

# Surgical Correction of Congenital Apical Left Ventricular Aneurysm: A Case Series

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## Abstract

**Background:** Congenital apical left ventricular aneurysm is a rare cardiac anomaly and the procedure for the corrective surgery is often not well described. The purpose of this study is to present our surgical technique for the management of this rare cardiac anomaly and to report the outcome of our series of patients.

**Methods:** We detailed our experience with three patients with congenital apical left ventricular aneurysm. Their ages were three months, eight months, and four years, all of whom were operated between the years 2012 and 2013. The main technique was apical amputation and linear repair of ventricular wall with or without endoventricular circular patch under cardiopulmonary bypass.

**Results:** All patients underwent operations successfully without any perioperative complications and were discharged from the cardiac intensive care unit within one day after surgery. Postoperative echocardiogram showed normal left ventricular function in all cases. All patients have good functional status.

**Conclusion:** Based on our experience, apical amputation and linear plication with or without endoventricular circular patch is a simple, safe, effective and reproducible technique for the management of congenital apical left ventricular aneurysm.

**Keywords:** Congenital left ventricular aneurysm, endoventricular patch, linear plication apical, left ventricular aneurysm, echocardiogram, amputation

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## INTRODUCTION

Congenital apical left ventricular aneurysm is a rare cardiac anomaly, with a prevalence of 0.04% in the population.<sup>1</sup> Patients may be asymptomatic, or have congestive heart failure, with arrhythmia, and may face sudden death from rupture of the aneurysm.<sup>1-5</sup> Details of surgical strategy are not often described due to the rarity of the condition. Only a few case reports have been published and the surgical technique is not well documented.<sup>6</sup> In the present article we present our experience in treating this rare condition, and report

the short-term outcomes of our approach.

## PATIENTS AND METHODS

From 2012 to 2013, there were three patients in Chiang Mai University Hospital who were diagnosed as having true apical left ventricular aneurysm. All three presented with symptoms of heart failure. One patient had hemopericardium (Table 1).

Diagnosis was achieved by the use of imaging studies such as transthoracic echocardiography and CT scan (Figures 1 & 2). Pathological diagnosis of true

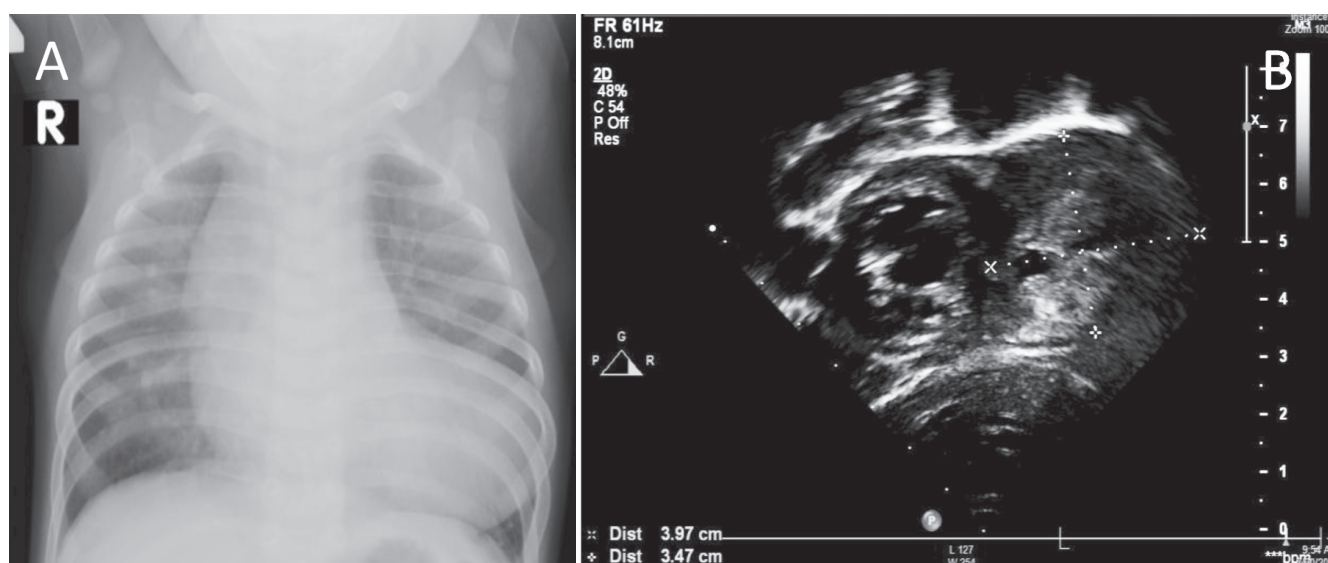
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Table 1 Patients in the case series.

| Patient No. | Age (mo) | Sex | Presentation         | Aneurysmal size (mm × mm) | Peak gradient across aneurysmal neck (mmHg) |
|-------------|----------|-----|----------------------|---------------------------|---------------------------------------------|
| 1           | 7        | M   | CHF                  | 30 × 40                   | 60                                          |
| 2           | 3        | M   | CHF, hemopericardium | 34 × 35                   | 73                                          |
| 3           | 48       | M   | CHF                  | 32 × 26                   | 58                                          |

M=Male, CHE=congestive heart failure



**Figure 1** A) Chest X-ray of a 7-month-old infant shows abnormal bulging of left cardiac border. B) Transthoracic echocardiogram of the same patient demonstrates a 3.9x3.4 cm aneurysm protruding from left ventricle.

LV aneurysm was confirmed in all cases (Figure 3).

given in Table 2.

### *Surgical techniques*

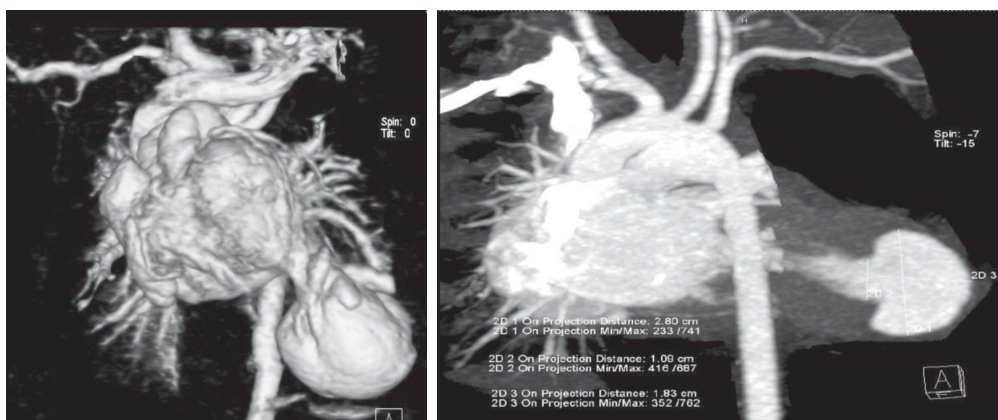
Correction of congenital LV aneurysm was performed under cardiopulmonary bypass with cardioplegic cardiac arrest. There were three main surgical steps: apical aneurysmal amputation; aneurysmal neck closure; and linear plication of aneurysmal wall (Figure 4).

There were two techniques of aneurysmal neck closure, depending on the size of the neck. In the case of small aneurysmal neck, closure was done directly using interrupted horizontal mattress 4-0 polypropylene sutures with pledget reinforcement (Figures 4C, D). For large aneurysmal neck, a circular endoventricular PTFE patch was placed prior to the use of horizontal mattress sutures (Figure 5). A summary of operative procedures for all three patients is

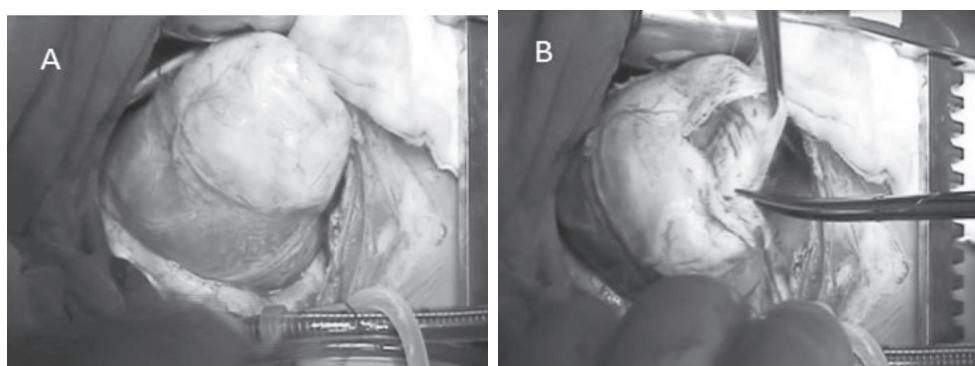
### **OUTCOMES**

All patients underwent successful surgical correction of congenital LV aneurysm, without postoperative complications. All were discharged from the cardiac intensive care unit within one day after surgery.

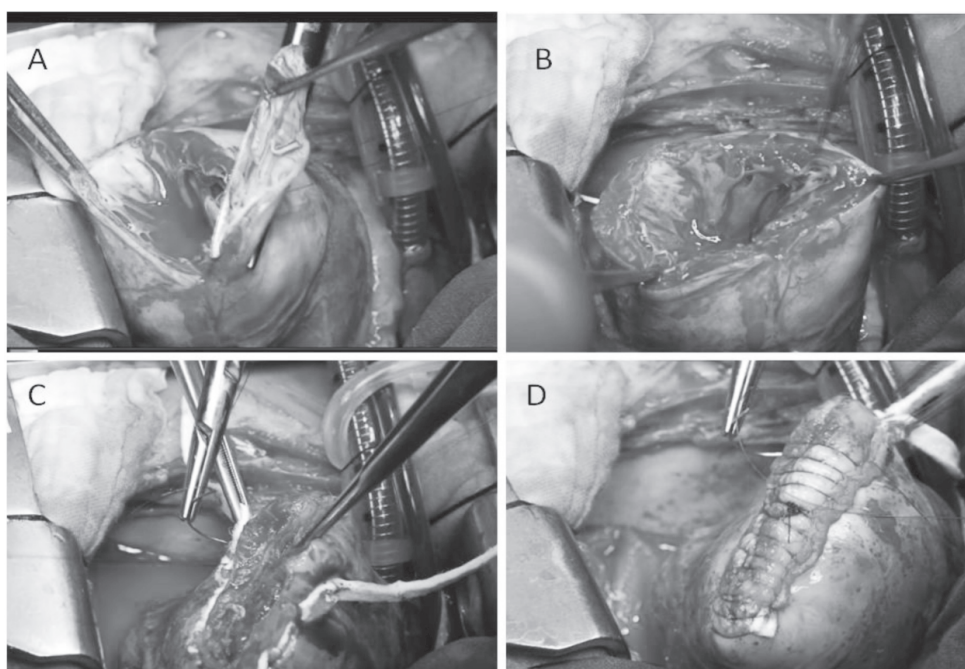
Preoperative echocardiographic results of all patients were compared with those obtained postoperatively at two months. The diameter of the left ventricle was measured along the parasternal axis at the level of the mitral valve tips. Ventricular function was measured using fractional shortening of the ventricle. Postoperative echocardiograms show improvement of the left ventricular function in all cases, compared with preoperative results (Table 3).



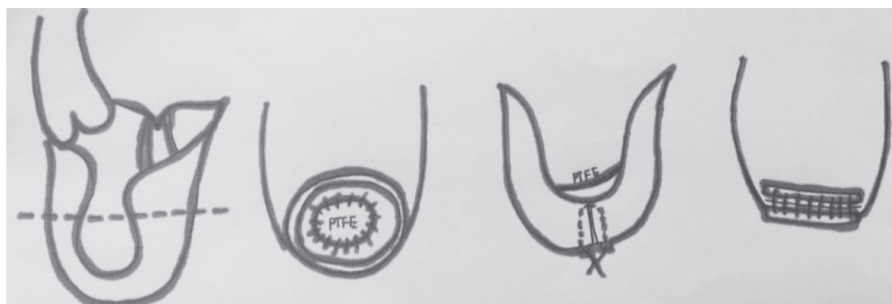
**Figure 2** 3D CT reconstruction demonstrates a large outpouching sac arising from left ventricular apex, measuring about 3.7x3.7 cm in caliber.



**Figure 3** Intraoperative findings in three-month-old infant (patient No. 1). A) Showing apical LV aneurysm. The wall of the aneurysm contracted in synchrony with the corresponding chamber. B) No intraluminal thrombus was found.



**Figure 4** A) The wall of aneurysm is excised. B) The residual wall of aneurysm, with good blood supply, is electrocauterized. C, D) Linear plication of aneurysmal wall is done using double layered, horizontal mattress 4-0 polypropylene sutures with stripped pledget reinforcement.



**Figure 5** A circular endoventricular PTFE patch is placed prior to horizontal mattress polypropylene sutures.

**Table 2** Operative details of the three patients in the series

| Patient No. | BW (Kg) | Technique of repair                                | Bypass time (min) | Clamp time (min) | Post-op intubation time (hr) |
|-------------|---------|----------------------------------------------------|-------------------|------------------|------------------------------|
| 1           | 5.5     | Directed aneurysmal neck closure, linear plication | 67                | 25               | 21                           |
| 2           | 7       | Endoventricular circular patch, linear plication   | 61                | 42               | 9                            |
| 3           | 12.7    | Directed aneurysmal neck closure, linear plication | 49                | 32               | 9                            |

**Table 3** Comparison between preoperative and postoperative values of ventricular size and ventricular function

| Patient No. | LVEDD(mm)     |                | LVESD(mm)     |                | FS %          |                |
|-------------|---------------|----------------|---------------|----------------|---------------|----------------|
|             | Pre-operative | Post-operative | Pre-operative | Post-operative | Pre-operative | Post-operative |
| 1           | 34            | 27             | 29            | 19             | 14.4          | 29.8           |
| 2           | 30.1          | 24             | 21.7          | 16             | 28            | 34             |
| 3           | 43            | 38             | 35            | 22             | 18.7          | 42.9           |

LVEDD = left ventricular end diastolic diameter, LVESD = left ventricular end systolic diameter, FS = fractional shortening

Mitral valve function was also evaluated in all patients after operation. One patient (Patient No. 2) had mild mitral valve insufficiency, which was not clinically significant.

All patients were followed over a period of 3 to 23 months (mean, 15 months), and are still currently under follow-up. The most recent clinical information was obtained by means of outpatient evaluation or telephone interview. All patients had good functional status.

### CONCLUSION

Based on our experience, apical amputation and

linear plication with or without endoventricular circular patch is a simple, safe, effective and reproducible technique for the surgical correction of congenital apical left ventricular aneurysm.

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**บทคัดย่อ** ผลการรักษาโรคหัวใจห้องล่างซ้ายโป่งพองแต่กำเนิด (Congenital Left Ventricular Aneurysm) โดยวิธีการผ่าตัด: Case Series

ฉัตรอรุณ ริมสุขเจริญชัย, สุรินทร์ วรกิจพูนผล

สาขาศัลยศาสตร์ทรวงอก คณะแพทยศาสตร์ มหาวิทยาลัยเชียงใหม่

**วัตถุประสงค์:** เพื่อรายงานวิธีการผ่าตัดรักษาโรค congenital left ventricular aneurysm ซึ่งเป็นภาวะที่พบน้อยมาก และยังไม่มีการรายงานวิธีการและขั้นตอนในการผ่าตัดที่เป็นมาตรฐานชัดเจน รวมถึงรายงานผลของการรักษาทั้งในแง่ของการตรวจทางภาพสะท้อนคลื่นหัวใจและอาการทางคลินิก

**วิธีการ:** รวบรวมข้อมูลของผู้ป่วยที่ได้รับการวินิจฉัยว่าเป็น congenital left ventricular aneurysm ของโรงพยาบาลมหาวิทยาลัยเชียงใหม่ย้อนหลัง ตั้งแต่ มกราคม 2555 ถึง ธันวาคม 2556 ในรายละเอียดของอาการแสดง ผลตรวจทางรังสีวิทยา และรายละเอียดวิธีการผ่าตัด รวมทั้งผลการรักษา

**ผลของการศึกษา:** มีผู้ป่วย congenital left ventricular aneurysm 3 ราย ได้รับการรักษาโดยวิธีการผ่าตัดภายใต้เครื่องปอดและหัวใจเทียม ซึ่งเทคนิคที่ใช้ได้แก่ การตัดผนังกล้ามเนื้อหัวใจ (apical amputation) และทำการซ่อมแซมด้วยวิธี linear plication และบางรายใช้วิธี endoventricular circular patch ร่วมด้วย ไม่มีผู้ป่วยคนใดมีภาวะแทรกซ้อนจากการผ่าตัด และใช้เวลาในหอผู้ป่วยวิกฤตน้อยกว่า 24 ชั่วโมง ผลการตรวจภาพสะท้อนคลื่นหัวใจหลังผ่าตัดพบการทำงานของหัวใจห้องล่างซ้ายเป็นปกติ ผู้ป่วยทุกรายมีสมรรถภาพการดำรงชีวิต (functional status) ปกติ

**สรุป:** การผ่าตัดรักษาโรค congenital left ventricular aneurysm โดยเทคนิค apical amputation และ linear plication, endoventricular circular patch เป็นวิธีที่ไม่ซับซ้อน สามารถนำไปใช้ได้อย่างแพร่หลาย และมีความปลอดภัยโดยที่สามารถรักษาการทำงานของกล้ามเนื้อหัวใจให้กลับคืนสู่ปกติอีกด้วย

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