Ablation on the mitral annulus for the treatment of atrial fibrillation: Anatomical consideration to prevent coronary injury

Hajime Imura, MD a,*, Kiyomi Y. Hames, MD a, Yasuo Miyagi, MD a, Hiroshige Murata, MD b, Takashi Nitta, MD a, Masami Ochi, MD a

a Cardiovascular Surgery of Nippon Medical School Hospital, 1-1-5, Sendagi Bunkyo-ku, Tokyo, 113-8603, Japan
b Cardiology of Nippon Medical School Hospital, 1-1-5, Sendagi Bunkyo-ku, Tokyo, 113-8603, Japan

ARTICLE INFO

Article history:
Received 1 October 2013
Received in revised form
4 November 2013
Accepted 27 November 2013
Available online 14 January 2014

ABSTRACT

Coronary injury is a crucial complication of ablation on the posterior mitral annulus (PMA). Fifty autopsy heart specimens were classified into different types according to the final branch of the left circumflex coronary artery. The no-coronary area on the PMA was examined in each type. The posterolateral type was most common (39/50); the no-coronary area was located between 50.7% ± 6.5% and 83.5% ± 8.0% on the PMA. Ablations at 38.6% ± 5.2% (for catheter intervention) and the middle point (for surgery) appear safe for the obtuse marginal type but not for the posterolateral type. Thus, the no-coronary area should be considered during PMA ablation.

© 2013 Japanese Heart Rhythm Society. Published by Elsevier B.V. All rights reserved.

1. Introduction

Ablation on the mitral annulus is an important procedure for the non-pharmacological treatment of atrial fibrillation. However, it is known to cause injury of the left circumflex coronary artery (Lcx) [1, 2].

2. Materials and methods

The Lcx from 50 adult autopsy heart specimens were examined and divided into 3 types according to its final branch: obtuse marginal branch (OM) type, posterolateral branch (PL) type, and posterior descending branch (PD) type. To distinguish between the OM and PL types, we examined the Lcx in the front view of the left anterior descending artery where the ventricular septum and mitral annulus were present vertical to the investigator’s eyes. If the final branch was visible in this view, it was defined as the OM type. If the PD originated from the Lcx, it was defined as the PD type. We measured the lengths from the anterior commissure to the following points on the PMA (Fig. 1): (a) the end of the Lcx (length-a); (b) the right coronary artery (length-b); and (c) the catheter ablation point (length-c), to which the shortest line was drawn from the left inferior pulmonary vein in the posterolateral mitral isthmus [3]. Each point was expressed as a percentage of each length to the total length of the PMA (length-PMA).

3. Results

We noted that 7, 39, and 4 heart specimens were classified as the OM, PL, and PD types, respectively. The location of the no-coronary area was between 24.5% ± 6.4% and 70.4% ± 7.7% for the OM type, 50.7% ± 6.5% and 83.5% ± 8.0% for the PL type, and 97.0% ± 3.8% and 100% for the PD type. The catheter ablation point was located at 38.6% ± 5.2%. Therefore, the catheter intervention and surgical ablation (the middle of the PMA) points are suitable for the OM type, but not for the PL type. No safe area could be identified for the PD type.

4. Discussion

To our knowledge, this is the first report that examines the use of the no-coronary area on the PMA as a potential safe ablation site.
As coronary arteries cannot be identified during either catheter intervention or surgery for atrial fibrillation, elucidating the location of the no-coronary area on the PMA would be helpful. Although catheter ablation can be performed under the guidance of three-dimensional computed tomography, information about the Lcx is occasionally unclear. In the present study, we noted that the no-coronary area was located between 60% and 75% for the PL type, which is approximately 1.5 cm to the right of the catheter ablation point. In the surgeon’s viewpoint, it is located around the gap between P2 and P3 of the mitral leaflet. Catheter ablation from the CS to the PMA is associated with a risk of Lcx injury as the distance between the CS and Lcx is only 4.6 mm. Thus, the current finding is consistent with those of previous studies that indicated a significant risk of Lcx injury in such cases [1].

Due to the variation of the mitral annulus size, each point on the PMA was expressed as a percentage of the total PMA length. Thus, considering that the dilatation occurs evenly, we believe that our findings can be applied to PMAs with different degrees of dilatation.

5. Conclusion

The no-coronary area should be carefully considered during ablation on the PMA.

Conflict of interest

None declared.

References