Received: 18 March 2019 | Revised: 28 March 2019 | Accepted: 8 April 2019
DOI: 10.1002/joa3.12191

CASE REPORT

Journal of Arrhythmia Open Access WILEY

In situ needle deflection technique using a steerable introducer for site-selective radiofrequency transseptal puncture

Taihei Itoh MD | Masaomi Kimura MD | Yuji Ishida MD | Hirofumi Tomita MD

Department of Cardiology, Hirosaki University Graduate School of Medicine, Hirosaki, Aomori, Japan

Correspondence
Taihei Itoh, Department of Cardiology, Hirosaki University Graduate School of Medicine, 5 Zaifu-cho, Hirosaki, Aomori, 036-8562, Japan.
Email: taihei.itoh@gmail.com

Abstract

Transseptal puncture (TP) is a prerequisite for gaining access to the left atrium. Selection of a puncture site in the fossa ovalis can impact on catheter ablation of left atrial arrhythmias. However, TP sometimes requires a needle shape modification in vitro, which can make it difficult to accomplish site-selective TP. This report illustrated a novel needle deflection technique in vivo using a steerable introducer. This in situ needle deflection technique is useful in excluding the needle shape modification in vitro and achieving fine adjustment of the needle curve in vivo, thus contributing to site-selective radiofrequency TP and reducing procedure time.

KEYWORDS
catheter ablation, in situ needle deflection, radiofrequency transseptal puncture, steerable introducer

1 | INTRODUCTION

Transseptal puncture (TP) is a prerequisite for gaining access to the left atrium (LA) for catheter ablation of left atrial arrhythmias. Selection of a puncture site in the fossa ovalis (FO) can impact on mapping and ablation in the LA, because the puncture site acts as a pivot point for catheter manipulation in the LA. One of the favorable TP sites is in the posterior region of the FO for left atrial arrhythmia ablation, especially for atrial fibrillation (AF) ablation.[1] In patients with the interatrial septum remote from the inferior vena cava, even using a radiofrequency needle, a needle shape modification is occasionally required for TP in the posterior region of the FO. However, a steerable introducer cannot deflect a TP needle through the introducer and dilator assembly due to the stiffness of the straight segment of the needle. Therefore, the needle must be removed from and inserted into the introducer to reshape the needle curve in vitro, which not only provides laborious processes, but also can make it difficult to accomplish the site-selective TP.

2 | CASE REPORT

A 68-year-old man with a history of cardioembolic stroke due to AF at the age of 67 underwent TP for catheter ablation of persistent AF. The patient had undergone total gastrectomy for gastric cancer at the age of 58 and left lower lobectomy for lung cancer at the age of 63. Figure 1 shows intracardiac ultrasound and fluoroscopic images exhibiting radiofrequency TP. For the purpose of TP, the tip of a radiofrequency needle (Radiofrequency NRG Transseptal Needle, C0 curve, 71-cm length, Baylis Medical, Montreal, Canada) outside a dilator assembled with a steerable introducer (Agilis NxT Steerable Introducer, Small curl, 61-cm length, Abbott, MN, USA) was positioned toward the FO, as previously described.[2] However, the needle tip could not reach the posterior region of the FO, which was revealed by intracardiac echocardiography (Figure 1A). Therefore, the introducer was detached from the dilator and advanced along the needle and dilator assembly beyond the straight segment of the needle. Deflection of the introducer was then gradually increased coaxially to the needle curve, and the assembly was advanced a small distance through the introducer until intracardiac echocardiography showed the needle tip engaging the posterior region of the FO with tenting into the LA (Figure 1B). After perforation of the FO by radiofrequency energy delivery through the needle, the assembly was gently advanced through the introducer into the LA. The dilator was further advanced over the needle, and then the introducer was advanced along the dilator until the distal end of the introducer crossed the FO. Thereafter, the needle and dilator were removed from the introducer with restoration of the deflection in its neutral configuration, thus completing the site-selective transseptal approach.

3 | DISCUSSION

In this case, a mediastinal shift due to the left lower lobectomy may have caused the interatrial septum distant from the inferior vena

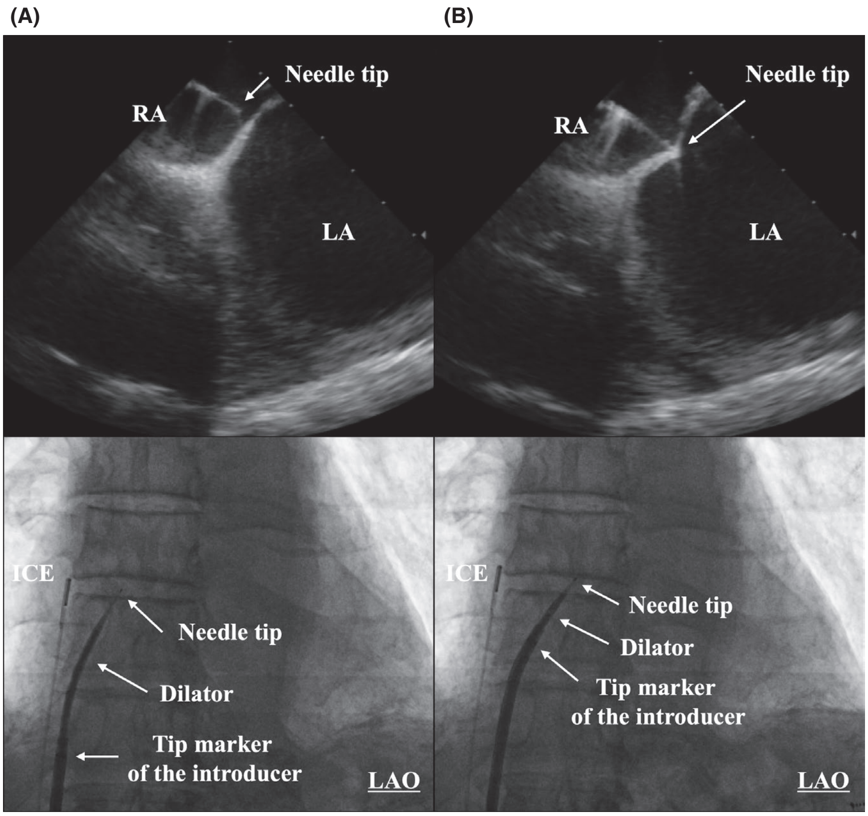

FIGURE 1 Intracardiac ultrasound and fluoroscopic images exhibiting radiofrequency transseptal puncture before (A) and after applying in situ needle deflection technique using the steerable introducer (B). Note that the distance between the needle tip and the intracardiac echocardiography (ICE) catheter. LA, left atrium; LAO, left anterior oblique projection; RA, right atrium

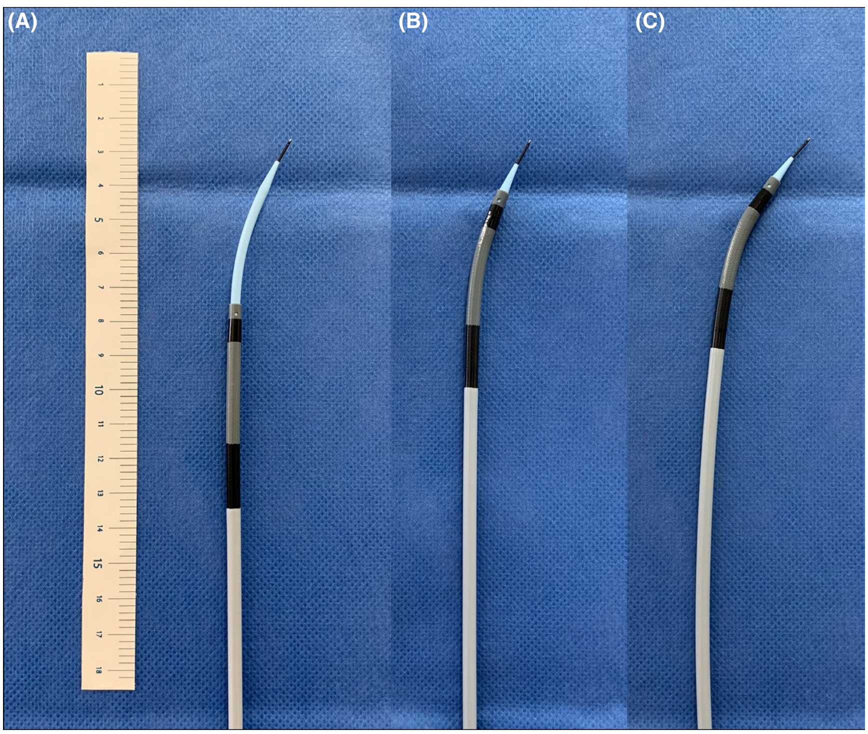

FIGURE 2 Illustrations exhibiting the curve of the transseptal puncture apparatus (Radiofrequency NRG Transseptal Needle, C0 curve, 71-cm length, Baylis Medical, Montreal, Canada; Agilis NxT Steerable Introducer, Small curl, 61-cm length, Abbott, MN, USA) with a centimeter scale before (A) and after the introducer in its neutral configuration was advanced along the dilator beyond the straight segment of the needle (B), and when applying in situ needle deflection technique by the introducer deflected to its maximum deflection (C)

cava. Structural remodeling of the atria due to persistent AF may also have provided such an anatomical relationship between them. In this anatomical feature, the tip of a TP needle may not reach the FO, and the needle curve needs to be adjusted to the distance between the interatrial septum and the inferior vena cava.

This report illustrated a novel needle deflection technique in vivo only using the steerable introducer for adjustment of the needle curve and subsequent successful radiofrequency perforation of the FO without mechanical force. Therefore, as with the standard radiofrequency transseptal puncutre,[3] the radiofrequency needle using this technique can also provide safer and more effective TP compared to the conventional needle. In this case, the needle deflection in vivo could be achieved by the deflectable portion of the steerable introducer located at the curve segment of the TP needle (Figure 2). Therefore, given a steerable introducer with a certain degree of bending force, in situ needle deflection using the introducer can theoretically be obtained, to varying degrees. Other combinations of a radiofrequency needle and steerable introducer might be available for this technique.

In the needle deflection technique in vivo, the steerable introducer contributed to exclusion of the processes of reshaping the needle curve in vitro. Using the needle shape modification in vitro, a radiofrequency needle needs to be advanced back and forth through a plastic dilator and sheathe, which may shave off sub-visible plastic particles,[4] while using our in situ needle deflection technique, the risk of plastic particle formation can be reduced by exclusion of those processes of potentially scraping off particles from the inner wall of the apparatus. The steerable introducer also contributed to the site-selective radiofrequency TP by achieving fine adjustment of the needle curve under guidance of the intracardiac echocardiography. Using the needle shape modification in vitro, the *fixed* curve of a radiofrequency needle in vivo may result in TP at a nonselective site in the FO. Such an inadvertent puncture site in the FO can make catheter manipulation in the LA difficult and may also cause prolongation of total procedure time. Thus, this in situ radiofrequency needle deflection technique using a steerable introducer can facilitate mapping and ablation in the LA and also may be useful in reducing total procedure time for left atrial arrhythmia ablation.

CONFLICT OF INTEREST

Authors declare no conflict of interests for this article.

ORCID

Taihei Itoh https://orcid.org/0000-0002-8473-0320

REFERENCES

1. Ruisi CP, Brysiewicz N, Asnes JD, Sugeng L, Marieb M, Clancy J, et al. Use of intracardiac echocardiography during atrial fibrillation ablation. Pacing Clin Electrophysiol. 2013;36:781–8.
2. Winkle RA, Mead RH, Engel G, Patrawala RA. The use of a radiofrequency needle improves the safety and efficacy of transseptal puncture for atrial fibrillation ablation. Heart Rhythm. 2011;8:1411–5.
3. Hsu JC, Badhwar N, Gerstenfeld EP, Lee RJ, Mandyam MC, Dewland TA, et al. Randomized trial of conventional transseptal needle versus radiofrequency energy needle puncture for left atrial access (the TRAVERSE-LA study). J Am Heart Assoc. 2013;2:e000428.
4. Feld GK, Tiongson J, Oshodi G. Particle formation and risk of embolization during transseptal catheterization: comparison of standard transseptal needles and a new radiofrequency transseptal needle. J Interv Card Electrophysiol. 2011;30:31–6.

How to cite this article: Itoh T, Kimura M, Ishida Y, Tomita H. In situ needle deflection technique using a steerable introducer for site-selective radiofrequency transseptal puncture. *J Arrhythmia*. 2019;35:565–567. https://doi.org/10.1002/joa3.12191