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Lambl's Excrescences: A Brief Overview of Morphology, Clinical Implications, and Management

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Abstract

Lambl's excrescences are thin, thread-like projections that develop on heart valves, primarily at points where the valves close. First documented in 1856 by Lambl, these formations consist of fibrous tissue cores with a mucopolysaccharide matrix. Lambl's excrescences are commonly found on aortic, mitral, pulmonary, and tricuspid valves, both native and prosthetic and occasionally on the endocardial surface of the interatrial septum and papillary muscles. Advanced cardiac imaging techniques, particularly transesophageal echocardiography, have increased the detection of these structures. While lambl's excrescences are often asymptomatic and incidentally discovered, studies have investigated the clinical significance of these with embolic strokes and other cardiovascular events, yielding mixed results. Treatment varies from monitoring and medical management with antiplatelet or anticoagulation therapy to surgical excision in recurrent or symptomatic cases.

Keywords: Lambl's excrescences; Thromboembolic events; Endocardial lesions; Valvular strands; Cardiac papillary fibroelastomas;

Introduction

Lambl's excrescences (LE) are slender, thread-like projections in areas where heart valves come into contact during closure. They can manifest independently of any other signs of heart-related conditions. These structures initially develop as tiny blood clots on the heart's inner lining (endocardium) where the valve edges meet. These specific locations may experience minor damage to the endothelial cells, often attributed to the natural wear and tear of the heart's functioning. These projections possess fibrous cores lacking cellular components, and they exhibit a concentric, granular appearance owing to the layer-by-layer accumulation of an acid mucopolysaccharide matrix [1]. In 1856, Prague's Lambl discovered LE as small fibrous tissue extensions on aortic valve cusps. These findings have been documented in various valve types, including native aortic, mitral, pulmonary, tricuspid, prosthetic, and interatrial septum valves. Infrequently, these structures have been found on papillary muscles and interatrial septum surfaces [2]. With the widespread utilization of advanced cardiac imaging techniques, particularly transesophageal echocardiography, the discovery of abnormal structures affixed to cardiac valves has become common. These structures can be categorized into two primary groups. The larger, more substantial formations often signify valvular vegetations, thrombi, or myxomas. On the other hand, "valvular strands" are the usual term for thin, continuous, and movable filamentous structures connected to valves. Accurate identification and classification of these valvular strands is clinically significant because of their possible correlation with systemic embolization. Valvular strands that affect

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prosthetic valves in some individuals have been associated with systemic embolization; the histological makeup of these strands has shown resemblances to LE [3]. LEs are smaller and more common lesions near the valvular closure lines that tend to be numerous and have a broader base. When these growths become larger, they are called cardiac papillary fibroelastomas. These fibroelastomas are not only limited to the areas where the valves meet during closure, but they can also appear on the inner surfaces of the atria and ventricles [4]. LE are typically asymptomatic and accidentally discovered on echocardiography however they are rarely linked to stroke or coronary artery obstruction. Embolizing to the brain, particularly on the leaflets of the aortic and mitral valves, can cause a stroke. Echocardiography and Doppler ultrasonography are used in the diagnosis process [5]. The article aims to provide a comprehensive review of LE, detailing their morphology, clinical significance, diagnostic approaches, and management strategies, particularly about their potential association with embolic events such as ischemic strokes.

Discussion

LE can be solitary or in clusters, measuring approximately 1 mm in diameter and up to 10 mm in length. They are often shorter due to their location on valve leaflets, especially on the high-pressure aortic valve. Sometimes, they cluster to form "giant LE" up to 2cm long. While isolated reports link these giant excrescences to ischemic strokes, no conclusive evidence links excrescence size to embolic risk. Ischemic events are more frequent in LE on the aortic valve [6]. LEs typically exhibit a slender profile, measuring ≤ 2 mm in width, and they have an elongated shape ranging from 5 to 10 mm in length. There is also a variant known as giant LE, which can reach lengths up to 2.5 cm. Two different varieties of LEs are seen depending on the age group affected: lamellar excrescences, which are more common in individuals under 30 years old, and filiform excrescences, which are more common in older patients [7]. Older adults are more likely to have LEs, men are more likely than women to have them, and the aortic valve is more likely to have them than the mitral valve [8]. Their presence on heart valves is estimated to be between 5% and 40% [9]. These strands are typically multiple in more than 90% of cases. These strands are often not linked to cardioembolic events [10].

While the exact cause of these excrescences remains uncertain, there is a prevailing theory suggesting that their formation begins with an endocardial lesion or tear in regions exposed to significant stress and trauma, such as the closure lines of the left heart valves. Fibrin deposits subsequently form over the damaged endothelium, leading to the overgrowth of an endothelial layer. It is theorized that an age-related increase in shear forces could contribute to developing small tears in the endocardial surface, potentially explaining their higher prevalence in older individuals [11]. These excrescences consist of a central core composed of elastic connective tissue surrounded by a layer of endothelial cells. Notably, they do not contain blood vessels, which accounts for the absence of granulation tissue at their base [8]. Elevated stress along the closure lines of the left-sided heart valves can induce tears or lesions in the endocardium, triggering the onset of LE. Fibrin deposition on this injured endocardium's surface leads to the growth of endothelial tissue, giving rise to the formation of papillary projections. These projections partially detach from the surface, undergo hyalinization, and eventually become fibrous. The increased shear forces that come with aging further contribute to their development. A cluster of LE may detach from the valve surface, potentially resulting in thromboembolism. While these lesions can be associated with conditions like rheumatic heart disease, a history of endocarditis, and pulmonary or systemic hypertension, they may also occur in otherwise healthy individuals [5].

The potential differential diagnosis encompasses fibroelastomas, thrombi, and vegetations. Fibroelastomas typically manifest away from the valvular closure lines, tend to be larger, and possess a more gel-like consistency compared to valvular strands. Clinical indications of infective endocarditis and valve dysfunction are frequently linked to vegetation. By comparison, Libman-Sacks and thrombotic vegetations are usually spherical or sessile, distributed throughout the leaflets, and lack autonomous movement. Although cardiac valves are the most common sites for valvular strand observations, they can also infrequently be seen on the interatrial septum, chordae, and papillary muscles [8]. LE does not significantly impact life expectancy [12]. Although most of these lesions are typically symptomless and are incidentally found through echocardiography or post-mortem examinations, they are considered an infrequent source of thromboembolic events. This is because they often lead to the fragmentation of the aortic valve or the formation of microthrombi atop the lesions, potentially resulting in conditions like peripheral thromboembolism in various regions, such as the retina, kidney, or popliteal artery, acute coronary syndrome (ACS), ischemic stroke or transient ischemic attack (TIA) [9,13].

Several studies have investigated the potential clinical significance of LE and related cardiac valve abnormalities in various patient populations. These studies have sought to establish associations between these cardiac findings and embolic events, particularly ischemic strokes, to understand their clinical relevance better and guide appropriate management strategies. Salehi Omran et al. conducted a case-control study involving patients with embolic stroke of undetermined source and those with identified stroke etiologies. Their findings suggested no significant association between the presence of LE and embolic strokes after adjusting for various factors, such as demographics and mode of echocardiography. Notably, the majority of LE were

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visualized using TEE [9]. In contrast, Schevchuck et al. (year not specified) focused on patients with SLE and examined the relationship between LE and neurological symptoms. Their study did not find a clear link between LE and embolism events, such as strokes. This suggests that the presence of these excrescences in SLE patients may not be a significant contributor to cerebrovascular complications [14]. Zuo et al. investigated a different patient population, specifically those undergoing radiofrequency catheter ablation for atrial fibrillation. Their study found no clear association between LE and intraoperative embolism or post-procedure cardiovascular events. This suggests that these excrescences may not pose a significant risk in the context of catheter ablation procedures [15]. Chong-Lei et al. provided clinical recommendations based on their experience with LE on the aortic valve. They emphasized the importance of TEE for diagnosis and suggested surgical excision for certain patients, particularly those with a history of recurrent cerebrovascular accidents (CVAs) or other heart diseases. Their surgical interventions were successful without complications [16]. Cammalleri et al. explored the prevalence of LE in patients with aortic valve stenosis scheduled for transcatheter aortic valve implantation (TAVI). Their findings revealed that while LEs were not uncommon in this population, they did not appear to increase the rate of cerebral ischemic events or other TAVI-related complications. This suggests that these excrescences may not significantly impact the outcomes of TAVI procedures [17]. Lastly, Cohen et al. conducted a case-control study and follow-up analysis in older patients to investigate the association between mitral valve strands and brain infarction. Their research identified an association between mitral valve strands and the risk of initial brain infarction; however, no increased risk of recurrent brain infarction was observed in older patients. This raises questions about the causal relationship between mitral valve strands and cerebrovascular events in this age group [18]. In summary, these studies provide valuable insights into the clinical implications of LE and related cardiac valve abnormalities in various patient populations. While some studies did not find a significant association with embolic events, others provided clinical recommendations for specific patient groups. Further research may be needed to elucidate the precise role of these cardiac findings in embolic events and to guide clinical management decisions.

Table 1: Summary of studies with their key findings

Study	Study Type	Population/Participants	Main Findings	Key Observations/Notes
Salehi Omran et al [9]	Case-Control Study	Cornell Acute Stroke Academic Registry (923 patients)	No association was found between LE and cryptogenic embolic stroke.	The majority of LE visualized using TEE
Schevchuck et al [14]	Controlled Cross-Sectional Study	SLE patients, matched controls, healthy controls	LE is common in SLE patients but not associated with embolism events.	No increase in stroke/TIA incidence in the presence of LE .
Zuo et al [15]	Prospective Cohort Study	Atrial fibrillation patients (8081)	No clear association found between LE and embolism events during or after catheter ablation.	No cardiovascular events during follow-up.
Chong-Lei et al [16]	Retrospective Analysis	Patients with LE	TEE is recommended for diagnosis and surgical excision for some patients with LE.	Surgical treatment had no complications or mortality.
Cammalleri et al [17]	Prospective Study	Patients with aortic valve stenosis scheduled for TAVI	No increase in cerebral ischemic events or other TAVI-associated complications in patients with LE.	Cerebral protection device used in some cases.
Cohen et al [18]	Case-Control and follow-up Study	Patients with brain infarction (cases) and controls (over 60 years old)	Association between mitral valve strands and brain infarction risk but no increased risk of recurrence.	Interobserver variability in detecting strands; potential causal relation questioned in older patients.

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Diagnosis and Treatment

LE is rarely associated with stroke or coronary artery blockage, although they are usually asymptomatic and incidentally found on echocardiography. Stroke may result from embolizing to the brain, especially those on the leaflets of the aortic and mitral valves. Diagnosis involves Doppler ultrasonography and echocardiographic scanning [5]. TEE is preferred for stroke evaluation due to its higher sensitivity, although high-resolution TTE can detect valvular strands [1,19]. On echocardiography, LE presents as autonomous, wavy, hypermobile, strand-like structures. Differential diagnosis includes various cardiac neoplasms, with fibroelastomas being the most challenging to distinguish from LEs. Treatment lacks definitive guidelines but may involve antiplatelet therapy, anticoagulation, or surgery. Asymptomatic patients should be closely monitored, while those with TIA/CVA may receive antiplatelet therapy, with some advocating dual antiplatelet therapy (DAPT). LE should be considered in the differential diagnosis of cryptogenic stroke, with TEE recommended for evaluation. Recurrent ischemic events may prompt a trial of anticoagulation therapy before surgical intervention, especially after a second CVA related to LE [5,19] . In patients with poor compliance, surgical excision and valve replacement may be preferable due to bleeding risks associated with antiplatelet/anticoagulation therapy [20].

Table 2: Summary of the diagnostic options and management of LE [1,5,19,20]

Aspect	Description
Diagnosis	
Tools	Doppler ultrasonography of carotid arteries, echocardiographic scanning of aorta segments (ascending, transverse, arch)
Recommended Imaging	TEE for higher sensitivity, but high-resolution TTE can suffice
Characteristics findings on imagings	At the leaflet's coaptation, autonomous, wavy, hypermobile, strand-like structures (≤ 2 mm thick and ≥ 3 mm long)
Differential Diagnosis	Imaging artifact, vegetations, thrombi, fibroelastomas, other cardiac neoplasms
Treatment	
Options	Single/dual antiplatelet therapy, anticoagulation, surgery
Asymptomatic patient	Close monitoring with TEE follow-up
Patients with TIA/CVA	Conservative: antiplatelet therapy (aspirin alone or DAPT)
Recurrent Ischemic Events	Consider anticoagulation therapy (warfarin, acenocoumarol)
Surgical Intervention	Valve replacement after second CVA related to LE, especially in non-compliant patients

Legends: DAPT: dual antiplatelet therapy

Conclusion

LE, though often incidental findings, play a crucial role in the differential diagnosis of cryptogenic stroke and other embolic events. Advanced imaging techniques, particularly TEE, are paramount in identifying and evaluating these structures. While most LEs do not pose significant clinical risks, understanding their potential to cause thromboembolic events is essential. Current treatment approaches need more definitive guidelines, necessitating individualized patient management. Further research is needed to elucidate the precise clinical implications of LEs and to establish standardized protocols for their management, ensuring optimal outcomes for affected patients.

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