Mudança de Conduta Cirúrgica Motivada pela Ecocardiografia Transesofágica Intraoperatória *

Changes in Surgical Conduct Due to the Results of Intraoperative Transesophageal Echocardiography

Alexander Alves da Silva, TSA[1], Enis Donizete Silva, TSA[1], Arthur Vitor Rosenti Segurado, TSA[1], Pedro Paulo Kimachi, TSA[1], Claudia Marques Simões, TSA[1]

RESUMO
Silva AA, Silva ED, Segurado AVR, Kimachi PP, Simões CM – Mudança de Conduta Cirúrgica Motivada pela Ecocardiografia Transesofágica Intraoperatória.

JUSTIFICATIVA E OBJETIVOS: *A utilização da ecocardiografia transesofágica (ETE) é de valor indiscutível em procedimentos cirúrgicos como valvoplastias, cirurgias da aorta torácica e correções de cardiopatias congênitas. Entre as grandes vantagens da utilização da ETE destacam-se a pouca invasividade do método e a capacidade de agregar informações que podem alterar o curso da cirurgia. O objetivo deste relato foi apresentar um caso onde a condução cirúrgica da paciente foi alterada em decorrência de novos diagnósticos feitos pela ecocardiografia transesofágica no intraoperatório e ressaltar a importância da utilização do eco transesofágico em cirurgias para correção de cardiopatia congênita.*

RELATO DO CASO: *Paciente do sexo feminino, 28 anos, ASA II, com história de dispneia progressiva aos médios e depois pequenos esforços, veio encaminhada de outro serviço para correção cirúrgica eletiva de estenose da valva pulmonar diagnosticada pela ecocardiografia transtorácica. A ecocardiografia transesofágica intraoperatória evidenciou presença do forâmen oval patente, estenose infundibular da via de saída do ventrículo direito e comunicação interventricular (CIV) perimembranosa subaórtica medindo 0,4 cm com fluxo da esquerda para direita. Após a entrada da paciente em circulação extracorpórea foram confirmados os diagnósticos mencionados acima, e a cirurgia realizada incluiu o fechamento do forâmen oval e da CIV e a ressecção da estenose do infundíbulo. Não houve intercorrências cirúrgicas, e a paciente foi encaminhada intubada para a unidade de terapia intensiva.*

CONCLUSÕES: *A ecocardiografia transesofágica em pacientes submetidos à correção de cardiopatia congênita é de extrema utilidade, pois, além de ajudar no manejo hemodinâmico do paciente, pode trazer novas informações, capazes de melhorar o resultado final da cirurgia.*

Unitermos: CIRURGIA, Cardíaca: cardiopatia congênita, comunicação Interventricular; DOENÇAS, Congênita: cardiopatias; MONITORIZAÇÃO: ecocardiografia transesofágica

SUMMARY
Silva AA, Silva ED, Segurado AVR, Kimachi PP, Simões CM – Changes in Surgical Conduct Due to the Results of Intraoperative Transesophageal Echocardiography.

BACKGROUND AND OBJECTIVES: *Transesophageal echocardiography (TEE) is extremely useful in surgeries like valvuloplasty, of the thoracic aorta, and correction of congenital cardiopathies. The low degree of invasiveness and the capacity to aggregate information that can change the course of the surgery are among the advantages of TEE. The objective of this report was to present a case in which the surgical conduct was changed due to a new diagnosis provided by intraoperative transesophageal echocardiography, and to emphasize the importance of using the transesophageal echo in surgeries to correct congenital cardiopathies.*

CASE REPORT: *A 28-year old female, ASA II, with a history of dyspnea progressing from medium to small efforts was referred by another department for elective surgical correction of stenosis of the pulmonary valve diagnosed by transthoracic echocardiography. Intraoperative transesophageal echocardiography showed patent foramen ovale, infundibular stenosis of the right ventricular outlet, and perimembranous subaortic interventricular communication (IVC) of 0.4 cm with left to right shunt. After beginning ECC, the above mentioned diagnoses were confirmed and the surgery included closure of the foramen ovale and IVC, and resection of the infundibular stenosis. Intraoperative intercurrences were not observed and the patient was intubated when she was transferred to the intensive care unit.*

CONCLUSIONS: *Transesophageal echocardiography is extremely useful in patients undergoing surgical correction of congenital cardiopathies because, besides helping the hemodynamic management, it can provide new information capable of improving the final result of the surgery.*

Keywords: DISEASES, Congenital: cardiopathies; MONITORING: transesophageal echocardiography; SURGERIES, Cardiac: congenital cardiopathy, interventricular communication.

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1. Anestesiologista da São Paulo Serviços Médicos de Anestesia

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*Endereço para correspondência (**Correspondence to**):*
Dr. Alexander Alves da Silva
Rua Leôncio de Carvalho, 303/62
Paraíso
04003-010 São Paulo, SP

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Alexander Alves da Silva, M.D.; Enis Donizete Silva, M.D.; Arthur Vitor Rosenti Segurado, M.D.; Pedro Paulo Kimachi, M.D.; Claudia Marques Simões, M.D.

INTRODUCTION

Since the introduction of intraoperative transesophageal echocardiography in the 1980s, its popularity has increased significantly. Currently, more than 90% of teaching and training cardiovascular anesthesiology programs in the United States use transesophageal echocardiography as diagnostic a or monitoring tool.

The American Society of Anesthesiologists, along with the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists, created guidelines for the intraoperative use of the transesophageal echo to guarantee its use would meet acceptable academic standards.

Despite countless, well-conducted studies on the subject, the benefits of the routine use of this tool in all cardiac surgeries is still controversial[1], although strong evidence support the routine use of transesophageal echocardiography in surgeries to correct congenital cardiopathies.

CASE REPORT

A 28 years old female, 1.65 m, 69 kg, from São Paulo, ASA II, with echocardiographic diagnosis of stenosis of the pulmonary valve, was scheduled for elective surgery.

In the pre-anesthetic evaluation, the anesthetic-surgical procedure proposed, as well as potential benefits and risks, were explained to the patient.

Upon arrival to the operating room, the patient was monitored with cardioscope, pulse oximeter, BIS®, and non-invasive blood pressure. Anesthesia was induced with 10 $\mu g.kg^{-1}$ of fentanyl, followed by the slow injection of propofol until the bispectral index was below 60, and 15 $\mu g.kg^{-1}$ of cisatracurium, and it was maintained with isoflurane, even during extracorporeal circulation. After tracheal intubation, a Zeus® anesthesia device was connected; a vesical catheter was introduced; nasopharyngeal thermometer was placed; the right anterior jugular vein was punctured for central venous access, and the left radial artery was cannulated for invasive blood pressure monitoring.

The stomach was carefully aspirated; this was followed by the placement a protective cannula, through which the multiplanar probe of the transesophageal echo (TEE), lubricated with 2% lidocaine gel, was introduced in the esophagus.

The initial TEE was performed according to the routine of our department, in which all views and films necessary for the basic exam are obtained and digitally recorded in the echocardiography equipment (Sonosite Micromaxx®) to be analyzed later; it is only then that the most striking findings are carefully reviewed.

Intraoperative echo showed significant right ventricular hypertrophy (Figure 1), and globally preserved contractile function with an estimated ejection fraction of 56%. The presence of a patent foramen ovale was detected by the administration of agitated NS (that works as echocardiographic contrast) through the central line, and the right to left flow was visualized in the standard four-chamber view with multiplane axis of 0°; right ventricular outlet infundibular stenosis seen in the short axis aortic view with multiplane angle of 58° (Figures 2 and 3); and tricuspid valve reflux, which allowed us to estimate the systolic pressure in the pulmonary artery at approximately 80 mmHg. This is done by using the Bernoulli equation that transforms the velocity of the flow measured by the Doppler placed on the reflow of the valve under pressure. To this, we added

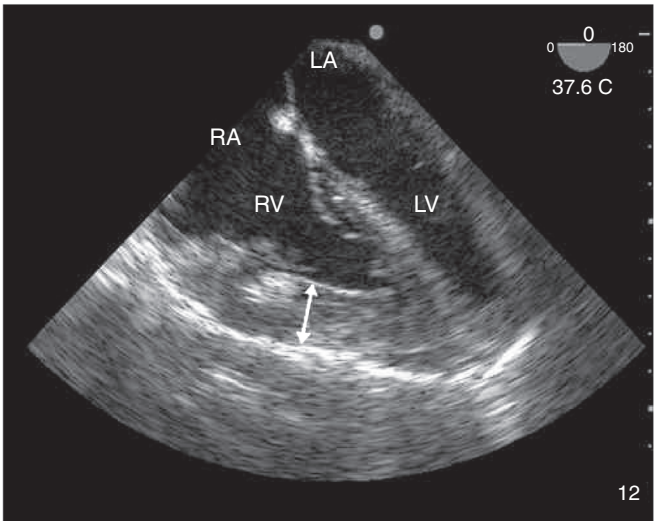

Figure 1 – Four-chamber view with multiplane (right upper corner) of 0° showing significant hypertrophy of the RV (white arrow).

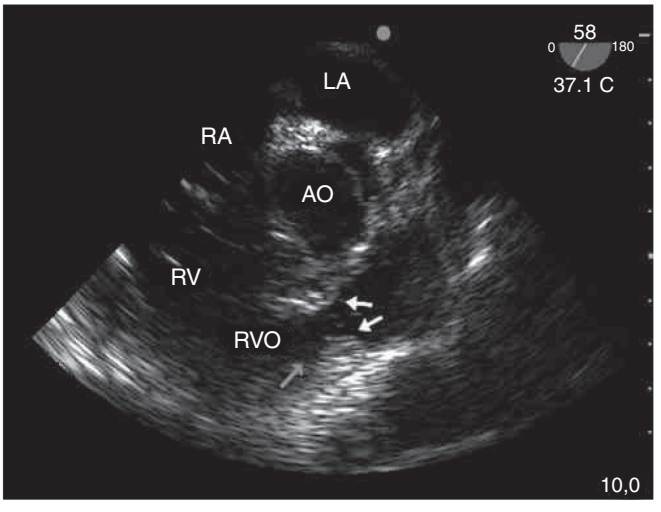

Figure 2 – Short axis aortic view with multiplane of 58° showing infundibular stenosis (gray and white arrows).

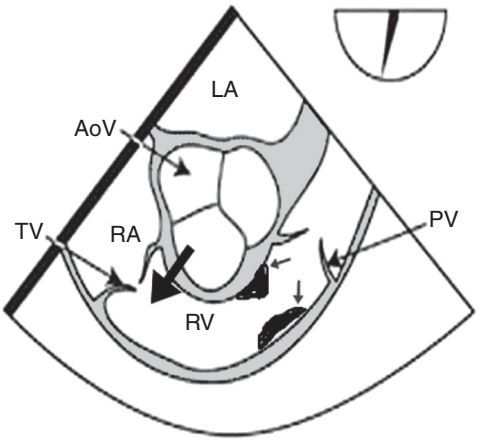

Figure 3 – Illustration showing the short axis aortic view of the subaortic IVC (black arrow) and infundibular stenosis (thin arrows).

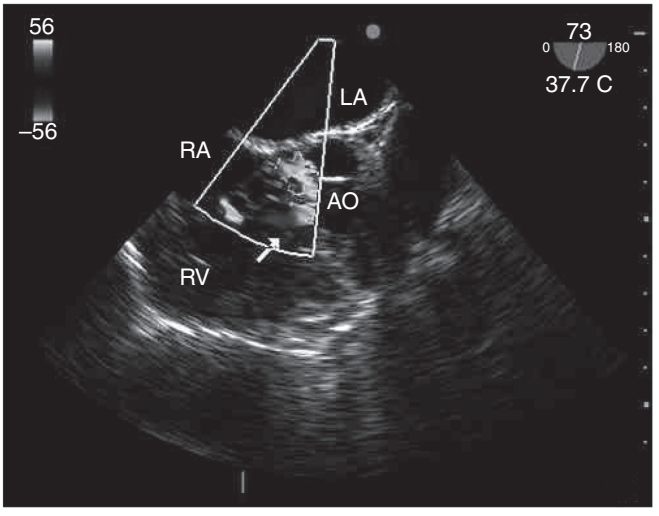

Figure 4 – Short axis aortic view with multiplane of 73°. Color Doppler mapping shows the flow (white arrow) from the subaortic region to the right ventricle.

the right atrial pressure, using the central venous pressure. Lastly, the perimembranous subaortic interventricular communication (IVC), measuring 0.4 cm, with left-to-right shunt was seen on color Doppler (Figure 4).

After connecting the extracorporeal circulation, all echocardiographic findings were confirmed by the surgeon. The interventricular communication was repaired with an autologous pericardial patch prepared previously, the foramen ovale was closed with prolene suture, and the infundibular stenosis was resected.

At the end of the surgical correction, the TEE was used once more to monitor the presence of air in the heart chambers during removal of the extracorporeal circulation, which was done without intercurrences, as well as for a control exam that confirmed the absence of flow through the IVC and foramen ovale, and the increase in the right ventricular infundibular diameter. Systolic pressure in the pulmonary artery could not be estimated because the negligent tricuspid flow did not allow the calculation.

Since the patient was at risk of developing acute pulmonary edema due to the resection of the right ventricular outlet, she was still intubated when transferred to the intensive care unit. Seven hours after arriving to the ICU, the patient was extubated, being discharged from the unit on the third postoperative day. She was discharged from the hospital on the sixth postoperative day without intercurrences.

DISCUSSION

The impact of the transesophageal echocardiography in patients with congenital cardiopathies has been studied by several investigators. The rate of a new diagnosis by intraoperative TEE reported in the literature reaches up to 19%, and when we consider a change in surgical strategy due to additional data, this change in conduct has been reported in about 2.1% of the cases[2].

This last number may seem small, but note that many patients undergoing cardiac surgery cannot undergo a second intervention in a short time; therefore, in those cases, the use of the echo is extremely important.

The quality of the preoperative transthoracic echo, the time between this exam and the surgery, and patients who undergo surgeries based only on the cardiac catheterization are among the main reasons for the variations observed by the authors of different studies. Besides, individual characteristics of each patient that can lead to an unfavorable technique (poor acoustic window) of the transthoracic exam, such as deformities of the rib cage, obesity, and prior surgeries, were also mentioned.

On the other hand, multivariate analysis did not identify one or more of those factors as major determinants of the risk of an incomplete surgical correction[3].

According to the literature, the major impact of the transesophageal echocardiography is seen in patients undergoing Ross procedure (autotransplantation of the pulmonary valve into the position of the aortic valve), resection of subaortic stenosis, and defects on the atrioventricular septum, followed by correction of tetralogy of Fallot, interventricular communications, and interatrial communications[4,5].

In the present case, the diagnosis of IVC by the transesophageal echo was fundamental to avoid future surgery, since the characteristics and severity of the defect would impose this need. Without this additional information, the surgeon would not have looked for the defect, since there was no need of surgical inspection of the subaortic region and, therefore, would not have repaired it. Both the infundibular stenosis and patent foramen ovale would have been intraoperative findings. The pulmonary valve did not have any changes requiring manipulation.

Note that, in this case, there was no need to reinstate the ECC for correction of new diagnosis. This is another matter that generates many arguments because it might not be so simple, especially when the first ECC was prolonged.

The detailed intraoperative exam allows the cardiac surgeon and anesthesiologist to validate the preoperative findings and,

consequently, avoid unnecessary interventions and the associated morbidity. Besides, the intraoperative findings could provide an opportunity to change the intended procedure, improving the final result for the patient, and possibly avoiding future surgeries.

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RESUMEN

Silva AA, Silva ED, Segurado AVR, Kimachi PP, Simões CM – Cambio de Conducta Quirúrgica Motivada por la Ecocardiografía Transesofágica Intraoperatoria.

JUSTIFICATIVA Y OBJETIVOS: *La utilización de la ecocardiografía transesofágica (ETE) es de un valor indiscutible en los procedimientos quirúrgicos como valvuloplastias, cirugías de la aorta torácica y correcciones de cardiopatías congénitas. Entre las grandes ventajas de la utilización de la ETE se destacan la poca invasión del método y la capacidad de agregar informaciones que pueden alterar el curso de la cirugía. El objetivo de este relato fue presentar un caso donde la conducción quirúrgica de la paciente fue alterada como consecuencia de nuevos diagnósticos detectados por la ecocardiografía transesofágica en el intraoperatorio y resaltar la importancia de la utilización del eco transesofágico en las cirugías para la corrección de la cardiopatía congénita.*

RELATO DEL CASO: *Paciente del sexo femenino, 28 años, ASA II, con historial de disnea progresiva a los medios y después de pequeños esfuerzos. Llegó remitida de otro servicio para la corrección quirúrgica electiva de estenosis de la valva pulmonar diagnosticada por la ecocardiografía transtorácica. La ecocardiografía transesofágica intraoperatoria arrojó la presencia del foramen oval patente, estenosis infundibular de la vía de salida del ventrículo derecho y comunicación interventricular (CIV) perimembranosa subaórtica, midiendo 0,4 cm con flujo de la izquierda hacia la derecha. Después que la paciente entró en circulación extracorpórea, fueron confirmados los diagnósticos mencionados anteriormente y la cirugía realizada incluye el cierre del foramen oval y de la CIV, y la resección de la estenosis del infundíbulo. No se registraron intercurrencias quirúrgicas, y la paciente fue derivada, ya intubada, a la unidad de cuidados intensivos.*

CONCLUSIONES: *La ecocardiografía transesofágica en pacientes sometidos a la corrección de cardiopatía congénita es de extrema utilidad, porque además de ayudar en el manejo hemodinámico del paciente, puede traer nuevas informaciones, capaces de mejorar el resultado final de la operación.*