A 64-year-old man underwent catheter ablation of drug-resistant paroxysmal atrial fibrillation. After the pulmonary vein (PV) isolation, a PV fibrillation was recorded in the left superior PV (LSPV). Double Lasso catheters were then positioned with one in the mid-LSPV and the other in the distal LSPV, and a mapping catheter (MAP) was inserted into an apicodorsal PV. There was a large frequency gradient in the PV electrical activities: the mean cycle length of MAP 1, 2 (99±6 ms) differed significantly from that of the distal LSPV (108±12 ms; P=0.027), and the mean cycle length of the distal LSPV was significantly shorter than that of the mid-LSPV (137±10 ms; P<0.001). These characteristic features of conduction delay and frequency gradient indicate fibrillatory conduction within the remaining arrhythmogenic substrate.

Moreover, the electrogram was recorded 60 mm distal to the LSPV ostium, and it showed that the myocardial sleeve extended up into the apicodorsal LSPV. Histology has shown that the maximum length of the human myocardial sleeve is 40–48 mm, mostly 10–13 mm. In addition, it has been reported that electrophysiological properties of human PVs, including very short refractory periods and slow conduction, may create a substrate for local reentry. In association with long conduction times in PVs, short refractory periods provide a very favorable milieu for arrhythmogenicity, particularly reentry in or around the veins, which may perpetuate arrhythmia and thus act as a substrate for maintenance of atrial fibrillation.

Further, a similar phenomenon in the superior vena cava has been reported.
been reported.\textsuperscript{5,6} A long myocardial sleeve with a conduction delay may be associated with an arrhythmogenicity.

Finally, to the best of our knowledge, this is the first documented case of PV fibrillation arising from an apicodorsal LSPV with a conduction delay.

**References**