

Incidence and significance of adhesions encountered during epicardial mapping and ablation of ventricular tachycardia in patients with no history of prior cardiac surgery or pericarditis

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BACKGROUND Pericardial adhesions can prevent epicardial access and restrict catheter movement during mapping and ablation of ventricular tachycardia (VT). The incidence of adhesions in patients without prior cardiac surgery or clinically evident pericarditis is not known.

OBJECTIVE To describe the incidence of pericardial adhesions and explore their impact in patients without prior cardiac surgery or pericarditis.

METHODS A retrospective search of our ablation database containing patients who underwent epicardial ablation for VT was undertaken. Adhesions were diagnosed with routine contrast pericardiography after pericardial entry. Demographics and long-term outcomes were compared between patients with and without adhesions.

RESULTS Between 2004 and 2016, successful epicardial entry was achieved in 188 of 192 attempts (98%). In 155 first-time epicardial access attempts, pericardial adhesions were diagnosed in 13 (8%). When comparing baseline demographics, there was no significant difference. However, adhesions tended to occur more frequently

with severe renal impairment (2% of patients without adhesions vs 15% of patients with adhesions, $P = .07$). No patient with a structurally normal heart had adhesions present. Adhesions were associated with limited epicardial mapping (3% of patients without adhesions vs 85% of patients with adhesions, $P < .001$) and lower short-term procedural success (68% of patients without adhesions vs 46% of patients with adhesions, $P = .02$), but complication rates were similar. The presence of adhesions did not translate into lower VT-free survival ($P = .64$) or freedom from a combined end point of VT recurrence, death, or transplant at 1 year ($P = .93$).

CONCLUSION Adhesions may be unexpectedly encountered in patients without prior cardiac surgery or pericarditis. When present, they can limit mapping and may be associated with lower short-term success. Larger studies are required to determine their impact on long-term outcomes.

KEYWORDS Ablation; Adhesions; Epicardial; Pericardial; Ventricular tachycardia

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Introduction

Catheter ablation has been shown to be effective for the treatment of ventricular arrhythmias.^{1,2} However, long-term success from these procedures remains modest.³ Percutaneous epicardial access, as described by Sosa and colleagues,⁴ has improved our ability to treat patients when endocardial ablation has failed because of a predominantly epicardial substrate. Epicardial access can be achieved in most patients, and catheters can usually be maneuvered without restriction.⁵

However, the presence of pericardial adhesions, usually attributed to prior pericarditis or cardiac surgery, can interfere with catheter movement in the epicardial space.⁶ Whereas adhesions after cardiac surgery are nearly a universal finding, the incidence and impact of adhesions in patients undergoing a first epicardial procedure with no prior clinically evident pericarditis or prior cardiac surgery is not known. Further, little is known about the risk of pericardial adhesions after previous epicardial mapping and whether factors such as use of pericardial contrast injection or pericardial bleeding during the index case affect the likelihood of successful repeat epicardial access. Therefore, the aim of this study was to identify the incidence of adhesions in patients without prior pericarditis or cardiac surgery who were undergoing first-time and repeat epicardial procedures and to evaluate their effect on short-term and long-term outcomes.

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Methods

Patient population

The participants in this study comprised consecutive patients of age >18 years who underwent catheter ablation of ventricular tachycardia (VT) via percutaneous epicardial access. Exclusion criteria were documented prior cardiac surgery or those with a prior history of clinical pericarditis. The etiology of structural heart disease was established according to conventional diagnostic criteria, and patients were imaged preprocedurally with cardiac magnetic resonance imaging or transthoracic echocardiography or both. Where possible, antiarrhythmic drug therapy was withdrawn 5 half-lives prior to the procedure except in those patients on amiodarone. The study was approved by an institutional review board.

Epicardial access technique and identification of adhesions

The decision to perform epicardial access was based on one of the following: electrocardiogram of the clinical tachycardia suggestive of an epicardial origin, preprocedure imaging or cardiac etiology suggestive of epicardial substrate, prior failed endocardial ablation procedure, or “no entry” left ventricle (LV) (eg, LV thrombus). All information regarding epicardial puncture, the presence of adhesions, and impact of adhesions on mapping were documented in detail in the procedure reports.

Access to the pericardium was usually obtained prior to the administration of systemic anticoagulation in accordance with institutional protocol.⁵ The right anterior oblique projection was used to direct access in the anterior/posterior plane, and the left anterior oblique was used to direct the needle (17-gauge Tuohy) leftward tangentially to the cardiac silhouette. After pericardial entry, a guidewire was advanced to the left heart border in the left anterior oblique projection, and 10 mL of contrast was injected into the pericardial space through a soft-tip 5F dilator to allow for visualization of adhesions

(Figure 1 and Video 1). An initial aspirate through the 5F dilator was performed for early detection of pericardial bleeding.

We defined a failed access as failure of entry into the pericardium sufficient to enable contrast injection into the pericardial space. The presence of adhesions was diagnosed by any of the following: failure to advance the wire freely in the pericardial space, appearance of nonuniform contrast pooling, or resistance to catheter movement during mapping. In cases where dense adhesions at the access site prevented sheath insertion, discretionary attempts were made to enter the pericardium at an alternative site either during the same procedure, or at a later date if trauma from the initial attempts was considered problematic (Figure 2 and Video 2). The locations of adhesions were documented from retrospective review of biplane fluoroscopic images.

A SL-0 sheath (St Jude Medical, St Paul, MN) or a bidirectional steerable sheath (Agilis, St Jude Medical, St Paul, MN) was then inserted into the pericardial space. Whenever an ablation catheter was not present in the sheath, an alternative mapping or angiographic catheter (Berman wedge) was always placed inside the sheath to avoid trauma from an exposed sheath tip. In most cases, the pericardium was double-wired to retain pericardial access in the event of inadvertent loss of the primary access.

At the conclusion of the procedure, any fluid present was withdrawn from the pericardial space, verified by intracardiac echocardiography, and 250 mg methylprednisolone was instilled. If >20 mL of blood was aspirated, a pigtail drain was retained overnight. All patients underwent transthoracic echocardiography prior to pericardial drain removal.

Mapping and ablation

Our strategy for ablation of scar-mediated VT at our center has been previously reported.⁷ Epicardial mapping was usually undertaken at the start of the procedure to minimize

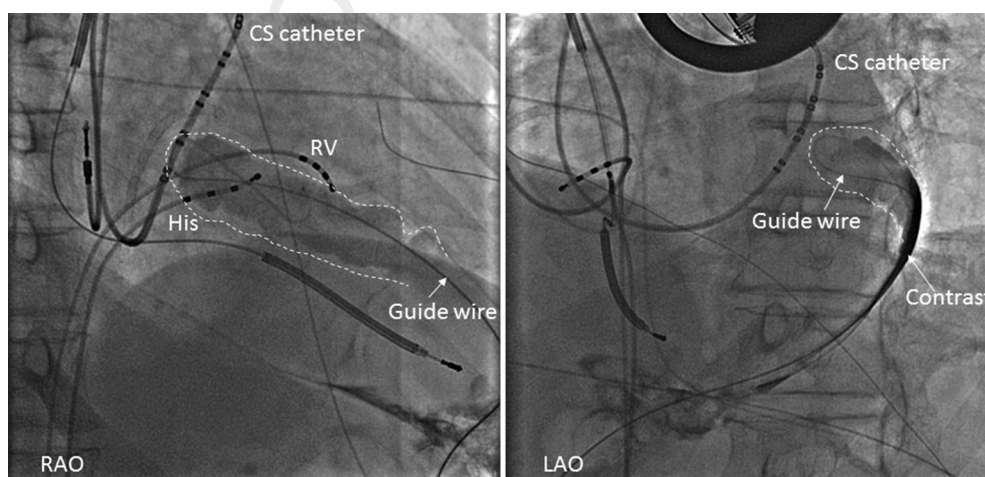


Figure 1 Visualization of adhesions on biplane fluoroscopy after contrast pericardiography. The J-tipped guide wire can be seen to buckle in the presence of adhesions, which are highlighted by contrast pooling (dashed line). CS = coronary sinus; His = His catheter; LAO = left anterior oblique; Quad = quadripolar catheter; RAO = right anterior oblique.

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