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Original research article

Pericardiocentesis guided by echocardiography performed in echocardiography laboratory – Safety profile of the single center prospective registry

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ARTICLE INFO

Article history:
Received 20 February 2015
Received in revised form
30 June 2015
Accepted 1 July 2015

Keywords:
Pericardial effusion
Pericardial tamponade
Complications of pericardiocentesis

ABSTRACT

Introduction: Pericardiocentesis is an invasive procedure for treatment of large pericardial effusion or cardiac tamponade and for diagnostics of pericardial effusion of unknown origin. Fluoroscopy navigation has been the preferred method during the past decades. Nevertheless, new imaging methods such as echocardiography emerged as an alternative guiding method for pericardiocentesis. These methods may improve safety of the procedure.

Methods: All consecutive pericardiocenteses performed in noninvasive cardiology department of a tertiary cardiovascular center during the period between 1998 and 2012 were prospectively recorded. We focused on the procedural safety and procedural success rate.

Results: During a 15-year period, 253 pericardiocenteses were performed in 185 patients. Most of the procedures (240 cases) were performed under echocardiographic control in our noninvasive cardiology laboratory under strictly sterile conditions and with equipment for cardiopulmonary resuscitation on site. Etiology of effusion was heart transplantation in 38 patients (25%), postoperative in 20 patients (14%), infective pericarditis in 25 patients (16%), malignancy in 18 patients (12%), and invasive procedures in 19 patients (8%). Apical approach was the most frequent in 218 patients (92%), parasternal in 13 patients (5%) and subxiphoideal in 7 patients (3%). The procedural success rate was 97% overall, with a total complication rate of 3% (2 major complications (0.3%); 7 minor complications (2.7%)). Minor complications included 2 cases of small pneumothorax, 2 cases of pericardial fluid drainage into pleural space, 2 cases of transient right chamber entries, and in 1 case the procedure was complicated by hemopericardium without the need for surgical management. Major complications included 2 cases due to ventricular perforation, one with left ventricule wall laceration in a loculated effusion and one complication due to right ventricular laceration, both resulting in hemopericardium and requiring emergency surgical repair.

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http://dx.doi.org/10.1016/j.crvasa.2015.07.001

Conclusion: Echocardiography-guided pericardiocentesis performed by echocardiologists in noninvasive cardiology department under strictly sterile conditions and with equipment for cardiopulmonary resuscitation is a safe procedure with infrequent complications. Apical entry site is safe and the dominant approach for pericardiocentesis under echocardiographic navigation.

Introduction

Pericardial effusion is defined as a presence of abnormal accumulation of fluid in the pericardial cavity either as an incidental finding or a manifestation of cardiac as well as systemic disease. Cardiac tamponade is a clinical syndrome resulting from increase of pericardial pressure, and chamber compression leading to hemodynamic compromise [1]. The clinical presentation of pericardial effusion depends on the speed of pericardial fluid accumulation and pericardial compliance. In slowly accumulated pericardial fluid, as in chronic cardiac or systemic disease, the pericardium stretches allowing accumulation of significant amount of pericardial fluid, till 1.5–2 L, without the manifestation of cardiac tamponade [2–4]. Pericardial tamponade is a life-threatening medical emergency with serous hemodynamic impact including shock, and death, which requires urgent management. Pericardiocentesis is an invasive procedure for treatment of large pericardial effusion or cardiac tamponade and for diagnostic purposes. Blind pericardial aspiration via a subxiphoid approach is advisable only as an emergency procedure as it may be associated by high complication rate with recorded mortality and morbidity rates of 6% [5,6]. Fluoroscopy navigation has been the preferred method during the past decades. Currently, 2-dimensional echo-guided pericardiocentesis appears to be an alternative technique for guidance of pericardiocentesis [6–10].

Methods

We evaluated our single center experience with echocardiographically guided pericardiocentesis performed in noninvasive cardiology department. All pericardiocenteses guided by 2-dimensional echocardiography performed in our noninvasive cardiology department were prospectively recorded in the period between 1998 and 2012. The main focus was on efficacy and safety of the procedure with evaluation of procedural complications.

Echocardiographic evaluation

All pericardiocenteses were performed by 15 participating echocardiologists under strictly sterile conditions and with equipment for cardiopulmonary resuscitation on site. All procedures were guided by echocardiography; no fluoroscopy for navigation was used. Standard 2-dimensional echocardiographic images with commercially available equipment were obtained (Image point – Hewlett Packard, Accuson Soquoia 512, Vivid i, Vivid 5, Vivid 7 – General Electric). Right atrial systolic collapse (>1/3 of systole duration), diastolic chamber compression or collapse of right ventricle, inferior vena cava plethora (inspiratory decrease of diameter by <50%) [11], and respiratory variation of mitral and tricuspid inflow velocities were used to evaluate the hemodynamic impact of pericardial effusion [11–16]. Mitral and tricuspid valve velocities were obtained by using PW Doppler ultrasound by placing the sample volume on the tip of the leaflets to record antegrade flow. The cut-off value of >25% was considered as sign of hemodynamically significant pericardial effusion [15].

Pericardiocentesis

The location, distribution, and the ideal entry site were determined first by echocardiography [17]. After local infiltration with lidocaine, a needle (16–18 gauge) was introduced and by reaching the pericardial fluid a guidewire was inserted into the pericardium. After dilation of the puncture site with a dilator, the catheter was then inserted and the guidewire withdrawn. Drainage was performed by large volume syringe until the pericardial sac was nearly emptied. In some patients the pericardial catheter was left for complete drainage and was removed once the amount of fluid drained was <30 ml/24 h and follow-up echocardiography showed no significant residual effusion. Pericardiocentesis was considered successful if the pericardial fluid was drained with relief of symptoms of tamponade. Minor complication is an event requiring noninvasive monitoring only. Major complication is considered as an undesirable event occurring as a result of pericardiocentesis that required invasive intervention such as need for emergency surgery or pleural drainage. Procedural complications were evaluated till hospital discharge. Patients on anticoagulation therapy on admission with hemodynamic stability were managed after the decrease of INR <2.

Definitions

Large pericardial effusion was defined as echocardiographically free space of >10 mm [18]. Recurrence was defined as any accumulation of fluid within 21 days requiring repetition of pericardiocentesis. Large symptomatic effusions including those with hemodynamic collapse were considered as clinically significant; effusions with hemodynamic collapse were accompanied by hypotension (<90 mmHg) and/or requiring vasopressors. Emergent pericardiocentesis was a procedure performed in patients with hemodynamic collapse immediately after echocardiographic diagnosis in the emergency department,