

# Technique for supravalvular pulmonary artery stenosis



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A novel beating-heart technique for supra-avalvular pulmonary artery stenosis

## INTRODUCTION:

Pulmonary artery stenosis (PAS) may be congenital or acquired and presents itself as isolated or multiple lesions. Acquired PAS generally occurs following the surgical correction of congenital cardiac malformations such as anomalous origin of the left coronary artery arising from the pulmonary artery (ALCAPA) and tetralogy of Fallot (TOF). Treatment options for critical PAS include stent implantation, balloon angioplasty, and surgery.

In this report, our objective is to present a new surgical technique without the need for cardiopulmonary bypass used for a patient undergoing surgery for ALCAPA who required re-operation on the first postoperative day due to supra-avalvular pulmonary stenosis.

## CASE REPORT:

In a 8-year old boy, direct re-implantation of the left coronary artery into the aortic root was accomplished through median sternotomy under cardiopulmonary bypass. The general status of patient declined with accompanying signs and symptoms of right-sided heart failure within the first six postoperative hours. Also, liver enzyme levels were elevated and renal functions deteriorated. A biochemical profile revealed serum glutamic-oxaloacetic transaminase (SGOT) 832 mU/dl, serum glutamic-pyruvic transaminase (SGPT) 789 mU/dl, serum urea 65 mg/dl, and creatinine 2.1 mg/dl. Echocardiography showed severe right ventricular dysfunction and mild pulmonary insufficiency. As well as the supra-avalvular gradient was 80

mmHg, there was no transvalvular pressure gradient. Since supra-avalvular PAS was the suspected cause of the clinical instability of the patient, an urgent surgery was planned.

## SURGICAL TECHNIQUE

A median sternotomy was used for the surgical procedure. Pump was not used to avoid the possible adverse consequences of cardiopulmonary bypass in this patient with a poor general status and impaired renal and liver functions.

Firstly, an incision line on the stenotic supra-avalvular pulmonary artery segment was drawn. Then the dimensions of the graft to be placed were determined visually and the graft was prepared. The oval-shaped graft was sutured on the target stenotic pulmonary artery segment using 6/0 polypropylene sutures. During this procedure, special emphasis was placed on two issues:

1. Other than the proximal edge of the graft (the right ventricular side) all other edges were sutured using continuous sutures. However, no knots were tied and both ends of the suture were left free.
2. During the placing of the grafts, a space was created to form a convex structure in-between the anterior surface of the pulmonary artery.

Then, a small linear incision on the pulmonary artery was made distally on the pulmonary artery using a scalpel inserted from the proximal opening of the graft. Simultaneous pressure on the incision site was exerted digitally to prevent bleeding. The incision was propagated longitudinally using a <https://assignbuster.com/technique-for-supra-avalvular-pulmonary-artery-stenosis/>

Metzenbaum scissor. Upon exposure of the pulmonary artery, the convex structure disappeared spontaneously by eliminating the distance between the graft and the anterior surface of the pulmonary artery.

Soon after the incision was made in the distal direction on the pulmonary artery according to a pre-determined length, the sutures on the proximal surface of the graft were stretched as to fix the graft on the pulmonary artery. At the end of the procedure, while a moderate level of tension was maintained on the sutures manually, the proximal end of the graft was closed using continuous sutures. Thus, at the end of the procedure the desired pulmonary artery diameter was achieved.

No hemodynamic instability was observed during the procedure.

Intraoperative echocardiography showed no residual gradients on the pulmonary artery. The patient was extubated at postoperative 12<sup>th</sup> hour. A quick clinical improvement of right-sided heart failure was observed during the follow-up along with restoration of normal liver enzyme levels within 48 hours and normal renal functions within one week after surgery. The patient was discharged at postoperative 8<sup>th</sup> day.

Follow-up examination at 1 year after surgery showed a good general status with weight gain. No gradient was detected at the pulmonary artery by echocardiography.

#### DISCUSSION:

PAS may be congenital or acquired. Acquired pulmonary artery stenosis is generally a complication of the surgical procedures performed for the repair <https://assignbuster.com/technique-for-supraaortic-pulmonary-artery-stenosis/>

of complex congenital cardiac malformations (1). For instance, in patients such as ours with ALCAPA, supra-avalvular PAS may develop following surgery (2). In certain circumstances, both congenital and acquired types of pulmonary artery stenosis may pose significant surgical challenges. Particularly, the presence of clinical instability may severely limit the therapeutic options in newborns.

Treatment options for critical PAS include stent implantation, balloon angioplasty, and surgery. In recent years, despite significant advances in the technology of stent and balloon production, surgical repair remains an important therapeutic option. The success rates with balloon dilatation in these patients are limited (3). On the other hand, intravascular stents are associated with the formation of re-stenosis in the long term due to somatic growth (4). Thus, surgical repair stands out as an important alternative to both other approaches in pulmonary stenosis. We didn't prefer catheterization because of early period after surgery and impaired kidney function.

The current surgical methods for the reconstruction of the PAS may be associated with untoward consequences due to the need for cardiopulmonary bypass. Therefore, in order to avoid possible adverse effects of cardiopulmonary bypass, we developed a novel surgical technique to be used for the repair of supra-avalvular pulmonary artery stenosis without pump.

The surgical technique utilized in this patient is simple and safe distinguishing itself from other techniques by negating the need for pump.

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Particularly, it seems suitable for selected, clinically unstable cases who may be adversely affected by cardiopulmonary bypass. In previously operated patients with supra-avalvular pulmonary artery stenosis, this technique may be safely applied without the increased risk of bleeding or thromboembolic events. However, larger patient populations are warranted to more firmly establish its safety. Nevertheless, we believe that this technique for the pulmonary artery reconstruction may provide significant increases in the diameter of the pulmonary artery in a beating heart with minimal morbidity and mortality.

According to our knowledge, there have not been reported any off-pump technique for PAS in the English literature to date.

In conclusion, this newly developed method of supra-avalvular PAS surgery is safe and long lasting. This surgical technique may be applied on patients not only who had an isolated supra-avalvular PAS but also who were previously operated, developed restenosis in early period and were under risk if pump was used without disrupting the hemodynamic stability.