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# Lambl's Excrescences and Congenital Heart Disease: Could they Increase the Risk of Ischemic Stroke in Adults? A New Research Perspective

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## Abstract

Lambl's Excrescences (LEx) have a low prevalence in the general population. They occur most frequently in adults over 60 years-old and their importance is related to cryptogenic stroke. Only a few studies have shown the prevalence in the pediatric population, and even more infrequent is to describe them in association with congenital heart disease. This manuscript describes the initial working hypothesis on the little known relationship between LEx and the possible increased risk of ischemic stroke in adults.

## Keywords

Lambl's excrescences; Cardiovascular research; Stroke; Congenital heart disease

## Background

Lambl's Excrescences (LEx) are avascular filiform extensions and fibrous projections often containing varying degrees of elastic fibrils. In order of frequency, they affect the mitral valve (68-76%), followed by the aortic valve (38-50%), and, less frequently, the tricuspid valve [1]. Their importance is related to cryptogenic stroke [2].

## Introduction

Lambl's Excrescences, also known as strands, occur at valve closure sites, and develop due to the natural wear and tear on the valvular surfaces. They often begin as small thrombi on the endocardial surfaces where the valve edges meet at the valve closure sites (Figure 2).

In addition to the heart valves, they can also affect prosthetic valves and endocardial surfaces. Dr. Vilem Dusan Lambl first reported on LEx in 1856 [3]. They are often diagnosed in adults, with increased prevalence after the sixth decade of life, peaking between 61-70 years, and decreasing after the heart valves age and become increasingly calcified, making them hard to see and increasing their under diagnoses.

In children, LEx have a very low prevalence (0.9%-2.6%). This supports the age-related "wear and tear" process described in previous studies [4]. They are generally asymptomatic in children and require no intervention. However, in adults, they are associated with thromboembolic events, cerebrovascular accidents, peripheral embolization and acute coronary syndrome [5,6].

## Research Hypothesis

Most cases of LEx are diagnosed in adults and in healthy hearts, but they are also associated with rheumatic disease, a history of endocarditis or chronic inflammatory processes [1,7]. We previously published a study of 17 LEx cases which included several pediatric cases related to Congenital Heart Disease (CHD) [8].

Our research group has proposed to answer the question of the congenital origin of LEx, their relationship with CHD and the increased risk of Ischemic Stroke (IS) due to this cause. To date, a bibliographic search has been performed on Google Scholar and PubMed databases in the last 10 years with focus in LEx and CHD (Figure 1 and Table 1).

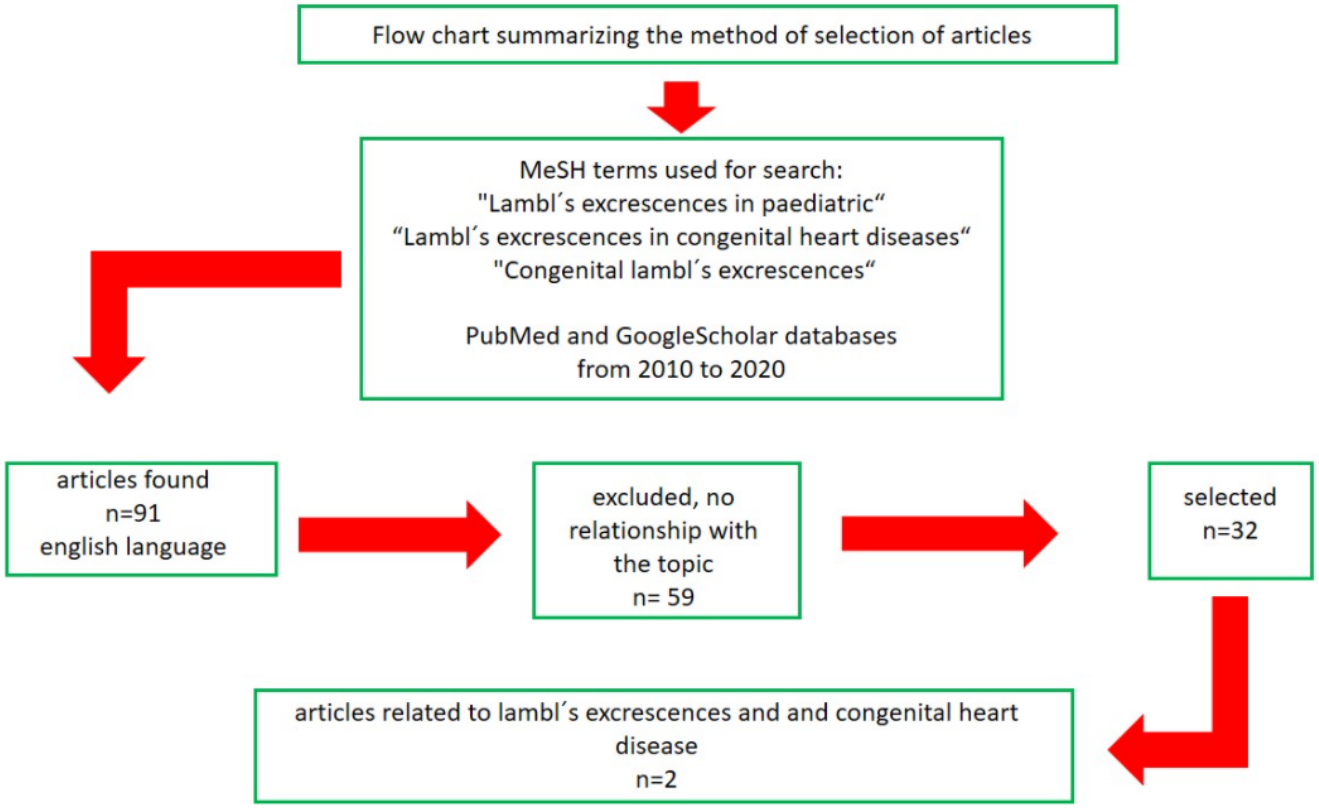


**Figure 1:** Flow chart summarizing the method of selection of articles.

| Author | Highlights | Follow-up outcome |
|---|---|---|
| Phillips, et al [4]. | • This research determined the prevalence of LEx in children from two eras (2004-2006 and 2011-2012) and the effect of technological advances in the detection of LEx.<br>• LEx have low prevalence, only 12/700 (1.7%) children<br>• No significant differences were found in the prevalence between the two periods. | Long-term follow-up, there were no clinical events in the 12 children identified with LEx. |
| Araujo, et al [8]. | • This research showed the association or coexistence of LEx with some Congenital Heart Disease (CHD)<br>• 94% of Lambl's outgrowths were located in the aortic valve.<br>• In 47% (8 cases), they coincided with a CHD (6 of these individuals were under 18 years of age)<br>• LEx outgrowths could be more frequent than is currently reported in the literature | No complications were found throughout the follow-up. |

## Research Perspective

One of the reasons our research group became interested in understanding the relationship between LEx and CHD is the scant number of articles published on the topic. As mentioned previously, we have found LEx associated with congenital heart defects, even in newborns. We have therefore wondered if there is a congenital origin of LEx, with this being the main reason. While we still do not have clear evidence of this, we are working on a research project which gathers several LEx cases diagnosed by transthoracic or transesophageal echocardiography during CHD diagnosis or follow up in the pediatric population of our healthcare center. Secondary reason in a future research would be to determine the relationship between LEx and the potential development of IS. Although it is very rare and scarce in children, it becomes more important in the adult population. Therefore, it is important to determine if persistent LEx associated with a repaired or monitored CHD is a cause of IS in adulthood. With the results we might obtain, we could consider the recommendation of whether it is pertinent to carry out an exhaustive search for LEx in all CHD patients, and determine if, once diagnosed in association with CHD, surgical resection is necessary during CHD repair, as we are confirming in several of our cases (Figure 2). Currently, more than 90% of children with CHD survive to adulthood [9] therefore, the persistence of LEx in adult survivors could explain one of the causes of IS in this population. Recently, Giang, et al. published the most relevant study to date related to IS and CHD. This study compared CHD patients with a control group without CHD. In general, patients with CHD have a five times higher risk of developing IS compared with the population without CHD. A comparison of the two groups (CHD vs. no CHD) showed that the cumulative incidence of IS at age 20 was 0.4% vs. 0.02%; at 50 years was 5.6% vs. 0.4%; and at 75 years was 20.8% vs. 6.8%, respectively [10]. Several known mechanisms and the development of IS are discussed, but the possibility of LEx and CHD is not considered, and this further motivates us to research the topic.

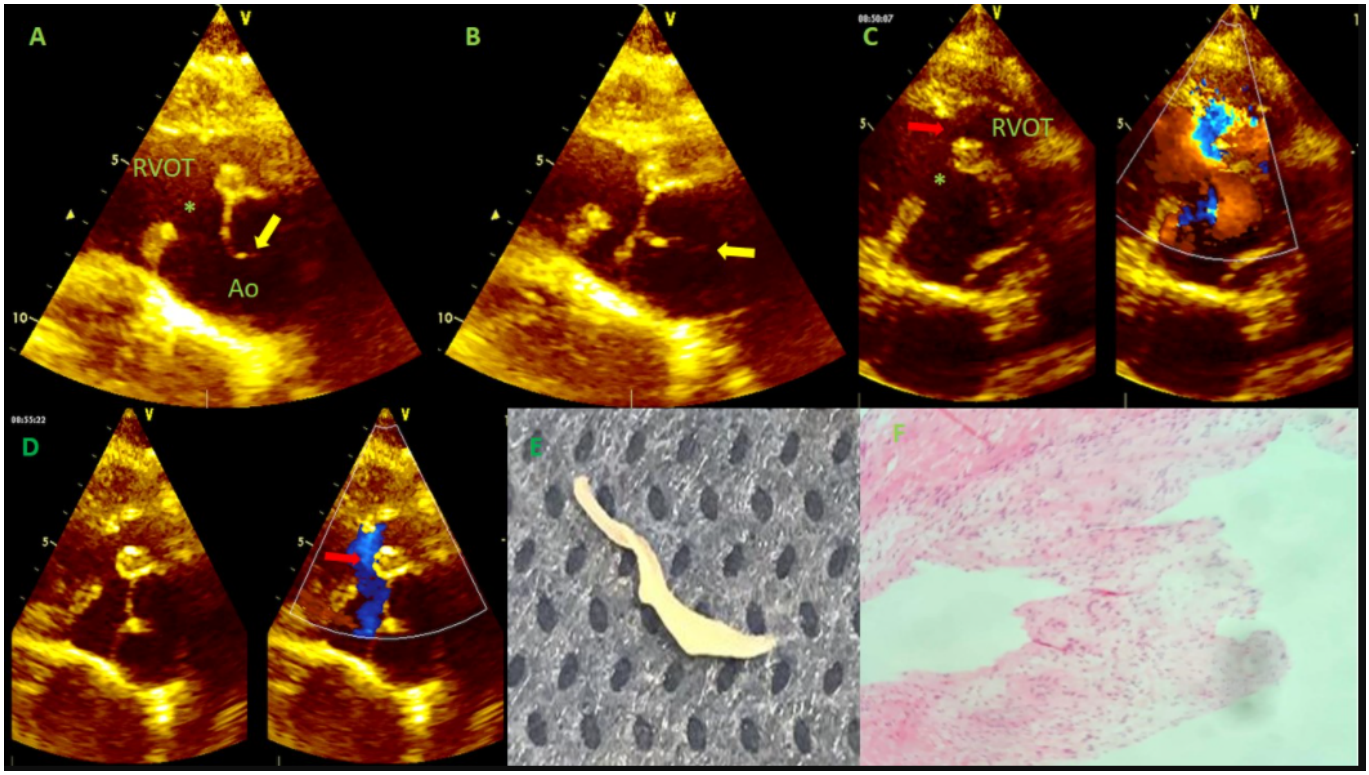


**Figure 2:** 26-year-old adult with unrepaired tetralogy of fallot, who underwent surgical repair and simultaneous resection of LEx in aortic valve (see below). 2A: Short axis view of the aortic

valve in systole (AO). Ventricular septal defect (*) is observed that extends to the Right Ventricular Outflow Tract (RVOT). Yellow arrow shows LEx (fine filaments) that extend over the edge of the right aortic leaflet. 2B: The same in A, dyastole (closed Ao). 2C: Short axis comparative mode color in systole wit focus on RVOT. Red arrow shows the hyperrophic infundibular septum, displaced anterior and right in RVOT. At this point there is an obstruction. 2D: The same view in D, the red arrow shows blood in diastole causing shear stress on the aortic valve, which is a described cause of the wear process and the development of Lex. 2E: Gross anatomic specimen of the LEx removed during surgical repair of CHD. 2F: microscopic examination of the tissue with hematoxylin eosin staining revealed that the structure consisted of focally hyalinized dense connective tissue with little inflammatory infiltrate.

## Conclusion

Lambl's excrescences have a low prevalence in the pediatric population and are frequently benign; thus, their detection is not routinely included in echocardiographic studies. However, in previous cases, we have noted the presence of LEx associated with repaired or unrepaired CHD, which suggests that the prevalence of LEx may be greater. At the same time, if CHDs are the most common congenital malformation and LEx may be associated with these congenital defects, we could conclude that it is necessary to surgically resect LEx during CHD repair. This is based on the fact that, today, more than 90% of children with CHD survive into adulthood, and IS is a common problem in adults. Our ongoing study seeks to explain the relationship between LEx and CHD, determining if they are coincidental or if they are a part of the CHD itself (congenital origin). We hope to conclude this study and contribute the answers to the questions proposed in the working hypothesis. This could provide guidelines for the surgical management of CHD and more explanations of IS in adults.

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## Conflict of Interest

The authors have no conflict of interests related to this publication.

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## Authors’ Contribution

- John Jairo Araujo: Performed echocardiogram, wrote the paper
- Daniela Alvarez Rendón: Wrote the paper
- Rafael Jose Meza: Performed surgery and observer

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