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## ***Transesophageal Echocardiography and Intraoperative Diagnosis of Persistent Left Superior Vena Cava***

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### **INTRODUCTION**

Isolate persistence of the left superior vena cava (SVC) affects up to 0.5% of the population, but in patients with congenital cardiopathy it has a prevalence that ranges from 3% to 10%<sup>1</sup>.

When present, it drains more commonly into the coronary sinus that might present varying degrees of dilation and in most cases leads to the diagnostic suspicion.

Transesophageal echocardiography (TEE) shows the left SVC as a hypoechoic image between the left atrial appendage and the left superior pulmonary vein. In longitudinal views, left SVC is seen as a vascular structure anterior to the left atrium and draining into the coronary sinus.

Confirmation of persistent left SVC is fundamental in cases in which a catheter will be inserted into the pulmonary artery, a transvenous pacemaker placement, or in cases in which the cardioplegic solution will be injected through the coronary sinus, since in all those situations it can have a negative influence in the procedure<sup>2</sup>.

### **CASE REPORT**

This is a 16-year old patient, 155 cm, 49 kg, from the state of Paraíba, Brazil, physical status ASA II, with a diagnosis of superior sinus venosus interatrial communication (IAC) with partial anomalous drainage of the pulmonary veins, scheduled for elective correction of the congenital cardiopathy.

Before the surgery, the anesthetic-surgical procedures to be performed were explained to the patient and his legal guardians.

On arrival at the operating room, the patient was monitored with cardioscope, pulse oximeter, bispectral index, and non-invasive blood pressure. Induction was achieved with fentanyl 10 µg.kg<sup>-1</sup>, followed by the administration of propofol until a bispectral index of 60 was achieved, cisatracurium 0.15 µg.kg<sup>-1</sup>, and maintenance was achieved with isoflurane, including during extracorporeal circulation. After tracheal intubation, the patient was maintained on controlled mechanical ventilation (Zeus® - Draeger, GmbH). Vesical as well as nasopharyngeal and rectal thermometers were introduced, a central venous access was inserted in the right anterior jugular vein, and the left radial artery was used to monitor the blood pressure.

The stomach was carefully emptied by aspiration with an orogastric tube and after it was removed a mouth piece was inserted for protection, through which the multiplanar transducer of the TEE lubricated with lidocaine gel was introduced into the esophagus.

The initial examination with the TEE followed the routine of the department, in which all cuts and films necessary for the basic exam are obtained and digitally recorded in the echocardiography equipment (Micromax® - Sonosite) for posterior analysis and review.

In this case, an increase of the right chambers (mid-esophageal standard four-chamber view with a multiplane angle of 0°), a 27-mm superior sinus venosus IAC (standard mid-esophageal bicaval view with a multiplane angle of 90°) that on Doppler showed a predominantly left-to-right shunt, and right SVC with "dependent droplet" aspect characteristic of anomalous pulmonary vein were detected. The remaining pulmonary veins were visualized in the normal localization.

The coronary sinus was seen on standard mid-esophageal four-chamber view with slight retroflexion of the transducer and a multiplane angle of 0°. It was dilated, measuring 15 mm (normal from 7 to 11 mm), which led to the suspicion of persistent left SVC. To confirm the diagnosis, 10 mL of agitated NS (works as a "contrast" in echocardiography) were quickly injected through the left arm venous access, and it was seen immediately afterwards filling the sinus venosus, thereby confirming the diagnosis.

After the institution of cardiopulmonary bypass, the interatrial septal defect was corrected with a pericardial patch prepared previously, and the right superior pulmonary vein was implanted directly into the left atrium.

After the surgical correction, TEE was repeated to monitor the presence of air in the cardiac chambers during removal of the cardiopulmonary bypass, which was uneventful, as well as a control exam that showed the patch occluding completely the septal defect and absence of flow between the atria on Doppler.

Since ventricular function as well as other hemodynamic parameters were satisfactory in the control exam, dobutamine infused at 5 µg.kg<sup>-1</sup>.min<sup>-1</sup> was discontinued. Twenty-five minutes after the end of the surgery, still in the operating room, the patient was extubated and transferred to the intensive care unit (ICU) without vasoactive drugs, only on nebulization with oxygen 5 liters per minute.

The evolution of the patient both in the ICU and in the ward was uneventful, and he was discharged from the hospital on the seventh postoperative day.

## DISCUSSION

Transesophageal echocardiography was introduced in anesthesia for cardiac surgery at the end of the 1980s<sup>2</sup> as a left ventricular monitoring tool. Since then, its use has been increasing among anesthesiologists, and it is recognized as an excellent alternative for intraoperative monitoring.

A minimally invasive method and the possibility to aggregate information that along those provided by other monitors allow a more complete view of difficult to control and/or to diagnose cases are among the advantages of TEE.

In response to the growing interest on the intraoperative use of TEE, the American Society of Echocardiography elaborated standardized guidelines for intraoperative TEE, composed by a series of anatomical cuts for careful assessment of the heart. Those guidelines were supported by the American Society of Cardiovascular Anesthesiologists, and they are the basis for the training of intraoperative TEE.

Systematic documentation also allows the creation of a data bank based on complete records and comparison among different moments of the same patient, as well as among different centers.

Recording the exams on video or their digital storage, making it possible to review them whenever necessary to clarify any doubts, is another important recommendation.

The different views are named according to the position of the transducer, description of the image, and the main structure visualized. The image on the right upper corner refers to the scanning angle of the multiplanar transducer beam.

Many of the same views are also used by color Doppler and spectral Doppler to study intracavitary and transvalvular flows. In our service, the exams are digitally stored in the equipment (Micromax® - Sonosite), and they are physically recorded on a standardized form in two copies (according to the recommendation of the task-force of the American Society of Cardiovascular Anesthesiologists), one of which is attached to the medical record and the other is filed to create a data bank.

Intraoperative echocardiography has some limitations, such as the scarcity of equipment available and adequate training, difficulty to insert the transducer, alignment of the ultrasound beam, and limitation of the depth. However, its use is invaluable in procedures like valvuloplasties, correction of congenital cardiopathies, and surgeries of the thoracic aorta, but it can also be useful in the management of patients with cardiopathies undergoing non-cardiac procedures and with difficult to control hemodynamic instability both in the ER and ICU.

## REFERÊNCIAS – REFERENCES

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**RESUMEN**

Silva AA, Silva ED, Segurado AVR, Kimachi PP, Simões CM - Ecocardiografía Transesofágica y Diagnóstico Intraoperatorio de Vena Cava Superior Izquierda Persistente.

**JUSTIFICATIVA Y OBJETIVOS:** La persistencia de la vena cava superior izquierda ocurre de forma aislada en 0,5% de la población normal, sin embargo, en los pacientes con cardiopatía congénita llega a estar presente de un 3% a un 10% de los casos. El objetivo de este relato, fue presentar un caso de diagnóstico intraoperatorio con la ayuda de la ecocardiografía transesofágica y resaltar la importancia de su utilización de rutina en intervenciones quirúrgicas para la corrección de cardiopatía congénita.

**RELATO DEL CASO:** Paciente del sexo masculino, 16 años, ASA II, con diagnóstico previo de comunicación interatrial (CIA), tipo seno venoso superior, con drenaje anómalo parcial de venas pulmonares, programado para la corrección quirúrgica de la cardiopatía. Después de la inducción de la anestesia general, se realizó el

ecocardiograma transesofágico (ETE). El examen inicial mostró lo siguiente: dilatación de las cámaras cardíacas derechas, CIA tipo seno venoso superior de 17 milímetros, drenaje anómalo de la vena pulmonar superior derecha desembocando en la vena cava superior (VCS) derecha, y dilatación del seno coronario, vislumbrándose así la posibilidad de la persistencia de la vena cava superior izquierda. Para la confirmación de la sospecha, se inyectaron en el acceso venoso del brazo izquierdo, 10 mL de solución fisiológica a 0,9% (haciendo el papel de "contraste" en el examen ecocardiográfico), e inmediatamente después, se visualizaron las micro burbujas pasando por el seno coronario, test positivo para el diagnóstico de VCS superior izquierda persistente.

**CONCLUSIONES:** La ecocardiografía transesofágica de rutina en el intraoperatorio de pacientes con cardiopatía congénita, tiene una fundamental importancia como método auxiliar no solo para el cirujano, que muchas veces está influenciando directamente la técnica quirúrgica usada, sino también para el anestesiólogo, que puede extraer del examen una serie de informaciones útiles en el manejo hemodinámico del paciente.