IJC Heart & Vasculature 7 (2015) 1–5

Contents lists available at ScienceDirect

IJC Heart & Vasculature

journal homepage: http://www.journals.elsevier.com/ijc-heart-and-vasculature

# Cardiac calcified amorphous tumor: A systematic review of the literature

Quentin de Hemptinne [a], Didier de Cannière [b], Jean-Luc Vandenbossche [a], Philippe Unger [a,*]

[a] Department of Cardiology, CHU Saint-Pierre, Université Libre de Bruxelles, Rue Haute, 322-1000 Brussels, Belgium
[b] Department of Cardiac Surgery, CHU Saint-Pierre, Université Libre de Bruxelles, Rue Haute, 322-1000 Brussels, Belgium

ARTICLE INFO

*Article history:*
Received 29 September 2014
Accepted 20 January 2015
Available online 29 January 2015

*Keywords:*
Calcified amorphous tumor
Heart
Nonneoplastic
Mass
Review

ABSTRACT

*Background:* Calcified amorphous tumor (CAT) of the heart is a rare non-neoplastic intracavitary cardiac mass. Several case reports have been published but large series are lacking.
*Objective:* To determine clinical features, current management and outcomes of this rare disease.
*Design:* A systematic review of all articles reporting cases of CAT in order to perform a pooled analysis of its clinical features, management and outcomes.
*Data sources:* An electronic search of all English articles using PUBMED was performed. Further studies were identified by cross-referencing from relevant papers.
*Inclusion criteria:* We restricted inclusion to articles reporting cases of CAT in the English language literature published up to July 2014.
*Data extraction:* One author performed data extraction using predefined data fields.
*Results:* A total of 27 articles, reporting 42 cases of CAT were found and included in this review.
*Conclusion:* In this review, the most frequent presenting symptoms were dyspnea and embolic events. Mitral valve and annulus were the most frequent location of CAT. Surgery was most of the time required to confirm diagnosis, and was relatively safe. Overall outcome after surgical resection was good.


## 1. Introduction

Calcified amorphous tumor (CAT) of the heart is a rare non-neoplastic intracavitary cardiac mass, with microscopic features of calcification and amorphous fibrinous material. Since its first description in 1997 as a specific entity by Reynolds and colleagues [1], several case reports have been published. Still, large series are lacking and, to date, we have no clear overview of the scope of the disease. In this article, we aim to perform a systematic review of the literature and to build a registry of all published cases of CAT in order to determine its clinical features, current management and prognosis.

## 2. Methods

We performed a systematic search using PubMed, according to the preferred reporting items for systematic reviews and meta-analysis (PRISMA) guidelines, for articles reporting cases of CAT in the English language literature. Additional articles were identified by a manual search of references of relevant papers. Authors of articles were contacted, if needed, to obtain additional data that was of interest to our review. We included all articles published since the first report (May 1st, 1997) up to July 31st, 2014. The titles and abstract of the identified articles were screened to determine if they met inclusion criteria. Full text articles were then retrieved and reviewed. Reference lists of the retrieved articles were searched for relevant literature. Predetermined variables were first author, year of publication, title, journal, patient clinical informations (age, gender…), tumor size and location, presenting symptoms, associated conditions, treatment, follow-up and outcome.

## 3. Results

A total of 27 articles reporting 42 cases of CAT were found. Table A lists the clinical characteristics of the patients. Table B reports the pooled clinical data. The mean age at presentation was 54 years (range 16–85), with a female predominance (64%). CAT was detected in all cardiac chambers, but predominated on the mitral valve or annulus (36%), in the right atrium (21%) or the right ventricle (17%). Mean tumor size was 29 × 17 mm, ranging from 1.7 mm punctate lesion to very large masses (20 × 90mm) or even diffuse left ventricular (LV) infiltration.

The most frequent presenting symptom was dyspnea (45%) followed by syncope (21%). Pulmonary or systemic embolization was reported in 31% of the cases. CAT was discovered incidentally in 17% of the patients.

* Corresponding author. Tel.: +32 25353351; fax: +32 25353362.
*E-mail addresses:* quentindh@gmail.com (Q. de Hemptinne), didier_decanniere@stpierre-bru.be (D. de Cannière), jlvdboss@ulb.ac.be (J.-L. Vandenbossche), punger@ulb.ac.be (P. Unger).

http://dx.doi.org/10.1016/j.ijcha.2015.01.012

**Table A**
Clinical characteristics of published cases of calcified amorphous tumor.

| Report | Case no | Sex | Age | Tumor site | Presentation | Follow-up | Comorbidities/underlying disease | Size (mm) | Treatment |
|---|---|---|---|---|---|---|---|---|---|
| Reynolds et al. (1997) [1] | 1 | M | 16 | LA | Exercise intolerance, near-syncope | Residual calcifications in LA | Mediastinal RT and chemo for neuroblastoma at age 3 months | 45 × 23 × 3 | Surgical excision |
| | 2 | M | 30 | LV | Near-syncope, chest pain, palpitations | Small residual calcified nodule in LV, 3 years 6 months | None | 30 × 12 × 10 | Surgical excision |
| | 3 | F | 33 | RV | Shortness of breath | Lost to follow-up | Recurrent PE | 20 × 23 | Surgical excision |
| | 4 | F | 34 | RV | Vertigo, orthopnea | Lost to follow-up | Systemic lupus-like illness | 35 × 25 × 15 | Surgical excision |
| | 5 | F | 48 | MV | CVA | NED 4 months | MR and TR, cleft mitral valve leaflet | 30 × 2 | Surgical excision |
| | 6 | F | 60 | LV, MV | CVA, retinal emboli | Alive, left jugular foramen tumor | MR and AR with enlarged LA | 15 × 15 × 15 | Surgical excision |
| | 7 | M | 65 | RV, TV | Shortness of breath | Died of non cardiac cause 30 days after diagnosis | CAD, recurrent PE | 33 × 27 × 12 | No surgery |
| | 8 | F | 67 | RA | Syncope | NED 18 years | CAD, CHF | 65 × 50 × 50 | Surgical excision |
| | 9 | M | 67 | LV | Syncope | NED 1 year 4 months | CAD, ESRD, tumoral calcinosis | 15 × 3 × 3 | Surgical excision |
| | 10 | F | 73 | RA, SVC | Dizziness, dyspnea on exertion | NED 1 year 5 months | Diverticulitis, partial resection, total parenteral nutrition | 20 × 90 | Surgical excision |
| | 11 | F | 75 | LV | "Funny sensation" in chest | NED 6 years 11 months | Diabetes mellitus | 20 × 20 × 20 | Surgical excision |
| Chaowalit et al. (2005) [15] | 12 | F | 20 | RV | PE, dyspnea | N/A | Chest trauma 3 years earlier | 40 × 22 × 18 | Surgical excision |
| Lewin et al. (2006) [12] | 13 | F | 60 | RV | Syncope | Died 1 day after surgery | No prior cardiac history. | 40 × 30 × 25 | Surgical excision |
| Fealey et al. (2007) [14] | 14 | F | 20 | RV | PE, cough, shortness of breath, fatigue | Residual calcified RV nodule, recurrent PE 2 years after surgical resection, second resection | None | 40 × 35 × 25 | Surgical excision |
| Khulbey et al. (2008) [16] | 15 | M | 26 | RA | Prolonged fever and constitutional symptoms | NED 1 year | Atrial septal closure | 30 × 20 × 20 | Surgical excision |
| Inamdar et al. (2008) [17] | 16 | F | 85 | MA | Chronic fatigue | N/A | MAC, ESRD, HTN, DM | 23 × 9 | Surgical excision |
| Ho et al. (2008) [3] | 17 | M | 44 | LV and mitral chordal apparatus diffuse infiltration | Shortness of breath on exertion | N/A | Severe LV systolic dysfunction | Diffuse infiltration | Referred for heart transplantation |
| Gutierrez et al. (2008) [18] | 18 | M | 35 | RA | Septic shock | NED 2 months | ESRD (Alport syndrome), HTN | 20 × 15 × 14 | Surgical excision |
| Flynn et al. (2009) [19] | 19 | M | Young | RV | Syncope, PE, severe tricuspid regurgitation | N/A | N/A | 14 × 12 × 5 | Surgical excision and pulmonary TEA |
| Habib et al. (2010) [5] | 20 | F | 58 | MA, MV, diffuse LV infiltration | Ventricular tachycardia | Medical treatment, persistent VT | Ventricular tachycardia, SCD, mild mitral regurgitation | Diffuse infiltration | Medical treatment |
| Gupta et al. (2010) [20] | 21 | F | 40 | RA | Shortness of breath on exertion, cough, fatigue | NED 8 months | None | 30 × 20 × 15 | Surgical excision |
| Vaideeswar et al. (2010) [13] | 22 | M | 56 | RA | Progressive shortness of breath, PE, blurring of vision | NED 2 years | N/A | N/A | Surgical excision and pulmonary TEA |
| | 23 | M | 35 | RA | Exertional dyspnea, dizziness on walking, PE | Died 7 days after surgery | N/A | 32 × 23 × 13 | Surgical excision and pulmonary TEA |
| Kubota et al. (2010) [8] | 24 | F | 64 | LV, MA | Incidental | NED 3 years | ESRD, DM | 3 × 27 | Surgical excision |
| | 25 | M | 44 | LV, PM | Incidental | NED 3 years | ESRD | 6 × 28 | Surgical excision |
| Greaney et al. (2011) [21] | 26 | F | 69 | LV, MV | Left-sided heart failure, stroke | NED 3 months | Severe COPD | 20 | Surgical excision |
| Ananthakrishna et al. (2011) [22] | 27 | F | 45 | LV | Breathlessness | NED 4 months | Rheumatic heart disease | 40 × 35 × 20 | Surgical excision, mitral and aortic valve replacement |
| Vlasseros et al. (2011) [2] | 28 | F | 65 | LV, MV | Visual loss (central retinal artery occlusion) | NED 8 months | DM, HTN | 26 × 17 × 5 | Surgical excision and MVR |
| Lin et al. (2011) [23] | 29 | F | 74 | LA | Incidental | NED 6 months | None | 14 × 27 | Surgical excision |
| De Sousa et al. (2011) [24] | 30 | M | 17 | TV | Cardiomegaly | NED 3 months | Ebstein anomaly | 15 × 15 × 13 | Surgical excision and TV valvuloplasty |