Background: Conventional radiofrequency (RF) catheter ablation of atrial fibrillation (AF) are occasionally associated with severe complications such as cardiac tamponade, thromboembolism or collateral damage. It is partly due to non-uniform heating of the tissue by direct heating of RF current under cooling of the regional flow. To perform uniform heating of the tissue, we developed a RF hot balloon catheter system. Methods and Results: Using a specially designed RF generator, the balloon was uniformly heated under agitation of the inner fluid by vibration. The tissue in contact with the hot balloon at a temperature between 60 to 65 degrees C could be ablated by the effect of heat conduction without thrombus formation, where the lesion depth was proportional to the delivery time of RF energy. After successful experimental study, we treated 446 patients with AF (Paroxysmal AF (PAF), n=269; Persistent AF (Per-AF), n=78; Long persistent AF (Long-AF), n=99) using this system. PV antral isolation or box isolation was performed, under esophageal temperature monitoring and phrenic nerve pacing, without severe complications. During 12 months follow up, no AF episodes were detected without anti-arrhythmic drugs in 346 patients (PAF, n=238 (88%); Per-AF, n=53 (69%); Long-AF, n=55 (56%)). Conclusion: PV antral isolation or box isolation by hot balloon ablation could successfully treat most of the patients with AF without severe complications. Keywords: balloon, ablation, atrial fibrillation