Anatomical and clinical features in patients underwent atypical coronary sinus cannulation

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**Introduction:** Clinical data in patients underwent atypical coronary sinus (CS) cannulation intraoperative has not been well described. We hypothesized that an atypical CS cannulation may clue to different kind of CS variation and aimed to retrospective analyze the anatomical and clinical features in patients with abnormal CS from viewpoint by whom underwent atypical coronary sinus cannulation during electrophysiology (EP) procedure.

**Methods:** We retrospective analyzes 7,206 consecutive patients underwent CS cannulation during EP procedure from January 2011 to February 2019. The definition of atypical CS cannulation are as follow: 1. Cannot put inside or difficult to advance the CS catheter; 2. Even though we cannulate favorably, the CS catheter stay in an unusual place or an unstable situation such as outside cardiac border, inside left atrium, extremely deviate from atrioventricular valve ring, transposition, Large swing with heartbeat, incongruous movement, drop out easily, etc. These were all judged by at least two EP physician who operate greater than 200 EP procedures independently every year. After that, these patients were accepted CS angiography or cardiac imaging to confirm the detail situation of CS.

**Result:** 72 patients (mean age 41.9±18.4 years, 61.1% male) included in the study were divided into two groups depended on the situation of CS cannulation. Group A contain 43 patients cannulated in an unusual place/unstable situation (UP/US) Group B contain 29 patients cannulated difficultly (CD). Compare to UP/US, CD has a higher body mass index (BMI); 25.7±4.9 vs 22.3±3.9, p=0.001. 28 patients (38.9%) complicate with structural heart disease and 11 of them has a cardiac function grade (NYHA)≥2. A total of 74 arrhythmias induced during EP study and most of it (70/74) were supraventricular tachycardia (SVT). There is no difference in the type of arrhythmia between two groups except UP/US has a higher proportion of right accessory pathway (19% vs 0%, p=0.025). After combined with CS angiography or cardiac imaging, we found that both two group have different kinds of CS variation. UP/US mainly subdivided into 23 persistent left superior vena cava (PLSVC), 11 abnormal CS position, 7 simple CS dilation and 2 unroof CS. CD can subdivided into 7 coronary sinus ostium atresia (CSA), 6 coronary sinus stenosis (CSS) and 16 undetermined/unknown (no obvious CS variation).

**Conclusion:** For patients underwent atypical coronary sinus cannulation may combine with abnormal coronary vein especially in patients with structural heart disease. When it comes to UP/US during EP procedure, abnormal CS position and PLSVC should be consider. As regard to CD, CSA or CSS cannot be neglected and apply CS angiography during procedure or CT scan after procedure may helpful for identify the cause of CD.