

# SYMPTOMATIC AORTIC ARCH FLOATING THROMBUS IN A PATIENT WITH “BOVINE ARCH”

Luis Ángel Suárez González<sup>1</sup>, Sara Busto Suárez<sup>1</sup>, Rafael Fernández-Samos Gutiérrez<sup>1</sup>, Marta Ballesteros<sup>1</sup> Pomar

<sup>1</sup> Complejo Asistencial Universitario de León, Department Vascular and Endovascular Surgery

\* Corresponding author: pedro\_psousa@hotmail.com

## Abstract

*Bovine arch is an aortic arch variant in which the left common carotid artery and the brachiocephalic trunk share the same origin. Several vascular pathologies, as aneurysm, dissection or strokes have an increased prevalence in patients with this anatomic variant. We describe the first reported case of a young patient with a symptomatic aortic arch floating thrombus in association with a bovine arch.*

## INTRODUCTION

Bovine arch is an aortic arch variant in which the left common carotid artery and the brachiocephalic trunk share the same origin, which is seen in almost 20% of population<sup>1</sup>.

The presence of bovine arch has been related with an increased incidence of vascular events, such as embolic stroke, dissection or aneurismatic degeneration<sup>2</sup>.

Aortic arch floating thrombus is a rare pathology, which is related to embolic events. Only a few short series of cases are reported, and there is no standardized treatment to the pathology. Open surgical repair (embolectomy, aortic arch replacement) is the classic treatment of choice in those symptomatic cases or when treatment with heparin doesn't achieve thrombus resolution<sup>3</sup>. New endovascular therapies have shown good results and could be the future gold standard.

We present, to our notice, the first reported case of a

patient who presents a bovine arch in addition with an aortic floating thrombus.

In lieu of a formal ethics committee, the principles of the Helsinki Declaration were followed. The patient gave his permission to publication.

## CASE REPORT

We present the case of a 47-old man, smoker patient with no other significant clinical history. He presented to our hospital with sudden left-hand rest pain, numbness and strength loss. He also refers self limited similar left hand episodes the last three months.

The patient had no axillary, brachial or distal pulses in his left arm. The left hand presented intense pallor, sensory motor deficit and slow capillary and venous refill time. The electrocardiogram showed no pathology.



**Figure 1**

*First angiogram showing aortic floating thrombus and bovine arch.*



**Figure 2**

*First angiogram showing aortic floating thrombus.*

CTAngiogram was performed to clarify the origin of ischemia. The CTAngiogram showed a bovine aortic arch, with left CCA having a common origin with the brachiocephalic trunk, with a floating thrombus originating proximal to the left subclavian artery that extended to the origin of this vessel (Figure 1 and Figure 2). Also, two occluded brachial artery

segments (middle segment and proximal to bifurcation) were noted.

Patient underwent trans brachial embolectomy under local anesthesia. Proximal and distal thrombectomy using 3F and 4F Fogarty catheters were performed, with extraction of two fleshy thrombus (Figure 3), achieving pulsatile inflow and distal return flow. Proximally, the catheter was progressed carefully and trying to not surpass the origin of the LSA to avoid mobilization of aortic thrombus. Distally, Fogarty catheters did not progress more than 10 cm into the radial artery, while complete progress of the Fogarty over the ulnar artery was achieved. The patient fully recovered from his previous symptoms and cubital pulse was detected by the end of the procedure.

After surgery, a conservative first approach was decided, starting a continuous perfusion of non-fractionated heparin. An anticoagulation regimen starting at 1000 UI/h was adapted to maintain 50-70secs aPTT. However, five days after surgery the patient suffered an episode of dizziness and visual alterations, compatible with vertebral territory stroke. A new CTAngiogram is performed at this time, showing persistence of the thrombus with no change or reduction (Figure 4).

Due to the new ischemic event despite heparin perfusion and considering that no changes into the thrombus had occur, we decided to perform a corrective hybrid surgery (thoracic endoprosthesis associated with a left carotid-subclavian by-pass).

Under general anesthesia, we first placed a 12 mm Amplatzer™ plug (AGA medical corporation) into the left subclavian artery origin from a trans brachial approach, preserving the left vertebral artery origin, to avoid new thromboembolic events during the thoracic endoprosthesis deployment.

After this, a 26x100 mm Tag A thoracic endoprosthesis (Gore medical) was placed from a percutaneous femoral approach covering the aortic thrombus and the left subclavian artery origin. Finally, we end the procedure performing a left carotid-subclavian by-pass, using a 6 mm ringed PTFE prosthesis, anastomosed in a terminal-lateral way in both left carotid and left subclavian arteries.

No postoperative incidences were recorded, and the patient was discharged from our hospital after five days, with acenocoumarol oral anticoagulation therapy. He attended to our institution one month after surgery for a clinical check, with all wounds healed and without any sequel and without suffering new embolic events. After 12 months follow-up, no other events have occurred.

## DISCUSSION

Historically considered a benign anatomic variation, bovine aortic arch seems nowadays to be related with several vascular abnormalities, which could be related with the abnormal hemodynamics caused due to the origin of supra-aortic vessels<sup>4</sup>. Syperek et al demonstrated that bovine arch had a significant association with embolic strokes. Moorehead et al found that this anatomical variation was more common in patients with arch aneurysm and dilation.<sup>5</sup> Other studies have

shown also the higher risk of these patients to develop thoracic aneurysm and type B dissections, even to suffer isthmic aortic injuries after a blunt trauma.<sup>6</sup>

Floating aortic arch is probably and underestimated cause of embolic events<sup>7</sup>. No consensus treatment of choice is established. Heparin anticoagulation can be a first approach treatment options, with some published series<sup>8</sup> showing good results, even with complete thrombus resolution. However, it seems that symptomatic patients have a high recurrence risk even with full heparin anticoagulation regimen, so open surgery has been proposed as an alternative treatment for these patients<sup>9</sup>. Between open surgery, there are different options to treat the pathology, like open arch thrombectomy or complete aortic arch replacement surgery. Good results using hybrid techniques, involving thoracic endografts with additional debranching of the supra-aortic vessels have been reported.<sup>10</sup>

### CONCLUSIONS

More and more publications are showing the risk of patients with bovine arch. Because of that, we can consider it a not-so-benign anatomic variation, and we should have a more strict control of these patients due to the life-threatening pathologies they can develop. New devices and techniques can help to solve these pathologies when they are present.

In this paper, we report another case of a patient treated with an hybrid approach with good results. Thanks to the advance of endovascular techniques we can now perform less aggressive procedures to treat this pathology, so a hybrid surgery first approach in young patients, especially in those symptomatic, seems to be safe and with low morbimortality. However, due to the small published cases and series, more casuistic is need to achieve a gold standard.



**Figure 3** *Fleshy thrombus.*



**Figure 4** *Second angiogram with no changes despite heparin conservative treatment.*

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