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Intestinal anastomosis blowout following post-operative cardiopulmonary resuscitation: A case report

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ABSTRACT

Background: Pneumoperitoneum following cardiopulmonary resuscitation (CPR) is a very rare complication with a challenging management. In this paper we describe the management of a patient who suffered a blowout of his colorectal anastomosis after undergoing CPR for a cardiac arrest in the early post-operative period. Additionally, we present a thorough literature review of the management of CPR-related pneumoperitoneum.

Summary: Five days after a sigmoid resection for colon cancer, a 71-year-old male went into pulseless electrical activity and CPR was initiated, with complete clinical recovery. After CPR the patient was found to have new hydropneumothorax and pneumoperitoneum. Because he had a normal abdominal examination, lack of leukocytosis, and no evidence of a bowel perforation on water-soluble CT imaging, the patient was initially managed non-operatively with close clinical follow-up. However, he failed the non-operative management and ultimately required a laparotomy demonstrating a blowout of his colonic anastomosis. **Conclusion:** Physicians should remain aware of the risk of damage to fresh bowel anastomoses following CPR. There should be a low threshold for surgical exploration in patients that develop CPR-related pneumoperitoneum soon after intestinal surgery, even when patient's clinical status is stable.

Keywords: Pneumoperitoneum; Cardiopulmonary resuscitation; Bowel surgery; Anastomotic leak

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Introduction

While cardiopulmonary resuscitation (CPR) is a life-saving intervention, it can also result in unintended iatrogenic complications with an incidence of 21% to more than 65% [1]

The most common CPR-related injuries occur in the neck and chest and include rib and sternal fractures, cardiac contusions, hemopericardium, lung contusions, pneumothorax, and hemothorax [2].

CPR can also cause intra-abdominal injuries such as liver and spleen lacerations [3,4], gastric perforations [5], traumatic pancreatitis [6,7], and bowel perforation [2].

A review of the literature found that intestinal anastomosis blowout has not been previously described as a complication of CPR. In this article we report a patient who suffered a blowout of his colorectal anastomosis after undergoing CPR for a cardiac arrest in the early post-opera-

tive period. A review of the management of this rare but serious complication is also presented.

Case Description

A 71-year-old man diagnosed with sigmoid colon cancer underwent an uneventful open sigmoid resection, with creation of a new colorectal anastomosis using a 29-mm Curved Intraluminal Stapler (ETHICON™). Intraoperative provocative testing of the new anastomosis with air insufflation per rectum via a rigid proctoscope revealed no air leaks. On the first post-operative day, the patient developed breathing difficulties which progressed to respiratory failure requiring endotracheal intubation and ventilatory support on post-operative day 2. CT imaging two days after the surgery showed severe right-sided aspiration pneumonia, without any evidence of anastomotic leak (Figure 1). Patient was started on broad-spectrum antibiotics, and 48 hours later he was successfully extubated to room air.



Figure 1. Coronal CT scan two days after an open sigmoid resection showing postsurgical changes without evidence of anastomotic leak (arrow).

The patient was recovering well when, in the middle of post-operative night 5, he suffered a vasovagal cardiac arrest after standing up quickly from a laying down position to go to the restroom. He was witnessed to immediately fall to the ground, was found to have profound hypotension and bradycardia, and soon thereafter went into pulseless electrical activity (PEA).

Cardiopulmonary resuscitation (CPR) measures were immediately initiated, including endotracheal intubation, with return of spontaneous circulation (ROSC) after 8 minutes. Repeat CT imaging a few hours later showed new bilateral hydropneumothoraces, multiple bilateral rib fractures, and new intra-peritoneal air near the anastomosis and tracking into the soft tissues under

the midline laparotomy incision without extravasation of contrast (Figure 2). Ten hours after

CPR the patient was successfully extubated, and demonstrated a complete clinical recovery.



Figure 2. Axial CT scan after CPR showing new extraluminal air near the anastomosis and tracking into the soft tissues under the midline laparotomy incision (arrows).

Given his normal clinical status, absence of signs of peritonitis on physical examination, normal white count, and lack of contrast extravasation on abdominal CT imaging, the decision was made to observe the patient's intraperitoneal air without immediate surgical intervention. After 24 hours of clinical normality (afebrile and normotensive with normal heart rate and absence of abdominal pain or distension) and absence of leukocytosis, patient was found to have a small amount of feculent material present in the midline laparotomy wound. An anastomotic leak was suspected, and patient was taken emergently to the operation room for an abdominal exploration.

During surgery, the colorectal anastomosis was found completely disrupted, with the two ends disconnected, resulting in feculent contamination of the pelvis. The rectal end was closed with non-absorbable sutures and left as a blind limb (Hartmann's pouch). The colonic end was brought up as an end-colostomy. After the abdominal cavity was thoroughly irrigated, two closed drains were placed in the deep pelvis.

Subsequently, the patient had an uneventful recovery and was discharged to home after the drains were removed.

Discussion

Pneumoperitoneum following CPR is a rare complication with a challenging management. Based on mechanism, post-CPR pneumoperitoneum can be considered primary or secondary. Primary pneumoperitoneum after CPR results from perforations of the gastrointestinal tract, most commonly the esophagus and stomach [8]. During CPR, air can track from the esophagus to the stomach secondary to chest compressions or ventilation, increasing gastric pressure causing mucosal tears or, more rarely, perforation [9]. In most cases, perforations occur in the lesser curvature of the stomach near the gastro-esophageal junction. This area is the least elastic part of the stomach due to fewer mucosal folds and fixation by the gastro-hepatic ligament [5]. Although less common, CPR has also been reported to cause perforation of the gastrointestinal tract distal to the stomach, such as duodenum and colon [2, 10].

In our patient, it appears that post-CPR pneumoperitoneum resulted from a blowout of a fresh colonic anastomosis. To the best of our knowledge, this complication is the first reported case of its kind.

There are several possible explanations for this complication. It is possible that chest compressions and ventilation increased intraperitoneal and intra-luminal pressure, and mechanically disrupted a fresh bowel anastomosis. Perhaps reduced abdominal visceral perfusion during the PEA led to ischemia of the anastomosis with subsequent perforation. Another possibility is that an anastomotic leak caused the cardiac arrest and thus preceded the CPR. However, the patient's unremarkable clinical status prior to the syncopal episode, CPR, and the intra-operative finding of complete anastomotic separation favor a mechanical blowout of the colonic anastomosis from increased intra-colonic pressure.

CPR-related pneumoperitoneum can also be secondary to pneumothorax or pneumomediastinum causing an air leak that migrates to the abdomen through physiologic (e.g. foramen of Winslow) or iatrogenic diaphragmatic apertures [5, 11].

Given the difficulty to quickly differentiate between primary and secondary causes of pneumoperitoneum following CPR, management of post-CPR pneumoperitoneum can be challenging for physicians caring for these critically ill patients.

Although it might be tempting to proceed with immediate surgical exploration of the abdomen in patients with pneumoperitoneum following CPR, it is important to realize that about one third of laparotomies fail to demonstrate visceral perforation, even in the presence of massive pneumoperitoneum following CPR [12-14]. Furthermore, pneumoperitoneum without recognizable gastro-intestinal perforation was found on autopsy in several cases of patients who did not survive CPR [15-16].

Given low yield of exploratory laparotomy for patients with post-CPR pneumoperitoneum, it is crucial to avoid unnecessary surgery in these critically ill patients, as operative interventions

immediately after resuscitation are associated with potentially high morbidity and mortality.

As a result, different management algorithms have been shared to address this dilemma, and they are dependent on the patient's history and clinical stability.

If the patient with post-CPR pneumoperitoneum is hemodynamically stable, prompt imaging such as chest x-ray or abdominal x-ray, esophagogram, or CT of the neck, chest and abdomen with oral contrast can be pursued [17]. Further, a nasogastric tube (NG) can be diagnostically helpful and potentially therapeutic. Abdominal distention following CPR not relieved by an NG tube is highly suggestive of a pneumoperitoneum caused by esophageal or gastric perforation [18].

When available, esophagogastroduodenoscopy (EGD) and bronchoscopy should both be done in patients who have pneumoperitoneum after CPR, in order to diagnose esophageal, gastric, duodenal, or tracheobronchial injuries [19].

If the patient remains in a stable clinical condition without signs of peritonitis and imaging studies are negative, a non-operative approach can be pursued [16,19,20]. However, the patient should be closely followed, with serial physical examination and repeat complete blood counts to evaluate for developing peritonitis [16, 19].

Diagnostic peritoneal lavage (DPL) may be a reasonable alternative to surgical exploration in patients without signs of peritonitis and where investigative capabilities such as EGD or CT scan are not available [19]. DPL could also prove beneficial in potentially avoiding laparotomies when clinical examination of the abdomen is not reliable (such as in intoxicated or obtunded patients) [14]. However, it is important to understand that despite high negative predictive values of 97-98% [21] a negative DPL does not always rule out an intra-abdominal injury [16]

Exploratory laparotomy is always indicated if there are signs of peritonitis, even with normal investigative studies [16,19].

As outlined above, our patient developed hydropneumothorax and pneumoperitoneum after CPR. Because he had a normal abdominal

examination, lack of leukocytosis, and no evidence of a bowel perforation on water-soluble CT imaging, he was initially managed non-operatively with close clinical follow-up. However, he failed the non-operative pathway and ultimately required a laparotomy demonstrating a blowout of his colonic anastomosis.

Based on our experience with the failure of non-operative management in our post-surgical patient, we propose a lower threshold for surgical exploration in patients that develop CPR-related pneumoperitoneum soon after abdominal surgery, especially when a new bowel anastomosis is created.

Conclusion

Physicians should remain aware of the risk of damage to fresh bowel anastomoses following CPR. There should be a low threshold to return to the operating room when the patient develops CPR-related pneumoperitoneum soon after intestinal surgery, even when patient's clinical status is stable.

Lessons Learned

The management of pneumoperitoneum after CPR can be challenging for physicians caring for these critically ill patients. Surgical re-exploration would avoid delays in the treatment of patients that develop CPR-related pneumoperitoneum soon after intestinal surgery.

References

- [1] Sommers MS. Potential for injury: trauma after cardiopulmonary resuscitation. *Heart Lung*. 1991;20(3):287-293.
- [2] Beom JH, You JS, Kim MJ, et al. Investigation of complications secondary to chest compressions before and after the 2010 cardiopulmonary resuscitation guideline changes by using multi-detector computed tomography: a retrospective study. *Scand J Trauma Resusc Emerg Med*. 2017;25(1):8.
- [3] Meron G, Kurkciyan I, Sterz F, et al. Cardiopulmonary resuscitation-associated major liver injury. *Resuscitation*. 2007;75(3):445–453.
- [4] Lundqvist J, Jakobsson JG. Pulmonary emboli cardiac arrest with CPR complication: Liver laceration and massive abdominal bleed, a case report. *International Journal of Surgery Case Reports*. 2017;31: 24–26.
- [5] Spoormans I, Van Hoorenbeeck K, Balliu L, Jorens PG. Gastric perforation after cardiopulmonary resuscitation: Review of the literature. *Resuscitation*. 2010;81(3):272–280.
- [6] Aziz M. Traumatic Pancreatitis: A Rare Complication of Cardiopulmonary Resuscitation. *Cureus*. 2017;9:e1574.
- [7] Deras P, Manzanera J, Millet I, et al. Fatal pancreatic injury due to trauma after successful cardiopulmonary resuscitation with automatic mechanical chest compression. *Anesthesiology*. 2014;120(4):1038–1041.
- [8] Bernard SA, Jones BM, Scott WJ. Intra-abdominal complications following prolonged cardiopulmonary resuscitation. *Aust N Z J Surg*. 1993;63(4):312-314.
- [9] Koutserimpas C, Ioannidis A, Siaperas P, et al. Intra-Abdominal Hemorrhage following Cardiopulmonary Resuscitation: A Report of Two Cases. *Case Rep Emerg Med*. 2018;2018: 5243105-5243105.
- [10] Yamaguchi R, Makino Y, Chiba F, et al. Frequency and influencing factors of cardiopulmonary resuscitation-related injuries during implementation of the American Heart Association 2010 Guidelines: a retrospective study based on autopsy and postmortem computed tomography. *Int J Legal Med*. 2017;131(6):1655-1663.
- [11] Hartoko TJ, Demey HE, Rogiers PE, et al. Pneumoperitoneum — a rare complication of cardiopulmonary resuscitation. *Acta Anaesthesiologica Scandinavica*. 1991;35(3):235-237.
- [12] Atcheson SG, Peterson GV, Fred HL. Ill effects of cardiac resuscitation: Report of two unusual cases. *Chest* 1975;67:61.5-616.
- [13] Gordon HL. Walkup JL. Scrotal pneumotocele as an unusual sign of pneumoperitoneum: Report of a case and review of the literature. *J Urol* 1970;104:441-442.
- [14] Clinch SL, Thompson JS, Edney JA. Pneumoperitoneum after cardiopulmonary resuscitation: A therapeutic dilemma. *J Trauma* 1983; 23:428-430.
- [15] Gainant A, Gobeaux R, Renaudie J. Pneumoperitoneum secondary to cardiopulmonary resuscitation. *Presse Med* 1984;13:1845-1846.
- [16] Hargarten KM, Aprahamian C, Mateer J. Pneumoperitoneum as a complication of cardiopulmonary resuscitation. *Am J Emerg Med* 1988;6:358-361.
- [17] Keverian T, Bose S. Pneumoperitoneum after Cardiopulmonary Resuscitation. *Anesthesiology*. 2019;130(1):153-153.
- [18] Khan A, Merrett N, Selvendran S. Stomach perforation post cardiopulmonary resuscitation-A case report. *Int J Surg Case Rep*. 2017;40:43-46.

- [19] Milanchi S. Approach to pneumoperitoneum after cardiopulmonary resuscitation. *J Trauma*. 2006;61:1552–1553.
- [20] Offerman SR, Holmes JF, Wisner DH, Gastric rupture and massive pneumoperitoneum after bystander cardiopulmonary resuscitation, *J. Emerg.Med*. 2001;21:137–139.
- [21] Henneman PL, Marx JA, Moore EE, et al. Diagnostic peritoneal lavage: accuracy in predicting necessary laparotomy following blunt and penetrating trauma. *J Trauma*. 1990 Nov;30(11): 1345-55.

