ACS Case Reviews in Surgery
Vol. 3, No. 7

Not All Hemopericardium Requires Opening the Chest

AUTHORS:
Himmler A[a]; Galarza Armijos ME[b,c]; Salamea JC[b,d]; Puyana JC[e]; Cevallos Agurto C[b,c]

CORRESPONDING AUTHOR:
Amber Himmler, MD
Department of Surgery
MedStar Georgetown University Hospital
3800 Reservoir Road NW
Washington, DC 20007
Phone: (352) 870-2935
Email: amber.n.himmler@medstar.net

AUTHOR AFFILIATION:
a. Division of Surgery
MedStar Georgetown University Hospital
Washington, DC 20007/Washington Hospital Center, Washington, DC 20010

b. Division of Trauma and Acute Care Surgery
Hospital Vicente Corral Moscoso
Cuenca, Ecuador

c. Universidad de Cuenca
Cuenca, Ecuador

d. Universidad del Azuay, Cuenca, Ecuador

e. Division of Trauma and Surgery
University of Pittsburgh
Pittsburgh, PA 15213

Background	A patient presented with a positive focused assessment with sonography in trauma (FAST) on the pericardial window in the absence of hemodynamic instability following penetrating trauma to the chest.
Summary	A 19-year-old male presented after a stab wound to the cardiac box. An ultrasound on arrival demonstrated pericardial effusion concerning for hemopericardium. The patient was hemodynamically stable and was taken to the operating room for a subxiphoid pericardial window, where hemopericardium was evacuated after generous lavage with normal saline. The patient remained hemodynamically stable; therefore, a median sternotomy was not pursued. The patient continued to improve and was discharged home on postoperative day 1 after a repeat echocardiogram.
Conclusion	Penetrating cardiac injuries in select hemodynamically stable patients can be managed with subxiphoid pericardial window and lavage alone. Active bleeding after lavage is an indication for midline sternotomy.
Key Words	hemopericardium; penetrating cardiac injury; cardiac tamponade

DISCLOSURE STATEMENT:
The authors have no conflicts of interest to disclose.

FUNDING/SUPPORT:
The authors have no relevant financial relationships or in-kind support to disclose.

RECEIVED: August 17, 2020
REVISION RECEIVED: October 12, 2020
ACCEPTED FOR PUBLICATION: December 7, 2020

To Cite: Himmler A; Galarza Armijos ME; Salamea JC; Puyana JC; Cevallos Agurto C. Not All Hemopericardium Requires Opening the Chest. *ACS Case Reviews in Surgery*. 2022;3(7):30–33.

Case Description

Penetrating cardiac injury carries a high mortality, with some studies estimating that up to 90% of patients die before arriving at the hospital.[1] In-hospital mortality for these patients has been quoted as high as 61-65%.[2–4] The management of patients presenting with penetrating thoracic trauma and hemodynamic instability is unequivocally emergent surgery. However, several reports from busy centers with a high incidence of penetrating chest trauma have proposed the selective use of subxiphoid pericardial window and lavage in hemodynamically stable patients.[1,2,5–7]

We present the case of a 19-year-old male who suffered a single stab wound to the left anterior chest at the fourth intercostal space with moderate bleeding from the site of injury. His initial blood pressure (BP) was 120/65, heart rate (HR) of 53, respiratory rate (RR) of 30, oxygen saturation of 93%, temperature of 36.4°C, and Glasgow Coma Scale (GCS) of 15. Focused assessment with sonography for trauma (FAST) examination demonstrated pericardial effusion (22 mm thickness) (Figure 1). Admission hemoglobin was 14.6. Based on the FAST findings, the patient was taken to the operating room for a subxiphoid pericardial window (SPW). Several blood clots and approximately 50cc of serosanguinous fluid were evacuated (Figure 2). A number 12 Nelaton catheter was placed in the pericardial space, and lavage of the space with 2000 ml of warm normal saline was performed (Figure 3). After lavage, the returned fluid was clear. The incision was closed, and the patient was transferred to the recovery room in stable condition. A repeat echocardiogram on postoperative day 1 showed normal cardiac function, and the patient was discharged home that evening.

Figure 1. Preoperative Echocardiogram Demonstrating Pericardial Effusion (Indicated by *). Published with Permission

Figure 2. Blood Clots Removed From Pericardium. Published with Permission

Figure 3. Lavage of Pericardium Using No. 12 Nelaton Catheter and Warm Normal Saline. Published with Permission

Discussion

The gold standard for managing patients with suspected hemopericardium or those with equivocal studies is a diagnostic subxiphoid pericardial window. The finding of blood in the pericardium during the subxiphoid pericardial window is considered an absolute indication for sternotomy.[8] This paradigm was initially challenged by the group in South Africa, who found that in a group of 14 hemodynamically stable patients with penetrating cardiac trauma, ten patients had non-therapeutic sternotomies, as the cardiac injuries identified were AAST grade III or less.[6] This same group later published a randomized control trial finding that, in a group of 55 hemodynamically stable patients randomized to sternotomy over SPW and lavage, 51 patients had no cardiac wounds or tangential wounds, and four had wounds in the endocardium that had completely sealed.[2] A case series published by Isaza-Restrepo et al. in Bogota, Colombia noted that, in their population, lavage of the pericardial sac would have prevented sternotomy or thoracotomy in 8.4% of the reviewed cases.[1] Another study from a level I trauma center cited that 38% of patients with hemopericardium identified on the pericardial window had no identifiable or repaired cardiac or great vessel injury on sternotomy.[7]

During pericardial window and lavage, the process of irrigating the pericardial sac may dislodge a clot and perhaps exacerbate bleeding, alerting the surgeon to the presence of a significant wound that would not stop bleeding spontaneously, requiring that the chest be opened for suture repair. This particular scenario is characteristic of low velocity penetrating wounds rather than gunshot wounds. The only randomized control trial comparing hemodynamically stable penetrating cardiac injury managed with SPW and median sternotomy by Nicol et al. included penetrating traumas from stab wounds and gunshot wounds. However, the groups had only one gunshot randomized to each group, with the remaining patients being stab wound victims.[2] Following lavage of the pericardial sac, continued bleeding would be an indication for sternotomy. Though a drain was not left in this case, drain placement has been described.[9] Alternatively, we proceeded with a repeat echocardiogram on postoperative day 1 to demonstrate normal cardiac function and resolution of the pericardial effusion.

Opening the chest is necessary when these patients present with hemodynamic instability or when there is evidence of active bleeding that does not cease with lavage. It should be noted; however, that sternotomy is certainly not a benign procedure.[10,11] The incidence of complications in the cardiac surgery literature range from 0.75-3%.[9–11] Though no difference in the overall rate of complication was noted in the randomized control trial comparing sternotomy to SPW and lavage, no Clavien-Dindo grade 4 or 5 complications were found in the SPW and lavage group. The sternotomy group had one death related to an iatrogenic injury to the internal mammary artery leading to ischemic encephalopathy and one patient who developed sternal sepsis requiring debridement and pectoral flaps.[2] Another study cites iatrogenic pulmonary injury in a trauma patient undergoing a non-therapeutic sternotomy for a penetrating injury to the cardiac box.[7] Lower ICU and total length-of-stay was found to be statistically significantly lower in the drainage alone group compared to the sternotomy group in the study by Nicols et al.[2] Chestovich et al. described a trend to shorter ICU length of stay in the sternotomy group, but this did not reach statistical significance.[9]

It must be emphasized that the practice of lavage in the setting of a positive pericardial window does not currently represent the standard of care. Many results are from large trauma centers with experienced staff able to monitor these critical patients.[9] However, encouraging results from numerous studies are beginning to challenge the status quo.[2,5–7,9]

Conclusion

We describe one case of successful subxiphoid pericardial window and lavage in a patient presenting with a stab wound to the cardiac box. For this intervention, it is important that the appropriate patients, that is, those who are hemodynamically stable on presentation, be selected.

Lessons Learned

In select, hemodynamically stable patients with penetrating trauma to the cardiac box, there may be a role for subxiphoid window and lavage in lieu of opening the chest.

References

1. Isaza-Restrepo A, Bolívar-Sáenz DJ, Tarazona-Lara M, Tovar JR. Penetrating cardiac trauma: analysis of 240 cases from a hospital in Bogota, Colombia. *World J Emerg Surg*. 2017;12:26. Published 2017 Jun 12. doi:10.1186/s13017-017-0138-1
2. Nicol AJ, Navsaria PH, Hommes M, Ball CG, Edu S, Kahn D. Sternotomy or drainage for a hemopericardium after penetrating trauma: a randomized controlled trial. *Ann Surg*. 2014;259(3):438-442. doi:10.1097/SLA.0b013e31829069a1
3. Buckman RF Jr, Badellino MM, Mauro LH, et al. Penetrating cardiac wounds: prospective study of factors influencing initial resuscitation. *J Trauma*. 1993;34(5):717-727. doi:10.1097/00005373-199305000-00015
4. Asensio JA, Murray J, Demetriades D, et al. Penetrating cardiac injuries: a prospective study of variables predicting outcomes. *J Am Coll Surg*. 1998;186(1):24-34. doi:10.1016/s1072-7515(97)00144-0
5. Huang YK, Lu MS, Liu KS, et al. Traumatic pericardial effusion: impact of diagnostic and surgical approaches. *Resuscitation*. 2010;81(12):1682-1686. doi:10.1016/j.resuscitation.2010.06.026
6. Navsaria PH, Nicol AJ. Haemopericardium in stable patients after penetrating injury: is subxiphoid pericardial window and drainage enough? A prospective study. *Injury*. 2005;36(6):745-750. doi:10.1016/j.injury.2004.08.005
7. Thorson CM, Namias N, Van Haren RM, et al. Does hemopericardium after chest trauma mandate sternotomy?. *J Trauma Acute Care Surg*. 2012;72(6):1518-1525. doi:10.1097/TA.0b013e318254306e
8. Karmy-Jones R, Namias N, Coimbra R, et al. Western Trauma Association critical decisions in trauma: penetrating chest trauma. *J Trauma Acute Care Surg*. 2014;77(6):994-1002. doi:10.1097/TA.0000000000000426
9. Chestovich PJ, McNicoll CF, Fraser DR, et al. Selective use of pericardial window and drainage as sole treatment for hemopericardium from penetrating chest trauma. *Trauma Surg Acute Care Open*. 2018;3(1):e000187. Published 2018 Aug 30. doi:10.1136/tsaco-2018-000187
10. Heilmann C, Stahl R, Schneider C, et al. Wound complications after median sternotomy: a single-centre study. *Interact Cardiovasc Thorac Surg*. 2013;16(5):643-648. doi:10.1093/icvts/ivs554
11. Ståhle E, Tammelin A, Bergström R, Hambreus A, Nyström SO, Hansson HE. Sternal wound complications--incidence, microbiology and risk factors. *Eur J Cardiothorac Surg*. 1997;11(6):1146-1153. doi:10.1016/s1010-7940(97)01210-4