Echocardiography-Guided Pericardiocentesis for Effusions in Patients With Cancer Revisited*

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Echocardiography-guided pericardiocentesis was developed in the late 1970s with the introduction of 2-dimensional echocardiographic technology (1). This now widely used technique (1,2), pioneered by Dr. James Seward and colleagues at the Mayo Clinic, evolved with clinical testing over time in the Mayo echocardiography laboratory. The technique of echocardiography-guided pericardiocentesis, refined over a period of >20 years at the Mayo Clinic (3), involves the use of 2-dimensional echocardiography to guide the selection of the best window and trajectory for needle entry. The technique emphasizes identifying the entry site closest to the body surface and attaining maximal fluid collection (1). The safety and efficacy of the technique were established in the largest series from the Mayo Clinic, which included 1,127 consecutive procedures over 21 years (3). Patient outcomes were also differentially evaluated and described for patients with idiopathic effusions (4), in those with post-operative effusions (5), in rescue situations when tamponade occurs during coronary intervention and electrophysiological studies (6), in pediatric cases (7), in outpatient series (8), and in the largest series of malignant pericardial effusions (9). The American Society of Echocardiography endorsed the Seward technique as the standard for echocardiography-guided pericardiocentesis in its guidelines for echocardiography-guided interventions (2).

PERICARDIOCENTESIS IN PATIENTS WITH CANCER

Echocardiography-guided pericardiocentesis with extended catheter drainage was concluded to be safe and effective for both primary and secondary management of pericardial effusion in patients with malignancy, on the basis of 341 procedures in 275 patients with cancer (9). Fifteen years later, the safety and efficacy of percutaneous pericardiocentesis technique have been reconfirmed in a large population of patients with cancer at the MD Anderson Cancer Center. In this issue of the Journal, El Haddad et al. (10) report their assessment of the outcomes of 212 patients with cancer undergoing percutaneous pericardiocentesis. They conclude, consistent with previous results, that the procedure is safe and efficacious in this population. They reconfirm that extended catheter drainage reduces recurrence rates, as demonstrated in the Mayo series (3). The data regarding the safety of the procedure in patients with platelet counts greater than or less than 50,000/μl are new. The investigators conclude that the procedure is safe even in patients with low platelet counts.

Caution is warranted regarding this conclusion, however, as the patients in the study were transfused with platelets pre-pericardiocentesis if their platelet counts were <50,000/μl. Therefore, platelet counts of <50,000/μl should not be considered prohibitive if transfusion can be done prior to pericardiocentesis. It must also be kept in mind that many of these patients not only had low platelet counts, but their platelet function may have been compromised by chemotherapy or by concomitant therapies. Many pericardial effusions in patients with cancer develop

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over time. These patients do not always present in critical hemodynamic compromise that calls for immediate pericardiocentesis. Guidelines have been established on the basis of a meta-analysis of clinical trials of platelet transfusion for different procedures (11). For minimally or moderately invasive procedures, the threshold for platelet transfusion differs. Consideration of platelet transfusion is necessary if the clinical scenario permits prophylactic transfusion and the balance of risks and benefits for the particular case warrants it. There may be situations of severe hemodynamic instability in which expedient action is lifesaving. It is generally agreed that platelet counts <20,000/µl are critically low, making any invasive procedures unsafe without platelet transfusion.

In the Mayo series, the optimal entry site was located on the chest wall in 79% of cases, with the vast majority of these being para-apical approaches; a few were parasternal, axillary, or posterolateral (3), and only 18% of cases involved a subcostal approach. This contrasts substantially with the distribution of site selection in the MD Anderson Cancer Center series (10), in which 63% of the procedures used subxiphoid entry. In the Mayo series, the experience was that the distance to the heart from the surface was longer from the subxiphoid window for most patients, and the liver was often in the path. In the present series, the investigators classified the needle entry site as intercostal or subxiphoid only. The distribution of intercostal sites was not further elaborated. In both series, extended catheter drainage was associated with significantly lower recurrence rates. It is possible that the irritant effects of the pigtail catheter contribute to adhesive obliteration of the pericardial space and apposition of parietal and visceral pericardium.

PROGNOSIS OF PATIENTS WITH CANCER WITH PERICARDIAL EFFUSIONS

It is clear from the MD Anderson Cancer Center (10) and Mayo Clinic (9) malignant effusion series that as a group, these patients with cancer have an exceedingly poor prognosis. The median survival time was 143 days in the Anderson series and 135 days in the Mayo series. In both series, bronchogenic malignancies and effusions positive for malignant cells were correlates of poorer survival. Given the poor prognosis, the less invasive percutaneous echocardiography-guided pericardiocentesis, as opposed to surgical intervention, would be preferable for most of these patients. The Anderson series suggests catheter drainage over 3 to 5 days, which provides a reasonable compromise between more complete drainage and increased risk for infection. There was no infection related to the pigtail catheter in the Mayo series. The recommendation was to leave the catheter in until <25 to 30 ml of fluid over 24 h is achieved (3).

CONTEMPORARY UNDERSTANDING AND FUTURE RESEARCH EFFORTS

Although the technique and science of noninvasive echocardiography-guided pericardiocentesis have advanced over time, and safety and efficacy have been established in large series, debates continue with regard to whether the gold standard for treating malignant effusions should be nonsurgical or surgical (12). Jama et al. (12) concluded in 2014, on the basis of their review of the published research, that surgical drainage is superior to nonsurgical approaches for symptomatic relief, effusion recurrence, and morbidity, but their review did not include the Mayo series of malignant effusions treated with echocardiography-guided pericardial effusion (9) and, of course, could not have included this new series from the MD Anderson Cancer Center (10). There is no doubt that there are situations in which surgical approaches are the only meaningful solutions. For instance, echocardiographically-guided pericardiocentesis may be unsafe, ineffectve, or technically inaccessible for some loculated effusions, especially posteriorly loculated ones. There may also be patients in whom fluid accumulation is recurrent despite extended catheter drainage, in which case the surgical approach may become necessary. In patients with tamponade from malignant effusions in whom the prognosis is poor, a sensible decision regarding echocardiography-guided pericardiocentesis versus surgical management can usually be made on the basis of the clinical status and prognosis of the patient, echocardiographic findings in terms of effusion size and location, and the feasibility and safety of the percutaneous versus the surgical approach.

Data are sparse in terms of best management practices for patients with less than large pericardial effusions and without evidence of tamponade. Two-dimensional and Doppler echocardiography can define a spectrum of effusion hemodynamic parameters, from gross tamponade with chamber collapse and swinging heart to more subtle states of raised intrapericardial pressure with only early Doppler findings of hemodynamic significance or no definite evidence for any raised intrapericardial pressures. The point at which intervention is necessary remains contentious. The individualized decision comes down to a balance of risk and benefit to a specific patient.
The majority of pericardial effusions in patients with malignancies have accumulated over time, and patients usually do not present in dire, hemodynamically unstable states. For pericardial effusions related to pericarditis without tamponade, anti-inflammatory therapies, including nonsteroidal anti-inflammatory drugs and colchicine, have been used for medical management. Data regarding medical management or drug therapy for malignant effusions are practically nonexistent. Further research is warranted.

In summary, echocardiography-guided pericardiocentesis with extended catheter drainage has stood the test of time in terms of safety and efficacy. On the basis of the totality of evidence, and our knowledge, minimally invasive echocardiography-guided pericardiocentesis with extended catheter drainage should be considered the treatment of choice for most patients with cancer, and surgical options should be reserved for effusions with anatomy that is not amenable to such an approach or for patients in whom effusions recur despite adequate catheter drainage.

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