Received: 17 March 2019 | Revised: 17 April 2019 | Accepted: 16 May 2019

DOI: 10.1002/ccd.28356

ORIGINAL STUDIES

WILEY

Case report and systematic review of iatrogenic left atrial dissection in different cardiovascular specialties: A common treatment for an uncommon complication?

Alberto Francesco Cereda MD[1] | Fabio De Luca MD[2] | Alberto M. Lanzone MD[3] | Marzia Cottini MD[4] | Luca Pastori MD[3] | Giuseppe Sangiorgi MD, FESC, FSCAI[3,5]

[1]Cardiovascular Department, Papa Giovanni XXIII Hospital, Bergamo, Italy

[2]Department of Cardiothoracic Surgery, Humanitas Gavazzeni Hospital, Bergamo, Italy

[3]Cardiac Cath Laboratory, Humanitas Gavazzeni Hospital, Bergamo, Italy

[4]Department of Cardiac Surgery and Heart Transplantation, De Gasperis Center, Niguarda Hospital, Milan, Italy

[5]Department of Systemic Medicine, Division of Cardiology, University of Rome Tor Vergata, Rome, Italy

Correspondence
Alberto Francesco Cereda, MD, ASST PG-23, Piazza OMS, 1, 24127 Bergamo, Italy.
Email: alberto.cereda@email.it

Abstract

Objectives: Left atrial dissection (LatD) is a rare and heterogeneous condition affecting many cardiovascular areas. The present article, by the means of personal case report illustration and systemic review of different clinical management, is aimed to give to clinicians further knowledge on this controversial topic.

Background: LatD is an exceedingly rare but potentially fatal complication of cardiac surgery or catheter-based interventional procedures. Most of the cases are iatrogenic and its incidence is expected to grow due to an increase in the number of percutaneous coronary intervention and structural heart disease procedures. The management of this complication is controversial, and it may depend on related etiologies.

Methods: We have reported our single-case experience and review of the scientific literature, focusing on the decision-making process and the strategical approach by multimodality imaging techniques.

Results: Our case of LatD with initial hemodynamic instability was surgically treated. Conservative approach is often employed in literature despite the fact that conservative versus surgical approach is debatable, depending on clinical presentation, hemodynamic stability, multimodal imaging findings, and personal experience of the center.

Conclusions: According to systematic literature review, a watchful-waiting strategy supported by multimodality imaging could be a safe and effective management in stable LatD.

KEYWORDS

atrial imaging, iatrogenic complication, left atrial dissection, left atrial hematoma

1 | INTRODUCTION

Left atrial dissection (LatD) is a separation of atrial layers characterized by an endocardial flap between the mitral valve area and left atrium (LA) free wall or interatrial septum. This false blood-filled cavity can determine obliteration of the atrial cavity with hemodynamic instability secondary to mitral valve inflow and/or pulmonary vein outflow obstruction. Expansion of the atrial dissection depends on the pressurized inflow of blood (entry side) and left atrial communication (exit site) with unpredictable clinical evolution and outcomes.[1]

In the past, LatD was considered a complication mainly related to cardiac surgery but in the last decade, the number of cases reported has increased alongside the rise of complex percutaneous and structural

Abbreviations: CCS, Canadian Cardiovascular Society Angina Score; CMR, cardiac magnetic resonance; CT, computed tomography; CTO, chronic total occlusion; PCI, percutaneous coronary intervention.

interventions and catheter ablation procedures. Surgical cases are mainly related to mitral valve surgery (repair and prosthesis intervention) with an estimated range between 0.16 and 0.84% and an overall mortality greater than 10%.[2] Several cases are reported during aortic valve replacement, coronary artery bypass grafting, cardiac mass excision and pulmonary vein cannulation. Mitral annulus calcification and tissue fragility are considered secondary causative factors in the context of excessive traction of the sutures, tissues disruption during calcified valve debridement and prosthesis size mismatch.[3] For predisposing anatomical reasons, LatD occurs more often in the posterior atrioventricular wall in mitral valve surgery and along the interatrial septum and anterior wall in aortic valve surgery.[4] Noncardiac surgical aetiologies of LatD include myocardial infarction, percutaneous coronary intervention (PCI), ablation, chest trauma, and endocarditis. A distinct entity is spontaneous LatD related to systemic diseases such as amyloid and severe annular calcification.[5–9]

Treatment and management of LatD are controversial and choice varies from case to case according to clinical presentation (stable vs. unstable patients), etiologies (surgical vs. nonsurgical LatD), and imaging findings. In this setting, surgery has historically been the treatment of choice and different surgical approaches have been described such as evacuation of hematoma, obliteration of the false lumen, and closure of the entry point if identifiable. On the contrary, a conservative approach and a watchful strategy imaging-guided have been proposed for nonsurgical aetiologies in absence of hemodynamic instability. Reversal of anticoagulation[10] and percutaneous drainage[11] may also be reasonable therapeutic options reported in selected cases.

We reported herein our case experience together with a review of scientific literature, focusing on the decision-making process and strategical approach by multimodality imaging techniques in assessing and treating LatD of different aetiologies.

2 | MATERIALS AND METHODS

The purpose of our work was aimed at reviewing the clinical features of LatD (aetiologies, pathogenesis, and management) starting from our case report to a cases review of the literature.

A literature search on Pubmed and Embase was performed using "left atrial dissection" and "left atrial hematoma" as keywords. Additional references identified were used to expand the search, limited to English articles and only peer-reviewed original articles were included. Data were extracted independently, and any discrepancies adjudicated by two investigators (AC and GS). The article search identified 97 articles. All articles were separately reviewed by AC and GS. We contacted authors for additional data or clarification where required. All images available on articles were also reviewed by the aforementioned authors who dismissed articles not strictly related to LatD. Five articles did not have enough clinical information regarding etiology, treatment, and follow-up and were then excluded. The final search comprised of 115 patients from 1979 to 2014. Articles included in our analysis are reported in the supporting information. Our case was not included. Etiologies of LatD was classified and defined as follows: (a) cardiac arrest LatD: if LatD was related to CPR maneuver/resuscitation; (b) chest trauma LatD: if LatD was caused by a blunted trauma; (c) endocarditis related LatD: a LatD in presence of active mitral endocarditis; (d) left ventricular assist device (LVAD) implantation related LatD: a surgical LatD related specifically to LVAD implantation; (e) myocardial infarction LatD: a LatD derived from a complication of myocardial infarction (diagnosis of LatD myocardial infarction related made before coronary angiography); (f) electrophysiological procedure related LatD: LatD related to invasive electrophysiological studies or device implantation; (g) spontaneous/idiopathic LatD: a primary cause was not identifiable. Patients with amyloidosis disease were included in this category; (h) percutaneous related LatD: PCI (wiring and stenting) in stable and unstable patients, TAVI, mitral valvuloplasty, paravalvular leak repair; (i) cardiac surgery related LatD: mitral, aortic valve surgery, mass excision, and bypass surgery.

2.1 | Statistical analysis

Continuous variables are reported as mean ± *SD*. Categorical data are reported as counts and proportions. Comparisons between groups were based on unpaired Student *t*-test for continuous variables and chi-square or Fisher's exact tests for categorical variables. Statistical data were considered significant with a *p*-value <.05. Analyses were performed with SPSS (Statistical Package for Social Science, IBM) version 24. STATA/SE 15.O was used for the final subgroup analysis (surgical vs. nonsurgical treatment), the subgroup effect (favorable outcomes) was reported in terms of odds ratios.

2.2 | Case report

A 66-year-old man with a history of CCS-2 angina was admitted to our Institute for an inferolateral STEMI with pain onset 3 hours before. A fast-track echocardiogram showed septal akinesia and lateral wall dyskinesia with normal EF. At the coronary angiogram, there was a critical stenosis of the proximal segment of the right coronary artery, a critical stenosis of the proximal and mid left anterior descending artery and a thrombotic occlusion of the first marginal branch. PTCA with the placement of an Ultimaster 3.0x18 DES (Terumo; Tokyo, Japan) was performed, during which sudden sliding of the guide wire along the more distal part of a posterior-lateral vessel with a probable perforation of an atrial branch occurred (Figure 1, panel A, B, Videos S1 and S2). No pericardial dye staining was noticed at fluoroscopy at the end of the procedure and the patient was then transferred in CCU. However, a few hours after, the patient developed chest pain and dyspnea associated with severe hemodynamic instability requiring intravenous administration of fluid and dopamine support. A transthoracic echocardiogram was performed, which demonstrated a large circumferential pericardial effusion. The patient was then transferred to the operating room for emergency thoracotomy. When the pericardium was opened there was a massive blood pericardial effusion and the posterior interventricular sulcus appeared completely bruised with active bleeding in the pericardial sac. A transesophageal echocardiogram (TEE) showed an intramural left atrial mass occluding almost completely the mitral outflow

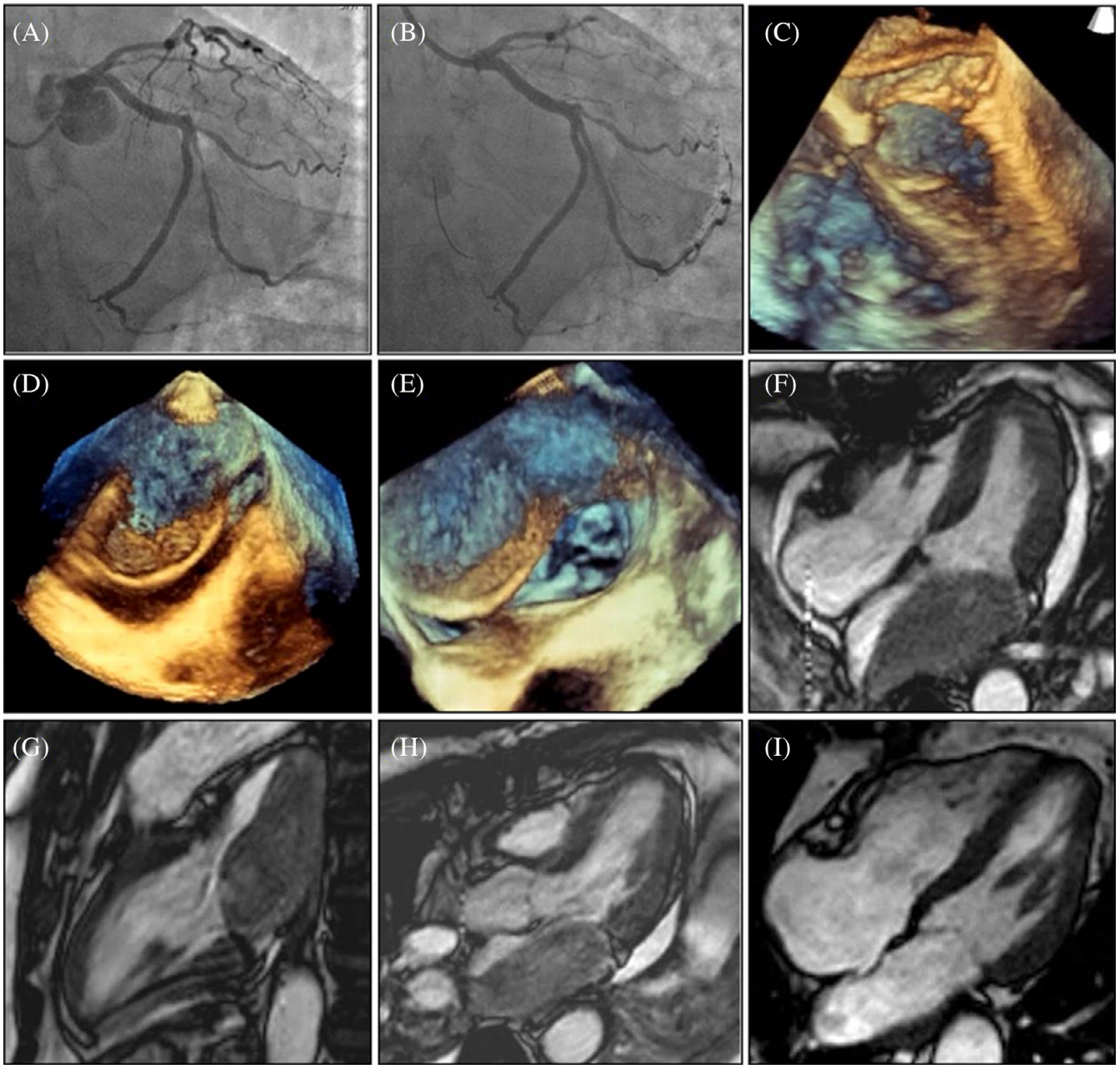

FIGURE 1 Culprit marginal obtuse branch lesion (A). Left atrial perforation (B). 3D TEE views of the left atrial dissection with mitral disturbance (C–E). CMR of the LatD in the acute phase (F–H). Follow-up CMR imaging confirming the healing of the atrial dissection. Angiography, 3D Echo, and CMR-Cine are available in the supporting information (Videos S1, S2, S3, S4, S5, S6, and S7). CMR, cardiac magnetic resonance; LatD, left atrial dissection; TEE, transesophageal echocardiogram [Color figure can be viewed at wileyonlinelibrary.com]

(Figure 1, panel C–E, Videos S3, S4, S5, and S6) and related to hemodynamic instability. Surgical glue repair of the posterior interventricular sulcus was done and the patient transferred to ICU. Cardiac magnetic resonance (CMR) highlighted the presence of a LatD limiting but not obstructing mitral flow with a normal cardiac output (Figure 1, panel F–H) The postoperative period was characterized by stable hemodynamics and the control-TEE documented reduction of LatD at 20 days after surgery (Figure 1, panel i, Video S7). At 2 months follow-up complete disappearance of the hematoma was evident and the patient is asymptomatic since then.

3 | RESULTS

One-hundred-fifteen patients were included in our cases review. Mean age was 62 ± 13 with a female sex prevalence of 41.7%. Coronary artery disease and mitral valvular disease were the most prevalent comorbidities, (mirroring the two prevalent etiologies). Forty-six out of 115 cases suffered from mitral valve disease, a known controversial risk factor for LatD. Cases divided for etiologies were the following: 3 cases of cardiac arrest related LatD (2,6%), 4 cases of endocarditis related LatD (3.5%), 3 chest trauma-related LatD (2.6%), 2 cases related to LVAD

implantation (1.7%), 4 myocardial infarction related LatD (3.5%), 8 related to electrophysiological procedure (7%), and 13 classified as spontaneous/idiopathic (11.3%). Percutaneous and surgical LatD were respectively 23 (20%) and 55 (47.8%) of the 115 selected cases. Percutaneous LatD were distinguished in PCI related (20/23) or structural intervention related (1 mitral valve leak repair, 1 mitral valvuloplasty, and 1 TAVI). Cardiac surgery related LatD comprised mitral valve surgery (42/55), aortic valve surgery (5/55), bypass surgery (4/55), atrial mass excision (3/55), and left ventricular aneurysmal repair (1/55).

LatD diagnosis was essentially based on imaging, mainly TEE (91.3%), cardiac computed tomography (CT) (14.8%), and CMR (12.2%) (Table 1).

The optimal choice between surgical or conservative treatment and survival rates vary largely across etiologies. Percutaneous LatD was the most frequent type of LatD treated with a conservative strategy (in this group 2 out of 23 patients were treated with a percutaneous drainage). Among other etiologies, spontaneous LatD had the lowest relative mortality (1/13, 7.7%), while endocarditis related LatD the highest one (3/4, 75%). Overall mortality was 15.6% (18/115), 16.7% for conservative treatment and 15.6% for surgical treatment with a strong variation between etiologies (Table 2).

Analyzing etiologies trend over time (decades based on year of publication), there is a decrease in surgical etiologies, a slight increase in percutaneous one and a significant increase in other etiologies (nonsurgical and nonpercutaneous LatD) (Table 3).

Considering the etiologies of LatD due to percutaneous intervention, 20 out of 23 happened after coronary revascularization procedure and only 3 after structural interventional valve procedures. In particular, coronary revascularization procedures were performed in stable CAD patients, and they had mainly interested the Circumflex branch (13 on 23 pts, 65%). Finally, 20% of attempted revascularizations were chronic total occlusion procedures.

Comparing LatD due to percutaneous intervention and surgery, patients with percutaneous LatD were older with a lower prevalence of female sex. There was different imaging modality pattern utilization between percutaneous and surgical etiologies (CT and CMR were more often employed in the percutaneous etiologies) with a different type of treatment (surgical treatment for percutaneous LatD 30.4% vs. 74.5% for surgical LatD, *p*-value .003). Despite the different therapeutic strategy, there was no difference in terms of treatment-related mortality (mortality related to surgical treatment for percutaneous LatD 13% vs. 10.9 for the surgical LatD, *p*-value .12). Table 4.

Finally, when analyzing adverse outcomes (death) according to LatD etiology, there was a nonsignificant trend favoring the surgical treatment for cardiac arrest, electrophysiology and spontaneous etiologies. Conservative treatment had a trend toward better outcomes in percutaneous and surgical etiologies (Figure 2).

TABLE 1 Demographics and clinical features of 115 patients with LatD

Number of patients	115
Age, years ± *SD*	62 ± 13
Female, *n* (%)	48 (41.7)
Relevant comorbidities	
End-stage heart failure, *n* (%)	1 (0.9)
Atrial myxoma, *n* (%)	1 (0.9)
Amyloidosis, *n* (%)	2 (1.7)
Coronary heart disease, *n* (%)	30 (26.1)
Valvular heart disease, *n* (%)	52 (45.2)
Mitral valve disease, *n* (%)	46 (40)
Aortic valve disease, *n* (%)	6 (5.2)
Aetiologies	
Cardiac arrest related, *n* (%)	3 (2.6)
Endocarditis, *n* (%)	4 (3.5)
Chest trauma, *n* (%)	3 (2.6)
LVAD implantation related, *n* (%)	2 (1.7)
Myocardial infarction related, *n* (%)	4 (3.5)
Electrophysiological procedure, *n* (%)	8 (7)
Spontaneous/idiopathic, *n* (%)	13 (11.3)
Percutaneous related	23
PCI related, *n* (%)	20 (87)
Mitral paravalvular leak repair, *n* (%)	1 (4.35)
Mitral valvuloplasty, *n* (%)	1 (4.35)
TAVI related, *n* (%)	1 (4.35)
Cardiac surgery related	55
Mitral valve surgery, *n* (%)	42 (76.4)
Aortic valve surgery, *n* (%)	5 (9.1)
Bypass surgery, *n* (%)	4 (7.3)
Atrial mass excision, *n* (%)	3 (5.4)
Left ventricular aneurysmal repair, *n* (%)	1 (1.8)
Neurological complication	
Stroke LatD related, *n* (%)	4 (3.5)
Imaging	
Transesophageal echocardiogram, *n* (%)	105 (91.3)
Cardiac CT, *n* (%)	17 (14.8)
Cardiac magnetic resonance, *n* (%)	14 (12.2)
Treatment	
Conservative treatment, *n* (%)	36 (31.3)
Surgical treatment, *n* (%)	77 (67)
Percutaneous drainage, *n* (%)	2 (1.7)

Abbreviations: CT, computed tomography; LatD, left atrial dissection; LVAD, left ventricular assist device; PCI, percutaneous coronary intervention.

4 | DISCUSSION

LatD is a multifaceted complication characterized by a varying presentation and clinical course. Diagnosis is difficult to make with different etiologies, ranging from classical surgical complication to iatrogenic complications, in the clinical background of hemodynamic instability. Multi-modality imaging (TEE, cardiac CT, and MR) is extremely important to address a correct diagnosis and define the extent of atrial compression with possible mitral inflow obstruction.[12] However, it is important to

TABLE 2 Management and outcomes of LatD according to etiology

Conservative management of LatD	
Cardiac arrest, *n*/*N* (%)	1/3 (33.3)
Endocarditis, *n*/*N* (%)	1/4 (25)
Atrial mass excision, *n*/*N* (%)	0/3 (—)
Chest trauma, *n*/*N* (%)	0/3 (—)
LVAD, *n*/*N* (%)	1/2 (50)
Myocardial infarction, *n*/*N* (%)	0/4 (—)
Spontaneous, *n*/*N* (%)	2/13 (15.4)
Electrophysiology, *n*/*N* (%)	2/8 (25)
Percutaneous LatD, *n*/*N* (%)	14/23 (60.9)
Surgical LatD, *n*/*N* (%)	14/55 (25.4)
LatD mortality	
Overall mortality, *n*/*N* (%)	18/115 (15.6)
Mortality related to the electrophysiology procedures, *n*/*N* (%)	1/8 (12.5)
Mortality related to myocardial infarction LatD, *n*/*N* (%)	1/4 (25)
Mortality for spontaneous atrial dissection, *n*/*N* (%)	1/13 (7.7)
Mortality related to cardiac arrest LatD, *n*/*N* (%)	2/3 (66.7)
Mortality related to endocarditis, *n* (%)	3/4 (75)
Mortality related to percutaneous procedures, *n* (%)	3/22 (13.6)
Mortality related to cardiac surgery procedures, *n* (%)	7/55 (12.7)
Mortality related to percutaneous drainage, *n* (%)	0/2 (—)
Mortality related to conservative treatment, *n* (%)	6/36 (16.7)
Mortality related to surgical treatment after other procedures, *n* (%)	12/77 (15.6)

Abbreviations: LatD, left atrial dissection; LVAD, left ventricular assist device.

note that LatD diagnosis poses a challenge even when the best imaging techniques are applied. Because clinical course and outcome of LatD are poorly understood, no available criteria exist to guide the treatment. An interventional/surgical approach is suggested by some authors in the presence of hemodynamic instability. Nevertheless, a conservative treatment could be successfully attempted also in the presence of hemodynamic instability. The rarity of LatD limits the clinical experience and contributes to the lack of evidence to guide different therapeutic strategies.

Fukuhara and associates.[1] published a review of left atrial dissection comprising 87 patients with findings similar to our study. In their review, 72.7% (63/87) of patients with LatD underwent surgical repair and 24.1% (21/87) a conservative treatment, with an overall mortality of 13.8% (12.7% after surgical intervention). Hemodynamic instability (as reported in Figure 3) is one of the critical factors to consider for surgical referral. However, follow-up imaging showed a left atrial remodeling and resolution of LatD in several cases limiting the expansion gap of LatD and avoiding inflow/outflow obstruction; In this way, coagulation reversal can be helpful.

TABLE 3 Etiologies of percutaneous related LatD

Patients, *n*	23
Coronary artery disease, *n* (%)	20 (86.9)
Stable CAD, *n* (%)	13 (56.5)
Acute coronary syndrome, *n* (%)	7 (30.5)
Valvular heart disease, *n* (%)	3 (13)
Procedure	
TAVI, *n* (%)	1 (4.35)
Mitral paravalvular leak repair, *n* (%)	1 (4.35)
Mitral valvuloplasty	1 (4.35)
PCI, *n*	20
CTO PCI, *n* (%)	4 (20)
Non CTO PCI, *n* (%)	16 (80)
Culprit vessel	
Circumflex coronary artery, *n* (%)	13 (65)
Right coronary artery, *n* (%)	7 (35)

Abbreviations: CAD, coronary artery disease; CTO, chronic total occlusion; PCI, percutaneous coronary intervention; TAVI, transcatheter aortic valve implantation.

TABLE 4 Differences between percutaneous related LatD and surgical related LatD

	Percutaneous related LatD	Surgical related LatD	*p* value
Patients, *n*	23	55	
Age, years ± *SD*	70 ± 9	62 ± 11	.002
Female sex, *n* (%)	5 (21.7)	25 (45.4)	.05
Relevant comorbidities			
Coronary artery disease, *n* (%)	17 (73.9)	6 (10.9)	.001
Valvular heart disease, *n* (%)	3 (13)	47 (85.4)	.001
Stroke, *n* (%)	2 (8.7)	1 (1.8)	.044
Imaging			
Transesophageal echocardiogram, *n* (%)	21 (91.3)	53 (96.4)	.03
Cardiac CT, *n* (%)	8 (34.7)	1 (1.8)	.001
Cardiac magnetic resonance, *n* (%)	2 (8.7)	1 (1.8)	.03
Treatment			
Conservative treatment, *n* (%)	14 (60.9)	14 (25.4)	.003
Percutaneous drainage, *n* (%)	2 (8.7)	0 (—)	—
Surgical treatment, *n* (%)	7 (30.4)	41 (74.6)	.003
Treatment related mortality			
Mortality related to conservative therapy, *n* (%)	0 (—)	1 (1.8)	—
Mortality related to surgical therapy, *n* (%)	3 (13)	6 (10.9)	.12

Abbreviation: CT, computed tomography.

TEE should be the first-choice imaging modality since it can be performed quickly at the bedside in critically ill patients providing an early evaluation of surgical complication or inadequate surgical repair.[13] Moreover, 3D imaging can deliver additional views of the atrial wall with

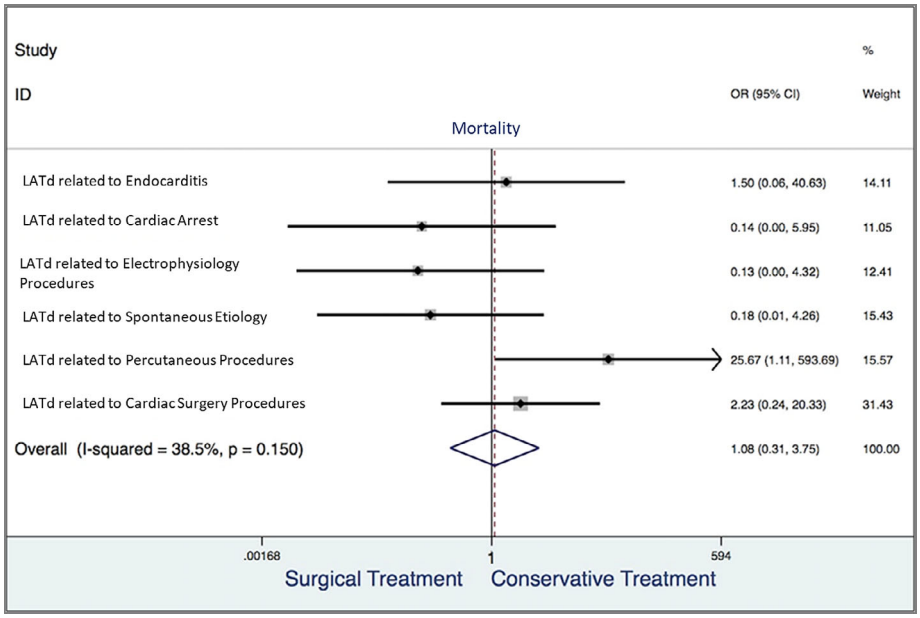

FIGURE 2 Subgroup analysis of favorable versus fatal outcomes according to etiologies and treatment [Color figure can be viewed at wileyonlinelibrary.com]

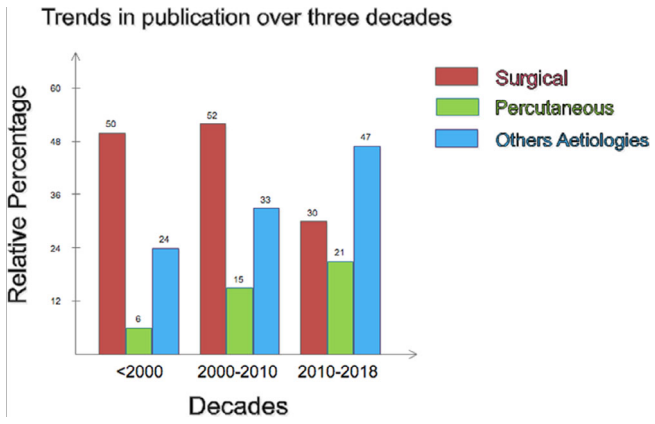

FIGURE 3 Trend in publication over three decades according to etiology (surgical, percutaneous, and others = not surgical or percutaneous) [Color figure can be viewed at wileyonlinelibrary.com]

immediate feedback on left atrial dysfunction. Limitations of TEE are the semi-invasiveness and the lack of tissue characterization.[14] In the presence of TEE equivocal findings, cardiac CT can define atrial pathology with great accuracy even if with a temporal resolution inferior to both CMR and TTE at present. CMR may give incremental information on tissue characterization of the dissection, evaluated the presence of thrombus in LA and confirming the definitive healing of dissection in the follow-up.[15]

A simple and practical operative algorithm supported by imaging is reported in Figure 4. The present review highlights some differences in terms of imaging usage and repair according to different etiologies. All LatD are different from each other and it is extremely important to understand the left atrial failure mechanism through imaging.

Since there are no guidelines for management of this rare entity, an individual-decision making approach with an imaging watchful strategy is encouraged. Conservative approach is often employed in the literature despite there is not a net clinical benefit in terms of mortality. In our cases review, the conservative management was

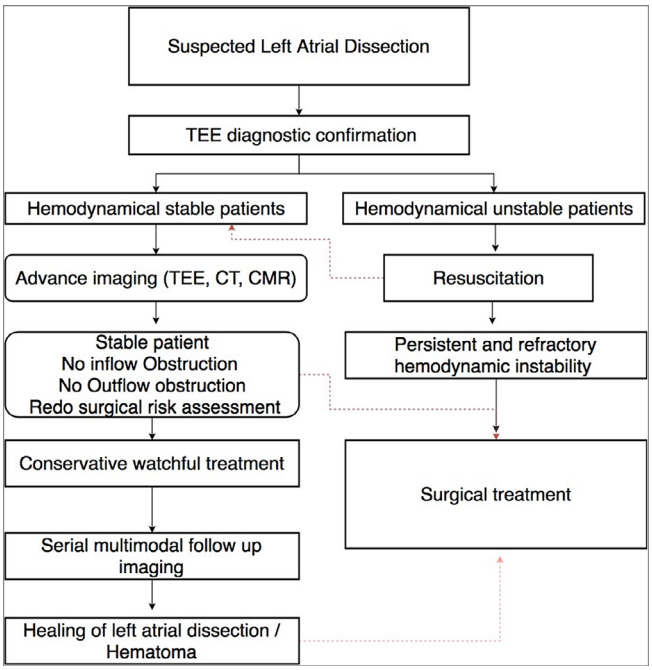

FIGURE 4 Proposed algorithm management of left atrial dissection according to an individual-decision making approach imaging-oriented [Color figure can be viewed at wileyonlinelibrary.com]

associated with a trend toward a lower mortality for surgical and particularly for percutaneous etiologies.

5 | LIMITS OF THE STUDY

Considering a general favor to report positive outcomes in case reports and series, publication bias should be considered in the interpretation of results. Including different etiologies from different

clinical scenarios and context, could have led to a not negligible pooling of data risk bias. Therefore, results should be interpreted with caution considering the limitations of the study.

However, a systematic review with exploration of heterogeneity can result in valuable information toward determining strengths and deficiencies of current literature, and thus guide future research.

6 | CONCLUSION

Left atrial dissection is a challenging and demanding entity related to multiple etiologies, difficult to diagnose and treat even when the best imaging and repair techniques are applied. In the case presented herein, percutaneous-related Latd was successfully treated with a surgical approach. The choice between conservative vs. surgical approach is still controversial and varies according to etiologies.

However, based on extensive literature search, a conservative approach, supported by serial imaging, in a hemodynamically stable patient, seems to be the most appropriate strategy, with a trend toward favorable outcomes, especially after percutaneous interventions.

ORCID

Alberto Francesco Cereda https://orcid.org/0000-0001-7325-4229
Giuseppe Sangiorgi https://orcid.org/0000-0001-5862-1967

REFERENCES

1. Fukuhara S, Dimitrova KR, Geller CM, Hoffman DM, Tranbaugh RF. Left atrial dissection: an almost unknown entity. Interact Cardiovasc Thorac Surg. 2015;20(1):96-100.
2. Fukuhara S, Dimitrova KR, Geller CM, Hoffman DM, Ko W, Tranbaugh RF. Left atrial dissection: etiology and treatment. Ann Thorac Surg. 2013;95(5):1557-1562.
3. Gual-Capllonch F, Arce J, Serés L, et al. Left atrial intramural haematoma associated with mitral annular calcification. Eur J Echocardiogr. 2010;11(5):E18.
4. Deniz H, Sokullu O, Sanioglu S, et al. Risk factors for posterior ventricular rupture after mitral valve replacement: results of 2560 patients. Eur J Cardiothorac Surg. 2008;34(4):780-784.
5. Leissner KB, Srinivasa V, Beutler S, et al. Left atrial dissection and intramural hematoma after aortic valve replacement. J Cardiothorac Vasc Anesth. 2011;25(2):309-310.
6. Pisklak PV, Tolpin DA, Youngblood SC, Collard CD, Pan W. Left atrial dissection after left ventricular aneurysm repair. Echocardiography. 2012;29(7):E163-E165.
7. Aoyagi S, Fukunaga S, Kosuga T, Akashi H. Left atrial intramural hematoma after resection of myxoma: report of a case. Ann Thorac Cardiovasc Surg. 2011;17(4):411-414.
8. Cresce GD, Peluso D, Panfili M, et al. Left atrial wall hematoma as a consequence of percutaneous coronary angioplasty. Ann Thorac Surg. 2012;93(3):e57-e59.
9. Ramakrishna G, Cote AV, Chandrasekaran K, Malouf JF. Endocardial flap of left atrial dissection following radiofrequency ablation. Pacing Clin Electrophysiol. 2003;26(8):1771-1773.
10. Maeda K, Yamashita C, Shida T, Okada M, Nakamura K. Successful surgical treatment of dissecting left atrial aneurysm after mitral valve replacement. Ann Thorac Surg. 1985;39(4):382-384.
11. Wilson WM, Spratt JC, Lombardi WL. Cardiovascular collapse post chronic total occlusion percutaneous coronary intervention due to a compressive left atrial hematoma managed with percutaneous drainage. Catheter Cardiovasc Interv. 2015;86(3):407-411.
12. Hulman M, Artemiou P, Ftacnikova A, Chnupa P. A rare cause of left ventricular assist device (LVAD) obstruction: left atrial dissection. Braz J Cardiovasc Surg. 2017;32(6):542-544.
13. Lestuzzi C, Nicolosi GL, Mimo R, Pavan D, Zanuttini D. Usefulness of transesophageal echocardiography in evaluation of paracardiac neoplastic masses. Am J Cardiol. 1992;70(2):247-251.
14. Alvarez J, Rubio A, Mora M, Fernández Madero G, Vivancos R, Malpartida F. Diagnosis by magnetic resonance imaging of a case of intramural left atrial hematoma. Rev Esp Cardiol. 2002;55(8):872-874.
15. Fernández-Golfín C, Jimenez Lopez-Guarch C, López Gude MJ. Left atrial wall dissection after mitral valve surgery: assessment with cardiac magnetic resonance. Magn Reson Imaging. 2011;29(4):584-585.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

How to cite this article: Cereda AF, De Luca F, Lanzone AM, Cottini M, Pastori L, Sangiorgi G. Case report and systematic review of iatrogenic left atrial dissection in different cardiovascular specialties: A common treatment for an uncommon complication? *Catheter Cardiovasc Interv*. 2019; 1–7. https://doi.org/10.1002/ccd.28356