



## Case Report: Paradoxical Embolization Followed by Ischemic Stroke after Hyaluronic Acid Procedure of Penile Bioplasty

<sup>[1]</sup>Ana Beatriz Lima Pedroza, <sup>[2]</sup>Julia Souza e Costa, <sup>[3]</sup>Tatiana Quintanilha Soares da Silva, <sup>[4]</sup>Mário Vicente Campos Guimarães, <sup>[5]</sup>Josué Andrade Martins  
<sup>[1, 2, 3, 5]</sup>Universidade Anhembi Morumbi, <sup>[4]</sup>Universidade de São Paulo  
<sup>[1]</sup>ana.bp09@gmail.com, <sup>[2]</sup>juliaszcosta@gmail.com, <sup>[3]</sup>tatiana.s.quintanilha@gmail.com,  
<sup>[4]</sup>mariovicente@gmail.com, <sup>[5]</sup>andrademartins.md@gmail.com

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### Abstract—

**Introduction:** Hyaluronic Acid (HA) used in aesthetic procedures is of animal or bacterial origin, differing from human HA, interfering with its solubility and metabolism, and may cause emboli to form. This article reports the case of a patient with a patent foramen ovale who suffered a stroke after a penile harmonization procedure with Hyaluronic Acid.

**Methods:** The case reported in this article was collected through the evaluation of medical records and interviews with the respective patient, and we evaluated the results considering the most recent literature. **Results, Discussion and Conclusions:** A 51-year-old man developed holocranial headache and tonic-clonic seizure after 40 minutes of glans plasty with hyaluronic acid. On physical examination, the patient had bilateral homonymous hemianopsia, worse on the left, magnetic resonance imaging showed areas of restriction to occipital diffusion bilaterally, more to the left, Doppler ultrasound of the skull showed a high conductance right-to-left shunt and transesophageal echocardiography showed a foramen patent oval, opting for anticoagulation. Negative results are generally caused by inadequate intravascular application, the interaction with HA causes chemical damage to the intimal vascular layer and activation of coagulation factors leading to venous obstruction and thromboembolus formation. In general, glans fillers are safe, but anatomical variations and the characteristics of HA can lead to complications.

**Index Terms—** Embolization, Ischemic Stroke, Hyaluronic Acid, Patent Foramen Ovale.

## I. INTRODUCTION

Hyaluronic Acid (HA) is a glycosaminoglycan disaccharide used in aesthetic filling procedures for rejuvenation. Although also found in human tissues, the one available for such procedures is of animal or bacterial origin, differing in terms of concentration, particle size, extrusion force, and other molecular characteristics of HA present in humans, interfering with the solubility and metabolism of this substance<sup>1</sup>. Although safe and effective, with the increase in the use of this disaccharide, there has been an increase in reports of adverse effects related to the application of HA, including the formation of emboli.<sup>2</sup> In this article, we report the case of a patient with patent foramen ovale who suffered a stroke after a penile harmonization procedure with Hyaluronic Acid.

## II. METHODS

The case reported in this article was collected through the analysis of medical records and interviews with the respective patient, and we evaluated the results in the light of the most recent literature.

## III. CLINICAL PRESENTATION

A 51-year-old male patient underwent glans plasty with hyaluronic acid injection. Approximately 40 minutes after the procedure, the patient developed holocranial headache and generalized tonic-clonic seizure with 2-minute ictal post-ictal, the first of his life. He was medicated with

Diazepam and then referred to the Isrelita Albert Einstein Hospital. On admission, the patient was normoglycemic, with a blood pressure (BP) of 170x100mmHg, heart rate (HR) of 80bpm, and respiratory rate (RR) of 15irpm. On physical examination, the patient had a bilateral homonymous hemianopia, but worse on the left, with a National Institutes of Health Stroke Scale (NIHSS) of 2, without sensory complaints or motor deficits, so the initial investigation was chosen with a Computed Tomography (CT) scan of the skull, which was without alterations (Figure 1), in addition to the dosage of myocardial injury markers, biochemistry, electrolytes and Electrocardiogram (ECG). all within normality.

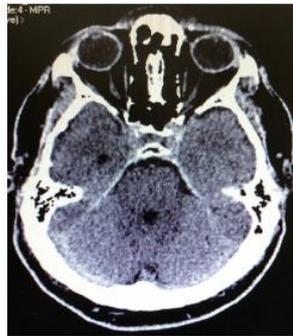


Figure 1. CT scan of the head

Subsequently, he was submitted to a continuous electroencephalogram (EEG), which was without alterations (Figure 2).

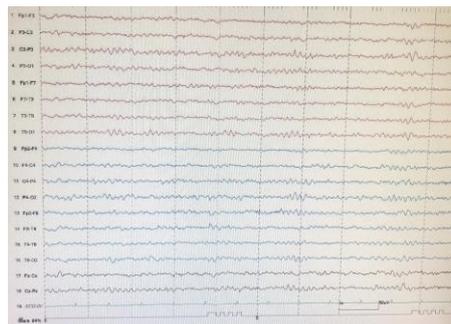


Figure 2. Continuous EEG

The cranial magnetic resonance imaging (MRI) showed areas of occipital diffusion restrictions bilaterally, more to the left, some regions with hypersignal also in flair (Figure 3 and Figure 4). Intracranial and cervical CT angiography without occlusion/stenosis (Figure 5).

Abdominal and lower limb ultrasonography (USG) were performed, which were un abnormal. Cranial Doppler ultrasound showed a high conductance right-to-left shunt and the transesophageal echocardiogram showed patent foramen ovale, and anticoagulation with eliquis 5 mg every 12 hours was then chosen. Due to the fall during the crisis, the patient had a compressive fracture of the upper plateau of the 11th thoracic vertebra (T11), with a reduction in somatic height by 15% and of the 12th thoracic

vertebra (T12), with a reduction in somatic height of about 50% and a small setback of the posterosuperior wall (estimated at 0.4cm), associated with minimal densification of the adjacent paravertebral myoadipose planes, in addition to reduction of the spinal canal at the level of T12. (Figure 6).

Thoracolumbar spine arthrodesis from the 10th thoracic vertebra to the 2nd lumbar vertebra was indicated, a procedure that occurred uneventfully and with significant improvement of the pain picture afterwards.

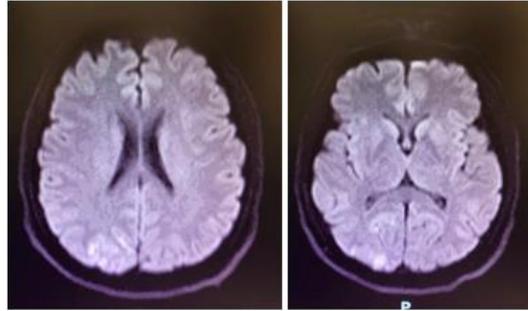


Figure 3 and Figure 4. Ischemia of the right occipital region



Figure 5. CT angiography of intracranial and cervical



Figure 6. MRI of the spine

## V. DISCUSSION

Although hyaluronic acid filling procedures have become popular because of their safety, the literature has an extensive collection of adverse effects remaining from this intervention. In general, the most common negative results due to glans plasty are the formation of nodules, edema, infections and subcutaneous hemorrhage, and there are also reports of local necrosis<sup>3,4,5</sup>. Severe complications caused by the application of hyaluronic acid, although rare in most cases, are caused by improper intravascular application<sup>6</sup>.

Chen et al<sup>2</sup>, in an observational study with Sprague-Dawley rats, were able to describe the formation of thrombi caused by the injection of hyaluronic acid in the inferior epigastric artery. The conclusions of the study pointed out that the interaction with HA causes chemical injury of the vascular intima layer and

consequent activation of intrinsic coagulation factors, leading to venous obstruction and thromboemboli formation.

In the procedure of glans plasty, the ideal site for HA injection is a sequence of perforations between the fascia of Dartos and Buck, in the proximal third between the apex of the glans and the coronal sulcus. In this region, it is important to note that anatomical variations and the very presence of extrinsic fluid can lead to inadequate infusions, which is aggravated by high penile vascularization, which may favor the conduction of emboli<sup>3,7</sup>. In this case report, the formation of post-glans embolus was aggravated by the presence of a patent foramen ovale, previously unknown in the patient, allowing the paradoxical distribution of the embolus from the venous to the arterial circulation, which would later reach the brain<sup>8,9</sup>.

### CONCLUSION

In general, glans plasty procedures with hyaluronic acid are safe and effective. However, the anatomical variations resulting or not from the procedure, especially vascular variations, and the very nature of the polysaccharide are important obstacles to be overcome and require further studies for this conclusion.

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