CARDIOLOGIE TUNISIENNE

CASE REPORT

Atrial Flutter Ablation Improves Cardiac Chamber Volume and Tricuspid Regurgitation: A Case Report

L'ablation d'un flutter atrial améliore les volumes des cavités cardiaques et l'insuffisance tricuspide : A propos d'un cas

Mariem Jabeur, Rania Gargouri, Amine Bahloul, Selma Charfeddine, Faten Triki, Leila Abid.

Hedi Chaker University Hospital of SFAX, Department of Cardiology

Summary

This case report describes the successful catheter ablation of typical atrial flutter in a 44-year-old female without a history of cardiac disease, who presented with escalating dyspnea and lower extremity edema. Echocardiography revealed important right ventricular dilatation and severe tricuspid regurgitation. Following ablation of the cavotricuspid isthmus, the patient's atrial flutter was eliminated, and follow-up echocardiography at six months demonstrated a notable reduction in right ventricular and atrial size and improvement in tricuspid regurgitation. This case illustrates the potential for catheter ablation of atrial flutter to reverse adverse cardiac remodeling and improve valvular function, highlighting the importance of considering ablation as a therapeutic option for patients with symptomatic atrial flutter and evidence of cardiac remodeling.

Keywords

Atrial Flutter ablation, tricuspide regurgitation, cardiac chamber volume

Résumé

Ce cas clinique décrit le succès de l'ablation par cathéter d'un flutter atrial typique chez une femme de 44 ans sans antécédents de maladie cardiaque, qui s'était présentée avec une dyspnée croissante et un œdème des membres inférieurs. L'échocardiographie avait révélé une dilatation importante du ventricule droit et une régurgitation tricuspide sévère. Après l'ablation de l'isthme cavotricuspide, une échocardiographie de contrôle à six mois a montré une réduction notable de la taille des cavités droites ainsi qu'une amélioration de la régurgitation tricuspide. Ce cas illustre le potentiel de l'ablation du flutter atrial à inverser le remodelage cardiaque défavorable et à améliorer la fonction valvulaire, soulignant l'importance de considérer l'ablation comme la principale option thérapeutique chez les patients présentant un flutter atrial symptomatique.

Mots-clés

Ablation de flutter atrial, insuffisance tricuspide, volume des cavités cardiaques

Correspondance

Mariem Jabeur, MD
Department of Cardiology, Hedi Chaker University Hospital, Sfax
Mariemjabeur2@gmail.com

INTRODUCTION

Atrial flutter, a common macroreentrant arrhythmia, can lead to significant hemodynamic compromise and structural remodeling of the heart [1].

Radiofrequency catheter ablation has emerged as a highly effective treatment strategy for atrial flutter, offering high success rates and improved quality of life [2]. Catheter ablation is a cornerstone in treating symptomatic atrial flutter that [3] demonstrating high success rates in restoring sinus rhythm and improving clinical outcomes; however, the impact of atrial flutter ablation on cardiac chamber volumes and the severity of tricuspid regurgitation remains unclear.

This case report aims to elucidate the beneficial effects of atrial flutter ablation on cardiac chamber volumes and the severity of tricuspid regurgitation, utilizing comprehensive echocardiographic assessments before and after the procedure.

CASE PRESENTATION

A 44-year-old female with a history of typical atrial flutter evolving for one year, was referred to our center for flutter ablation. The patient reported a noticeable decline in his functional capacity, accompanied by increased episodes of palpitations. His medical regimen included Apixaban for anticoagulation, bisoprolol for rate control, and furosemide for diuresis. Clinical examination showed irregular rhythm and lower extremity edema. An initial 12-lead electrocardiogram confirmed the presence of typical atrial flutter, characterized by a sawtooth pattern in the inferior leads, with variable conduction (Figure 1). Transthoracic echocardiography revealed importante right atrial (right atrial area: 38 m^2) and ventricular dilatation, (figure 2a) severe tricuspid regurgitation estimated by a PISA radius of 1.1 cm (figure 2b) and a right ventricular systolic pressure of 45 mmHg. The left ventricular ejection fraction was preserved at 55%, with mild left atrial enlargement noted.

The electrophysiology study was performed under conscious sedation, with fluoroscopic guidance and intracardiac electrogram mapping. A decapolar catheter was positioned in the coronary sinus, and an irrigated ablation catheter was used to ablate the cavotricuspid isthmus. Radiofrequency energy was delivered along the cavotricuspid isthmus which was very long, creating a complete line of block. Post-ablation, the atrial flutter was no longer inducible, and bidirectional block was confirmed. 12-lead electrocardiogram after ablation showed sinus rhythm (Figure 3). Follow-up transthoracic echocardiography, performed six months post-ablation, revealed a notable reduction in right atrial (right atrial area: 19cm^2) and ventricular size (Figure 4a), with improvement in tricuspid regurgitation, indicated by a decrease in the PISA radius of 0.7 cm (Fig 4b), and a reduction in right ventricular systolic pressure to 30 mmHg.

DISCUSSION

This case highlights the favorable impact of atrial flutter ablation on cardiac chamber remodeling and tricuspid regurgitation.

Atrial flutter, a common macroreentrant atrial arrhythmia, significantly impacts cardiac hemodynamics and structural integrity.

The rapid and irregular atrial activation characteristic of atrial flutter leads to a cascade of adverse effects on cardiac function. The restoration of sinus rhythm via catheter ablation has been shown to reverse some of these detrimental effects, with improvements observed in atrial and ventricular function [4].

Chronic atrial flutter induces a spectrum of structural and functional changes within the heart, notably impacting chamber volumes and valvular competence. Persistent rapid atrial rates contribute to atrial dilatation and subsequent ventricular remodeling, frequently culminating in tricuspid regurgitation.

Studies employing advanced imaging modalities, such as cardiac magnetic resonance imaging, have quantified the extent of reverse remodeling following ablation, demonstrating reductions in atrial and ventricular volumes [5].

Tricuspid regurgitation, a common sequela of atrial flutter-induced right ventricular dilatation, further complicates the clinical picture, exacerbating heart failure symptoms and increasing mortality risk. The success of atrial flutter ablation in mitigating tricuspid regurgitation has been attributed to a combination of factors, including reduced right atrial pressure,

improved ventricular filling, and restoration of normal valve geometry. [6].

The observed reductions in right atrial and ventricular volumes, along with the improvement in tricuspid regurgitation severity, suggest a reversal of the structural and functional consequences of chronic atrial flutter [7]. Atrial flutter ablation has emerged as a crucial intervention for managing symptomatic patients, demonstrating high success rates in restoring sinus rhythm and improving clinical outcomes [8]. The restoration of sinus rhythm through ablation eliminates the detrimental effects of rapid and irregular atrial activation on ventricular filling and function [9]. Sustained atrial flutter can lead to progressive right ventricular dilatation and dysfunction, which exacerbates tricuspid regurgitation [10]. Improvement in tricuspid regurgitation following atrial flutter ablation is likely multifactorial. The reduction in right atrial pressure following successful ablation reduces the backward pressure on the tricuspid valve, decreasing the severity of regurgitation.

Techniques for catheter ablation of cardiac arrhythmias have evolved considerably [11]. Ablation is an effective treatment strategy for rhythm control in atrial flutter patients [12]. Restoration of sinus rhythm after atrial flutter ablation, can lead to reverse remodeling of the right heart chambers and a decrease in the severity of tricuspid regurgitation, which could improve overall cardiac function and reduce the risk of heart failure progression.

CONCLUSION

Atrial flutter ablation can induce reverse remodeling of the right heart chambers and improve tricuspid regurgitation. Further research is needed to investigate the long-term clinical implications of these findings and to identify the predictors of reverse remodeling following atrial flutter ablation. This case underscores the importance of considering ablation as a therapeutic strategy for atrial flutter patients to improve cardiac function and reduce the risk of heart failure progression. It also reinforces the understanding that early intervention with catheter ablation in patients with atrial flutter can prevent progressive chamber remodeling and improve the overall prognosis.

REFERENCES

1. G. K. Feld, "New Approaches for the Management of Atrial Fibrillation:," Journal of Cardiovascular Electrophysiology, vol. 10, no. 9, Wiley, p. 1188, Sep. 01, 1999. doi: 10.1111/j.1540-8167.1999.tb00294.x.
2. A. R. Fath et al., "A Unique Compensatory Mechanism for Total Pulmonary Vein Occlusion Post Atrial Fibrillation Catheter Ablation Visualized by Multimodality Imaging," Case Reports in Cardiology, vol. 2020, p. 1, Sep. 2020, doi: 10.1155/2020/9673958.
3. Kim, "Non-fluoroscopic Catheter Tracking System for Atrial Fibrillation Ablation," Korean Circulation Journal, vol. 49, no. 1. Korean Society of Circulation, p. 97, Oct. 10, 2018. doi: 10.4070/kcj.2018.0319.
4. Steinberg, "Role of Atrioventricular Junctional Ablation and Cardiac Resynchronization Therapy in Patients with Chronic Atrial Fibrillation," Cardiac Electrophysiology Clinics, vol. 11, no. 1. Elsevier BV, p. 147, Feb. 01, 2019. doi: 10.1016/j.ccep.2018.11.013.
5. R. Barracano et al., "Implantable cardiac electronic device therapy for patients with a systemic right ventricle," Heart, vol. 106, no. 14. BMJ, p. 1052, Apr. 08, 2020. doi: 10.1136/heartjnl-2019-316202.
6. C. R. C. Wyndham, "Atrial fibrillation: the most common arrhythmia.," PubMed, vol. 27, no. 3, p. 257, Jan. 2000, Accessed: Feb. 2025. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/11093410
7. P. G. Pino et al., "Congenitally Corrected Transposition of the Great Arteries with Severely Stenotic Bicuspid Aortic Valve in an Adult: A Case Report," Echocardiography, vol. 29, no. 1, Oct. 2011, doi: 10.1111/j.1540-8175.2011.01522.x.
8. P. C. Seifert, J. Collins, and N. Ad, "Surgery for Atrial Fibrillation," AORN Journal, vol. 86, no. 1. Wiley, p. 23, Jul. 01, 2007. doi: 10.1016/j.aorn.2007.03.003.
9. L. Cox, "The role of surgical intervention in the management of atrial fibrillation.," PubMed, vol. 31, no. 3, p. 257, Jan. 2004, Accessed: Feb. 2025. [Online]. Available: https://pubmed.ncbi.nlm.nih.gov/15562846
10. T. Nomura, M. Miyasaka, E. M. Zahn, and R. Makkar, "Transcatheter aortic valve replacement for bicuspid aortic valve regurgitation in a 17-year-old patient with congenitally corrected transposition of great arteries: a case report," European Heart Journal - Case Reports, vol. 4, no. 3, p. 1, May 2020, doi: 10.1093/ehjcr/ytaa102.
11. L. Pison and H. J. G. M. Crijns, "How effective is ablation therapy for cardiac arrhythmias?," Clinical Practice, vol. 10, no. 2, p. 177, Mar. 2013, doi: 10.2217/cpr.13.6.
12. G. Hindricks and D. L. Packer, "Catheter ablation of atrial fibrillation: recent advances and future challenges," EP Europace, vol. 24, Apr. 2022, doi: 10.1093/europace/euac035..