Introduction: Visually guided laser balloon (VGLB) is a new balloon ablation technology, which facilitates pulmonary vein isolation (PVI). The aim of this study was to determine predictors of failure of PVI with use of VGLB.

Methods: Fifty-three consecutive patients who underwent PVI for paroxysmal atrial fibrillation using VGLB were studied. Pre-procedural cardiac computed tomography (CT) scanning was performed in all patients. The luminal esophageal temperature was monitored during the ablation procedure.

Result: Of the 210 PVs targeted by VGLB, 192 (91%) were successfully isolated by VGLB alone, and the remaining 18 PVs were not isolated by VGLB alone (left superior PV [LSPV]: 7 (13%), left inferior PV [LIPV]: 5 (9%), right superior PV [RSPV]: 2 (4%), right inferior PV [RIPV]: 4 (6%), p=0.39). There were no significant differences in the number and duration of laser applications and mean power applied between the PVs which were and were not isolated by VGLB alone (28±6 vs 26±10 [p=0.38], 556±141 seconds vs 510±231 seconds [p=0.23], and 9.0±1.2 W vs 8.9±1.2 W [p=0.82], respectively). Of the 12 left-sided PVs with isolation failure, laser was not applied enough due to the luminal esophageal temperature rise in 6 (LSPV: 1, LIPV: 5, 50%). The distance between the esophagus and PV ostium measured in cardiac CT images was significantly shorter in the 6 PVs with isolation failure due to the esophageal temperature rise than the other 99 left-sided PVs (3.8±0.9 mm vs 10.9±6.6 mm, p<0.01). From ROC curve analysis, the best cut-off value of the distance between the PV ostium and esophagus was 5.0 mm for predicting the esophageal temperature rise with sensitivity of 100% and specificity of 86%.

Conclusion: In this study, visually guided laser balloon ablation achieved isolation in 91% of the PVs. In the left-sided PVs, the luminal esophageal temperature rise is one of major causes of isolation failure, which can be predicted by the distance from the PV ostium and esophagus. The results of this study may be useful for determining use of laser balloon for PVI.