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Incidence and Management of Hemopericardium: Impact of Changing Trends in Invasive Cardiology

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Abstract

Objective: As invasive cardiovascular care has become increasingly complex, cardiac perforation leading to hemopericardium is a progressively prevalent complication. We sought to assess the frequency, etiology, and outcomes of hemorrhagic pericardial effusions managed through a nonsurgical echo-guided percutaneous strategy.

Patients and Methods: Over a 10-year period (January 1, 2007, to December 31, 2016), 1097 unique patients required pericardiocentesis for clinically important pericardial effusions. Of these 411 had drainage of hemorrhagic effusions (defined as a pericardial hemoglobin level >50% of serum hemoglobin or frank blood in the setting of cardiac perforation). Clinical characteristics, echocardiographic data, details of the procedure, and outcomes were determined.

Results: Median patient age was 67 years (interquartile range, 56-76 years), and 60% were men. The procedure was emergent in 83% and elective in 17%. The site of pericardiocentesis was determined by echo-guidance in all: 68% from the left para-apical region, 18% from the left or right parasternal areas, and 14% were subxyphoid. Half (n=215 [52%]) occurred after cardiac perforation with percutaneous interventional procedure (ablation, n=94; device lead implantation, n=65; percutaneous coronary intervention, n=22; other, n=34), whereas 30% followed cardiac or thoracic surgery. Pericardial fluid volume drained was 546±440 mL. In 94% of cases, echo-guided pericardiocentesis was the only treatment of the effusion needed, whereas definitive surgery was required in 25 (6%) cases for persistent bleeding or acute management of the underlying etiology. There was no procedural mortality. Late mortality was better for hemorrhagic effusions compared with a contemporary cohort with nonhemorrhagic effusions.

Conclusion: Echocardiographic guidance allows rapid successful pericardiocentesis in the setting of hemopericardium related to microperforation with interventional procedures, malignancy, or pericarditis, with most not requiring surgical intervention. Surgery should remain the first-line approach for aortic dissection or myocardial rupture.

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Small historical studies suggested that hemorrhagic effusions accounted for up to 50% of the pericardiocenteses performed.[1-3] However, as the practice of interventional cardiovascular care continues to evolve, the complexity of cases and available procedural technology is increasing. These procedures are not devoid of associated risks, including cardiac perforation where the myocardial or coronary artery architecture is disrupted, resulting in blood entering the pericardial space.[3-12] Hemopericardium may also occur in the setting of recent cardiovascular surgery.[1-3,13] Rarely, hemopericardium develops as a complication of acute aortic dissection or myocardial rupture after a myocardial infarction.

When hemopericardium develops, 3 treatment options exist: (1) observation, (2) pericardiocentesis, or (3) cardiovascular surgery. Echo-guided pericardiocentesis, first described in 1983,[14] is minimally invasive,

and can be performed rapidly in a controlled environment with conscious sedation. Given the increase in the interventional practice, we sought to evaluate the safety of pericardiocentesis in the setting of hemopericardium in contemporary clinical practice. We hypothesized that most hemopericardium cases may be safely managed nonoperatively with echo-guided pericardiocentesis.

PATIENTS AND METHODS

We analyzed all consecutive unique adult patients (≥18 years) who underwent echocardiography-guided pericardiocentesis at Mayo Clinic, Rochester, over the last 10 years (January 1, 2007, to December 31, 2016). For the purposes of comparison with historical cohorts,[1] where the grouping was based on the visual appearance of the effusion, the coding of the description of the appearance of the fluid by the echocardiographer at the time of centesis was used (Figure 1). Operators coded the fluid as appearing bloody, serosanguinous, serous, or other. Because the article by Tsang et al had reported 3 distinct 7-year time periods, the current data were restricted to the most recent 7-year period (2010 through end of 2016) to allow direct comparison.[1] Otherwise the focus of this study was those patients with confirmed hemopericardium, rather than the visual appearance of the fluid and assessed over a 10-year span. Hemopericardium was defined as either (1) pericardial hemoglobin (Hgb) more than 50% of the circulating Hgb or (2) in cases of emergent echo-guided pericardiocentesis with frank blood return during or after a percutaneous cardiac interventional procedure. Patients with nonhemorrhagic pericardial effusions (ie, serous, serosanguineous [pericardial Hgb <50% of peripheral Hgb], or purulent) were analyzed separately. Data regarding echo-guided pericardiocentesis were retrieved from a prospectively recorded electronic database and supplemented by retrospective chart review. For outcomes analysis, surviving patients were censored at 5 years. The study was approved by the Mayo Clinic Institutional Review Board (institutional review board 12-00214). All patients provided informed consent for use of medical data for research purposes.

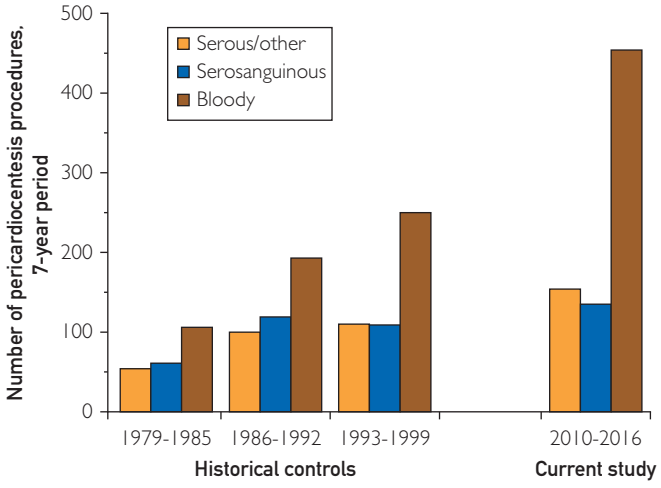

FIGURE 1. Temporal trends in pericardiocentesis. Compared with institutional historical data,[1] there has been a significant rise in the need for pericardiocentesis over the past 3 decades, with the difference related predominantly to a major rise in the incidence of hemorrhagic pericardial effusions.

Echo-Guided Pericardiocentesis

Patients who underwent pericardiocentesis did so in accordance with a standard protocol that includes continuous monitoring (electrocardiogram, blood pressure, respiratory rate, oxygen saturation) in the semirecumbent position under moderate conscious sedation.[1,15] A proportion of studies were performed emergently in the interventional procedural area (eg, catheterization or pacemaker laboratory) by a member of the same echo specialist group with similar equipment and a similar echocardiographic-guided approach. The site and angle of entry were selected on the basis of transthoracic findings (largest fluid pocket, closest distance to the skin, furthest distance from the heart).[15] After sterile skin preparation, initial pericardial access was obtained with a 4.5-cm or 8.3-cm 16-gauge AngioCath. After echocardiographic confirmation of appropriate position with agitated saline injection, a 0.038-mm polytef-coated, floppy-tipped guidewire was advanced into the pericardial space with a modified Seldinger technique. The AngioCath was exchanged with a 6F introducer sheath, and a 5F standard pigtail angiocatheter was then advanced into the pericardial space through the sheath. The effusion was drained in its entirety. In patients who required emergent pericardiocentesis with large-volume