal 17-34) and serum iron level 15 mcg/dL (normal 50-212) that confirmed malnutrition.

Imaging diagnosis

Plain radiograph demonstrated inferior screws pullout with plate migration.

Computed tomography (CT) scan showed subcutaneous air tracking along the neck soft tissues. Esophagram revealed ingested oral contrast tracking along the right subcutaneous tissues of the neck.

Treatment

Management included suspended oral intake, a nasogastric tube feeding, removal of anterior hardware, revision C4-5 corpectomy, iliac crest strut autograft and halo orthosis immobilization. The wound left opened and a 10-french gauge rubber tube was placed for daily irrigation. The patient was placed on ceftriaxone and flagyl for 6 wk.

Related reports

The majority of publications recommended surgical repair of esophageal injury due to the associated morbidity and mortality. However, some have reported successful conservative management.

Term explanation

Fifty percent of esophageal fistulas occur at C5-6 level instrumentation. At this anatomic landmark, known as Lannier's triangle, the pharynx transitions to the esophagus and the posterior esophageal mucosa is extremely thin and covered only by fascia.

Experiences and lessons

When esophageal injury is suspected, contrast swallow studies may reveal extravasation of the contrast material and CT scan may demonstrate subcutaneous air. The current report shows that this complication can be successfully treated with open wound management.

Peer-review

Text well written and easily comprehensible with clear figures.

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P- Reviewer: Lakhdar F, Leonardi M, Teli MGA **S- Editor:** Kong JX
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