Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/IPEJ

Age-related location of manifest accessory pathway and clinical consequences

Béatrice Brembilla-Perrot [a,*], *Olivier Huttin* [a], *Arnaud Olivier* [a], *Jean Marc Sellal* [a], *Thibaut Villemin* [a], *Vladimir Manenti* [a], *Anne Moulin-Zinsch* [a], *François Marçon* [a], *Gauthier Simon* [a], *Marius Andronache* [a], *Daniel Beurrier* [a], *Christian de Chillou* [a], *Nicolas Girerd* [b]

[a] *Adult and Pediatric Cardiology, CHU de Brabois, Vandoeuvre Les Nancy, France*
[b] *INSERM, Centre d'Investigations Cliniques 9501, Université de Lorraine, Institut Lorrain du cœur et des vaisseaux, CHU de Nancy, Nancy, France*

ARTICLE INFO

Article history:
Available online 2 March 2016

Keywords:
Accessory pathway
Location
Prognosis
Electrophysiological study
Ablation

ABSTRACT

Background: Accessory pathway (AP) ablation is not always easy. Our purpose was to assess the age-related prevalence of AP location, electrophysiological and prognostic data according to this location.

Methods: Electrophysiologic study (EPS) was performed in 994 patients for a pre-excitation syndrome. AP location was determined on a 12 lead ECG during atrial pacing at maximal preexcitation and confirmed at intracardiac EPS in 494 patients.

Results: AP location was classified as anteroseptal (AS)(96), right lateral (RL)(54), posteroseptal (PS)(459), left lateral (LL)(363), nodoventricular (NV)(22).

Patients with ASAP or RLAP were younger than patients with another AP location. Poorly-tolerated arrhythmias were more frequent in patients with LLAP than in other patients (0.009 for ASAP, 0.0037 for RLAP, <0.0001 for PSAP).

Maximal rate conducted over AP was significantly slower in patients with ASAP and RLAP than in other patients. Malignant forms at EPS were more frequent in patients with LLAP than in patients with ASAP (0.002) or PSAP (0.001).

Similar data were noted when AP location was confirmed at intracardiac EPS. Among untreated patients, poorly-tolerated arrhythmia occurred in patients with LLAP (3) or PSAP (6). Failures of ablation were more frequent for AS or RL AP than for LL or PS AP.

Conclusions: AS and RLAP location in pre-excitation syndrome was more frequent in young patients. Maximal rate conducted over AP was lower than in other locations. Absence of poorly-tolerated arrhythmias during follow-up and higher risk of ablation failure should be taken into account for indications of AP ablation in children with few symptoms.

* Corresponding author. Cardiologie, CHU de Brabois, 54500 Vandoeuvre Les Nancy, France. Tel.: +33 3 83 15 31 42; fax: +33 3 83 15 42 26.
E-mail addresses: b.brembilla-perrot@chu-nancy.fr, bbrembilla@gmail.com (B. Brembilla-Perrot).

Peer review under responsibility of Indian Heart Rhythm Society.
http://dx.doi.org/10.1016/j.ipej.2016.02.012

Introduction

Radiofrequency ablation of the accessory pathway (AP) is the usual treatment of symptomatic ventricular pre-excitation syndrome (Wolff–Parkinson–White syndrome) and of asymptomatic pre-excitation syndrome with signs of malignancy at electrophysiological study [1,2]. Therefore electrophysiological study (EPS) is recommended to evaluate the pre-excitation syndrome-related risk [3–6]. It is well-known that ventricular fibrillation may be the first event of the pre-excitation syndrome. Ventricular fibrillation was the first manifestation in 8 of 15 patients (53%) in the study of Timmermans et al. [7], but aborted sudden death was rare and seen in 2.2% of this population of 690 patients referred for a Wolff–Parkinson–White syndrome [7]. The risk was reported as lower in a personal study [8]; 6 of 645 patients (0.9%) were resuscitated from a ventricular fibrillation. Fitzsimmons et al. [9] reported a sudden cardiac death risk of 0.02% per patient per year. Male gender, young age, sport, septal accessory pathway (AP), short AP refractory period, atrial fibrillation (AF) were reported as risk factors of sudden death in pre-excitation syndrome [2]. Other indications for AP ablation were the occurrence of spontaneous AV re-entrant tachycardia [10]. But, ablation of atrioventricular AP is not always simple either associated with a risk of failure mainly in the case of right lateral location or associated with complications as the risk of complete AV block in the case of anteroseptal (AS) or parahisian location [11,12].

The purpose of the study was to evaluate the prevalence of AP location according to the age of patient with a pre-excitation syndrome, the clinical data and the prognosis of these patients.

Material and methods

Population of study

The population included 994 consecutive patients referred to our center between 1990 and august 2015 for overt pre-excitation and indication for electrophysiological study (EPS).

Patients underwent examination for various reasons: a) 414 patients (41.6%) had a known history of paroxysmal reciprocal tachycardia; b) 31 patients (3.1%) presented with a well-tolerated AF; c) 359 patients (36%) in whom asymptomatic pre-excitation was discovered during a systematic assessment prior to anesthesia, before obtaining a sporting license, prior to employment in certain at-risk occupations, or during an ECG in the preventive medicine department or in presence of congenital heart disease; d) 114 patients (11.5%) presented with unexplained syncope without documentation of any arrhythmia event; e) 76 patients (7.6%) presented a poorly-tolerated tachycardia, defined as a documented life-threatening hemodynamically non-tolerated arrhythmia, with collapsus or syncope and requiring emergency treatment (ventricular fibrillation in 7 patients, rapid and poorly-tolerated AF conducted over the accessory pathway in 68 patients rapid and poorly-tolerated reentrant tachycardia in one patient).

The retrospective study of patients' files was approved by the Commission Nationale Informatique et Libertés (CNIL), in keeping with French law for single-center usual care observational studies. Prior to EPS and ablation, informed consent was obtained for clinical purposes from all patients and in the case of children, from children and their parents.

Protocol

The protocol included systematic non-invasive (24 h Holter monitoring and exercise testing) and invasive studies.

EPS was performed systematically generally by transesophageal route in asymptomatic patients or patients with undocumented tachycardia, or by conventional intracardiac method. Fig. 1 reports the number of patients studied only by esophageal route (the most frequent), only intracardiac route or by both routes. Patients were not sedated. Details of the EPS protocol have been previously described [5,8].

Briefly, incremental atrial pacing was performed until the highest rate conducted 1/1 through the AP and/or atrioventricular node. Programmed atrial stimulation at a basic cycle length of 600 and 400 ms with the respective introduction of one and two extra-stimuli was performed. For the measurement of the AP effective refractory period (AP ERP), one atrial extra-stimulus was delivered after 7 paced atrial stimuli at a cycle length of 400 ms from 390 ms until the AP refractory pathway or the atrial effective refractory period with 10-msec decrements. The disappearance of the pre-excitation pattern was indicated upon reaching the AP ERP. When a fast AF conducted over AP was induced with this method, the protocol was halted; in the absence of induction of tachycardia conducted over AP at a rate higher than 240 bpm, isoproterenol (0.02–1 $\mu g\ min^{-1}$) was infused to increase sinus rate to at least 130 bpm after which the pacing protocol was repeated.

Pre-excitation was characterized by the following data:

AP location was determined with the 12-lead ECG recorded in maximal pre-excitation according to classical data [13–24]. The location was performed by only one Electrophysiologist. The location is easy and reliable for left AP and right or left posteroseptal location. It is more difficult to differentiate with certainty a right lateral or a parahisian AP (errors in 25% of cases). Nodo-ventricular AP is diagnosed by the absence of modification of preexcited QRS and a progressive increase of AV interval when premature extrastimuli are used.

The exact location of AP was determined by intracardiac route by the determination of the site where atrioventricular conduction was the shortest in bipolar and unipolar recording in 494 patients. Other mapping criteria used for the location were the earliest ventricular activation, the recording of AP potential, and the successful ablation site when decision of ablation was made. The presence of a His bundle potential near this site in a patient without criteria of malignancy were contraindications of ablation for our group in the past (before 2010).

Sustained AF or reciprocating tachycardia was defined as a tachycardia lasting longer than 1 min.

Conduction over the AP was evaluated by the maximal rate conducted over AP either in tachycardia or during atrial pacing.