CASE REPORT

Placement of an Implantable Cardioverter Defibrillator Thorough a Transatrial Approach. A Case Report.

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SUMMARY

Thrombosis of the superior vena cava is not frequent, but its appearance makes difficult the way for the implantation of pacemakers and defibrillators. There are alternatives when endovascular and epicardium vias cannot be used. However, some implantations of catheters of defibrillators via transatrial through minimal thoracotomy with good results at long-term and with an adequate threshold of defibrillation were described. In this presentation the case of a patient with history of Chagasic cardiopathy and dual-chamber pacemaker due to bimodal disease is described. As he is a young patient with difficult accesses, transatrial via through minimal thoracotomy was used preserving the atrial catheter for stimulation and sensing.

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Key words > Defibrillator - Chagas – Transatrial

CLINICAL CASE

Patient of 43 years with history of chronic Chagasic myocardiopathy and implantation of a DDDR pacemaker due to bimodal disease in 1999.

In August 2002, with the appearance of jugular ingurgitation this patient was diagnosed with occlusion of the left subclavian (way of access of the pacemaker).

In July 2006, due to signs and symptoms compatible with superior vena cava syndrome, an angiography of both upper limbs was performed which evidenced occlusion of the superior vena cava. Oral anticoagulation therapy was started with gradual improvement of the symptoms'.

In September 2009, this patient consulted for two syncopal episodes with prodromes, with mild traumatic brain injury and asymptomatic recovery. When analysing the pacemaker no relevant data were obtained as there were no intracavitary electrograms (Pacemaker 2022T).

The echocardiogram showed normal cardiac diameters with preserved systolic function and mild dilatation of the right chambers. During Holter monitor the patient presented sequential stimulation with salvos of ventricular tachycardia 3-beat. The ergometry did not show relevant data.

In the electrophysiological study, with ventricular overstimulation (2 extrastimulus), sustained monomorphic ventricular tachycardia with hemodynamic decompensation (cycle 300 msec) that reverted spontaneously was induced.

Given that it was a patient with syncope, Chagasic cardiopathy and ventricular tachycardia with hemodynamic decompensation inducible in the electrophysiological study, the implantation of a cardioveter-defibrillator was the final decision.

To evaluate the implantation via, a phlebography which reported occlusion of both subclavian and of the superior vena cava was performed (Figure 1).

As there were no possibilities to implant the system via endovascular, transatrial via through minimal thoracotomy was the option, preserving the catheters of the functioning pacemakers for stimulation and sensing.

In the surgical procedure, through extrapleural right anterior thoracotomy, the fourth cartilage was

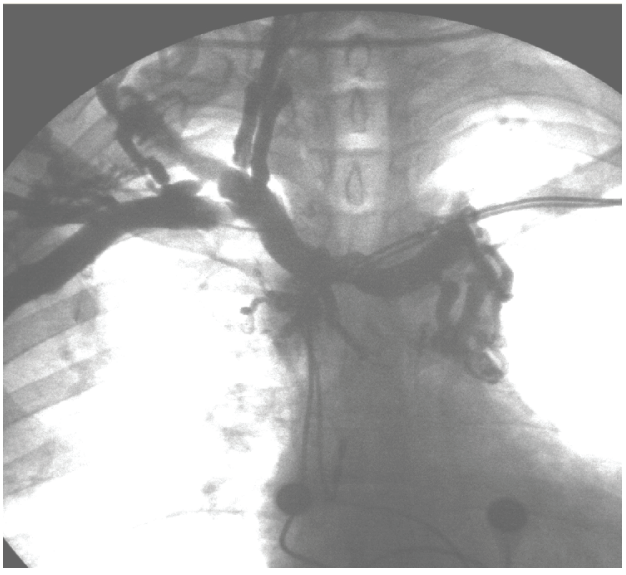

Fig. 1. Right upper limb phlebography where we can see occlusion of right subclavian vein and superior vena cava, with plentiful collateral circulation.

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removed, the pericardium was released, and a sheath in the lateral side of the right auricle was performed. The sheath was punctured, a peel-away introducer was inserted and a Giudant® 0137 catheter was placed at the tip of the right ventricle. Thresholds were optimum (Figure 2). Then, the catheter was tunnelled from the thoracotomy, via sternum, up to the pacemaker pocket where it was connected to the cardioveter-defibrillator together with the anterior auricular catheter. The ventricular catheter of the pacemaker was abandoned. The final position of the system was assessed through radioscopy (Figure 3).

Ventricular fibrillation was observed which was reverted with a shock of 20 joules.

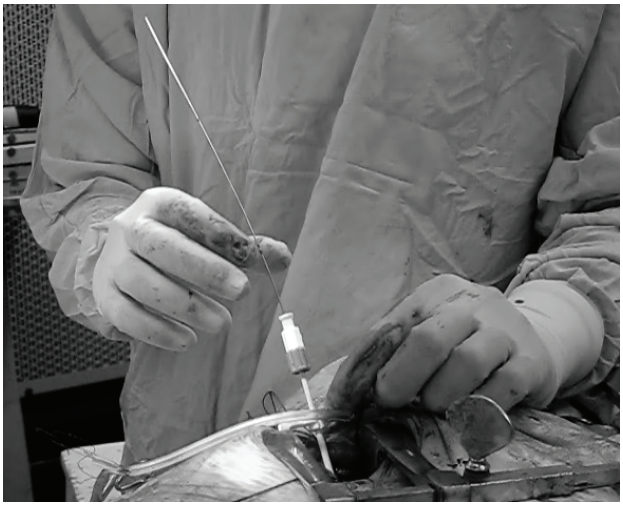

Fig. 2. Placement of the introducer peel-away through the sheath in the right auricle and positioning of the catheter in the right ventricle.

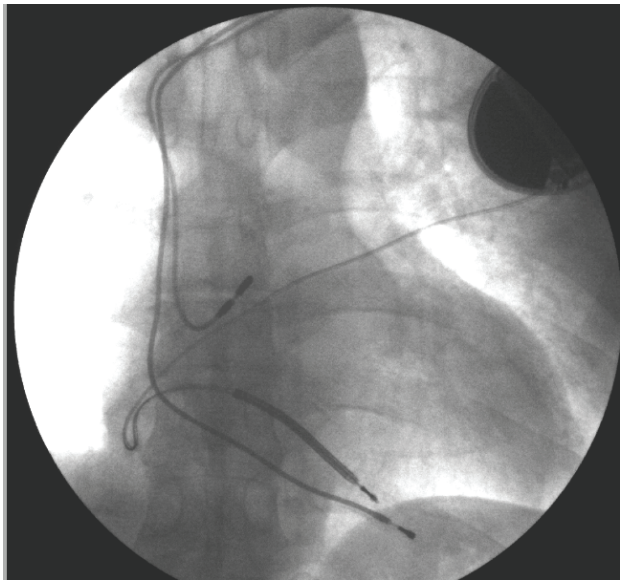

Fig. 3. Final control through radioscopy. Here we can see the catheters for stimulation and sensing placed by endovascular via and the defibrillation catheter through transatrial via tunneled until the pocket.

DISCUSION

This presentation is the first communication in Argentine of the implantation via transatrial of a cardioveter-defibrillator in a patient with difficult vascular accesses.

Several studies of secondary prevention of sudden death in patients with ischemic cardiopathy have demonstrated that the cardioveter-defibrillator is better than antiarrhythmic drugs, so in recent years the indications have been spread to primary prevention cases and other types of cardiopathies. (1) However, there are no randomized studies that support this technique in Chagasic patients, so its treatment is extrapolated from coronary patients. (2)

Endovascular via is the best choice for implantations of pacemakers or cardioveter-defibrillators as they achieve a more physiological stimulation, lower mortality and morbidity and less complications in the epicardial via. However, the occlusions of the superior vena cava or the veins that drain into it are a challenge when choosing the implantation via.

The syndrome of superior vena cava can occur due to several causes, including radiation, thrombophilias, extrinsic compression, implantation of multiple catheters (pacemakers or defibrillators, central via or dialysis). Its incidence is of 1% to 3%. (3) Among these cases, epicardial via is the most used for pacemakers, (4) but the solution is not so simple for defibrillators.

Initially, epicardial defibrillation patches through sternotomy were used. Among the multiple complications for this method we find postpericardiotomy syndrome, mediastinitis, constrictive pericarditis and even broken patches. Another drawback was that up to 25% of the patients had a high defibrillation threshold (average, 10 joules more than endovascular via). Most of these patients needed a reoperation to replace the patches because they were ineffective. (5)

As a consequence subcutaneous patches arose, they were inserted in the lateral and/or dorsal side of the thorax and had less complications than epicardial ones. They were used as complements and not as alternative to endovascular catheters in patients with high defibrillation threshold.

Later, another technique to replace subcutaneous patches in patients with high thresholds emerged; the technique involved placing subcutaneous catheters of defibrillation (arrays) in the posterior and left lateral side of the thorax in adults. There are reports of good results and adequate defibrillation thresholds in children with no accesses, both with two subcutaneous catheters and with one subcutaneous catheter, one endovascular catheter implanted via iliofemoral and a carcass in the abdomen. (6) The most important disadvantage in subcutaneous catheters is that the coil defibrillation is exposed to any external traumatism as it is not protected by the ribcage. This leads to the catheter broken or to isolation loss.

Kettering et al. found 6% of complications in patients with subcutaneous array, the most frequent (4%) was the broken of catheters. (7)

On account of these drawbacks other accesses vias which guarantee good thresholds and protection to the catheter were proposed. In 1989, transatrial via emerged, (8) which at the beginning needed sternotomy, but eventually this technique was improved and subxiphoid via and minimal thoracotomy were adopted. There are no follow-ups at long term, only descriptions of cases, but it was highly effective in children with a follow-up to 14 years. (9)

The interesting point of this via is that through

radioscopy the placement of the catheter is similar to the implantation through conventional via. So it is important to make clear the approach via just in case future removals are needed.

The advantages of transatrial via with the current approach techniques is that it is minimally invasive, endocavitary catheters are used, is an alternative for patients of high risk with no adequate vascular accesses, it has good defibrillation threshold and the catheters are protected by the ribcage so the risk of broken is lower. (10)

An important disadvantage is the complexity of removal due to catheter malfunction, as an invasive approach is needed to release the catheter of adhesions and pericardial surface. (10)

CONCLUSIONS

There are many causes that can prevent the endovascular access for the placement of a cardioveter-defibrillator. Transatrial via is one of the alternatives in those cases, with good thresholds of defibrillation and greater durability of the catheters.

As the indications of a cardioveter-defibrillator are becoming known, as it happened in recent years, more patients with difficult accesses will present and it is important to know alternative implantations vias.

RESUMEN

Implante de cardiodesfibrilador por vía transauricular. Descripción de un caso

La trombosis de la vena cava superior es infrecuente, pero su aparición dificulta la vía de acceso para el implante de marcapasos y desfibriladores. Existen alternativas cuando no se puede utilizar la vía endovascular y la vía epicárdica es la de elección. Sin embargo, se descri¬bieron implantes de catéteres de desfibrilador por vía transauricular por toracotomía mínima con buenos resultados a largo plazo y con el logro de un umbral de desfibrilación adecuado. En esta presentación se describe el caso de un paciente con antecedentes de cardiopatía chagásica e implante de un marcapasos bicameral por enfermedad binodal que necesita un desfibrilador. Debido a que se trata de un paciente joven con accesos dificultosos se decidió utilizar la vía transauricular por toracotomía mínima conservando el catéter auricular para estimulación y sensado.

Palabras clave > Desfibrilador - Chagas - Transauricular

BIBLIOGRAPHY

1. Bardy GH, Lee KL, Mark DB, Poole JE, Packer DL, Boineau R, et al; Sudden Cardiac Death in Heart Failure Trial (SCD-HeFT) Investigators. Amiodarone or an implantable cardioverter-defibrillator for congestive heart failure. N Engl J Med 2005; 352:225-37.

2. Muratore C, Rabinovich R, Iglesias R, González M, Darú V, Liprandi AS. Implantable cardioverter defibrillators in patients with Chagas' disease: are they different from patients with coronary disease? Pacing Clin Electrophysiol 1997; 20:194-7.

3. Lickfett L, Bitzen A, Arepally A, Nasir K, Wolpert C, Jeong KM, et al. Incidence of venous obstruction following insertion of an implantable cardioverter defibrillator. A study of systematic contrast venography on patients presenting for their first elective ICD generator replacement. Europace 2004; 6:25-31.

4. Zuber M, Huber P, Fricker U, Buser P, Jäger K. Assessment of the subclavian vein in patients with transvenous pacemaker leads. Pacing Clin Electrophysiol 1998; 21:2621-30.

5. Goyal R, Harvey M, Horwood L, Bogun F, Castellani M, Chan KK, et al. Incidence of lead system malfunction detected during implantable defibrillator generator replacement. Pacing Clin Electrophysiol 1996; 19:1143-6.

6. Perzanowski C, Timothy P, McAfee M, McDaniel M, Meyer D, Torres V. Implantation of implantable cardioverter-defibrillators from an ileofemoral approach. J Interv Card Electrophysiol 2004; 11:155-9.

7. Kettering K, Mewis C, Dörnberger V, Vonthein R, Bosch RF, Seipel L, et al. Long-term experience with subcutaneous ICD leads: a comparison among three different types of subcutaneous leads. Pacing Clin Electrophysiol 2004; 27:1355-61.

8. Hayes DL, Vlietstra RE, Puga FJ, Shub C. A novel approach to atrial endocardial pacing. Pacing Clin Electrophysiol 1989; 12:125-30.

9. Molina JE. Surgical options for endocardial lead placement when upper veins are obstructed or nonusable. J Interv Card Electrophysiol 2004; 11:149-54.

10. Cannon BC, Friedman RA, Fenrich AL, Fraser CD, McKenzie ED, Kertesz NJ. Innovative techniques for placement of implantable cardioverter-defibrillator leads in patients with limited venous access to the heart. Pacing Clin Electrophysiol 2006; 29:181-7.